

Design Aid Manual

*Now also includes
Letter of Certification
& Bearer Span Table*



HOPLEYS

OPENWEBSTEELJOISTS



"...has over 60 years experience and a respected reputation in Sheet Metal fabrication and associated engineering."

"Their innovative design, high quality fabrication, neat appearance and light weight have proven to be dominant features in outstanding market acceptance of this relatively new product."

Design Certification

To the Building Surveyor,

All span tables, connection details and installation advice given in this Design Aid Manual has been prepared using a combination of practical load testing procedures and sound accepted engineering principles in accordance with the following Australian Standards.

AS1170.1 - Structural design actions - Permanent, imposed and other actions.


AS1170.2 - Structural design actions - Wind Loads.

AS4100 - Steel Structures

AS4600 - Cold Formed Steel Structures

I certify that the information contained in this Design Aid Manual is correct and complies with the relevant standards listed above. For site specific certification, or special requirements not covered in this manual, please contact your Hopleys representative.

Certified for and on behalf of Hunt Engineering & Staff Pty Ltd.


Howard Morley
 Howard Morley & Associates P/L
 MIEAust, CPEng, EC-1350



Hopleys, a division of Hunt Engineering & Staff Pty. Ltd., has over 60 years experience and a respected reputation in Sheet Metal fabrication and associated engineering.

Hopleys' steady growth has been based on mechanical and structural engineering skills, backed up by first class craftsmanship.

During the 1970's when the building and construction industries were experiencing a rapid growth, prefabrication suddenly became a high growth opportunity. Faster, more economical time saving components were required on building and construction sites.

Hopleys, the metal building products division of Hunt Engineering identified the opportunity for the development of a light weight steel joist. The result of the research and development was a unique open web steel joist, made from light weight, high grade steel, galvanised for corrosion protection. Having taken the decision to produce and market joists, Hopleys set about designing and building special rolling and welding equipment and set up production facilities.

Modern fasteners, such as self tapping screws, along with versatile tools were by then readily available and widely in use. These, together with specially designed standard fittings greatly enhanced the ease of installation.

Hopleys steel joists are manufactured from light weight galvanised steel for durability and require little or no maintenance. Their obvious advantages over timber products are stability without warping or shrinking, lack of costly offcuts and ease of handling during construction. These characteristics afford the ease of modular design for enhanced strength plus a pleasing appearance when exposed.

The HJ range comes in standard heights of 150mm, 200mm, 250mm & 300mm. The HB range comes in standard heights of 300mm, 350mm,

400mm & 450mm as well as 'made to order' specials as requirements dictate, and are manufactured to any length required.

The open web design permits ready access for all pass through services, such as pipes and cables. The unique design has no sharp edges or surfaces which adversely affect these services. They offer flat surfaces for easy seating and fixing of ceilings and flooring. They also offer easy man handling, low cartage and crane costs and are an economical, strong alternative to conventional timber and rolled steel beams.

Benefits

Their innovative design, high quality fabrication, neat appearance and light weight have proven to be dominant features in outstanding market acceptance of this relatively new product.

Hopleys open web steel joists offer the following design features:

1. Economical
2. Conform to building standards
3. Light weight for ease of handling
4. Made from galvanised steel for long life and low maintenance
5. No twisting under loads, thus improved stability
6. No shrinkage or warping problems
7. Reduced dead loads
8. Open web construction permitting access for pass through services
9. Standards heights available 150mm, 200mm, 250mm, 300mm, 350mm, 400mm & 450mm
10. Hopleys open web steel joists are available Australia wide from our extensive distributor network
11. Steel products conserve our natural timbers and forests

The following information provides an insight into some of the typical applications of the Hopleys joist, but the range of uses is only limited to the imagination of the user.

- *Termite proof*
- *Corrosion resistant*
- *Can be trimmed on site*
- *Cost competitive*
- *Uniform sizes & widths*
- *Large joist spans allow wider bearer spacing and less columns*
- *All steel*
- *No shrinking & warping*
- *Environmentally friendly*
- *Light weight & easy to handle*



“Their open web design permits ready access for all pass through services such as pipes and cables.”



