ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

Technical Data Sheets

Metric Specification

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R·M·D KWIKFORM

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Introduction

Alshor Plus is the market leading Aluminium shoring system from RMD Kwikform and has a maximum working leg load of 120kN. The system has been designed in conjunction with experienced concrete frame contractors to maximise production on site and incorporates a number of unique features which provide bemefits in safety, performance and versatility.

Health and Safety

Designers should make themselves familiar with the contents of Equipment Guidance Notes UIX10203-Alshor Plus Falsework and Application Risk Assessment UIX20200-Falsework. These documents are available to customers via hyperlinks embedded in PDF scheme drawings. Residual risks pertaining to design issues are marked in this document with the symbol and, if relevant to the scheme being prepared, should be highlighted on the RMDK scheme drawing.

Design to EN Standards

The RMD Kwikform Alshor Plus System has been verified in accordance with EN12812:2008 Falsework Performance Requirements and General Design with manufacturing procedures certified in accordance with BS EN ISO 9001: Quality Management Systems.

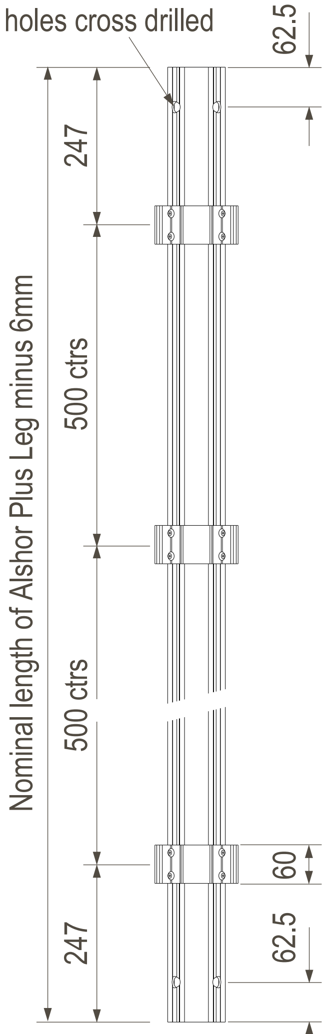
To facilitate a simplified scheme design using established permissible load methods, load performance data in this document is displayed as an 'Allowable Working Load'. Should Limit State Design be required, the Design Resistance may be obtained by multiplying the Allowable Working Load values by 1.5.

Alshor Plus Legs

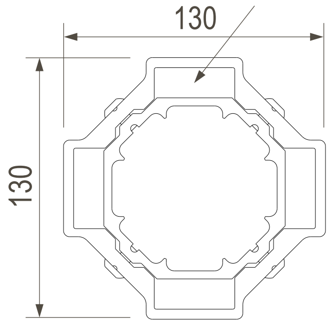
Alshor Plus Legs are unique in that they incorporate fixed pocket extrusions at 500mm intervals. The load capacity of assembled towers is highly sensitive to the vertical location of the frames and the fixed pockets eliminate the need for site measurement to establish frame location during assembly/ checking of the structure thus reducing time and enhancing safety. Fixed pockets also guarantee straightness of the falsework structure and facilitate the assembly of tall Alshor Plus towers horizontally followed by erection and positioning by crane thus reducing work at height providing further safety and productivity benefits.

Allowable working loads in compression depend on restraint conditions - refer to the loading graphs in Appendix B

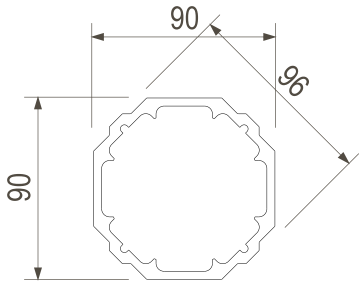
Note: When the shoring is constructed from more than one leg in height, the joint in the leg can be placed anywhere in the height - providing there is no more than one joint located between a pair of adjacent Alshor Plus Frames.



Elevation on Alshor Plus Leg



Enlarged Section at Pocket Position



Enlarged Section Through Alshor Plus Leg

Maximum allowable load applied to a pocket by an Alshor Plus Frame or Ledger is 10kN in any direction

Maximum allowable bearing load in a pair of end holes using an Alshor Plus Straight Pin 16mm (ASX10020) is 40kN

Code	Description	Weight
ASX34000	Alshor Plus Leg 4000mm	19.6 kg
ASX33000	Alshor Plus Leg 3000mm	14.7 kg
ASX32500	Alshor Plus Leg 2500mm	12.3 kg
ASX32000	Alshor Plus Leg 2000mm	9.79 kg
ASX31500	Alshor Plus Leg 1500mm	7.33 kg

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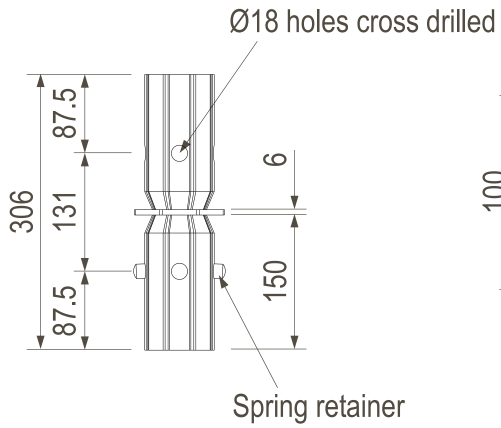
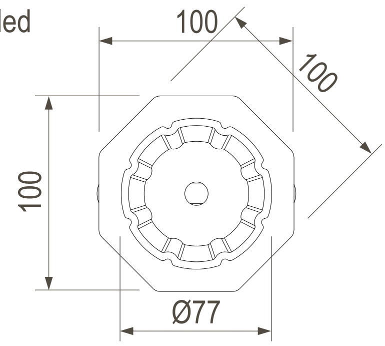
Alshor Plus Spigot 6mm (ASX10013) weight 2.46kg

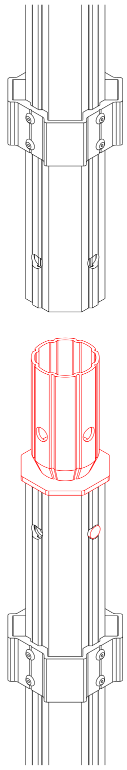
Used to align and join Alshor Plus Legs end to end. In applications where the leg joints will experience tension such as crane handling of tables or up-ending of towers by crane, add two Alshor Plus straight Pins 16mm (ASX10020) per joint.



Elevation



Enlarged Plan

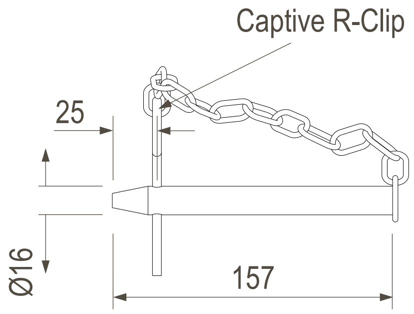


Alshor Plus Straight Pin 16mm (ASX10020) weight 0.11kg

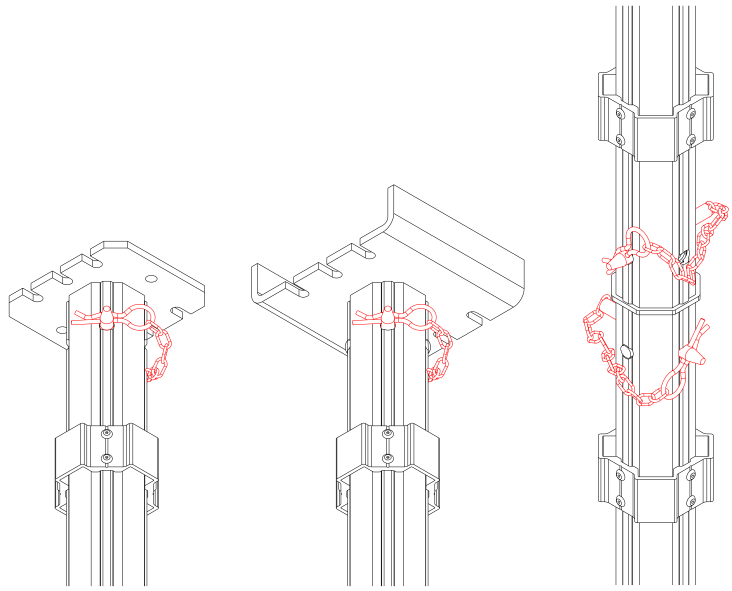
Used to connect leg components in tension applications.

Note: The spring retainer does not need to be removed from mating components before inserting a Straight Pin 16mm.

AWL = 40kN



Elevation



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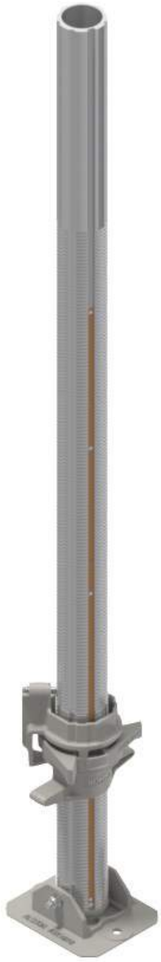
Alshor Plus Jack Long 200-1250mm (ASX10012) weight 14.9kg



A versatile screw jack having an adjustment range of 200-1250mm with many innovative features:

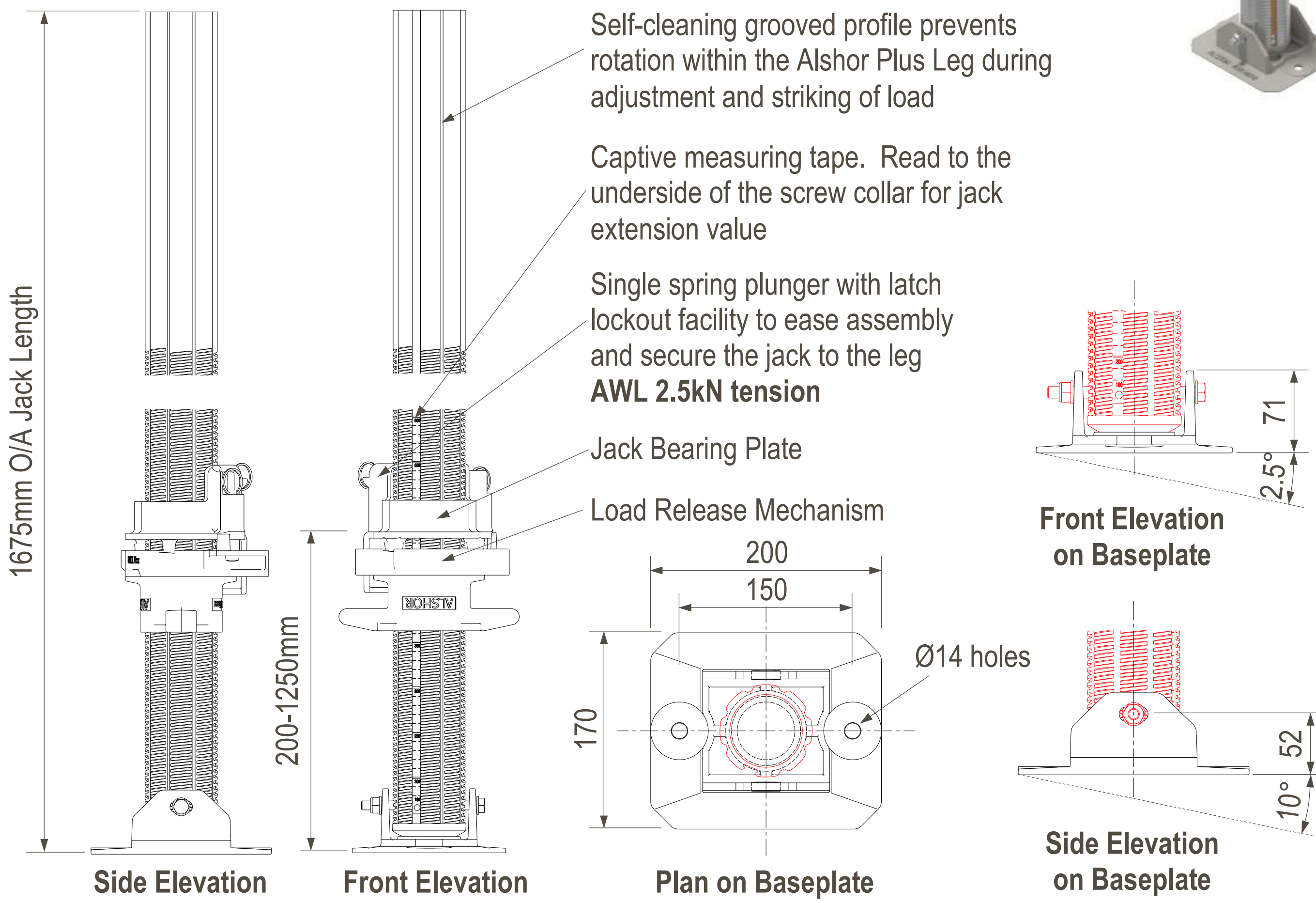
A fast, self cleaning thread provides 25mm of length adjustment with each collar rotation and an integral measuring tape facilitates initial set up. The grooved exterior profile engages with the ridged leg interior preventing jack rotation during collar adjustment. An integral spring retainer secures the unit into the leg facilitating crane or trolley handling of falsework assemblies.

A unique load release mechanism enables full and rapid striking using only a club hammer by reducing the leg length by 12mm thus reducing striking time/effort, site noise and equipment damage as well as enhancing safety; refer to Equipment Guidance Notes UIX10203 for full operating details.

A robust cast steel base plate accepts impact loads during the fine positioning of falsework legs and includes holes enabling bolting to the foundation where required or fastening to a primary beam or U head when used inverted.

A part-spherical joint between the jack stem and base plate ensures concentric loading which enhances load capacity and provides 10 degrees of rotation in one axis and 2.5 degrees in the other. Once the leg load is applied the friction generated within the joint generates sufficient internal friction so as to provide moment fixity further enhancing the allowable leg load. Ensure that the foundation to the falsework can also provide rotational fixity to the base jack and never allow the spherical joint between the base plate and jack to become lubricated.

Allowable working loads in compression depend on tower geometry and jack extension - refer to the loading graphs in Appendix B



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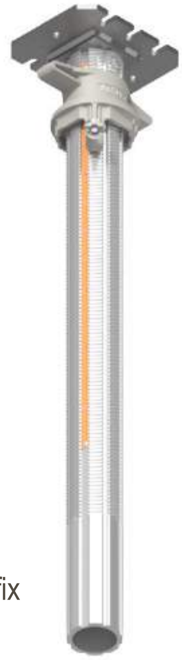
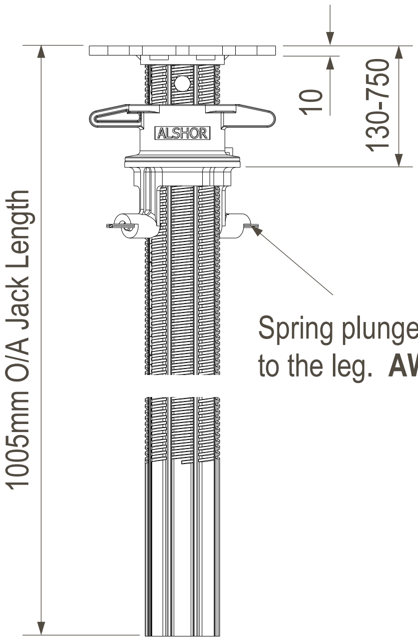
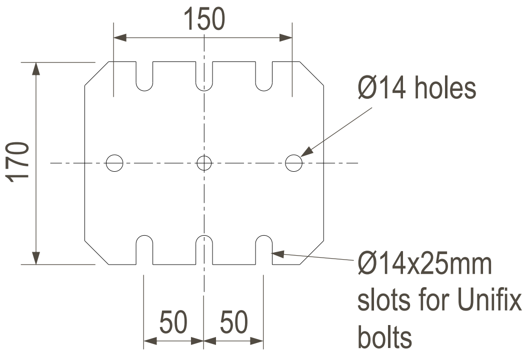
Alshor Plus Short Jack (ASX10030) weight 4.79kg



A shorter jack with a fixed baseplate and no load release mechanism. Used most commonly at the head of flat soffit falsework over 10m high or in backpropping applications. **AWL = 120kN max** (see Appendix B)



Side Elevation

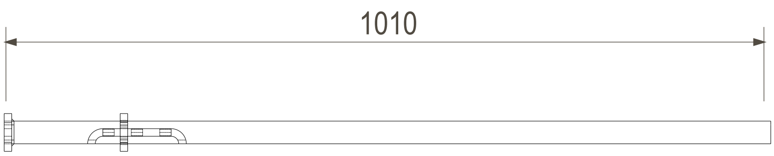


Plan on Baseplate

Alshor Plus Jack Spanner (ASX10029) weight 4.79kg

Used for adjusting jack extensions on built tables. Not designed for releasing load.

Plan



Side Elevation

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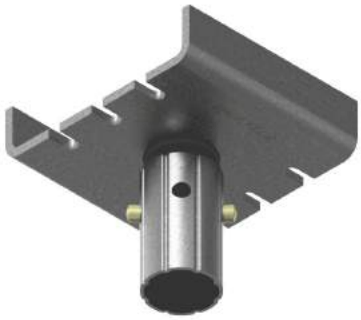
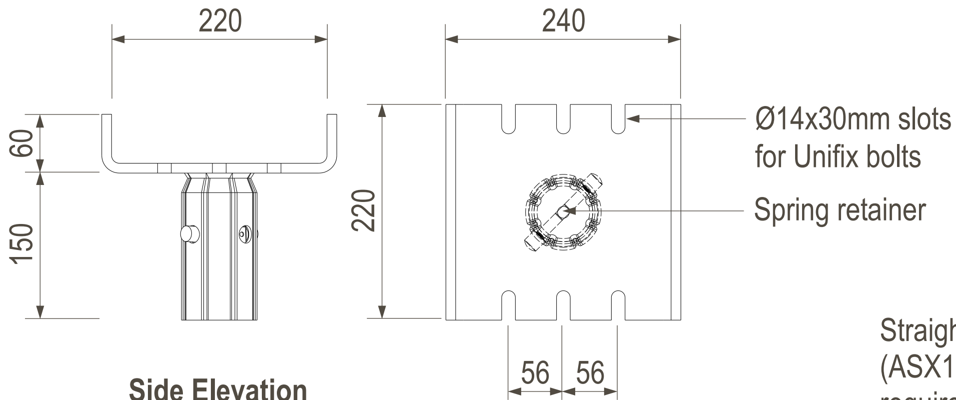
Alshor Plus U-Head 220w x 10mm (ASX10015) weight 6.58kg

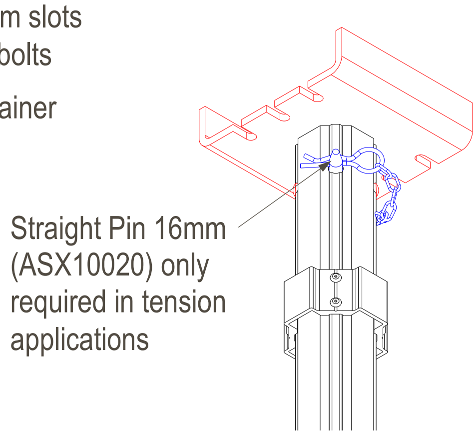


Used to support primary beams in flat soffit applications where height adjustment is not required. When incorporated into tables that will be lifted from the soffit add an Alshor Plus Straight Pin 16mm (Code ASX10020). There is no need to remove the spring retainer. **AWL = 12kN tension with straight pin**



Side Elevation

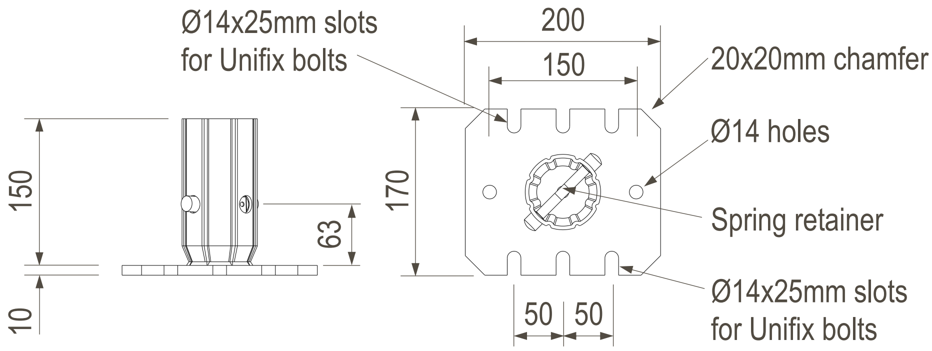
Plan



Alshor Plus Base 10mm (ASX10011) weight 3.50kg

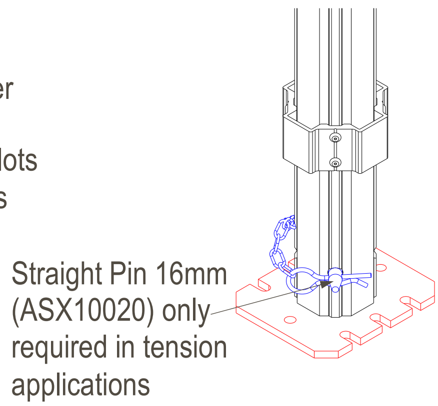
Used at the base on a smooth planar foundation where adjustment is not required or at the head when a U-Head is not required. When used at the head with tables that will be lifted from the soffit add an Alshor Plus Straight Pin 16mm (Code ASX10020). There is no need to remove the spring retainer.

AWL = 12kN tension with straight pin



Side Elevation

Plan



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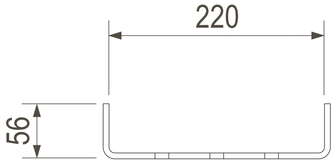
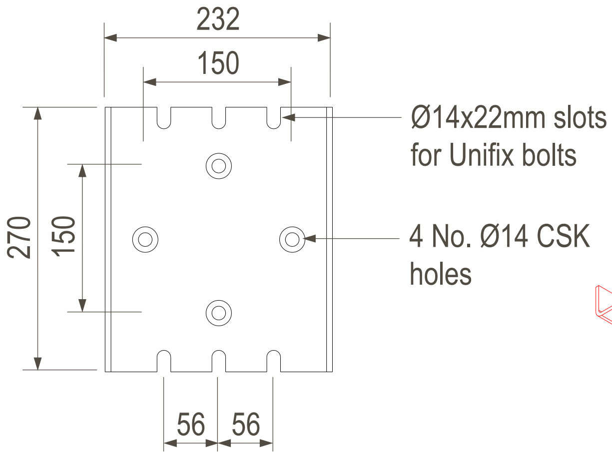
Alshor Plus U-Plate 270 x 220w x 6mm (ASX10023) weight 3.98kg

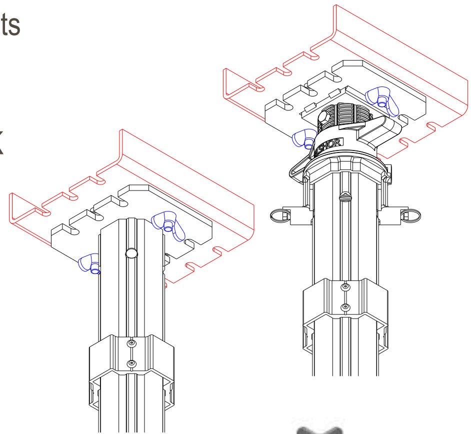
Used attached to the Long Jack, Short Jack or the Alshor Plus Base 10mm. Fix using 2 No. M12x40 Set Pins gr8.8 BZP CSK and M12 Wing Nuts gr.8 BZP (BNX12001 + BNU12004).



Side Elevation



Plan

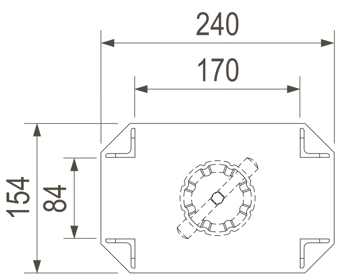


Alshor Plus T200 Forkhead (ASU20001) weight 5.11kg

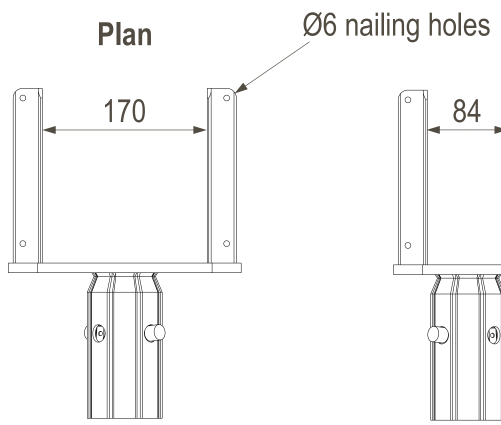
Used to accommodate either single or twin T200 beams. Orientate the unit accordingly during assembly.

AWL to suit T200 Beam Max Reaction

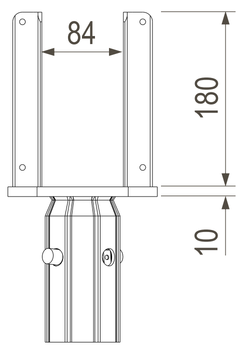
(22kN for single beam, 44kN for twin beams)



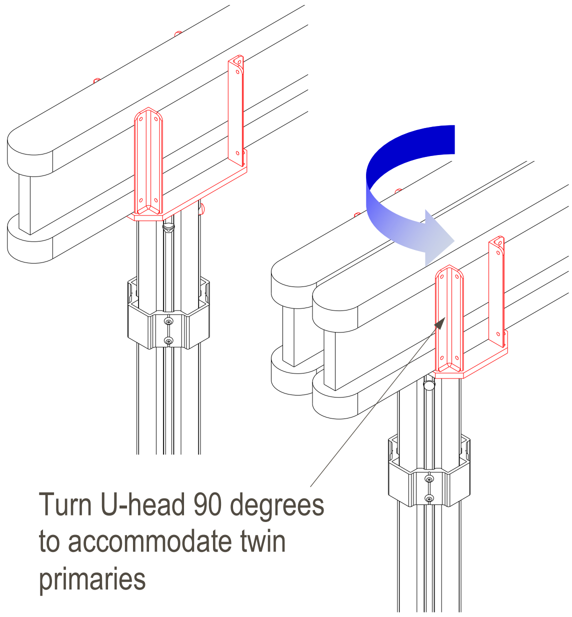
Plan



Side Elevation



Front Elevation



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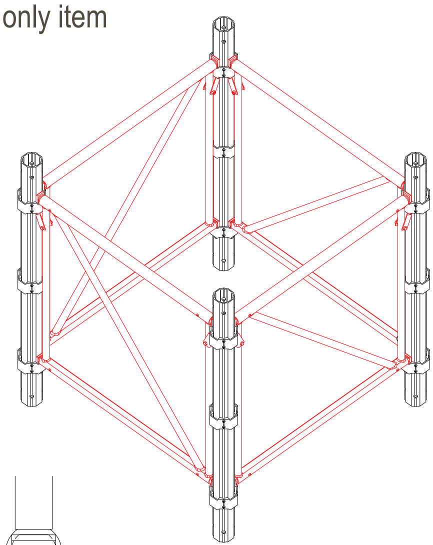
Bracing Frames

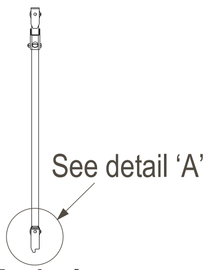
These stiff yet lightweight units are used to space the Alshor Plus Legs legs apart and laterally restrain them as well as for the support of access components. Tongue connectors engage with the leg pockets and are captivated by simple sprung latches providing the fastest assembly times. The lower tongues are 25mm longer than the upper ones and stepped in their width to further aid and speed frame installation.

AWL on tongues and spring latches = 10kN in any direction

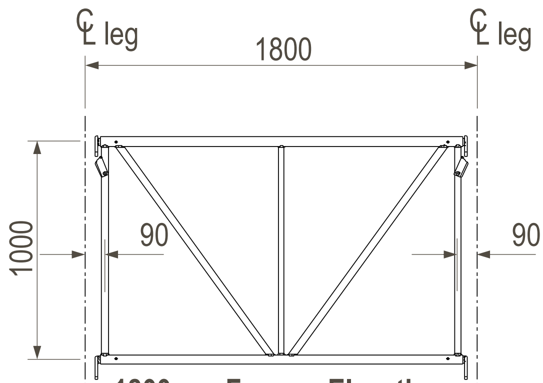
Code	Description	Weight
ASX43000	Alshor Plus Frame 3000mm	16.9 kg
ASX42400	Alshor Plus Frame 2400mm	14.5 kg
ASX41800	Alshor Plus Frame 1800mm	12.2 kg
ASX41200	Alshor Plus Frame 1200mm	8.91 kg
ASX40900	Alshor Plus Frame 900mm*	7.79 kg

* Sale only item

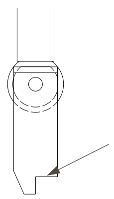




Typical Section

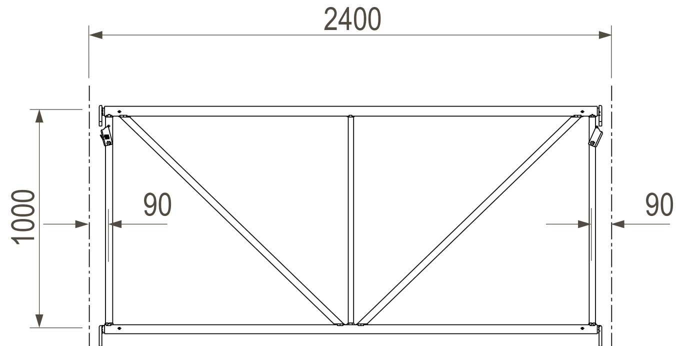


1800mm Frame - Elevation

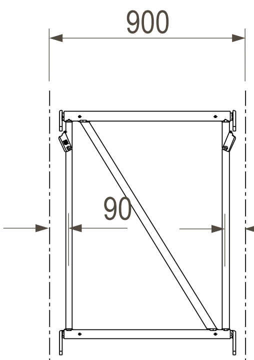


Lower frame tongue stepped in width to aid installation process. Refer to EGN UIX10203 for further details

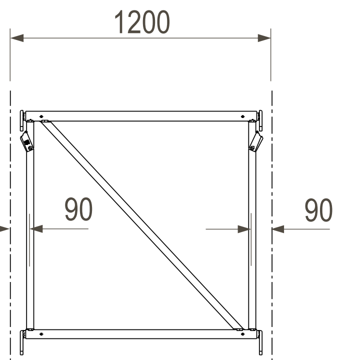
Detail 'A'



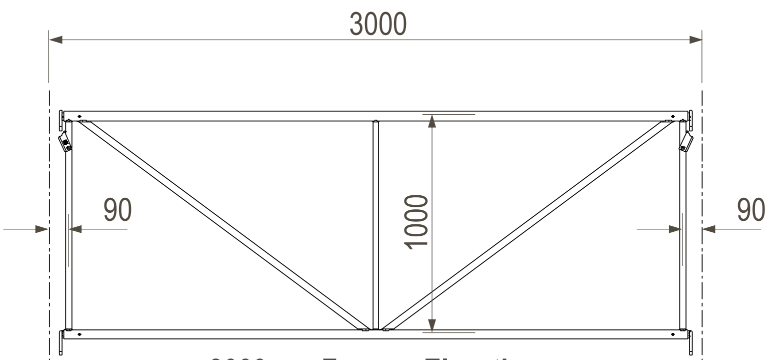
2400mm Frame - Elevation



900mm Frame Elevation



1200mm Frame Elevation



3000mm Frame - Elevation

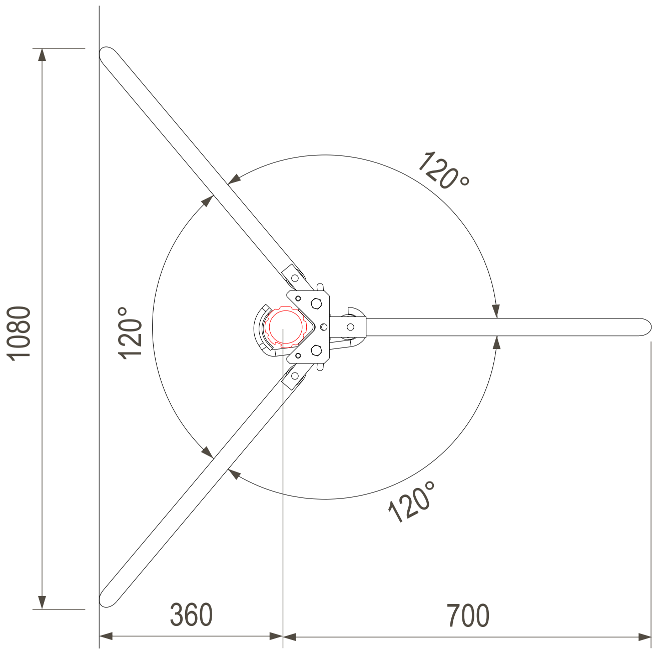
Alshor Plus Leg Tripod (ASX10060) weight 11.0kg

Used to stabilise Alshor Plus props up to 5.25m long in vertical falsework applications without brace frames and founded on a flat level surface.

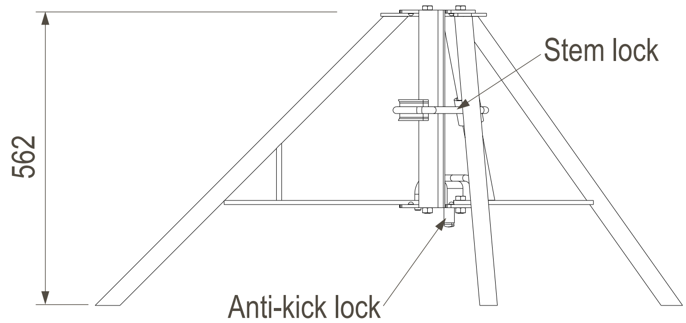
Folds flat for storage - rotate each leg and lock in place with the built in anti-kick lock mechanism. Position around the prop and secure with the built-in stem-lock tightening lightly with a hammer.

Fits all sizes of tube prop between 48.3mm and 80mm diameter. When used with Alshor Plus the minimum jack extension is 700mm.

Fit tripods to the props supporting each end of primary beams up to 4.8m long and at maximum of 4.8m centres for longer beams. Ensure that the heads of all props are clipped to the primary beams.



Plan



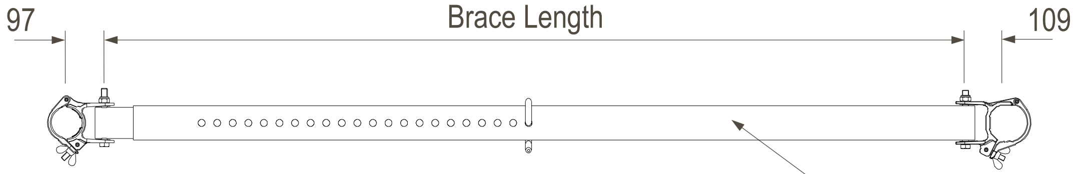
Elevation

Adjustable Jack Braces

Used to brace head jacks to increase allowable working loads in head jack applications. Position four braces on a spiral at the top of the tower.

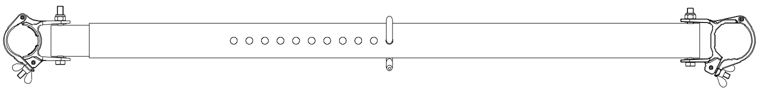
The collars incorporate wing nuts to enable the braces to be positioned without the need for spanners. Tighten the wing nuts by hand followed by a further quarter turn.

Allowable working load in the brace is 14.1kN at all lengths however this is limited by the 10kN slip between the collars and the leg and jack sections. Graphs showing the allowable working load for towers with braced head jacks are shown in series 500 in Appendix B.

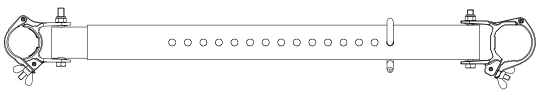


Plan on Jack Brace 2400-3000mm

Telescopic aluminium body fixed to length at 40mm increments with captive pin

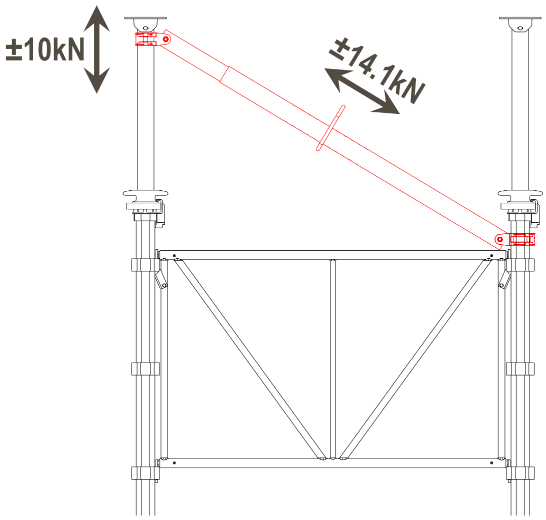


Plan on Jack Brace 1800mm



Plan on Jack Brace 1200mm

Elevation on Jack Brace 1200mm

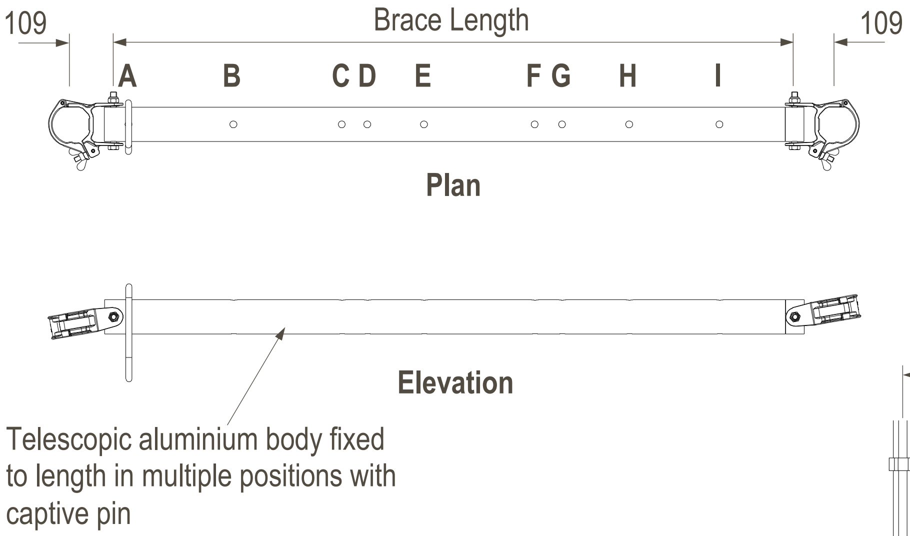


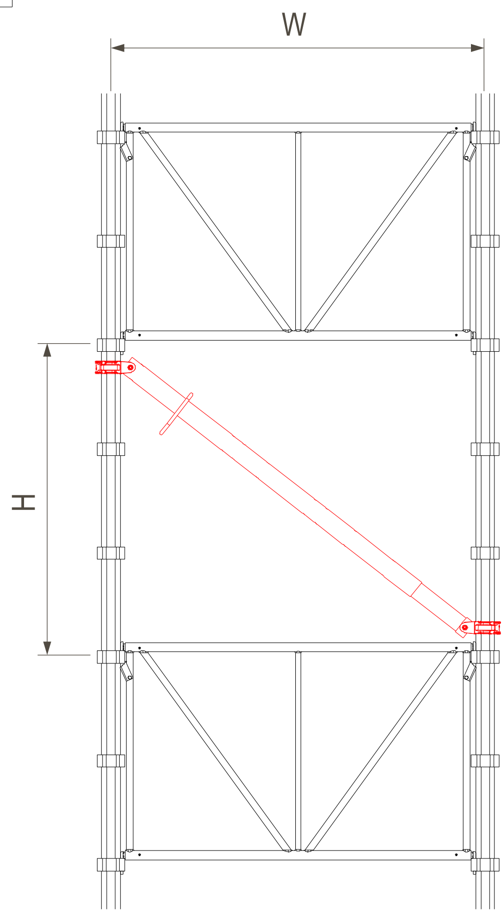
Code	Description	Brace Range	Weight
ASX92400	Alshor Plus Jack Brace 2400-3000mm	2260-3140mm	14.1 kg
ASX91800	Alshor Plus Jack Brace 1800mm	1670-2100mm	12.1 kg
ASX91200	Alshor Plus Jack Brace 1200mm	1080-1650mm	10.7 kg

Alshor Plus Leg to Leg Brace (ASX10050) weight 15.2kg

Used to brace between the Alshor Plus frames in freestanding applications where lateral loads need to be carried by the falsework to the foundation and it is not possible to stagger the frames (see sheets 62-64). The collars incorporate wing nuts to enable the braces to be positioned without the need for spanners. Tighten the wing nuts by hand followed by a further quarter turn.

Allowable working load of 10kN at all lengths is limited by the slip between the collars and the leg section.





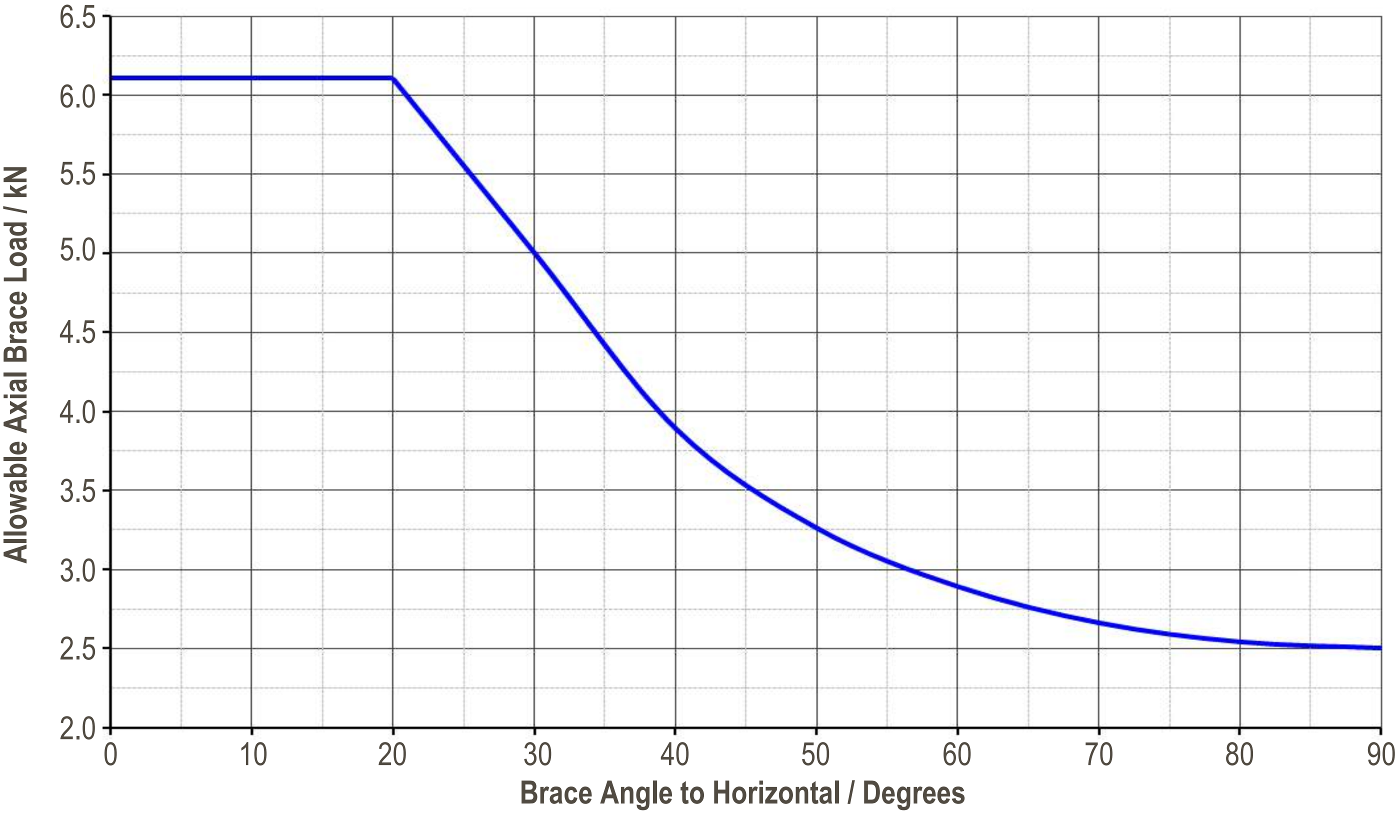
Ref	Brace Length	Bay Size W x H
A	1765mm	1800x1000mm
B	2037mm	1200x2000mm
B	2037mm	1800x1500mm
C	2318mm	2400x1000mm
D	2384mm	1800x2000mm
E	2531mm	2400x1500mm
F	2818mm	2400x2000mm
G	2889mm	3000x1000mm
H	3062mm	3000x1500mm
I	3296mm	3000x2000mm

Alshor Modified Jack Coupler (ASU10001) weight 1.80kg

Used to attach tube bracing to Alshor Plus Jacks. A standard swivel coupler shall be used to connect the remote end of the tube to the top or bottom chord of the Alshor Plus frame close to the leg.

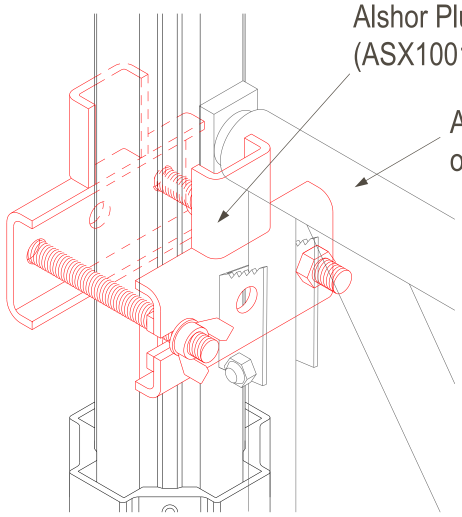
The allowable slip load of the coupler along the jack is 2.5kN.

The allowable load for the coupler at right angles to the jack stem and in slip along the tube is 6.1kN. This combination of loading gives rise to the allowable working load graph below.



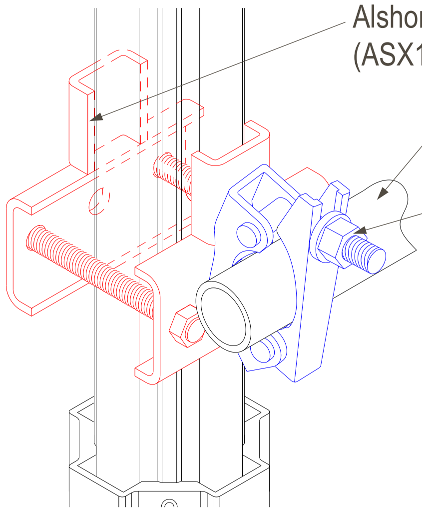
Alshor Plus Adjustable Pocket (ASX10016) weight 2.67kg

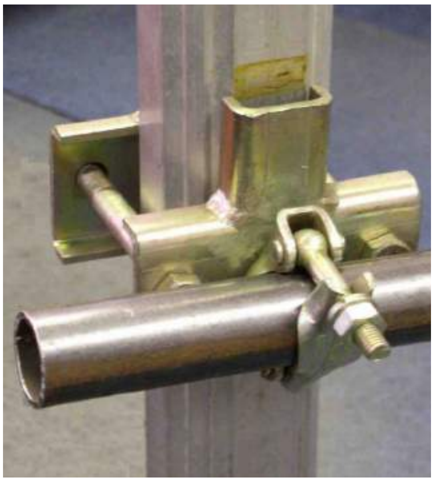
Used alone the Adjustable Pocket enables a frame, ledger or guardrail to be connected to an Alshor Plus leg at a level between the pocket extrusions. **AWL = 6.25kN** (does not resist uplift).



Alshor Plus Adjustable Pocket with Tube Coupler

Use a Half Coupler connected to the Adjustable Pocket to connect scaffold tube to an Alshor Plus leg. **AWL = 6.25kN**



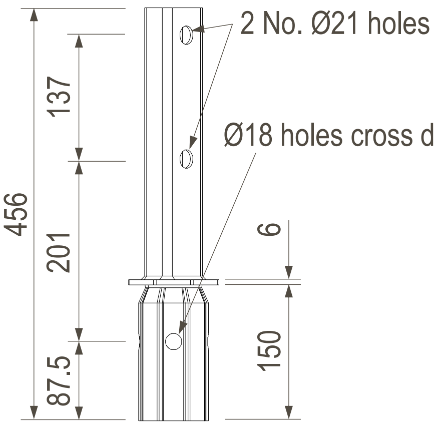


Code	Description	Weight
ASX10016	Alshor Plus Adjustable Pocket	2.67 kg
SFU10014	2" Half Coupler 18mm Dia Hole	0.50 kg
BNX16018	M16 x 25 Set Pin gr8.8 BZP CSK	0.05 kg
BNU16001	M16 Hexagon Nut gr.8 BZP	0.03 kg

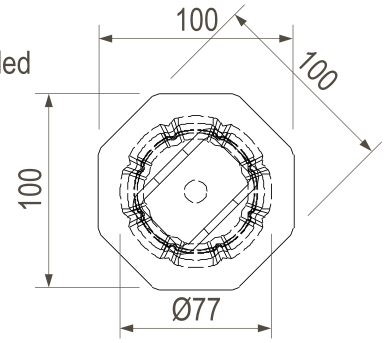
Alshor Plus Spade End Adaptor (ASX10051) weight 2.99kg

Use to connect Alshor Plus Legs to Superslim Primary Beams in Knee Brace Table applications. Connect to Alshor Plus Leg using Straight Pin 16mm (ASX10020) and Soldier using 2 No. Superslim 19mm Pins & R-Clips (SSX10046). Remove lower pin on Soldier to facilitate rotation of leg during table shifting operation. For applications see sheet 55.

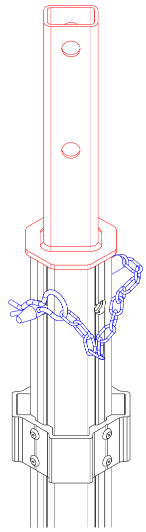
AWL = 50kN with 1No. 19mm Pin, 100kN with 2 No. Pins



Elevation



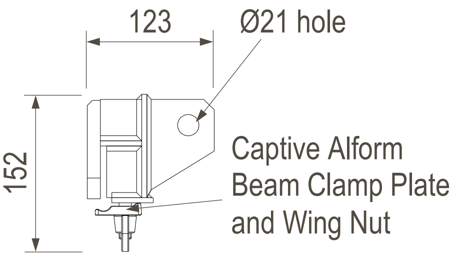
Enlarged Plan



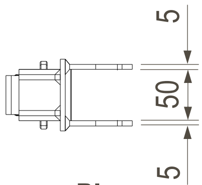
Alshor Plus Node Lug (ASX10052) weight 1.65kg

Use to connect Alshor Plus Knee Brace Struts to Alshor Plus Legs in Knee Brace Table applications. Blade on unit slots into pocket on Alshor Plus Leg and is locked in place using the captive Alform beam Clamp Plate & Wing Nut.

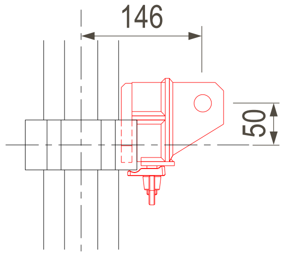
AWL = 10kN

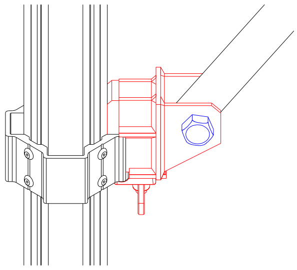


Elevation



Plan



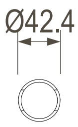


Setting Out Dimensions

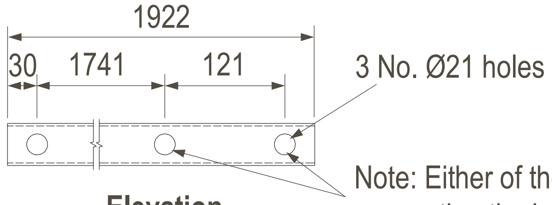
Alshor Plus Knee Brace (ASX10053) weight 4.86kg

A Ø42.4 O.D. tube used to brace between Superslim Soldier Primary Beam and Alshor Plus Node Lug in Knee Brace Table applications. Connect to Soldier and Node Lug using 2 No. Superslim 19mm Pins & R-Clips (one at either end of Knee Brace).

AWL = 15kN



Section



Elevation

Note: Either of these 2 holes can be used for connecting the brace to the Superslim Primary Beam

ALSHOR PLUS

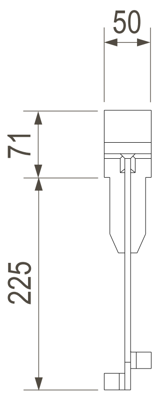
VERSATILE ALUMINIUM SHORING SYSTEM

Alshor Plus Drop Beam Bracket (ASX10040) weight 1.60kg

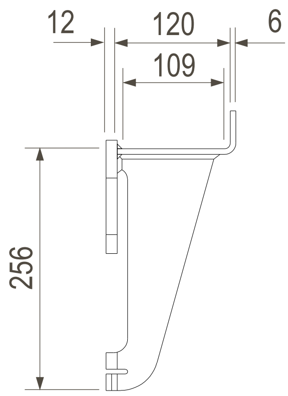
Enables support to drop beams to be provided from the falsework supporting the main area of slab. **AWL = 10kN.**

Ensure that the Drop Beam Bracket is placed opposite the top or bottom chord of an Alshor Plus Frame. The total allowable load in the Alshor Plus Leg that supports the Drop Beam Bracket is reduced from that indicated in Appendix B as follows:

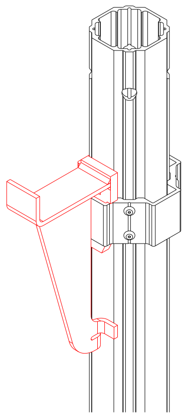
Drop Beam Load	Multiply AWL by
1 kN	0.97
2 kN	0.93
3 kN	0.90
4 kN	0.86
5 kN	0.83
6 kN	0.80
7 kN	0.77
8 kN	0.74
9 kN	0.71
10 kN	0.68



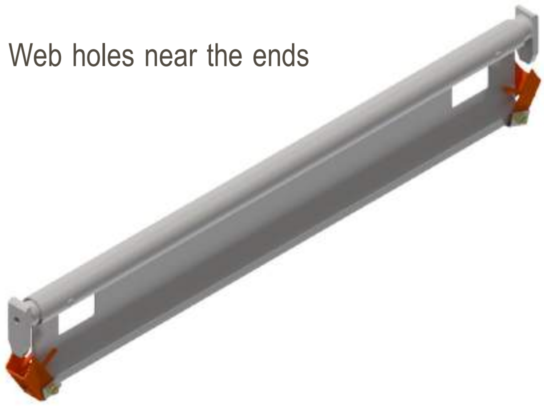
Front Elevation



Side Elevation



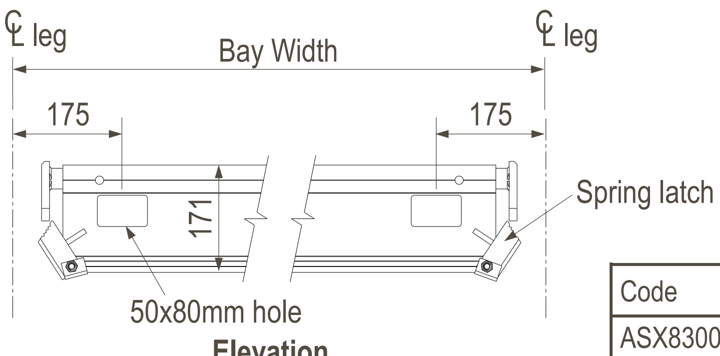
Alshor Plus Ledgers



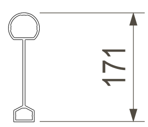
Used to space the Legs apart and support ladders and board bearers. Web holes near the ends enable scaffold couplers to be connected.

Allowable BM = 5.9kNm Allowable

End Reaction = 10kN



Elevation



Section

Code	Description	Weight
ASX83000	Alshor Plus Ledger 3000mm	10.1 kg
ASX82400	Alshor Plus Ledger 2400mm	8.46 kg
ASX81800	Alshor Plus Ledger 1800mm	6.68 kg
ASX81200	Alshor Plus Ledger 1200mm	4.88 kg
ASX80900	Alshor Plus Ledger 900mm	4.02 kg

Handrails

Locate in the lug extrusions with integral spring latches to provide guardrails. Not to be used as supports to board bearers. Painted orange to aid visual checks and designed to comply with the loading and deflection requirements of BS 1139 Part 5 (5.4).

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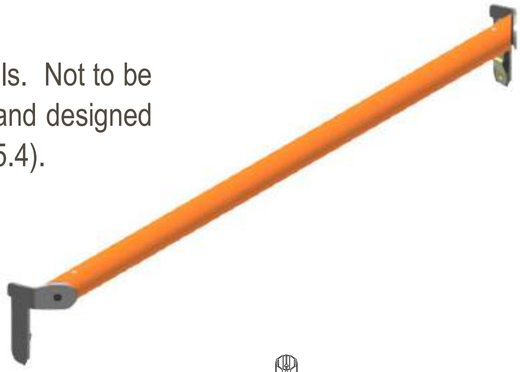
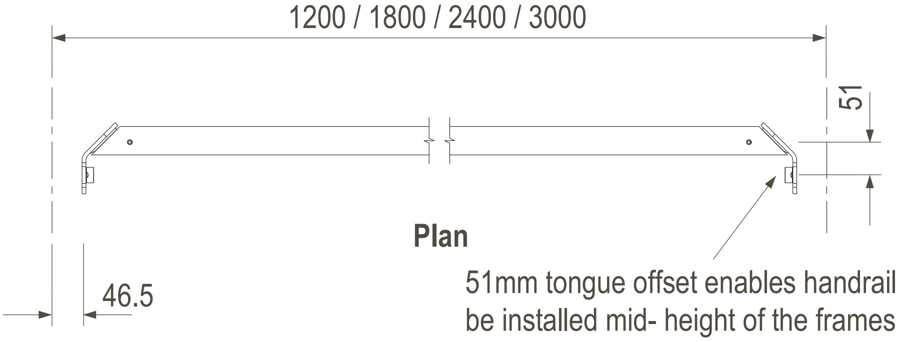
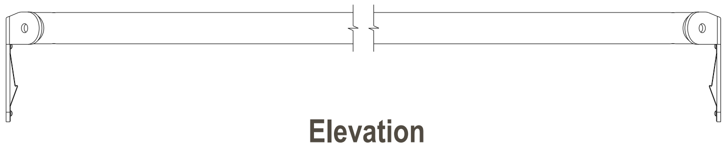


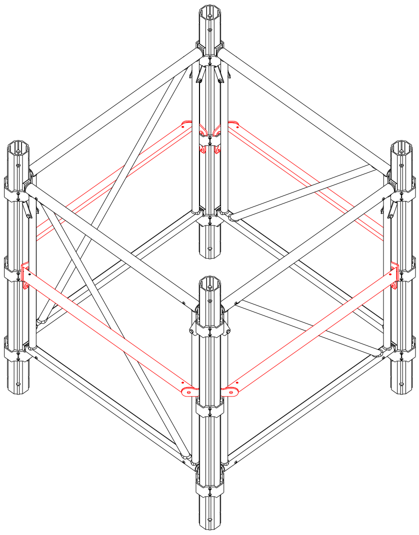


Plan

51mm tongue offset enables handrail to be installed mid- height of the frames



Elevation



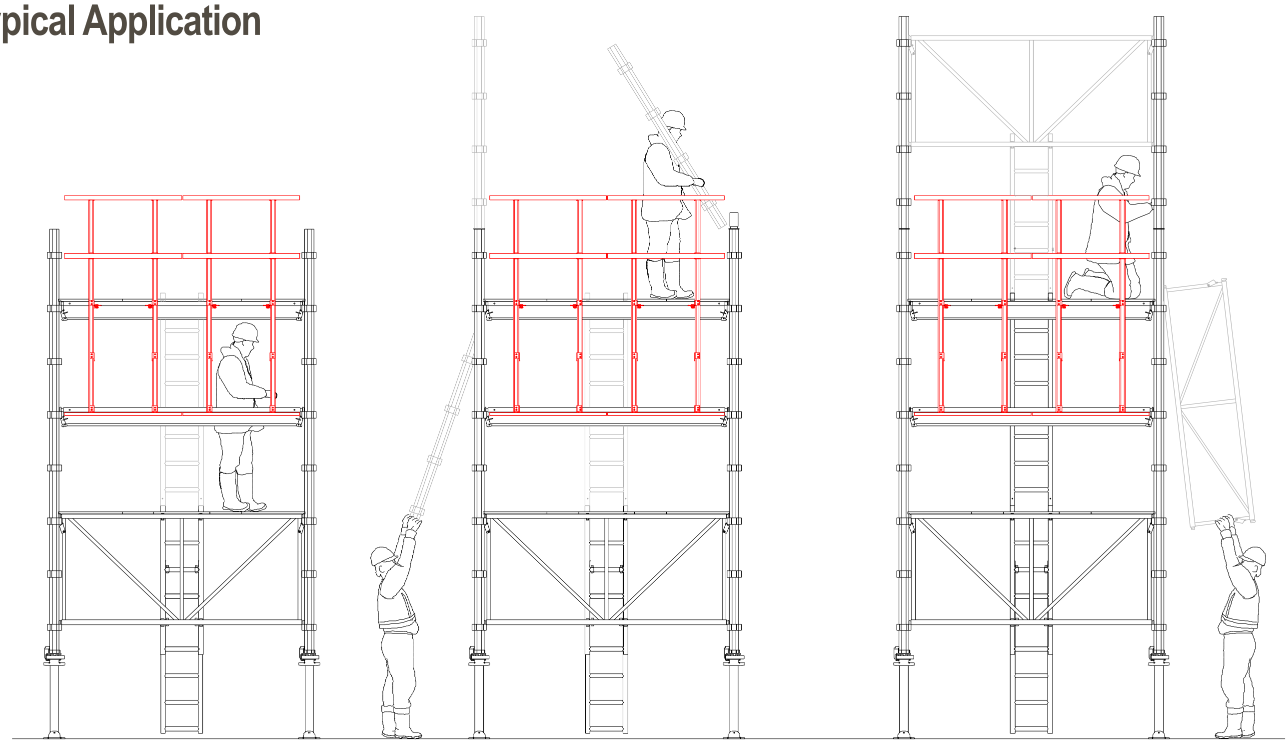
Code	Description	Weight
ASX73000	Alshor Plus Handrail 3000mm	6.08 kg
ASX72400	Alshor Plus Handrail 2400mm	5.08 kg
ASX71800	Alshor Plus Handrail 1800mm	4.08 kg
ASX71200	Alshor Plus Handrail 1200mm	3.08 kg

Advancing Handrails

Used with other accessories to enable the erection of Alshor Plus towers in vertical mode without the need for personal fall arrest equipment (harnesses).

