Timber I-Joists

A Cheaper, Lighter, Stronger Structural Alternative

From

EcoStructural PRODUCTS

Pioneers Of African Timber I-Joist Technology

Operated By: RSB (Pty) Ltd
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RSB Specialist Timber Manufacturer

Timber I-Joists For Use In Permanent Structures
Design & General Application Manual

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Case Study 1

Patio Enclosure

Tapered I-Joists with parallel fascia girder on a private house near Randburg South Africa.
In spite of relatively small rafter spans, the girder members were deep and had long spans which also formed a fascia.

Engineering:

Max Rafter Span	4230mm
Max Girder Span	5800mm
Rafter Profile	Tapered (1.5°)
Rafter c/c	813mm
Deck	18mm shutterply
Skylights	4
Total Area	32m²
Applied Load	.7398 kN/m

Case Study 2

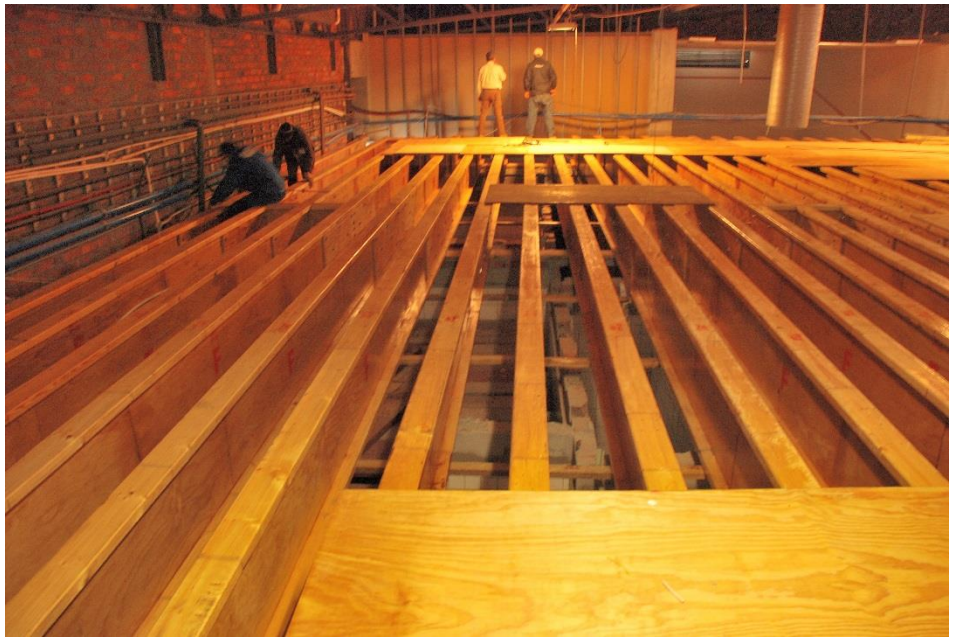
Roof Structure

Tyger Valley College Pretoria.
This project was part of an extension to existing facilities. The roof structure had initially been specified as steel I sections which were heavy and considerably more expensive than timber I-Joists. The I-Joists were delivered in single lengths and a crew of only 1 carpenter and 3 labourers installed roughly 3000m² of roof. The exposed rafter cantilevers were treated with 3 coats Rystix Timbercare exterior deep penetrating sealer.

Engineering:

Max Rafter Span:	9000mm
Rafter c/c:	1250mm
Roof Pitch:	15°
Total Rafter Length	11000mm
Roof Cover:	Steel Sheets
Applied Load:	.7375 kN/m

Case Study 3



Heavy Duty Floor Structure

This was part of a refurbishment project for Planet Fitness at their Durbanville facility in the Cape Province. Both alternative methods of construction proved to be considerably more expensive. Timber I-Joists were specified and the cost saving was 43%. The structure was installed by the main contractor who used 2 carpenters and 2 labourers who completed the project in 3 weeks. There were 21000 chipboard screws and 355 hexagon bolts. The structure spanned over change rooms which meant that continuous moisture had to be taken into account. The I-Joists were pressure treated TBTN-p followed by 3 coats Rystix Timbercare.

Engineering:

Max Span Floor Joist:	7500mm
I-Joist Depth:	500mm
I-Joist c/c:	488mm
Diaphragm Deck:	21mm Shutterply
Applied Load:	6.5kN/m²

Case Study 4

Flat Roof Deck

Private Dwelling Plettenburg Bay.
The original specification for this roof was cast in-situ concrete. The Project Manager discovered tapered I-Joists and the specification changed. This was a very challenging roof profile, but this tapered deck saved the client 33% in cost and reduced the build time by 3 weeks. There were 36 different lengths of tapered I-Joists
Supported on a steel skeletal frame.

Engineering:

Max Span:	5200mm
I-Joist c/c:	813mm
Skylights:	2
Applied Load:	.7398 kN/m

Case Study 5

Passive Solar Roof Structure

Private House Ou Baai near George South Africa. This building was designed by an architect who is passionate about alternative building technology. The near zero carbon footprint of timber I-Joists complimented the ethics and was more economical than laminated beams. The roof consisted of 50x76 purlins on top of the rafters and 21mm shutterply on top of the purlins. The roof covering was Tegola felt shingles, an ideal specification for coastal applications. All exposed timber was treated with 3 coats Rystix Timbercare.

Engineering:

Max Rafter Span:	8000mm
I-Joist Rafter c/c	1200mm
Roof Pitch:	15°
Purlin c/c:	610mm
Applied Roof Load:	.9720 kN/m

Case Study 6

Roof Level Studio

Private Dwelling Northcliff Johannesburg. The brief was to create a studio on top of the existing building which did not have adequate foundations for conventional construction methods so had to be lightweight. There were to be no internal walls and the client wanted a vaulted ceiling. This structure consists of laminated portal Frames, I-Joist rafters and I-Joist floor members. The existing ceilings were left in-situ and screwed to the bottom flanges of the I-Joists.

