

## Sheet Piling, Hydraulic Bracing Systems & Engineering Project Services.



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## Sheet Piling & Trench Sheets.

### What are Mabey Sheet Piles and Trench Sheets?

Mabey Sheet Piles and Trench Sheets are thin steel members that are driven into the ground to provide earth retention and excavation support. Sheet Piles can also be used in river and coastal applications with corner piles to help reduce the amount of inflow into a cofferdam.

**Sheet Piles** are strong and heavy and have interlocking edges which allows the sheets to clutch together to create a continuous wall.

**Trench Sheets** are light, easy to handle and have an overlapping connection which do not clutch together to create a lapping wall.

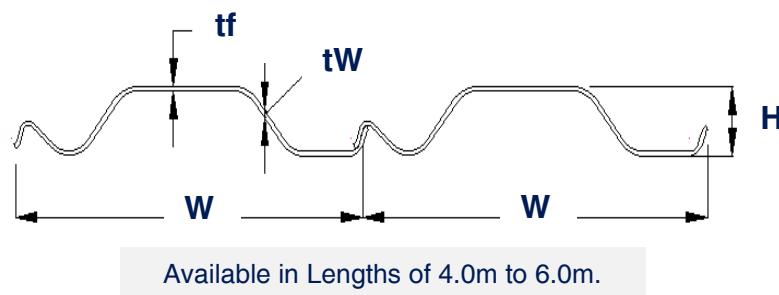
Both sheet types can be used for Temporary Works and Permanent Works Applications. Both sheet types are available for [hire](#) and for sale.

### Product Specifications

Table 1

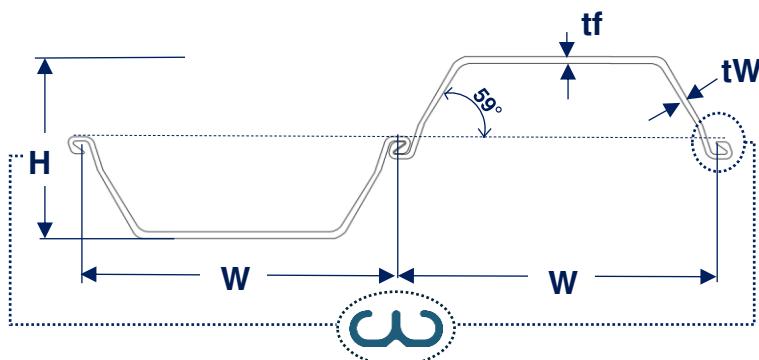
| Profile | Steel Grade | W (mm) | H (mm) | tf (mm) | tw (mm) | Weight (kg/m) | Weight (kg/m <sup>2</sup> ) | Moment of Inertia (cm <sup>4</sup> /m) | Section Modulus (cm <sup>3</sup> /m) | Moment Capacity (WLL) - FOS of 1.5 |
|---------|-------------|--------|--------|---------|---------|---------------|-----------------------------|--|--------------------------------------|------------------------------------|
| M12     | HA350       | 550    | 87.5   | 6       | 6       | 32            | 58.2                        | 796                                    | 182                                  | 42.7                               |
| SPU- 3W | S355        | 600    | 360    | 13.4    | 13.4    | 81.6          | 136                         | 32400                                  | 1800                                 | 426                                |

Overlapping Trench Sheet uses. - 550 mm (w)



- ▶ Trench and Manhole Construction
- ▶ Utilities Construction
- ▶ Working in and around Services
- ▶ Shallow single sided cantilever walls
- ▶ Shallow to Medium Cofferdams

3W – Interlocking Sheet Pile. 600mm (W)



- ▶ All above
- ▶ Medium single sided cantilever walls
- ▶ Deep Cofferdams
- ▶ Working in and near Rivers
- ▶ Basements

Available in Lengths of 6.0m & 12m

NOTE: Other Sheet lengths are available upon request.

## Piling Attachments – Excavator Mounted Vibrator.

### How EMV's Work?

EMVs reduce the cohesion and friction of soils through vibrations which effectively fluidises the soil, making it easier and more cost efficient to install trench sheets and sheet piles. The weight of the piling hammer and the applied force are enough to drive the trench sheet/sheet pile to the required depth quickly, quietly and efficiently. The same applies when extracting and the required pulling force is minimized due to the reduced friction. EMV's work best in granular (sands and gravels), and they will still function in cohesive soils (clays), but piles will not penetrate as far.

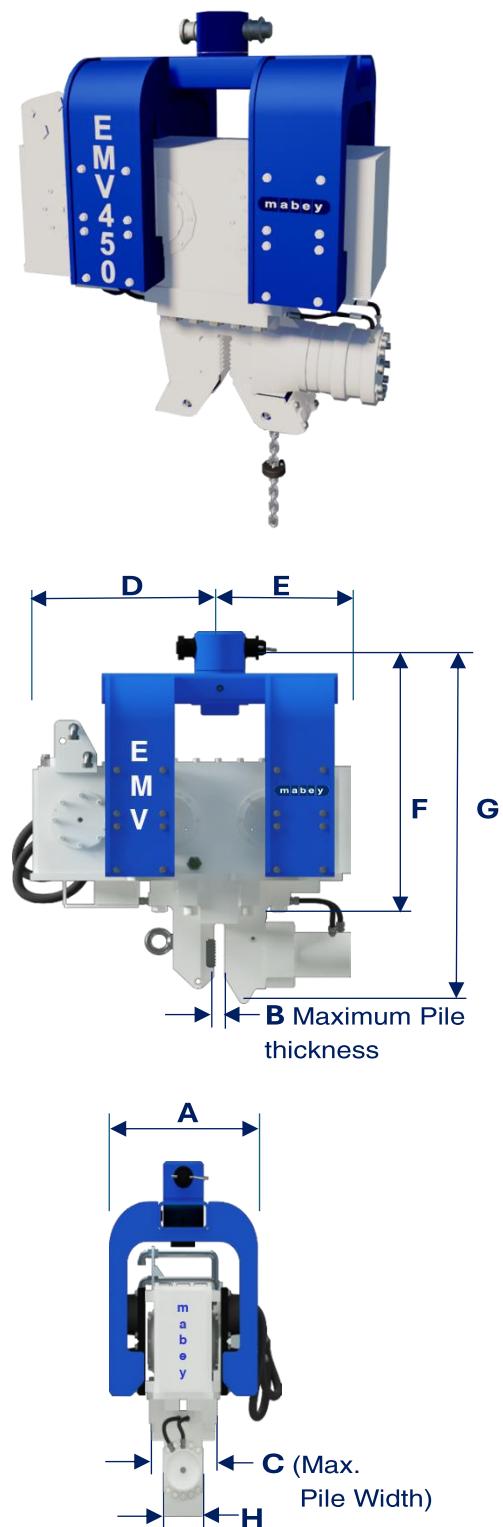
\*Pre- drilling can be used in the 1st instance to increase driving efficiency.\*

### Product Specifications

Table 2

| DAWSON                           | EMV 300 | EMV 450 |
|----------------------------------|---------|---------|
| Static Moment(kg/m)              | 4.6     | 6.9     |
| Frequency(rpm)                   | 2400    | 2460    |
| Centrifugal Force(kN)            | 300     | 453     |
| Amplitude(mm)                    | 14.7    | 13.7    |
| Min. Hydraulic Flow Rate (L/min) | 130     | 195     |
| Max. Hydraulic Flow Rate (L/min) | 250     | 350     |
| Max Hydraulic Pressure(bar)      | 350     | 350     |
| Min Hydraulic Power(kW)          | 60      | 88      |
| Dynamic Mass(kg)                 | 625     | 1008    |
| Total Mass (kg)                  | 965     | 1275    |
| Max Pile Mass(kg)                | 800     | 1000    |
| Max Push/Pull Force(kg)          | 15000   | 15000   |
| Clamp Force (tonne)              | 36      | 54      |
| Typical Excavator Weight (tonne) | 12to25  | 25to45  |