Code	Description	Weight
ASX10058	Alshor Advancing Handrail 1800mm	15.7 kg
ASX10057	Alshor Advancing Handrail 1200mm	13.3 kg

Typical Application

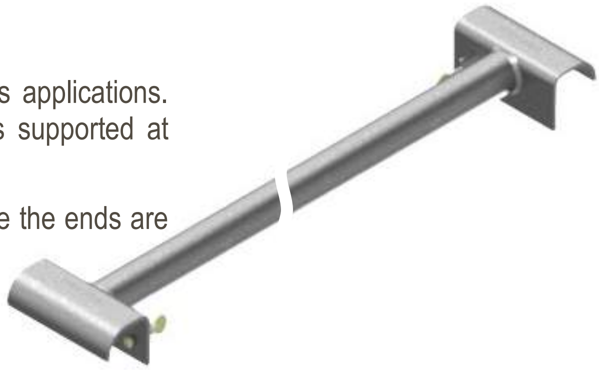


Use 1200mm units with 1200mm frames, 1800mm units with 1800mm frames, 2 x 1200mm units with a 2400mm frame and 1200 + 1800mm units for a 3000mm frame.

ALSHOR PLUS

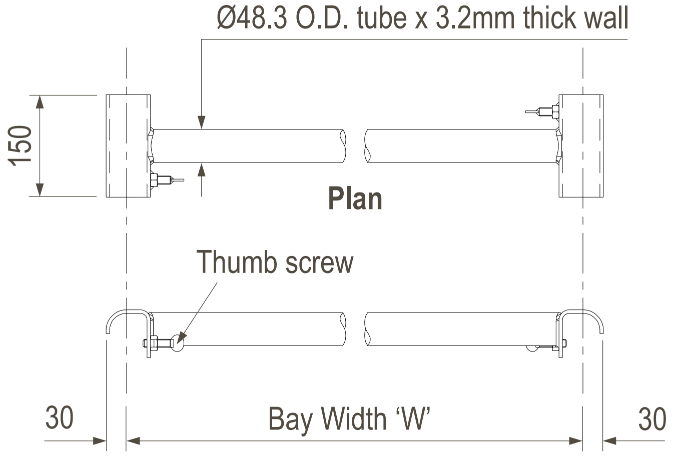
VERSATILE ALUMINIUM SHORING SYSTEM

Board Bearers



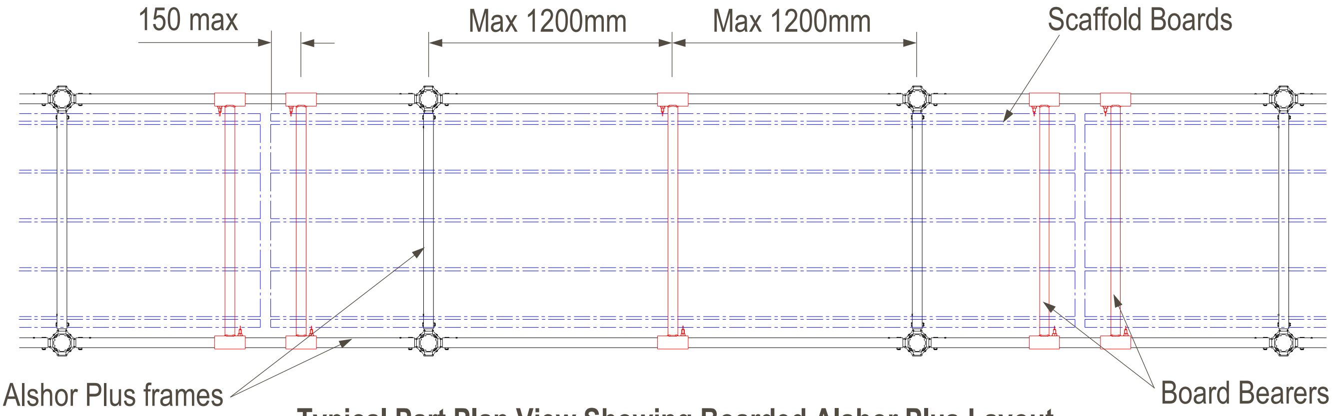
Used to provide intermediate support to scaffold boards in access applications. AWL 1.5kN/m^2 when used with standard RMDK scaffold boards supported at 1200mm maximum centres.

Note: Do not cantilever scaffold boards more than 150mm. Ensure the ends are supported either by a Ledger or a Board Bearer.



Elevation

Code	Description	Weight
ASX62400	Alshor Plus Board Bearer 2400mm	10.1 kg
ASX61800	Alshor Plus Board Bearer 1800mm	7.97 kg
ASX61200	Alshor Plus Board Bearer 1200mm	5.84 kg



Typical Part Plan View Showing Boarded Alshor Plus Layout

ALSHOR PLUS

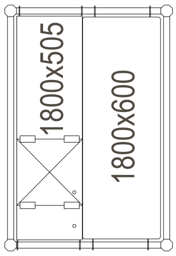
VERSATILE ALUMINIUM SHORING SYSTEM

Access Platforms

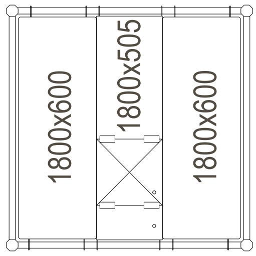
Used with 1800 and 2400mm bays of Alshor Plus to provide a working platform. The plain access platforms are 300 and 600mm wide. The 525mm wide trapdoor platforms are used to permit ladder access with the Alshor Plus Ladders. These units feature a unique double hinged trapdoor ensuring safety at all stages of use. Trapdoor units incorporate a latch to prevent unintentional uplift.

AWL = 2.0kN/m²

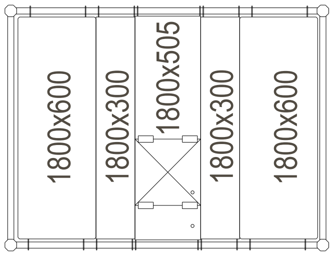
Standard Boarded Bay Details



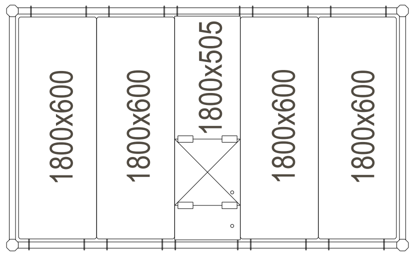
1200x1800
Bay



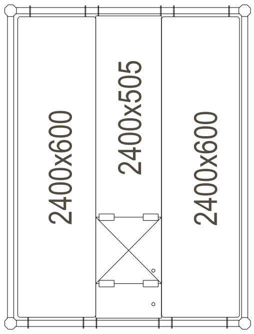
1800x1800
Bay



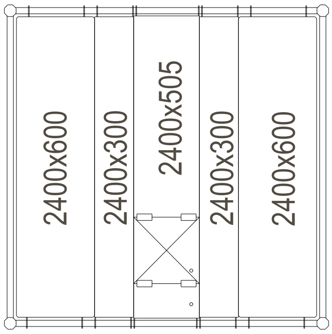
2400x1800
Bay



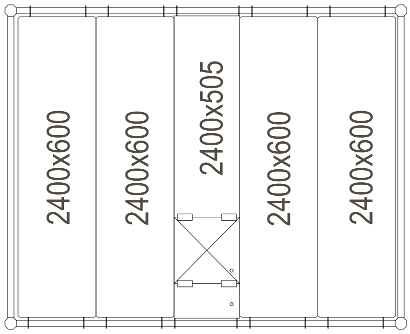
3000x1800
Bay



1800x2400
Bay



2400x2400
Bay



3000x2400
Bay

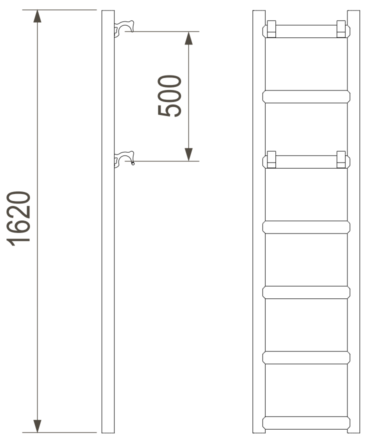
Code	Description	Weight
ASX10048	Platform 2400 x 600mm	17.1 kg
ASX10047	Platform 2400 x 505mm	17.4 kg
ASX10046	Platform 2400 x 300mm	12.3 kg
ASX10045	Platform 1800 x 600mm	12.8 kg
ASX10044	Platform 1800 x 505mm	12.7 kg
ASX10043	Platform 1800 x 300mm	9.32 kg

ALSHOR PLUS

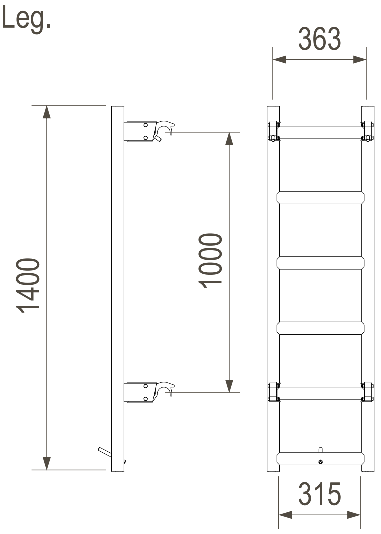
VERSATILE ALUMINIUM SHORING SYSTEM

System Ladders

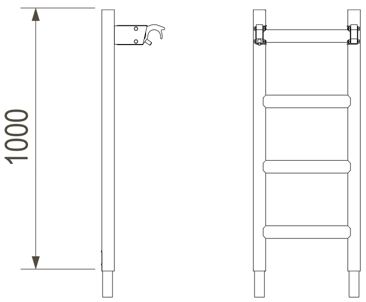
Used to access working platforms. Connect the Starter Ladder to an Alshor Frame or a pair of Ledgers in the lowest lug extrusion position. Use the Bottom Ladder between the Starter Ladder & the floor. Use the other Ladders to extend the Starter Ladder. Place the ladder in the centre of the Alshor Plus Frame except with the 1200mm frame where the ladder is positioned against the Alshor Plus Leg.



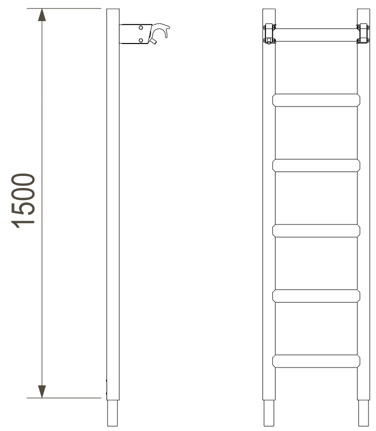
Bottom Ladder



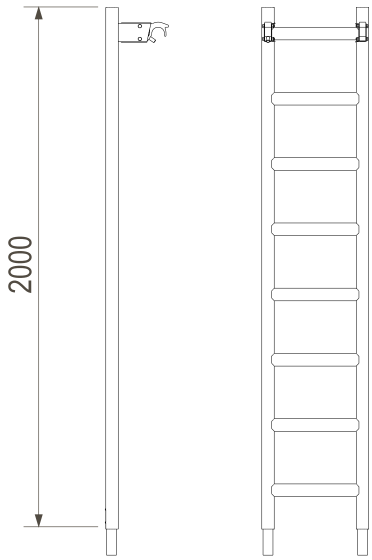
Starter Ladder



1000mm Ladder



1500mm Ladder



2000mm Ladder

The maximum distance from the ground to the first platform shall be 4.4m. The distance between platforms shall not exceed 4m thereafter.

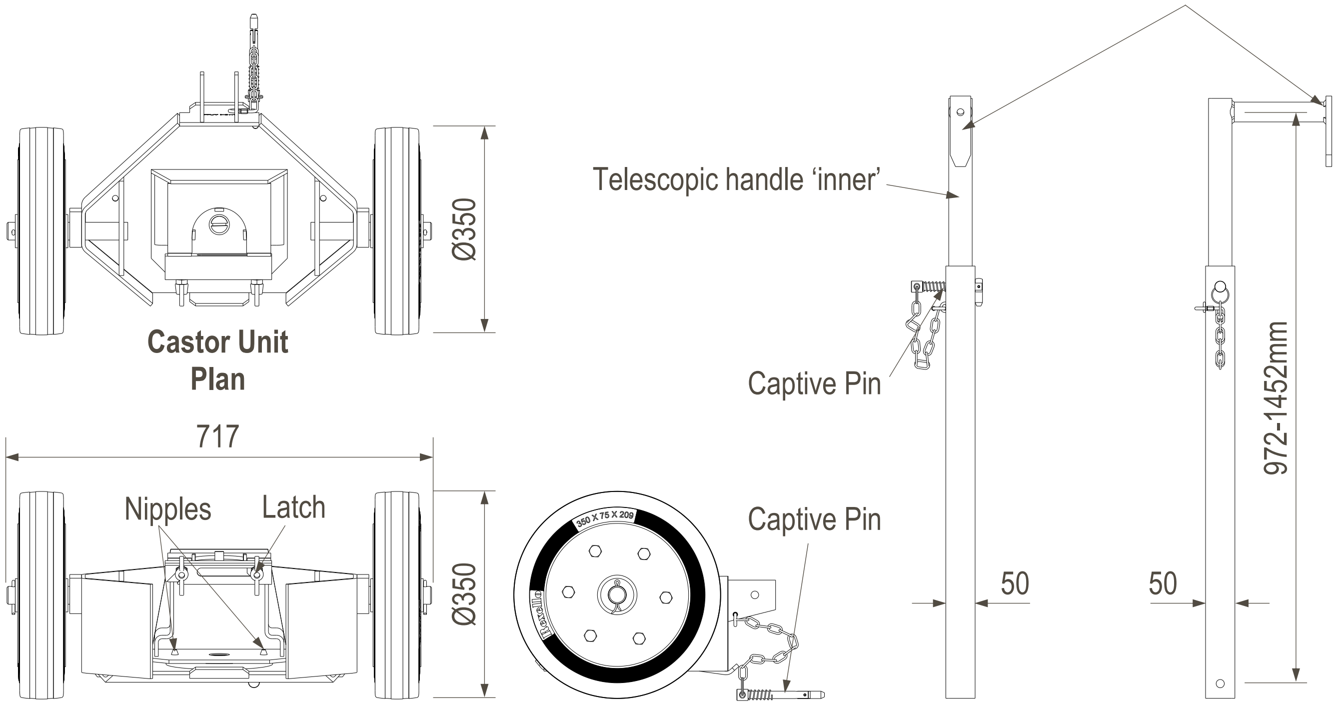
Code	Description	Weight
ASX50001	Alshor Plus Bottom Ladder	4.77 kg
ASX50002	Alshor Plus Starter Ladder	5.29 kg
ASX52000	Alshor Plus Ladder 2000mm	6.10 kg
ASX51500	Alshor Plus Ladder 1500mm	4.88 kg
ASX51000	Alshor Plus Ladder 1000mm	3.66 kg

Alshor Plus Castor Unit

A unit with solid tyres used to transport Alshor Plus tables; the Castor Unit slips over and positively locates onto the bottom of the Alshor Plus Jack. Optional pneumatic tyres are available for use with large heavy falsework structures; provided all pneumatic wheels have the same tyre pressure, even load sharing between wheels can be ensured by adjusting base jacks to equalise bulging of all tyres. Pneumatic tyres are also essential when rolling smaller falsework structures over soft ground in which case reduce the tyre pressure to reduce the ground bearing pressure. **AWL = 800kg per Castor Unit**

When tables are designed for moving using this product the minimum base jack extension should be 350mm.

Code	Description	Weight
ASX10038	Alshor Plus Castor Unit	50.4 kg
ASX10039	Alshor Plus Castor Unit Handle	8.39 kg
ASX10073	Pneumatic Wheel for Castor Unit	5.0 kg



Castor Unit Plan

Castor Unit Front Elevation

Castor unit Side Elevation

Alshor Plus Handle Front Elevation

Alshor Plus Handle Side Elevation

Notes:

1. Ensure the running surface is relatively flat & clear of obstructions to enable smooth running and even loading.
2. Ensure that the jack baseplate locates over the Castor nipples & that the latch is around the jack before moving.
3. Extend the handles not being used for steering and locate in the Alshor Plus leg pocket extrusions.
4. Take appropriate measures to avoid tables running away on slopes or running beyond slab edges.
5. Do not allow personnel to ride on Castor Units.

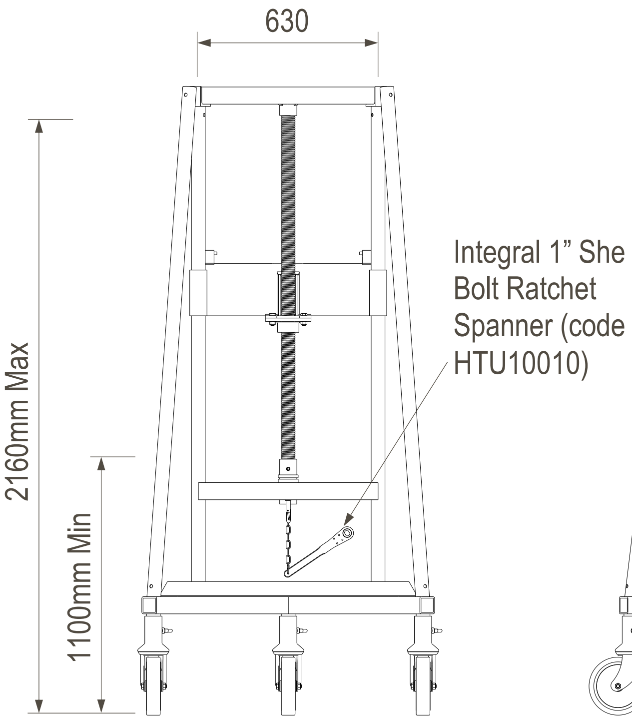
ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

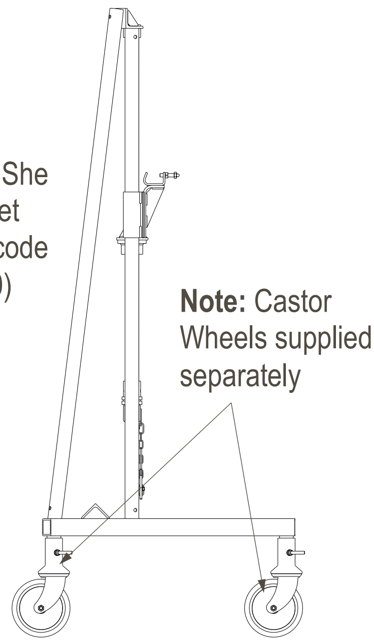
Trolley Unit

Lifts off the top or bottom boom of the Alshor Plus Frames to raise, lower and roll Alshor Plus tables on a smooth, level surface. Refer to Equipment Guidance Note UIX10604 for information regarding safe use.

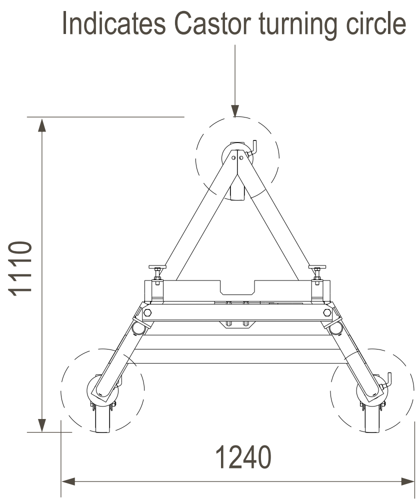
AWL = 500kg



Front Elevation



Side Elevation



Plan

Code	Description	Weight
ASX10014	Alshor Plus Trolley	95.5 kg
SFX10008	Castor Wheel 203mm	5.00 kg

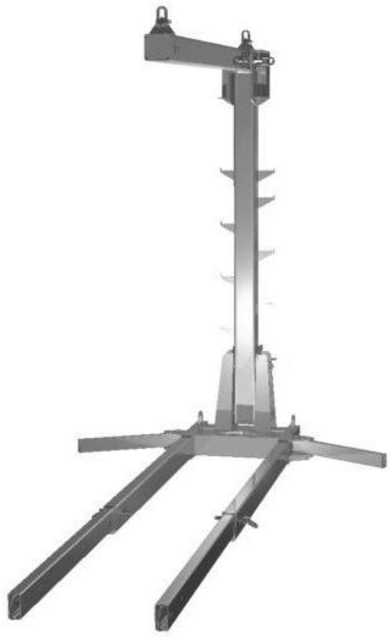
ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

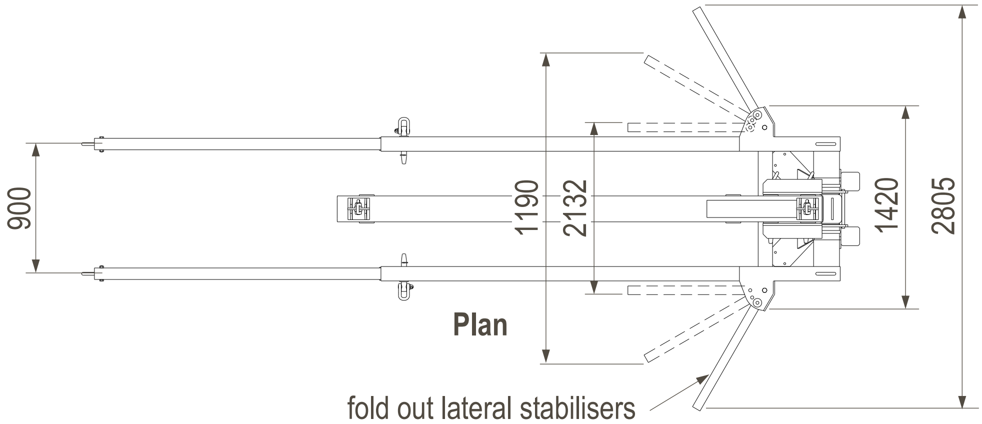
Single Depth Folding Telescopic C-Hook

A fully foldable lifting accessory with adjustable length forks and fold out stabilisers used for crane handling of Alshor Plus Tables up to 4000kg and a maximum length of 7.2m. To be used in conjunction with the C-Hook Chain Assembly.

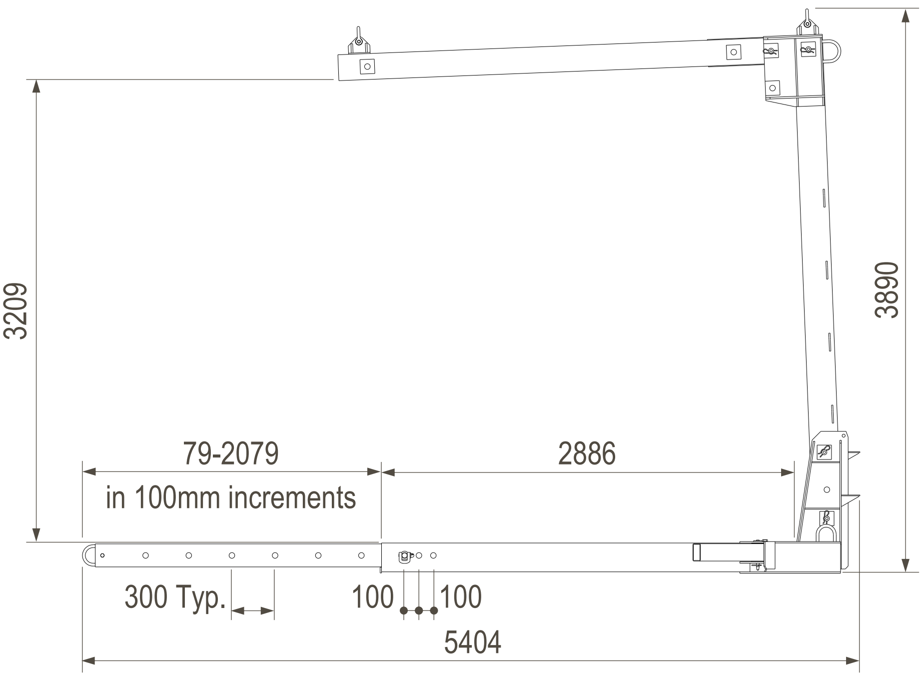
Refer to sheet 32 for Allowable Working Load Graph



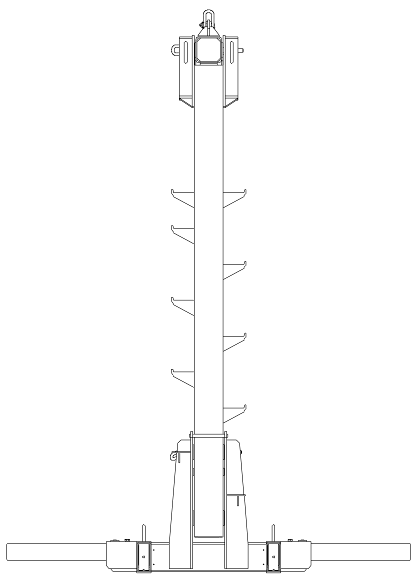
Code	Description	Weight
ASX10067	Twin Pronged Table C-Hook - Single Height	996 kg
ASX10042	C Hook Chain Assembly	82.0 kg



Plan



Elevation



End View

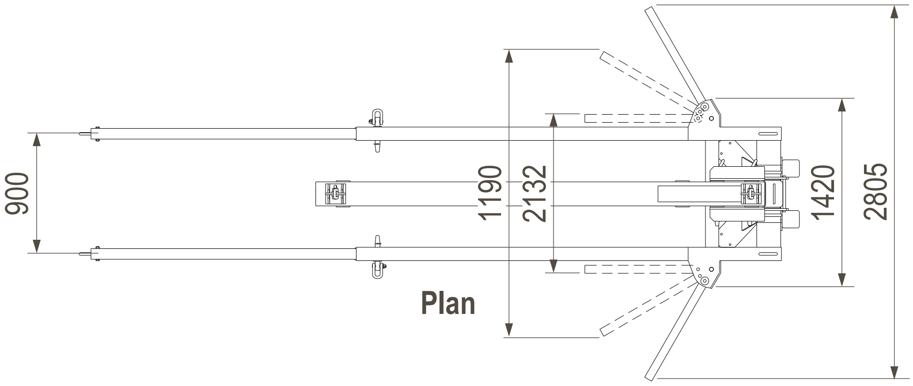
Folds down to 985h x 3760w x 1420w for transportation.

Refer to Equipment Guidance Note UIX10602 - Alshor Plus C-Frame for instructions on use.

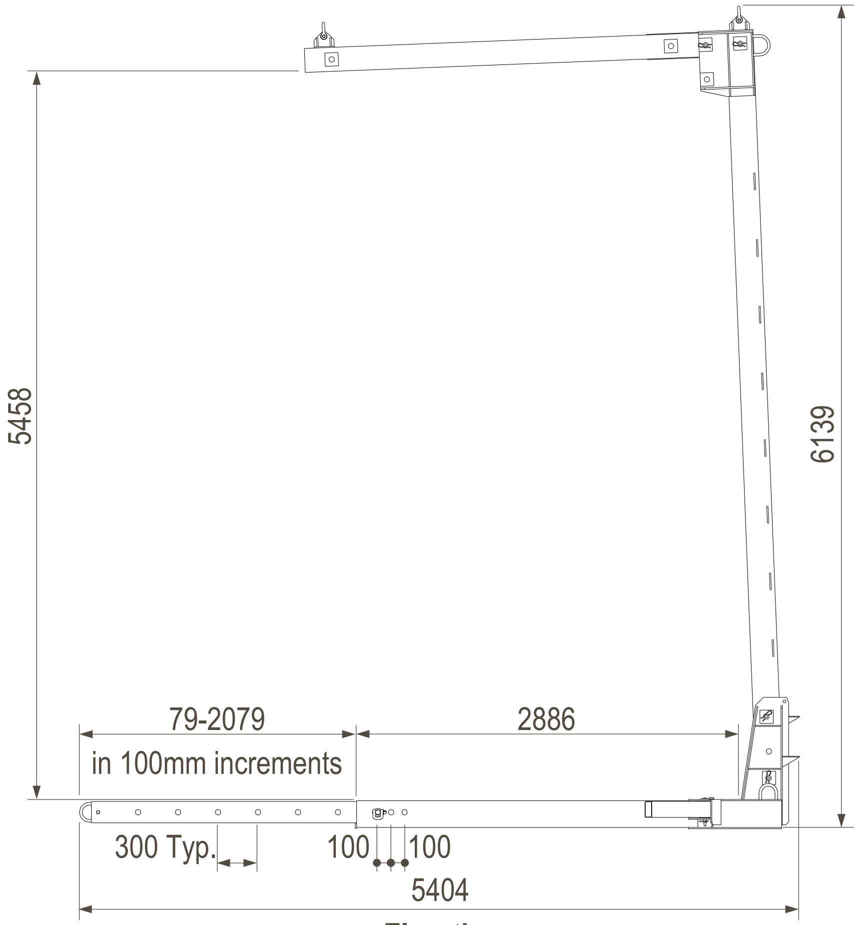
Double Depth Folding Telescopic C-Hook

A fully foldable lifting accessory with adjustable length forks and fold out stabilisers used for crane handling of Alshor Plus Tables up to 4000kg and a maximum length of 7.2m from lower levels. To be used in conjunction with the C-Hook Chain Assembly. **Refer to sheet 32 for Allowable Working Load Graph**

Code	Description	Weight
ASM10068	Twin Pronged Table C-Hook - Double Height	1140 kg
ASX10042	C Hook Chain Assembly	82.0 kg

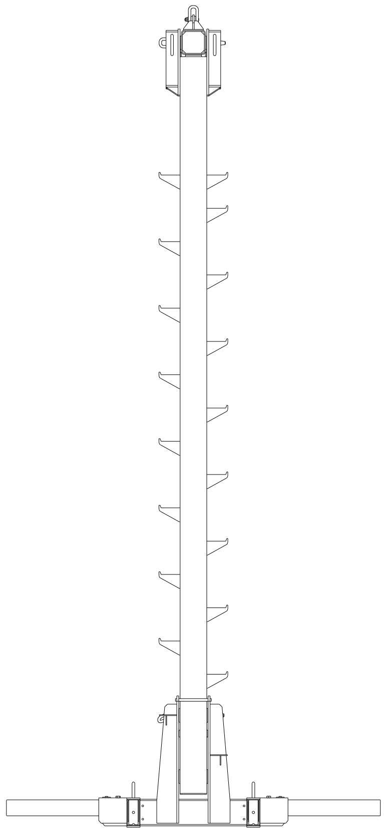


Plan



Elevation

Folds down to 985h x 6009w x 1420w for transportation.

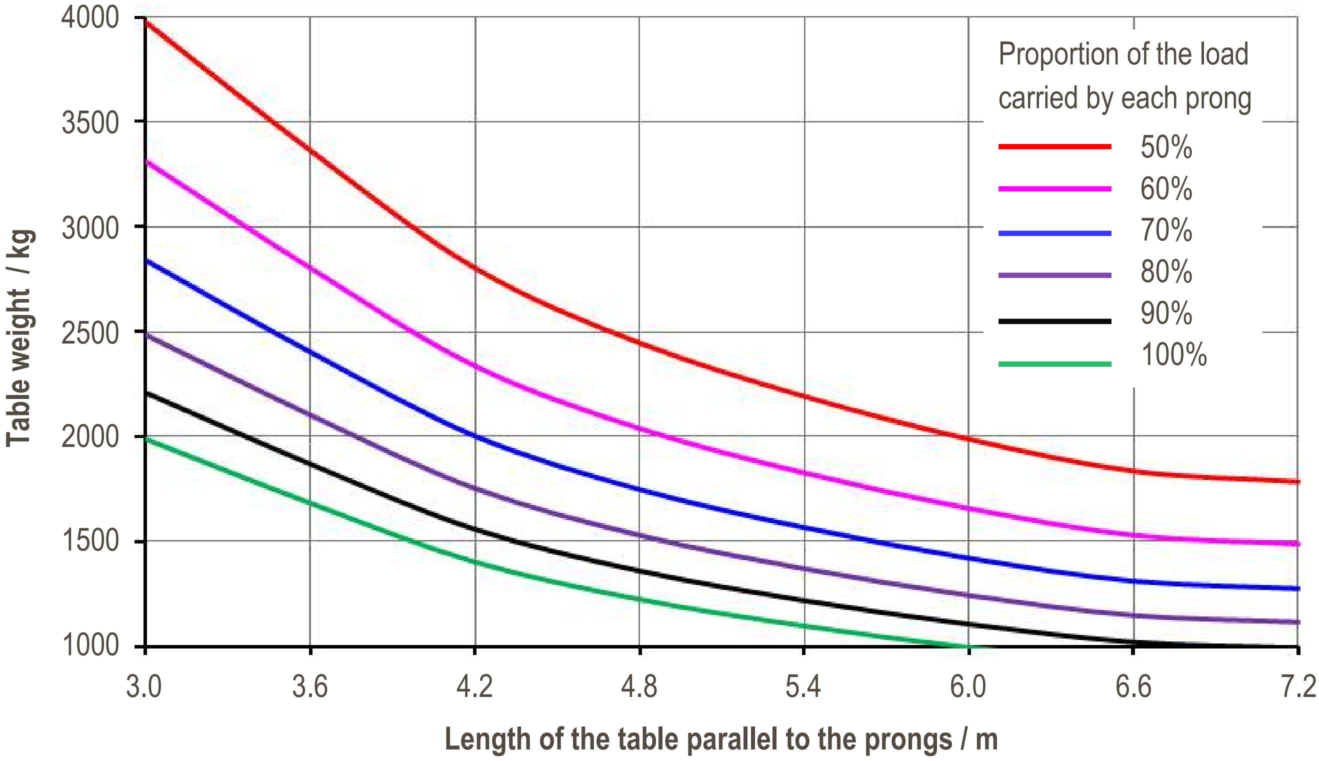


End View

Alshor Twin Pronged Table C-Hook - Allowable Working Loads

The lifting duty graph for the C-Hook is detailed below and on the C-Hook identification plate attached to the vertical member. Lifting duties vary depending on the position of the centre of gravity of the load relative to the C-Hook. This depends on two factors as follows.

- The length of the table parallel to the forks; longer tables have a centre of gravity further out along the forks and hence result in lower lifting duties. The duty graph is plotted assuming that the forks are fully inserted beneath the table top up to the vertical C-Hook member and that the soffit formwork load is even along its length. For arrangements outside these parameters refer to RMD Kwikform Engineering.
- The proportion of the load carried by each C-Hook fork; if the table is uniform and rectangular then the centre of the table top can be accurately set out and marked. Provided the C-hook is centred on these marks and square to the table, each fork will carry 50% of the load. Where the table is an odd shape the position of the centre of gravity may be less certain and allowances should be made for this when checking the duty of the C-Hook.



The folding stabiliser arms are rated for a maximum point load on the end of 500kg. This is not additive to the overall C-Hook rating. The arms are intended to provide stability of the table should the suspended load be subjected to an impact during crane handling.

Do not position the C-Hook such that the centre of gravity of the table lies outside of the forks.

C-Hook Chain Assembly (ASX10042) weight 82.0kg

Compliments the Twin Pronged Table C-Hooks ASX10067 and ASM10068. Enabling the centre of lift to be adjusted whilst loaded to match the centre of gravity of the load.

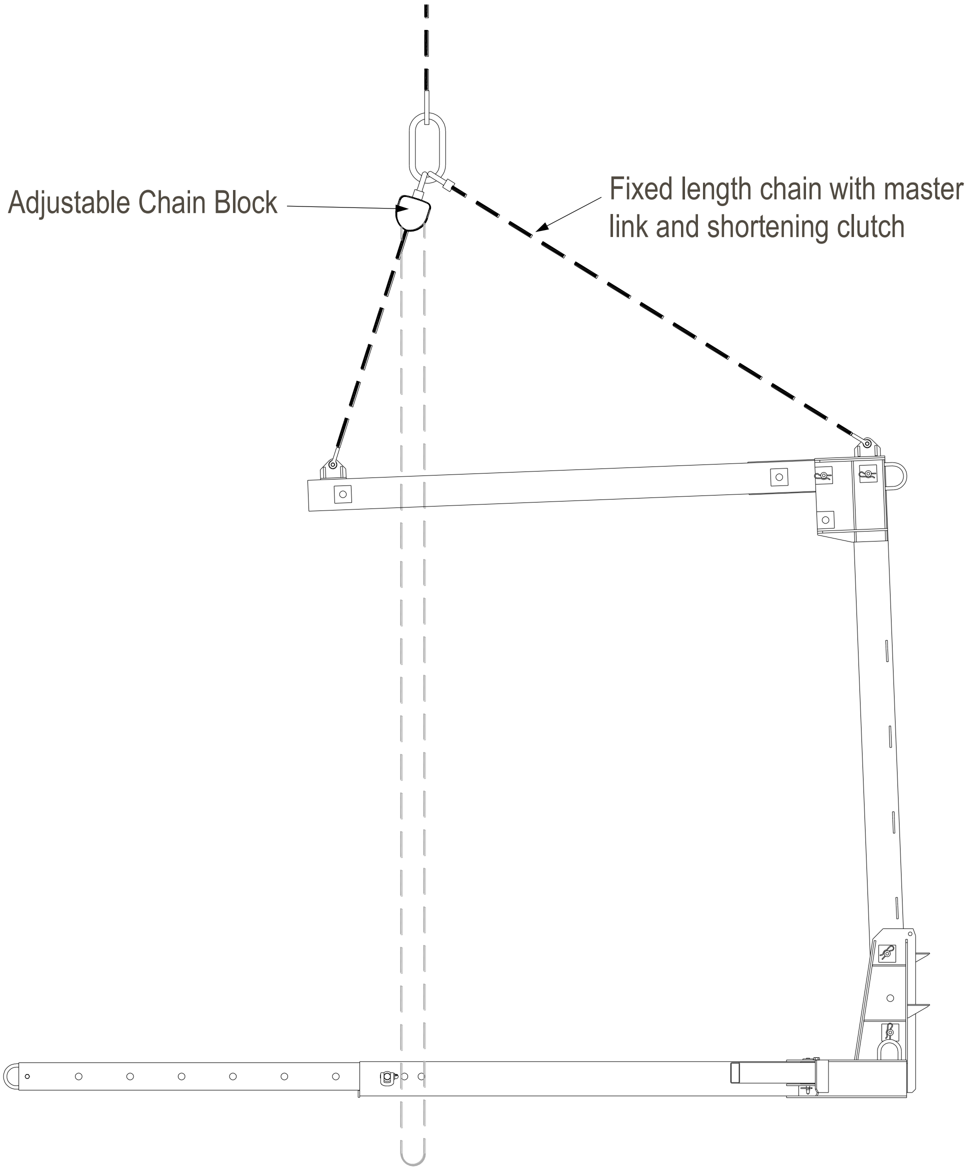
C-Frame Chain Assembly comprises:

Quantity	Description	Weight
1	Adjustable Chain Block	46.5 kg
3	Eyebolt Assembly*	3.00 kg
1	Fixed Length Chain c/w Clutch	82.0 kg

* Part of the C-Frame Chain Assembly but not required in this application.

Fixed length chain with master link and shortening clutch

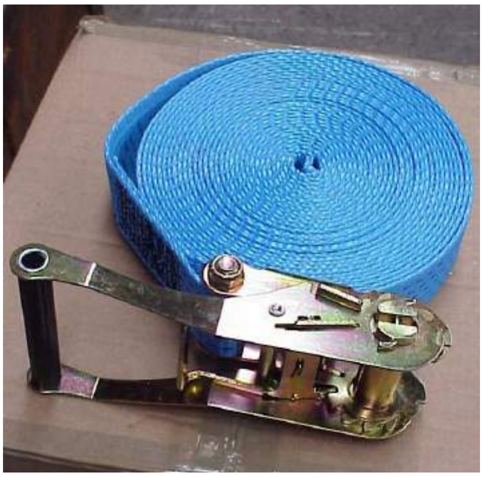
Adjustable Chain Block
(5 tonnes pull lift)



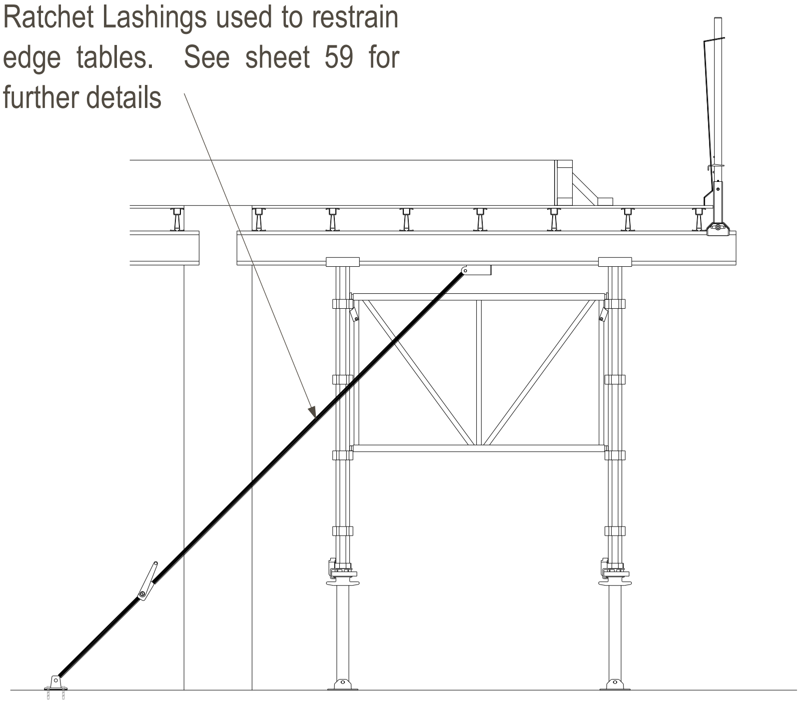
Ratchet Lashings

A multipurpose ratchet lashing supplied with 12 or 24 metres of 50mm wide, endless polyester webbing. Used for providing horizontal restraint to tables at the edge of a pour where the head fixity provided by the interface with the permanent works is in doubt. Cut the webbing length to suit on site. **AWL = 25kN**

Do not use for restraint of free-standing falsework due to high elasticity. Use Rapid Bar Tie restraints instead (see sheet 60).



Code	Description	Weight
RCX10008	Rapidclimb Ratchet Lashing 12m	2.20 kg
RCX10010	Rapidclimb Ratchet Lashing 24m	3.40 kg

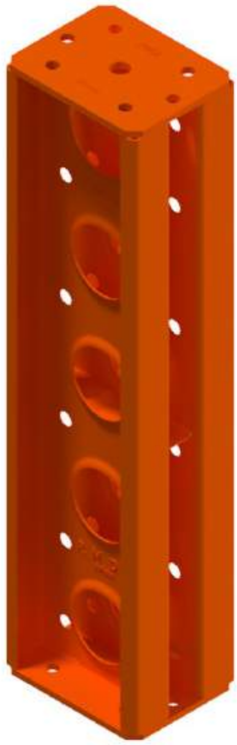


Typical Section at Deck Edge

Superslim Soldiers

Used as the primary beam in falsework applications.

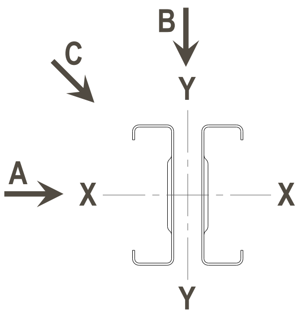
Superslim Soldier Properties	
Area: Gross	26.06 cm^2
Area: Nett	19.64 cm^2
I xx	1916 cm^4
I yy	658 cm^4
r xx	9.69 cm
r yy	5.70 cm
Z xx	161 cm^3
Z yy	61 cm^3
EI xx	4020 kNm^2
EI yy	300 kNm^2
GA xx	17350 kN
M max x	40 kNm
M max y	6.24 kNm
Max Joint Moment (4 M16 bolts)	12 kNm
Max Joint Moment (6 M16 bolts)	18 kNm
Max Joint Moment (stiffeners see sheet 30)	20 kNm
Max Joint Tension (4 M16 bolts)	100 kN
Max Joint Tension (6 M16 bolts)	140 kN
Max Joint Tension (4 M16 bolts and stiffeners)	150 kN
Mean compressive yield stress	370 N/mm^2
Mean Self weight for Analysis	0.235 kN/m run*



* Self weight varies depending on makeup / length - see below right

Effective area (Ae) for wind calculation purposes

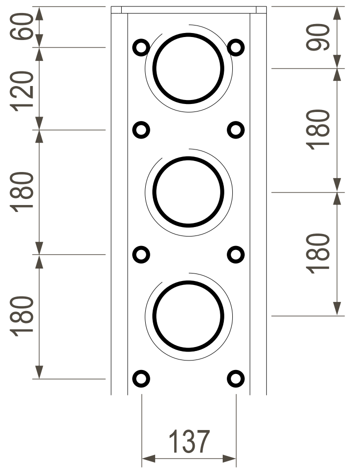
Direction A	0.177 m^2/m
Direction B	0.130 m^2/m
Direction C	0.286 m^2/m



Section

Code	Description	Weight
SSX13600	Superslim Soldier 3600mm	72.2 kg
SSX12700	Superslim Soldier 2700mm	55.4 kg
SSX11800	Superslim Soldier 1800mm	38.8 kg
SSX10900	Superslim Soldier 900mm	22.0 kg
SSX10720	Superslim Soldier 720mm	18.7 kg
SSX10540	Superslim Soldier 540mm	15.2 kg
SSX10360	Superslim Soldier 360mm	12.0 kg
SSU10035	Superslim Soldier 360mm H/Shoe	11.7 kg
SSU10045	Superslim Soldier 360mm O/E	11.5 kg
SSX10090	Superslim Soldier 90mm	7.3 kg
SSX10040	Superslim End Plate 10mm	2.9 kg

Punchings and Geometry



Key:

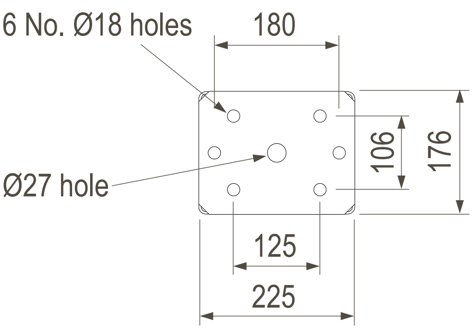
◯ 100mm dia porthole max bearing in hole pair 65kN

o 21mm dia max bearing in hole pair when used with:

- M20 x 90 Bolt/Nut gr 8.8 (BNX20030+BNU20001) = 45kN
- M20 x 100 Bolt/Nut gr 8.8 (BNU20015+BNU20001) = 59kN
- Superslim 19mm Pin & R-clip (SSX10046) = 47kN

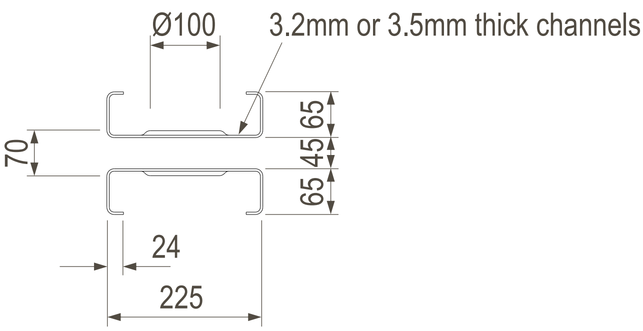
The allowable bearing load in this hole may be increased to 100kN by reinforcing the hole, refer to Head Technical Office for details.

Note: The arrangement of holes in the end plates of hire fleet soldiers vary - see below. If post 1997 version soldiers are required please specify '7 hole end plate soldiers'.

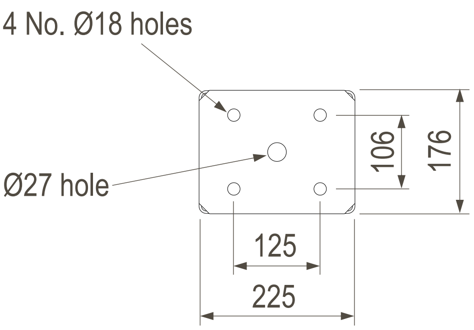


Detail on End Plate

10mm thick - Post 1994 version

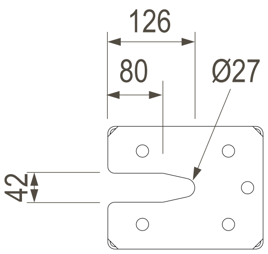


Typical Section

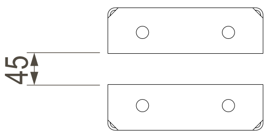


Detail on End Plate

8mm thick - Pre 1994 version



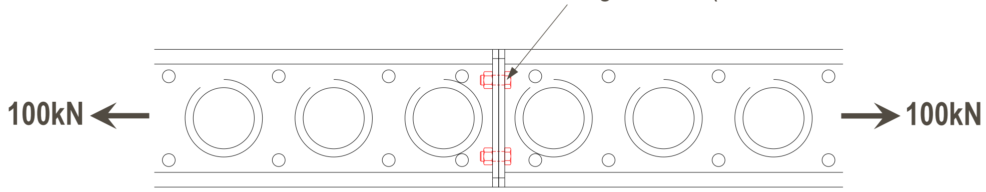
Detail on End Plate
360mm Open End Soldier (Horseshoe)
(SSU10035)

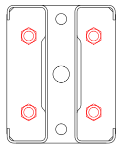


Detail on End Plate
360mm Open End Soldier
(SSU10045)

Bolted Joints - Allowable Working Loads

4 No. M16x40 Set Pins gr8.8 BZP & M16 Hexagon Nut gr.8 BZP (BNU16007 + BNU16001).



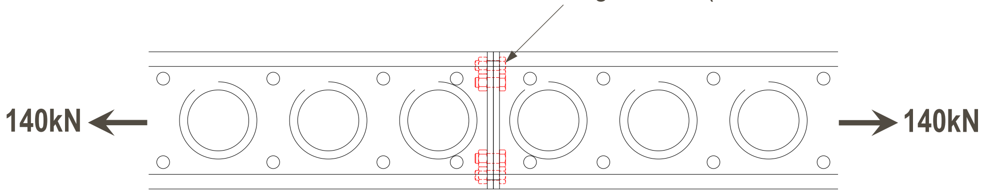


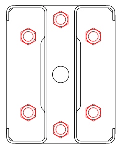
Elevation Showing Joint Connected With 4 Bolts

Allowable Bending Moment = 12kNm

Section

6 No. M16x40 Set Pins gr8.8 BZP & M16 Hexagon Nut gr.8 BZP (BNU16007 + BNU16001).



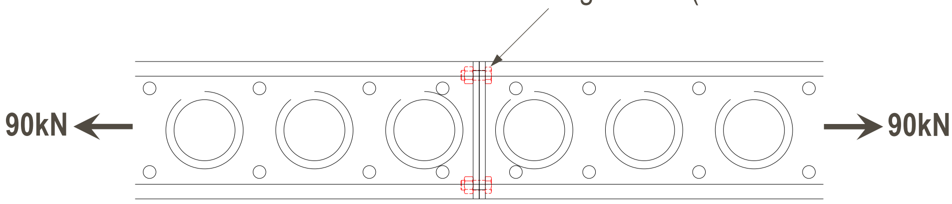


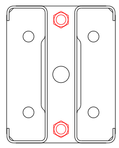
Elevation Showing Joint Connected With 6 Bolts

Allowable Bending Moment = 18kNm

Section

2 No. M16x40 Set Pins gr8.8 BZP & M16 Hexagon Nut gr.8 BZP (BNU16007 + BNU16001).



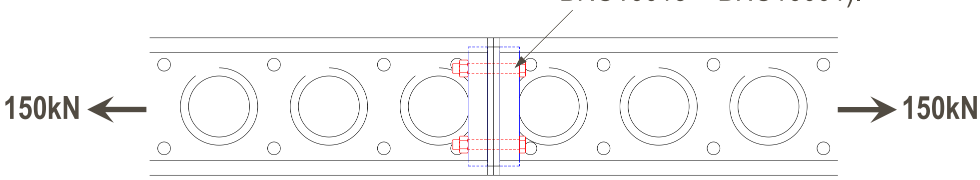


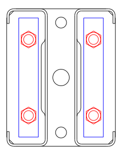
Elevation Showing Joint Connected With 2 Bolts

Allowable Bending Moment = 9kNm

Section

4 No. S/Slim Joint Stiffeners Galv with 4 No. M16x110 Bolts gr8.8 BZP & M16 Hexagon Nut gr.8 BZP (SSU10010 + BNU16013 + BNU16001).





Elevation Showing Joint Connected With 4 Joint Stiffeners & 4 Bolts

Allowable Bending Moment = 20kNm

Section

Combined Stresses - Tension & Bending must satisfy the following:

$$\frac{\text{Actual Tensile Load}}{\text{Allowable Tensile Load}} + \frac{\text{Actual Bending Moment}}{\text{Allowable Bending Moment}} \leq 1$$

ALSHOR PLUS

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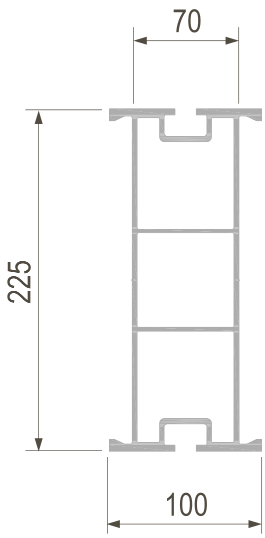
Albeam

Used as primary beams in falsework applications.

Albeam Properties	
Gross Area	33.06cm^2
Second Moment of area I xx	2131cm^4
Flexural Rigidity EI	1468kNm^2
Shear Rigidity GA xx	35110kN
Maximum Bending Moment xx	25kNm
Self Weight	8.4kg/m
220mm - Intermediate Bearing	120kN
200mm - Intermediate Bearing	115kN
170mm - Intermediate Bearing	100kN
110mm - End Bearing	38.5kN



Section

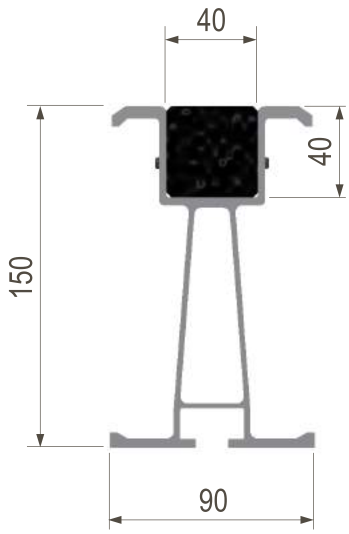
Code	Description	Weight
ABX11800	Albeam 1800mm	15.1 kg
ABX12400	Albeam 2400mm	20.1 kg
ABX12700	Albeam 2700mm	22.7 kg
ABX13000	Albeam 3000mm	25.2 kg
ABX13600	Albeam 3600mm	30.2 kg
ABX14800	Albeam 4800mm	40.3 kg
ABX15400	Albeam 5400mm	45.3 kg
ABX16000	Albeam 6000mm	50.3 kg
ABX17200	Albeam 7200mm	60.4 kg
ABX18400	Albeam 8400mm	70.5 kg
ABX19600	Albeam 9600mm	80.5 kg

Note: Non standard lengths are available on a sale only basis.

Alform Beams

An aluminium beam with recycled plastic insert used as a primary and / or secondary beams in falsework applications. Unique inclined twin webs, together with edge stiffening lips provide great lateral stability and robustness in use. Plywood formwork is simply attached by nail connection to the insert provided in the upper flange, and the bevelled edge to the top flange allows for easy removal of the formwork on completion of use.

Alform Beam Properties	
Gross Area	17.6cm^2
Modulus of Elasticity E	6890kN/cm^2
Second Moment of area I xx	558cm^4
Flexural Rigidity EI	385kNm^2
Shear Rigidity GA xx	18489kN
Position of Neutral Axis above base	74.6mm
Section Modulus xx	74.1cm^3
Maximum Bending Moment xx	10kNm
Max Reaction (Intermediate) 75mm bearing	55kN
Max Reaction (End) 44mm bearing	40kN
Self Weight (with recycled plastic insert)	5.66kg/m



Section

Code	Description	Weight
AFX11200	Alform Beam 1200mm	6.80 kg
AFX11500	Alform Beam 1500mm	8.50 kg
AFX11800	Alform Beam 1800mm	10.1 kg
AFX12100	Alform Beam 2100mm	11.3 kg
AFX12400	Alform Beam 2400mm	13.5 kg
AFX12700	Alform Beam 2700mm	15.2 kg
AFX13000	Alform Beam 3000mm	16.9 kg
AFX13600	Alform Beam 3600mm	20.3 kg
AFX14200	Alform Beam 4200mm	23.7 kg
AFX14800	Alform Beam 4800mm	27.1 kg
AFX15400	Alform Beam 5400mm	30.5 kg
AFX16000	Alform Beam 6000mm	33.9 kg
AFX16600	Alform Beam 6600mm	37.3 kg
AFX17200	Alform Beam 7200mm	40.7 kg

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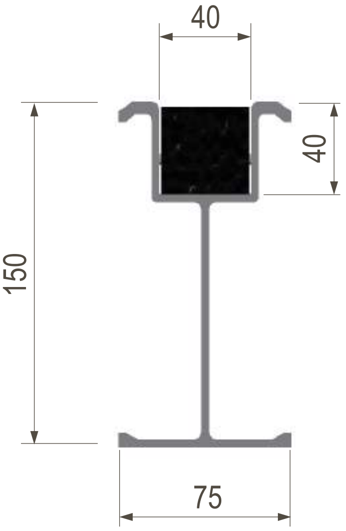
VERSATILE ALUMINIUM SHORING SYSTEM

Alsec Beams

A lightweight and economical aluminium beam with recycled plastic insert used as a secondary beam in falsework applications. Plywood formwork is simply attached by nail connection to the insert provided in the upper flange, and the bevelled edge to the top flange allows for easy removal of the formwork on completion of use.

Alsec Beam Properties	
Gross Area	12.47cm^2
Second Moment of area I xx	389cm^4
Flexural Rigidity EI	268kNm^2
Shear Rigidity GA xx	12000kN
Maximum Bending Moment xx	7kNm
Max Reaction (Intermediate) 75mm bearing	33kN
Max Reaction (End) 44mm bearing	15kN
Self Weight (with recycled plastic insert)	4.65kg/m



Section

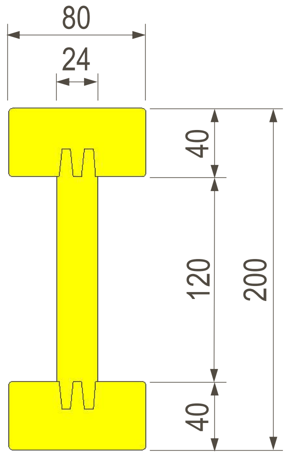
Code	Description	Weight
ALX11200	Alsec Beam 1200mm	5.57 kg
ALX11500	Alsec Beam 1500mm	6.97 kg
ALX11800	Alsec Beam 1800mm	8.36 kg
ALX12100	Alsec Beam 2100mm	9.76 kg
ALX12400	Alsec Beam 2400mm	11.2 kg
ALX12700	Alsec Beam 2700mm	12.6 kg
ALX13000	Alsec Beam 3000mm	14.0 kg
ALX13600	Alsec Beam 3600mm	16.8 kg
ALX14200	Alsec Beam 4200mm	19.5 kg
ALX14800	Alsec Beam 4800mm	22.3 kg
ALX15400	Alsec Beam 5400mm	25.1 kg
ALX16000	Alsec Beam 6000mm	27.9 kg
ALX17200	Alsec Beam 7200mm	33.5 kg

T200 Composite Timber Beams

A composite timber beam used as primary beam and/or for secondary beams in falsework applications.