Engineering:

Roof Span:	8000mm
Portal c/c:	3300mm
Max Floor Span:	4800mm
Deck Cantilever:	1500mm
Applied Load Roof:	.9804 kN/m
Applied Load Floor:	.9467 kN/m

Case Study 7

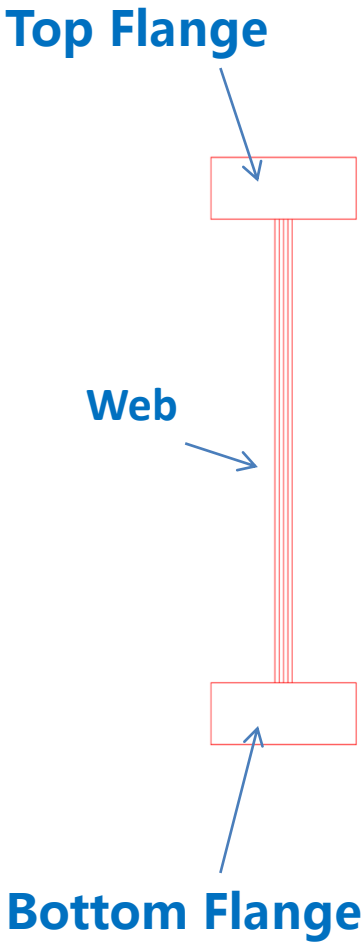
New House With Flat Roof And Timber Floor Structure

Lonehill Johannesburg South Africa.
The client wanted to create an energy efficient house using the roof to support solar panels. The floor included a double volume area where a large Saligna beam was used as girder member and proved aesthetically very pleasing. Saligna members were also used as girders as can be seen in the pictures taken during construction.

Engineering:

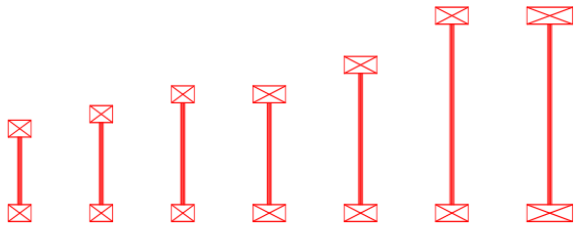
Max Roof Span:	6600mm
I-Joist c/c Roof:	813mm
Max Floor Girder Span:	5800mm
Max Floor Joist Span:	6300mm
Applied Load Roof:	.7398 kN/m
Applied Load Floor:	.9467 kN/m

I-Joist Basic Terminology

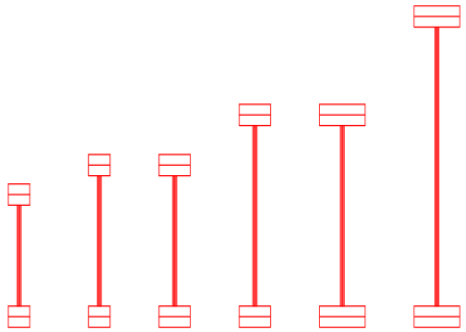


The principle behind I-Joist technology is about putting strength where it is needed at the lowest possible cost. Hence the top and bottom flanges do most of the work, whilst the web keeps the flanges apart and takes care of shear forces.
The range of I-Joists we offer has been developed specifically for use on the African continent. Low level on site skills are required whilst at the same time the product is supported by engineering services on an internationally accepted level.
The maximum depth of the web is determined by a formulation that we have developed and which prevents the webs from buckling under heavy loading conditions. The flange materials can be changed to suit various load and economic factors in the design. Currently we use only high grade Pine and Saligna (Super=Lam). The webs are cut from exterior quality plywood, not less than 12mm thick and are glued into a specially developed slot in the flanges. The flange and web are secured with resorcinol adhesive, generally as described in BS 1204 *(WB/BP)* and SANS 1349 *(Exposure Class 1 weather proof / boil proof)* and SANS 1720 *(Laminated Timber).*
There are a few additional components which may be required under certain loading conditions and which can be viewed on Slide 22.

Two Ranges Of I-Joists



Standard Pine Flanged Range



Saligna Super=Lam Range

Two Ranges of I-Joists

There are currently two ranges of timber I- Joists available to the African and Middle Eastern markets. The standard range has high grade SA Pine flanges, whilst the heavy duty or industrial range has Super=Lam *(Saligna Grandis)* flanges.

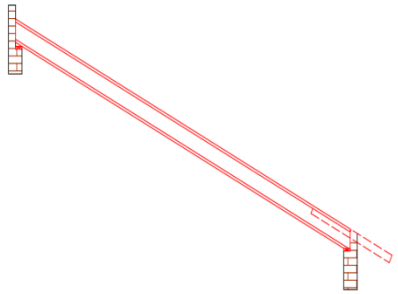
As a standard issue, both ranges are supplied with 12mm exterior plywood webs which can be altered in thickness and depth to suit various applications.

Both ranges of I-Joists have similar accessories, however, should special products be needed they will be designed and supplied through Engineering Services.

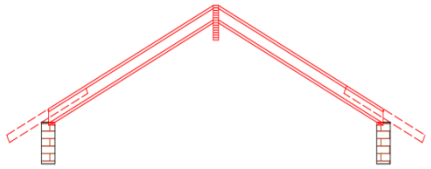
All tables in this manual have been engineered, the size and cost comparisons have been carefully worked out to ensure a direct comparison to laminated beams.

We have been around for a long time and have gained much knowledge and experience along the way. As the only supplier on the African continent are able to offer our product range to the African and Middle Eastern markets with confidence. This is based upon 27 years experience and sound engineering principles which lead to a world class range of structural support members. All structures supplied by Eco Structural Products cc are rational design.