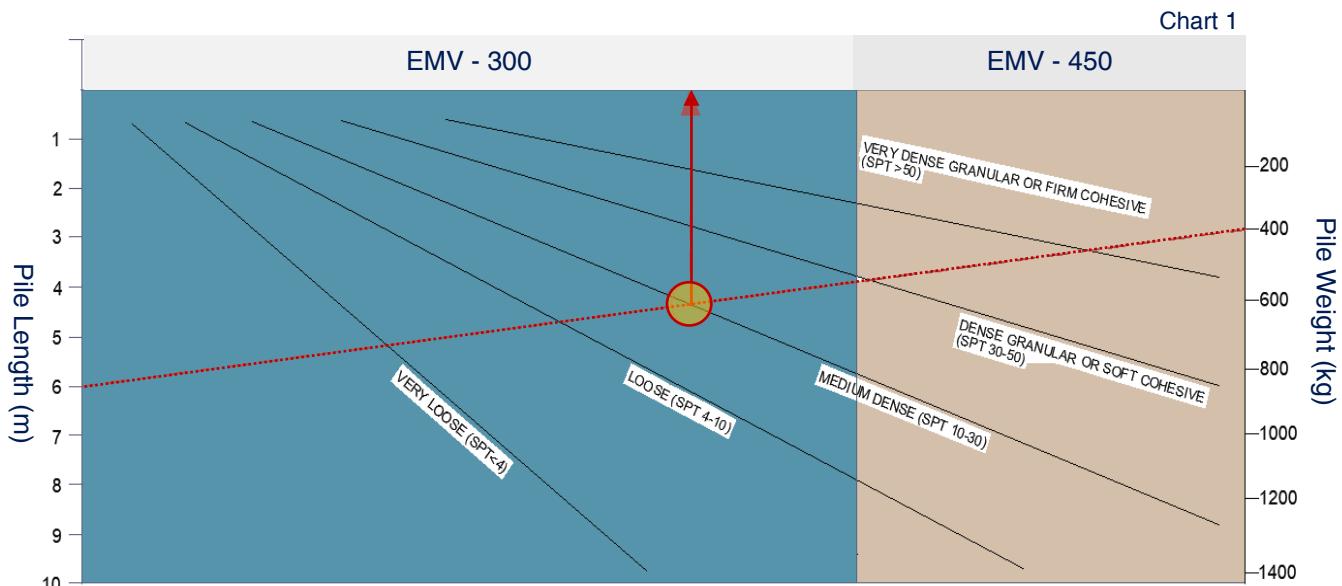
| Dimensions | A | 615  | 615  |
|------------|---|------|------|
|            | B | 25   | 32   |
|            | C | 250  | 230  |
|            | D | 582  | 640  |
|            | E | 429  | 510  |
|            | F | 927  | 945  |
|            | G | 1200 | 1250 |
|            | H | 150  | 175  |



## Piling Attachments – Excavator Mounted Vibrator.

### EMV's Suitability Chart.

The Chart below can be used to give an estimate on the EMV unit to use in given ground conditions. The chart below is a guide, not a guarantee!



**Example:** For a 6.0m long, 400kg sheet driven into Medium Dense Soil. An EMV-300 or larger is required (see dashed red line).

### Mabey Sheets Suitability table for Selecting the appropriate EMV.

The Table below has been put together based on the above EMV Suitability Chart. The table below is a guide, not a guarantee! Note that sheet piles up to 6.0m long are only included in the bellow table due to lifting height restrictions on specific excavator. Pre-drilling can be used in the 1<sup>st</sup> instance to increase driving efficiency.

Table 3

| Mabey Sheet Profile | GROUND SOIL PROFILE |                 |                         |  |   |
|---------------------|---------------------|-----------------|-------------------------|--|---|
|                     | Very Loose (SPT<4)  | Loose (SPT4-10) | Medium Dense (SPT10-30) | Dense Granular or Soft Cohesive (SPT30-50) | Very Dense Granular or Firm Cohesive (SPT>50) |
| 4m - M12            | ●                   | ●               | ●                       | ●  | ●   |
| 5m - M12            | ●                   | ●               | ●                       | ●  | ●   |
| 6m - M12            | ●                   | ●               | ●                       | ●  | ●   |

Guide – Minimum EMV Required.

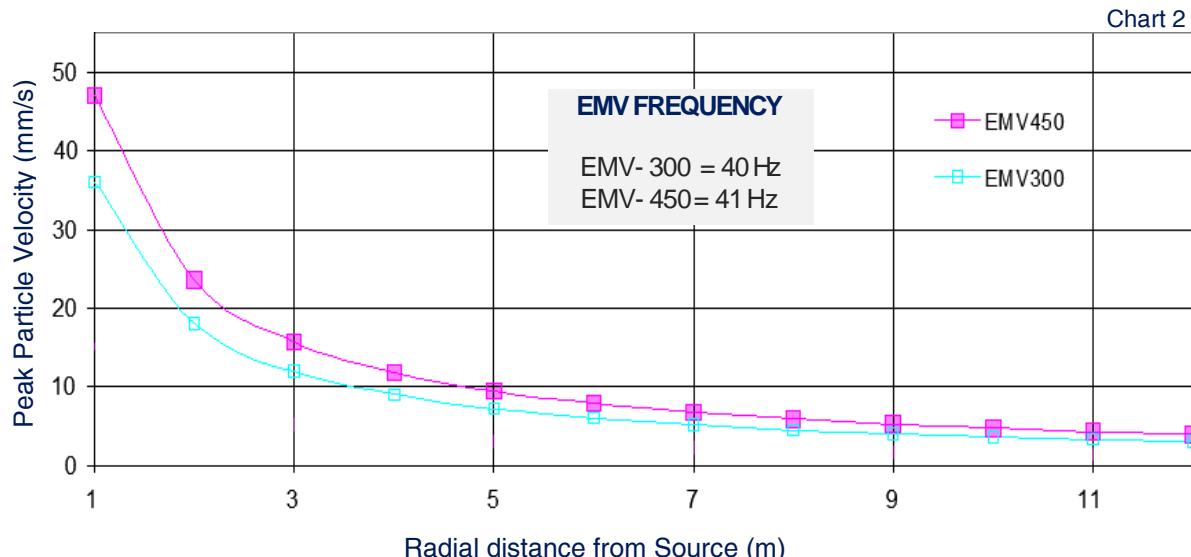
EMV - 300 ●

EMV - 450 ●

## Piling Attachments – Excavator Mounted Vibrator.

### EMV Vibration – Peak Particle Velocity (PPV) (mm/s).

Vibration occurs from all piling operations and varies from site to site. From extensive field testing our suppliers have provided information on how to predict Peak Particle Velocity in the ground at a given distance. Use the Chart below to estimate PPV (mm/s) for specific EMV's.