T200 Composite Beam Properties	
Gross Area	92.8cm^2
Second Moment of Area I xx	4181cm^4
Flexural Rigidity EI	420kNm^{2*}
Shear Rigidity GA xx	3014kN
Maximum Bending Moment xx	5.0kNm
Max Shear Load	11kN
Maximum Reaction Load	22kN*
Self Weight	4.70kg/m

*T200 must be supported at least 150mm from the end of the beam for maximum reaction.



Section

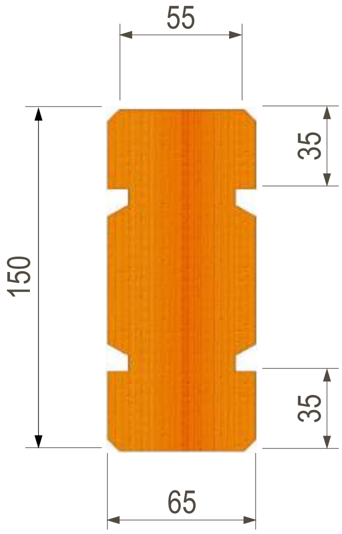
Code	Description	Weight
TBB11800	T200 Beam 1800mm	8.50 kg
TBB12400	T200 Beam 2400mm	11.3 kg
TBB12700	T200 Beam 2700mm	12.7 kg
TBB13000	T200 Beam 3000mm	14.1 kg
TBB13550	T200 Beam 3550mm	16.7 kg
TBB14900	T200 Beam 4800mm	23.0 kg
TBB10001	T200 Beam 6000mm	28.2 kg

GTX Beams

A structural laminated veneer timber beam used as a primary and / or secondary beam in falsework applications. Manufactured using 3mm Radiata Pine veneer, individually graded for stiffness and phenolically bonded for consistent and predictable engineered performance.

GTX Beam Properties	
Gross Area	94cm²
Flexural Rigidity EI	150kNm²*
Shear Rigidity GA xx	3932kN
Maximum Bending Moment xx	5.0kNm*
Max Shear Load	25.8kN
Allowable Bearing (on top or bottom faces)	6.6N/mm²
Self Weight	5.50kg/m

* In climates where the moisture content of the GTX beams is likely to be very low (e.g. Middle East) these values may be enhanced by 20%



Section

Code	Description	Weight
GTX11800	GTX Beam 1800mm	9.90 kg
GTM12100	GTX Beam 2100mm	11.6 kg
GTX12400	GTX Beam 2400mm	13.2 kg
GTM12700	GTX Beam 2700mm	14.9 kg
GTX13000	GTX Beam 3000mm	16.5 kg
GTX13600	GTX Beam 3600mm	19.8 kg
GTX14200	GTX Beam 4200mm	23.1 kg
GTX14800	GTX Beam 4800mm	26.4 kg
GTX15400	GTX Beam 5400mm	29.7 kg
GTX16000	GTX Beam 6000mm	33.0 kg

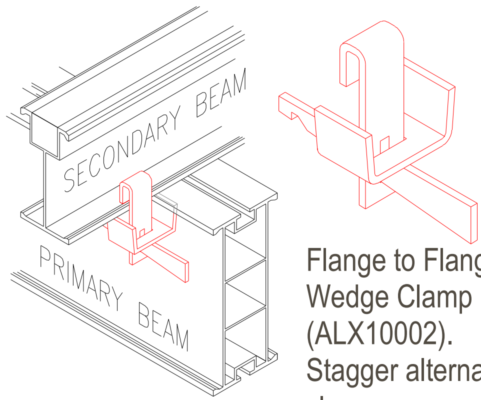
Secondary to Primary Beam Connections

Flange to Flange Wedge Clamp (ALX10002) weight 0.75kg

A fast lightweight and secure clamp used for connection of backing members to primary beams in strip and erect applications for all falsework systems. Connects Albeam, Alform, Alsec and Superslim in any combination.

AWL Tension = 1.6kN
AWL Slip = 0.25kN

Secondary to Primary Connection Strip & Erect Applications



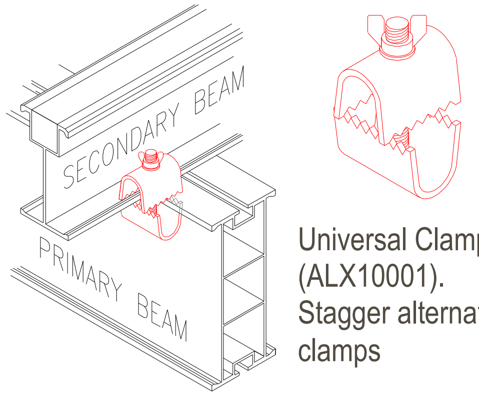
Flange to Flange Wedge Clamp (ALX10002). Stagger alternate clamps

Universal Clamp (ALX10001) weight 0.75kg

A secure serrated clamp used with all falsework systems in heavier crane handled applications. Connects Albeam, Alform, Alsec, Superslim Soldiers, GTX150 and T200 composite timber beams in any combination. Tighten the unit by tapping the wings of the nut with a hammer.

AWL Tension = 2.5kN
AWL Slip = 0.35kN

Secondary to Primary Connection Crane Handled Applications



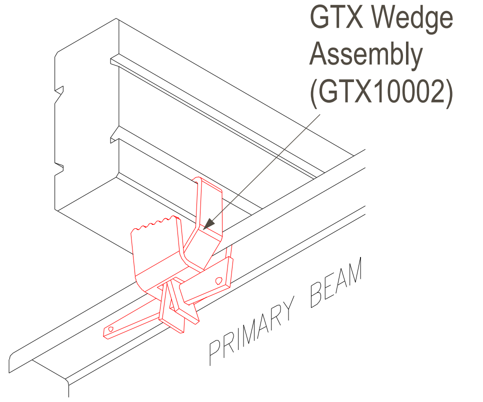
Universal Clamp (ALX10001). Stagger alternate clamps

GTX Wedge Clamp Assembly (GTX10002) weight 1.09kg

Use to connect Alform / Albeam / T200 / Superslim Soldier primaries to GTX secondaries in strip and erect falsework applications. Use two clamps per intersection, staggered either side of primary beam.

AWL Tension = 1.0kN
AWL Slip = 0.25kN

Secondary to Primary Connection Strip & Erect Applications

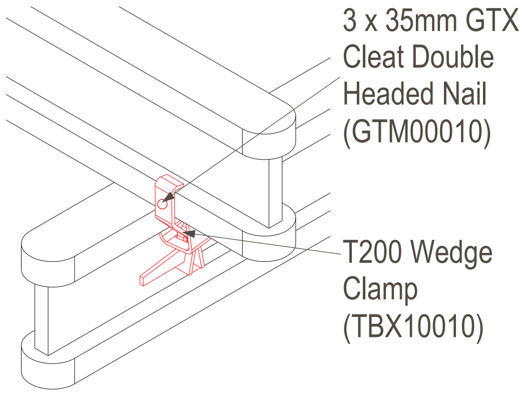


T200 Wedge Clamp (TBX10010) weight 0.89kg

Use to connect T200 primaries to T200 secondaries in strip and erect falsework applications. Use two clamps per intersection, staggered either side of primary beam.

AWL Tension = 1.0kN
AWL Slip = 0.25kN

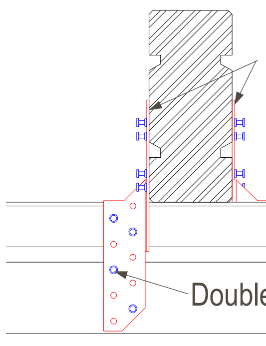
Secondary to Primary Connection Strip & Erect Applications



GTX to GTX Cleat (GTM00005) weight 0.20kg

Connects GTX primary to GTX secondary at right angle, using 8 No. 3 x 35mm Double Headed Nails.

Secondary to Primary Connection
Crane Handled Applications



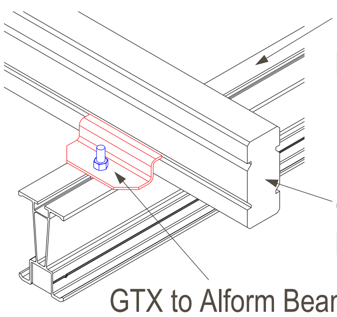
3 x 35mm GTX Cleat Double Headed Nails / kg (GTM00010)

Used to secure GTX Cleats (GTM00005) to GTX primary and GTX secondary beams. Easily removed during dismantling using the additional head. **Supplied per kg (approx. 350 No. per kg).**

GTX to Alform Beam Connection (GTM00007) weight 0.50kg

Use with M12 Unifix Bolts and M12 Hexagon Nuts gr.8 BZP (AFX20022 + BNU12001) to connect Alform/Albeam Primaries to GTX Secondaries in falsework applications.

Secondary to Primary Connection
Crane Handled Applications



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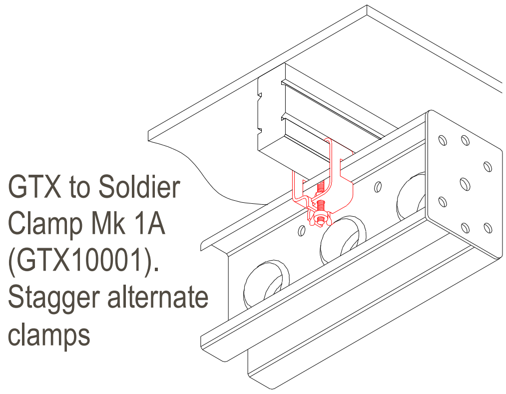
GTX to Soldier Clamp Mk1A (GTX10001) weight 0.80kg

Connects Superslim Solder primary to GTX secondary in crane handled falsework applications.

Secondary to Primary Connection
Crane Handled Applications



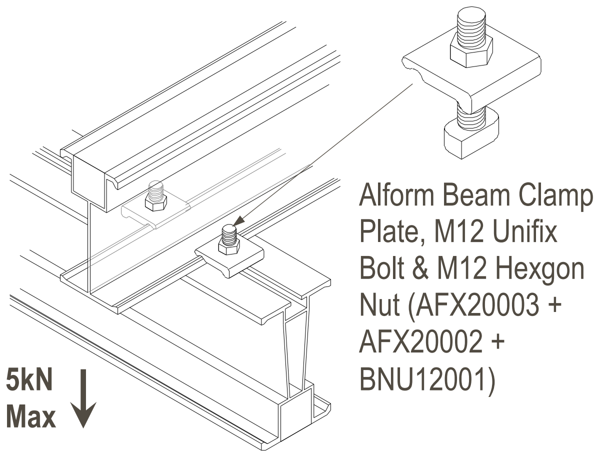
AWL Tension = 2.0kN
AWL Slip along GTX = 1.0kN
AWL Slip along Soldier = 0.8kN

Underslung Clamp

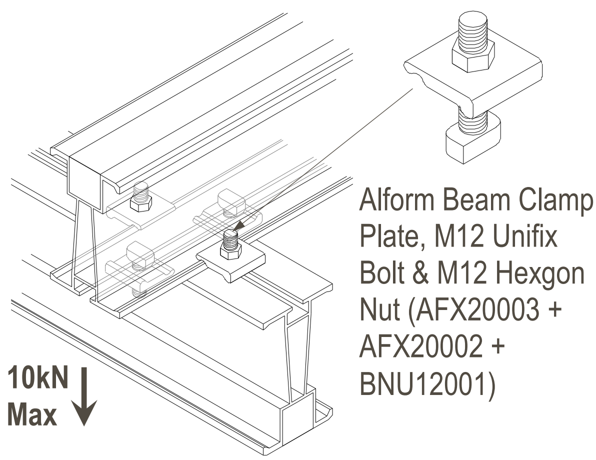
A secure clamp supplied in three parts used to connect underslung aluminium beams where a known load capacity for the connection is required. Note that one of the connected beams must be either an Alform or an Albeam. When four clamps are used both beams must be an Alform or an Albeam. **AWL with 2 clamps = 5kN, AWL with 4 clamps = 10kN**

Code	Description	Weight
AFX20003	Alform Clamp Plate	0.01 kg
AFX20022	M12 Unifix Bolt	0.01 kg
BNU12001	M12 Hex Nut Plated	0.01 kg

Underslung Beam Connection
using 2 No. Clamps



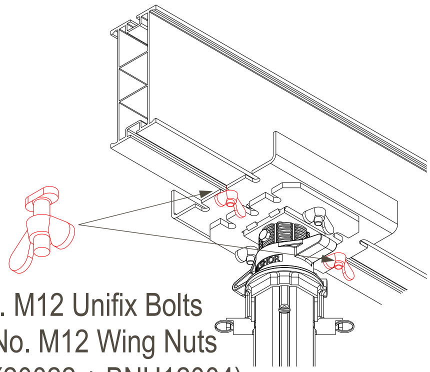
Underslung Beam Connection
using 4 No. Clamps



Primary Beam to Alshor Plus Head Connections

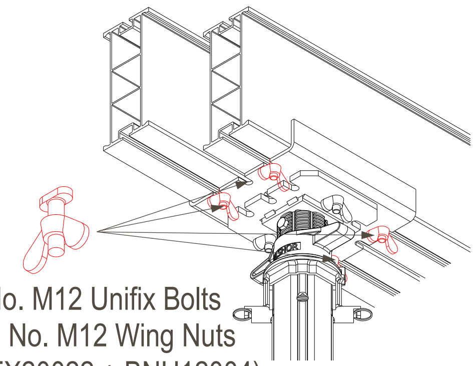
The details shown below can be used to connect primary beams to Alshor Plus Heads where a positive connection is required.

Primary Beam to Head Connection
Single Albeam / Alform



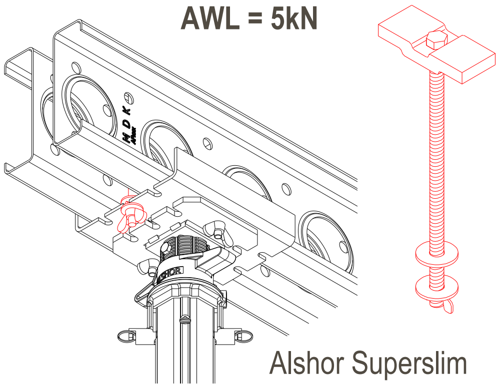
2 No. M12 Unifix Bolts
& 2 No. M12 Wing Nuts
(AFX20022 + BNU12004)

Primary Beam to Head Connection
Twin Albeam / Alform



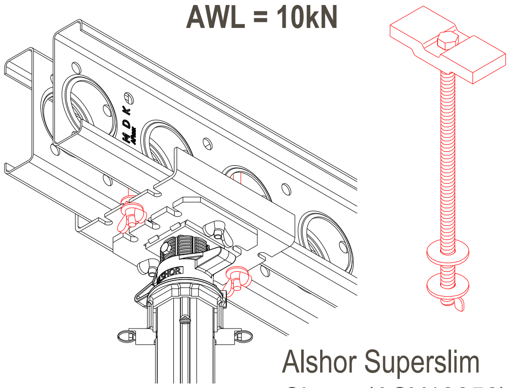
4 No. M12 Unifix Bolts
& 4 No. M12 Wing Nuts
(AFX20022 + BNU12004)

Superslim Primary Beam
to Head Connection - Single Clamp
AWL = 5kN



Alshor Superslim
Clamp (ASX10056)

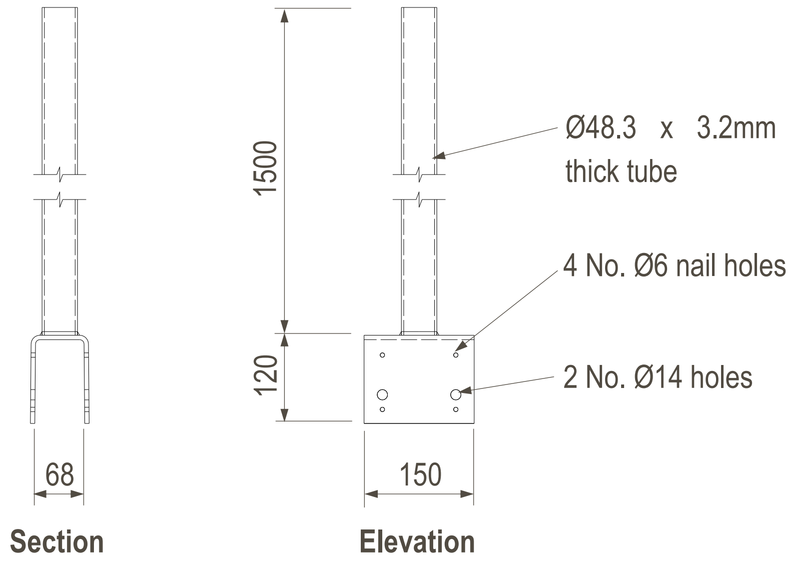
Superslim Primary Beam
to Head Connection - Twin Clamps
AWL = 10kN

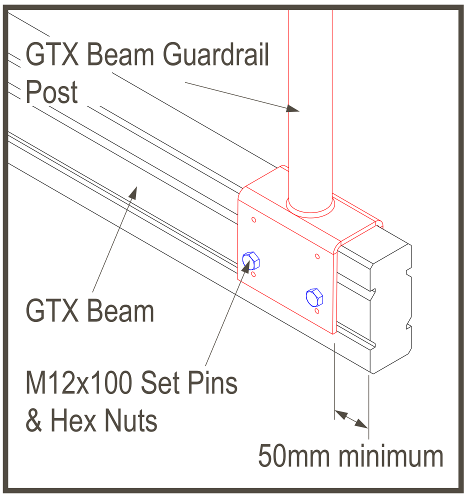


Alshor Superslim
Clamp (ASX10056)

GTX Beam Guardrail Post (GTM00004) Weight 8.50kg

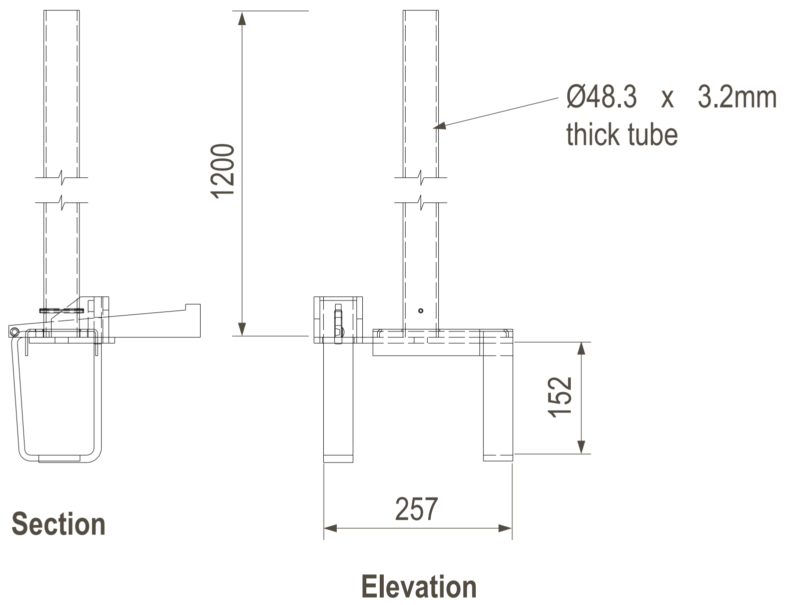
Connect to end of GTX beam using 2 No. M12x100 Set Pins gr8.8 BZP & M12 Hexagon Nuts gr.8 BZP (BNU12017 + BNU12001) to provide a 1.5m high vertical handrail post.

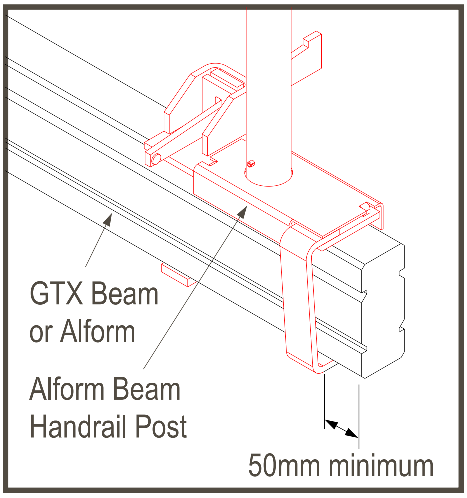




Alform Beam Handrail Post (AFM90025) Weight 9.90kg

Connect to end of GTX or Alform beam using its captive wedge to provide a 1.2m high vertical handrail post.





ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

Ultraguard Edge Protection

Used to provide edge protection to soffit formwork at the wet deck level and for exposed leading edges at the supporting slab level.

Code	Description	Weight
SAX10001	Ultraguard Slab Socket Base	1.65 kg
SAX10002	Ultraguard Slab Edge Clamp	8.80 kg
SAX10003	Ultraguard Steel Beam Clamp 914mm	17.5 kg
SAX10005	Ultraguard Alu Beam Bracket	4.17 kg
SAX10012	Ultraguard Soldier Socket	4.74 kg
SAX10015	Ultraguard Ext Alu Beam Bracket	5.50 kg
SAX10017	Ultraguard Shear Stud Socket	3.18 kg
SAX10018	Ultraguard Wall Bracket	2.56 kg
SAX11200	Ultraguard Post 1.2m	5.51 kg
SAX12550	Ultraguard Barrier 2550mm	17.3 kg
SAX13150	Ultraguard Barrier 3150mm	25.0 kg

Note: Ultraguard Barrier provides edge protection for operatives in accordance with EN13374:2004 Class A

Scaffold Tube & Fittings

Used for providing access within the main body of the falsework and/or for providing additional lacing & bracing where system components will not fit.

Code	Description	Weight
TUX80060	Scaffold Tube 0.6m (4mm)	2.62 kg
TUX80150	Scaffold Tube 1.5m (4mm)	6.55 kg
TUX80210	Scaffold Tube 2.1m (4mm)	9.17 kg
TUX80300	Scaffold Tube 3.0m (4mm)	13.1 kg
TUX80360	Scaffold Tube 3.6m (4mm)	15.7 kg
TUX80480	Scaffold Tube 4.8m (4mm)	21.0 kg
TUX80540	Scaffold Tube 5.4m (4mm)	23.6 kg
TUX80640	Scaffold Tube 6.4m (4mm)	28.0 kg
SFX10002	Coupler 90 Deg 2”x2”	1.35 kg
SFX10003	Coupler Swivel 2”x2”	1.48 kg
SFX10004	Coupler Fixed 2 3/8”x2”	1.41 kg
SFX10005	Coupler Swivel 2 3/8”x2”	1.90 kg
SFX20240	Scaffold Board 2.4m - No. 2	11.0 kg
SFX20300	Scaffold Board 3.0m - No. 3	14.0 kg
SFX20395	Scaffold Board 3.95m	17.7 kg
SFX10026	Toe Board Clip	0.19 kg

Structural Design Parameters

Allowable Working loads have been established for falsework and backpropping applications using second order analysis (p-delta) with a factor of safety on failure of 2. Subsequent analyses have shown that the methods used produce conservative results when compared to those determined using EN 12812.

Boundary Conditions

- Falsework structures - fixed in position and free to rotate at the top of the structure, fixed in position and fixed in rotation at the base of the structure.
- Backpropping structures - fixed in position and fixed in rotation at the top and the base of the structure.
- Load eccentricity of 5mm at the top of the structure, concentric at the base.

Joints Between Components

- Joints between leg sections and between the leg and jack are modelled as continuous and are checked subsequent to modelling to ensure that M/N is less than 28mm where M is the applied bending moment at the joint and N is the applied axial force. Provided this condition is satisfied these joints cannot open.
- The second moment of area of the section of the leg with jack inserted is enhanced by 50% of the jack second moment of area.

Imperfections

- Jack rotation due to a tolerance gap of 2.18mm between the outside of the jack and the inside of the leg.
- Bow imperfection of L/666 and sway imperfection of L/285 where L is the overall height including the jack.

Lateral Restraint at the Top of the Structure

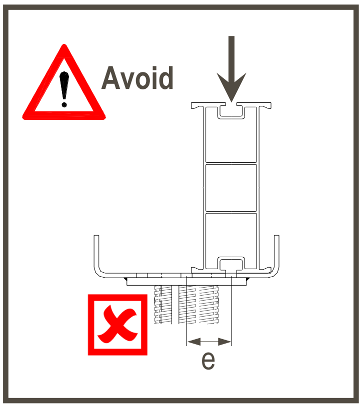
With the exception of the 700 series charts, allowable working loads in Appendix B are based on the equipment being laterally restrained at the top, i.e. there is restraint at the top of the falsework to prevent it from any lateral movement.

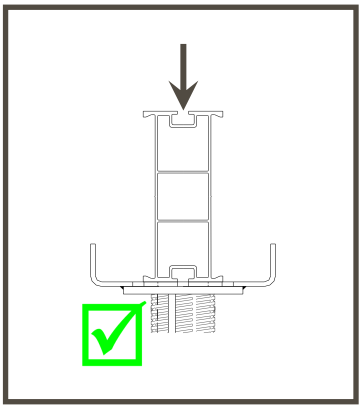
Further detailed information on this topic, effects of various applications and example calculations are provided in Appendix A.

Eccentric Loading

The allowable working load of legs loaded with an eccentricity of e mm may be determined by multiplying the value determined from the charts by **1-(e/81)**

Using this formula it is seen that an Alshor Plus leg loaded by a single Albeam, placed fully over to one side of the U-Head (56mm load eccentricity) is only **31%** of the value in the charts. When single primary beams are used fix them into the centre slot of the U-head as soon as they are placed.

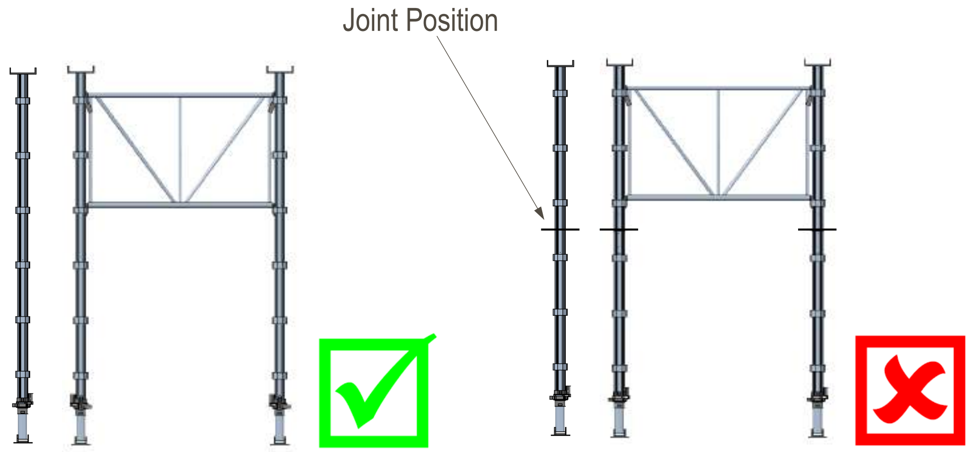




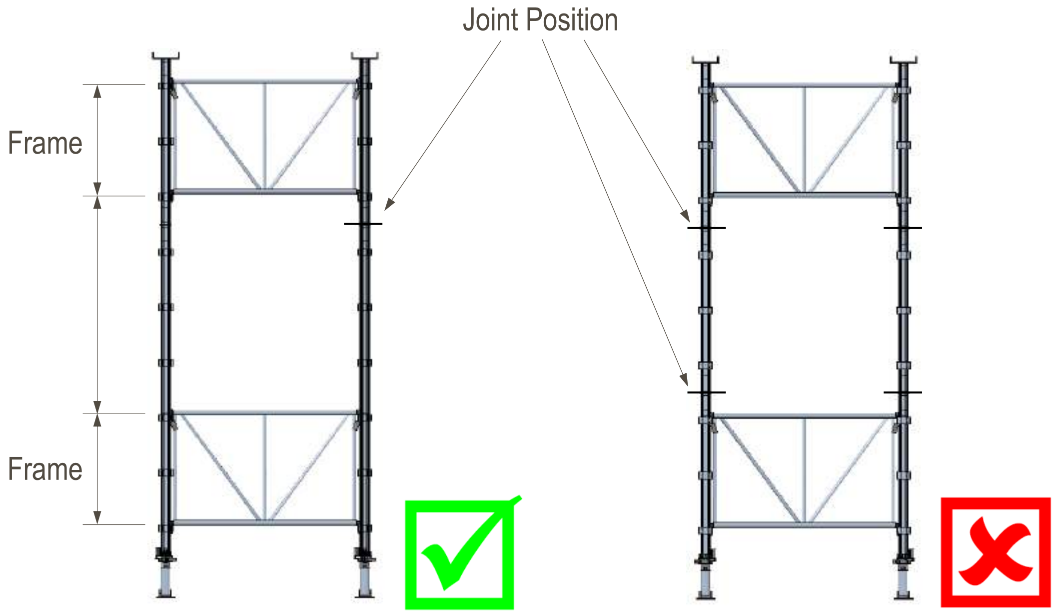
Leg Joint Rules

The position of joints between the leg sections in an Alshor Plus structure shall be checked during the design process. Every lift of Alshor Plus leg sections shall be connected by a level of Alshor Plus Frames (the leg must be connected to both the top and bottom of the frame). It is preferable to select leg sections that are as long as possible to make up the completed leg length. For example:

Individual props or structures with a single frame in the height shall be designed with a single leg section. (i.e. no joints are allowed).



Structures designed with multiple frames in the height shall have no more leg sections in height than the number of frames. At least one level of frames fully attached to each lift of legs etc.



Provided there is one level of frames attached to each level of legs then intermediate frames are permitted to span over the joint in the leg.

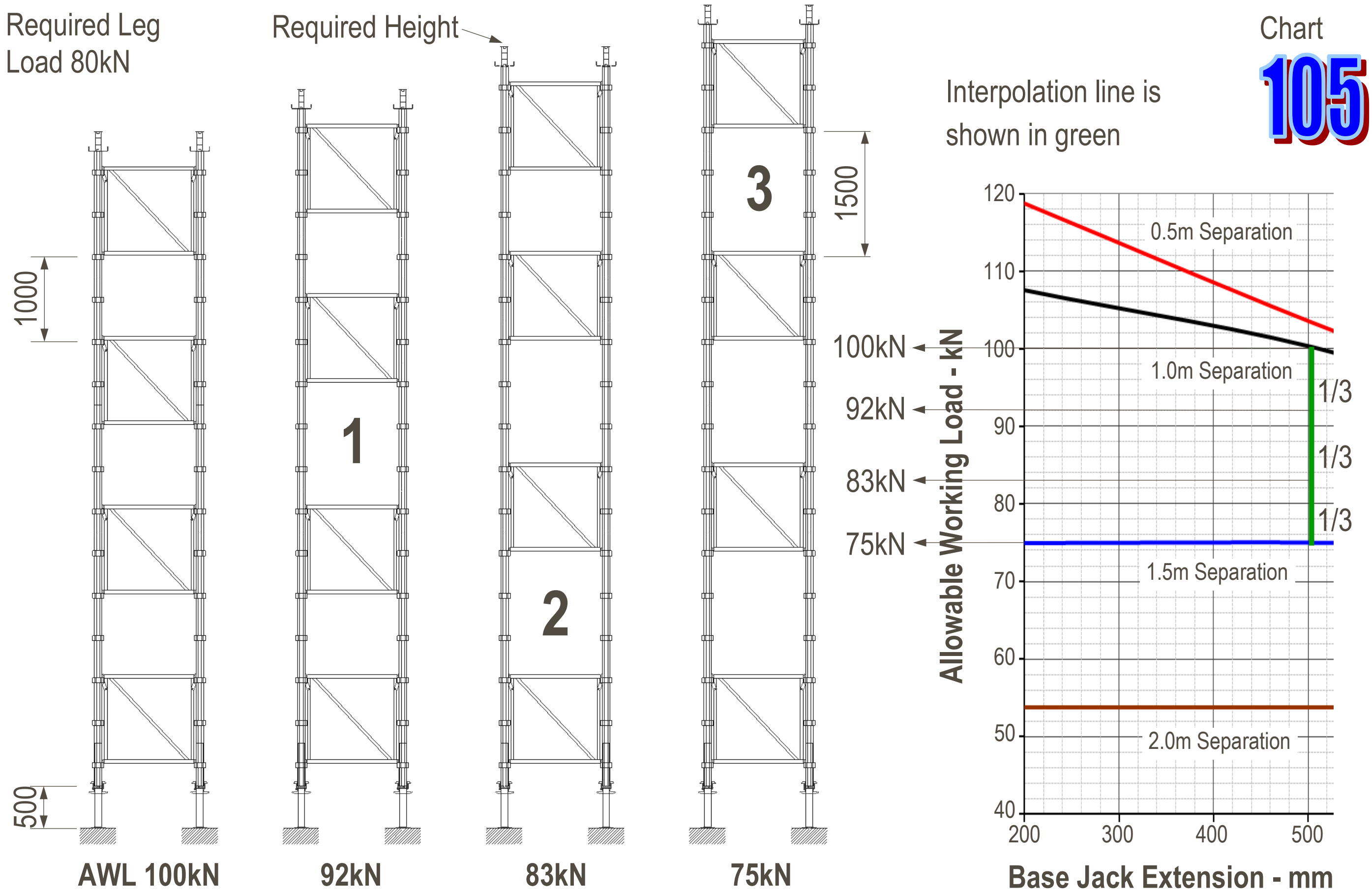
Optimising Brace Frame Positions

The 100 series charts for 4 frames in the height or more are plotted with equal separation between the frames throughout the height of the tower. This will not always be convenient however and rather than adding an additional layer of frames at close vertical separation, one or both of the following methods can be used to minimise the number of frames in the height.

1. Lift the bottom frame by 500mm. Compensate for the reduction in load capacity that this brings by adding 500mm to the design base jack extension and read the allowable working load from the relevant chart.

2. Interpolate between the charted lines for different frame separations: When a tower with mixed frame separations is needed, begin with a tower with equal frame separations just shorter than the required height and having a leg load capacity just higher than that required (left hand tower below). To increase the height of the tower, first add 500mm to the frame separation mid height, or just above mid height for towers with an odd number of frames (1). If further tower height is needed add 500mm to the frame separation below the mid-height position (2). If further height is again needed add 500mm to the frame separation above the mid height position (3). For towers with more frames, 500mm can be added to subsequent frame separations alternatively below and above the mid height of the tower to achieve the desired configuration.

For the example below the interpolation line drawn on the extract from chart 105 is shown in green and is divided equally by the number of gaps between frames, in this case three. For every frame separation which is increased by 500mm the allowable leg load is reduced by one division.



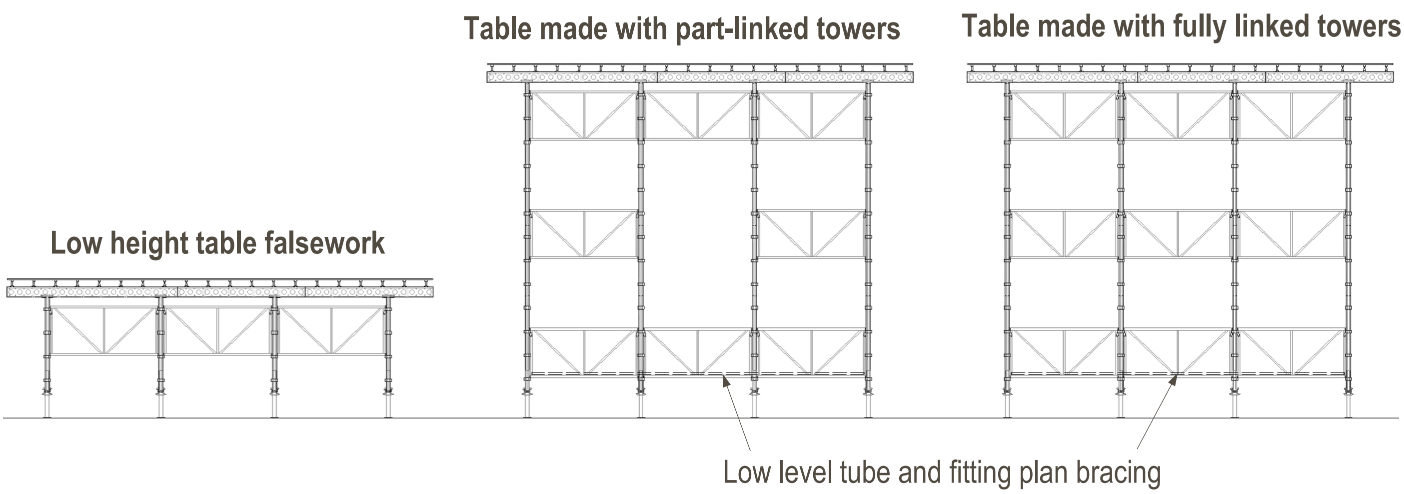
Design of Falsework Tables

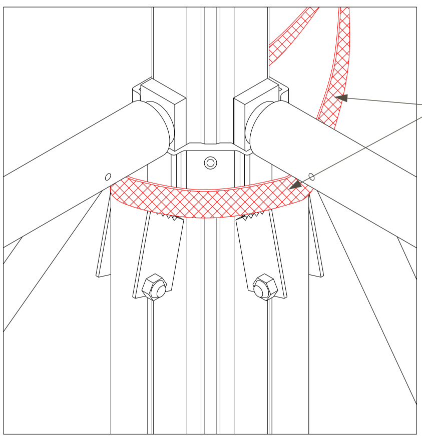
Alshor Plus towers may be linked with frames to make larger mobile falsework structures. Linking frames should generally be placed at the same levels as those in the towers which may be fully linked or partially linked. The additional frames provide little additional leg load capacity for the completed structure but can be taken into account when checking lateral stability during the free-standing stages of assembly/dismantling and during movement between pours. Where tables have a height more than three times their minimum base dimension, check the free-standing stages for wind overturning effects.

When the table is to be crane lifted or supported on castor units the frames enable the table structure to span between the points of support. Ensure that all component connections during these stages fall within allowable working loads.

Falsework tables should be plan braced to prevent them lozenging during movement. The plywood soffit acts as a diaphragm to provide plan bracing at soffit level and may be sufficient for tables up to 3.5m high. Tube plan braces should be added at the bottom of the structure for taller tables. For tables over 12m high add a set of plan bracing mid height.

Provided the running surface is relatively flat, smooth and un-obstructed, mechanical assistance should not be required when moving all but the heaviest tables.





Alshor Plus Crane Handling Via Frame Connection

Customer's soft slings

Important! Ensure Spring Retain Catches are fully engaged with Alshor Leg Pocket with each lift

Where the sling passes around:
One frame AWL = 10kN
Two or more frames AWL = 15kN

Design of Craneable Table Tops

It is common site practice to assemble the falsework and table top separately and crane the table top onto the falsework to complete the table. In some cases table tops may be separated during movement and will anyway be parted again at dismantling time.

Where primary and secondary beams are detailed as a single length of beam no additional design measures need be taken. For larger table tops, lapped or butted joints in primary beams are to be avoided if possible (bolted Superslim joints are usually fine). Where the table plan size necessitates lapped or butted secondary beams take adequate measures to ensure that the table top can be lifted safely e.g:

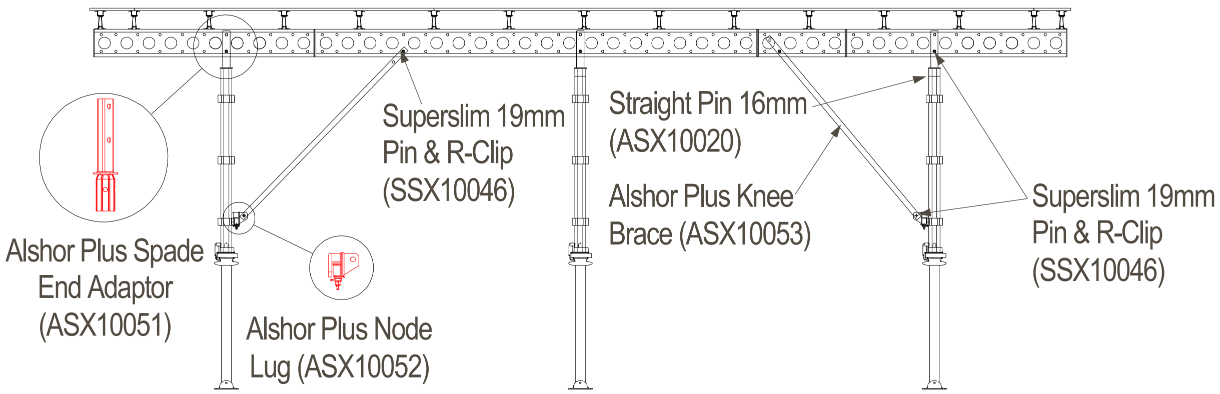
- use of dis-similar secondary beam lengths with staggered laps
- use of additional clipping at laps
- use of additional members to stiffen the table top

Consider how the table top is to be safely lifted. Identify the lifting points and how the lifting slings are to be attached and show the weight of the table top. Do not use wedge clamps at soffit level.

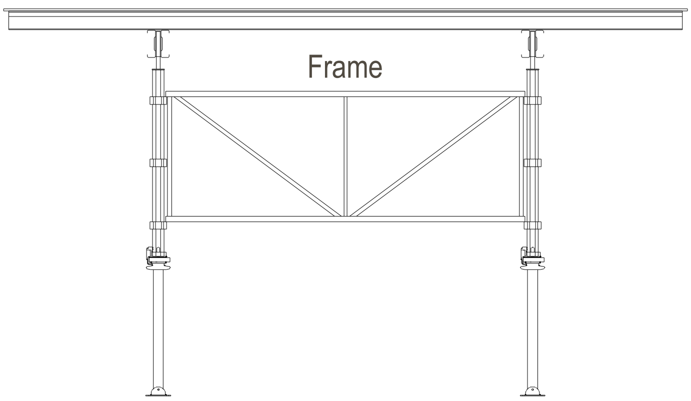
Design of Knee Brace Tables

An economical table assembly with foldable legs can be constructed using the arrangement shown below. The folding legs enable the table to be readily lifted out of the building when an up-stand is present at the slab edge. For further details of connecting items refer to sheet 21.

Plan Showing Leg, Knee Brace & Frame Configuration



Elevation



Section

ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

Leg Load Design Rules

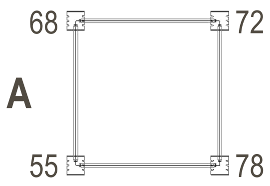
1. Where falsework consists of individual support towers, carry out continuous beam analysis for the soffit members to establish the maximum applied leg load. (The legs can be modelled as spring supports to lessen the effects of continuity if desired, see table right). Use the maximum calculated leg load when checking the allowable loads in falsework towers from the relevant chart.
2. Where tables or towers have multiple bays of falsework on plan in both directions, carry out continuous beam analyses for the soffit members to establish all leg loads. (The legs can be modelled as spring supports to lessen the effects of continuity if desired). Calculate the mean leg load and check the relevant chart against this mean value.

The second rule is valid provided:

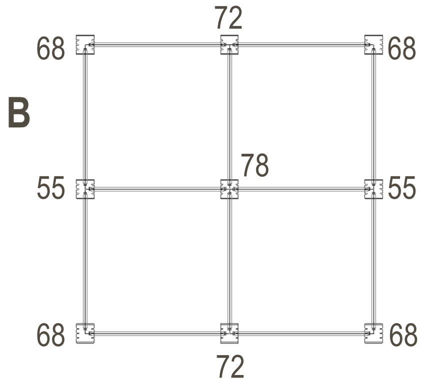
- The maximum leg load in the tower does not exceed the mean load by more than 20%. If this is the case the design leg load shall be 84% of the maximum leg load
- The maximum leg load does not exceed 120kN
- The primary beam can support the maximum reaction combined with the applied bending moment
- The tables are used to form flat or nominally flat slabs of uniform thickness
- The maximum leg load is shown on the scheme drawing as being resisted by the foundation

Overall Height (metres)	Support Stiffness (kN/mm)
1	101
2	50.3
3	33.5
4	25.2
5	20.1
6	16.8
7	14.4
8	12.6
9	11.2
10	10.1
12	8.38
14	7.19
16	6.29
18	5.59
20	5.03
22	4.57
24	4.19
26	3.87
28	3.59
30	3.35

Example:



Individual Tower A is shown with the calculated leg loads in the tower. The maximum leg load is 78kN. Use a design leg load for this tower of 78kN.



Linked Tower B is shown with the calculated leg loads. Loads are of similar magnitude to those in tower A and the maximum leg load is again 78kN, however because this tower has more than one falsework bay in both directions on plan, rule 2 can be used to establish the design leg load:

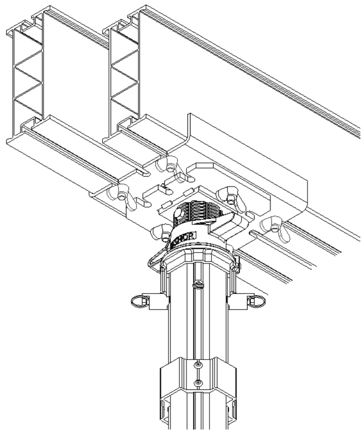
Mean leg load = 67kN

Mean leg load x 1.2 = 80.4kN > 78kN

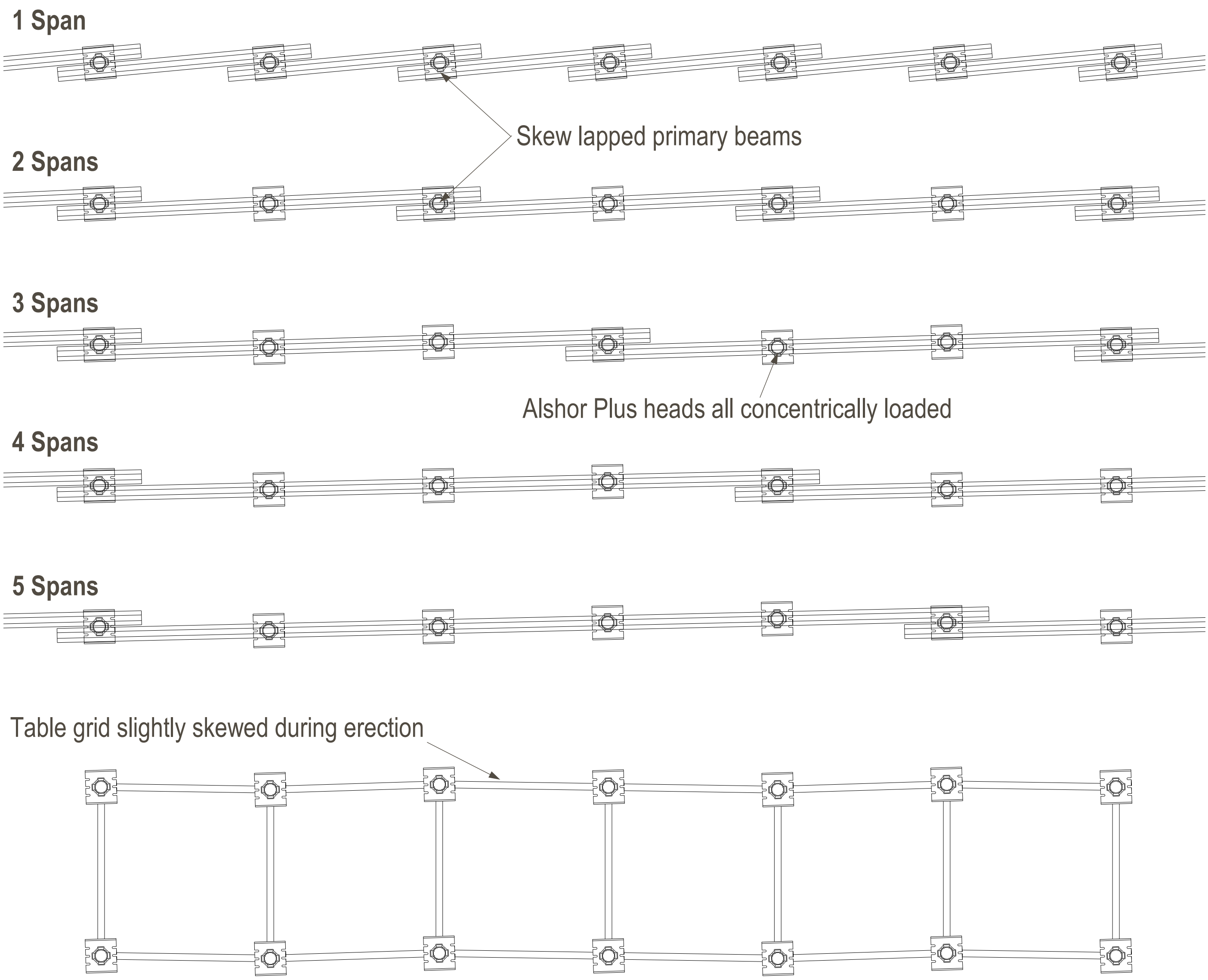
Hence the design leg load for this tower is 67kN

Lapped Primary Beams

Where primary beams are lapped in the U heads, skew lapping is used to reduce load eccentricity. Where the primary beams lap over one or two spans the Alshor Plus support grid remains rectangular. Where the primary beams lap over three or more spans the support grid will need to be skewed slightly during assembly to enable the primary beam to be clipped into the central U-Head slot at each support. Tolerances in the connection between the Alshor Plus Bracing Frame and the pocket extrusion on the legs are sufficient to permit this.



Provided this discipline is followed on site the lapping of the primary beams will not result in any reduction of allowable working load for the structure.

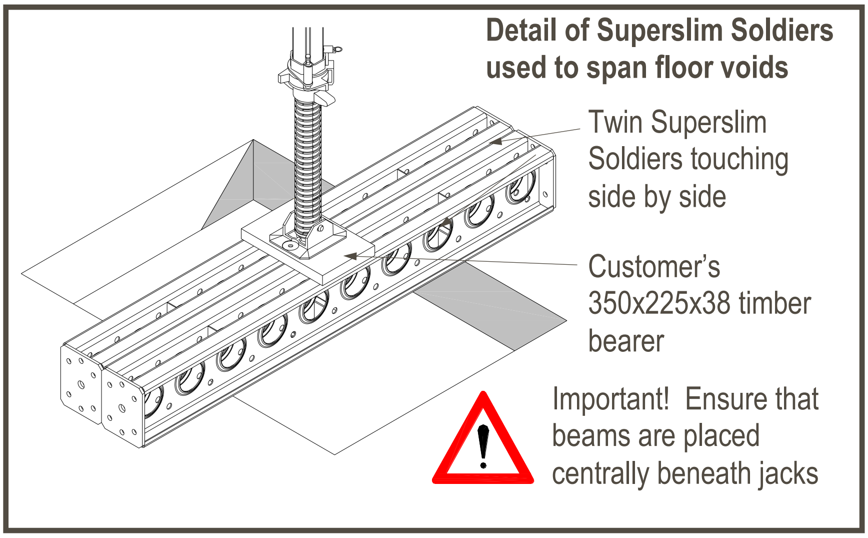


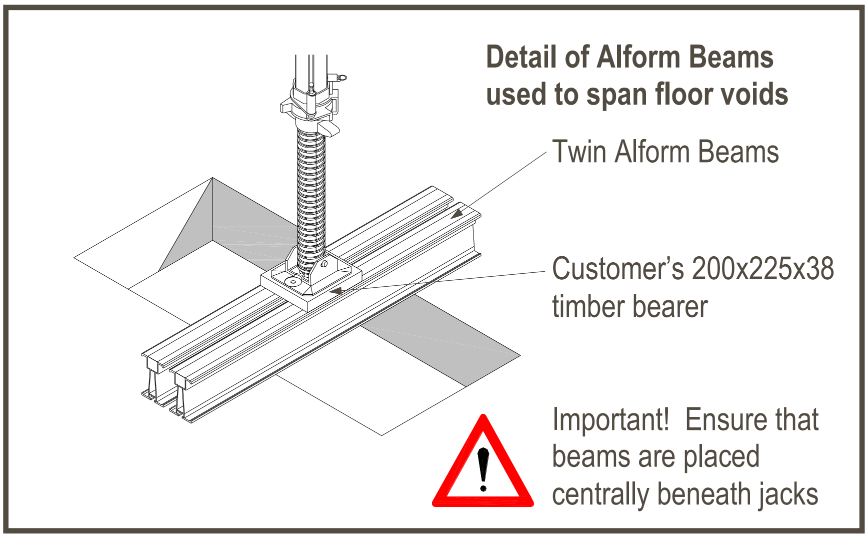
Spanning of Floor Voids

Alshor Plus design charts are based on the falsework foundation being fixed in rotation.

Where Alshor Plus legs fall over a floor void use twin spanning beams across the void spaced closely together with a suitable timber pack spanning between and at right angles to them. Ensure the timber pack and the pair of spanning beams are placed centrally beneath the jacks.

DO NOT USE SINGLE SPANNING BEAMS!





Maximum allowable leg load for both configurations is 80kN.

Spanning beams are laterally unrestrained and are to be designed using an effective length of 1.4L+2D where L is the length of the void spanned and D is the depth of the spanning member.

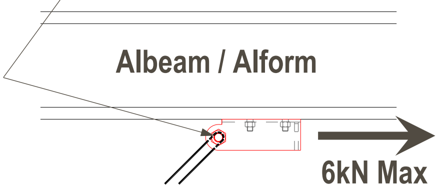
Lateral Restraint at the Edge of a Pour

Use inclined Ratchet Lashings at the edge of a pour to restrain the falsework where the permanent works can not. Details showing how to calculate whether/how many restraints are required are shown in Appendix A - sheet 68.

Alternative details at the top of the Ratchet Lashing

Edge Restraint Tie Connection A

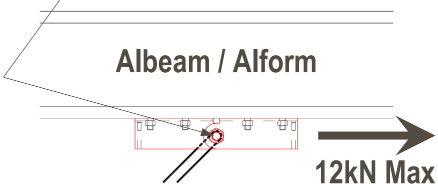
Use Fixing Pin & Sping Pin (AFX20018 + SSU10011) to connect Ratchet Tie



1 No. Alform Adjustable Internal Corner piece (AFX20001) fixed to beam with 2 No. Splice Clamp Blocks & 2 No. M12 Hex Nuts gr8 BZP (AFX20013 + BNU12001)

Edge Restraint Tie Connection B

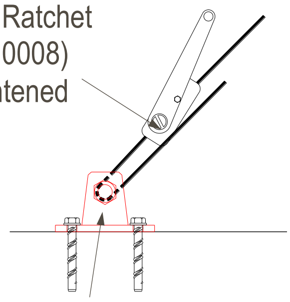
Use Fixing Pin & Sping Pin (AFX20018 + SSU10011) to connect Ratchet Tie



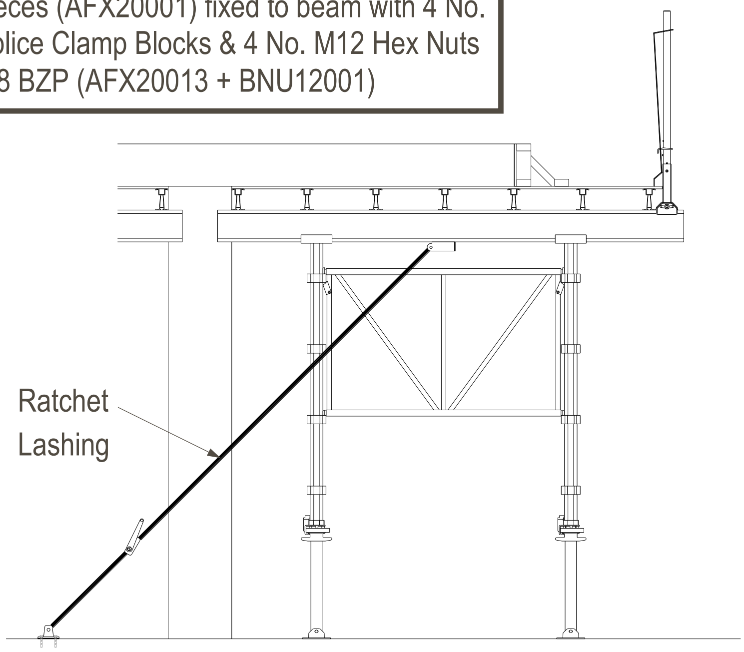
2 No. Alform Adjustable Internal Corner pieces (AFX20001) fixed to beam with 4 No. Splice Clamp Blocks & 4 No. M12 Hex Nuts gr8 BZP (AFX20013 + BNU12001)

Edge Restraint Base Details

Rapidclimb Ratchet 12m (RCX10008) suitably tightened



Paraslim Tilt Plate (PSX10008) & M20x100 Bolt gr8.8 BZP & M20 Hex Nut gr8 BZP (BNU20015 + BNU20001) Fixed to slab using Excalibur Screwbolts 12/100 or similar



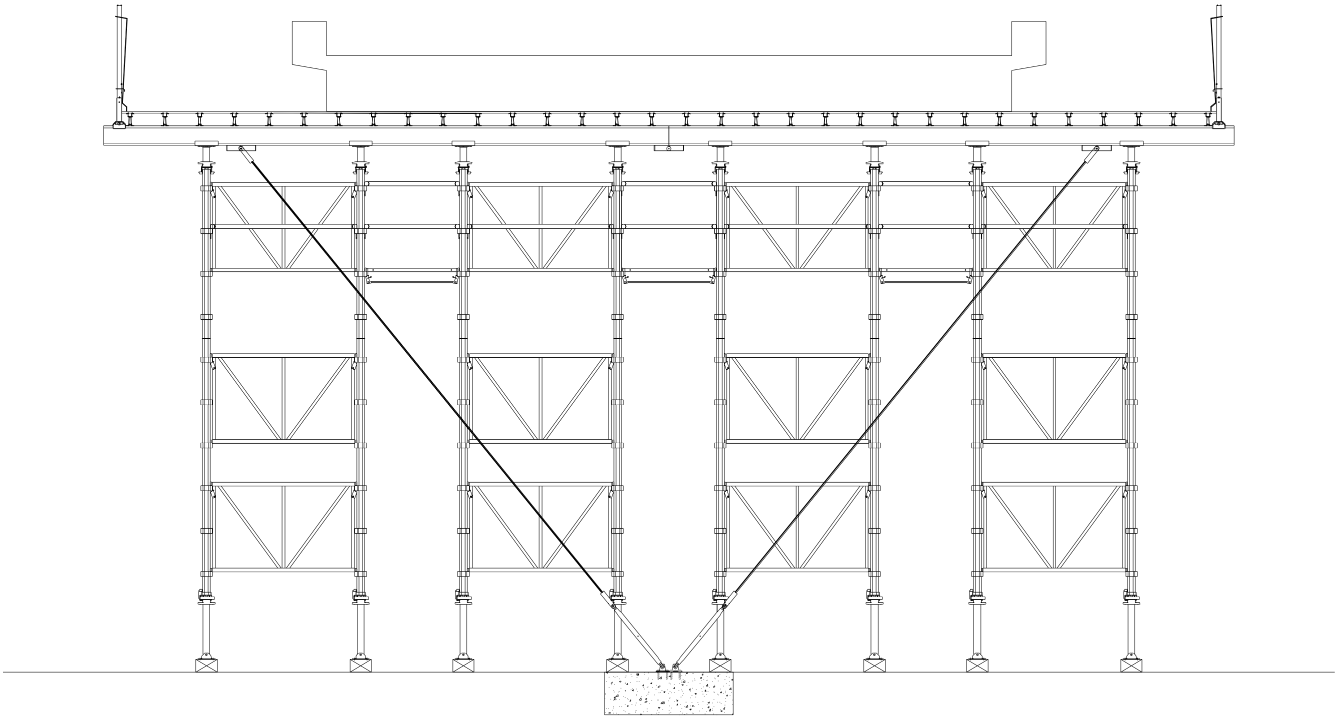
Typical Section at Deck Edge

Code	Description	Weight
AFX20001	Adjustable Internal Corner	3.81 kg
AFX20013	Clamp Block - Splice	0.09 kg
BNU12001	Nut - M12 Hexagon Plated	0.01 kg
PSX10008	Tilt Plate	2.38 kg
BNU20015	Bolt - M20 x 100 Gr 8.8	0.32 kg
BNU20001	Nut - M20 Hexagon	0.06 kg
FAU10051	Bolt – HSB Excalibur 12 x 100	0.10 kg

Lateral Restraint of Free-standing Falsework

In this case ratchet lashings do not provide a sufficiently stiff restraint and Rapid Bar Tie tension braces are used in crossed pairs to provide head fixity. It is economical if both ties can be anchored to a common foundation as with the arrangement of bridge falsework below.

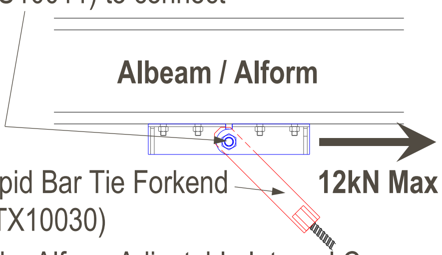
Relatively straight bridge decks may be top restrained longitudinally by virtue of the soffit being jammed between abutments. The structure is likely to be freestanding laterally except local to intermediate piers or columns, which may also provide top restraint. An access lift can be provided between the falsework towers.