Open Web Steel Joists offer unique possibilities in both design and cost effectiveness because of fast erection, high rigidity and a no maintenance finish.

Typical industrial applications include mezzanine and multi-level flooring, conveyor decks, catwalks, stages, platforms, workrooms and storage rooms.

Some typical commercial applications include office mezzanines, raised floors, showrooms, computer floors and raised storage areas.

They offer a flat easy to mount surface, with good load bearing characteristics and high durability.

The open web design also allows access for pass through services, reducing the overall floor thickness.

The ‘HB’ Range can be doubled up, when required, to provide structural members which can be hidden within the floor thickness, eliminating unsightly bulkheads.

Mezzanine Floors/Light Industrial Workrooms/Storage up to 2.4m high/General Industrial Mezzanines

Industrial Flooring		Maximum Allowable Span							
Load	Spacing (mm)	HJ150	HJ200	HJ250	HJ300	HB300	HB350	HB400	HB450
Live Load 3.0kPa	450	3.4	4.2	4.6	5.6	6.6	7.4	8.1	8.8
	600	2.9	3.6	4.0	4.7	6.1	6.7	7.3	7.0
Live Load 5.0kPa	450	3.1	3.8	4.5	5.1	5.8	6.5	7.2	8.0
	600	2.8	3.5	4.0	4.6	5.2	6.0	6.5	7.2

Dead Load = 0.3kPa Maximum Deflection = Span/250

Workshops/Factories/Classrooms/Offices/Commercial Kitchens/Gymnasiums/Shops

Commercial Flooring		Maximum Allowable Span							
Load	Spacing (mm)	HJ150	HJ200	HJ250	HJ300	HB300	HB350	HB400	HB450
Live Load 3.0kPa	450	-	3.3	3.9	4.5	5.0	5.7	6.3	6.8
	600	-	3.0	3.5	4.0	4.6	5.1	5.7	6.2
Live Load 5.0kPa	450	-	2.8	3.4	3.8	4.3	4.8	5.4	5.9
	600	-	2.6	3.0	3.4	3.9	4.4	4.9	5.4

Dead Load = 0.3kPa Maximum Deflection = Span/500



“They offer a flat surface, good load bearing characteristics and high durability.”

Hopleys light weight galvanised open web joists are ideal for domestic flooring applications. They are suitable for both subfloor and particularly first floor applications because of their light weight and easy installation. They also make fitting for pass through services, such as electrical wiring and plumbing,

extremely easy. They offer a flat surface, good load bearing characteristics and high durability. Our light weight joists reduce flooring dead loads which in turn reduces the size of the supporting members and lowers overall costs. They allow larger spans, reducing stump and bearer costs and installation time.



Residential Floors/Balconies under 1m high/Balconies over 2m high

Domestic Flooring				Maximum Allowable Span					
Load	Spacing (mm)	HJ150	HJ200	HJ250	HJ300	HB300	HB350	HB400	HB450
Live Load 1.5kPa	450	3.5	4.2	4.8	5.5	6.5	7.3	8.0	8.7
	600	3.2	3.8	4.3	5.0	6.0	6.6	7.2	7.9
Live Load 2.0kPa	450	3.1	3.8	4.5	5.1	5.8	6.5	7.2	8.0
	600	2.8	3.5	4.0	4.6	5.2	6.0	6.5	7.2

Dead Load = 0.25kPa Maximum Deflection = Span/500

Domestic Bearer Span Table		Maximum Allowable Span				
Live Load 1.5kPa		Load Width = Add the joist spans on both sides of the bearer then divide by 2				
Load Width	HJ150	HJ200	HJ250	HJ300	HB300	
1800	2400	2900	3500	4000	4500	
2400	2200	2700	3200	3600	4100	
3000	2000	2500	2900	3200	3800	
3600	1900	2300	2600	3000	3500	
4200	1800	2100	2400	2800	3300	
4800	1700	2000	2300	2600	3200	
5400	1600	1900	2100	2400	3100	
6000	1500	1800	2000	2200	3000	

Dead Load = 0.25kPa Maximum Deflection = Span/500

Please Note: If you are not familiar with Bearer Span Tables please contact your Hopley's Representative for clarification.