EMV – Maximum Predicted Vibration from Piling Operations- from BS5228

### Mabey EMV – 300 and 450 PPV (mm/s) from Radial Source.

The Table below has been put together based on the above EMV PPV Chart 2.

| EMV Model |            | DISTANCE FROM RADIAL SOURCE(M) |      |      |      |     |     |     |     |     |     |     |
|-----------|------------|--------------------------------|------|------|------|-----|-----|-----|-----|-----|-----|-----|
|           |            | 1                              | 2    | 3    | 4    | 5   | 6   | 7   | 8   | 9   | 10  | 11  |
| EMV 300   | PPV (mm/s) | 36.1                           | 18.0 | 12.0 | 9.0  | 7.2 | 6.0 | 5.2 | 4.5 | 4.0 | 3.6 | 3.3 |
| EMV 450   | PPV (mm/s) | 47.1                           | 23.6 | 15.7 | 11.8 | 9.4 | 7.9 | 6.7 | 5.9 | 5.2 | 4.7 | 4.3 |

### (EMV) Excavator Mounted Vibrator Refusal

Like all machinery, there are limits to the operational conditions in which it is designed to function. For vibratory driving, The Shoring Technology Interest Group (STIG) defines the limit conditions for **REFUSAL** and **REBOUND** as follows:

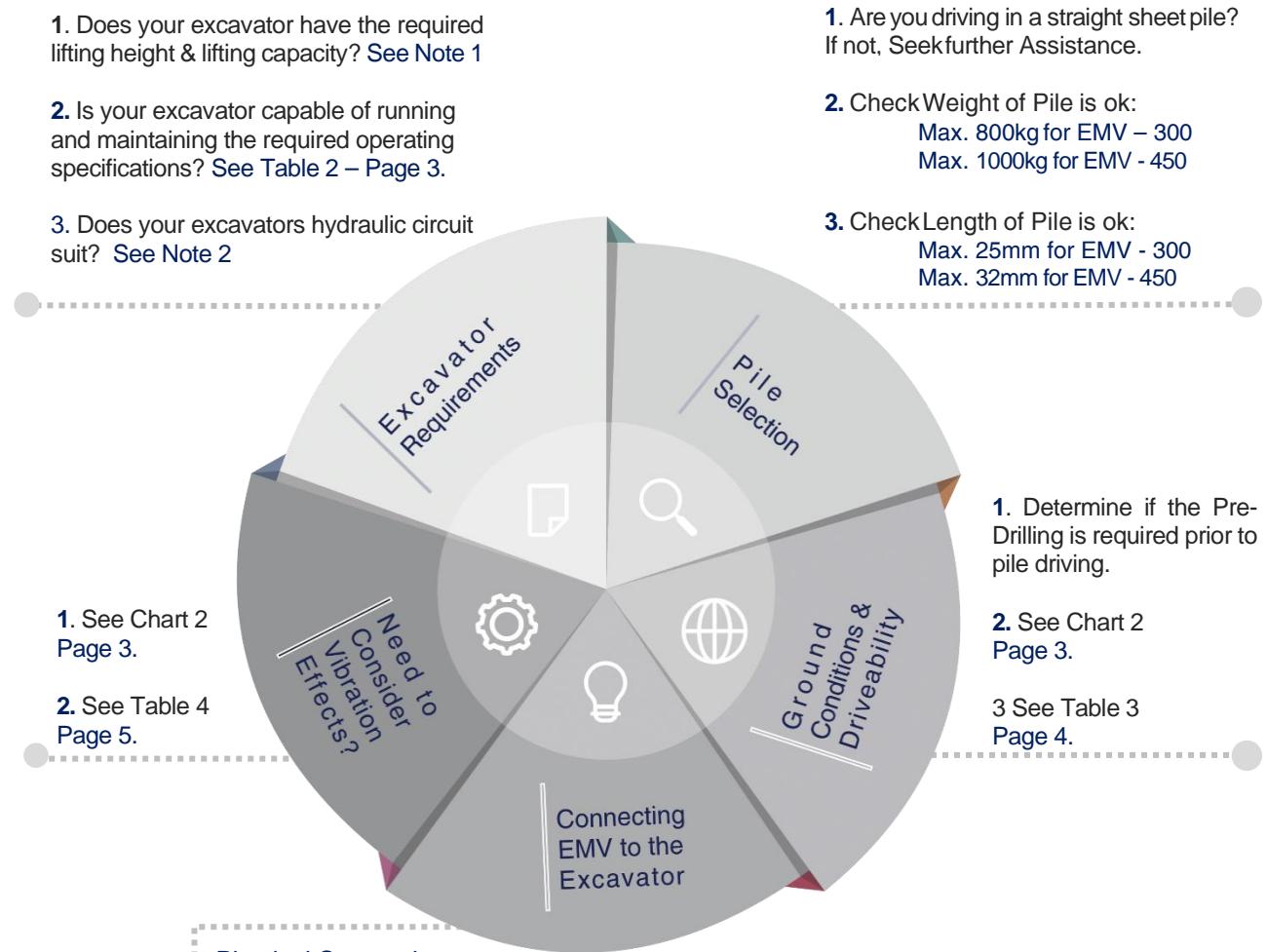
**REFUSAL**, under normal conditions, refusal occurs when it takes more than 5 minutes to drive a pile 250mm. The 250mm penetration is absolute; no conversions are allowed, such as 20 minutes for 1m of penetration.

**REBOUND** - This happens when a significant portion of the EMV's energy is reflected through the pile due to hitting an impenetrable layer or obstruction. The reflected forces will transfer back into the EMV and suppressor head, causing the head to 'jump' relative to the vibratory case. In this situation, driving must be stopped **immediately**.

## Piling Attachments – Excavator Mounted Vibrator.

### Thinking of ordering an EMV?

If an EMV is what you need to complete your piling project, then follow the below chart to ensure your job goes smoothly.



#### Physical Connection

Suggest using Mabey Fully Adjustable Quick Hitch which is suitable for 20-50T excavators. Mabey require the following information:

- Coupler pin centres (mm)
- Coupler pin sizes (mm)
- Distance between ears (mm)

#### Hydraulic Connection

There are 3 hoses that require attachment.

- The Pressure line, connected to the bucket ram "extend" circuit.
- The return line, connected to the bucket ram "retract" circuit.
- The drain line fed either directly back into the hydraulic tank on the excavator or connected to the breaker circuit return line (must be unrestricted).

#### NOTE 1:

The full weight of an EMV + Mabey attachments can weigh as much as 2T. The weight of pile is to then be added on.

The EMV + attachments will take up approx. 2m of the excavator lifting height. The length of the pile is to be then added on.

#### NOTE 2:

Auxiliary hydraulic circuit of excavator must have:

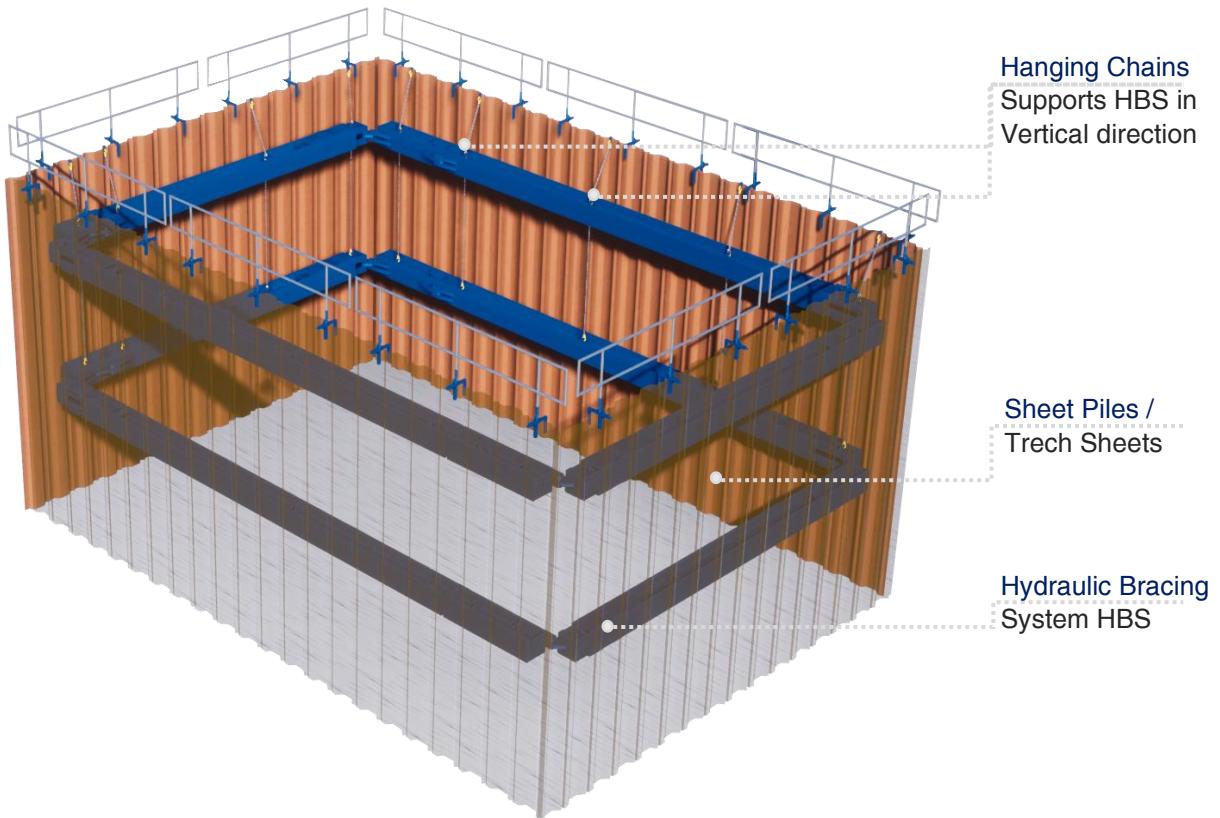
- Bi-directional flow capability
- Hard lines
- Screw on couplings & case drain
- All fitting must be Unrestricted