Typical Section Through Bridge Deck Falsework

Upper Restraint Detail

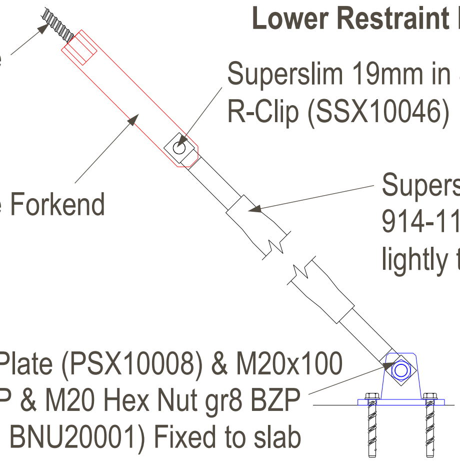
Use Fixing Pin & Sping Pin (AFX20018 + SSU10011) to connect



Rapid Bar Tie Forkend (BTX10030)

2 No. Alform Adjustable Internal Corner pieces (AFX20001) fixed to beam with 4 No. Splice Clamp Blocks & 4 No. M12 Hex Nuts gr8 BZP (AFX20013 + BNU12001)

Lower Restraint Detail



ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

Tall Top-Restrained Towers

Design graphs for Alshor Plus applications cover many falsework geometries up to 12 frames high. Sometimes structures need to be taller than this and in such cases intermediate lateral restraint can sometimes be added to the towers to enable design to proceed. Intermediate lateral restraints are added with the progress of the false-work build and this should be noted on the scheme drawing.

Lateral Restraint Design

Tower lateral restraints should be designed in accordance with BS5975 for the greater of 2.5% of the supported vertical load or 1% of the vertical load plus all known horizontal loads - likely mostly wind. Intermediate lateral restraint should be considered in both plan directions.

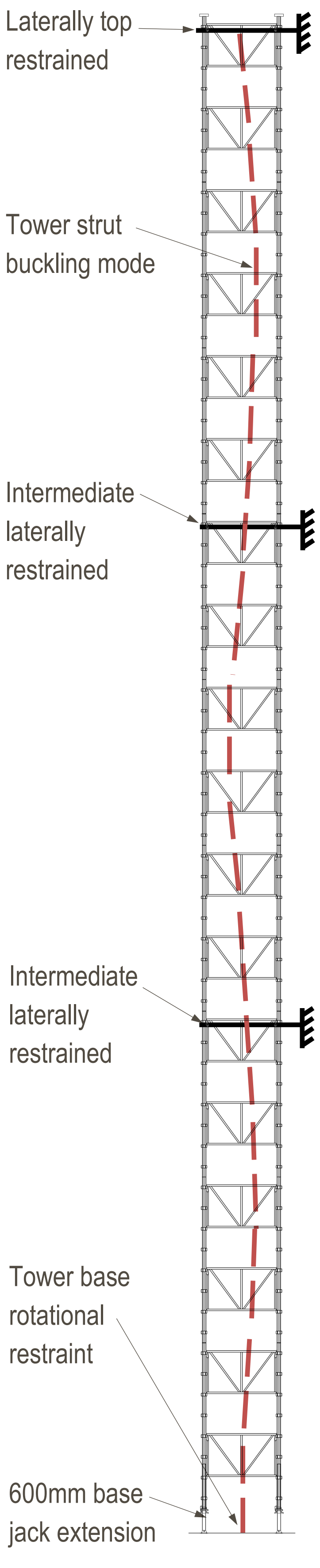
Tower Design

The tower acts as a lattice strut with node points at the levels of lateral restraint. The effective length of the tower strut is the distance between the levels of lateral restraint.

Reference can be made to series 100 and 200 design charts having the same number of frames as the distance between the tower lateral restraints.

e.g. The tower shown right can be designed using chart 107 (6 frame high towers). With the base jacks extended 600mm and a 1m spacing between frames, the allowable working leg load using 1200mm frames is 93kN. Again very short top jacks can be used without load penalty.

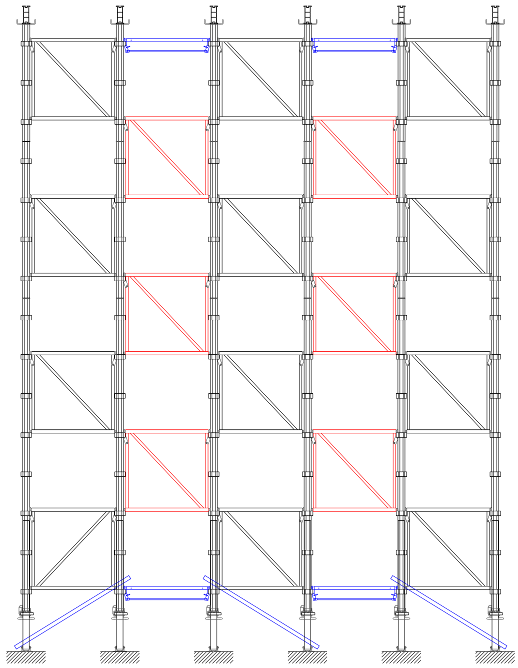
Graph 209 can be used to obtain an enhancement factor for use with the 1800mm frames. For 6 frames high this is 1.15. Hence the maximum design load for this tower is 1.15 x 93 = 107kN.



Tall narrow Alshor Plus towers with two levels of intermediate lateral restraint spanning between previously cast columns

Freestanding Linked Tower Design

For freestanding applications, Alshor Plus towers with a frame spacing of 1m may be staggered in alternate bays of shoring in both directions on plan to effectively fully brace the main body of the structure. Data is provided for this application in the form of two graphs; an upper load graph and a lower deflection graph. Refer to series 1000 graphs.



Mean Top Applied Vertical Load

The failure mechanism for such structures is by sideways sway, global buckling of the whole structure and/or base jack failure. Buckling of individual tower legs does not occur and as a result the applied load to the top of the whole tower is more relevant to the design than individual applied leg loads. Provided no individual leg load is more than 15% above the mean leg load, the continuity effect brought about by the use of continuous beams at soffit level can be ignored and an 'area approach' used for design. Where any individual leg carries more than 15% above the mean load, a mean design load for the tower shall be taken as 87% of the maximum leg load.

Mean Top Applied Horizontal Load

Horizontal loads are applied to freestanding structures during design in accordance with BS 5975:2008:2011: Code of Practice for Temporary Works Procedures and Permissible Stress Design of Falsework as follows:

Load Case 1. 2.5% of the applied vertical load.

Load Case 2. 1% of the vertical load plus all known applied horizontal loads (wind etc.)

In the load graphs, the top-applied horizontal load is shown on the x-axis and starts at the 2.5% minimum that satisfies load case 1. For taller structures, load case 2 will likely govern and wind load being split equally between the base of the structure and the top; i.e. the top applied wind load will be 50% of the wind load on the full height of the structure & load case 2 thus becomes:

> 1% of vertical load applied to the tower plus 50% of the total wind load acting on the tower plus any other horizontal loads applied to the top of the falsework

For taller towers the maximum applied horizontal loads are limited by global overturning of the structure. In such cases data for higher horizontal loads does not appear on the graphs.

Base Jack Loads

Due to tower self weight and overturning effects, base jack loads are higher than top-applied loads. Base jack loads are read using the broken lines on the load graphs and should be indicated on drawings such that the customer can provide proper foundations.

Effect of Linking Frames

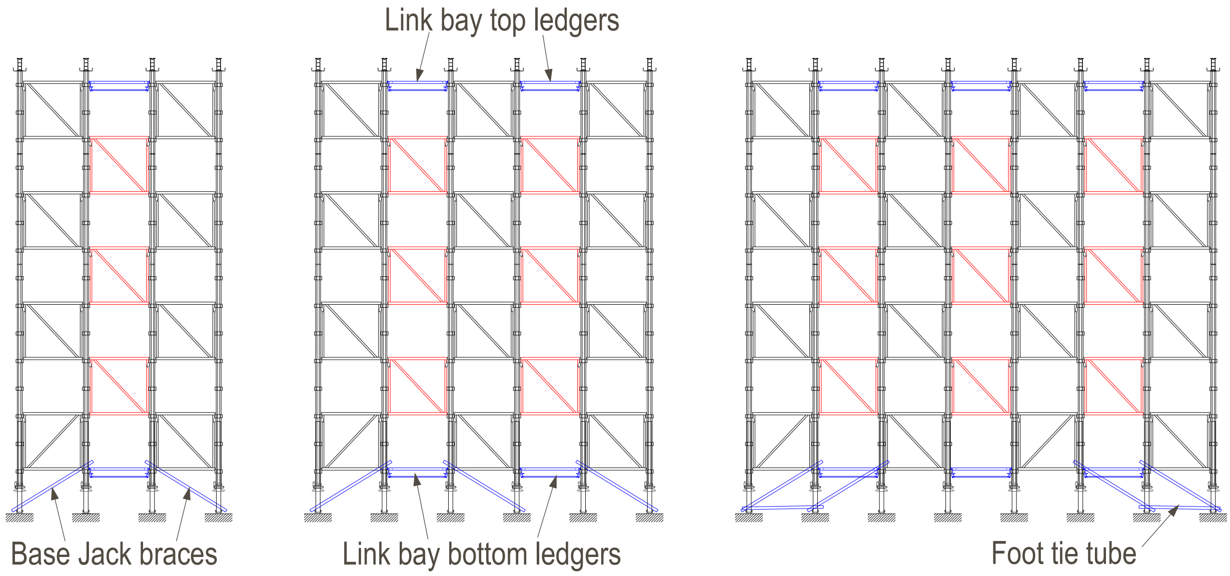
The linking frames provide continuous 'ledgers' throughout the width of the linked structure and triangulate the un-braced bays in the main towers. A single set of linking frames between 2 independent towers to make a structure with 3 linked bays will be less laterally stiff than when more towers are linked. Studies have determined though that there is little beneficial effect on allowable leg load in linking more than 7 adjacent bays. The load graphs show data for 3, 5 and 7 or more linked bays, structures having 4 linked bays should be designed using the data for 3 linked bays and those having 6 linked bays should be designed using the data for 5 linked bays. For rectangular towers design linked structures using the smaller number of bays on plan.

Base Jacks and Link Bay Ledgers

Base jacks may be used at any extension up to the maximum provided they are laterally braced in both directions. The amount of base jack bracing can be calculated in the same way that Rapidshor jack bracing is designed by examining the horizontal load to be transferred in the level below the lowest frame, resolving through the brace angle and dividing the resulting total load by the load capacity of the individual braces; in most cases 6.1kN as tube and fittings are the norm.

The outermost bays in a structure shall always be braced with the braces terminating at ground level on the outermost leg. In the event that this outer leg is too lightly loaded to transfer the horizontal load into the foundation by friction, either bolt the leg to the foundation or provide a foot tie tube connecting the lightly loaded base to adjacent units. Where the base layer requires an odd number of braces, the odd brace should be positioned in or near the middle of the structure. Even numbers of braces shall be positioned at the outer extremities of the tower as shown below. When continuously linking large blocks of falsework, do not leave more than 3 un-braced bays between braced jacks. No data has been produced for structures with un braced base jacks.

The top and bottom pocket extrusions of the main towers shall be linked using ledgers or tube and fittings.

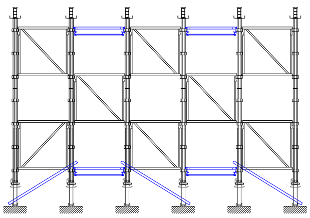


Top Jacks

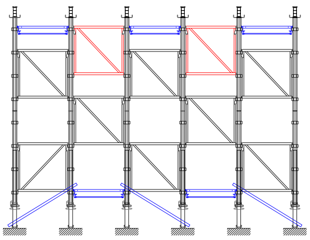
Top jacks having a maximum design extension of 165mm can be used without any reduction in load capacity. The maximum in-situ top jack extension shall be 200mm and this shall be clearly marked on the drawings. If longer top jacks are required, design head jack bracing in the same manner as the base jack bracing.

Top Frames

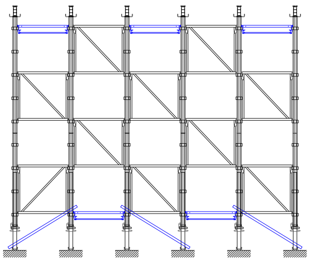
Often it will not be possible to fit linking frames perfectly in the height makeup of the towers. In these situations, start linking at the base of the structure where the leg loads are higher and work up to the top of the structure. Adjust the position of the top frames and ledgers in the main and link bays to provide best linking continuity.



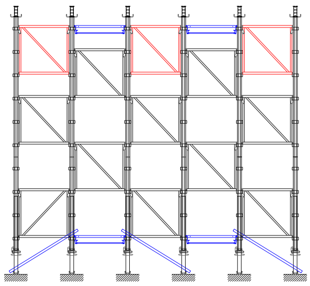
2 Frames High



2 Frames + 500mm



2 Frames + 1000mm



2 Frames + 1500mm

Changing the Frame Size

Graphs are plotted for structures made using 1200mm frames. The 200 series design charts can be used to adjust the load values if different frame sizes are used. The base jack load may limit and should not be allowed to rise above 120kN.

For structures where the frame size varies, either from one side on plan to the other, or along one side of the structure, design the whole structure using the smallest frame size.

Deflection Graphs

Top applied horizontal load as a percentage of mean applied vertical load is plotted against top horizontal displacement (sway) at the maximum allowable mean applied leg load. The sway will be less on a pro rata basis for lower mean applied leg loads.

In all but the most extreme of site conditions the actual applied horizontal load will be far lower than that allowed for in the design and the sway will consequently be much reduced. Most falsework structures will also have available a degree of top restraint which will further reduce sway of the structure.

For most applications it is not necessary or usual to calculate the lateral deflection at the top of the structure or communicate this in calculations or on drawings. Inclusion of the graphs showing peak lateral deflection do though enable side sway to be checked should the sensitivity of the application merit. Tall slender towers will obviously deflect laterally more than squat towers with many linked bays and should be avoided where deflection needs to be minimised.

Appendix A - Lateral Top-Restraint

1. Introduction

British Standard BS5975:2008 Code of Practice for Temporary Works Procedures and the Permissible Stress Design of Falsework states in paragraph 19.2.9.1:

'A basic requirement for all falsework systems is that they should be designed to be able to resist, at each stage of construction, the applied vertical loads W together with a horizontal disturbing force FH which is the greater of:

a. *2.5% of the applied vertical loads (i.e. 2.5%W) considered as acting at the points of contact between the vertical loads and the supporting falsework; or*

b. *The forces that can result from erection tolerances, normally taken as 1% of the vertical load (i.e.1%W) plus the sum of other imposed loads, including wind, out of vertical by design, concrete pressures, water and waves, dynamic and impact forces and any forces generated by the permanent works.'*

Where the falsework is designed using a fully braced system, (e.g. Rapidshor, Megashor etc.) FH is carried by the internal system of bracing from the point of load application to the falsework foundation.

Where the selected falsework system is not fully braced, (e.g. Alshor Plus, Airodek, Tableform, standard props etc.) FH is usually transferred between the point of load application and the permanent works which then provides lateral top-restraint.

During the design of these popular, incompletely braced, top-restrained arrangements, frequently used for in-situ casting of concrete slabs in buildings, the required transfer of load FH between temporary and permanent works is usually provided by the soffit system being cut closely around previously cast columns and walls which then transfer the loads to the permanent works foundations.

The guidance in this Appendix has been established for use by RMDK falsework designers/engineers by the combination of available reference material and engineering judgement to produce 'rules of thumb'. Many of these have already been used with great success in RMD Kwikform for an extended period.

To keep example calculations simple and enable this guidance to be used internationally, the vertical load applied due to access and soffit self weight has been taken as 2.0kN/m^2.

In example calculations the density of reinforced concrete has been taken as 24.5kN/m^3 and of plain concrete 23.5kN/m^3.

2. Stability During Assembly Stage

All such systems need to be provided with sufficient lateral stability during the assembly phase to enable the equipment to be safely put together and for the minimum number of operatives to access the deck to install ply infill between the system soffit and the permanent works walls and columns.

With Airodek, spacing gates are used to provide this interim stability, with Alshor Plus, a minimum number of brace frames are used, with prop-based systems tripods or spacing gates are often used and with the Tableform system, stability during erection is provided by portal action between the props and the assembled soffit table tops.

Additional measures are described in Equipment Guidance Notes for each system to guard against loss of soffit or falsework equipment during high wind conditions.

3. Lateral Restraint Considerations

For most normal lift-height building applications the 2.5%W value for FH will govern and for successful falsework design a number of important criteria must be met:

3.1 Permanent Works Competence

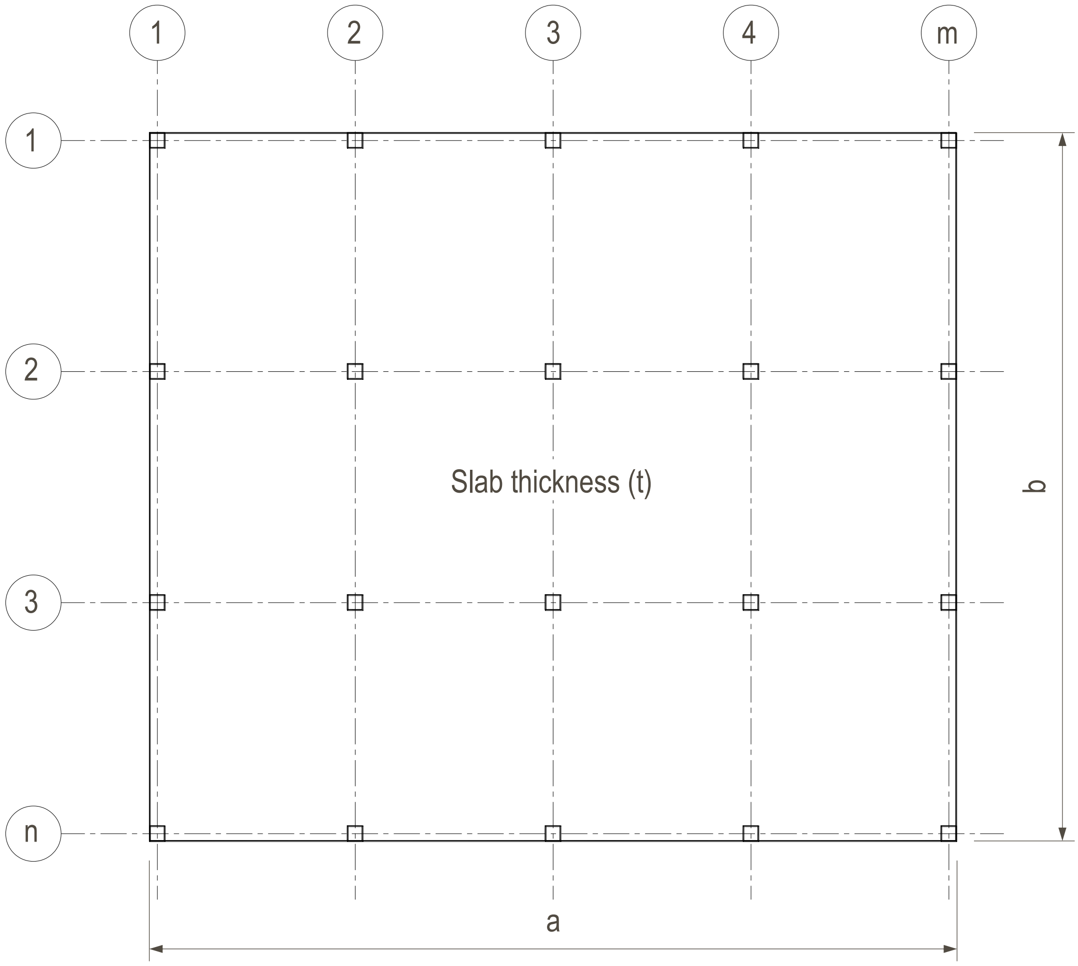
The previously cast walls and columns must be capable of resisting the top-restraint loads FH. The customer is responsible for checking that the permanent works can carry these loads and, in order that these checks can be made, the top-restraint loads should be indicated on the RMDK scheme drawing.

For falsework to the full building area having x column gridlines in one direction and y column gridlines in the other and relatively constant slab thickness, the design top-restraint load for each column, fH = FH/[x(y-1)] in the direction parallel to the x grid lines and FH/[y(x-1)] in the direction parallel to the y grid, see figure 1. The number of gridlines is reduced by one in each case because transfer of horizontal loads between the soffit and permanent works is usually be compression only, one grid of columns in each direction is hence inoperative.

In practice it is sufficient to calculate the higher of these values and state that it is the customer's responsibility to verify that each column can safely resist the higher top-restraint load in both directions.

Great care should be taken when the columns below the slab are poured with that slab or where precast columns are used particularly if, as is commonly the case, they are not grouted and cured to their supporting slab when the slab they support is cast. In such circumstances, diagonal props or a braced falsework tower can be designed and supplied to laterally restrain the top of each column/column form for a restraint load of f_H. In such cases the self weight of the columns also needs to be included in W. Alternatively the whole falsework should be internally braced such that it can resist horizontal load F_H.

Figure 1 - Lateral Top Restraint Loads



Vertical load due to concrete: **abtρ**. Where ρ is the density of the concrete, usually taken as 24.5 kN/m³.

Vertical load due to live load and self weight of equipment = 2.0kN/m².

Total vertical load **W = ab(tρ+2.0kN/m²)**

For example:

Where a = 24m, b = 21m & t = 200mm

W = 24m x 21m x (0.2m x 24.5kN/m3+2.0kN/m2) = 3480kN

Then **F_H = 2½%W = 0.025 x 3480kN = 87kN**

If x=5 & y=4 (number of column gridlines),

Then f_H is the greater of : **F_H/[x(y-1)] = 87kN/[5x3] = 5.8kN**

F_H/[y(x-1)] = 87kN/[4x4] = 5.4kN

Therefore use **f_H = 5.8kN**

3.2 Temporary Works Competence

The soffit formwork system has to have sufficient in-plane strength and stiffness to be able to transfer top-restraint loads from all loaded areas into the previously cast walls and columns. For flat soffit construction, the presence of what can be considered as a continuous plate of face contact material in areas enclosed on all sides by columns and walls will nearly always provide sufficient in-plane stiffness and edge bearing strength to transfer all lateral top-restraint loads.

Where drop beams are present on the column grid lines, lateral top-restraint loads have to find their way from the flat soffit areas, through the drop beam edge formwork, into the drop beam soffit formwork and away into the columns or walls. Drop beam edge formwork is nearly always designed and supplied by the customer and care is needed with workmanship on site to ensure that drop beam edge forms are braced such that adequate load transfer takes place. The deeper the drop beams relative to their width, the more care is needed to ensure that the drop beams can not lozenge during concrete pouring.

When the soffit is not enclosed by columns or walls on all sides the situation becomes more complicated and additional local top-restraint may be required; vulnerable areas include:

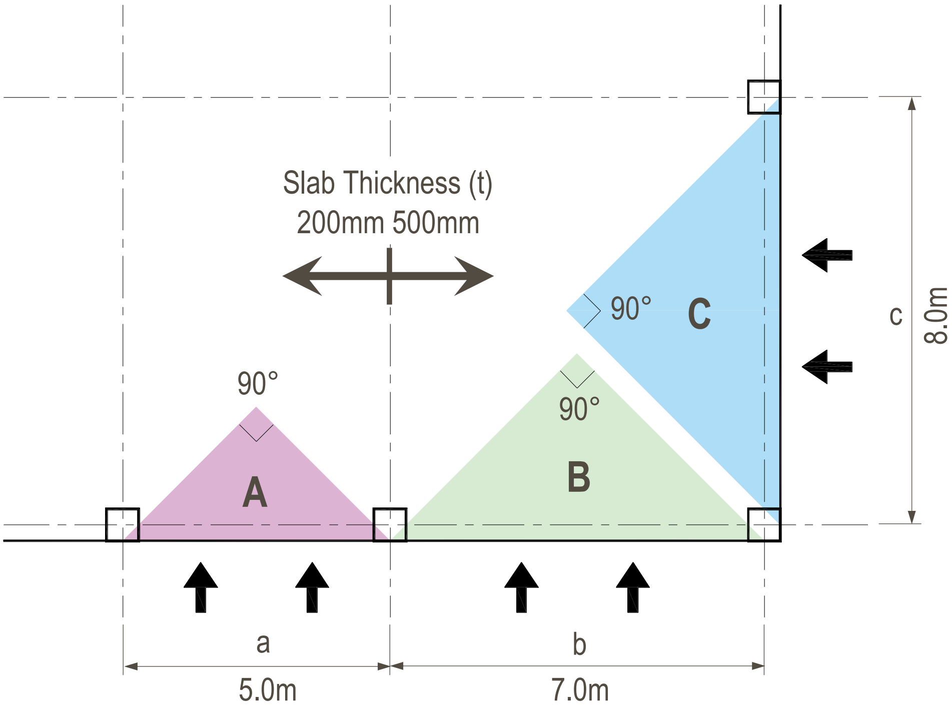
3.2.1 Perimeter Edges Between Columns

At the perimeter edge of a slab being cast, particularly where the column spacing is wide, the section of soffit formwork mid-way between the columns may move perpendicular to the edge of the slab due to both concrete pressure acting on the edge formwork and top-restraint loads. A minor effect may be a finished slab edge that bulges between columns and a little grout loss from the soffit; more seriously, a local section of falsework remote from the columns could become unstable and collapse, although there are no published cases of failure of this nature.

Systems and schemes vulnerable to this effect should be designed with additional lateral top-restraint in the form of diagonal bracing or ratchet lashings placed in the middle third between the column grid. Different soffit systems have different in-plane strength and stiffness and hence should be treated differently; examples are included for most RMDK systems in Appendix A - Section 4.

These local braces/restraints should be designed to carry the top-restraint force associated with a triangular area of slab as shown in figure 2 on the next sheet, **plus** the concrete pressure associated with full fluid concrete pressure acting over an edge form length of 1/2 of the dimension between column centres.

Figure 2 - Provision of Local Lateral Restraint of Perimeter Edges



Note! bracing/lashing not required for column centres of <6.0m

Note! Provide bracing/ratchet lashings in the middle third of the area between columns. This could be a single bracing/lashing placed centrally

Area A: a ≤ 6.0m and t ≤ 300mm hence no additional restraints are required

Area B = 7.0m x 7.0m / 4	=	12.25m²
Concrete load B = 12.25m² x 24.5kN/m³ x 0.5m	=	150kN
Live load & Self weight B = 12.25m² x 2.0kN/m²	=	24.5kN
Total Load Area B = 150kN + 24.5kN	=	**174.5kN**
Top restraint load area B = 174.5kN x 0.025	=	**4.36kN**
Concrete Pressure Area B = 50% x 7.0m(23.5kN/m³ x 0.5m/2 x0.5m)	=	**10.3kN**
Design restraint load Area B = 4.36kN + 10.3kN	=	**14.7kN**
Total load in bracing/ratchet lashings at 45° = 14.7kN x √2	=	**20.8kN**
Area C = 8.0m x 8.0m / 4	=	16.0m²
Concrete load C = 16.0m² x 24.5kN/m³ x 0.5m	=	196kN
Live load & Self weight C = 16.0m² x 2.0kN/m²	=	32.0kN
Total Load Area C = 196kN + 32.0kN	=	**228kN**
Top restraint load area C = 228kN x 0.025	=	**5.7kN**
Concrete Pressure Area C = 50% x 8.0m(23.5kN/m³ x 0.5m/2 x0.5m)	=	**11.8kN**
Design restraint load Area C = 5.7kN + 11.8kN	=	**17.5kN**
Total load in bracing/ratchet lashings at 45° = 17.5kN x √2	=	**24.7kN**

Note how the required restraint loads increase rapidly with increasing column spacing and slab thickness!

3.2.2 Leading Edge Soffit Formwork

Areas of falsework erected beyond the last line or area of columns/walls capable of providing lateral top-restraint are termed ‘leading edge soffit formwork’. The requirement to design and provide additional top-restraint in these areas depends on the ability of the soffit formwork to collect the top-restraint loads and concrete pressure associated with the leading edge area and transfer these back into the internal soffit area and away into the walls/columns.

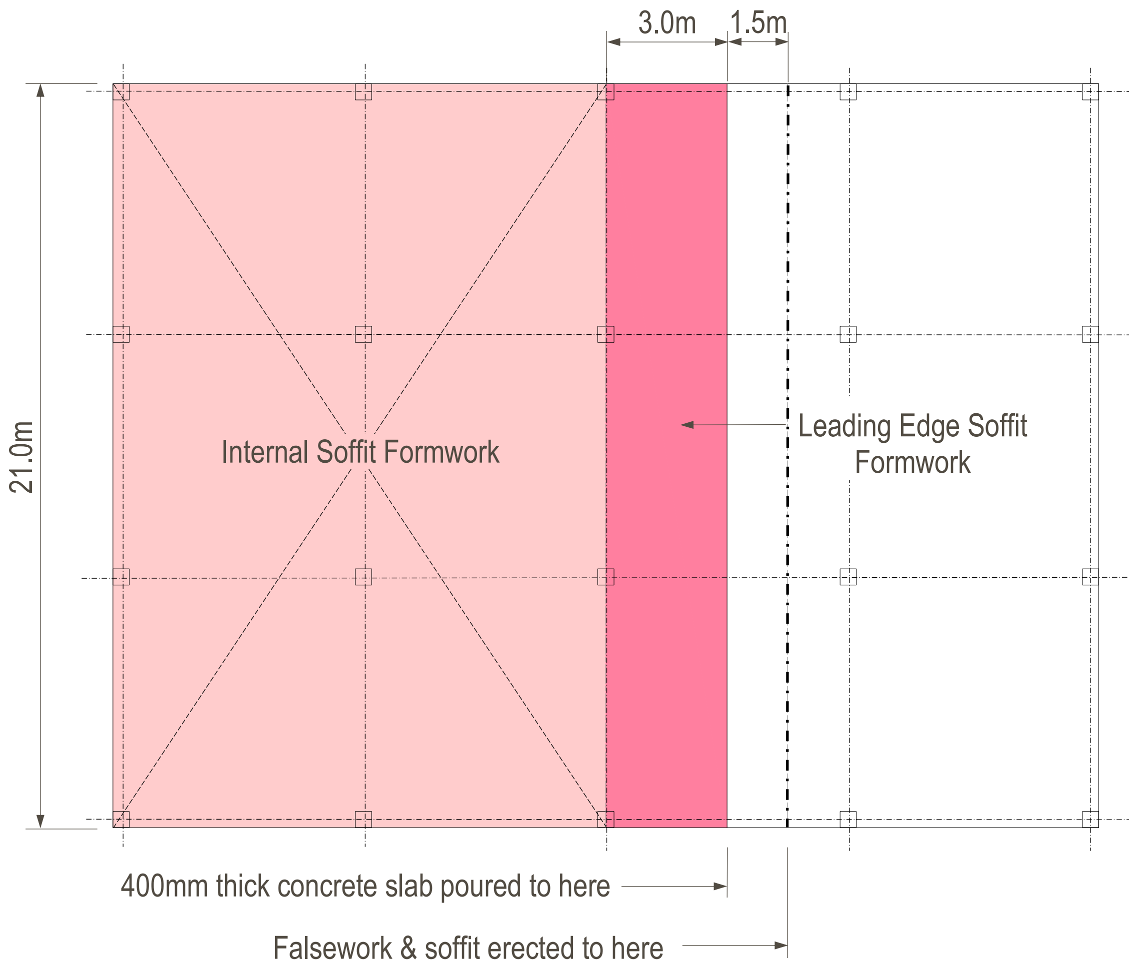
Where the soffit system is not able to transfer loads in this way, additional bracing or inclined ties shall be designed and provided to carry the top-restraint load associated with the leading edge area plus the full fluid concrete pressure acting on 50% of the length of the line dividing the leading edge soffit area from the internal soffit area, see figure 3 on page 71. Furthermore some shoring systems may be capable of safely withstanding the top–restraint load without additional bracing being provided. See Section 4.4.

Note that if the falsework and soffit are erected beyond the front of the leading edge of the slab and infills with columns/walls are placed around the next line of columns/walls, then this area of soffit formwork is no longer considered to be leading edge, see figure 4 page 72. As such no additional top-restraint measures are required.

Different soffit systems have different in-plane capabilities and hence should be designed differently; examples are included for RMDK systems in Section 4.

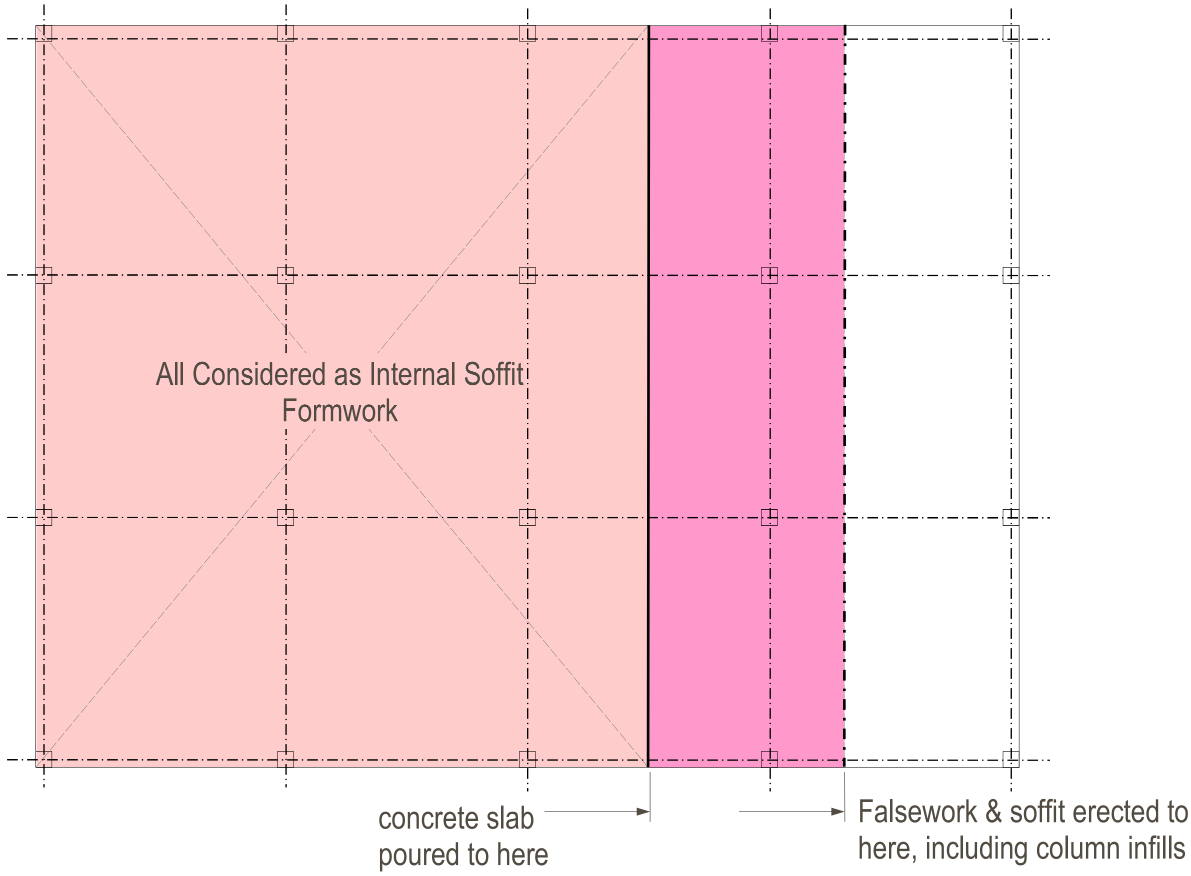
Experience gained over many years has shown that, provided the column centres are equal to or less than 6m and slabs are equal to or less than 300mm thick, additional leading edge restraint is not required for any RMDK system falsework.

Figure 3 - Unrestrained Leading Edge Soffit Formwork



Leading edge concrete load = 3.0m x 21.0m x 0.4m x 24.5kN/m^3	=	617kN
Leading edge live load & self weight = 4.5m x 21.0m x 2.0kN/m^2	=	189kN
Total leading edge vertical load Area = 617kN + 189kN	=	**806kN**
Top restraint load area = 806kN x 0.025	=	**20.2kN**
Concrete pressure load = 50% x 21.0m x (23.5kN/m^3 x 0.4m/2 x0.4m)	=	**19.7kN**
Design top restraint load for leading edge soffit formwork	=	20.2kN + 19.7kN
	=	**39.9kN**
Total load in bracing/ratchet lashings at 45° = 39.9kN x √2	=	**56.4kN**

Figure 4 - Non-Leading Edge Soffit Formwork



3.3 Competence of the Interface

The interface is the point where temporary works and permanent works meet and top-restraint load is transferred between them. Most usually this will be via a section of plywood infill supplied by the customer and positioned by joiners on site. Materials and fixings will almost never be explicitly shown on RMDK drawings and hence responsibility must lie with the customer for correct design and installation.

A particular risk in this area is the case where a number of columns or walls on a building lift are accidentally constructed with the top level cast below the soffit level. Impromptu plywood makeup to extend the height of these short columns may not have the structural competence to transfer top-restrained loads.

4. Rules for Various Configurations of RMDK Equipment

4.1 Airodek Prop and Panel System

Four Airodek Panels are supported at the point where they meet on an Airodek Crown. The locating lugs and claws on the crown provide a good connection and load transfer between the panel frames which forces the soffit structure to act as a continuous stiff plate.

Provided the soffit is flat, no additional top-restraint is required either midway between columns at slab perimeters or in the leading edge soffit area. Care needs to be taken when steps in soffit level force panel level changes that result in loss of continuity of the soffit plate.

4.2 Airodek Decking

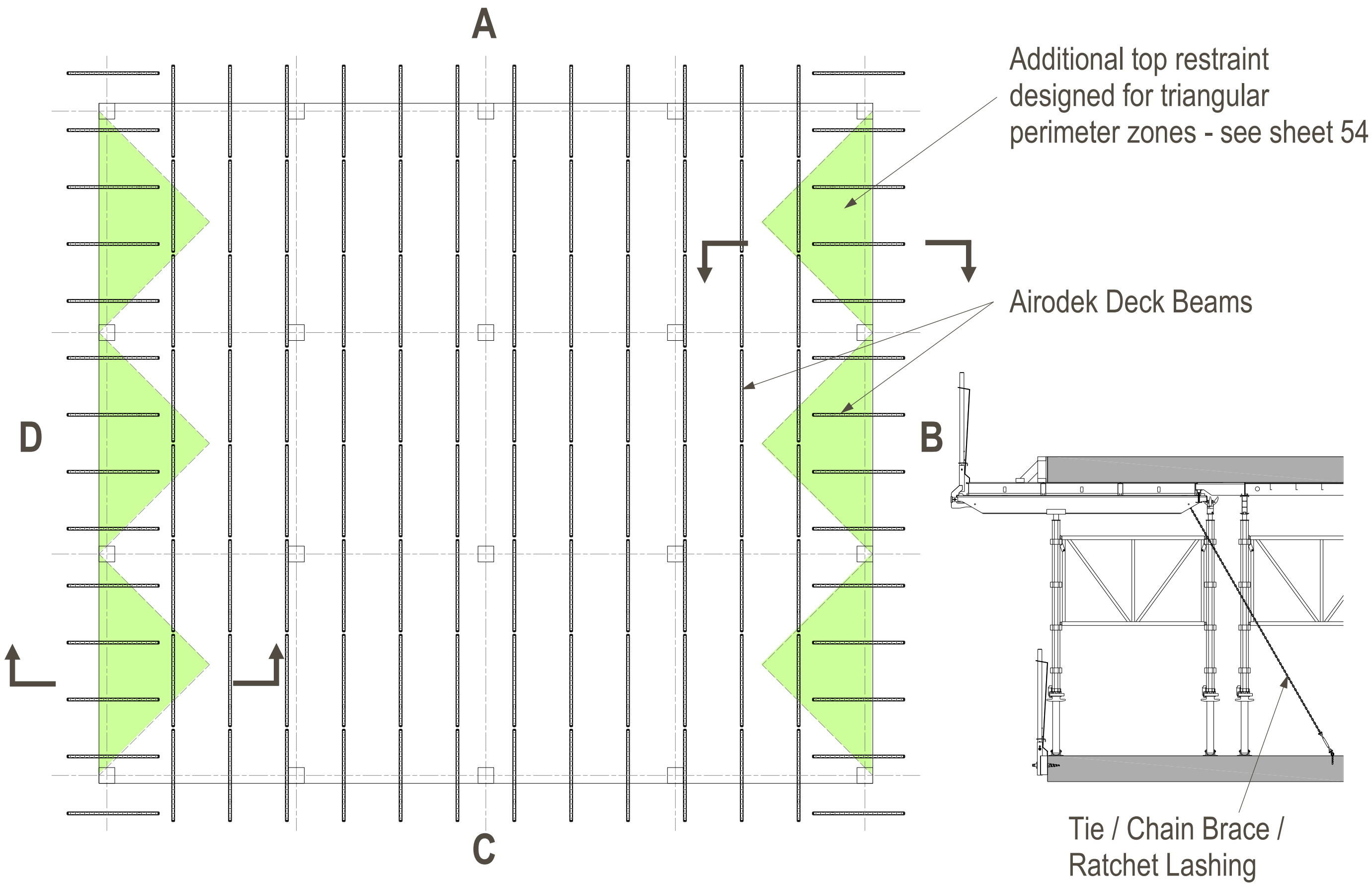
Airodek Panels meet at and are supported by Airodek Deck Beams. The panels locate into the castellated plastic comb incorporated into the top of the Decking Beams. The comb provides a less positive and lower strength connection between the panel edge members which means that additional measures are required to ensure top lateral restraint as shown in pages 74 and onwards.

Deck Beams engage over the claws of Airodek Crowns or Airodek/Alshor Drop Heads which provide a good load bearing connection between these beams capable of transferring top-restraint loads through the soffit system along the line of the Deck Beams.

4.2.1 Perimeter Edges

At the building perimeter, Airodek Deck Beams, shown in figure 5 below, are orientated so that they run perpendicular to the slab edge and cantilever beyond the edge of the building to provide space for access and placement of the edge slab formwork. In these areas, the end of each Deck Beam remote from the slab edge is tied down to the slab using inclined ties/braces/ratchet lashings.

Figure 5 - Airodek Decking Perimeter



Plan Showing Airodek Deck Beam Layout

Section Through Deck Edge

Building edges A & C have continuous runs of Deck Beams transferring edge top restraint loads into the internal soffit area. Design ties/braces/ratchet lashings only to prevent edge Deck Beams from tipping over.

Building edges B & D have single Deck Beams & there is less competent top restraint load transfer with the internal soffit area. Design ties/braces/ratchet lashings to carry top restraint loads & concrete pressure loads described on sheet 68.

Where the Deck Beam at the edge of the building is connected through a Drop Head or Crown to another Deck Beam further under the slab, diagonal ties/bracing/ratchet lashings should be designed only to prevent the cantilevering Deck Beams tipping up as a result of application of the access load on the cantilever. This loading condition should be considered in the least favourable loading condition when the soffit is unloaded i.e. before fixing of rebar or placing of concrete.

Where the Deck Beam at the edge of the building is not connected via a Drop Head or Crown to another Deck Beam further under the slab, the inclined braces/ties/lashings should be designed to carry the greater of:

Either;

The load to prevent the edge Deck Beam tipping up due to application of the access load to the cantilever when the soffit is empty i.e. before fixing of rebar or placement of concrete.

Or;

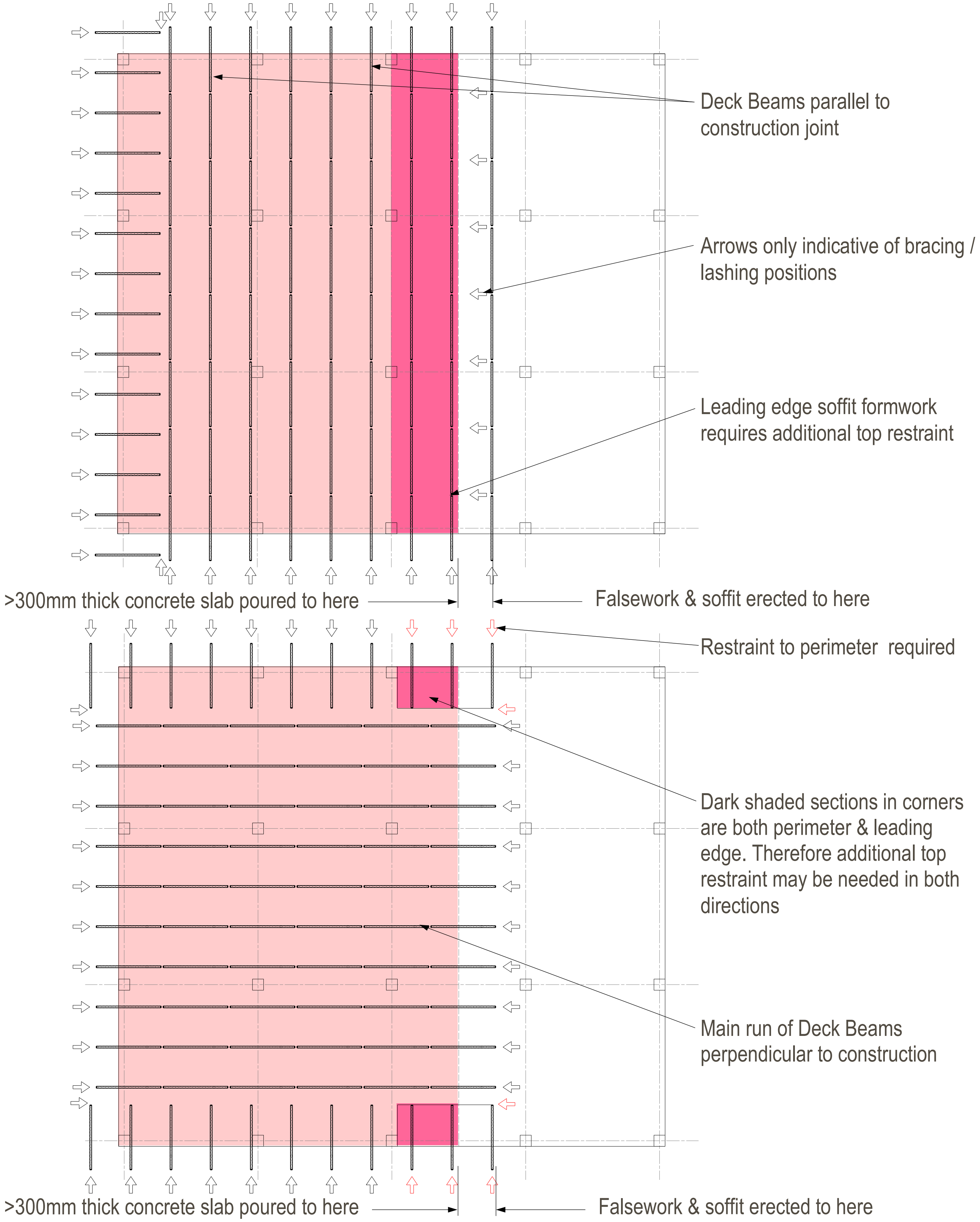
The top-restraint and concrete pressure loads described on sheet 68.

4.2.2 Leading Edge Soffit Areas

If the leading edge soffit area is tied back into the internal soffit area by continuous runs of Deck Beams linked by Crowns or Dropheads, no additional top-restraint provision is required (see figure 6).

If the leading edge soffit area is tied back into the internal soffit area by the Airodek Panel frame interlock with the Deck Beam plastic combs only, design and provide lateral restraints in accordance with the paragraph on Leading Edge Soffit Formwork - see sheet 70.

Figure 6 - Airodek Decking Leading Edge



4.3 Alshor Plus and Tableform Tables

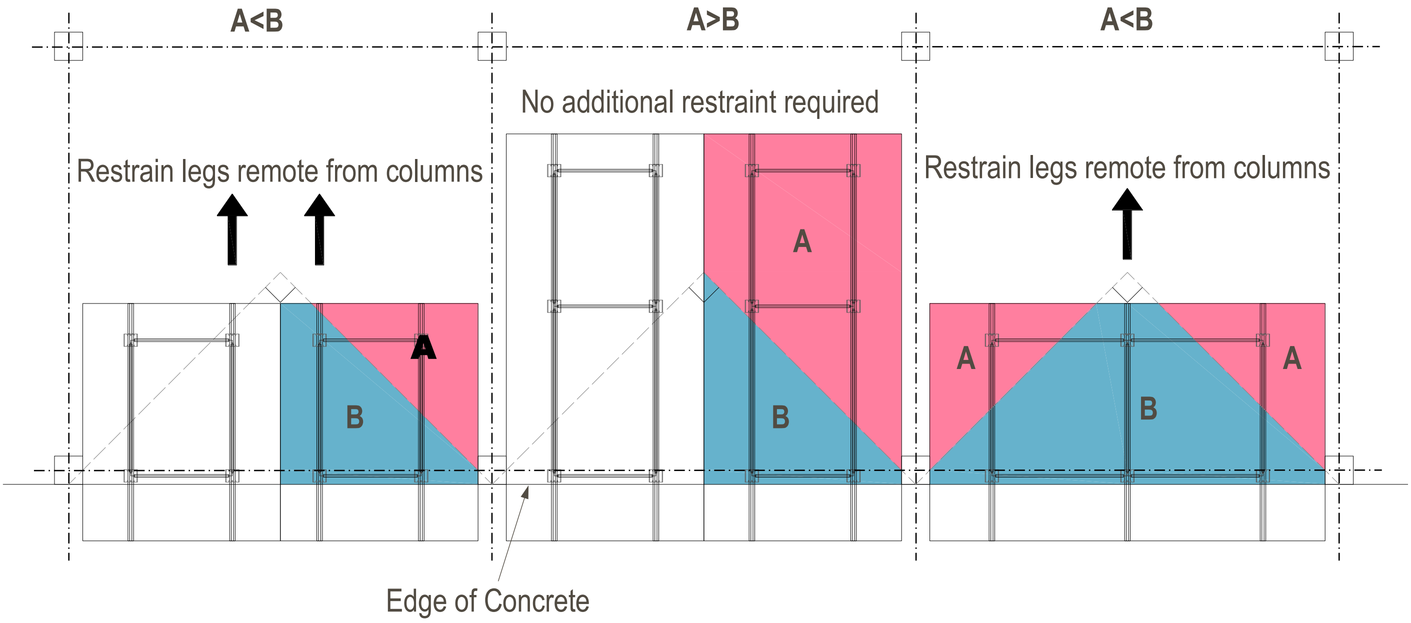
4.3.1 Perimeter Edges

Tables at the building perimeter are usually arranged such that they are rectangular in shape with the long side perpendicular to the building perimeter.

Tables where more than 50% of the supported concrete soffit area lies inboard of the triangular zone shown in figure 7 can be considered as internal to the area restrained by the columns/walls and no additional top-restraint measures are required.

Tables where less than 50% of the supported concrete soffit area lies inboard of the triangular zone should be designed with bracing/inclined lashings to carry the forces shown in figure 6 and acting perpendicular to the slab edge.

Figure 7 - Alshor Plus Tables Perimeter Edges

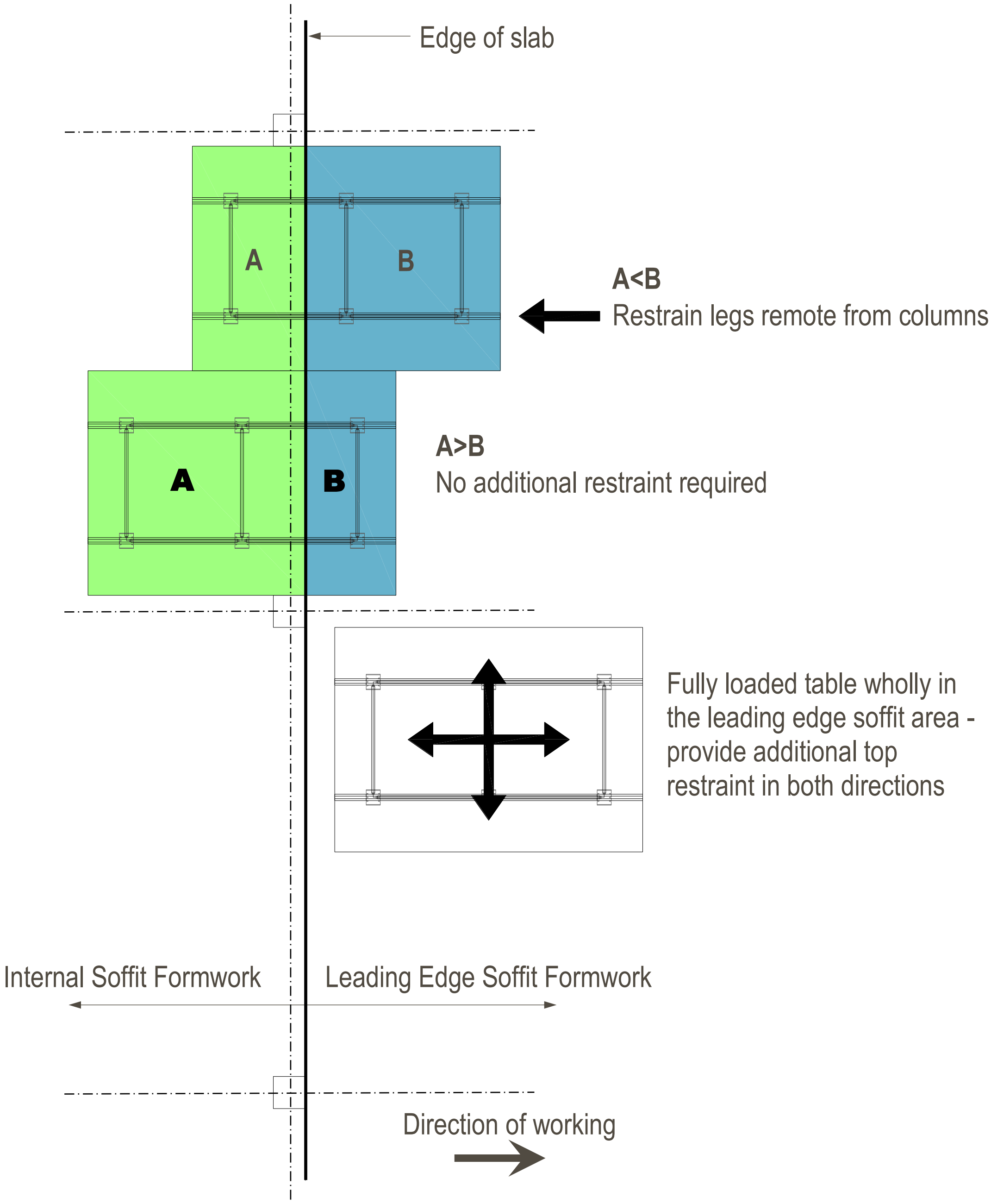


Design restraints to carry the top restraint loads associated with Area B only <u>plus</u> the fluid head concrete pressure on the edge formwork acting on a length equal to 50% of the distance between the column centres.

4.3.2 Leading Edge Soffit Areas

Tables where more than 50% of the supported concrete area falls in the leading edge soffit formwork zone should be provided with additional lateral restraint measures in accordance with 3.2.2 for the part of the table area falling in the leading edge soffit formwork zone only, see figure 8.

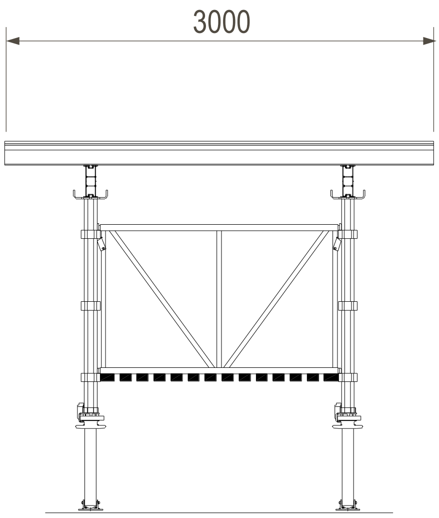
Figure 8 - Alshor Plus Tables Leading



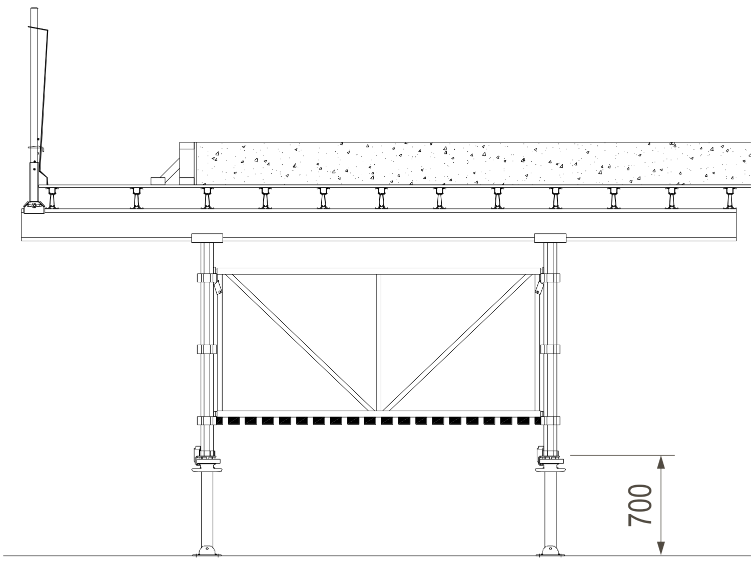
4.4 Tables with Low Leg Loads - Freestanding Design

In some instances, the shoring system may be capable of withstanding the top restraint load without the need for additional bracing.

For example, consider a 3m wide x 5.0m long table positioned at the edge of a 250mm thick slab, with the perimeter columns 8m apart. The table is constructed from plywood, Alform Beam secondary members & Albeam primary members supported by Alshor Plus.



Section



Elevation

The Alshor Plus consists a 1500 leg with no top jack & a Base Jack extended 700mm. Whilst a detailed assessment of the individual leg loads is warranted, for this example a basic analysis is shown below;-

The total load on the table	= 110kN
2.5% of 110kN	= 2.75kN
Total load from the edge form:	
3.0m x 0.25m x 25kN/m^3 x 0.25m x 0.5	= 2.35kN
Total top restraint load = 2.75kN + 2.35kN	= 5.1kN
Top restraint load per leg = 5.1kN/4 legs	= 1.3kN
Leg load = 110kN/4 legs	= say 30kN
Referring to Alshor+ chart 700:	
AWL for a 700mm Base Jack extension	= 63kN > 30kN ∴ leg ok
2.5% side load = 63kN x 0.025	= 1.6kN > 1.3kN ∴ ok

Therefore the table is capable of withstanding the top restraint load without introducing the additional bracing

5. Culvert Roof Construction

Culvert roofs are often constructed using falsework that requires provision of top-restraint. Culverts are unique in that in one direction the soffit formwork is trapped between and restrained by the culvert walls and in the other direction acts, at least partly as a freestanding structure.

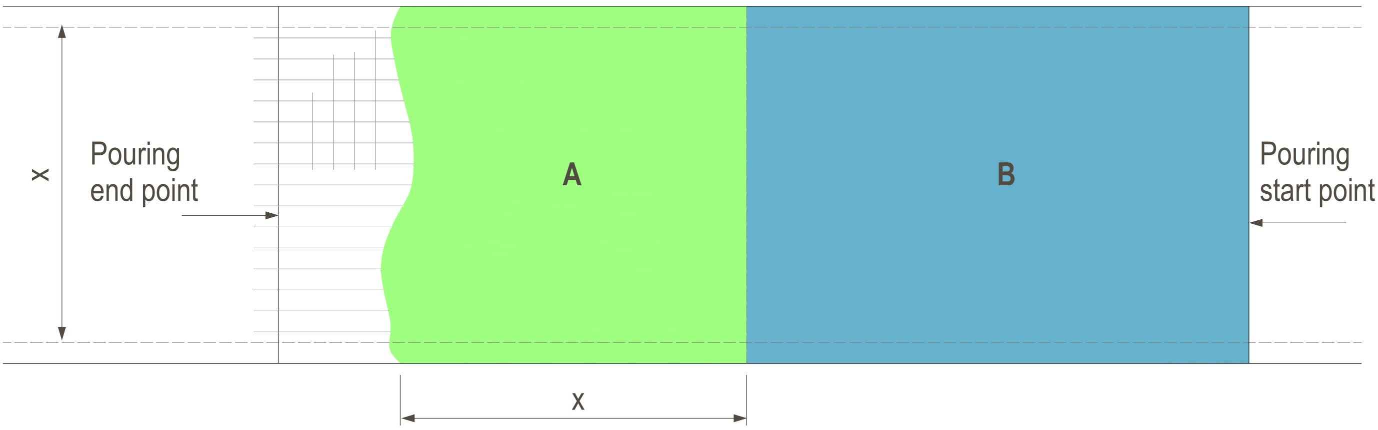
Concrete pouring of the culvert is a linear process with concrete placing progressing continuously or nearly so from one transverse roof construction joint to the next. As pouring progresses the early poured concrete stiffens and the new slab is made up of a fresh plastic zone and a stiffened zone. The concrete in the stiffened zone quickly develops sufficient in-plane stiffness and strength such that it is capable of transferring the relatively small top-restraint falsework loads into the culvert side walls. As a result, falsework for the whole soffit pour need only be designed for longitudinal top-restraint loads associated with the plastic concrete zone as it moves from one end of the pour to the other.