General Applications
Roof Structures 1



Mono Pitched Roofs



Dual Pitched Roofs

I-Joists work well when specified as rafters for both concrete tiled and steel sheeted roofs.
In the case of concrete tiles, spans of up to 11.0m can easily be accommodated, whilst for steel sheets the maximum span is 12.0m. More recently, there has been a shift in the market as more professionals are specifying timber I-Joists for energy efficient projects such as passive solar buildings and **mono** pitched roof structures.
I-Joist rafters can be supplied with a special *overhang sprocket* which forms the eaves at either end of the rafter. The sprocket is profiled in such a way as to fit under the rafter top flange with the exposed section remaining in line with the rafter top to enable purlins or battens to be installed in the same plane.
and is fastened under the top flange, but finishes flush with he top flange to provide continuity in the rafter top level.

Another common application is for **dual pitched** roofs as shown opposite. This is typically for attic roofs or as a support structure for architectural or vaulted ceiling requirements. The ridge beam may be designed as either a laminated beam or as an I-Joist depending upon aesthetic requirements.

General Applications
Roof Structures 2

Single Tapered I-Joist For Flat Roof or Flat Deck Design

Dual Tapered I-Joist For Flat Roof Design or Special Applications Various Configurations Are Available

The heading 'Roof Structures 'includes flat roofs as is most common in North African and Middle Eastern countries. The architectural requirements in some of these situations can be diverse. There are several advantages in applying I-Joist technology in flat roof situations mainly:

- ✓ Timber I-Joists have an excellent strength to weight ratio.
- ✓ The system involves no wet trades
- ✓ Timber is inert to thermal expansion, reducing the likelihood of cracked parapets.
- ✓ Skylights an be easily cut into the roof deck without compromising structural integrity.
- ✓ The lightweight nature of this product reduces building mass and is especially effective in situations where foundations may be under-designed or situated in expansive soil conditions.

Single and double tapered I-Joists can be designed as shown in the examples opposite.

Tapered I-Joists are spaced on a fixed module of 813mm c/c and have a minimum pitch of 1.5°. The maximum span achieved to date is 11.5m. 21mm exterior shutterply is screwed to the top flange to form the deck and virtually any waterproofing system can be laid on top.

There are no load/span tables for this system, all designs are specifically engineered for purpose.

General Applications
Floor Structures 1

Single Span Floor Joist

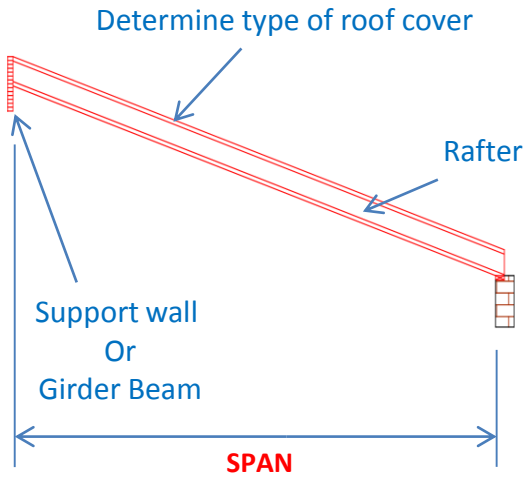
Single Span Floor Joist
With Stair Well

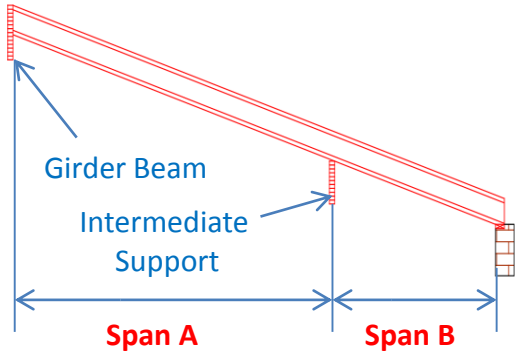
Single Span Floor Joist With
Girder Support And Cantilever

Single Span Floor Joist
With Cantilevered Deck

Applications that are suitable for timber I-Joists in floor structures range from simple domestic floors for a mezzanine level or attic roof floor to industrial and commercial structures which carry much higher loads.
Some floors include stairwells and cantilevered balconies extending from attic roofs are common. We have developed a system called Bridging which enables a single length of I-Joist to be installed across an entire building with a maximum span of 7.5m. The existing roof structure and ceilings can be screwed to the I-Joists before cutting out the truss webs, a significant safety feature.
Generally, I-Joists in floor structures are spaced at 488mm c/c and the use of a sub-floor is always recommended. This is usually 21mm shutterply which is screwed to the top flange of the I-Joist. In certain heavily loaded situations the shutterply is also glued which forms a diaphragm and helps to stiffen the floor.

Selecting The Right I-Joist
Roofs





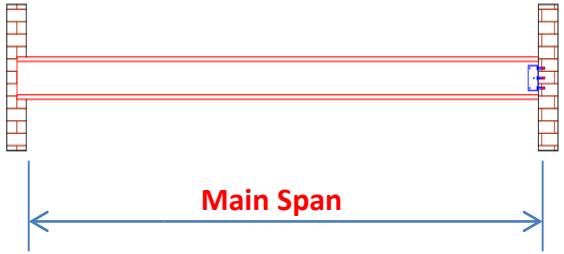
Required Information For I-Joist Selection:

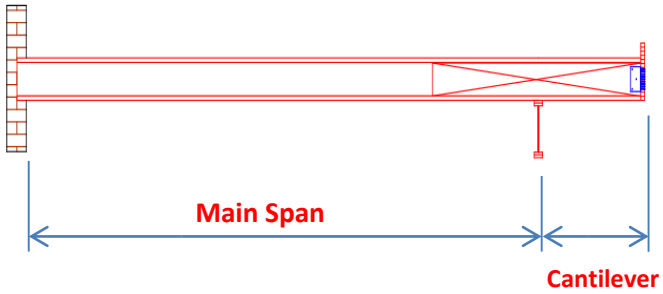
1. Determine what type of roof covering you are going to use, steel sheets or concrete tiles *(in the case of something else, contact Engineering Services)*
2. Determine the maximum span, the longest distance between two supports, see Span A & Span B as an example
3. Add 100mm on each end for bearing if the I-Joists are to rest on a wall.
4. Check what roof pitch you are going to use, for concrete tiles no less than 17.5° and for steel sheets (IBR type) not less than 7°.
5. How long is your eaves overhang, you will need to specify this when ordering your I-Joist rafters