"Hopleys Joists may be powder coated in a range of fashion colours to make them a design feature on internal applications."



Roofing - General



Although commonly referred to as a joist, the HJ & HB range of products are ideal for use as a truss or rafter in all types of roofing.

Skillion or gable constructions are suited to our joists for use in domestic, industrial and agricultural areas. ie. houses, carports, garages, factories, farm sheds and lean-to's.

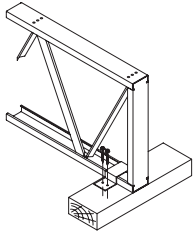
They may also be used for hanging beams and suspended ceilings.

Hopleys Joists may be powder coated in a range of fashion colours to make them a design feature on internal applications.

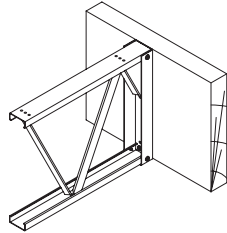
Span		Maximum Allowable Spacing, Simply Supported				
Metres	HJ150	HJ200	HJ250	HJ300	HB350	HB450
3.5	3600					
4.0	2700	4200				
4.5	2100	3300	3600			
5.0	1700	2600	3300	3600		
6.0	1200	1800	2300	3000		
7.0	900	1300	1700	2400	7000	
8.0	650	1000	1300	1800	5600	7000
9.0		800	1000	1200	4400	5800
10.0			800	1100	3400	4700
11.0				900	2500	3900
12.0					1800	3200
Live Load 0.25kPa Dead Load 0.13kPa		Maximum Deflection Span / 180				

This table may also be used for wind uplift to a maximum of 0.4 kPa with suitable lateral restraints. Where wind load governs, ie., in excess of 0.4 kPa, the span shall be reduced. No provision has been made for the 1.3kN concentrated load. Where joist ends have rigid connections or are over multiple supports the spans may be increased. Consult your / our engineer for details.

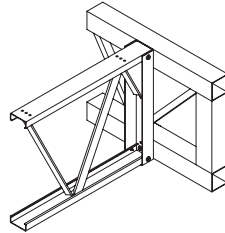
Standard Connection Details



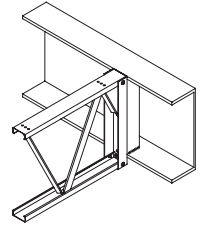
HOPLEYS JOIST TO WALL PLATE
END CLIP FITTED / NAIL CLIP &
4 - 12 x 40 SELF TAPPING SCREWS



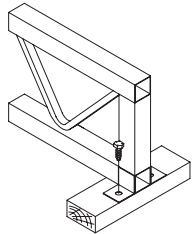
HOPLEYS JOIST TO WALL PLATE
4 - 12 x 40 SELF TAPPING SCREWS TO TIMBER
4 - 12 x 20 SELF TAPPING SCREWS TO JOIST



HOPLEYS JOIST TO HOPLEYS
BEAM WITH HJ SHOE
8 - 12 x 20 SELF TAPPING SCREWS TOTAL



VERTICAL HUNG SHOE
50 X 1.6 SHS TACK WELDED
BETWEEN BEAM FLANGES



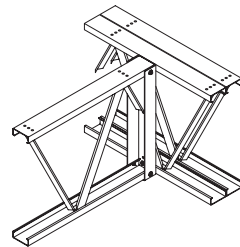
HOPLEYS BEAM TO WALL PLATE
HOLDING DOWN ANGLES B/S
2 - M12 x 40 COACH SCREWS



