Design Aid Manual
Now also includes
Letter of Certification
& Bearer Span Table
“...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.”

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.

Design Information

To the Building Surveyor,

All aspect 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 engineering principles in accordance with the following Australian Standards:

AS4110 - Structural design codes - Permanent imposed and other loading

AS1170.2 - Structural design - In-Plane Loads

AS4600 - Cold Formed Steel Structures

I certify that the information contained in this Design Aid Manual is correct and complete with any relevant standards issued alone. For any specific certification, all standard requirements not covered in this manual, please contact your Hopleys representative.

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

[Signature]

Howard Wilmot

Head of Development

Hunt Engineering & Staff Pty Ltd.
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, 400mm & 450mm as well as ‘made to order’ specials as requirements dictate, and are manufactured to any length required.
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.
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.

**Flooring - Commercial & Industrial**

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.

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

<table>
<thead>
<tr>
<th>Industrial Flooring</th>
<th>Maximum Allowable Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>Spacing (mm)</td>
</tr>
<tr>
<td>3.0kPa</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>600</td>
</tr>
<tr>
<td>5.0kPa</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>600</td>
</tr>
</tbody>
</table>

Dead Load = 0.3kPa  Maximum Deflection = Span/250

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

<table>
<thead>
<tr>
<th>Commercial Flooring</th>
<th>Maximum Allowable Span</th>
</tr>
</thead>
<tbody>
<tr>
<td>Load</td>
<td>Spacing (mm)</td>
</tr>
<tr>
<td>3.0kPa</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>600</td>
</tr>
<tr>
<td>5.0kPa</td>
<td>450</td>
</tr>
<tr>
<td></td>
<td>600</td>
</tr>
</tbody>
</table>

Dead Load = 0.3kPa  Maximum Deflection = Span/500
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.

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

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

<table>
<thead>
<tr>
<th>Load</th>
<th>Spacing (mm)</th>
<th>Mj 150</th>
<th>Mj 200</th>
<th>Mj 250</th>
<th>Mj 300</th>
<th>HB300</th>
<th>HB350</th>
<th>HB400</th>
<th>HB450</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live Load 1.5kPa</td>
<td>450</td>
<td>3.5</td>
<td>4.2</td>
<td>4.8</td>
<td>5.5</td>
<td>6.5</td>
<td>7.3</td>
<td>8.0</td>
<td>8.7</td>
</tr>
<tr>
<td>Live Load 2.0kPa</td>
<td>450</td>
<td>3.1</td>
<td>3.8</td>
<td>4.5</td>
<td>5.1</td>
<td>5.8</td>
<td>6.5</td>
<td>7.2</td>
<td>8.0</td>
</tr>
<tr>
<td>Live Load 2.0kPa</td>
<td>450</td>
<td>3.8</td>
<td>4.3</td>
<td>5.0</td>
<td>6.0</td>
<td>6.6</td>
<td>7.2</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>Load Width = Add the joist spans on both sides of the bearer then divide by 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dead Load = 0.25kPa  Maximum Deflection = Span/500

Domestic Bearer Span Table

<table>
<thead>
<tr>
<th>Load Width</th>
<th>Hj 150</th>
<th>Hj 200</th>
<th>Hj 250</th>
<th>Hj 300</th>
<th>HB300</th>
</tr>
</thead>
<tbody>
<tr>
<td>1800</td>
<td>2400</td>
<td>2900</td>
<td>3500</td>
<td>4000</td>
<td>4500</td>
</tr>
<tr>
<td>2400</td>
<td>2200</td>
<td>2700</td>
<td>3200</td>
<td>3600</td>
<td>4100</td>
</tr>
<tr>
<td>3000</td>
<td>2000</td>
<td>2500</td>
<td>2900</td>
<td>3200</td>
<td>3800</td>
</tr>
<tr>
<td>3600</td>
<td>1900</td>
<td>2300</td>
<td>2600</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td>4200</td>
<td>1800</td>
<td>2100</td>
<td>2400</td>
<td>2800</td>
<td>3300</td>
</tr>
<tr>
<td>4800</td>
<td>1700</td>
<td>2000</td>
<td>2300</td>
<td>2600</td>
<td>3200</td>
</tr>
<tr>
<td>5400</td>
<td>1600</td>
<td>1900</td>
<td>2100</td>
<td>2400</td>
<td>3100</td>
</tr>
<tr>
<td>6000</td>
<td>1500</td>
<td>1800</td>
<td>2000</td>
<td>2200</td>
<td>3000</td>
</tr>
</tbody>
</table>

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.”