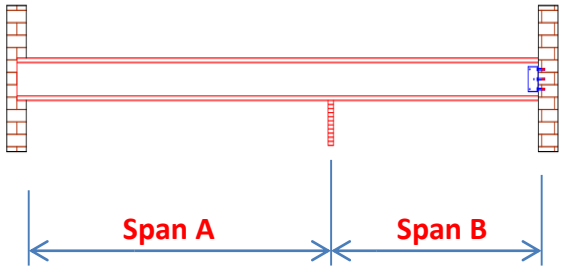
All intermediate timber support members (girders) are to be referred to Engineering Services for design.

Once you have established the roof covering and the maximum span, look up the relevant load/span table on page 18 for the correct I-Joist size and call one of our Sales Team for a quote.

Selecting The Right I-Joist
Floors







Required Information For I-Joist Selection:

1. Determine what type of floor you are intending to construct, domestic or commercial/industrial.
   (Note: ALL applications other than domestic are to be referred to Engineering Services)
2. Determine the maximum span, the longest distance between two supports.
3. Add 100mm on each end for bearing if the I-Joists are to rest on a wall.
4. Once you have your span it is easy to choose your domestic I-Joists from the load/span tables provided on Page 18

All intermediate timber support members (girders) are to be referred to Engineering Services.

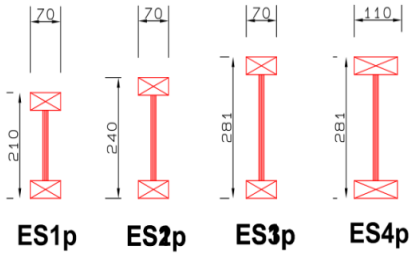
Section Size Comparison Table
Pine I-Joist Vs. Pine Laminated Beam
An Equivalent Load Comparison

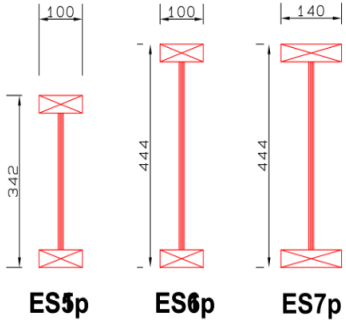
Roofs	*Direct Size Comparison Between Pine Flanged I-Joists and Pine Laminated Beams*							
Roof Type		1	2	3	4	5	6	7
Concrete Tiles	**I-Joist**	ES1p	ES2p	ES3p	ES4p	ES5p	ES6p	ES7p
	Lamstock	65 x 231	65 x 264	65 x 297	97 x 297	97 x 330	97 x 396	97 x 429
Steel Sheets	**I-Joist**	ES1p	ES2p	ES3p	ES4p	ES5p	ES6p	ES7p
	Lamstock	65 x 231	65 x 264	65 x 264	97 x 297	97 x 330	97 x 396	97 x 429

Floors		1	2	3	4	5	6	7
Domestic Floors	**I-Joist**	ES1p	ES2p	ES3p	ES4p	ES5p	ES6p	ES7p
	Lamstock	65 x 231	65 x 264	65 x 264	97 x 297	97 x 330	97 x 396	97 x 429

Design criteria has been taken from loadings as specified in SANS 10160, 10163 and relevant associated documents. The designs have been determined by using 'Working Stress' and NOT Limit States methodology.

Solid Pine Flanged I-Joists





SOLID PINE FLANGED I-JOISTS

12-10-2013

Assumptions for Roof design:

Roof pitch:	25 degs tiles, 10 degs metal sheeting
Live load: (statutory)	0.3 to 0.5 kN/m2, depending on area supported
Concrete Roof Tiles:	0.54kN/m2
Metal sheeting 0.5mm:	0.10kN/m2
Ceiling load: 6.4mm gypsum	0.14kN/m2
Allowable deflection ratio	span/250

Other loads not allowed for:
Aircon ducts or units, water sprinkler systems, solar water geysers

Standard battens/purlins:			Recommended Spacing
Concrete roof tiles:	38 x 38mm battens		760mm
Metal sheeting:	50 x 76mm purlins on edge		1250mm

Roofs		I-Joist span m						
Roof Types	Joist c/c mm	ES1p	ES2p	ES3p	ES4p	ES5p	ES6p	ES7p
Concrete tiles	760	4,80	5,30	6,10	7,10	8,40	10,30	11,40
Metal sheeting	1250	4,90	5,50	6,30	7,40	8,80	11,10	12,50

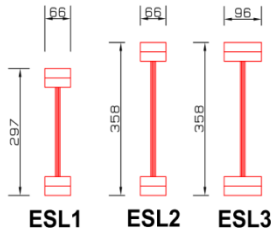
Assumptions for Floor Design (Pine Flanged I-Joists)

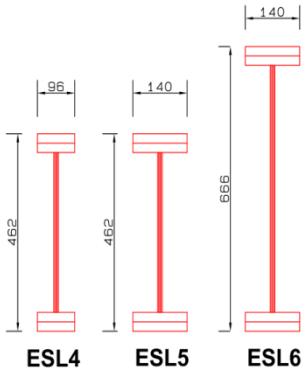
Live load: (statutory)	1.5kN/m2	
Floor dead load:	0.126kN/m2	0,126
Ceiling load: 6.4mm gypsum	0.14kN/m2	
Allowable deflection ratio	span/400	

Spacing:	488mm - Module of Sub-Floor board length 2440mm

Floors		I-Joist Span m						
	Joist c/c mm	ES1p	ES2p	ES3p	ES4p	ES5p	ES6p	ES7p
Domestic	488	4,20	4,70	5,30	6,20	7,20	8,90	9,80