## Hydraulic Bracing Systems (HBS).

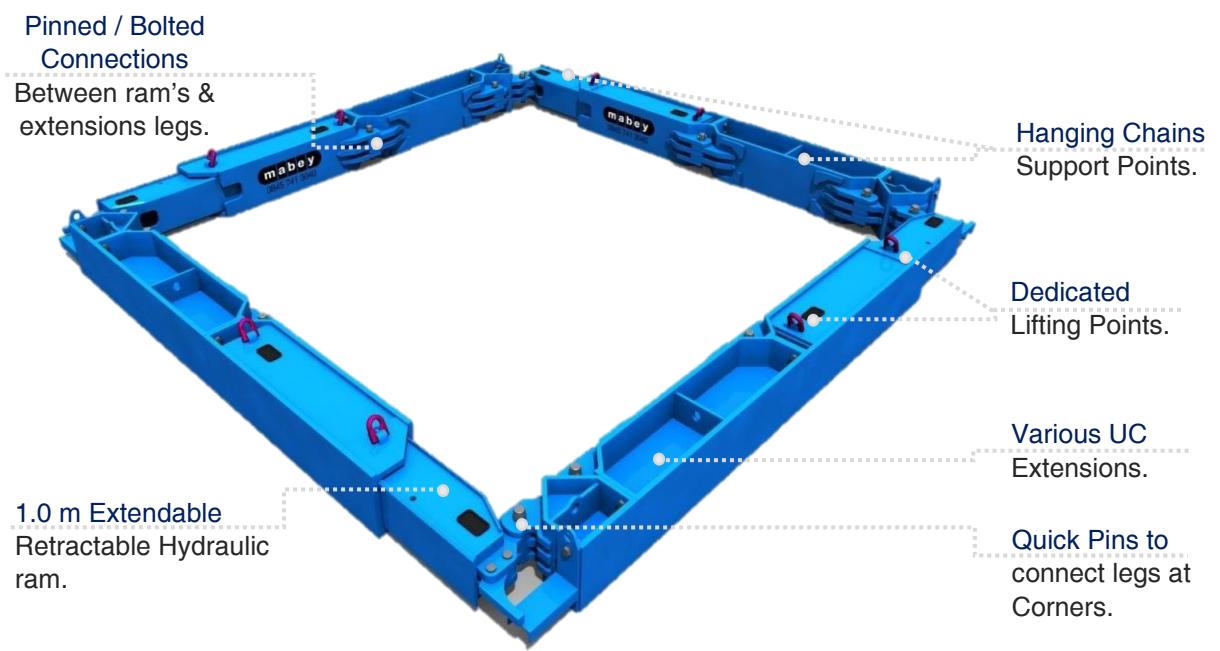
### What is an HBS?

Hydraulic Bracing is a proprietary horizontal UC section with an extendable and retractable 1m hydraulic ram end unit. HBS is traditionally **used as an internal support brace for supporting steel sheet piles and trench sheets** in a wide variety of shapes and sizes. A HBS can also be **used as an internal support for permanent works** structures such as basements and capping beams. A HBS requires no on-site welding.

Typical 3D Image Layout



3D Frame Image of main components



## Hydraulic Bracing Systems (HBS).

### Product Specifications

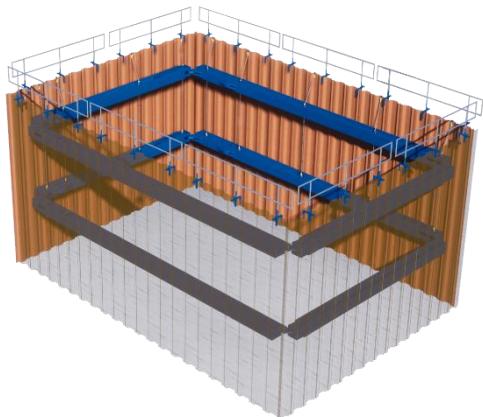
Mabey stock 2 types of Hydraulic Bracing Systems:

- ▶ Multibrace
- ▶ Supers Shaft brace

Also available is the Mabey **Mechanical Bracing Strut (MBS)**. MBS is a mechanical steel box section that connects to the Excavation Bracing System (EBS) to increase the total frame span, and reduce frame deflection. The MBS requires no on-site welding.

### Product Specifications

#### Multibrace (254 x254 UC x107)



#### Super Shaftbrace (356 x 368 UC x 202)



#### Mechanical Bracing Strut (250 x250 10tk SHS)



### Description

All Bracing Systems are flexible and can shore up many square, rectangular or irregular shaped holes.

- ▶ **Multibrace** is ideally suited for hole sizes of 2.8m to 10m square\*.
- ▶ **Supershaft** Brace is ideally suited for hole sizes of 3m to 16m square\*.
- ▶ **Mechanical Bracing Struts** can span up to a total length of 12m.

\*Larger hole sizes are possible if Struts permit\*

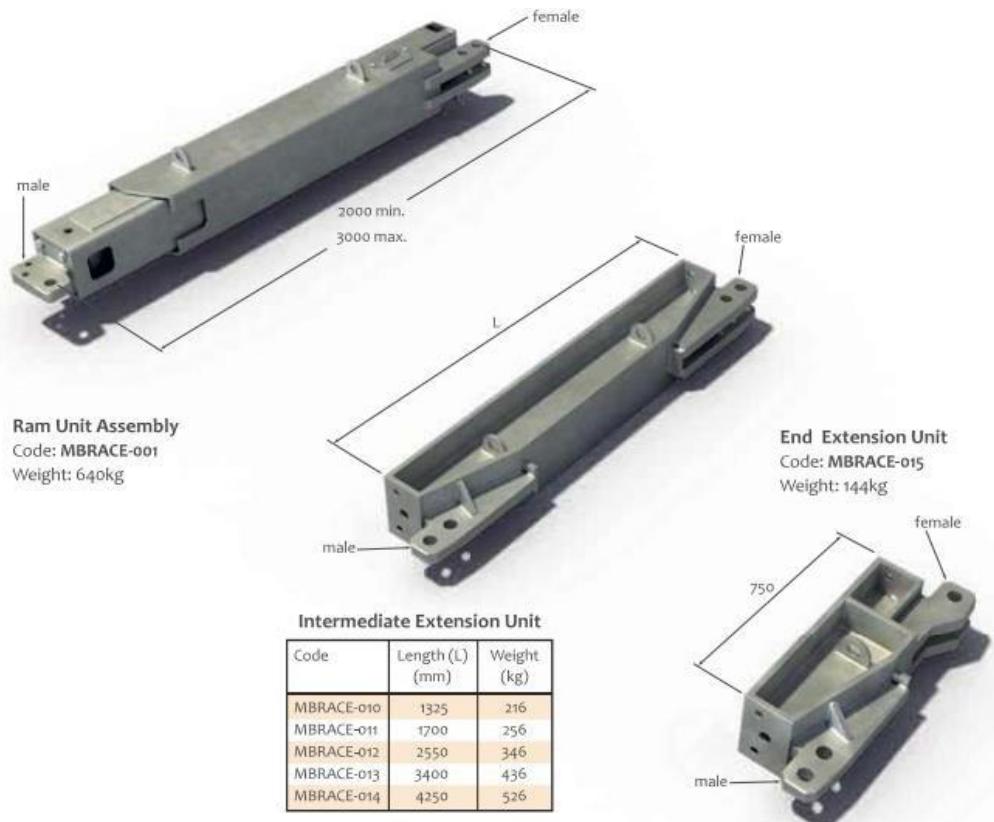
Typical HBS shoring Applications are:

- ▶ Fuel Tank
- ▶ Thrust and Reception Pits (Pipe Jacking)
- ▶ Underground Utility Structures E.g. Wet wells, GPT's, Valve Pits, Manholes, Electricity Boxes etc.
- ▶ Lift Pits
- ▶ Crane Bases
- ▶ Pile Caps
- ▶ Bridge Abutments
- ▶ Bridge Piers



## Hydraulic Bracing Systems (HBS)

### Multibrace typical Build up Components.

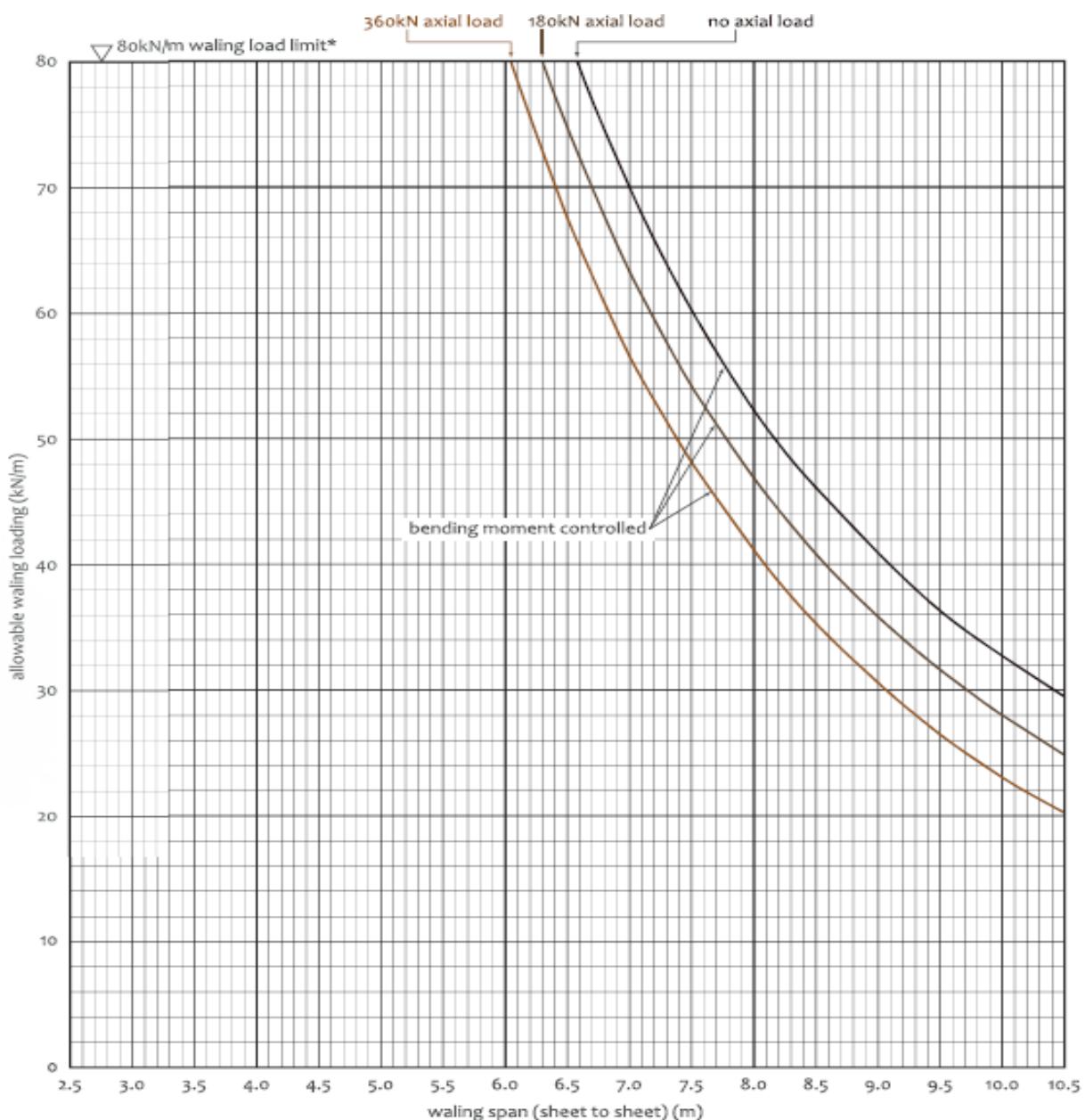


| Leg Arrangement | Leg Code    | Clear Internal Dimensions (mm) |      |                        |      | Corner Pin to Pin Dimension (mm) |      | Dimensions over Frame (Sheet to Sheet) (mm) |       | Leg Weight (kg) |  |
|-----------------|-------------|--------------------------------|------|------------------------|------|----------------------------------|------|---|-------|-----------------|--|
|                 |             | Between Walling Flanges        |      | Between Walling Joints |      | min.                             |      | max.  |       |                 |  |
|                 |             | min.                           | max. | min.                   | max. | min.                             | max. | min.  | max.  |                 |  |
| RAM             | MBRACEL-01  | 1923                           | 2923 | N/A                    | N/A  | 2000                             | 3000 | 2523  | 3523  | 640             |  |
| RAM 750         | MBRACEL-01A | 2736                           | 3736 | 2620                   | 3620 | 2750                             | 3750 | 3270  | 4270  | 784             |  |
| RAM 1325        | MBRACEL-02  | 3311                           | 4311 | 3195                   | 4195 | 3325                             | 4325 | 3845  | 4845  | 856             |  |
| RAM 1700        | MBRACEL-03  | 3686                           | 4686 | 3570                   | 4570 | 3700                             | 4700 | 4220  | 5220  | 896             |  |
| RAM 2550        | MBRACEL-04  | 4536                           | 5536 | 4420                   | 5420 | 4550                             | 5550 | 5070  | 6070  | 986             |  |
| RAM 3400        | MBRACEL-05  | 5386                           | 6386 | 5270                   | 6270 | 5400                             | 6400 | 5920  | 6920  | 1076            |  |
| RAM 4250        | MBRACEL-06  | 6236                           | 7236 | 6120                   | 7120 | 6250                             | 7250 | 6770  | 7770  | 1166            |  |
| RAM 3400 1325   | MBRACEL-07  | 6711                           | 7711 | 7045                   | 8045 | 6725                             | 7725 | 7245  | 8245  | 1292            |  |
| RAM 4250 1325   | MBRACEL-08  | 7561                           | 8561 | 7445                   | 8445 | 7575                             | 8575 | 8095  | 9095  | 1382            |  |
| RAM 4250 1700   | MBRACEL-09  | 7936                           | 8936 | 7820                   | 8820 | 7950                             | 8950 | 8470  | 9470  | 1422            |  |
| RAM 4250 2550   | MBRACEL-10  | 8786                           | 9786 | 8670                   | 9670 | 8800                             | 9800 | 9320  | 10320 | 1512            |  |

Note that sheet to sheet and clear internal dimensions include no allowance for deflection under load

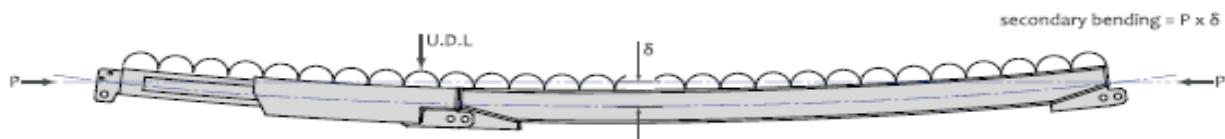
## Hydraulic Bracing Systems (HBS).