The length of the plastic concrete zone depends on the culvert roof slab width and thickness, rate of delivery of concrete, concrete constituents, temperature and compaction regime. For many years RMD Kwikform has successfully designed top-restrained culvert slab falsework by simplistically taking the plastic zone as equal in length to the width between the culvert walls, i.e. a square zone, see figure 9 below.

A = Transient Square Plastic Zone

B= Stiffened Zone

Figure 9 - Culvert Roof Concrete Zones

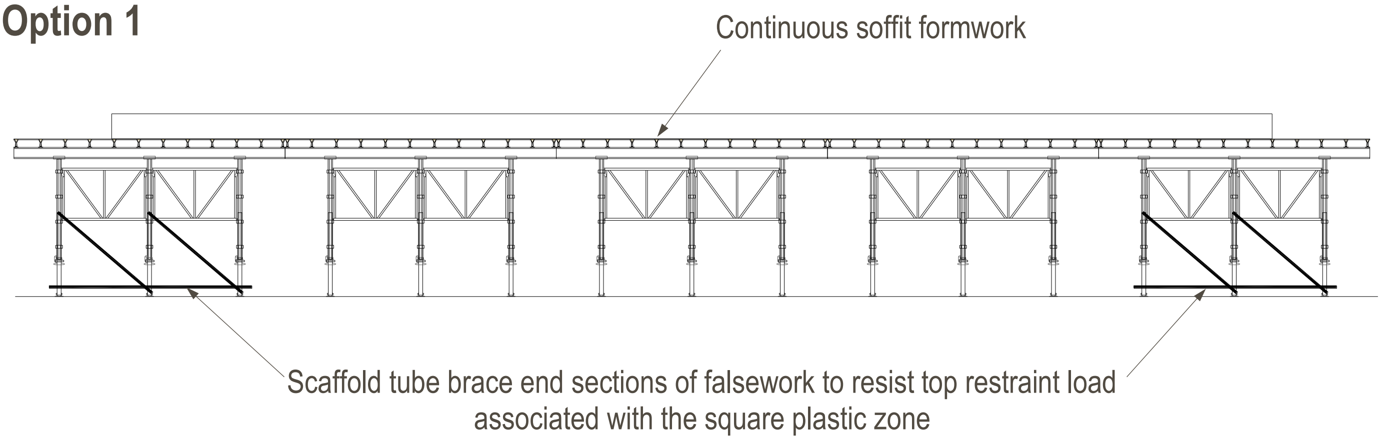


5.1 Culvert Roof Construction - The First Pour

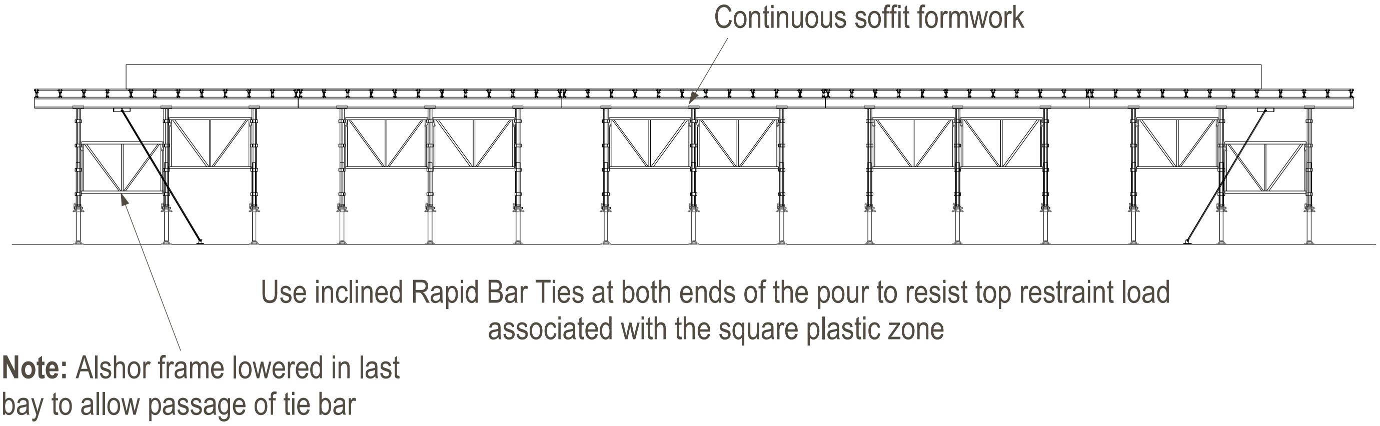
The sections of falsework at the extreme ends of the pour should be braced sufficiently to accept top-restraint loads associated with the square plastic zone, alternatively inclined tie bars can be provided at both ends of the pour designed for the same load, see figure 10 below. Ratchet lashings should not be used in this case as they are too elastic. Concrete pouring can begin at either end of the pour.

Figure 10 - Culvert Roof First Pour

Option 1



Option 2

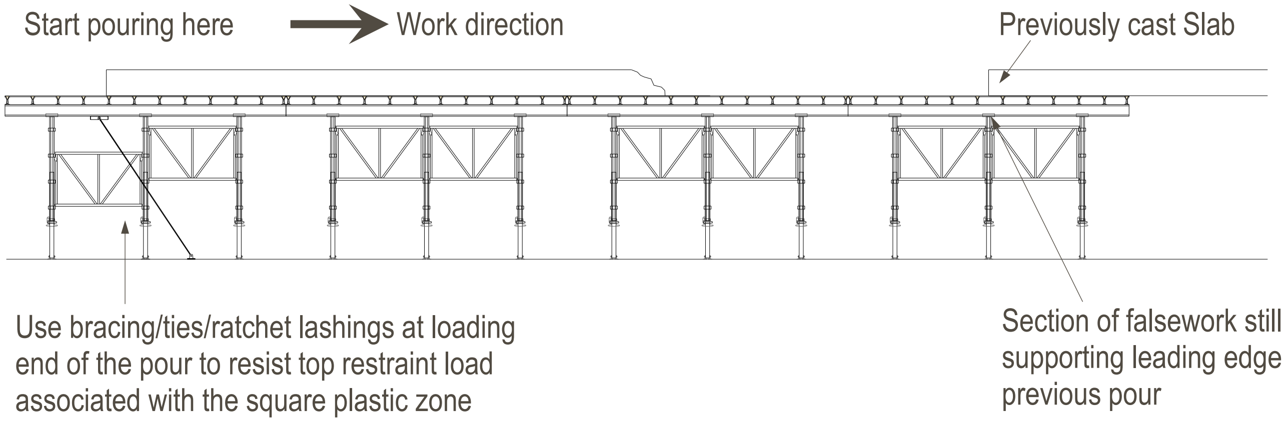


5.2 Subsequent Pours

The section of falsework supporting the leading end of the previously cast slab shall remain un-struck. Friction between this section of soffit and the cured concrete slab prevents the falsework to the subsequent pour moving toward the cured slab.

The section of falsework at the leading end of the subsequent pour shall either be braced to accept top-restraint loads associated with the square plastic zone or inclined restraints positioned at the leading end of the falsework to accept this load. Ratchet lashings can now be used instead of inclined tie bars as these are tensioned against the continuous stiff soffit formwork wedged up to the cured slab at the remote end, figure 11.

Figure 11 - Culvert Roof Subsequent Pours



Concrete placing for subsequent pours is best started at the remote end to the previously cast work as, provided the stop-end formwork is connected to/restrained off the soffit formwork, there will be no resulting concrete pressure longitudinal load transferred to the falsework until the last strip of concrete is poured to meet the previously cast and cured slab. By this time the large hardened zone in the new slab will be capable of resisting all concrete pressure longitudinal loads and again the falsework will see no resulting horizontal load. Notable exception is for inclined culverts - see 5.3.

In the event that pouring has to start against the previously cast slab, the bracing/ties/lashings shall be designed for the top-restraint load from the square plastic zone plus 50% of the concrete pressure acting on the stop-end formwork.

5.3 Sloping Culvert Construction

If the culvert has a longitudinal fall additional reference should be made to TI sheet 03/10 - Sloping Formwork. When the culvert is inclined, the falsework is most efficiently used with the system 'out of plumb by design' with the falsework legs perpendicular to the soffit.

The first pour should where possible take place at the lowest point in level for the whole culvert with subsequent pours working away from the lowest level pours towards the higher levels.

Working 'uphill' in this way with concrete pouring now starting abutted against previously cast work and with falsework legs perpendicular to the slope, minimises both the leg loads and lateral loads in the falsework.

Where working 'downhill' is required, the falsework needs also to be designed to resist the out of plumb component of the leg load, alternatively consider placing the falsework legs vertically.

Either way, concreting is best started at the leading stop end and worked back towards the existing work which again avoids the need to design the falsework to carry concrete pressure loads.

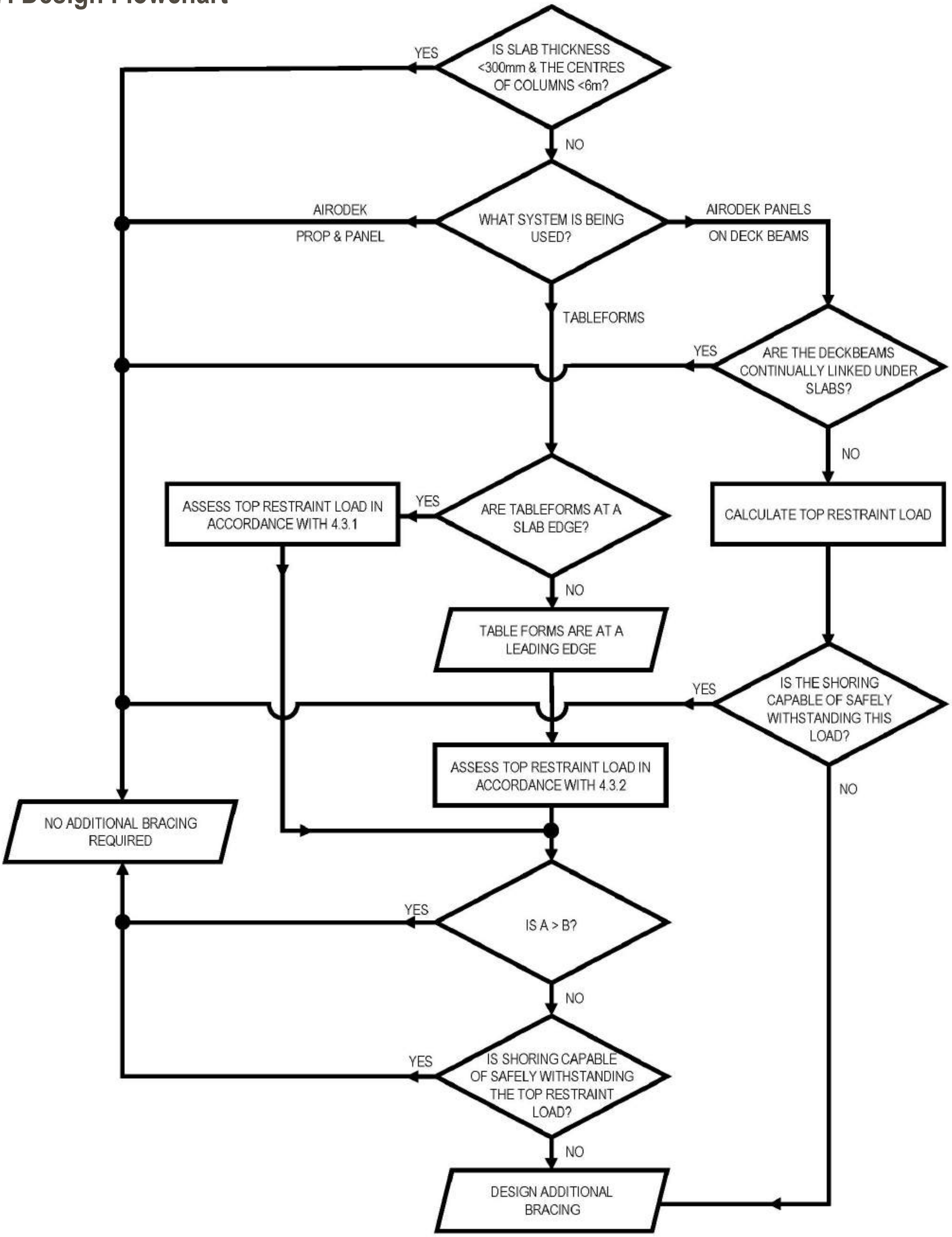
One method of avoiding the need for large amounts of falsework bracing in downhill construction is to use continuously bolted Superslim primary beams placed longitudinally to the direction of the culvert. Provided the leading edge section of falsework to the previously cast slab is left un-struck, such that the Superslim primary beams remain anchored in place at their upper end, the Superslim primary beams have the potential to act in tension to transfer horizontal loads back into the previously cast work.

6. Residual Risk Notes on Drawings

Whichever configuration is designed, if the design relies on the site placing concrete starting in a particular location and/or proceeding in a particular direction, this 'prescribed pouring regime' should be clearly marked on the RMDK scheme drawings using the residual risk symbol.

Similarly if the success of the design relies on a particular striking sequence or leaving of a section of falsework un-struck, this too shall be clearly marked in the same manner.

7. Design Flowchart



Appendix B: Allowable Working Load Charts

Allowable working load charts have been plotted for the following conditions:

- Series 100: Top restrained falsework with 1200mm frames for general falsework use
- Series 200: Influence factors for use with towers having frame sizes other than 1200mm
- Series 300: Top restrained falsework towers with the frame lowered below the top position
- Series 400: Top restrained falsework towers with un-braced head jacks
- Series 500: Top restrained falsework towers with braced head jacks
- Series 600: Top restrained falsework for backpropping applications
- Series 700: Freestanding falsework towers
- Series 800: Top restrained towers used with Airodek crowns or drop heads
- Series 900: Alshor plus push pull props
- Series 1000: Freestanding falsework towers with staggered frames

Series 100 Charts

Optimised top restrained towers for use in general falsework applications.

Charts for structures having 4 frames or more are plotted with equal separation between the frames. Allowable working loads for unequal frame separations may be found using the interpolation method described on page 52.

Use of top jacks should be avoided where possible (tables as tall as 15m high have been used with great success without them). For taller structures, or when customers require top jack adjustment to enable final level adjustment, 750mm head jacks - code ASX10030 (not inverted base jacks) may be added to the top of structures with 4-12 frames in height without load penalty* provided the jack extension in-situ does not exceed 200mm. When designing using top jacks, show a top jack extension of 165mm and state on the drawing.

Top jack extension shown allows a final level adjustment of +/-35mm after falsework erection. DO NOT EXCEED 200mm FINAL TOP JACK EXTENSION.

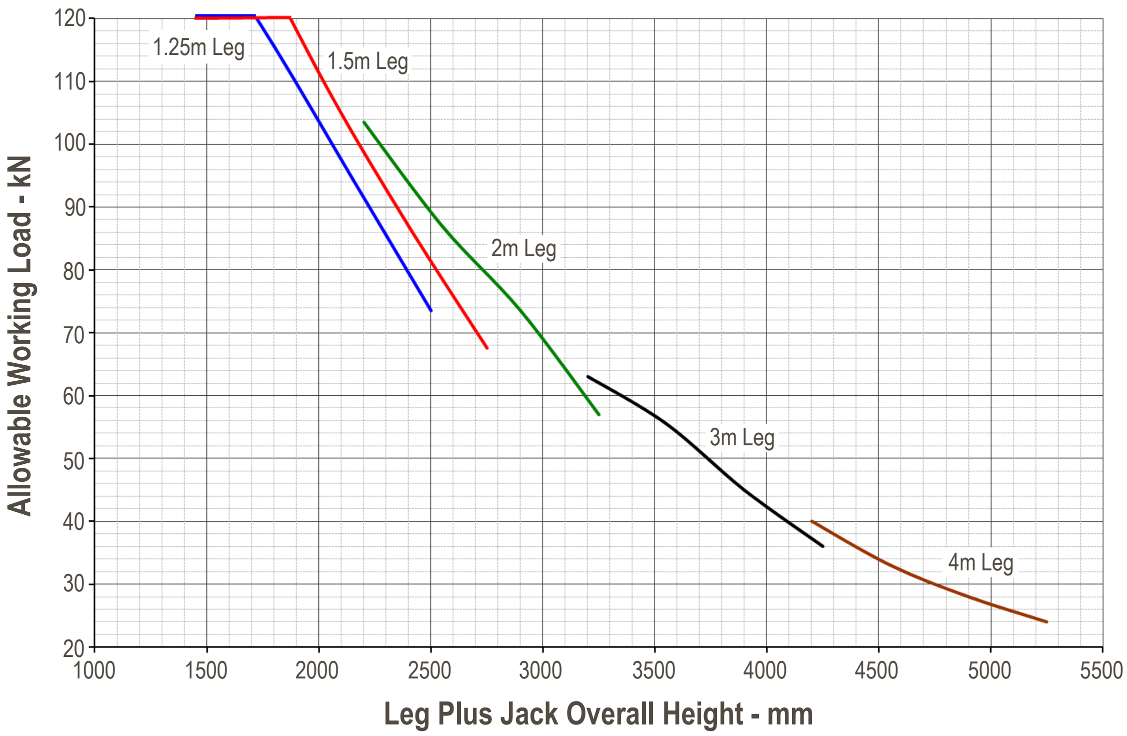
Where longer head jack extensions are required either use the series 400 charts with un-braced head jacks or the series 500 charts with braced head jacks. Alternatively the 100 series charts can be used without load penalty provided the head jacks are braced for 2.5% of the vertical load.

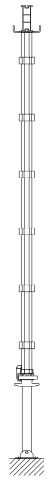
* The minimum jack extension case for the 100 series charts has been justified by modelling the top of the head jacks so that the formwork presents such partial resistance to rotation that the top may reach up to a maximum of 1.5 degrees of rotation at failing load. This allows, also for manufacturing and assembly tolerances.

100

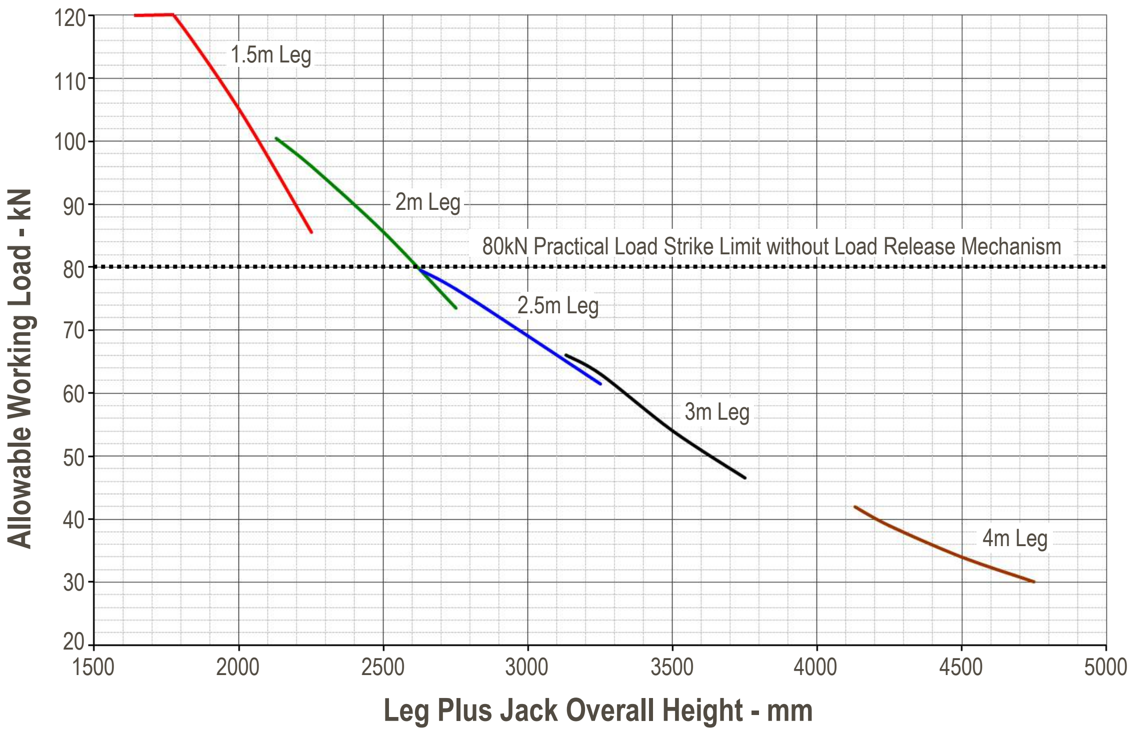
Top Restrained Alshor Plus Props with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

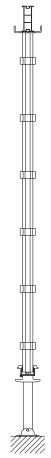
100





101

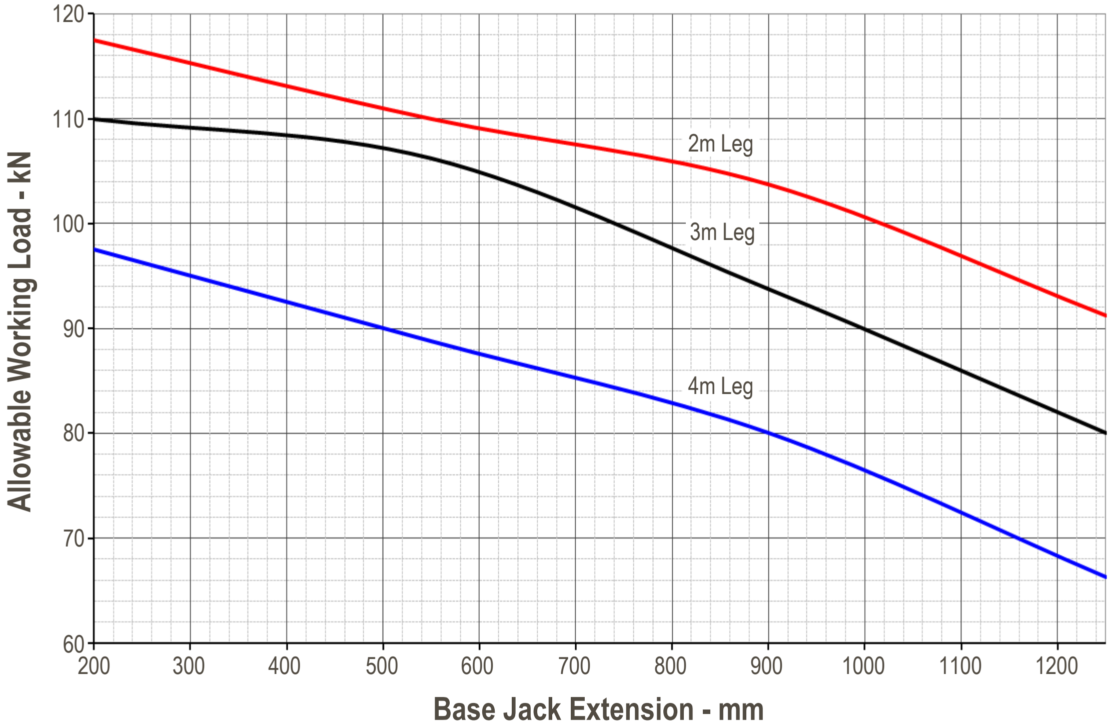




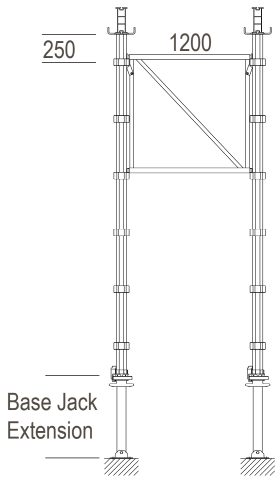
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Top Restrained Alshor Plus Falsework Towers with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

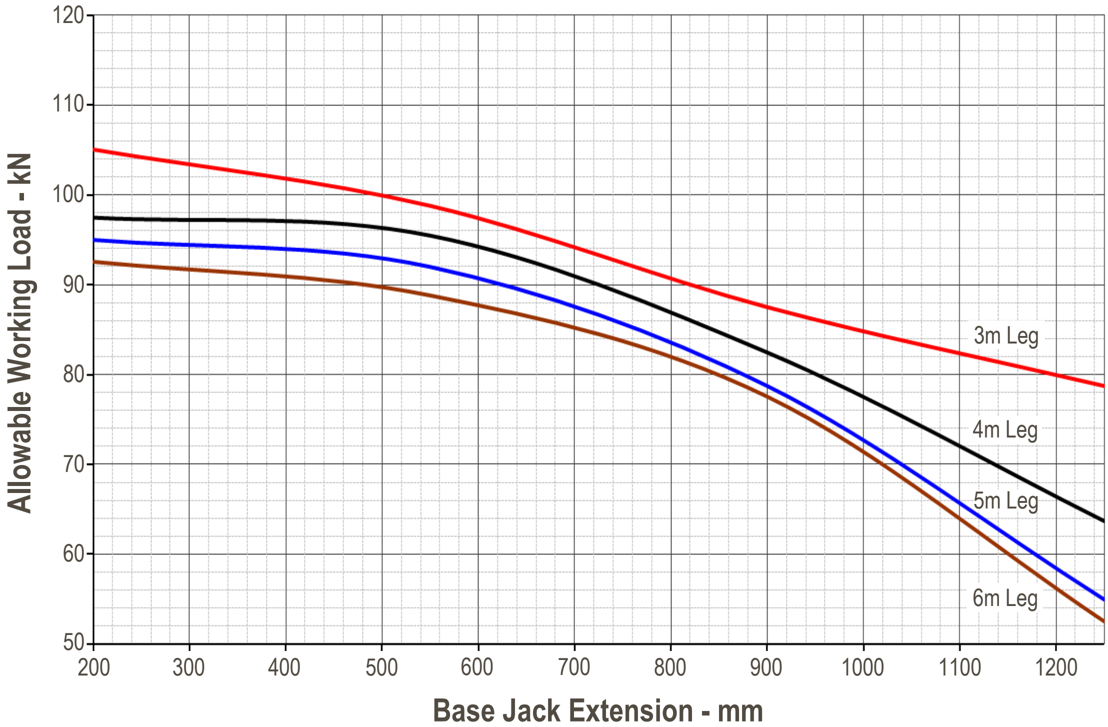
102



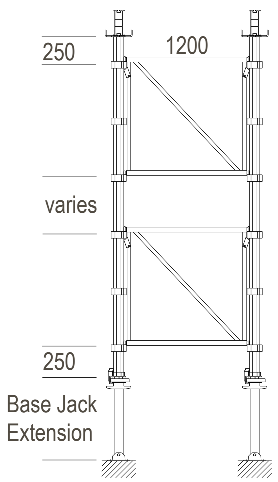
1 x 1200mm Frame



103



2 x 1200mm Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

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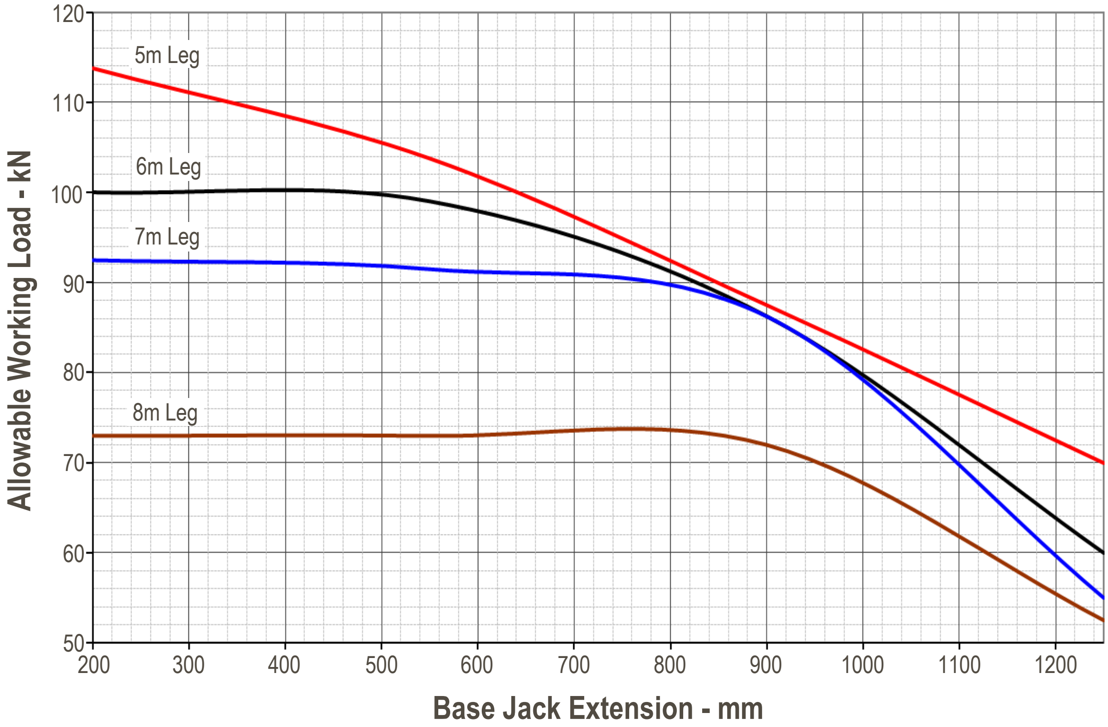
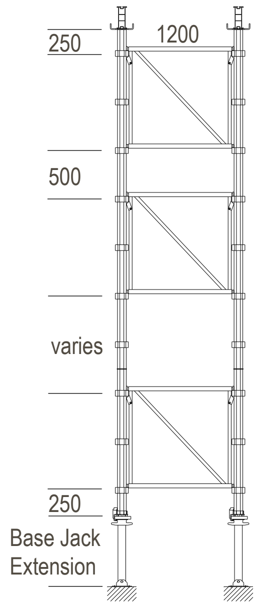
Top Restrained Alshor Plus Falsework Towers with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

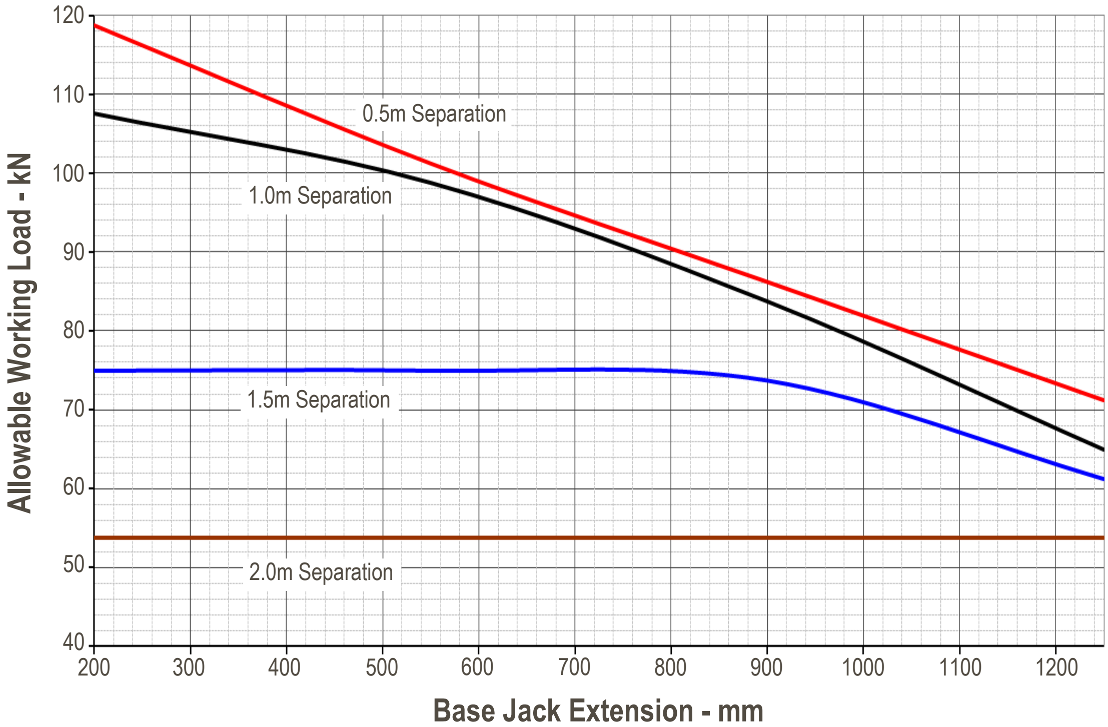
104



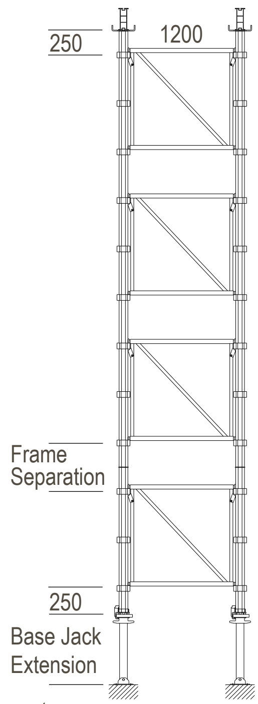
3 x 1200mm Frames



105



4 x 1200mm Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

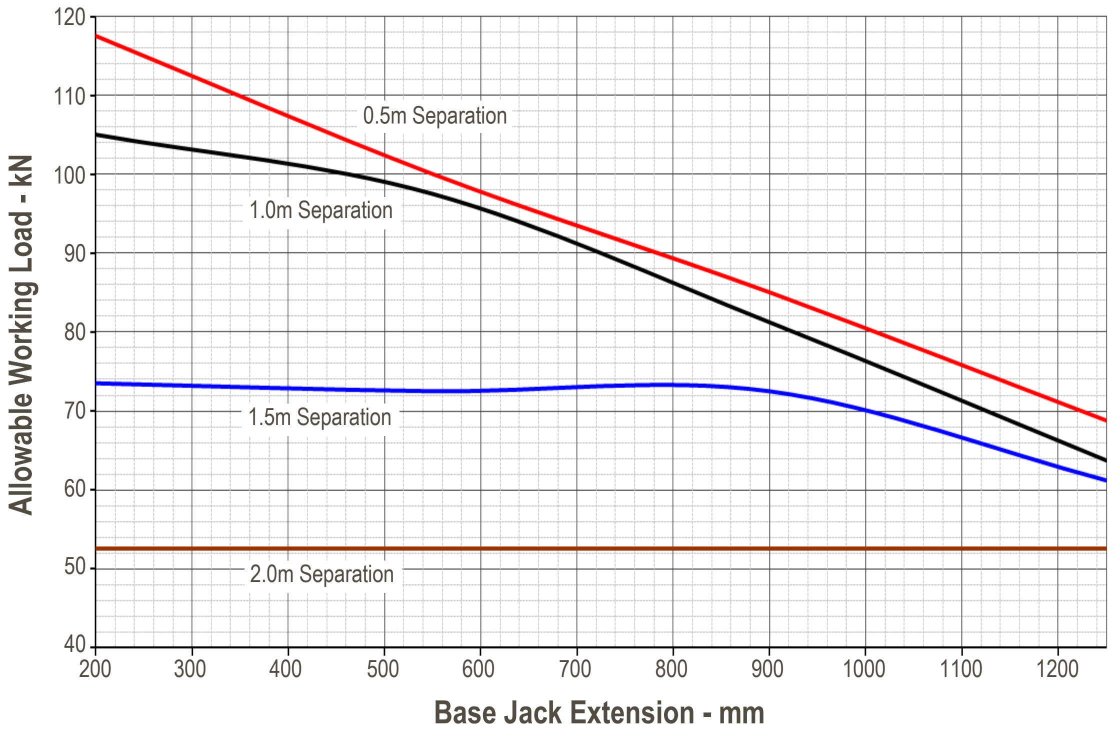
ALSHOR PLUS

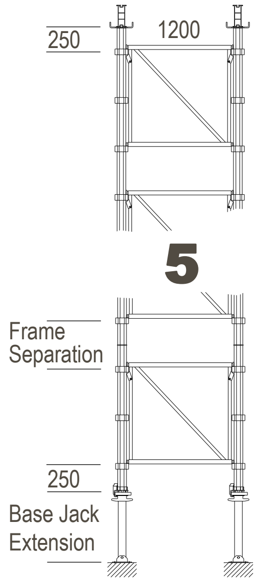
VERSATILE ALUMINIUM SHORING SYSTEM

Top Restrained Alshor Plus Falsework Towers with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

106

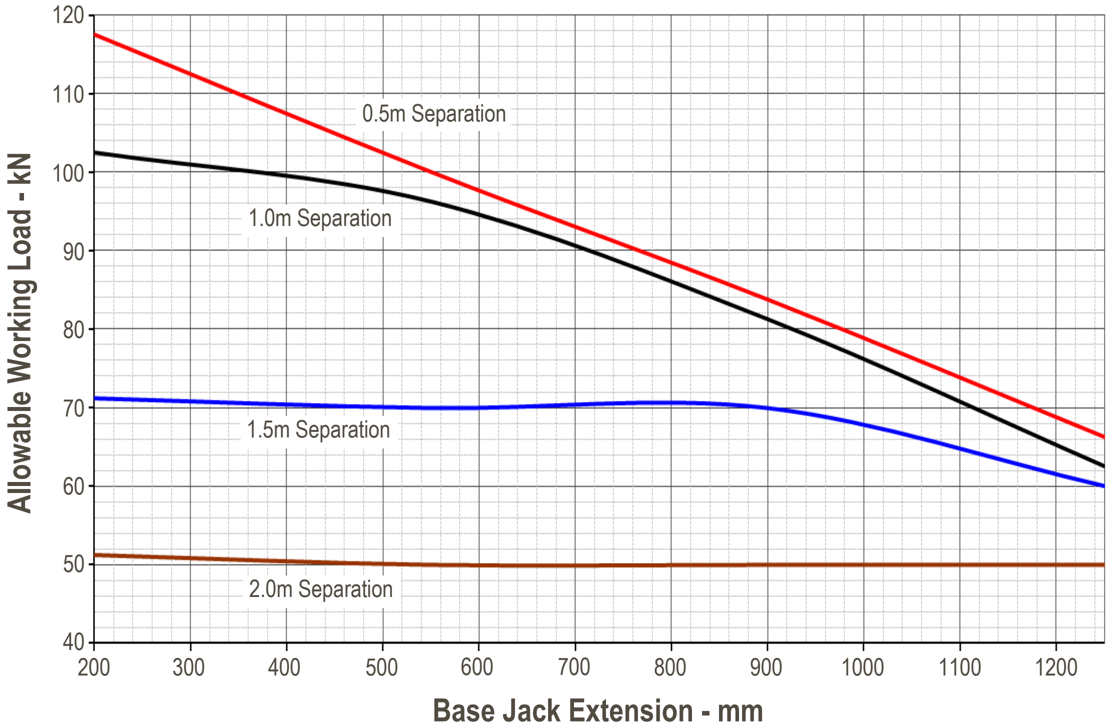
5 x 1200mm Frames

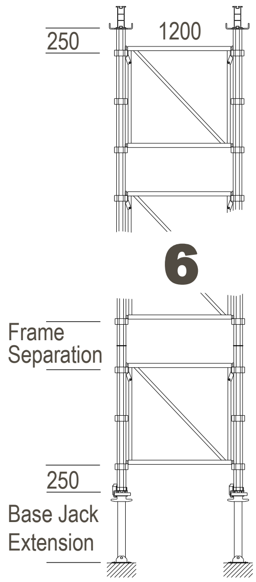




107

6 x 1200mm Frames



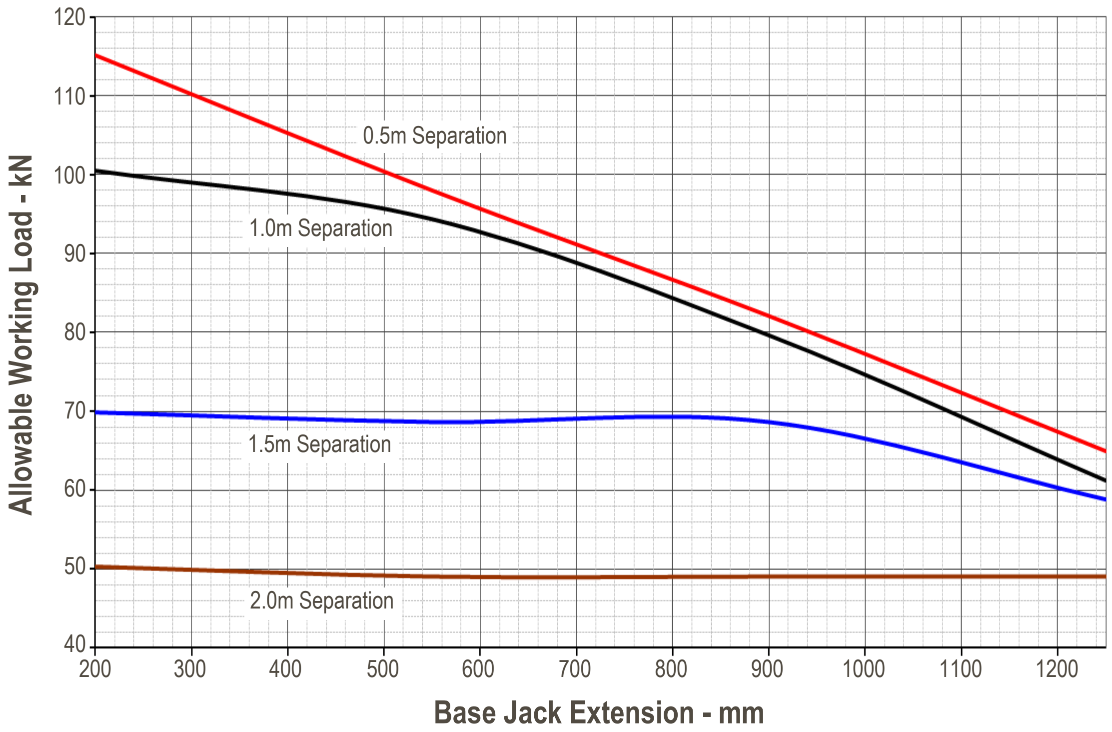


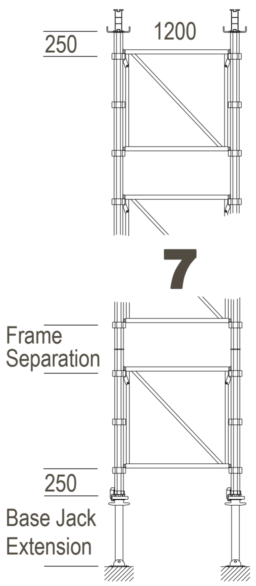
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Top Restrained Alshor Plus Falsework Towers with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

108

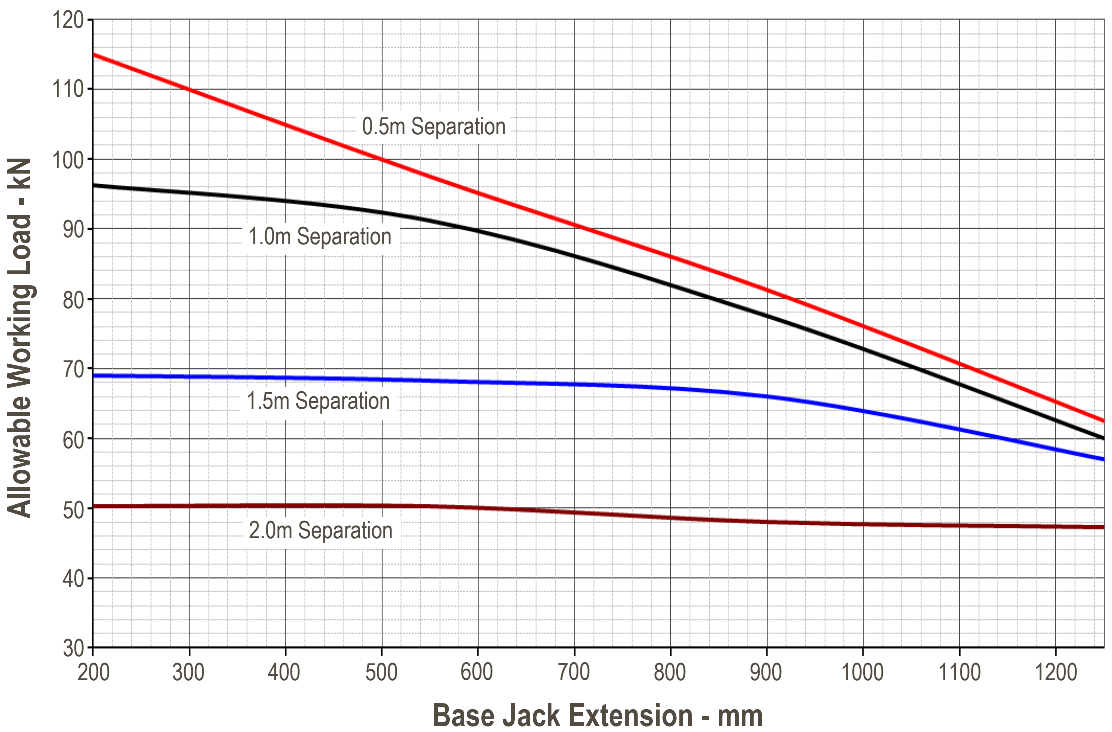
7 x 1200mm Frames

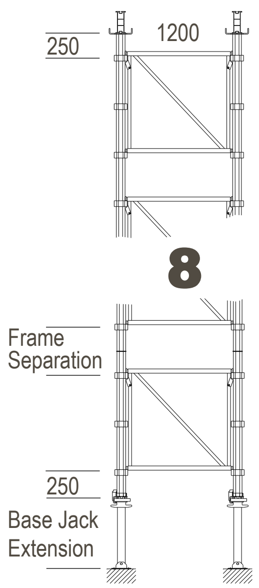




109

8 x 1200mm Frames

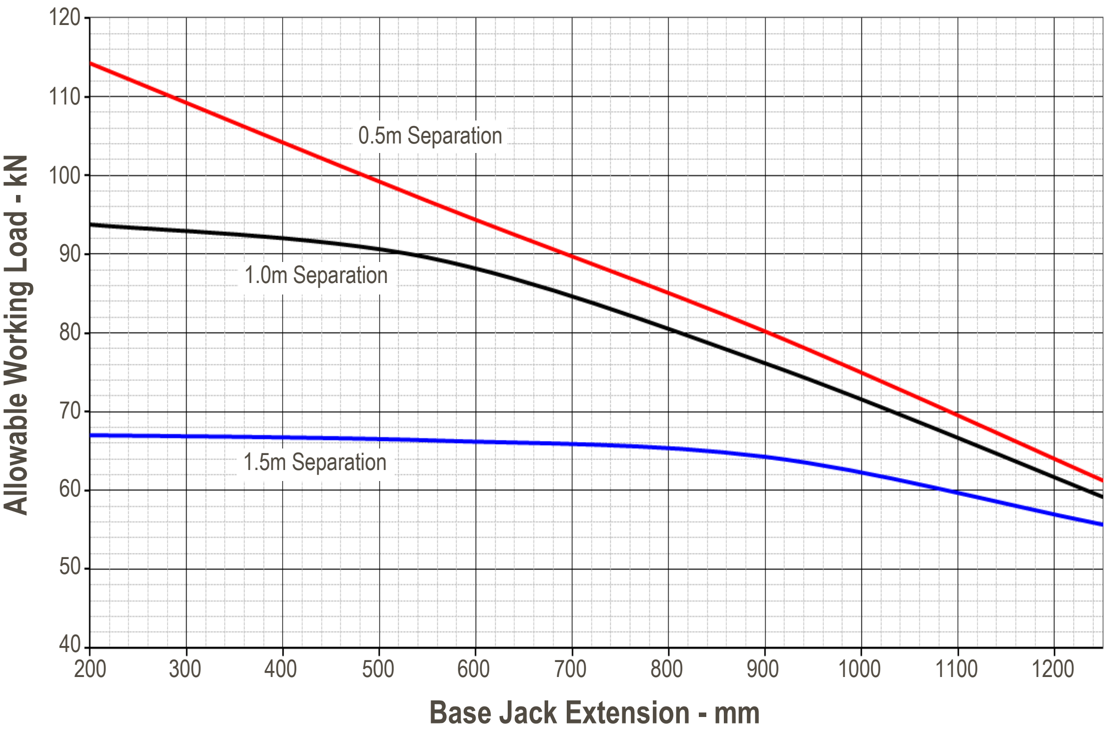




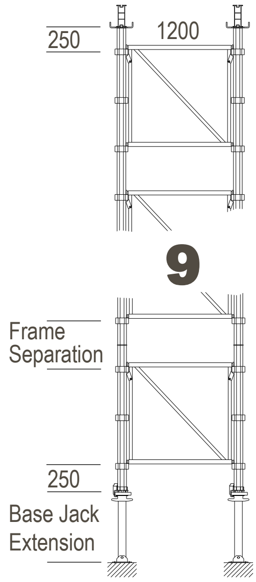
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Top Restrained Alshor Plus Falsework Towers with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

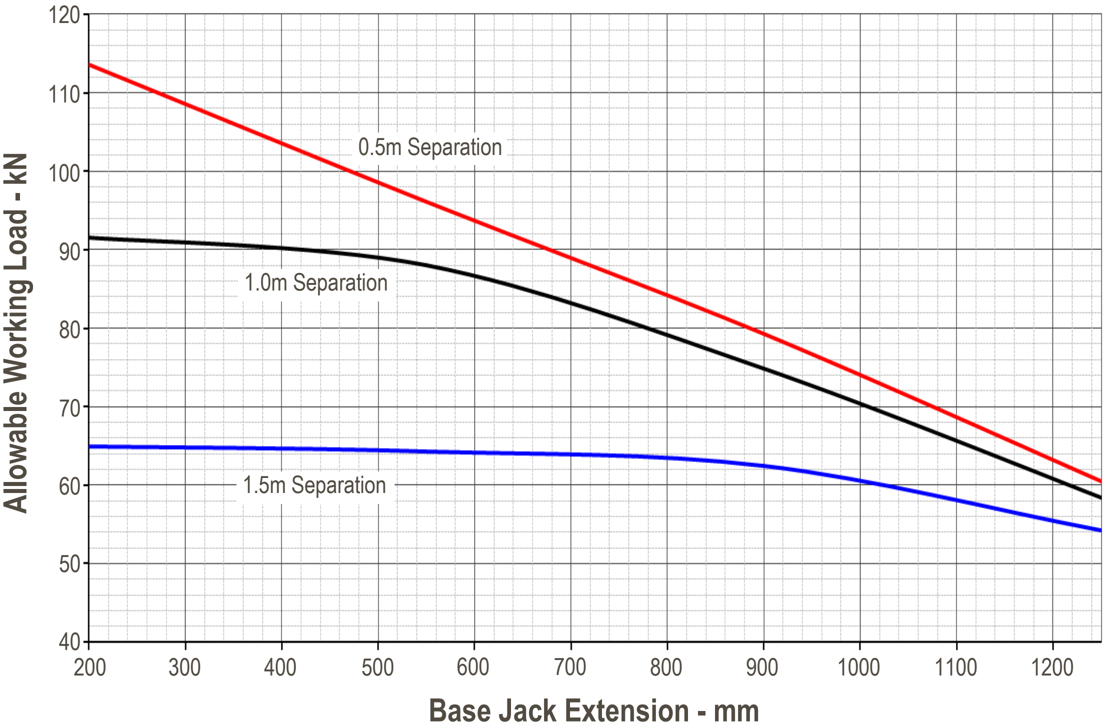
110



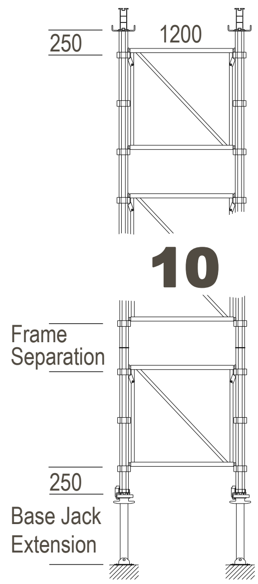
9 x 1200mm Frames



111



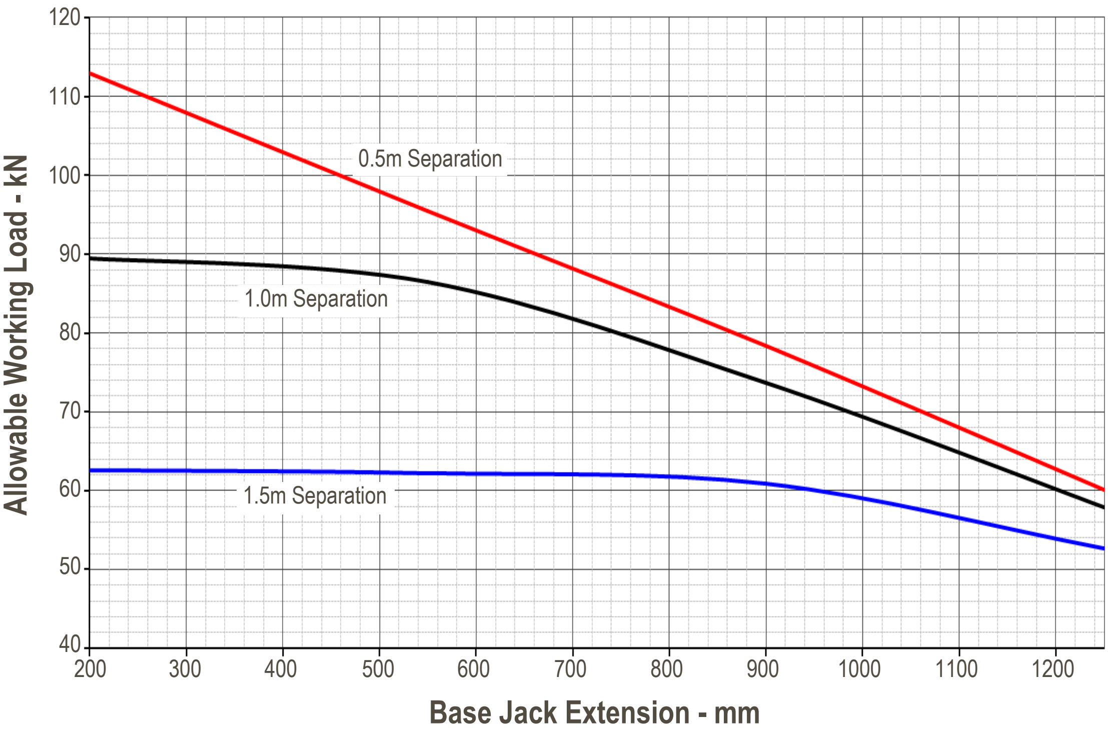
10 x 1200mm Frames



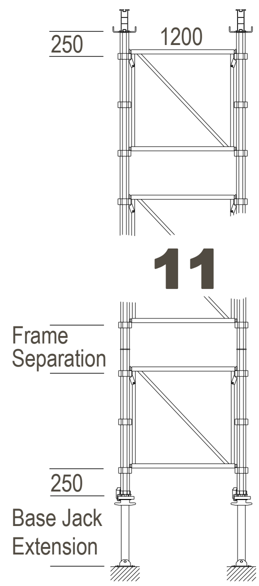
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Top Restrained Alshor Plus Falsework Towers with Base Fixed in Rotation & Top Pinned with a Load Eccentricity 5mm (fos = 2.0)

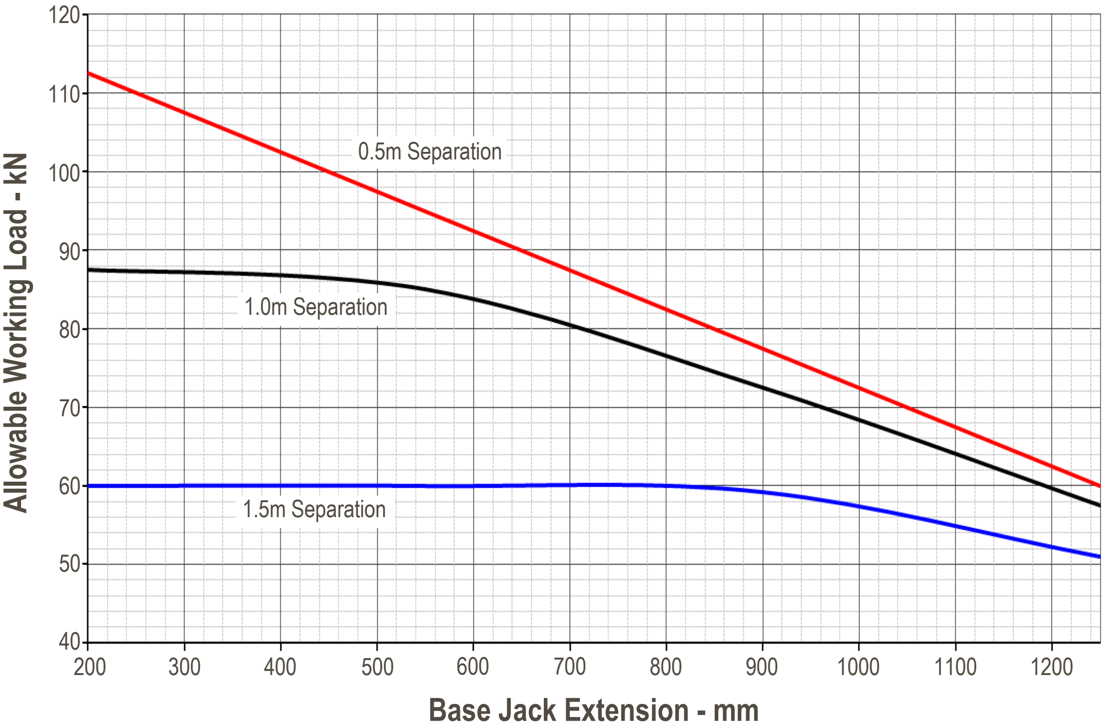
112



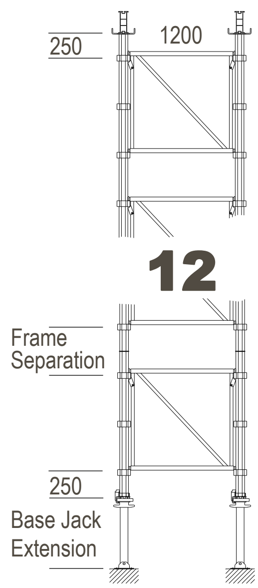
11 x 1200mm Frames



113



12 x 1200mm Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Series 200 Charts

Influence factors read from these charts can be used to take account of varying the frame size from the 1200mm value used to plot the 100 series charts only.

Data is provided for 900mm frames (not available in some markets), 1800mm frames and 2400/3000mm frames. Individual figures are not provided for 3000mm frames as the improvement in load capacity resulting in increasing the frame size from 2400 to 3000mm is minor.

Towers built with a larger frame size have a lower slenderness than those with a smaller frame size and as a result have a higher allowable working load. Conversely towers built using 900mm frames are more slender than those with 1200mm frames and as a result allowable working loads per leg are reduced.

E.G. for a 12 frame high tower with 1000mm frame separation and having 1200mm frames and a 800mm base jack extension, chart 113 gives an allowable working load of 76kN.

The allowable working load for the same tower having 2400mm frames can be found using a factor from chart 214. Reading from this graph the influence factor is 1.2 resulting in an allowable working load for the wider tower of 1.2 x 76 = 91.2kN.

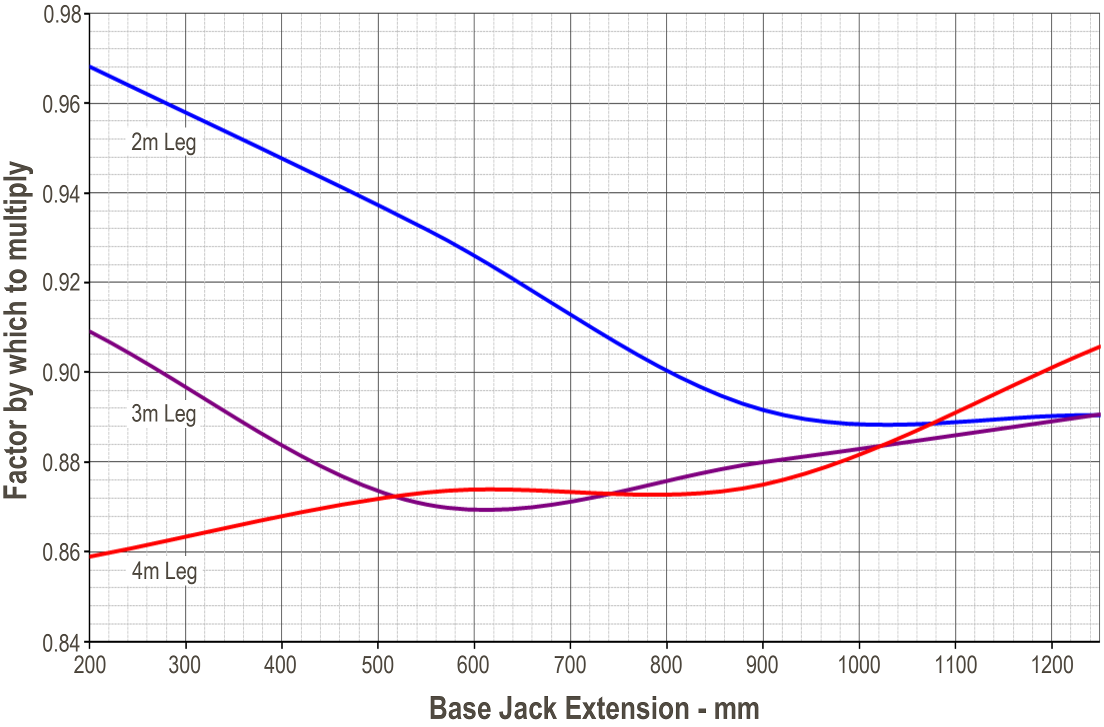
Similarly the allowable working load for a 4 frame high tower made with 1200mm frames with 1000mm separation and a 600mm base jack extension is found from chart 105 to be 97kN. The allowable working load for the same tower built using 900mm frames can be calculated using a factor of 0.815 found from chart 204 giving an allowable working load of 97 x 0.815 = 79kN.