Saligna 'Super=Lam' Flanged I-Joists Load-Span Table





Saligna Super=Lam Flange I-Joists

11-01-2014

Assumptions for Roof design:

Roof pitch:	25 degs for concrete tiles, 10 degs for metal sheeting
Live load: (statutory)	0.3 to 0.5 kN/m2, depending on area supported
Concrete Roof Tiles:	0.54kN/m2
Metal sheeting 0.5mm:	0.10kN/m2
Ceiling load: 6.4mm gypsum	0.14kN/m2
Allowable deflection ratio	span/250

Other loads not allowed for:
Aircon ducts or units, water sprinkler systems, solar water geysers

Standard battens/purlins:		**Recommended Spacing**
Concrete roof tiles:	38 x 38mm battens	760mm
Metal sheeting:	50 x 76mm purlins on edge	1250mm

Roofs		**I-Joist span m**					
Roof Types	Joist c/c mm	ESL1	ESL2	ESL3	ESL4	ESL5	ESL6
Concrete tiles	760	7,10	8,30	9,40	11,60	13,10	17,50
Metal sheeting	1250	7,40	8,70	10,00	12,50	14,10	18,50

Assumptions for Floor Design (Super=Lam Flanged I-Joists):

Live load: (statutory)	1.5kN/m2
Floor dead load:	0.126kN/m2
Ceiling load: 6.4mm gypsum	0.14kN/m2
Allowable deflection ratio	span/425

0,126

Spacing:	488mm - Module of Sub-Floor board length 2440mm

Floors		**I-Joist span m**					
	Joist c/c mm	ESL1	ESL2	ESL3	ESL4	ESL5	ESL6
Domestic	488	6,00	7,00	7,90	9,70	11,00	14,50

Engineering - Safe Load Tables

PINE - SOLID

E	9600	4500
fb	7,1	
ft	5,2	
fv	0,9	2

Pine Flanges					Safe Load Table				Eco Structural Products				
I-Joist Ref	T -Depth	plydepth	b	tflange	tweb	h	EI	J	Z	Mr	Vrflange	Vweb	Vr
													0,0001
ES1p	211	169	70	36	12	139	3,8775E+11	2,2148E+06	3,8285E+05	2,718	4,946	4,141	4,141
ES2p	240	198	70	36	12	168	5,2995E+11	2,2226E+06	4,6003E+05	3,266	5,799	4,785	4,785
ES3p	281	239	70	36	12	209	7,7237E+11	2,2337E+06	5,7263E+05	4,066	7,037	5,689	5,689
ES4p	281	239	110	36	12	209	1,1902E+12	3,4779E+06	8,8245E+05	6,265	6,901	5,769	5,769
ES5p	342	300	110	36	12	270	1,8766E+12	3,4943E+06	1,1432E+06	8,116	8,711	7,139	7,139
ES6p	444	402	110	36	12	372	3,4040E+12	3,5219E+06	1,5972E+06	11,340	11,851	9,402	9,402
ES7p	444	402	149	36	12	372	4,5288E+12	4,7349E+06	2,1250E+06	15,087	11,640	9,502	9,502

Super=Lam Flanges

E	12000	4500
fb	10,5	
ft	6	
fv	0,9	2

Saligna Super=Lam Flanges					Safe Load Table				Eco Structural Products				
I-Joist Ref	T -Depth	plydepth	b	tflange	tweb	h	EI	J	Z	Mr	Vrflange	Vrweb	Vr
													0,001
ESL1	297	239	66	44	12	209	1,1676E+12	3,7932E+06	6,5523E+05	6,880	7,151	5,958	5,958
ESL2	358	300	66	44	12	270	1,8178E+12	3,8064E+06	8,4625E+05	8,886	8,971	7,316	7,316
ESL3	358	300	96	44	12	270	2,6037E+12	5,5101E+06	1,2122E+06	12,728	8,834	7,395	7,395
ESL4	462	404	96	44	12	374	4,6800E+12	5,5326E+06	1,6883E+06	17,727	11,928	9,735	9,735
ESL5	462	404	140	44	12	374	6,7171E+12	8,0313E+06	2,4232E+06	25,443	11,739	9,834	9,834
ESL6	666	608	140	44	12	578	1,5192E+13	8,0754E+06	3,8018E+06	39,919	17,843	14,443	14,443

Spare Page For Interactive design

Span-Tek

Under Development

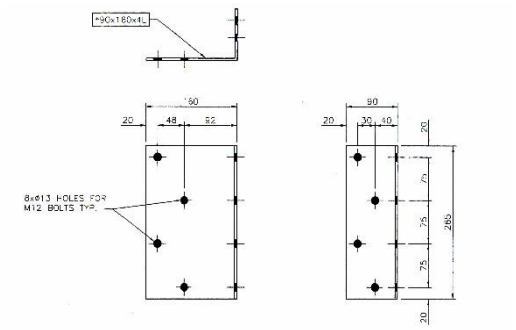
Accessories

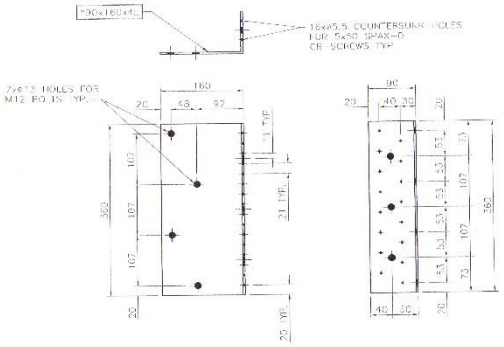
Product Name	General Description
Diaphragm Sub-Floor	21mm exterior grade shutterply which is screwed to the top flange of the I-Joist
Wedge	Tapered section of timber used to form drainage channel on flat roof decks
Shear Block	Cut from 12mm exterior grade plywood sheet and fixed to the I-Joist web to add stiffness at the bearing points
Standard Range Steel Brackets	Specially designed steel brackets for application with both ranges of I-Joist see slide 23 for details
Eaves overhang sprocket	Specially developed for the I-Joist range where standard eaves appearance is required and may only be purchased from ESP
Fasteners	A range of chipboard screws and hexagon bolts with steel plate washers is available specifically for use with timber I-Joists