### Safe Working Load Charts for Multibrace



The performance chart above allows for:

- A Uniformly Distributed Load (U.D.L) on the waling from sheet piles.
- A combined axial loading from adjacent walings.
- An allowance for additional secondary bending due to waling deflection

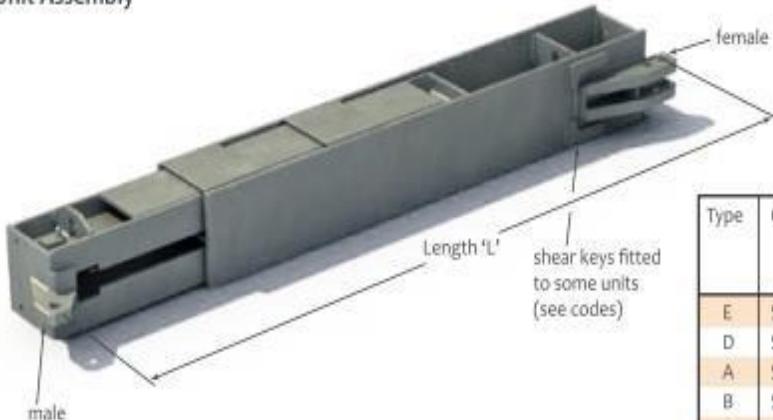


\* For waler lengths shorter than those shown on the above chart it may be possible to increase the allowable rail load above 80kN/m. This could also apply in schemes where the walers are supported by intermediate props or knee braces.

## Hydraulic Bracing Systems (HBS).

### Shaftbrace typical Build up Components.

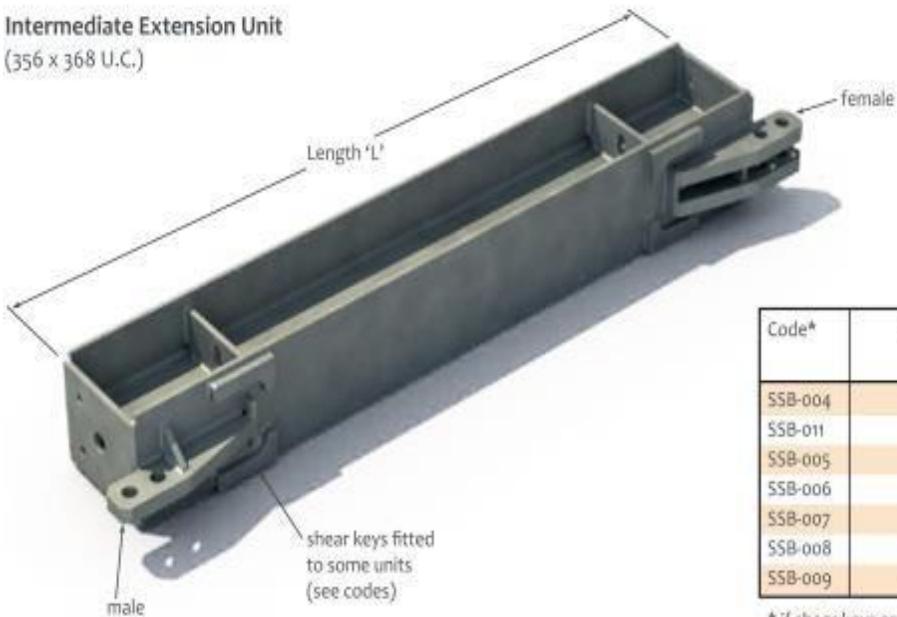
Ram Unit Assembly



| Type | Code*   | Length 'L' (mm) |       | Weight (kg) |
|------|---------|-----------------|-------|-------------|
|      |         | min.            | max.  |             |
| E    | SSB-024 | 2000            | 2650  | 860         |
| D    | SSB-010 | 3000            | 4000  | 1123        |
| A    | SSB-001 | 6400            | 7400  | 1742        |
| B    | SSB-002 | 8950            | 9950  | 2202        |
| C    | SSB-003 | 10650           | 11650 | 2538        |

\* If shear keys are required, add suffix /SK to code

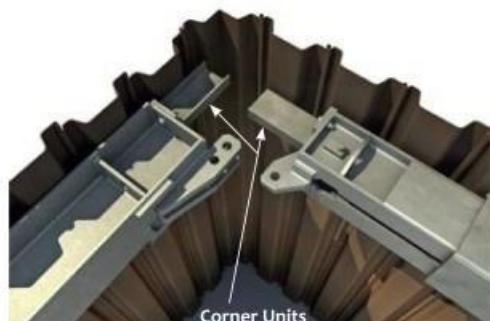
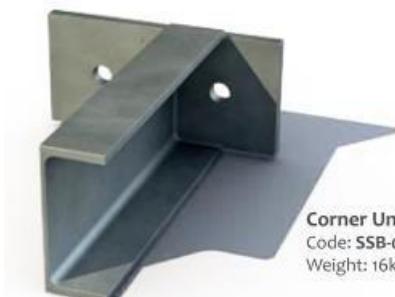
Intermediate Extension Unit  
(356 x 368 U.C.)



| Code*   | Length 'L' (mm) | Weight (kg) |
|---------|-----------------|-------------|
| SSB-004 | 850             | 261         |
| SSB-011 | 1325            | 360         |
| SSB-005 | 1700            | 431         |
| SSB-006 | 2550            | 525         |
| SSB-007 | 3400            | 736         |
| SSB-008 | 6800            | 1379        |
| SSB-009 | 11050           | 2175        |

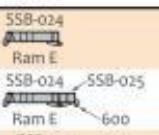
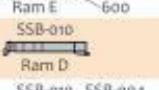
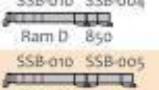
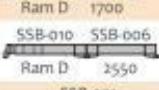
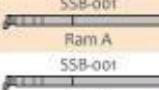
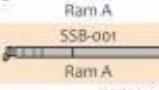
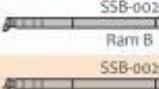
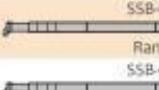
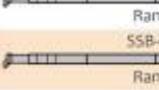
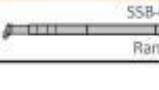
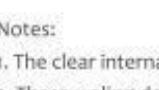
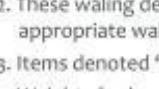
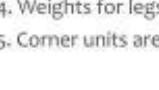
\* If shear keys are required, add suffix /SK to code