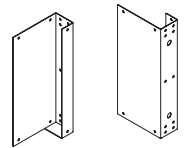
NAIL CLIP
12 x 20 SELF TAPPING SCREW



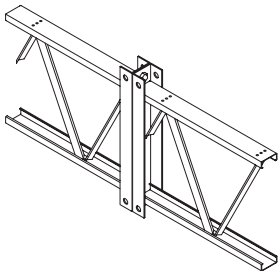
HOLDING DOWN ANGLE
M12 x 40 COACH SCREW



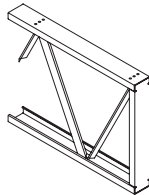
HOPLEYS JOIST TO HJ DOUBLE
WITH HJ SHOE
8 - 12 x 20 SELF TAPPING SCREWS TOTAL



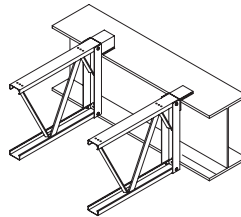
HJ SHOES



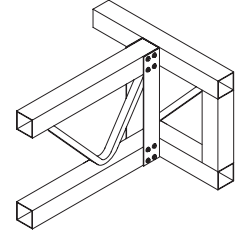
HOPLEYS JOIST
CONNECTION USING KNEE
CHANNELS, 2 - M16 X 40 BOLTS



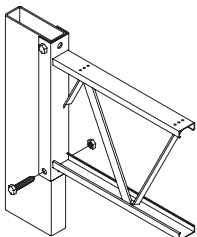
HOPLEYS JOIST
END CLIP FITTED



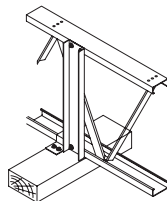
HOPLEYS TOP HUNG SHOES
50x50 SHS OR 75x8 E.A.
WELD SHOE AT TOP ONLY



HOPLEYS BEAM TO HOPLEYS
BEAM WITH HB SHOE
24 - 12 x 20 SELF TAPPING SCREWS TOTAL



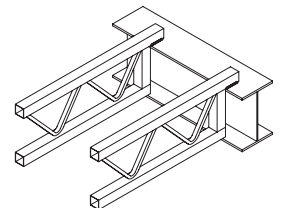
HOPLEYS JOIST TO COLUMN
REVERSE KNEE CHANNEL
2 - M16 x 80 BOLTS



HOPLEYS JOIST OVER WALL PLATE
LOAD CLIP 1 SIDE, 4 - 12 x 20 SELF
TAPPING SCREWS



LOOSE END CLIP
ALSO DOUBLES AS
A LOAD CLIP

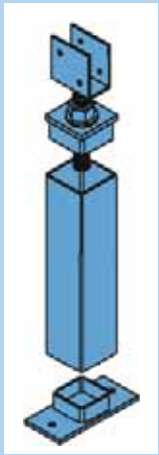


HOPLEYS TOP HUNG HB
WELD TO SUPPORTING
STEEL WORK

ALL STEEL FIXINGS CAN BE REPLACED WITH WELDED CONNECTIONS



Check with your/our Engineer to determine the appropriate design loads for your floor.



"We use and recommend DURAGAL® Adjustable Stumps"

FLOOR SHEETING

We recommend the following minimum sheet flooring thickness:

1.5kPa Floor Load, Joists @ 450mm c/c

19mm Structaflor™ 'Yellow Tongue' Particleboard Flooring OR 17mm Plywood, F11

1.5kPa Floor Load, Joists @ 600mm c/c

22mm Structaflor™ 'Red Tongue' Particleboard Flooring OR 17mm Plywood, F14

3.0kPa Floor Load, Joists @ 450mm c/c

22mm Structaflor™ 'Red Tongue' Particleboard Flooring OR 17mm Plywood, F14

3.0kPa Floor Load, Joists @ 600mm c/c

25mm Structaflor™ 'Blue Tongue' Heavy Duty Particleboard Flooring OR 19mm Plywood, F14

5.0kPa Floor Load, Joists @ 450mm c/c

25mm Structaflor™ 'Blue Tongue' Heavy Duty Particleboard Flooring OR 19mm Plywood, F14

5.0kPa Floor Load, Joists @ 600mm c/c

25mm Structaflor™ 'Blue Tongue' Heavy Duty Particleboard Flooring OR 21mm Plywood, F14

An approved construction grade adhesive should be used to bond the sheet flooring to the joists. Approximately 2 tubes of 850ml will be required per 10 - 3600mm x 900mm sheets.