Where multi-bay towers are constructed with different frame sizes in neighbouring bays take great care to use the correct frame size in the design. E.g. a 16 leg table on a 4x4 grid having 4 towers built with 1200mm frames at the corners linked by 1800mm central frames shall be designed as a tower having 1200mm frames. The same configuration with 1800mm frame towers at the corners linked by 1200mm central frames may be designed as a tower having 1800mm frames.

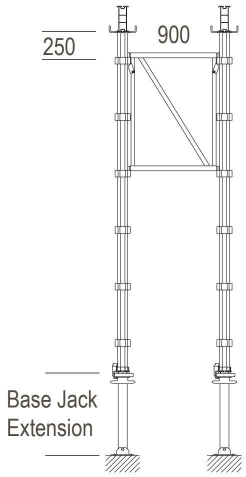
200

1 frame towers with frame 250 from top of leg. Factor by which to multiply the AWL of 1200 frames when using 900 frames

200

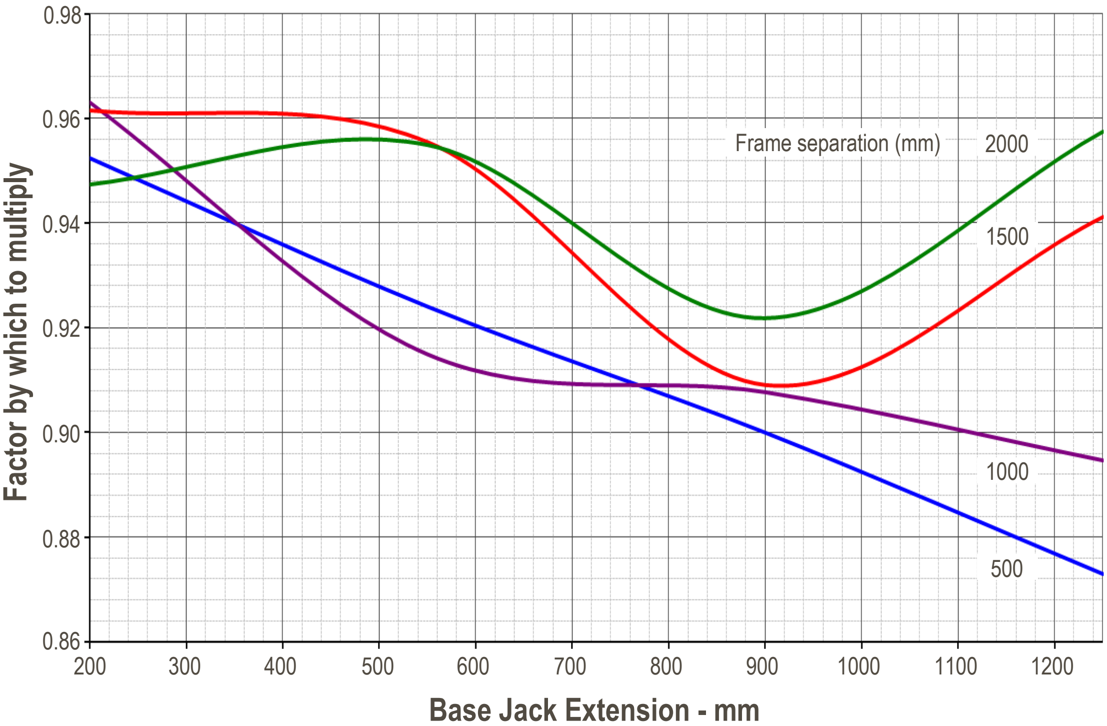


1 x 900mm Frame

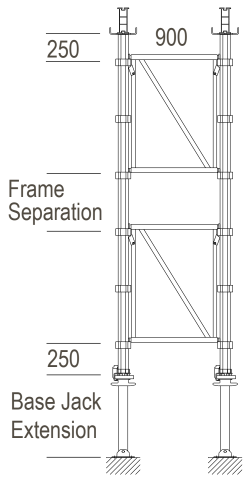


2 frame towers with spacing as in 103. Factor by which to multiply the AWL of 1200 frames when using 900 frames

201



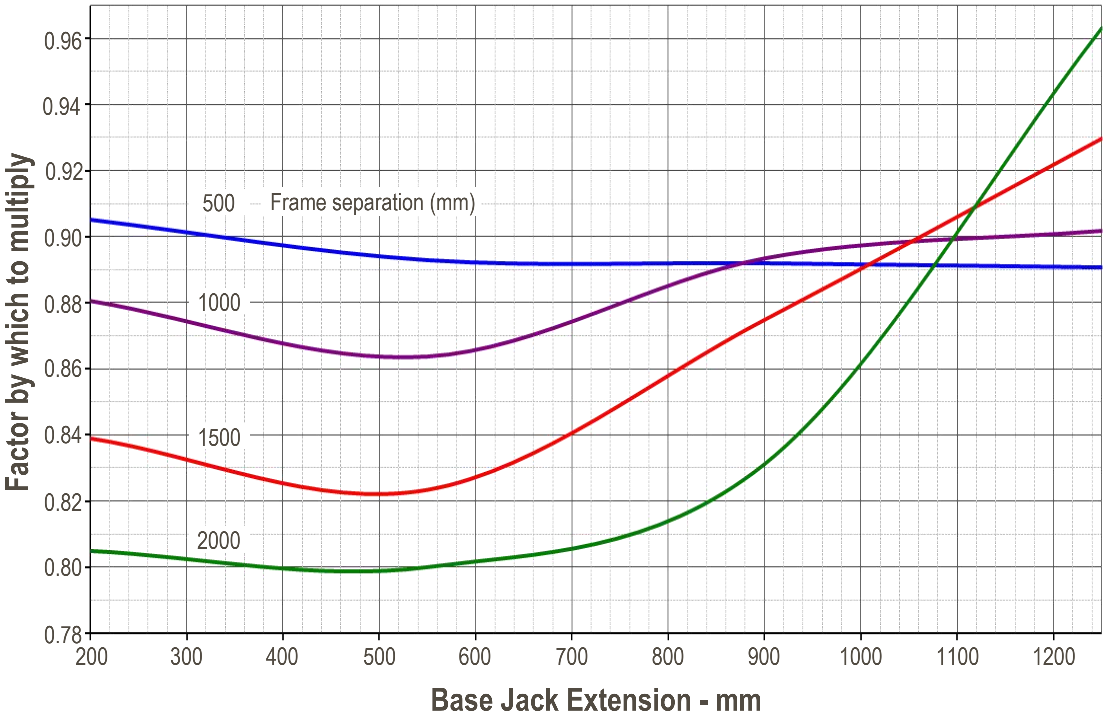
2 x 900mm Frames



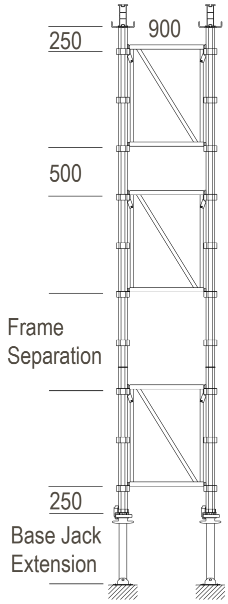
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

3 frame towers with frame spacing as in 104. Factor by which to multiply the AWL of 1200 frames when using 900 frames

202

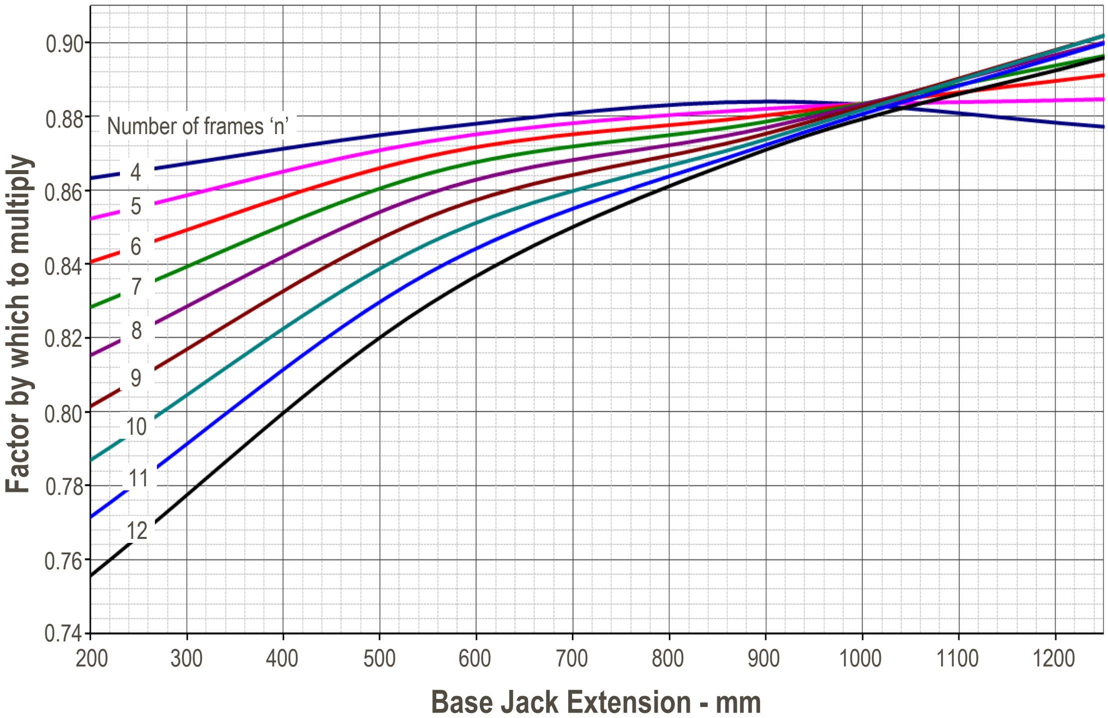


3 x 900mm Frames

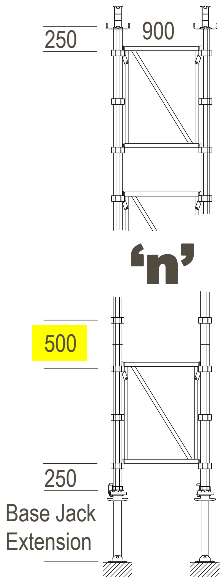


Factor by which to multiply the AWL of 1200 frames when using 900 frames for 500 separation between frames

203



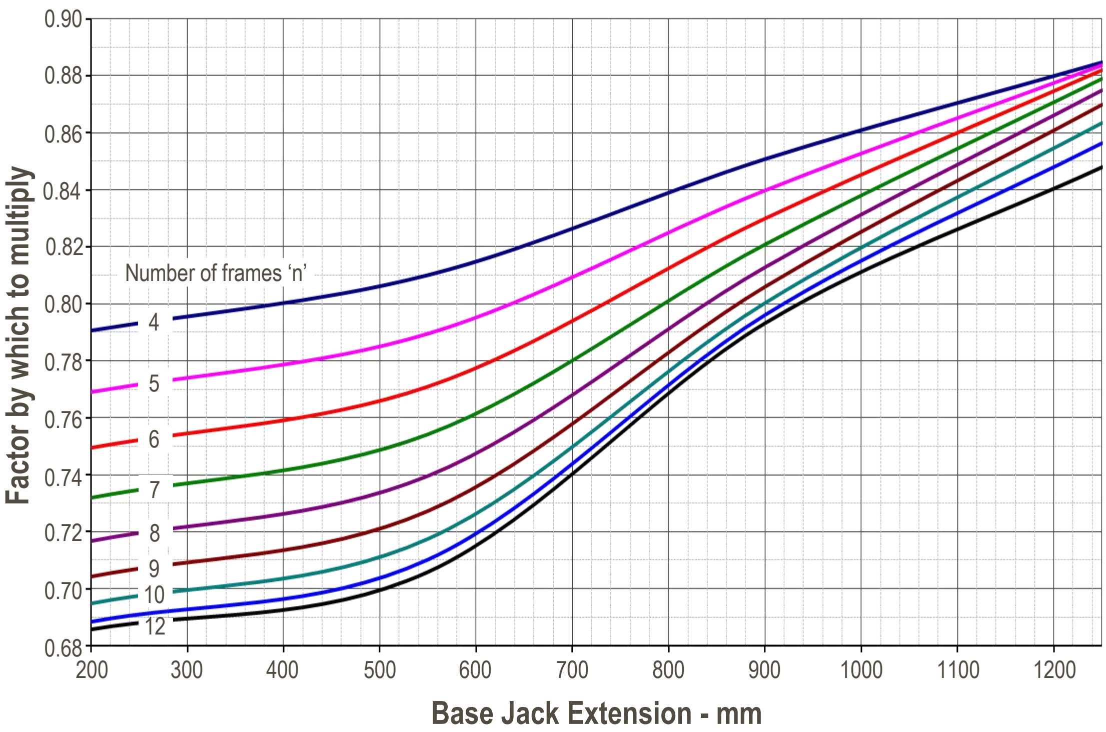
'n' x 900mm Frames

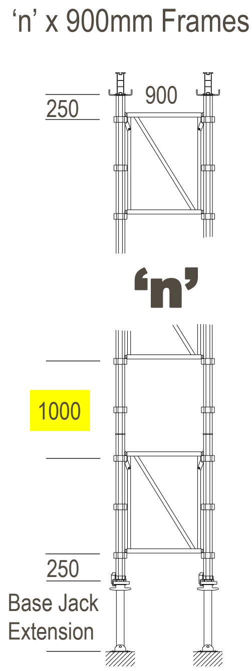


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

204

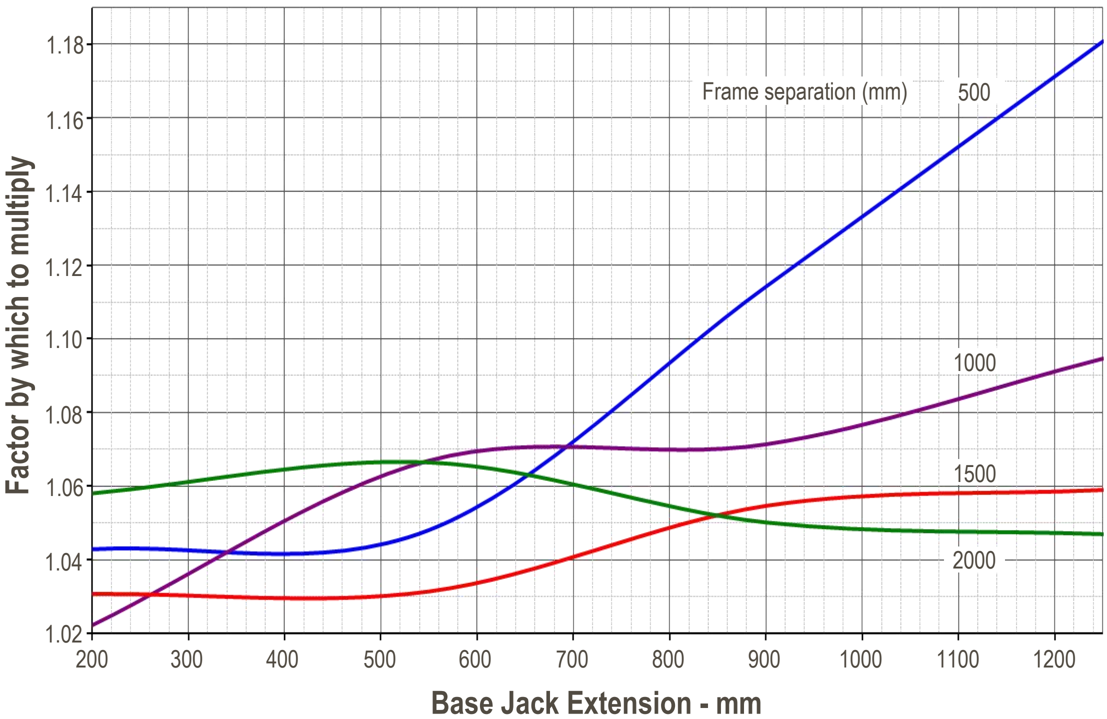
Factor by which to multiply the AWL of 1200 frames when using 900 frames for 1000 separation between frames

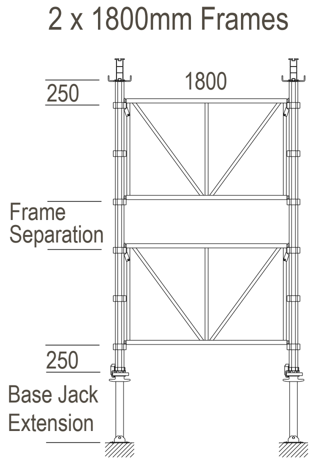




205

2 frame towers with frame spacing as in 103. Factor by which to multiply the AWL of 1200 frames when using 1800 frames





Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

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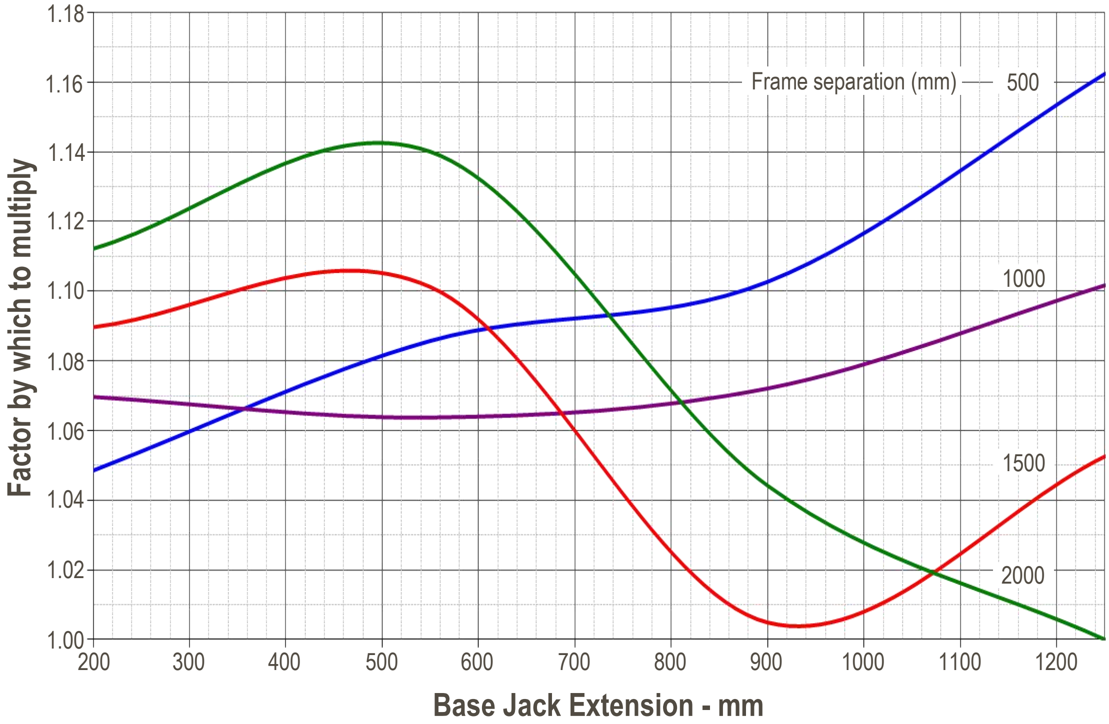
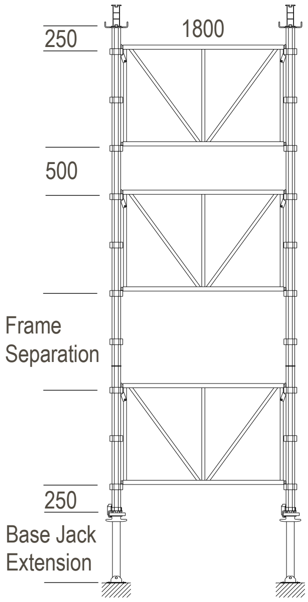
2 frame towers with frame spacing as in 104. Factor by which to multiply the AWL of 1200 frames when using 1800 frames

206

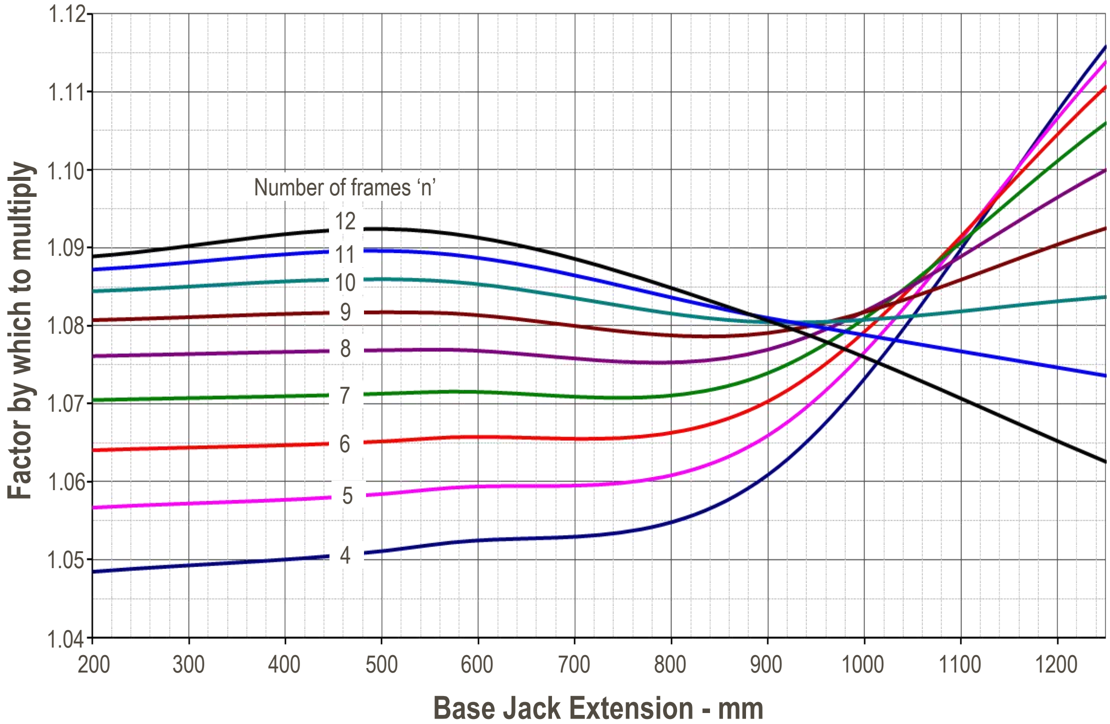


3 x 1800mm Frames

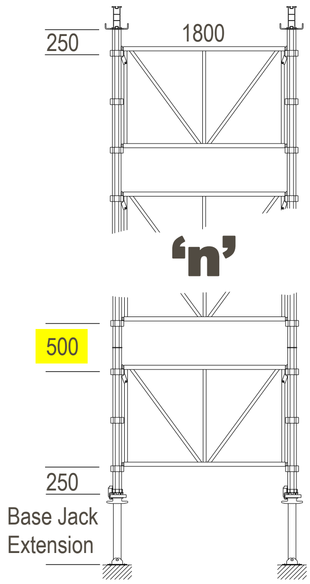


Factor by which to multiply the AWL of 1200 frames when using 1800 frames for 500 separation between frames

207



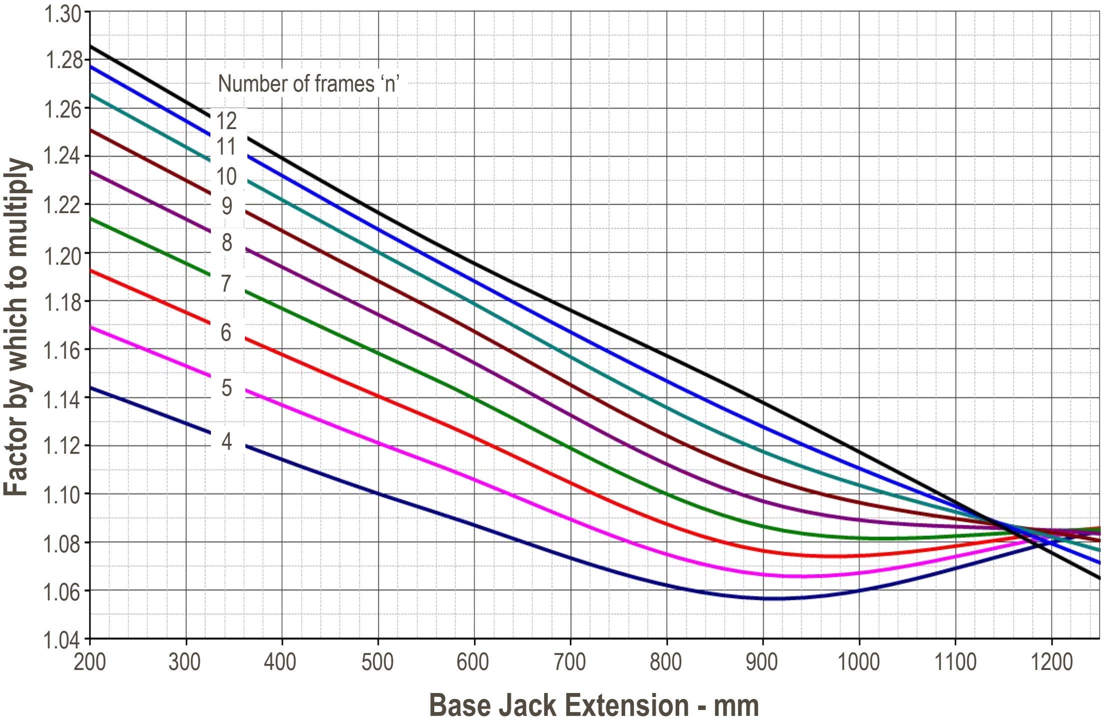
'n' x 1800mm Frames

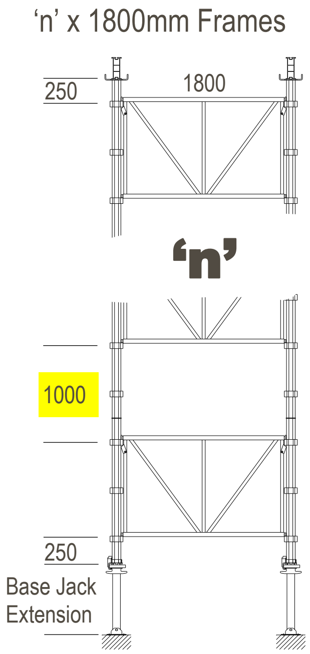


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

2 frame towers with frame spacing as in 104. Factor by which to multiply the AWL of 1200 frames when using 1800 frames

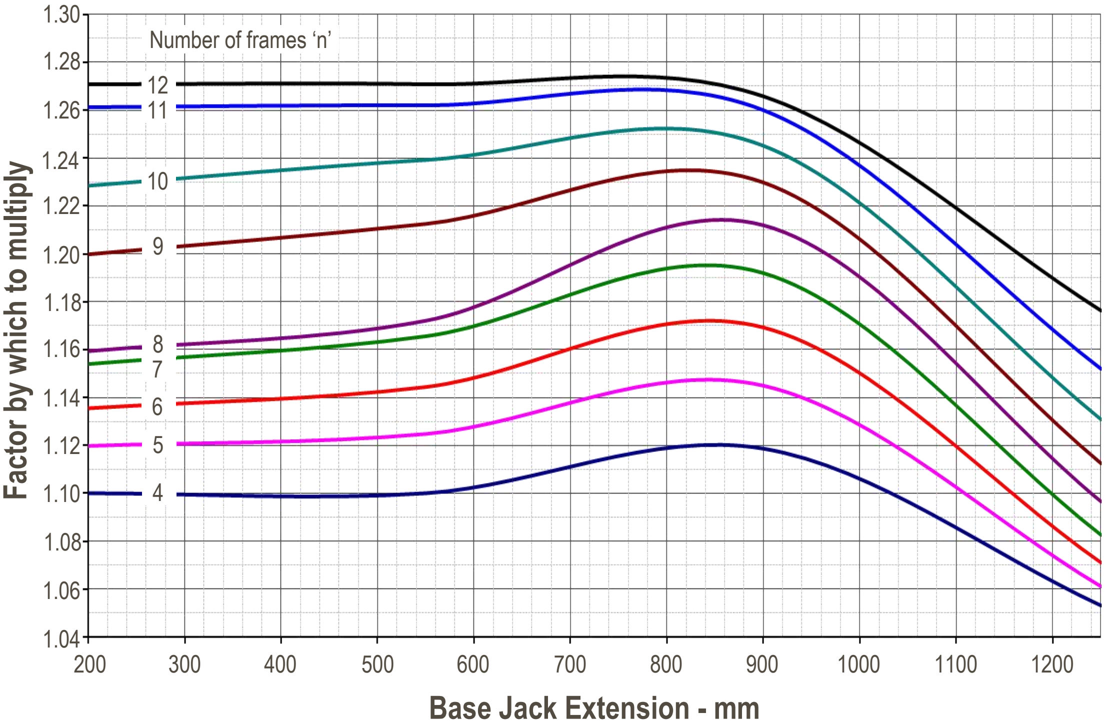
208

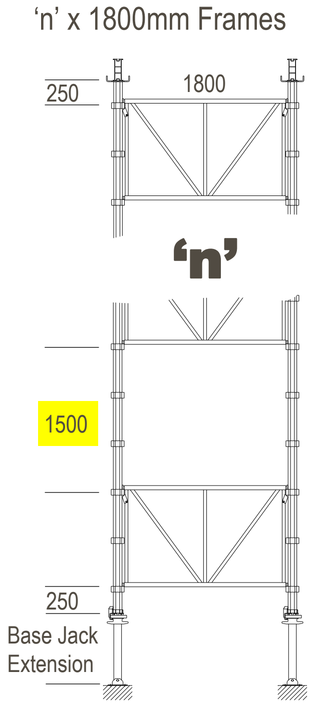




Factor by which to multiply the AWL of 1200 frames when using 1800 frames for 1500 separation between frames

209

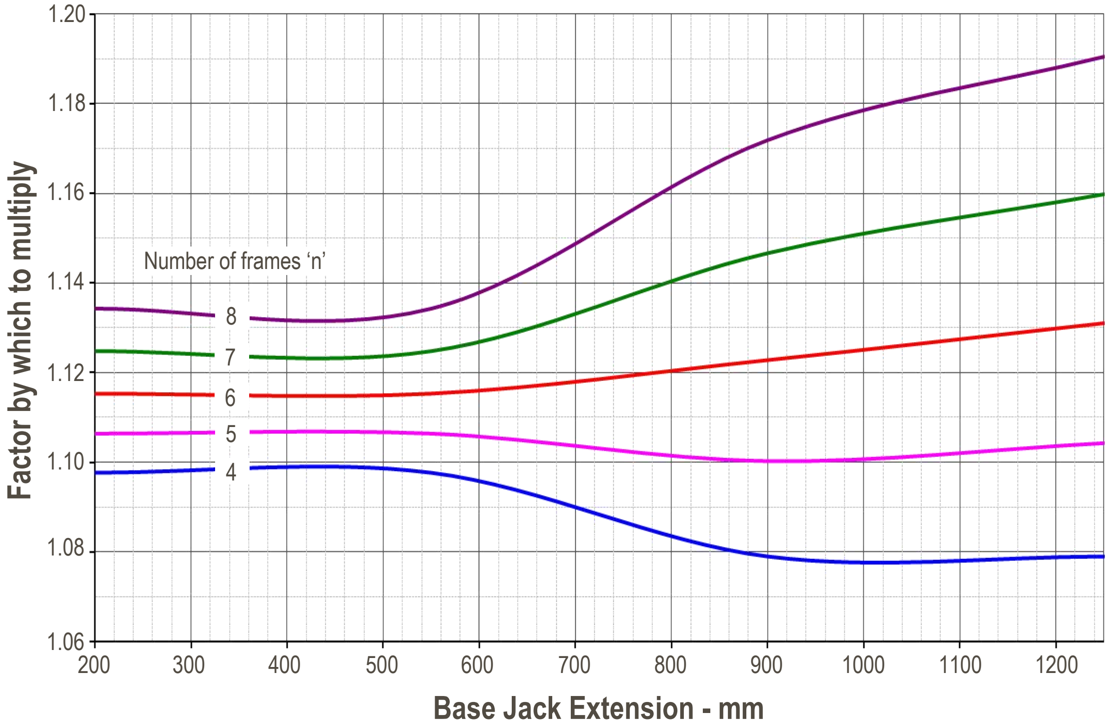




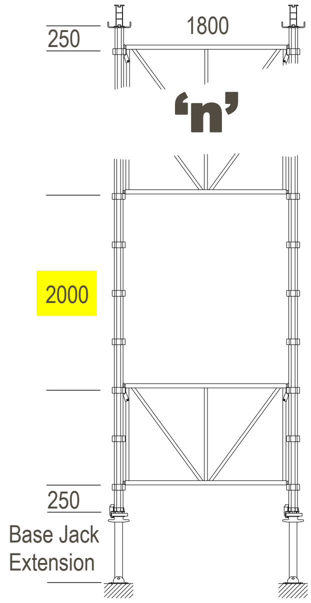
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Factor by which to multiply the AWL of 1200 frames when using 1800 frames for 2000 separation between frames

210

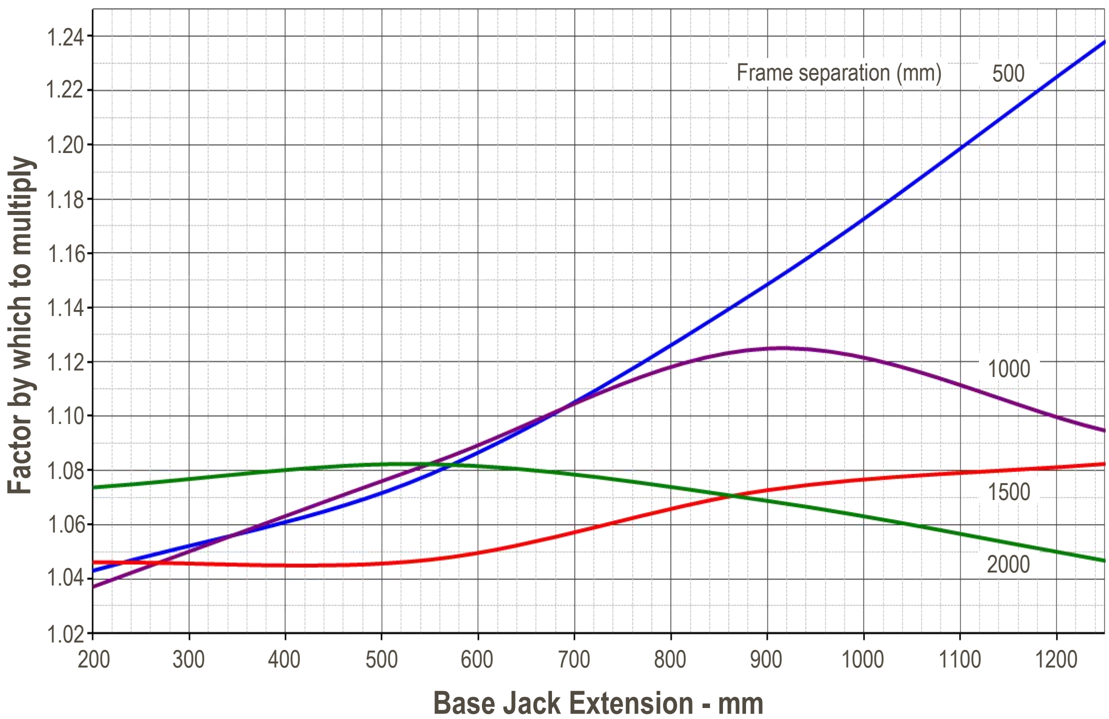


'n' x 1800mm Frames

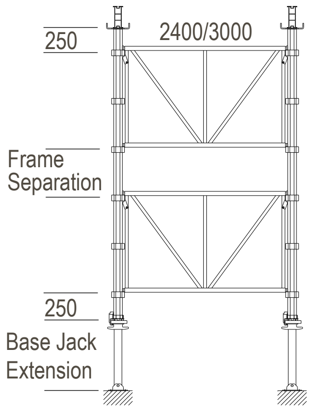


2 frame towers with spacing as in 103. Factor by which to multiply the AWL of 1200 frames when using 2400 & 3000 frames

211



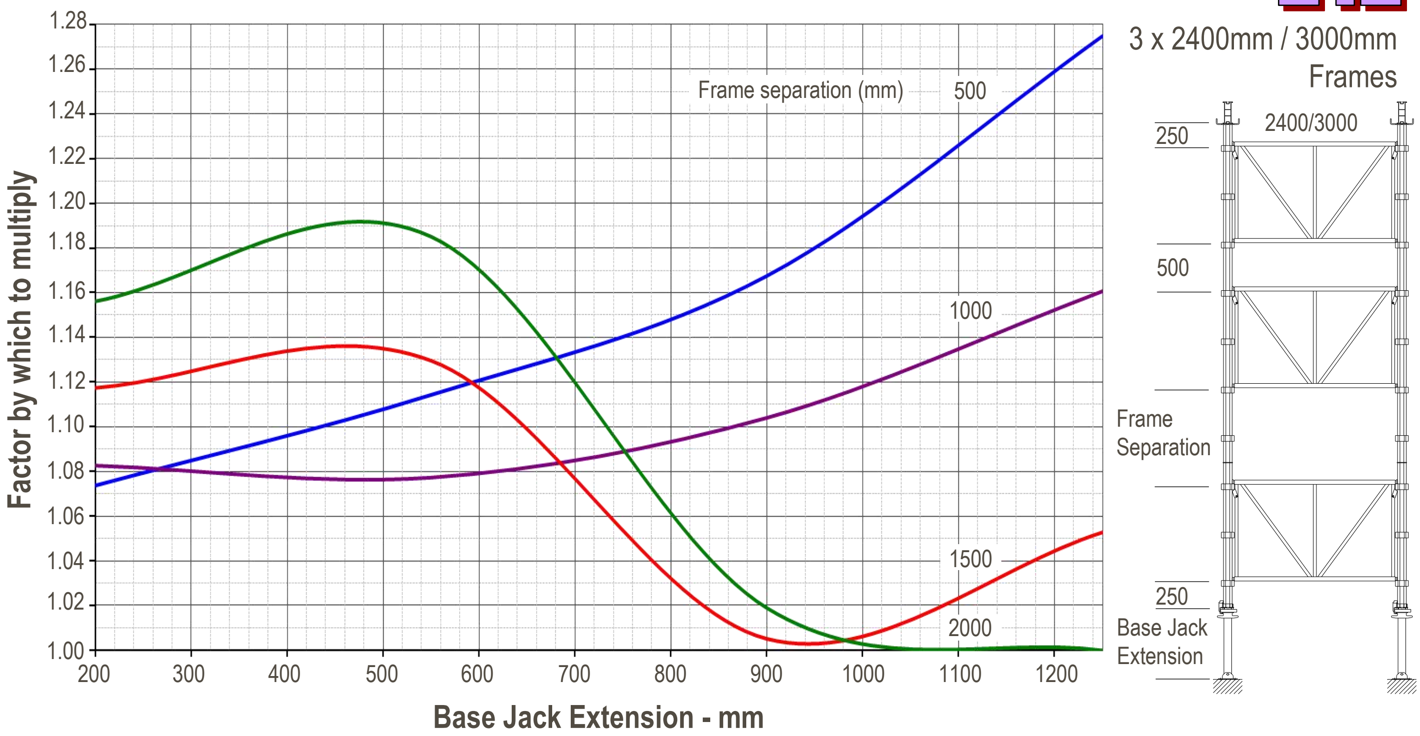
2 x 2400mm / 3000mm Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

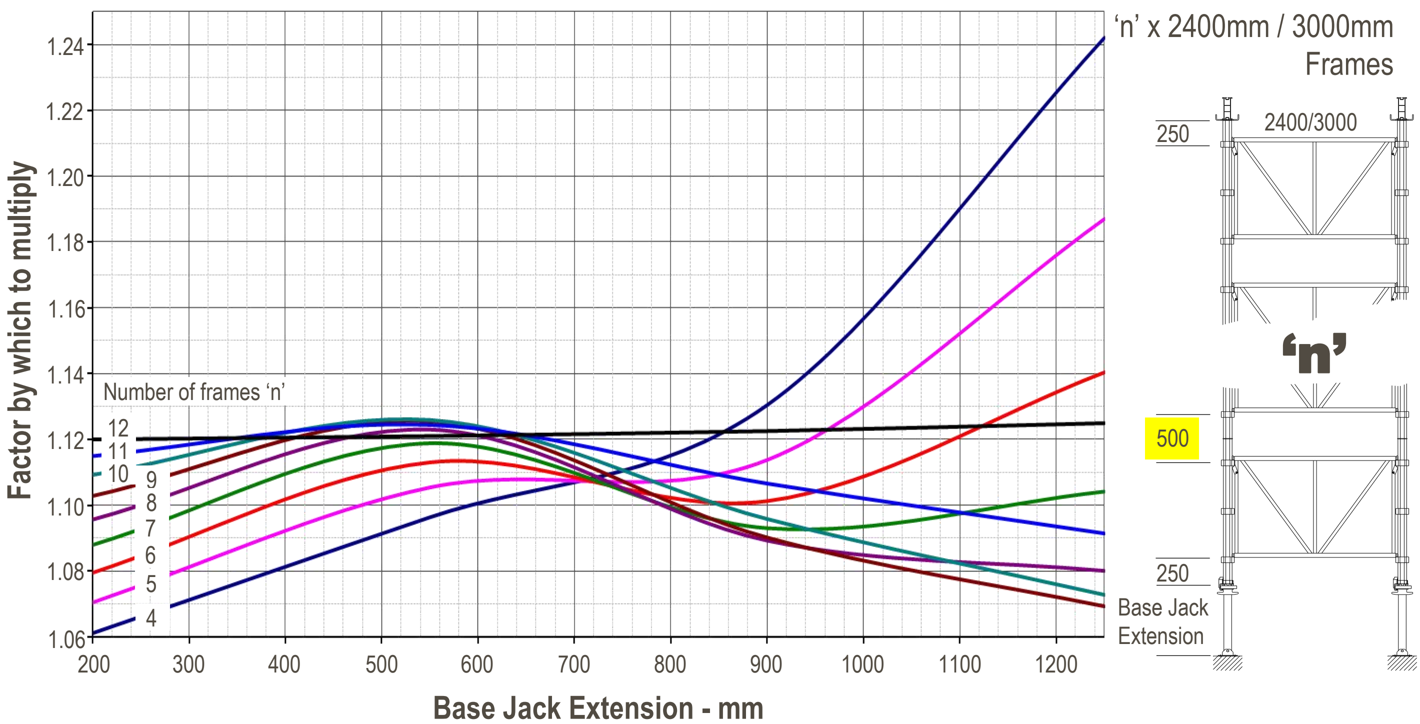
3 frame towers with spacing as in 104. Factor by which to multiply the AWL of 1200 frames when using 2400 & 3000 frames

212



Factor by which to multiply the AWL of 1200 frames when using 2400 and 3000 frames for 500 separation between frames

213



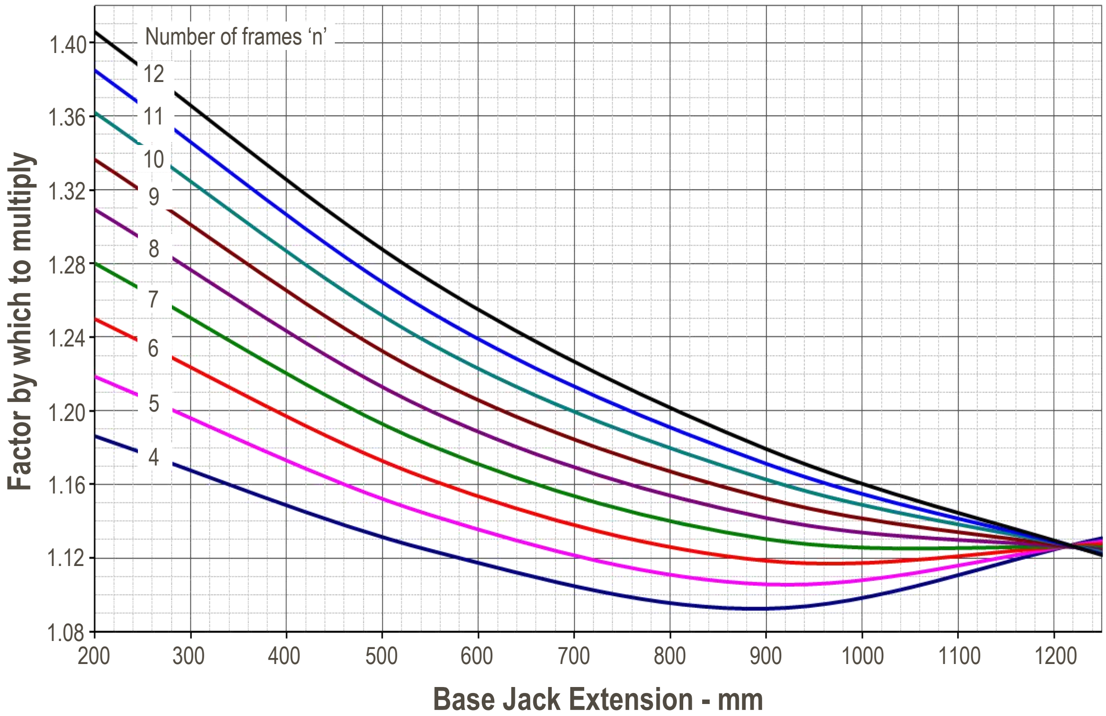
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

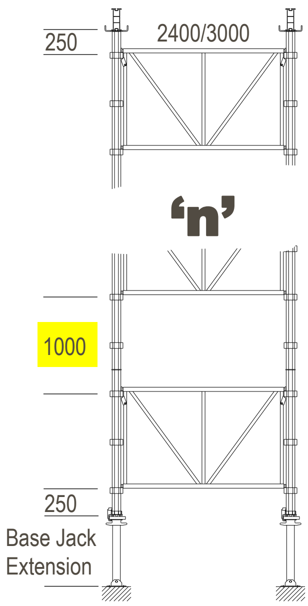
ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

Factor by which to multiply the AWL of 1200 frames when using 2400 and 3000 frames for 1000 separation between frames

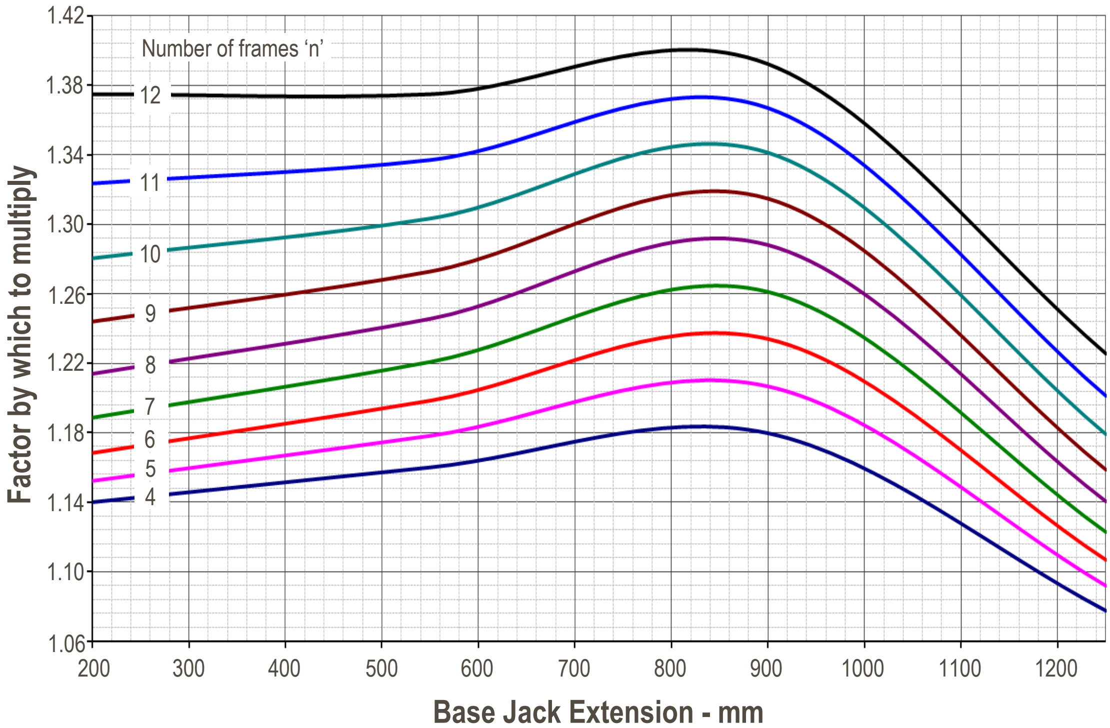
214

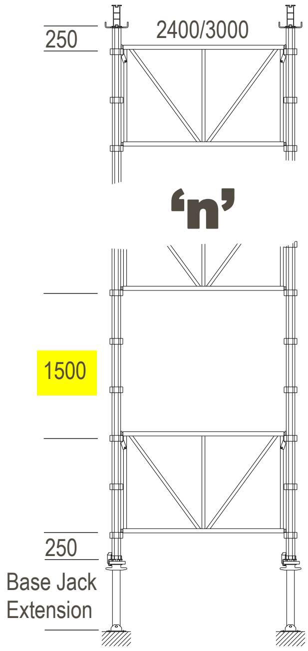




Factor by which to multiply the AWL of 1200 frames when using 2400 and 3000 frames for 1500 separation between frames

215

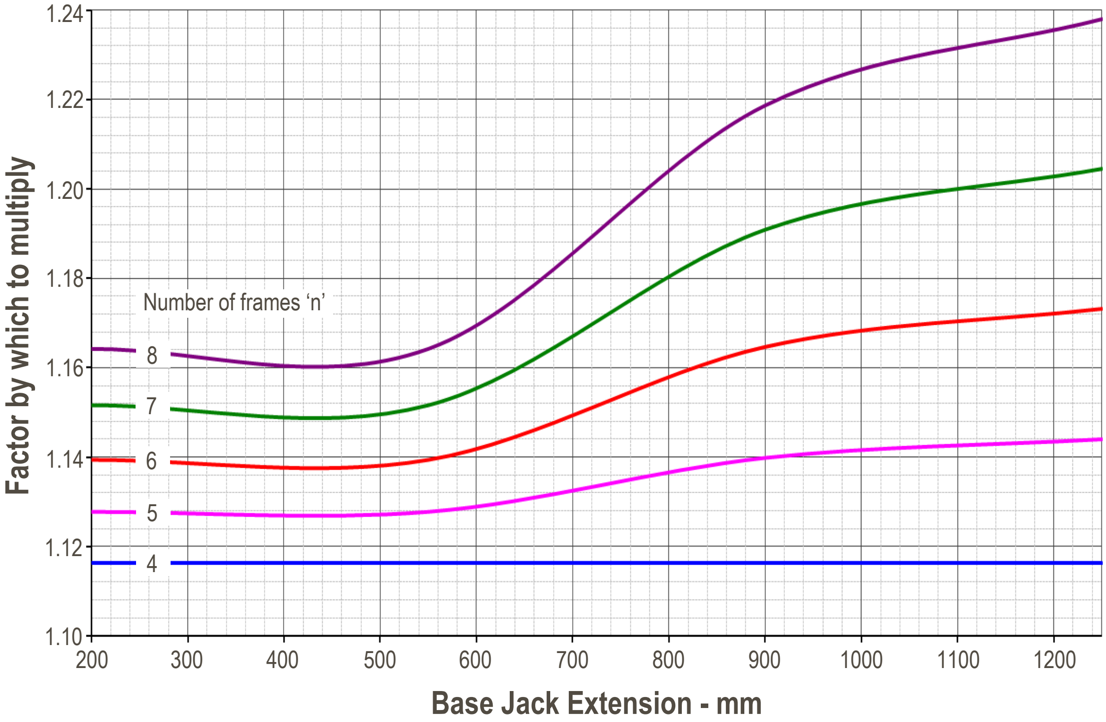


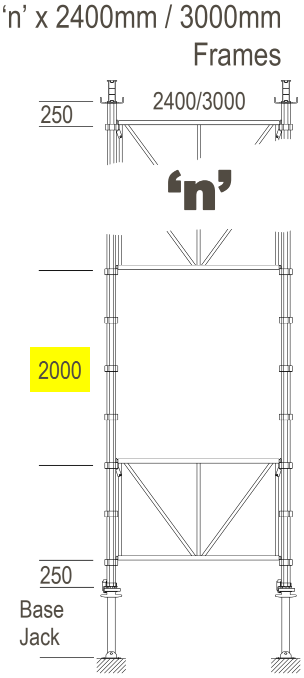


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

216

Factor by which to multiply the AWL of 1200 frames when using 2400 and 3000 frames for 2000 separation between frames





Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Series 300 Charts

Top restrained structures where the top frame has been lowered from the top lug extrusion.

These structures are non-preferred as the allowable leg load is significantly reduced from the values with the frame in the top position (see series 100 charts). It may however be desirable to lower the top frame to admit a deep C-hook/ frame lifting device when craning tables. Note that the Alshor Plus Folding C-Hook can be used with the frame in the top position.

When a boarded access is required at the top of the falsework this can usually be provided between the towers enabling the frames in the towers to be positioned in the top lug extrusion. It is not then required to provide a platform within the footprint of each tower.

DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

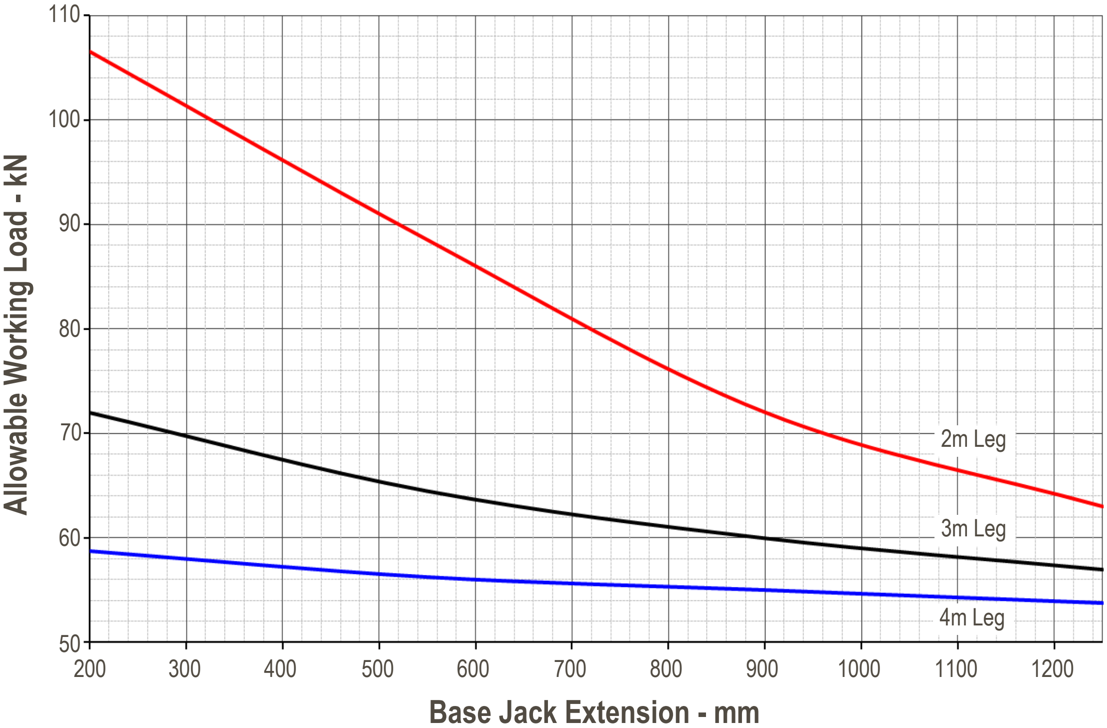
300

ALSHOR PLUS

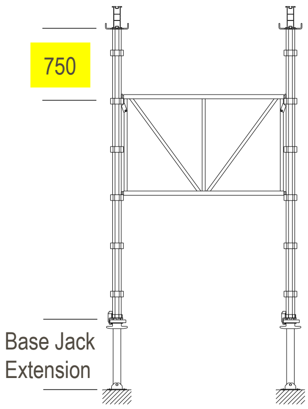
VERSATILE ALUMINIUM SHORING SYSTEM

Top Restrained Alshor Plus Falsework Towers. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

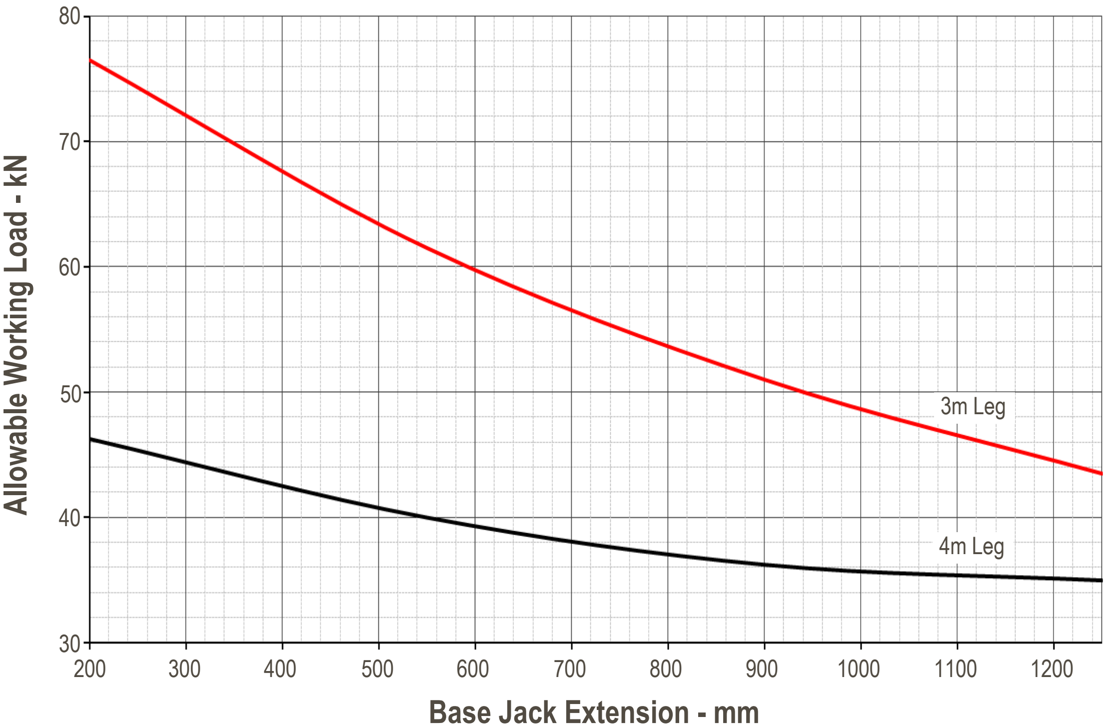
300



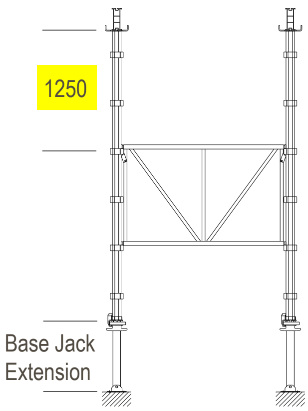
No Top Jack, 1 Frame



301



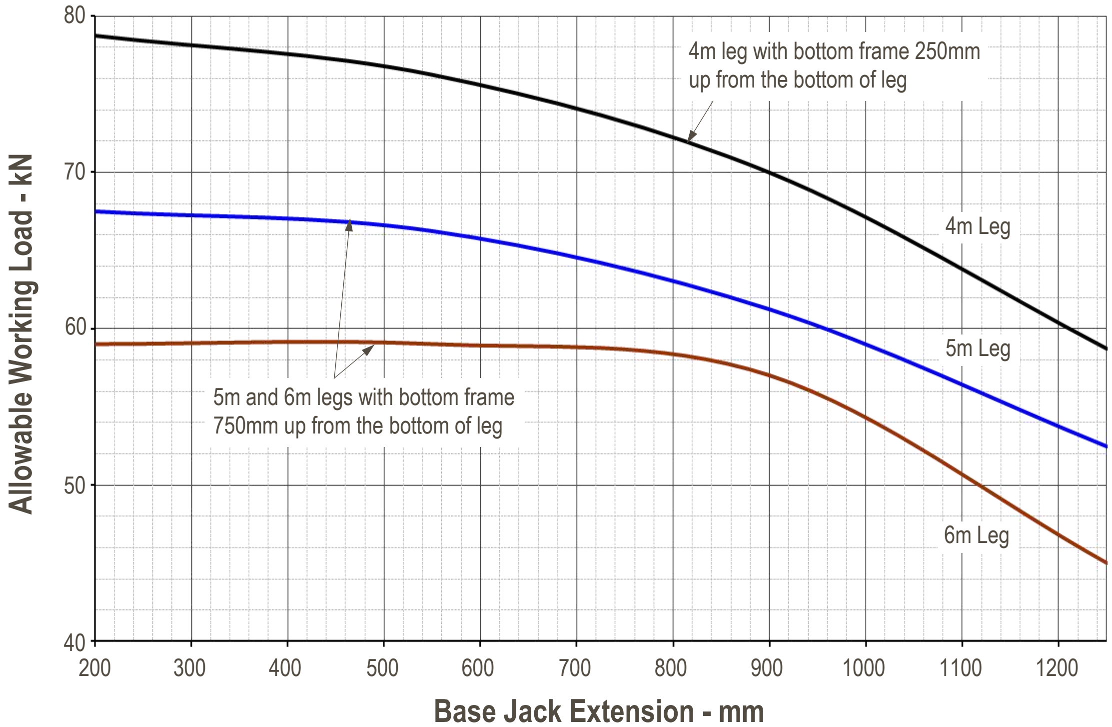
No Top Jack, 1 Frame

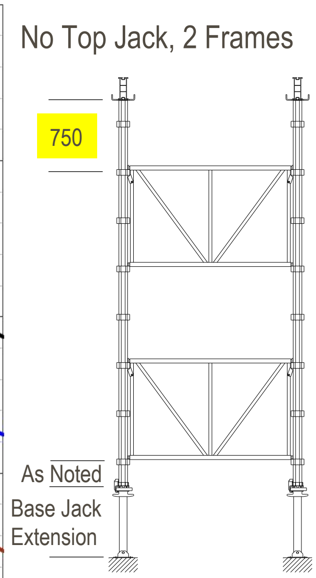


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

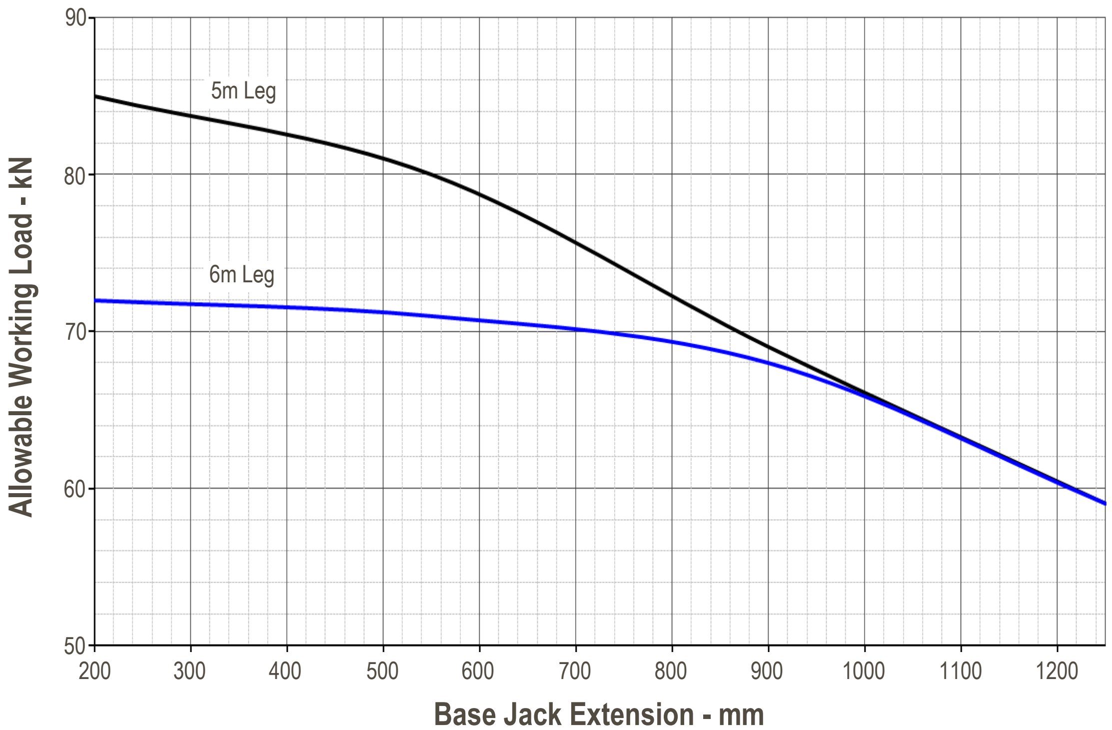
Top Restrained Alshor Plus Falsework Towers. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

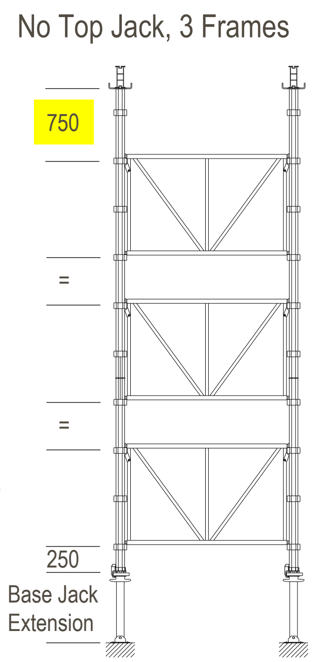
302





303





Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Series 400 Charts

Top restrained towers where extended top jacks or inverted base jacks are used at the top.