Corner Unit  
Code: SSB-015  
Weight: 16kg



## Hydraulic Bracing Systems (HBS).

### Shaftbrace typical Build up Components.

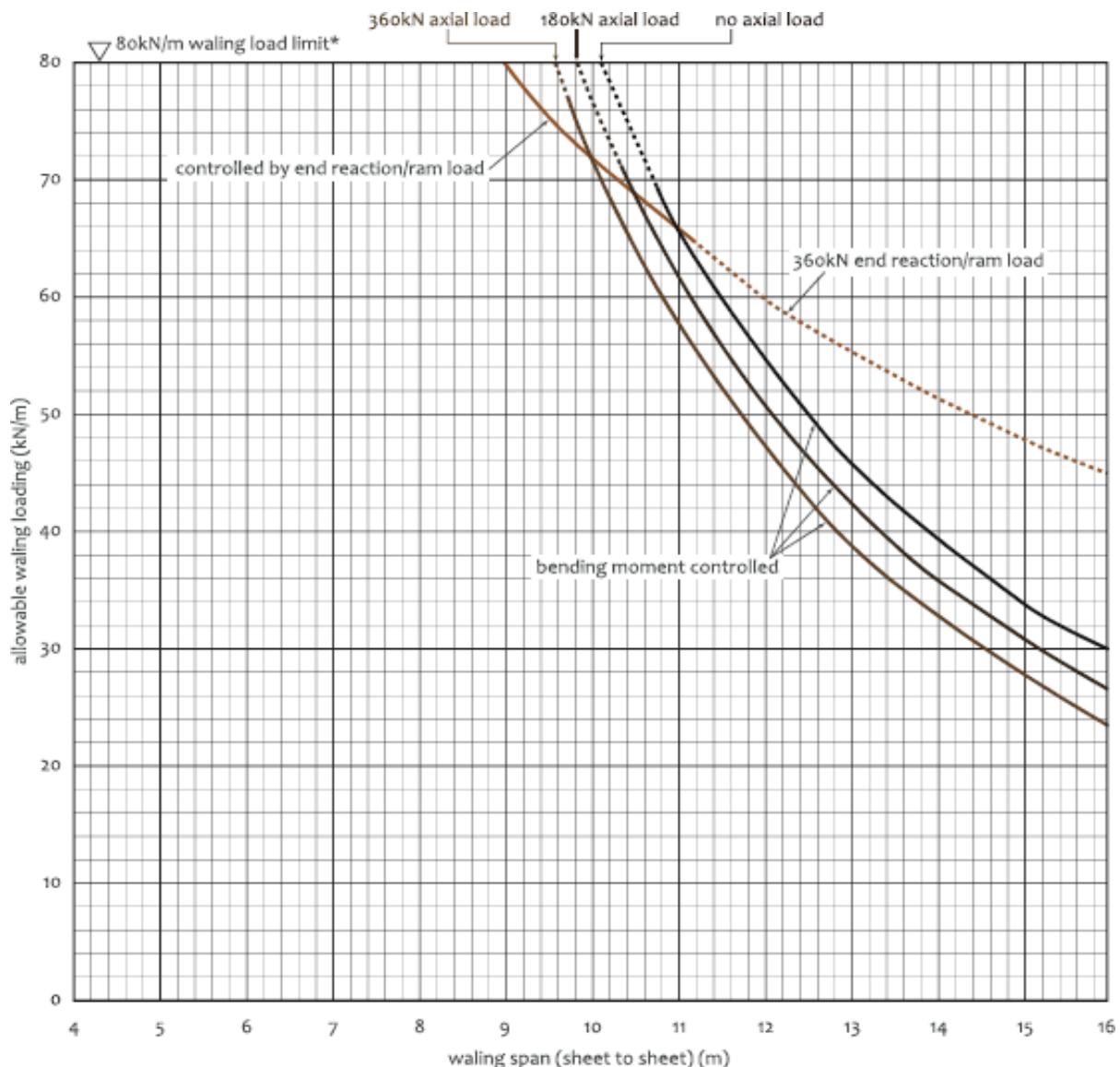
| Leg Arrangement   | Leg Code | Clear Internal Dimensions<br>(see notes below)                            |       |   |       | Corner<br>Pin to Pin<br>Dimension<br>(mm) | Dimension<br>to face<br>of sheet<br>(mm) | Approx.<br>max.<br>Deflection<br>per waling<br>(mm) | Approx.<br>Weight<br>of one<br>Leg<br>(kg) |     |      |  |  |
|---|----------|---|-------|---|-------|---|--|---|--|-----|------|--|--|
|   |          | Between Waling<br>Flanges except<br>at intermediate<br>connection<br>(mm) |       | Between<br>Walings at<br>intermediate<br>connection<br>(mm) |       |   |  |   |  |     |      |  |  |
|   |          | min.  | max.  | min.  | max.  |   |  |   |  |     |      |  |  |
|    | SSBLE-01 | 2140  | 2790  | N/A   | N/A   | 2000                                      | 2650                                     | 2880  | 3530                                       | 40  | 897  |  |  |
|    | SSBLE-02 | 2740  | 3390  | 2460  | 3110  | 2600                                      | 3250                                     | 3480  | 4130                                       | 40  | 1107 |  |  |
|    | SSBLD-01 | 3140  | 4140  | N/A   | N/A   | 3000                                      | 4000                                     | 3880  | 4880                                       | 40  | 1160 |  |  |
|    | SSBLD-02 | 3990  | 4990  | 3710  | 4710  | 3850                                      | 4850                                     | 4730  | 5730                                       | 40  | 1430 |  |  |
|    | SSBLD-03 | 4840  | 5840  | 4560  | 5560  | 4700                                      | 5700                                     | 5580  | 6580                                       | 40  | 1600 |  |  |
|   | SSBLD-04 | 5690  | 6690  | 5410  | 6410  | 5550                                      | 6550                                     | 6430  | 7430                                       | 40  | 1690 |  |  |
|  | SSBL-01  | 6540  | 7540  | N/A   | N/A   | 6400                                      | 7400                                     | 7280  | 8280                                       | 46  | 1780 |  |  |
|  | SSBL-02  | 7390  | 8390  | 7110  | 8110  | 7250                                      | 8250                                     | 8130  | 9130                                       | 60  | 2040 |  |  |
|  | SSBL-03  | 8240  | 9240  | 7960  | 8960  | 8100                                      | 9100                                     | 8980  | 9980                                       | 80  | 2200 |  |  |
|  | SSBL-04  | 9090  | 10090 | N/A   | N/A   | 8950                                      | 9950                                     | 9830  | 10830                                      | 93  | 2455 |  |  |
|  | SSBL-05  | 9940  | 10940 | 9660  | 10660 | 9800                                      | 10800                                    | 10680   | 11680                                      | 107 | 2715 |  |  |
|  | SSBL-06  | 10790   | 11790 | N/A   | N/A   | 10650                                     | 11650                                    | 11530   | 12530                                      | 121 | 2790 |  |  |
|  | SSBL-07  | 11640   | 12640 | 11360   | 12360 | 11500                                     | 12500                                    | 12380   | 13380                                      | 135 | 3050 |  |  |
|  | SSBL-08  | 12490   | 13490 | 12210   | 13210 | 12350                                     | 13350                                    | 13230   | 14230                                      | 153 | 3230 |  |  |
|  | SSBL-09  | 13340   | 14340 | 13060   | 14060 | 13200                                     | 14200                                    | 14080   | 15080                                      | 172 | 3370 |  |  |
|  | SSBL-10  | 14190   | 15190 | 13910   | 14910 | 14050                                     | 15050                                    | 14930   | 15930                                      | 189 | 3530 |  |  |

#### Notes:

1. The clear internal dimensions shown above do not include any allowance for deflection of the walings under load.
2. These waling deflections are listed separately above and generally it will be necessary to increase the clear internal dimensions by twice the appropriate waling deflection.
3. Items denoted "N/A" in the table = Not Applicable
4. Weights for legs using the type 'B' and 'C' ram units are based on the weight for the heavier U.C. 356 x 368 x 202kg/m in Gr50 material.
5. Corner units are fitted to each end of the Super Shaftbrace legs to carry the support for the sheets into the corners of the excavation:

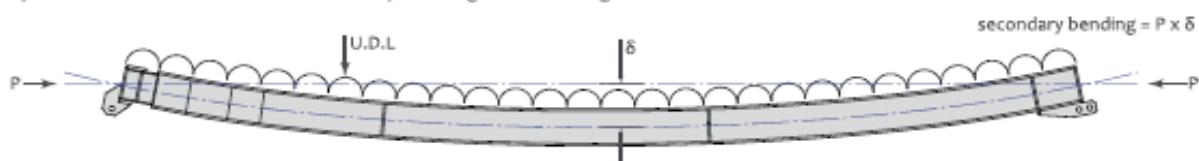
## Hydraulic Bracing Systems (HBS).