FLOOR PERFORMANCE

Steel framed floors are generally stronger, lighter and have less deflection than a conventionally framed timber floor. They offer many benefits including savings in costs, installation time and dead loads. Steel framed floors also react differently to applied loads than a timber floor. This dramatic increase in dynamic performance and without the effects of creep, rot and termites, will see your steel floor deflect the same amount after 20 years as it did when completed.

Our span tables have been designed to keep the deflection below the level required by the Building Code of Australia.

When using Hopleys Joists to create large open areas such as family or rumpus rooms, please consult your Hopleys representative.

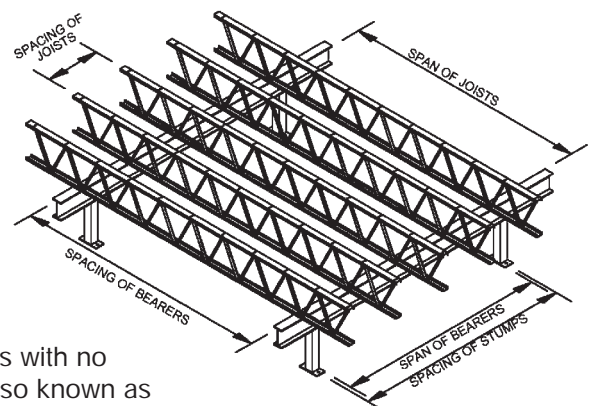
SPACING AND SPAN

"Spacing" is the centre to centre distance between structural members and is assumed to be 450mm unless noted otherwise.

"Span" is the face to face distance between points of support for the structural members.

"Single Span" is the span of a member supported at both ends with no intermediate support. This is also known as "simply supported".

"Continuous Span" is when a member has support at both ends and also at one or more evenly spaced points between the ends.



Installation Instructions

Extra joists should be added under non load bearing, internal partition walls which are within 80% of their maximum span.

Add extra joists at half spacing under spa baths or water beds.

For all load bearing internal walls or point loads, please consult with your Hopleys representative.

Do not notch top or bottom chords or remove webs. If a web needs to be removed, please consult with your Hopleys representative.

We highly recommend screwing the sheets to the joists using a

QuikDrive™ PRO250 Auto-Feed Screw Driving System, which can be purchased or hired from your Hopleys representative. You will require approximately 29 screws per 3600mm x 900mm sheet.

Alternatively the floor sheets can be nailed down using hardened twist nails available from various manufacturers such as Senco, Duo-Fast, Bostitch and Paslode.

Ensure that once the floor has been fixed that any nails protruding through and touching the webs are bent away a few millimetres using pliers.



Quik Drive



When using standard framing guns to install your sheet flooring, ensure hardened twist nails are used as per your gun manufacturers instructions.





Special Applications

Hopleys are ready to solve all the design criteria of your projects using their Computer Assisted Design techniques with their in house Engineers and Design Draftsmen.

The many advantages offered by open web steel joists allow you to form the most complex construction shapes while improving on site work speed and cost effective construction.

Hopleys joists are often used in place of heavier and larger structural steel sections originally specified. Savings are made in both installation and material costs.

The Hopleys joists have also been used for permanent and temporary grandstands, exhibition structures and for opera and theatre staging.