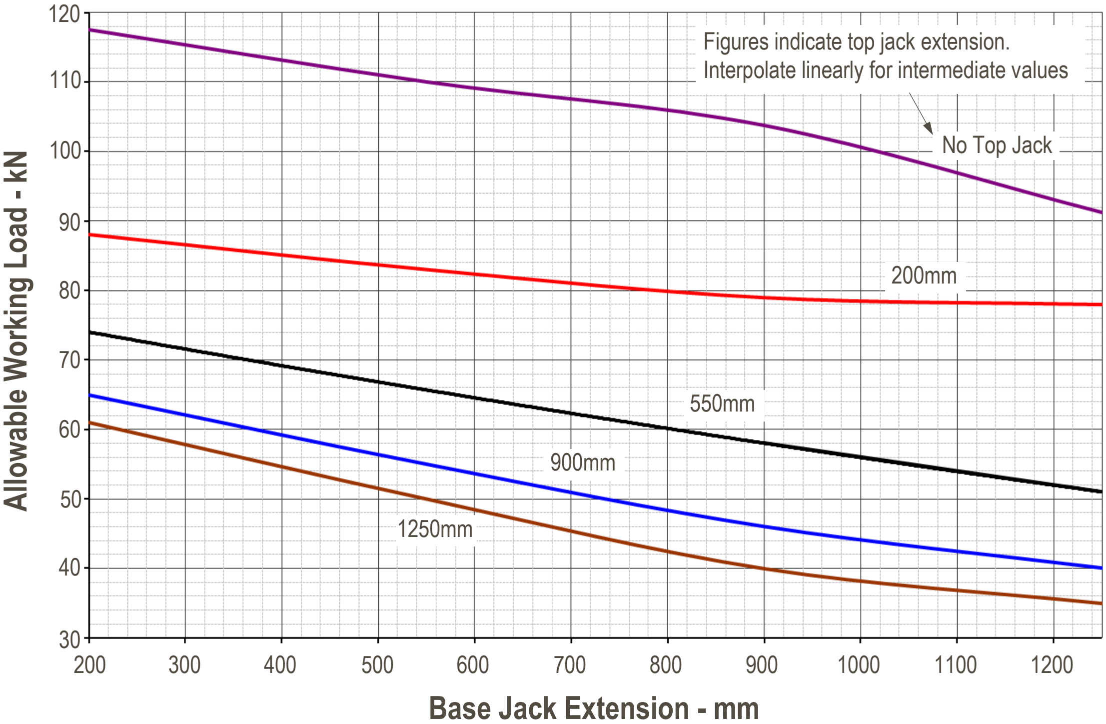
Top jacks should be avoided if possible due to the additional labour required to operate them and access that needs to be provided. Top jacks also result in significantly reduced allowable working loads. The arrangements can be useful though where sloping soffits are to be supported.

DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

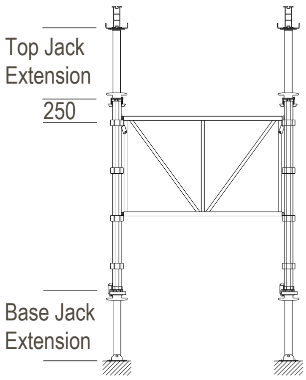
400

Top Restrained Alshor Plus Falsework Towers. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

400

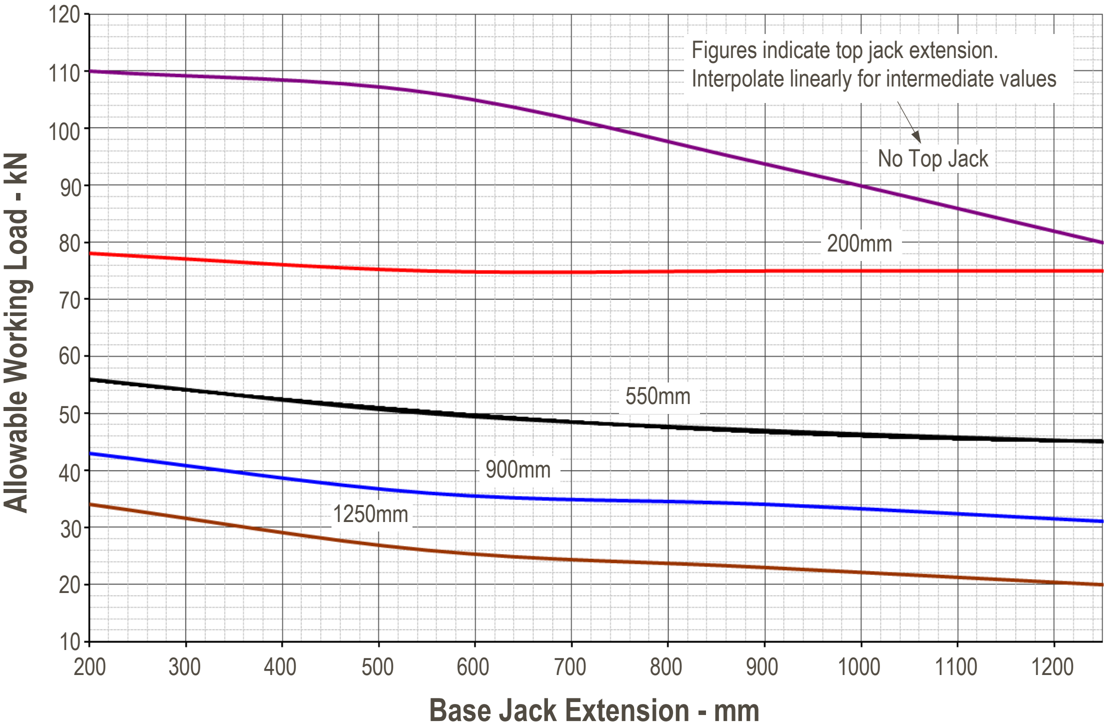


2m Leg, 1 Frame

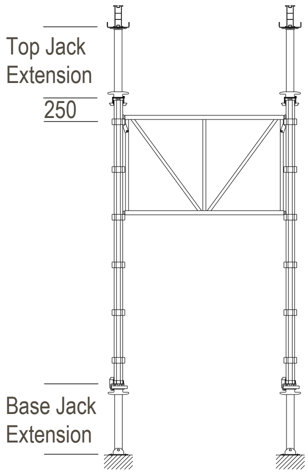


Note: to avoid clashing jacks when using the 2m Leg, the minimum combined jack extensions must be greater than 1375mm when using 2 No. long jacks and 625mm using a long jack at the base with short jack at the head.

401



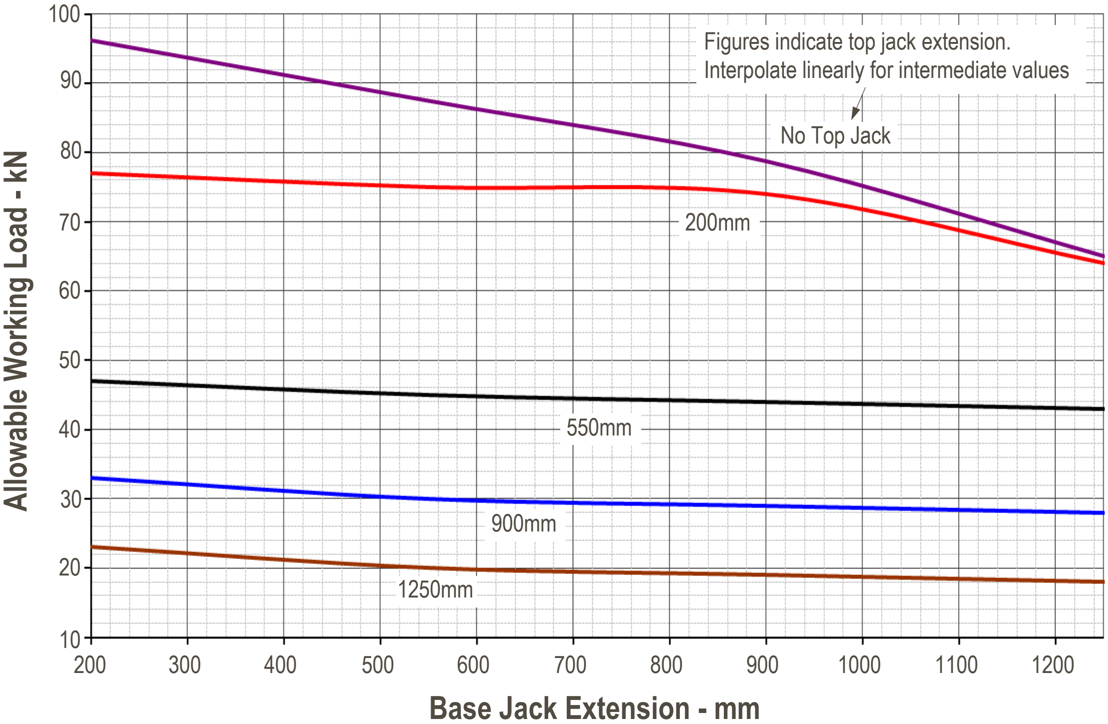
3m Leg, 1 Frame

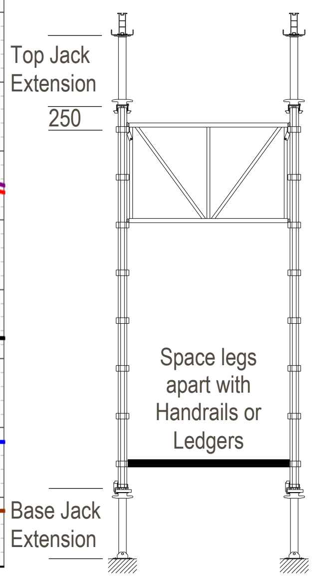


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

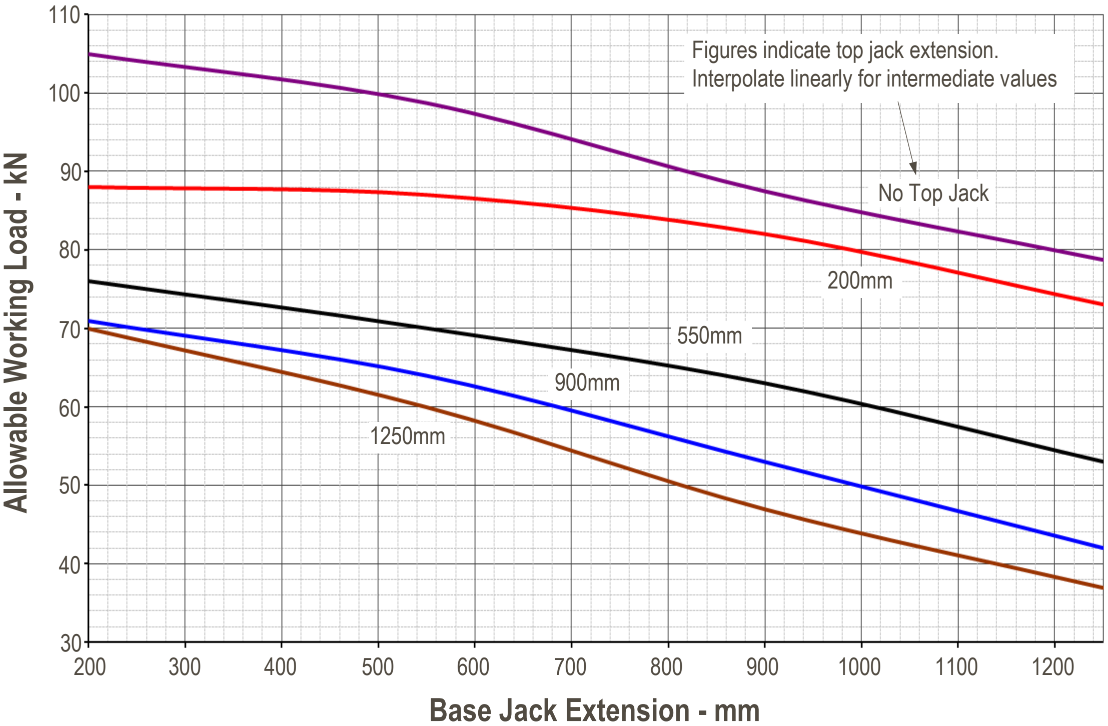
Top Restrained Alshor Plus Falsework Towers. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

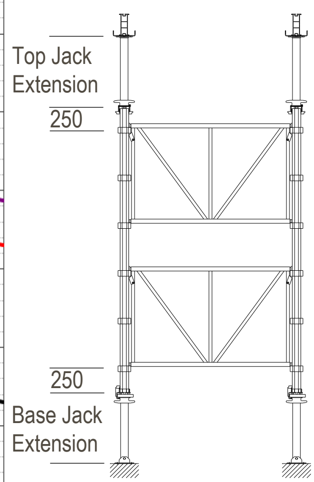
402





403





Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

ALSHOR PLUS

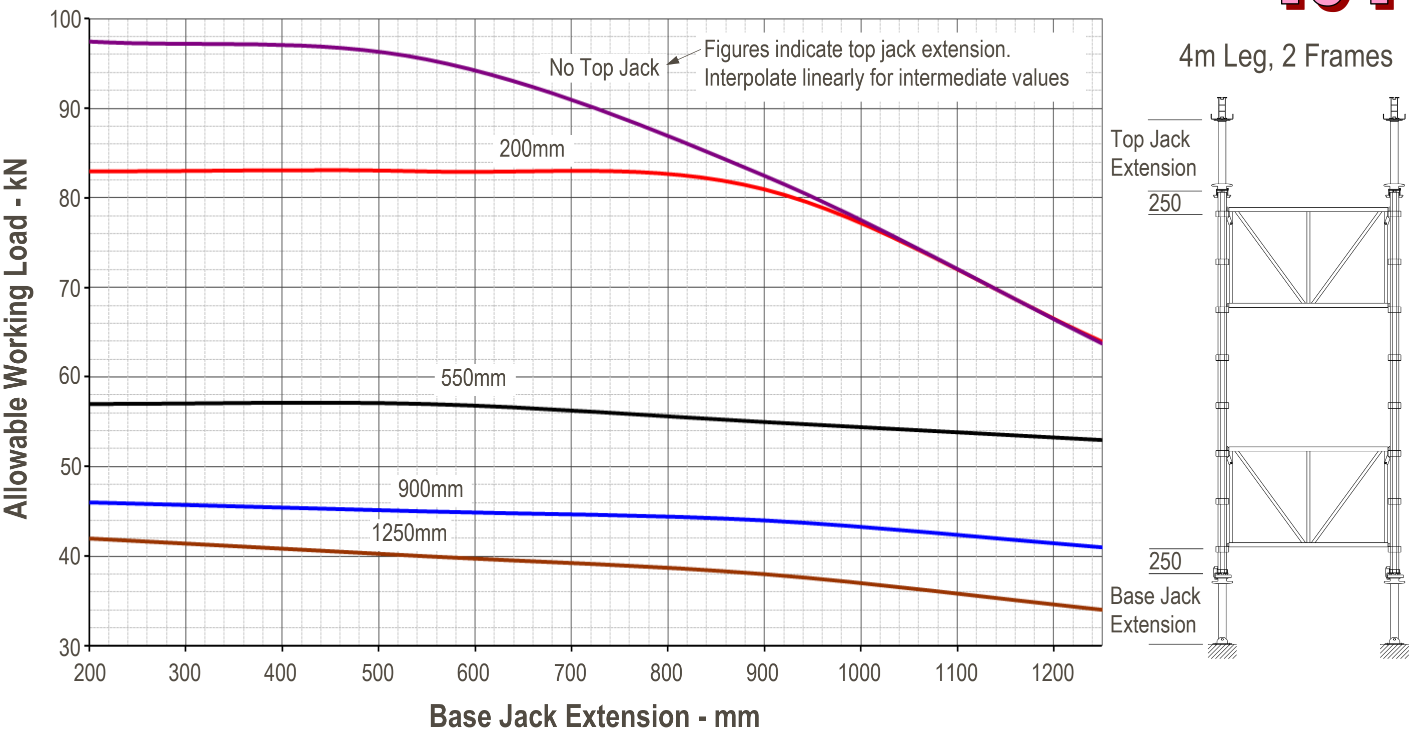
VERSATILE ALUMINIUM SHORING SYSTEM

R·M·D KWIKFORM

Top Restrained Alshor Plus Falsework Towers. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

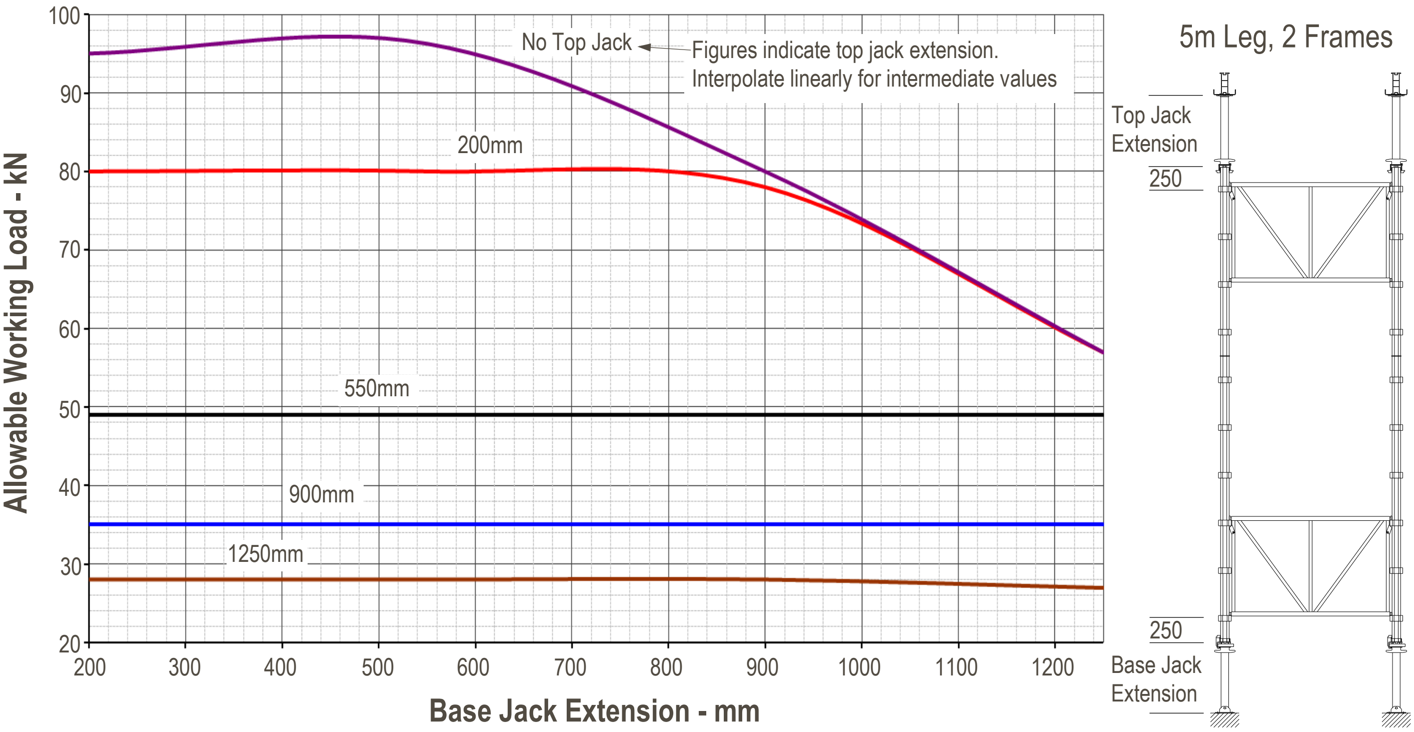
404

4m Leg, 2 Frames



405

5m Leg, 2 Frames

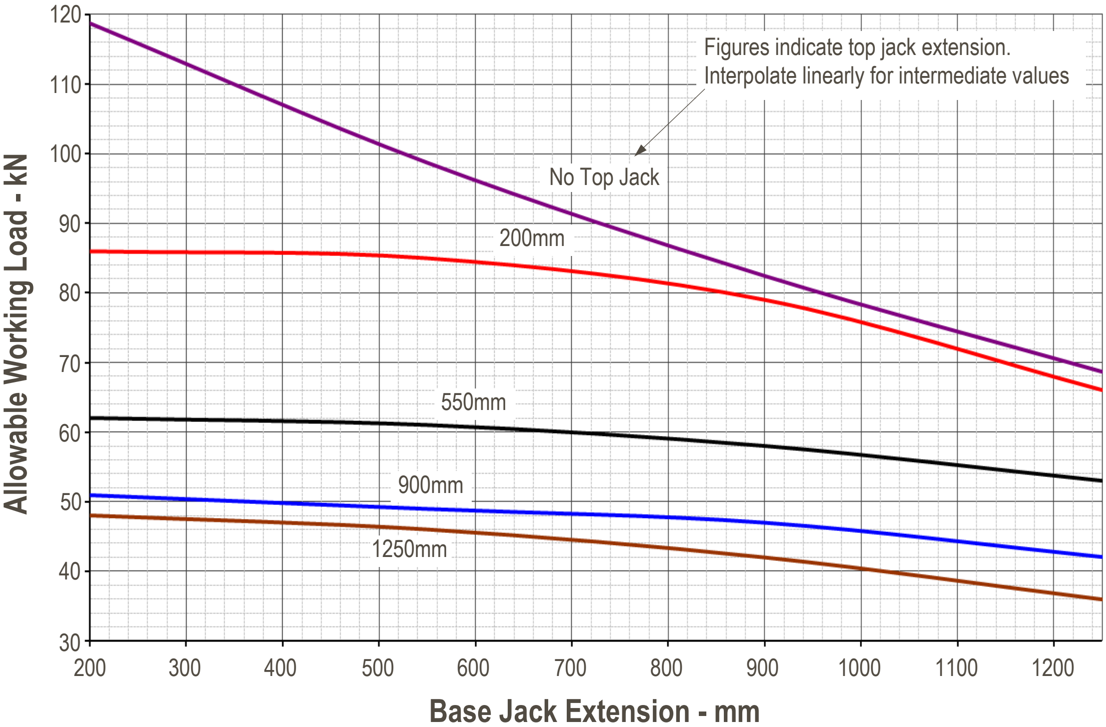


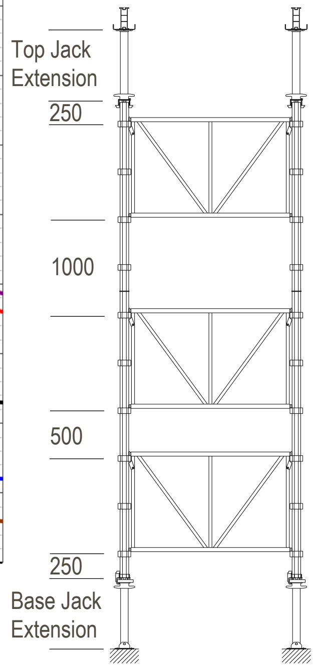
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Top Restrained Alshor Plus Falsework Towers. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

406

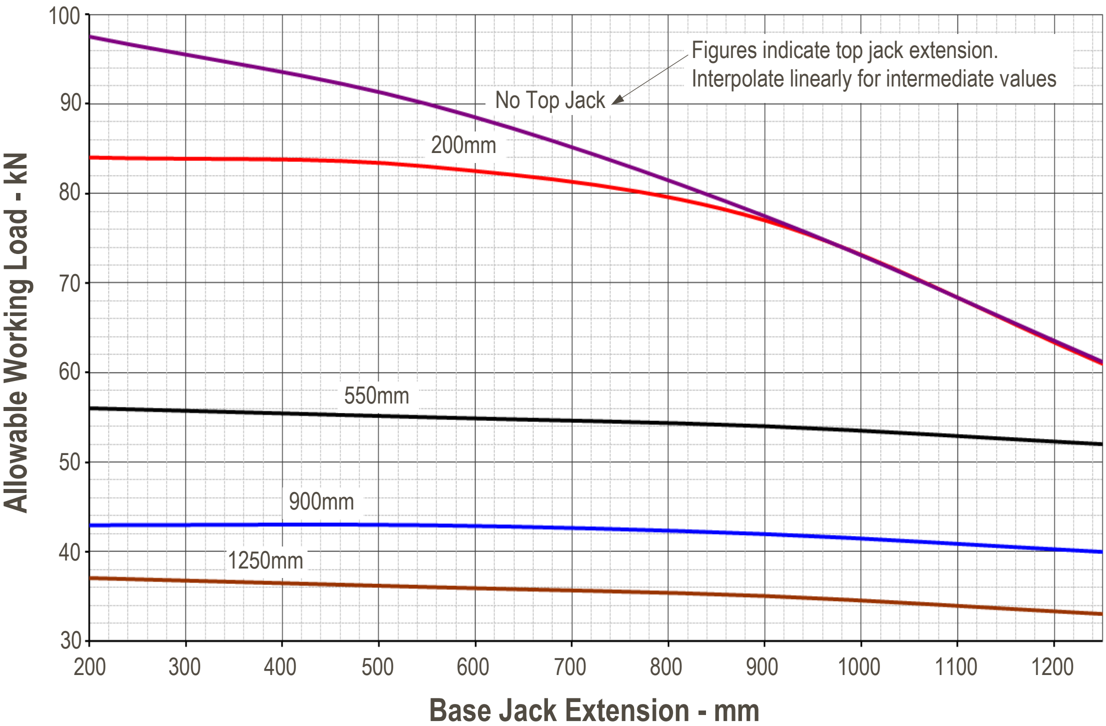
5m Leg, 3 Frames

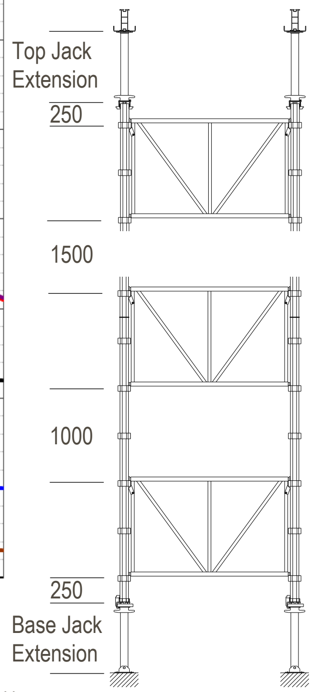




407

6m Leg, 3 Frames





Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Series 500 Charts

Top restrained towers with extended top jacks or inverted base jacks used at the top and the jacks are effectively braced to resist 2.5% of the vertical load. The top of the jack not shown braced is assumed to be connected to the braced jack by the soffit formwork.

Top jacks should be avoided if possible due to the additional labour required to operate them and access that needs to be provided. Bracing the top jacks improves allowable working loads significantly and these arrangements can be useful where sloping soffits are to be supported and heavier loads are present.

DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

500

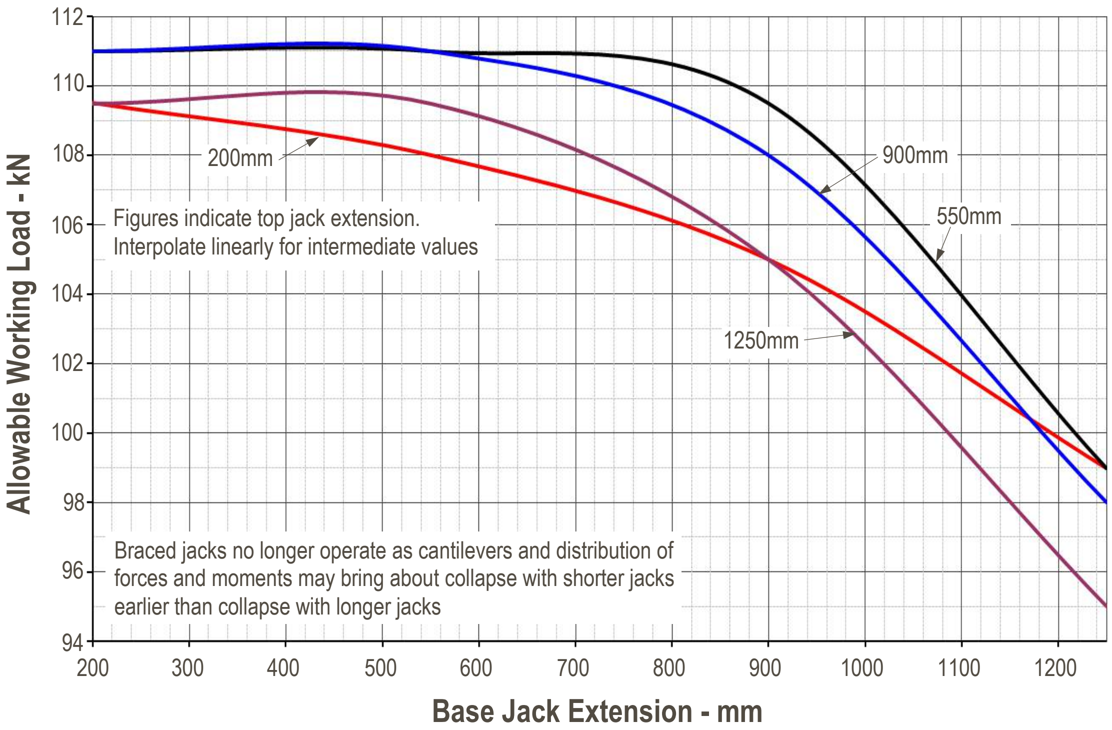
ALSHOR PLUS

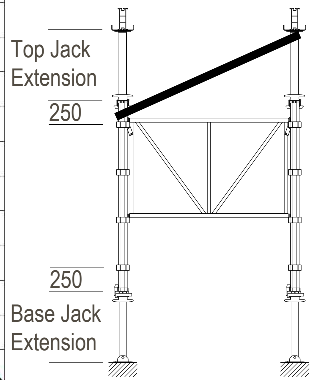
VERSATILE ALUMINIUM SHORING SYSTEM

Top Restrained Alshor Plus Falsework Towers with Braced Head Jacks. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

500

2m Leg, 1 Frame

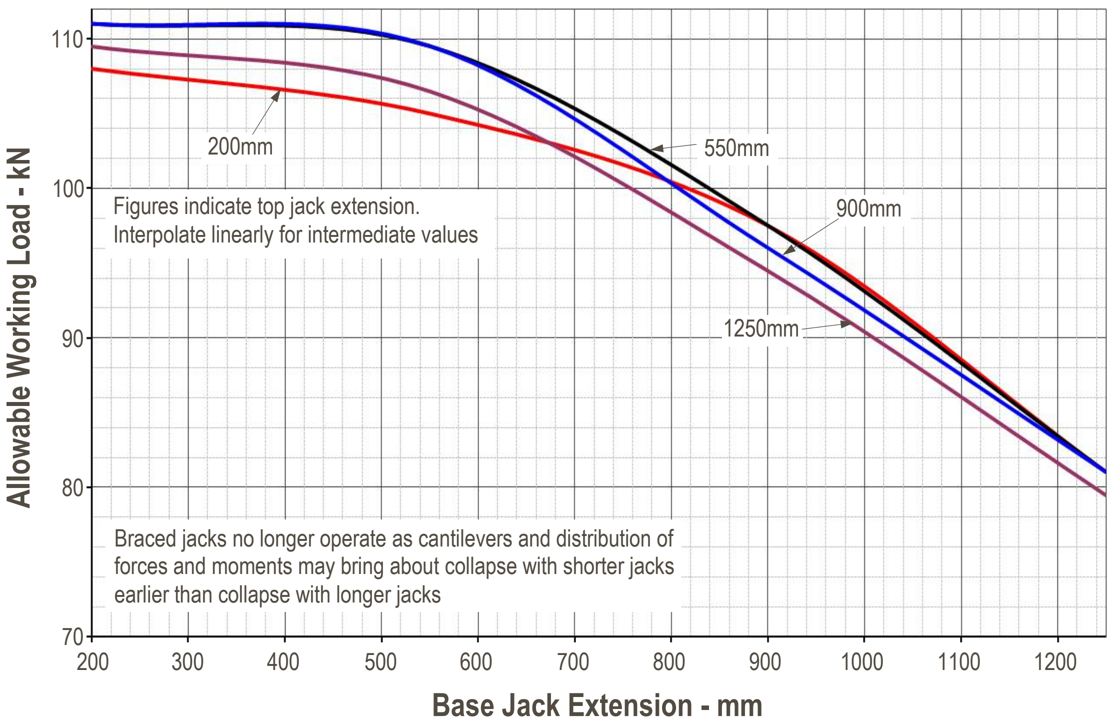


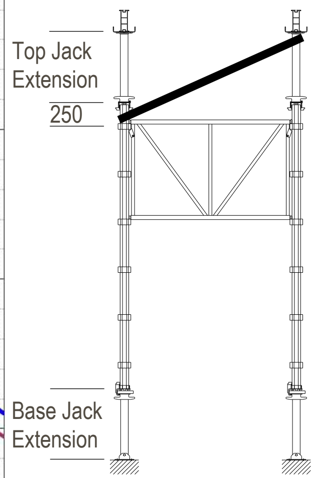


Note: to avoid clashing jacks when using the 2m Leg, the minimum combined jack extensions must be greater than 1375mm when using 2 No. long jacks and 625mm using a long jack at the base with short jack at the head.

501

3m Leg, 1 Frame

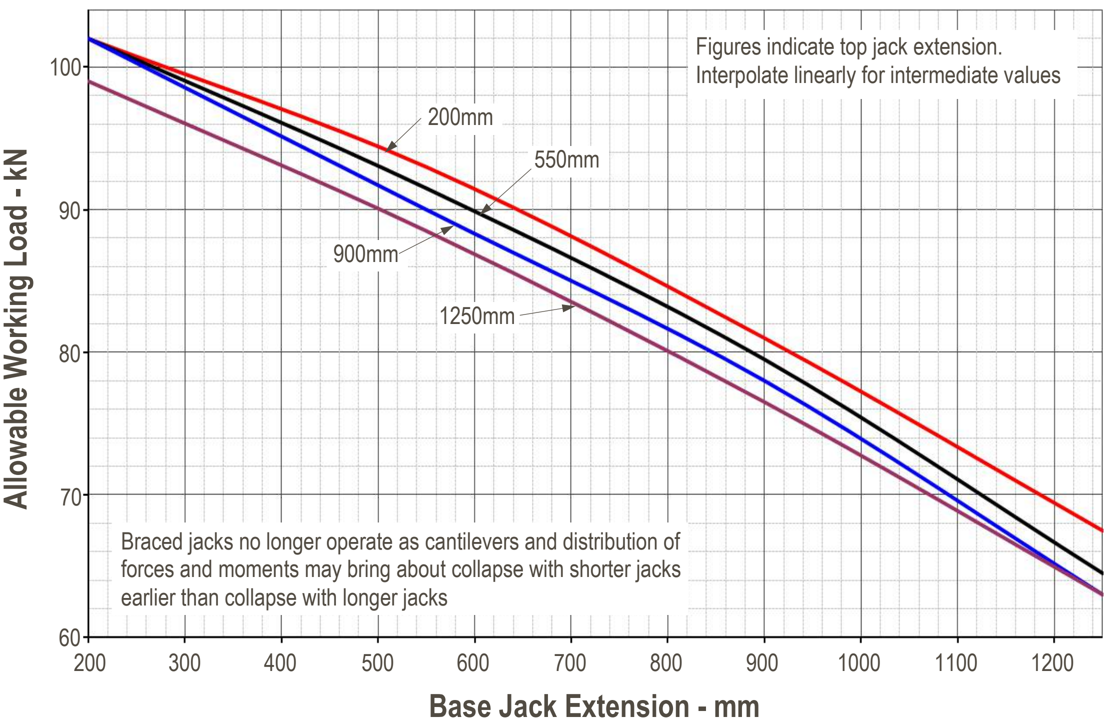




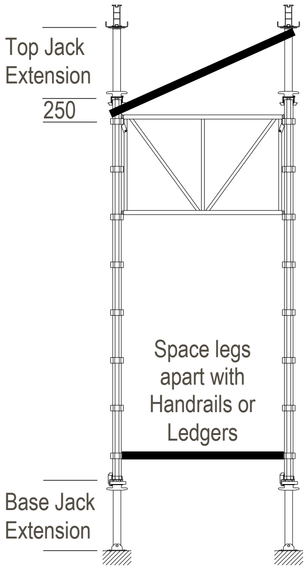
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Top Restrained Alshor Plus Falsework Towers with Braced Head Jacks. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

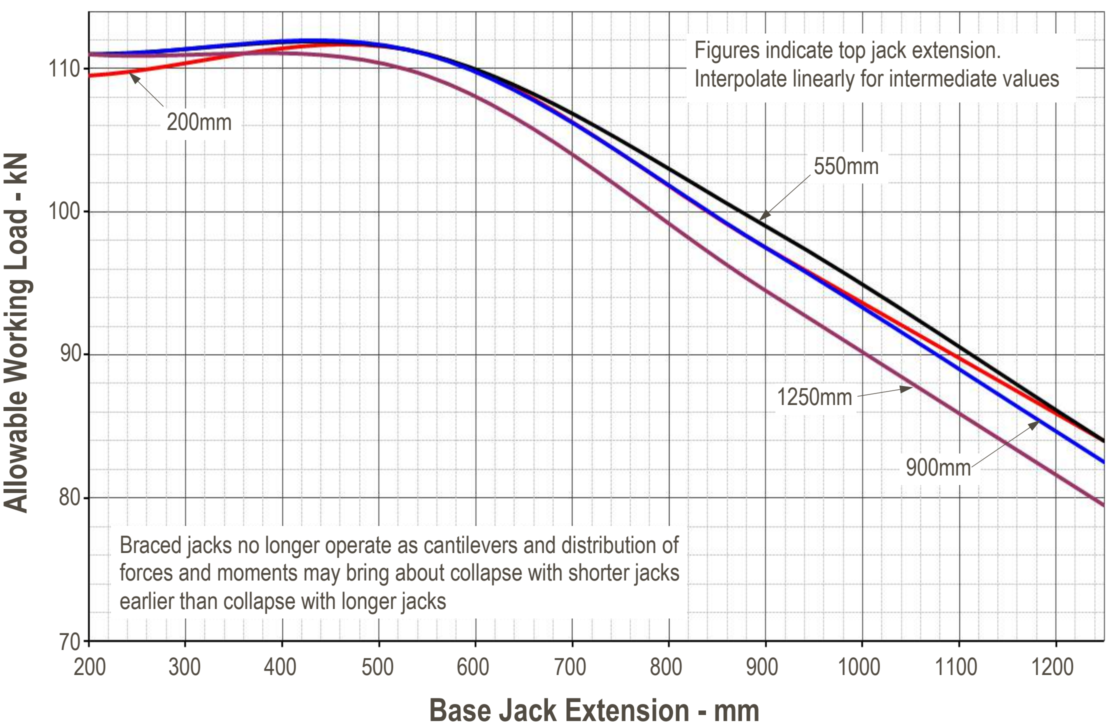
502



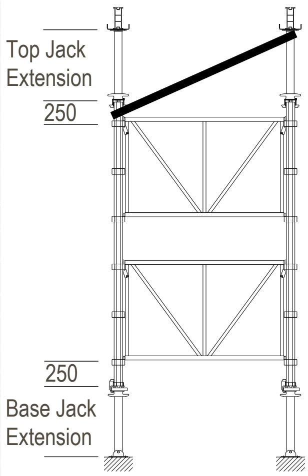
4m Leg, 1 Frame



503



3m Leg, 2 Frames

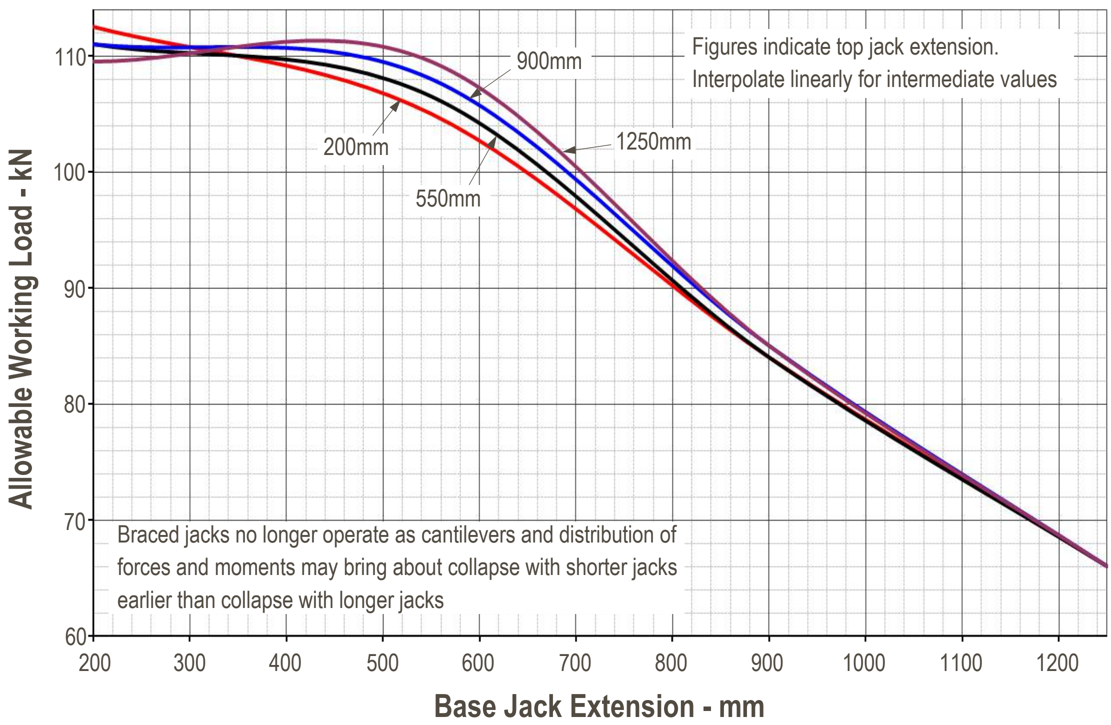


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

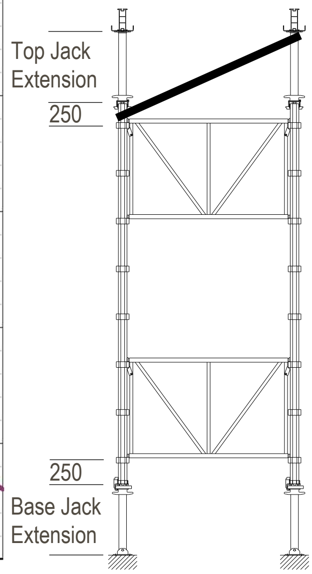
R·M·D KWIKFORM

Top Restrained Alshor Plus Falsework Towers with Braced Head Jacks. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

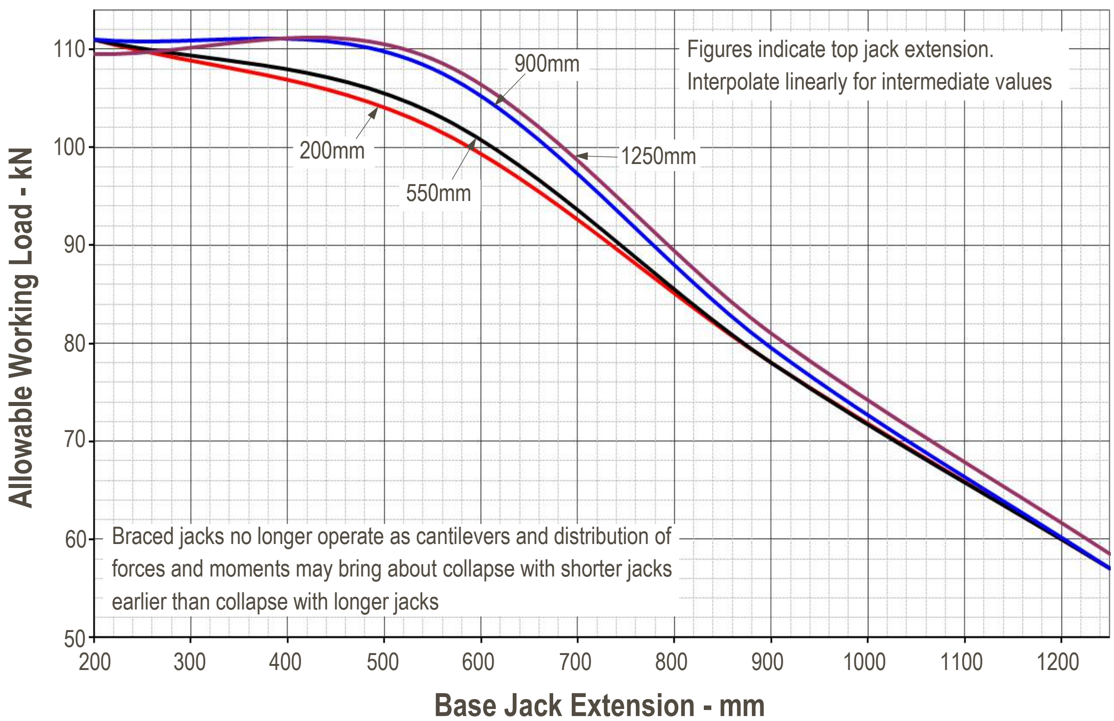
504



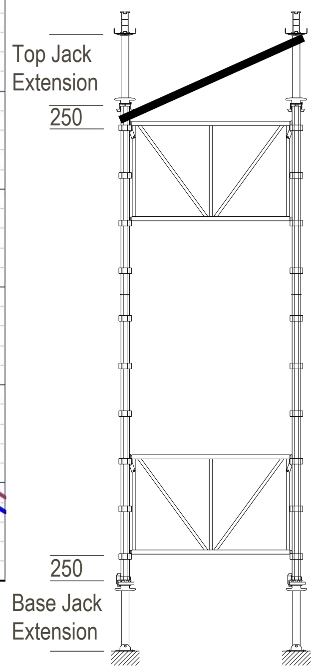
4m Leg, 2 Frames



505



5m Leg, 2 Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

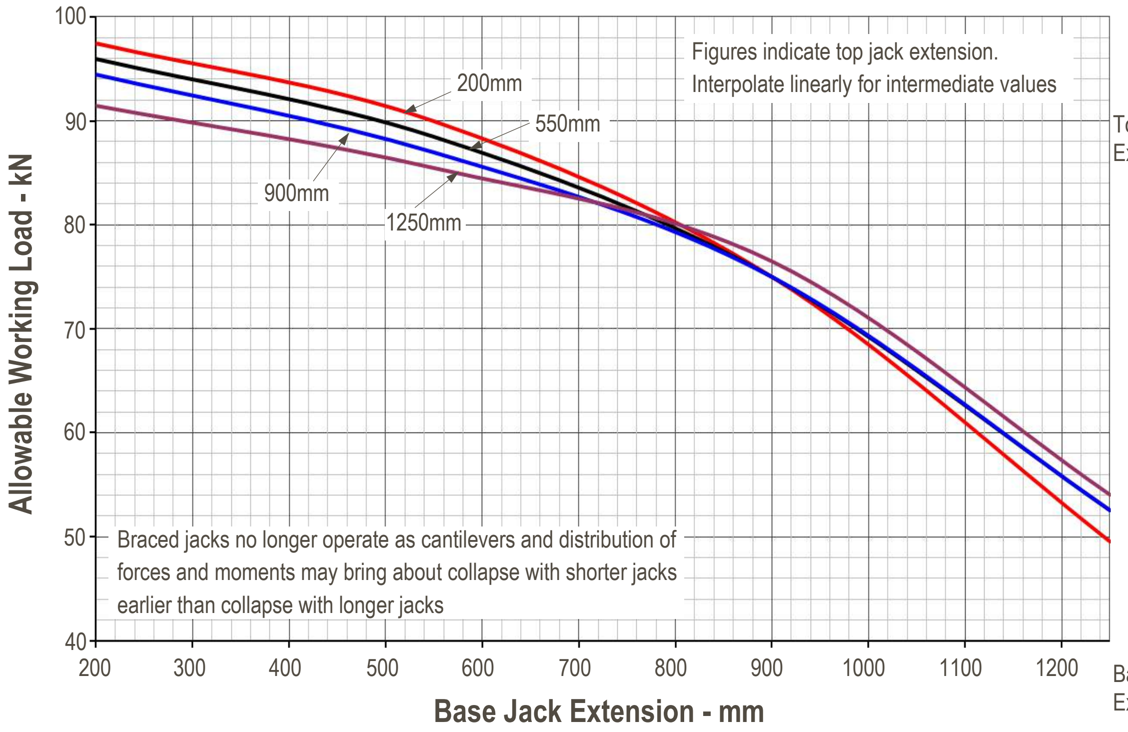
ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

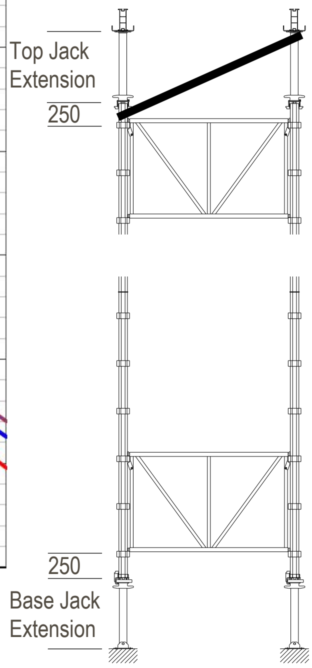
R•M•D KWIKFORM

Top Restrained Alshor Plus Falsework Towers with Braced Head Jacks. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

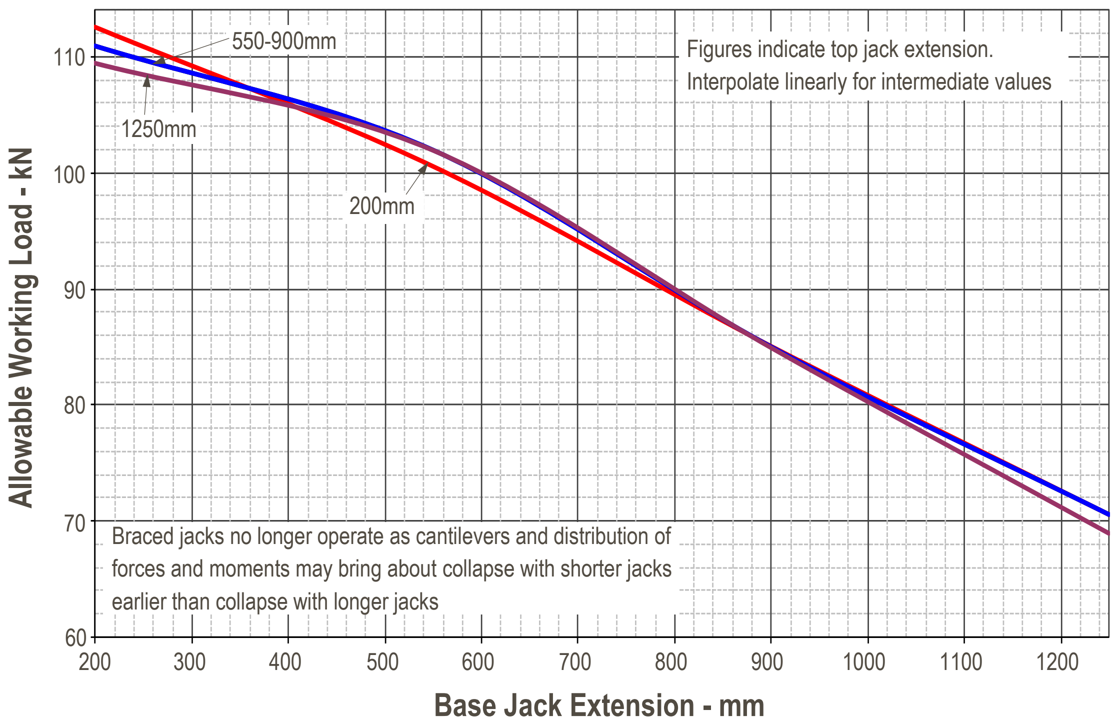
506



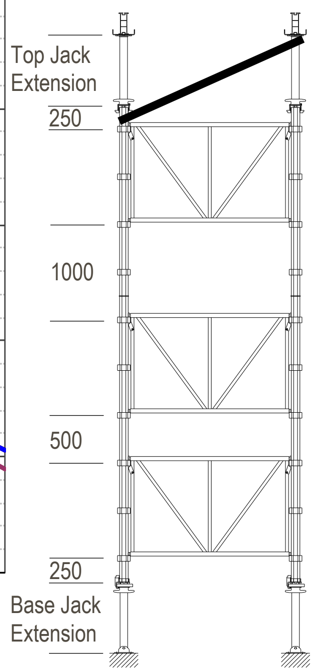
6m Leg, 2 Frames



507



5m Leg, 3 Frames



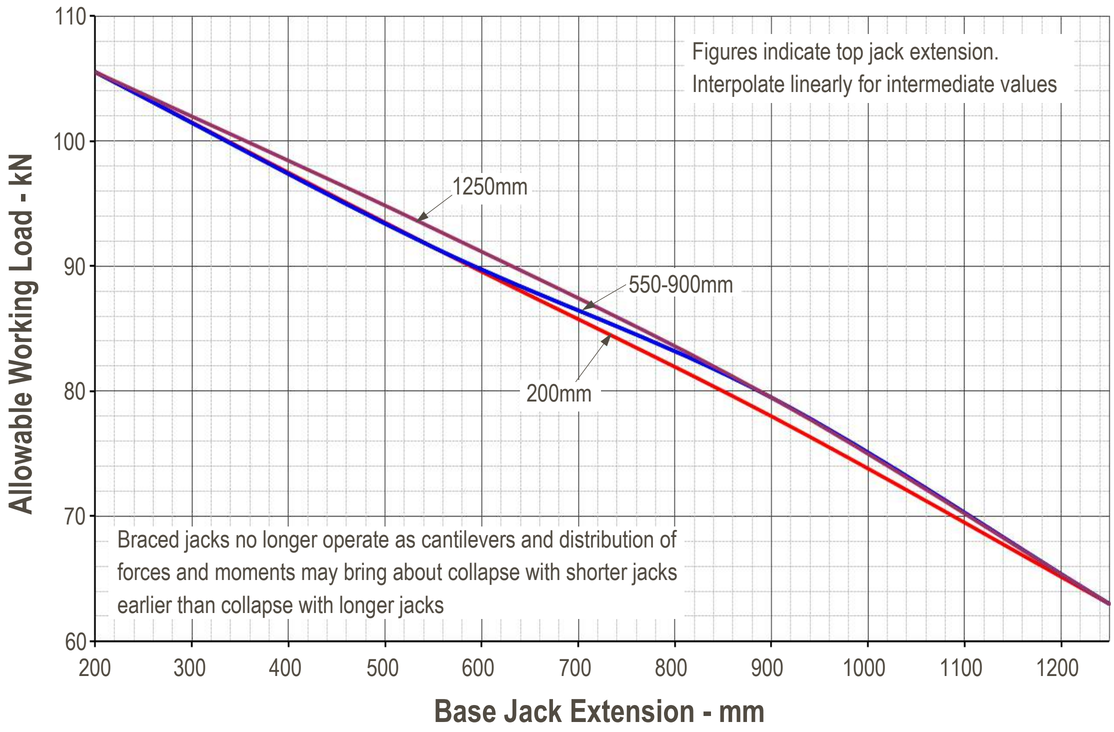
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

ALSHOR PLUS

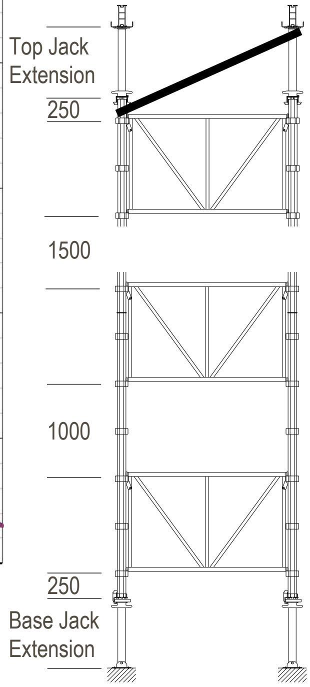
VERSATILE ALUMINIUM SHORING SYSTEM

Top Restrained Alshor Plus Falsework Towers with Braced Head Jacks. Base Fixed in Rotation & Top Pinned with Load Eccentricity 5mm (fos = 2.0)

508



6m Leg, 3 Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Series 600 Charts

Top restrained props or towers for use in disturbed or undisturbed backpropping applications.