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. i.e. houses, carports, garages, factories, farm sheds and lean-to’s.

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

This table may also be used for wind uplift to a maximum of 0.4 kPa with suitable lateral restraints. Where wind load governs, i.e., 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
  - 4 - 12 x 20 Self Tapping Screws to Joist

- **Hopleys Joist to Wall Plate**
  - 4 - 12 x 20 Self Tapping Screws to Timber

- **Hopleys Joist to Hopleys Beam with HJ Shoe**
  - 8 - 12 x 20 Self Tapping Screws Total

- **Hopleys Joist to HJ Double with HJ Shoe**
  - 8 - 12 x 20 Self Tapping Screws Total

- **Hopleys Beam to Wall Plate**
  - Holding Down Angle B/S
  - 2 - M12 x 40 Coach Screws

- **Hopleys Beam to Wall Plate**
  - Holding Down Angle Fixing
  - M12 x 40 Coach Screw

- **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

- **Hopleys Beam to Hopleys Beam with HB Shoe**
  - 24 - 12 x 20 Self Tapping Screws Total

- **Vertical Hung Shoe**
  - BS 1 & BS 2 With Welded Between Beam Flanges

- **Hopleys Joist to Wall Plate Holding Down Angles B/S**
  - 2 - M12 x 40 Coach Screws

- **Hopleys Joist with HJ Shoe**
  - 8 - 12 x 20 Self Tapping Screws Total

- **Hopleys Beam to Hopleys Beam with HB Shoe**
  - 24 - 12 x 20 Self Tapping Screws Total

- **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.
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.

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

<table>
<thead>
<tr>
<th>JOIST TYPE</th>
<th>CHORD AREA</th>
<th>JOIST MASS</th>
<th>RADIUS OF GYRATION</th>
<th>MOMENT OF INERTIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>HJ 150</td>
<td>288mm$^2$</td>
<td>2.78kg/m</td>
<td>$r_{yy} = 20\text{mm}$</td>
<td>$I_{xx} = 1.52 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HJ 200</td>
<td>288mm$^2$</td>
<td>2.89kg/m</td>
<td>$r_{yy} = 20\text{mm}$</td>
<td>$I_{xx} = 2.82 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HJ 250</td>
<td>288mm$^2$</td>
<td>3.04kg/m</td>
<td>$r_{yy} = 20\text{mm}$</td>
<td>$I_{xx} = 4.52 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HJ 300</td>
<td>288mm$^2$</td>
<td>3.11kg/m</td>
<td>$r_{yy} = 20\text{mm}$</td>
<td>$I_{xx} = 6.62 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HB300</td>
<td>606mm$^2$</td>
<td>6.00kg/m</td>
<td>$r_{yy} = 19.6\text{mm}$</td>
<td>$I_{xx} = 9.70 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HB350</td>
<td>606mm$^2$</td>
<td>6.10kg/m</td>
<td>$r_{yy} = 19.6\text{mm}$</td>
<td>$I_{xx} = 13.9 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HB400</td>
<td>606mm$^2$</td>
<td>6.20kg/m</td>
<td>$r_{yy} = 19.6\text{mm}$</td>
<td>$I_{xx} = 18.9 \times 10^6\text{mm}^4$</td>
</tr>
<tr>
<td>HB450</td>
<td>606mm$^2$</td>
<td>6.30kg/m</td>
<td>$r_{yy} = 19.6\text{mm}$</td>
<td>$I_{xx} = 24.5 \times 10^6\text{mm}^4$</td>
</tr>
</tbody>
</table>

### 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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