Standard Range Brackets

Bracket Reference	Thickness	Flange A	Flange B	Length	Bolt Holes	Chipboard Screw Holes
ES120 A	4	75	120	120	4	0
ES120 B	4	75	120	120	2	10
ES200 A	4	75	120	200	6	0
ES200 B	4	75	120	200	3	15
ES265 A	4	90	160	265	8	0
ES265 B	4	90	160	265	6	9
ES360 A	4	90	160	360	8	0
ES360 B	4	90	160	360	7	16

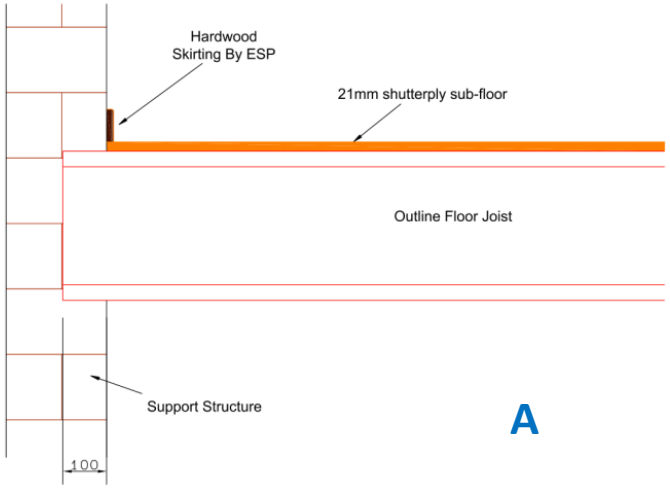
This range of brackets are available in both mild steel and stainless steel, often we design brackets specifically for purpose in special applications, examples are shown in the pictures left. Brackets can also be supplied with galvanized finish for coastal regions. Some brackets have only 14mm Ø bolt holes whilst others have Countersunk holes for chipboard screws as well as holes for bolts. There are reasons for this, check your specifications carefully and do not miss any fastenings out.



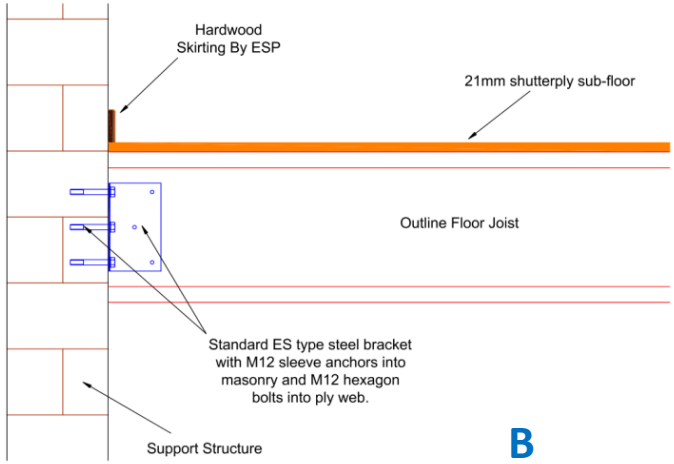


Installation Details - Floors 1

Most Common Situations



A



B

The floor joist in **Situation A** is the most common and cost effective way to install an I-Joist in a domestic application as no brackets or expensive fasteners are required. However, the portion of the I-Joist that rests inside the wall must be sealed with a suitable timber sealer to prevent chemical reactions and moisture entering the end grain of the flanges.

All I-Joist designs are based on the module of 488mm c/c unless otherwise authorised by Engineering Services

In **Situation B** the I-Joist is connected to the wall with a standard ESP bracket (see page 23). Only fix the bracket to the wall with M12 x 100mm long sleeve anchors and through the web with M12 x 50mm long hexagon set screws. A 38x38x4mm plate washer is to fitted to the ply face on the opposite side to the bracket.

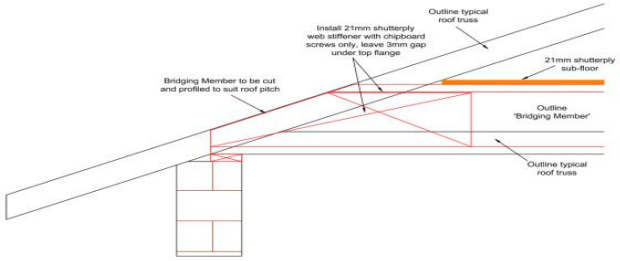
IF IN DOUBT CHECK WITH ENGINEERING SERVICES

Both situations A&B show the 21mm shutterply sub-floor screwed to the top flange of the I-Joists. The inclusion of the sub-floor is highly recommended, as it helps to stiffen the floor and improve overall performance. It also provides a platform onto which carpets and other floor finishes can be fitted directly, there is no need for wet trades such as screeds or lightweight concrete.