### Safe Working Load Charts for Shaftbrace



The performance chart above allows for:

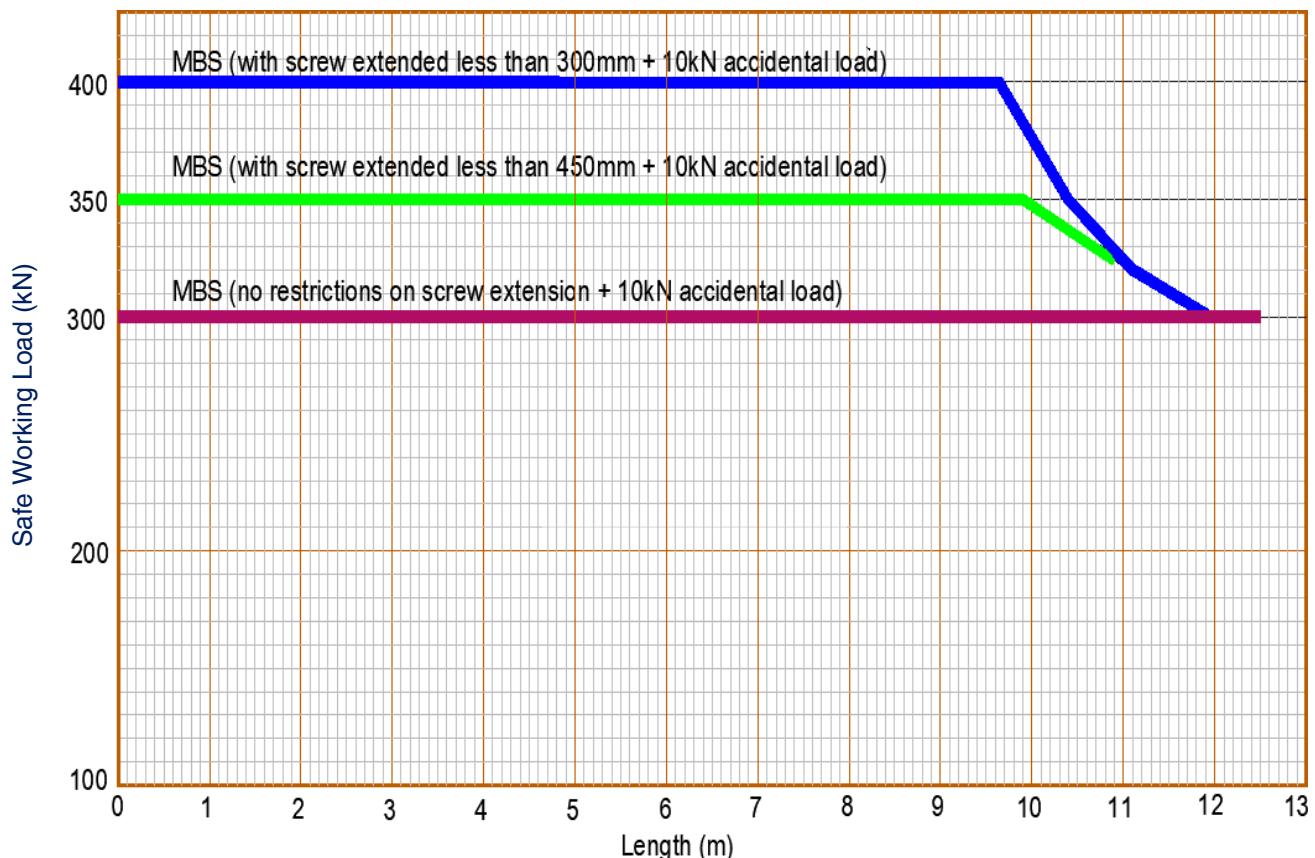
- A Uniformly Distributed Load (U.D.L) on the waling from sheet piles.
- A combined axial loading from adjacent walings.
- An allowance for additional secondary bending due to waling deflection



\* For waler lengths shorter than those shown on the above chart, it may be possible to increase the allowable rail load above 80kN/m. This could also apply in schemes where the walers are supported by intermediate props or knee braces.

## Hydraulic Bracing Systems (HBS).

### Safe Working Load Charts for Mechanical Bracing Strut – Up to 40t



## Performance Criteria

The Values / charts published on pages 10 to 12 are based on:

- ▶ Relevant parts of BS449: 1969: Part 2
- ▶ Testing

Where calculation has been used the following minimum factors of safety have been used:

- ▶ In bending = 1.65
- ▶ Axial (Rams) = 2.0

All Mabey HGSS Conform to:  
AS 5047 – 2005 Hydraulic Shoring and Trench Lining Equipment

## Safety Products

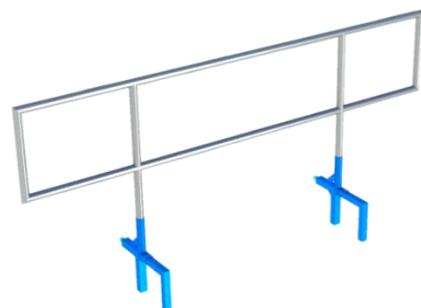
### Compatible Safety Products

The same products that connect to the Mabey trench boxes are also connectable to the sheet profile range.

NOTE: Timber packers are required for a tight fit



**David Arm**



**Clamping Handrails**



## Engineering and Projects Services

### How can Mabey Engineering add value to your Project?

Mabey's talented Temporary Works Engineering Team will work hard to ensure the success of your project. Our engineers are equipped with top-of-the-line CAD and design software. When necessary, Mabey's team of engineers will design a custom shoring solution using all our modular equipment. **That's; Hydraulic Bracing Systems, Sheet Piling, Trench Boxes etc.** We can provide structural design plans and back up calculations when called for by your project.

In addition to our extensive inventory of durable shoring equipment that can be tailored to meet your needs, the expertise of our staff is the reason so many contractors across Australia and New Zealand turn to Mabey as a dependable partner.

### Technical Field Support

While Mabey prides itself on providing easy-to-install solutions, we also understand that each project is unique and may involve complex conditions and unforeseen challenges. Knowing that your reputation is at stake with every project, we offer on-site field support as an added service. Mabey's Engineers and Area Managers will thoroughly explain the safest and most effective way to use our products so that you can install them quickly and get your project moving. Many of our clients have relied on that extra field support to help them meet critical deadlines and avoid expensive penalties.

### Have a Project where Groundworks Shoring is required?

If you have a project where shoring is needed and you require an Engineered Solution to ensure the proposed equipment is up to the job, then Mabey require certain project specific information to do that. The next page highlights the main information Mabey require and suggested attachments.

## Engineering and Projects Services

| Required Information: |  | Comments: |
|-----------------------|--|-----------|
| 1.                    | Is <b>RPEQ</b> or specific <b>Certification</b> Required (Y/N)   |           |
| 2.                    | <b>Excavation Purpose:</b><br>(e.g. pipe run, storage tank, wet well etc.)   |           |
| 3.                    | Plan Dimensions:<br>(State if internal clearance or external dimension provided.)  |           |
| 4.                    | <b>Excavation Depth:</b>   |           |
| 5.                    | Are any <b>ground reductions</b> taking place / OR possible? (provide levels):   |           |
| 6.                    | <b>Ground / Groundwater Conditions:</b><br>(provide site investigation report, relevant boreholes etc.)                                  |           |
| 7.                    | <b>Adjacent Water Courses:</b><br>(provide details / levels of any nearby rivers, creeks, oceans etc.)                                   |           |
| 8.                    | Details of any <b>Dewatering</b> taking place:<br>(e.g. sump pumps / dewatering spears and to what level the water is to be reduced to.) |           |
| 9.                    | Details of <b>Plant / Excavators / Cranes etc.</b> working around Excavation: (provide weights and distances.)                           |           |
| 10                    | Details of any additional <b>nearby Loads</b> :<br>(e.g. Spoil, Live Roads, Railways, Buildings etc.)                                    |           |
| 11.                   | Any <b>height restrictions</b> on use of lifting plant: (e.g. max lift height of excavator / overhead power cables.)                     |           |

## Suggested Attachments

- ▶ Shoring Structure Location map(s) & OR Sketch of Site Layout
- ▶ Photographs.
- ▶ Long sections.
- ▶ Existing Structures & proposed Structure drawings (if possible, in AutoCAD format).
- ▶ Relevant borehole / trial pit.
- ▶ Full Soil Survey Report.
- ▶ Others / Any relevant documents.

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