Portal Frames

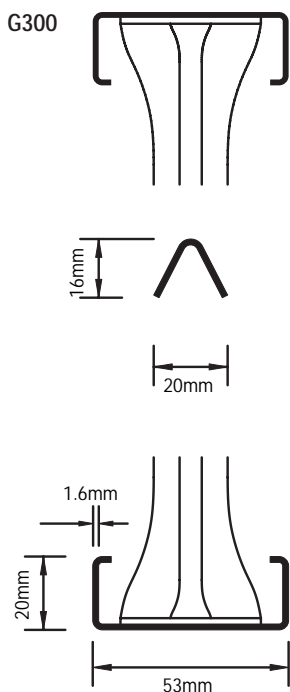
Hopleys open web light weight steel joists are an economical solution for portal frames. Typical applications include farm sheds, machine and hay sheds, horse sheds, garages and carpports.



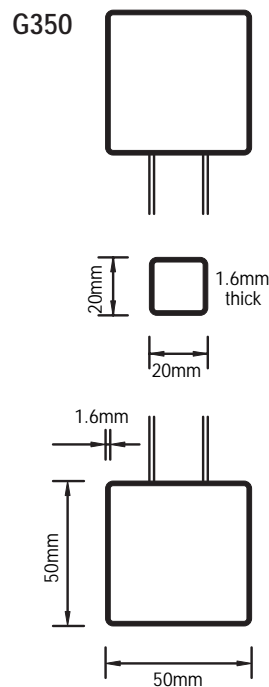
Section Properties

JOIST TYPE	CHORD AREA	JOIST MASS	RADIUS OF GYRATION	MOMENT OF INERTIA
HJ150	288mm ²	2.78kg/m	$r_{yy} = 20\text{mm}$	$I_{xx} = 1.52 \times 10^6\text{mm}^4$
HJ200	288mm ²	2.89kg/m	$r_{yy} = 20\text{mm}$	$I_{xx} = 2.82 \times 10^6\text{mm}^4$
HJ250	288mm ²	3.04kg/m	$r_{yy} = 20\text{mm}$	$I_{xx} = 4.52 \times 10^6\text{mm}^4$
HJ300	288mm ²	3.11kg/m	$r_{yy} = 20\text{mm}$	$I_{xx} = 6.62 \times 10^6\text{mm}^4$
HB300	606mm ²	6.00kg/m	$r_{yy} = 19.6\text{mm}$	$I_{xx} = 9.70 \times 10^6\text{mm}^4$
HB350	606mm ²	6.10kg/m	$r_{yy} = 19.6\text{mm}$	$I_{xx} = 13.9 \times 10^6\text{mm}^4$
HB400	606mm ²	6.20kg/m	$r_{yy} = 19.6\text{mm}$	$I_{xx} = 18.9 \times 10^6\text{mm}^4$
HB450	606mm ²	6.30kg/m	$r_{yy} = 19.6\text{mm}$	$I_{xx} = 24.5 \times 10^6\text{mm}^4$

HJ SECTION



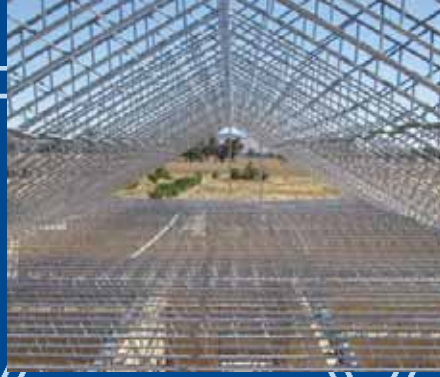
HB SECTION



Structural Joists

Additional to our Standard range, Hopleys can also design and manufacture customised Large Span Trusses to suit your specific application in a range of widths and depths.

Hopleys large span beams generally feature *DURAGAL*[®] rectangular hollow sections, which means extra strength and superior corrosion protection. Should you require any further information or advice, please contact our Engineer.

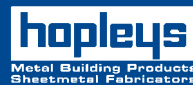


CONTACT DETAILS

For further information please contact us as per the numbers listed below.

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SALES ENQUIRIES

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