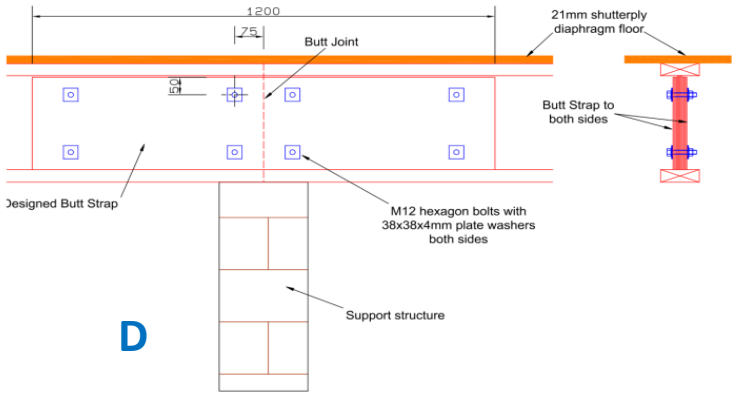
Installation Details - Floors 2

Other Applications

C

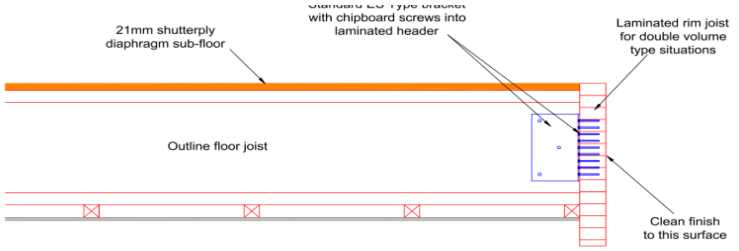


In **Situation C** a system known as **Bridging** is used to form a floor in an attic roof conversion. The I-Joist in a single Length, is fed into the roof cavity from one side of the building and spans the entire width. Existing roof truss members can be fastened to it as well as the ceiling battens which means that ceilings do not have to be replaced thus saving time and expense. Another development by:
Eco Structural Products cc



D

Situation D shows how to join I-Joists together on top of a wall or other support member. The two I-Joists are butted together and are connected with a Butt Strap which is then bolted as shown. The length of the butt strap and the number of bolts must be determined by Engineering Services.

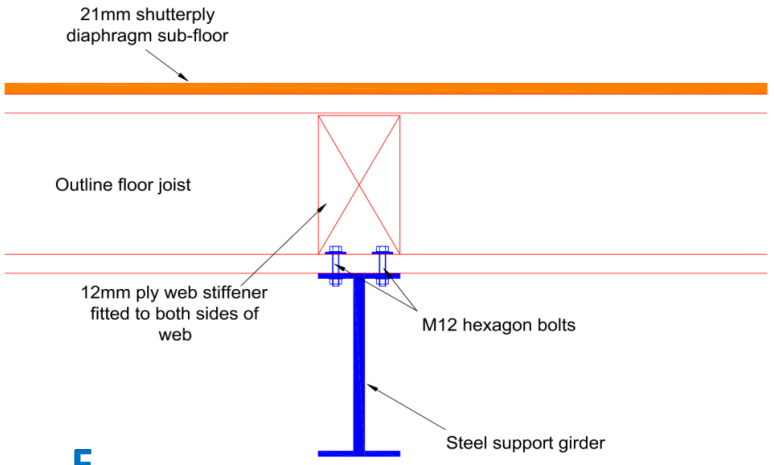


E

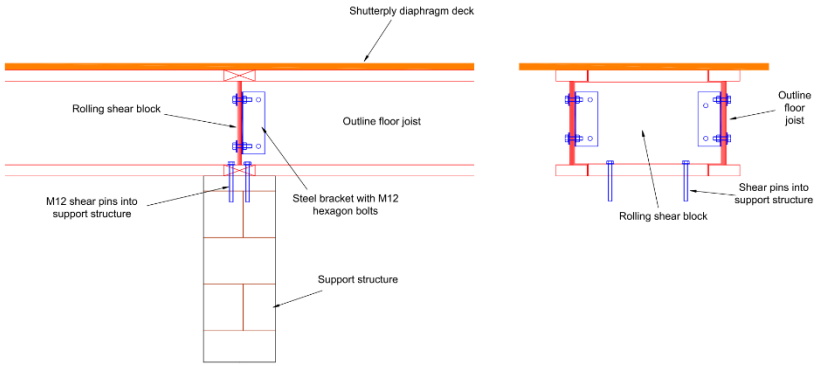
In cases where there are double volume spaces, balconies or stairwells, the I-Joists need to be secured to a rim joist or other girder. In **Situation E**, a laminated rim joist is used to form a stairwell or face of a double volume. The bracket is from the standard range of ESP brackets and it can clearly be seen why there are both bolt holes and chipboard screw holes in such a bracket.

Installation Details - Floors 3

Industrial Applications



F



G

In **Situation F**, there is an industrial floor with 21mm thick shutterply sub-floor stitched to the top flange of the I-Joist As previously described. The connection to the steel girder can be as on
top as shown or can be fixed to the side of the girder by means of a steel cleat welded into the steel beam to carry the I-Joist. This cleat must be large enough to accommodate the correct amount of bolts required for the connection. For Engineers, the value of an M12 bolt in 12mm ply is 2.7kN per bolt with spacings not less than 6 x diameter between the bolts.

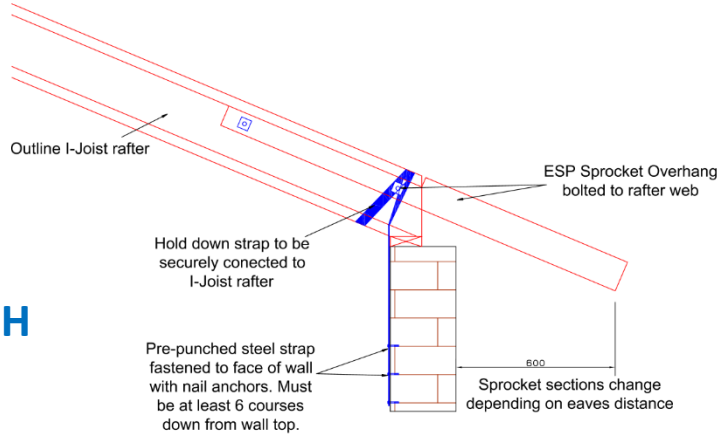
Situation G shows the application of a Rolling Shear Block which is a necessity in cases of heavily loaded floors. The rolling shear block prevents the I-Joists from rolling over like dominoes and is an essential component in terms of floor stability. These members are installed at designed centres along the length of the floor at the bearing points.

General Installation Information:

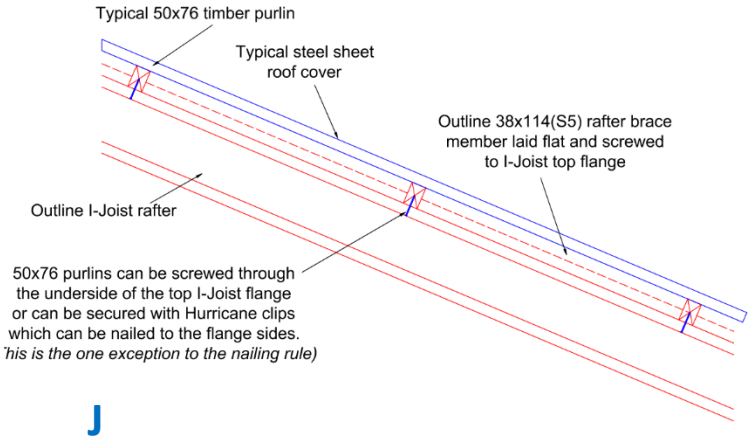
- ❑ Ensure that your support structure is level and is square before you start or your I-Joist structure may not perform as you want it to.
- ❑ Do not cut flanges under any circumstances beyond trimming to length.
- ❑ Drill holes to max 50mm Ø, preferably on the neutral axis or centreline only.
- ❑ Do not place fasteners closer to the flange end grain than 6 x fastener Ø and no nearer the edge of the member than 4 x Ø as splitting or tear-out could occur under load.
- ❑ Try not to insert fasteners on the centreline of the flanges as this could damage the glue line.

Installation Details - Roofs 1

Overhang Sprockets & Purlins For Sheeted Roofs



H



J

Timber I-Joists last longer and perform better if they remain inside your building protected from harmful UV and moisture. Exposing I-Joists to the elements, could result in costly annual maintenance. In cases where there are eaves overhangs, we have developed the Sprocket Overhang as in **Situation H**. Essentially this is an extension of the top flange which has been cut and strengthened to carry roof loads. It is installed under the top flange and bolted tough the web and screwed through the top flange ensuring total load transfer. Sprocket overhangs are available in two section sizes, 36x110 and 36x149. Also ensure that I-Joist rafters are held down to the superstructure with steel bracing strap as described in the detail opposite.

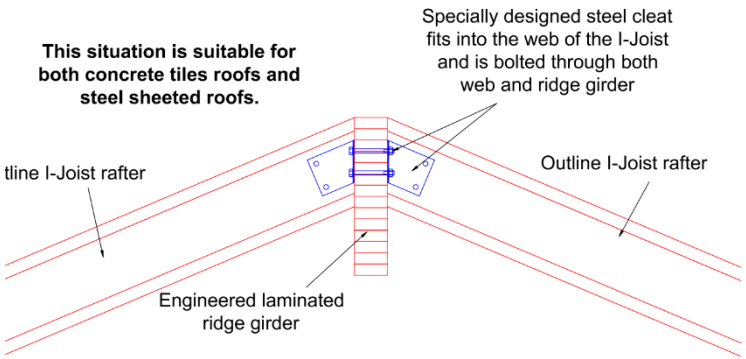
Situation J shows a typical I-Joist rafter with 50x76 pine purlins secured to the top flange. Purlins can be secured by means of Hurricane Clips or chipboard screws inserted from the underside of the top flange or both. Hurricane Clips can be nailed with 32mm clout nails and is the sole exception to the nailing rule.

General Installation Information:

- ❑ The space between the purlins provides an ideal platform into which bracing can be installed. In most cases use 36x110(S5) members laid flat on top of the top flange, ensuring that the full width of the flange is covered, then insert 4 x No.10x60mm long chipboard screws at each connection. The brace member needs only to span over two rafters and should be tight against the purlin side.
- ❑ DO NOT NAIL brace members.
- ❑ Do not exceed rafter spacings as specified.

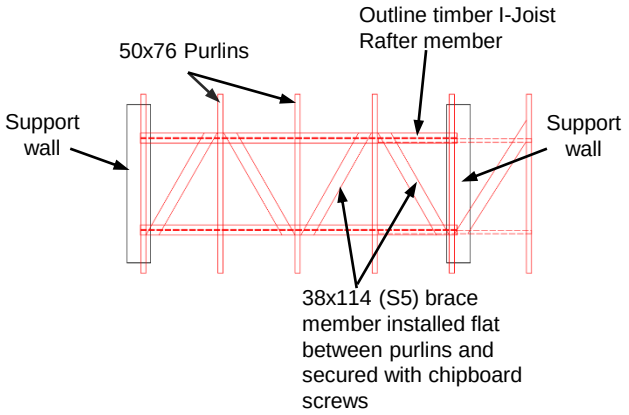
Installation Details - Roofs 2

Ridge Beam & Rafter Design - General Bracing Details



K

Situation K shows a very popular type of roof construction, especially for attic roofs or architectural situations where vaulted ceilings are required. In this case, the brackets are made specifically to suit the roof pitch and rafter depth.
This type of roof design can be adapted to carry concrete tiles, slate, steel sheets and is especially efficient for diaphragm roofing with felt shingles.
Ridge girders can be designed in laminated pine or Saligna beams or I-Joists. I-Joists with Super=Lam flanges are particularly well suited to longer spanning situations.



L

All roofs need to be braced in some way or another. In particular sheeted roofs must be braced and the space between the purlins is ideal for this as shown in **Situation L.** Generally, a 36x110(S5) member is laid flat on top of the rafter top flange and is screwed to the flange with 4 x No.10x60mm long chipboard screws evenly spaced and away from the centreline of the rafter.
For roofs with concrete tiles, the brace member is situated under the top flange and is positioned at 45° to the rafter.
The brace members will need to be trimmed to fit against the rafter web.