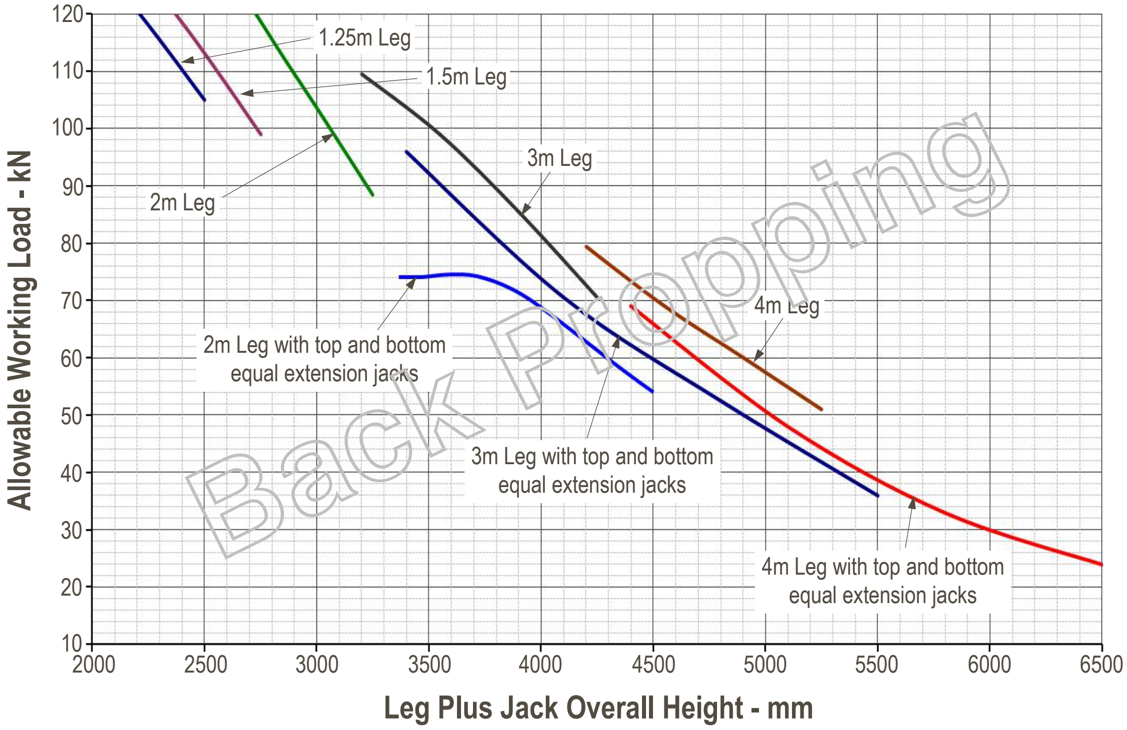
Higher allowable working loads are permitted as the structure is rotationally restrained at both top and bottom.

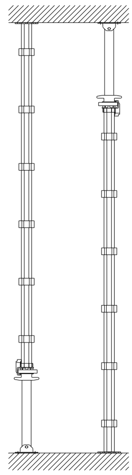
DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

600

Single Vertical Alshor Plus Back Props. Jack One End Except as Shown with Base and Head Fixed in Rotation (fos = 2.0)

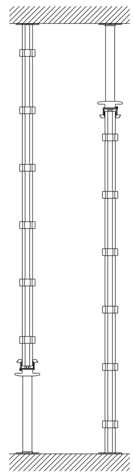
600





Top Restrained Alshor Plus Props with Short Jacks, Base and Head Fixed in Rotation (fos = 2.0)

601



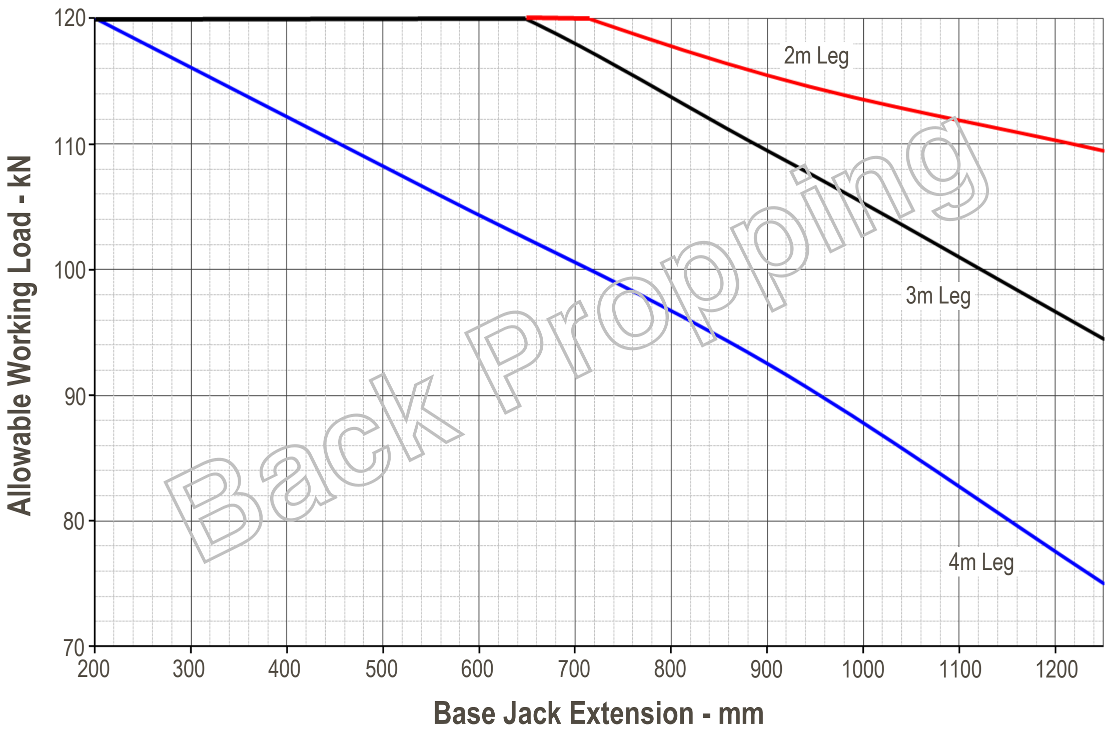
Note: Ensure that both ends of the structure bear against foundations that are fixed against rotation, e.g. a concrete slab or railway sleepers haunched with concrete. Erect props within 1.5 degrees of plumb. Place a softwood sole board between the non-jack end of the prop and the structure.

ALSHOR PLUS

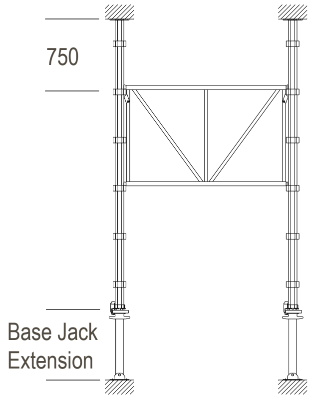
VERSATILE ALUMINIUM SHORING SYSTEM

Top Restrained Alshor Plus Backpropping Towers. Base and Head Fixed in Rotation (fos = 2.0)

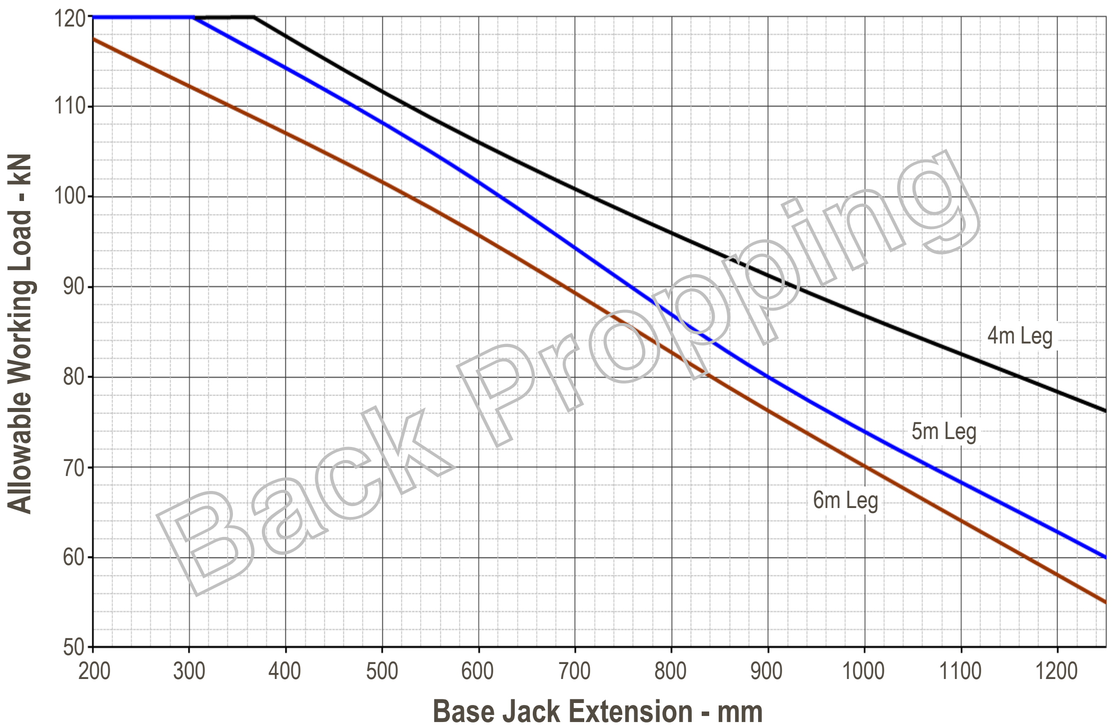
602



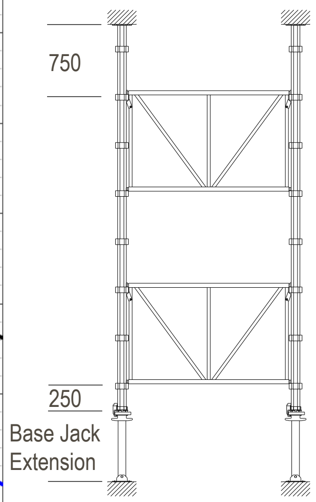
No Top Jack, 1 Frame



603



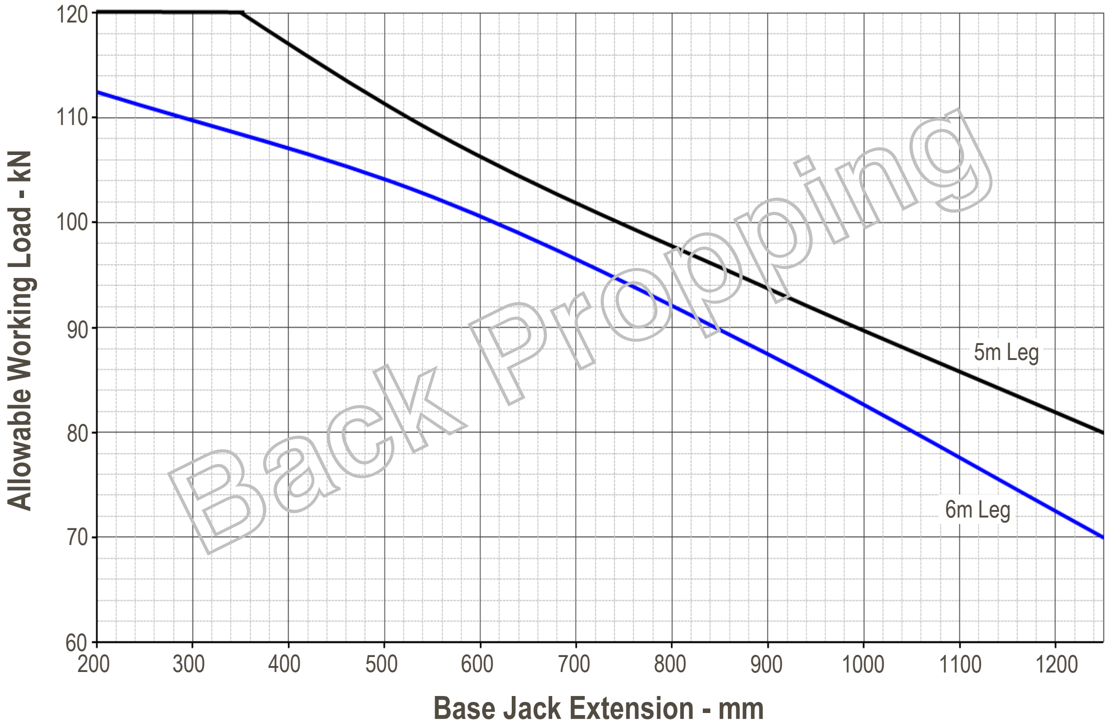
No Top Jack, 2 Frames



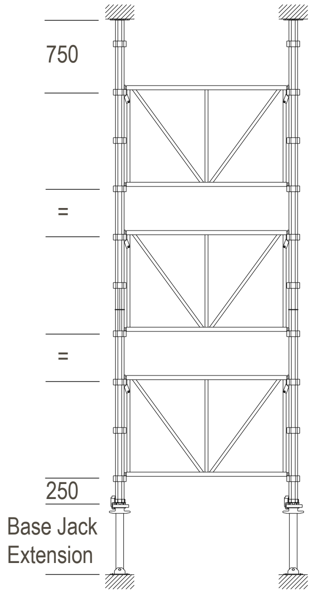
Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete. Place a softwood sole board between the non-jack end of the legs and the structure.

604

Top Restrained Alshor Plus Backpropping Towers. Base and Head Fixed in Rotation (fos = 2.0)



No Top Jack, 3 Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete. Place a softwood sole board between the non-jack end of the legs and the structure.

Series 700 Charts

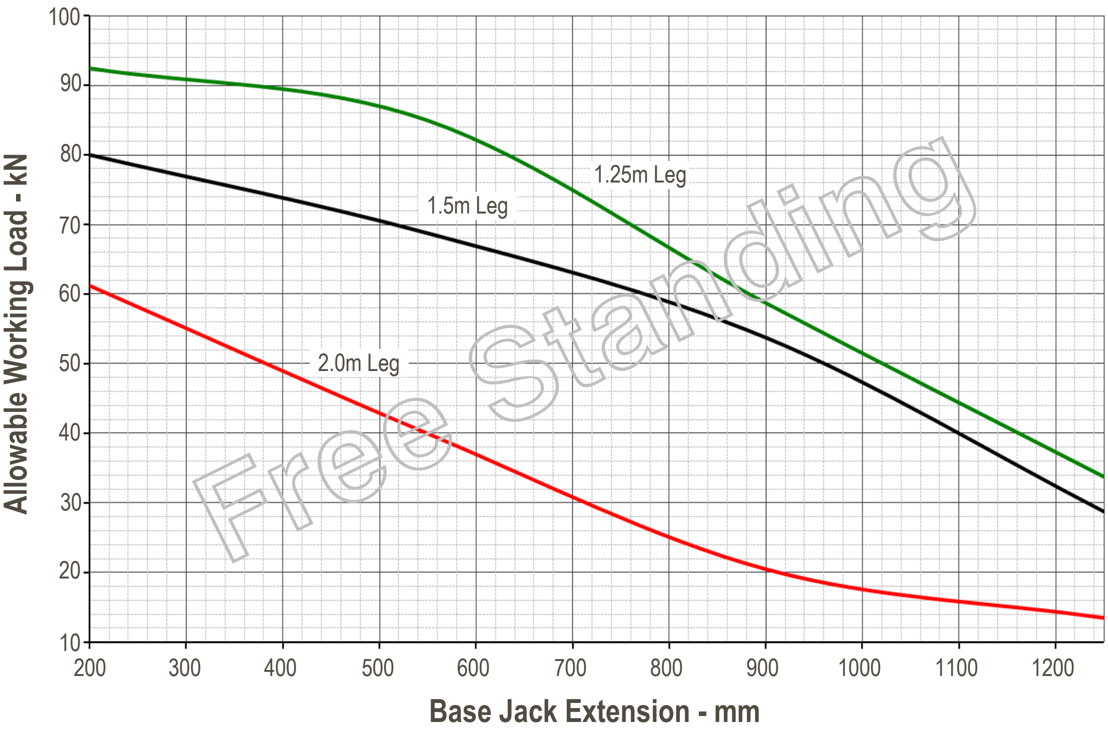
Freestanding towers where the equivalent of 2.5% of the vertical load acting on the towers acts horizontally at the top.

DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

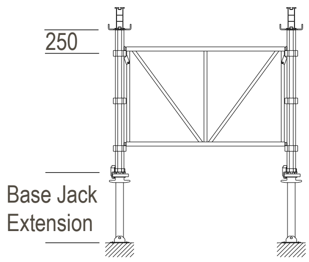
700

Free-Standing Alshor Plus Towers with 2.5% Side Load Applied at the Top. Base Fixed in Rotation & Head Pinned with a Load Eccentricity of 5mm (fos = 2.0)

700

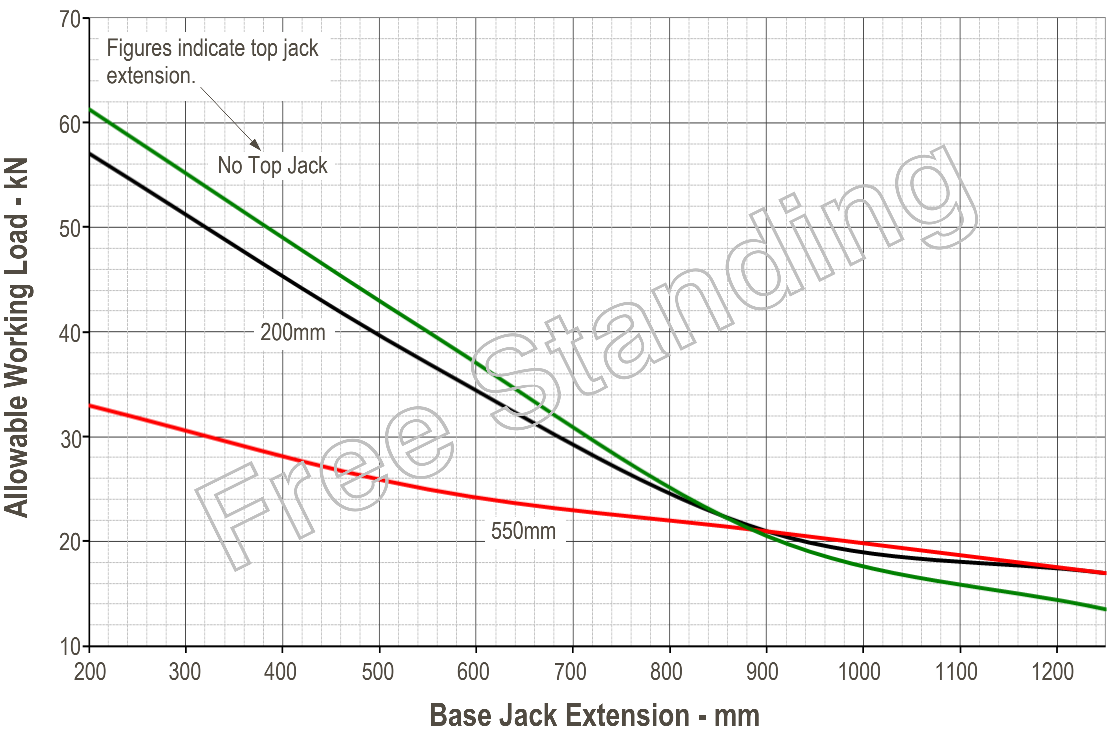


1 Frame, No Top Jack

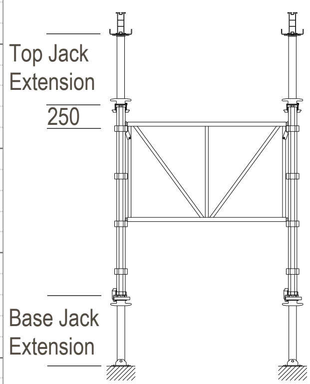


Free-Standing Alshor Plus Towers with 2.5% Side Load Applied at the Top. Base Fixed in Rotation & Head Pinned with a Load Eccentricity of 5mm (fos = 2.0)

701

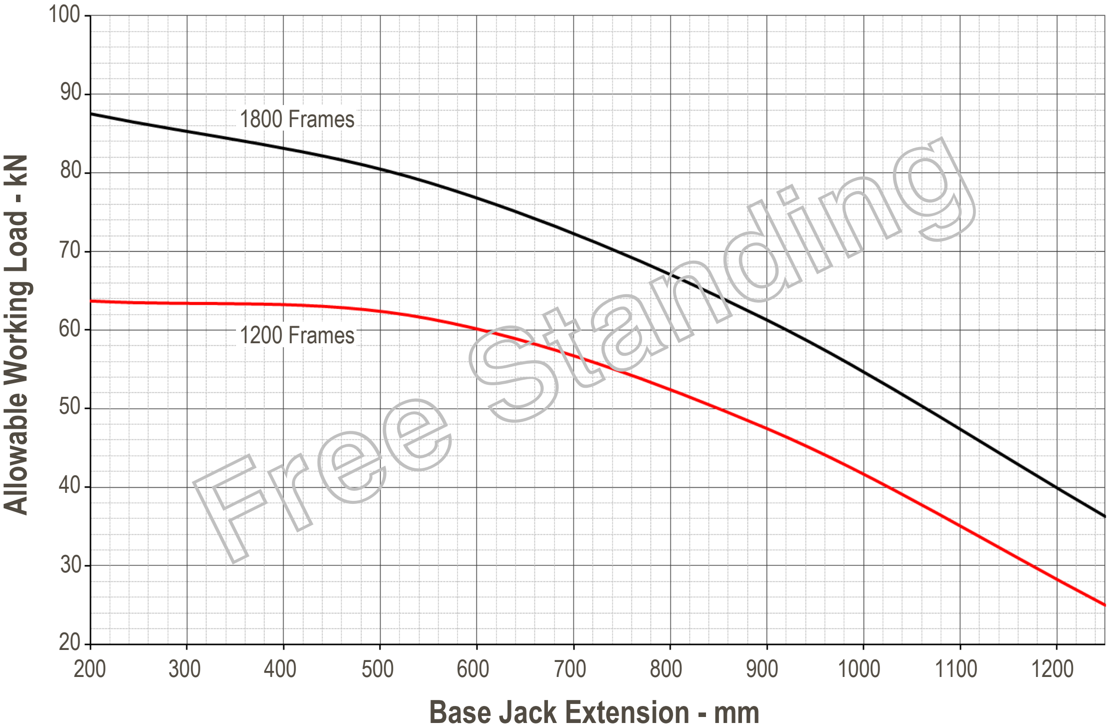


2m Leg, 1 Frame

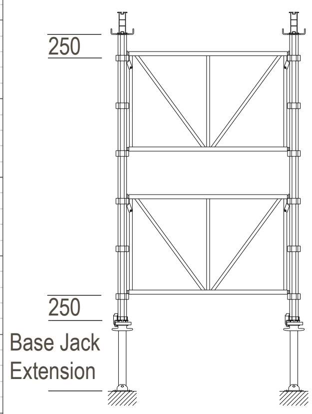


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Free-Standing Alshor Plus Towers with 2.5% Side Load Applied at the Top. Base Fixed in Rotation & Head Pinned with a Load Eccentricity of 5mm (fos = 2.0)



3m Leg, 2 Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

Series 800 Charts

Top restrained structures where Alshor Plus is used in conjunction with Airodek Crowns or Alshor Plus Drop heads.

Equal loading is assumed from decking beams on both sides of crown or drop head.

DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

800

ALSHOR PLUS

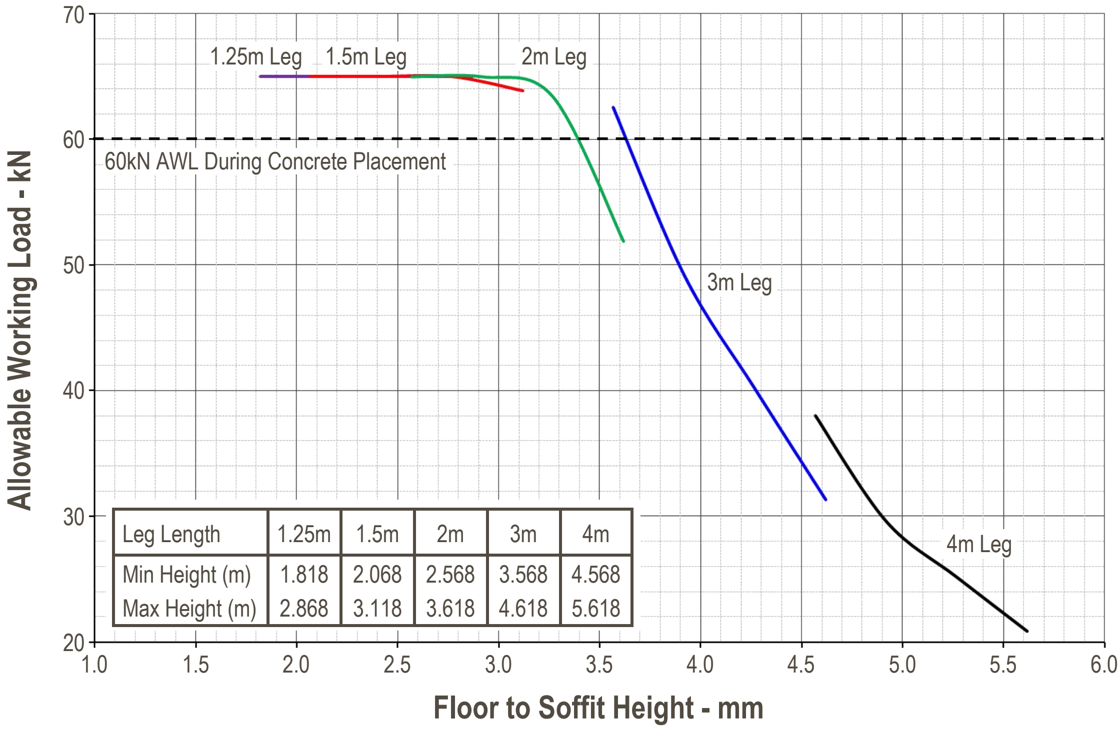
VERSATILE ALUMINIUM SHORING SYSTEM

R•M•D KWIKFORM

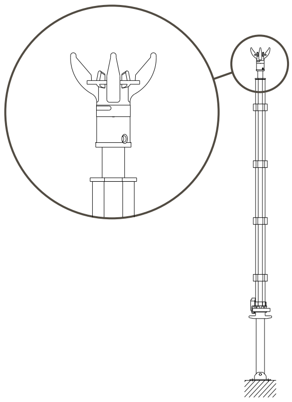
Allowable Working Load in Alshor Plus Props with Airodek Crown Plus Adapter, Base Fixed in Rotation

801

No Frames



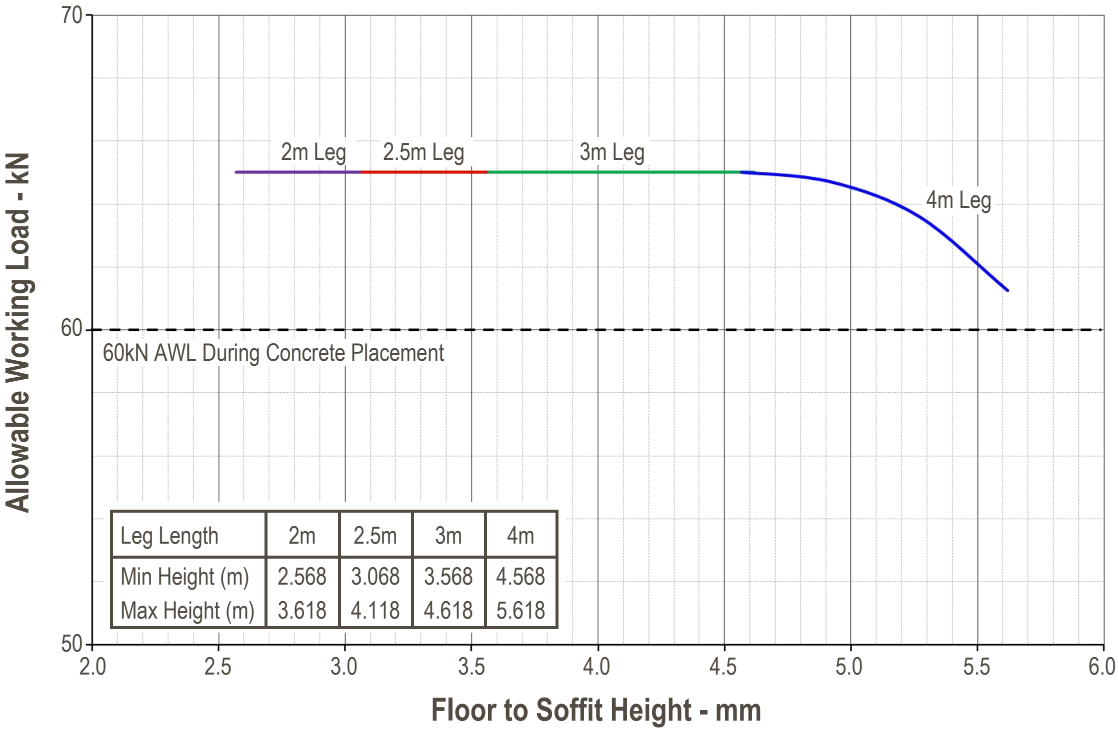
Leg Length	1.25m	1.5m	2m	3m	4m
Min Height (m)	1.818	2.068	2.568	3.568	4.568
Max Height (m)	2.868	3.118	3.618	4.618	5.618



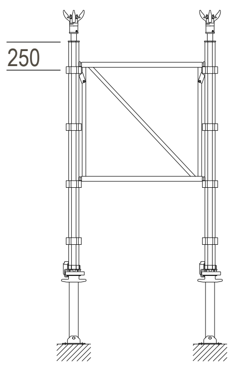
Allowable Working Load in Alshor Plus Tower Legs with Airodek Crowns Plus Adapters, Base Fixed in Rotation

802

1 Frame



Leg Length	2m	2.5m	3m	4m
Min Height (m)	2.568	3.068	3.568	4.568
Max Height (m)	3.618	4.118	4.618	5.618



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

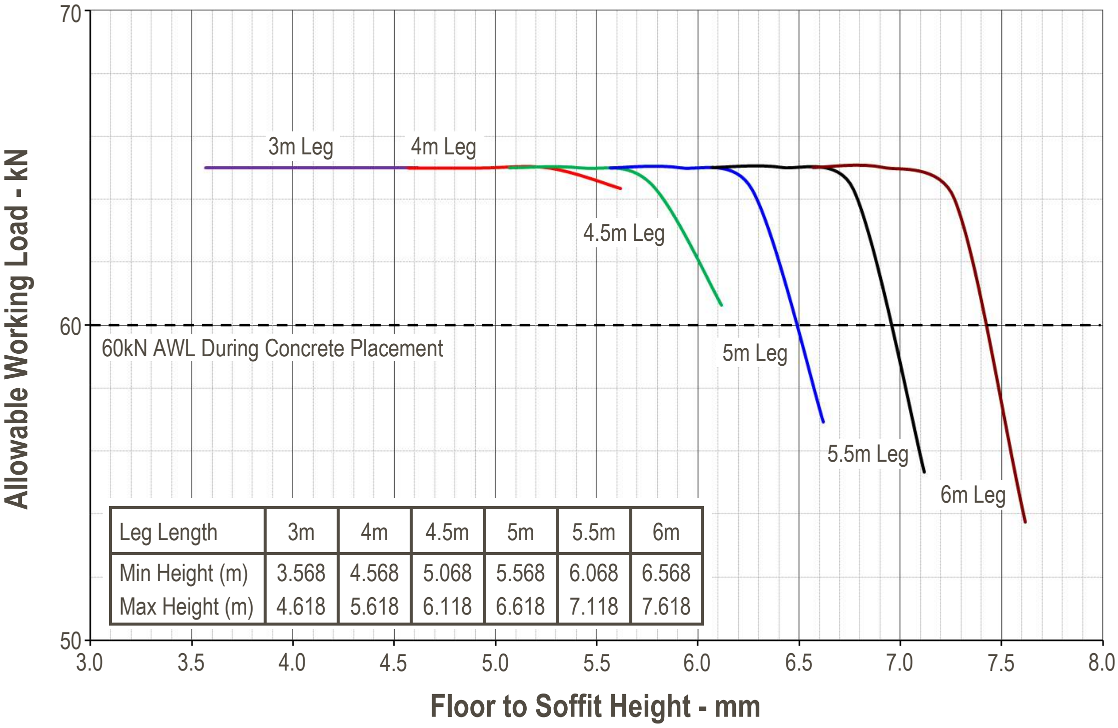
ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

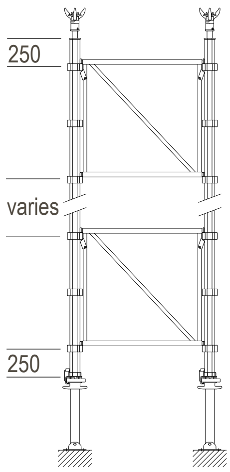
Allowable Working Load in Alshor Plus Tower Legs with Airodek Crown Plus Adapter, Base Fixed in Rotation

803

2 Frames

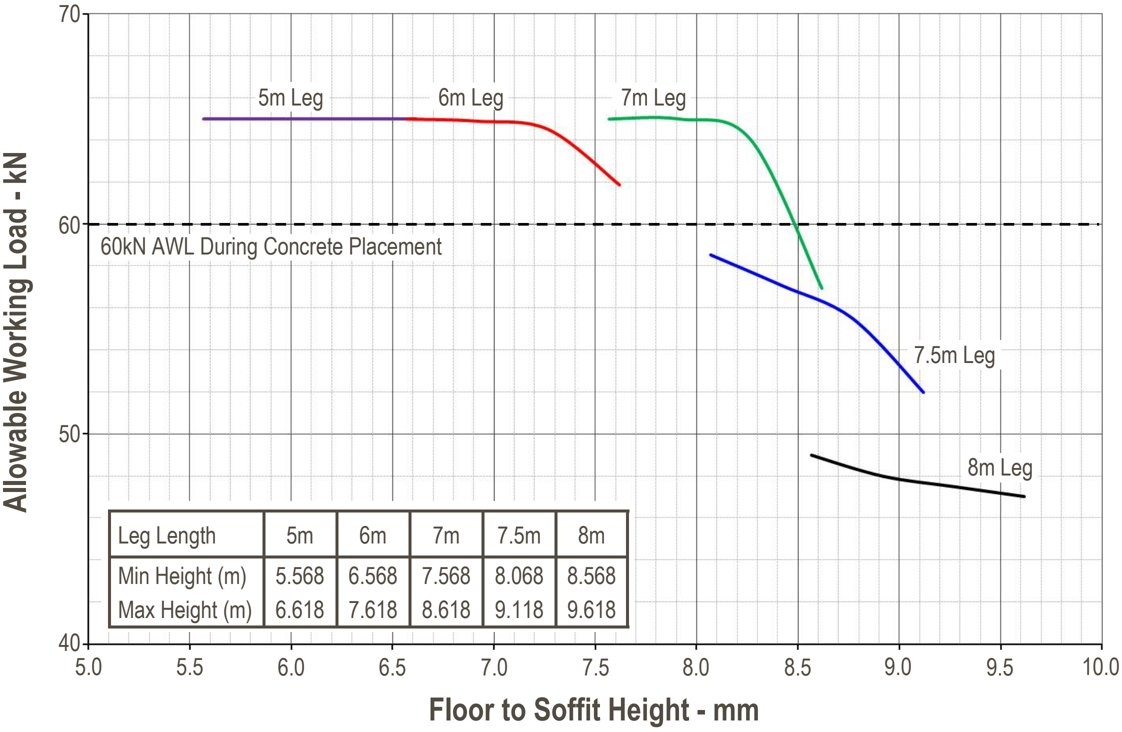


Leg Length	3m	4m	4.5m	5m	5.5m	6m
Min Height (m)	3.568	4.568	5.068	5.568	6.068	6.568
Max Height (m)	4.618	5.618	6.118	6.618	7.118	7.618

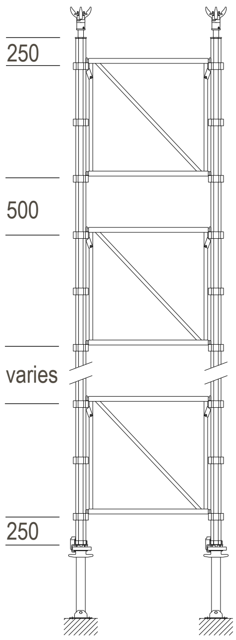


804

3 Frames



Leg Length	5m	6m	7m	7.5m	8m
Min Height (m)	5.568	6.568	7.568	8.068	8.568
Max Height (m)	6.618	7.618	8.618	9.118	9.618



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

ALSHOR PLUS

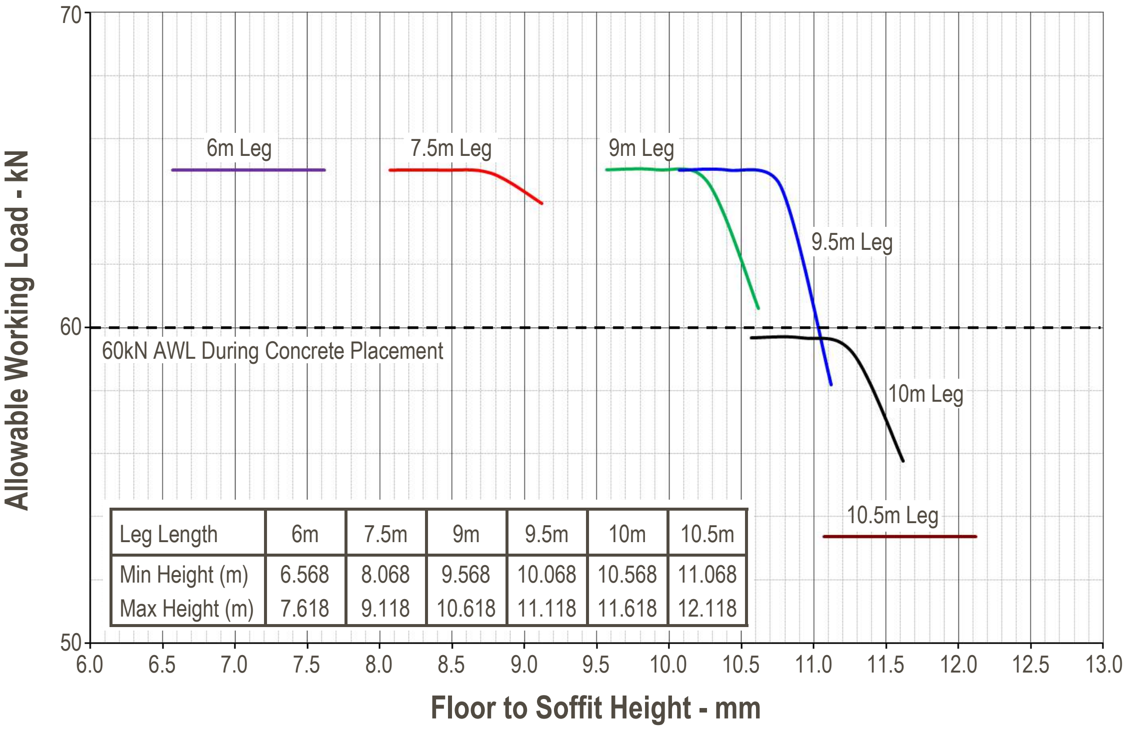
VERSATILE ALUMINIUM SHORING SYSTEM

R·M·D KWIKFORM

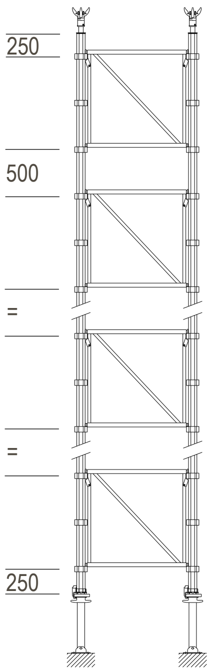
Allowable Working Load in Alshor Plus Tower Legs with Airodek Crown Plus Adapter, Base Fixed in Rotation

805

4 Frames



Leg Length	6m	7.5m	9m	9.5m	10m	10.5m
Min Height (m)	6.568	8.068	9.568	10.068	10.568	11.068
Max Height (m)	7.618	9.118	10.618	11.118	11.618	12.118

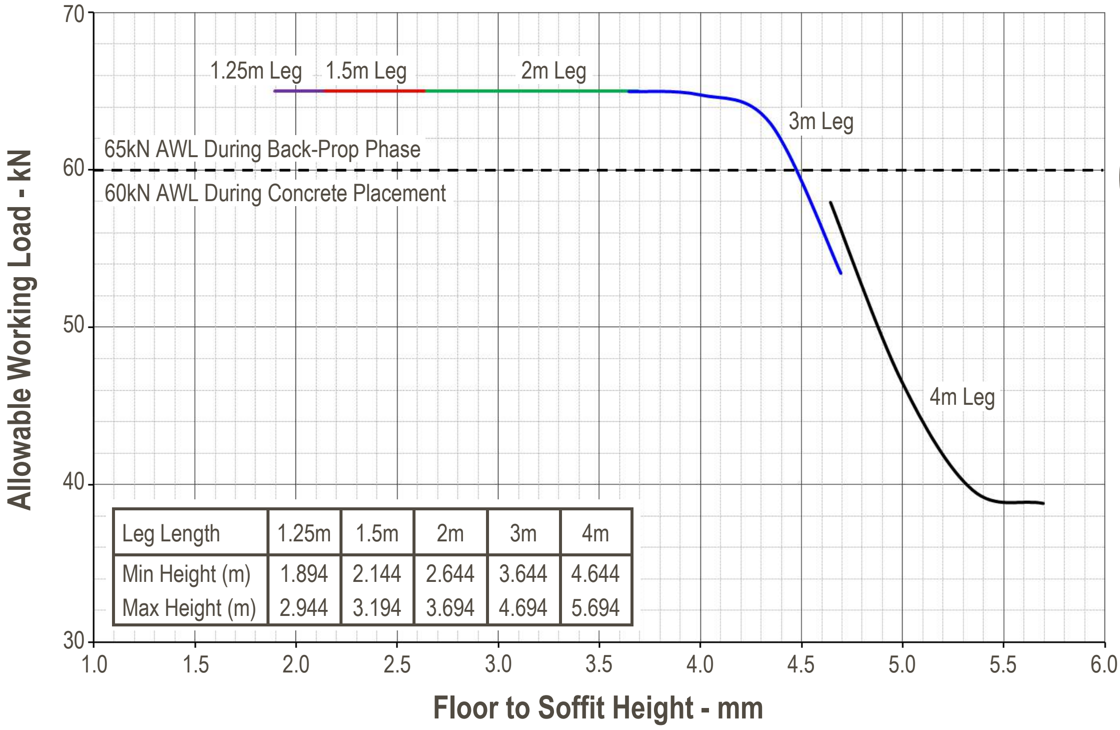


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

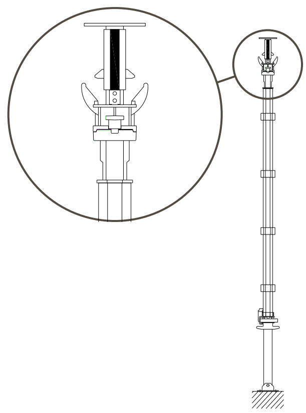
Allowable Working Load in Alshor Plus Props with Alshor Plus Drophead, Base Fixed in Rotation

806

No Frames



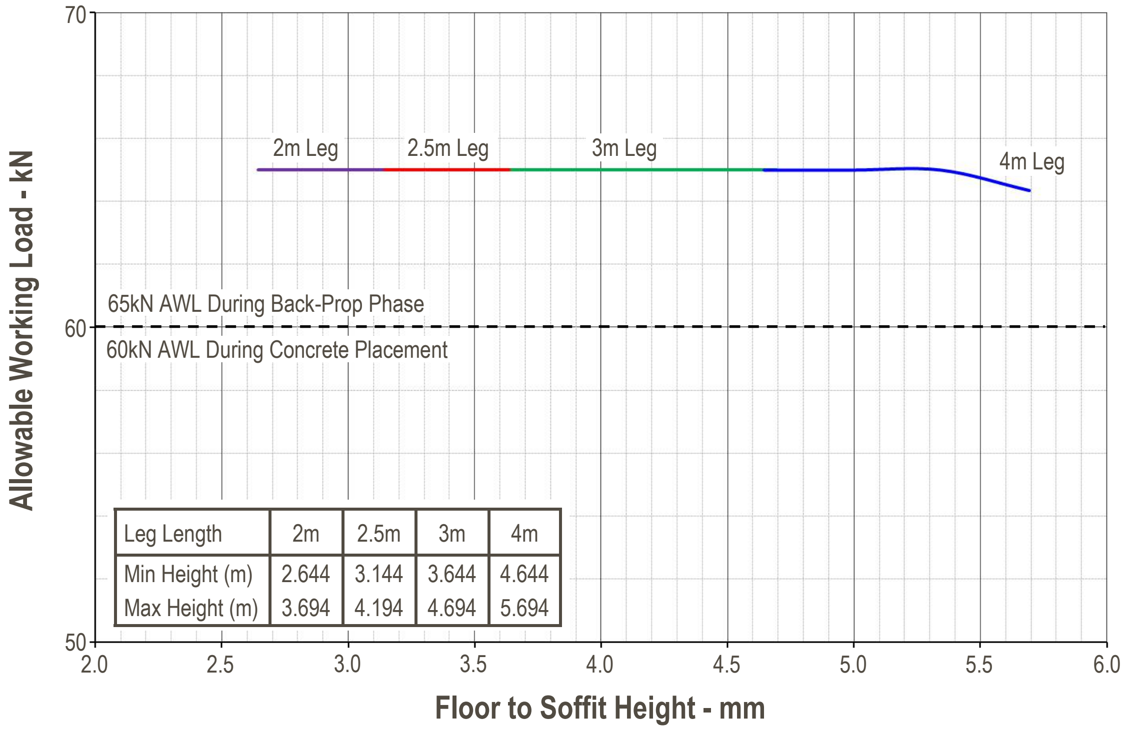
Leg Length	1.25m	1.5m	2m	3m	4m
Min Height (m)	1.894	2.144	2.644	3.644	4.644
Max Height (m)	2.944	3.194	3.694	4.694	5.694



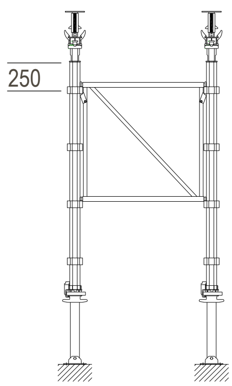
Allowable Working Load in Alshor Plus Tower Legs with Alshor Plus Drophead, Base Fixed in Rotation

807

1 Frame



Leg Length	2m	2.5m	3m	4m
Min Height (m)	2.644	3.144	3.644	4.644
Max Height (m)	3.694	4.194	4.694	5.694

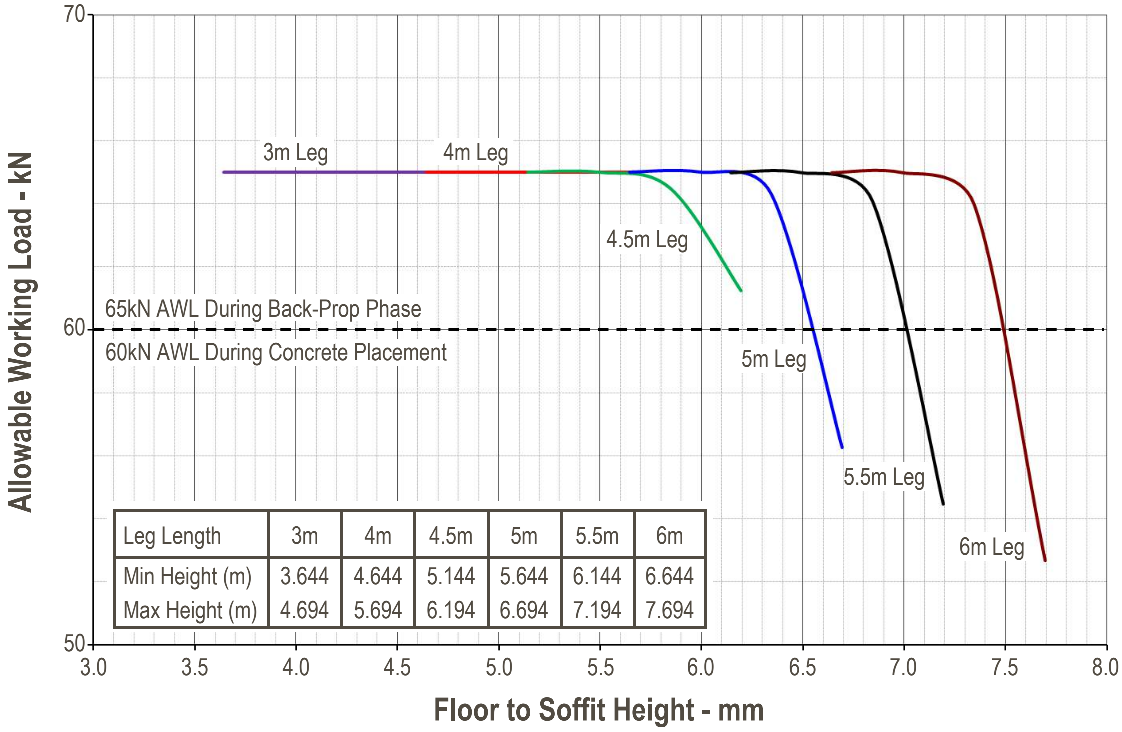


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

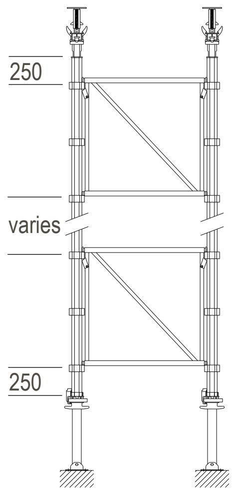
Allowable Working Load in Alshor Plus Tower Legs with Alshor Plus Drophead, Base Fixed in Rotation

808

2 Frames

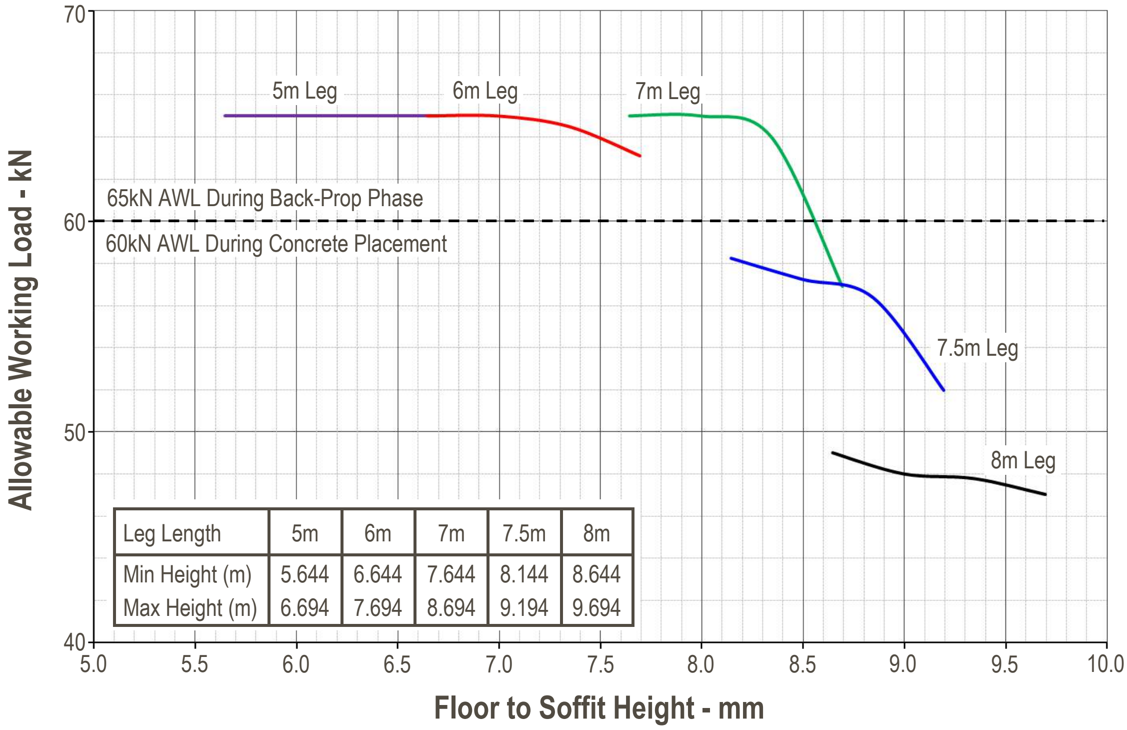


Leg Length	3m	4m	4.5m	5m	5.5m	6m
Min Height (m)	3.644	4.644	5.144	5.644	6.144	6.644
Max Height (m)	4.694	5.694	6.194	6.694	7.194	7.694

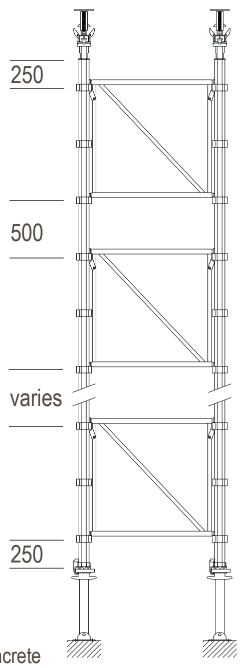


809

3 Frames



Leg Length	5m	6m	7m	7.5m	8m
Min Height (m)	5.644	6.644	7.644	8.144	8.644
Max Height (m)	6.694	7.694	8.694	9.194	9.694

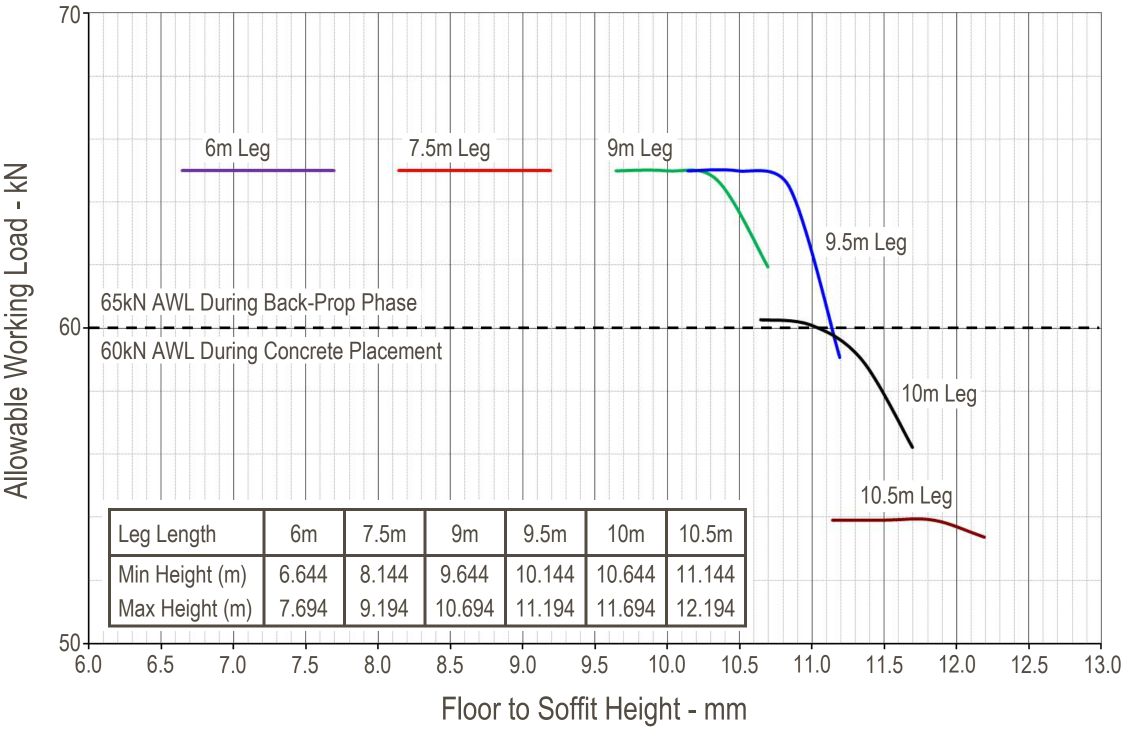


Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

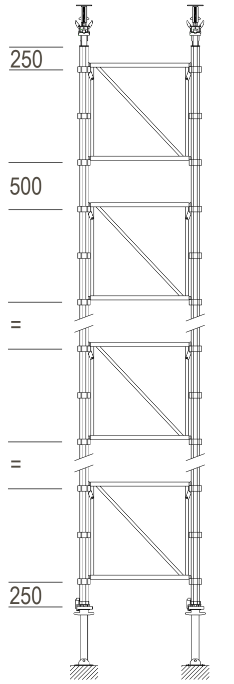
Allowable Working Load in Alshor Plus Tower Legs with Alshor Plus Drophead, Base Fixed in Rotation

810

4 Frames



Leg Length	6m	7.5m	9m	9.5m	10m	10.5m
Min Height (m)	6.644	8.144	9.644	10.144	10.644	11.144
Max Height (m)	7.694	9.194	10.694	11.194	11.694	12.194



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

ALSHOR PLUS

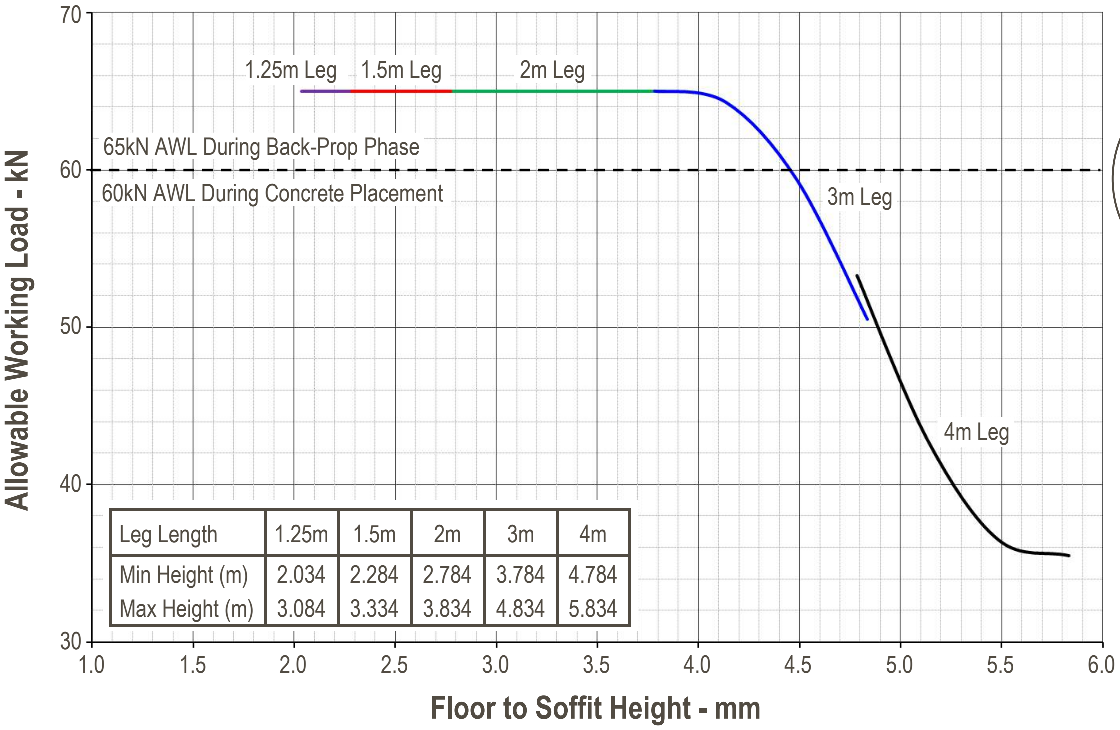
VERSATILE ALUMINIUM SHORING SYSTEM

R•M•D KWIKFORM

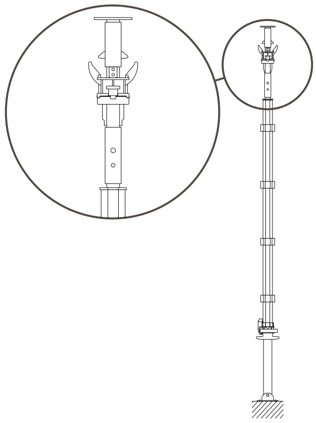
Allowable Working Load in Individual Alshor Plus Props with Airodek Drophead Plus Adapter, Base Fixed in Rotation

811

No Frames



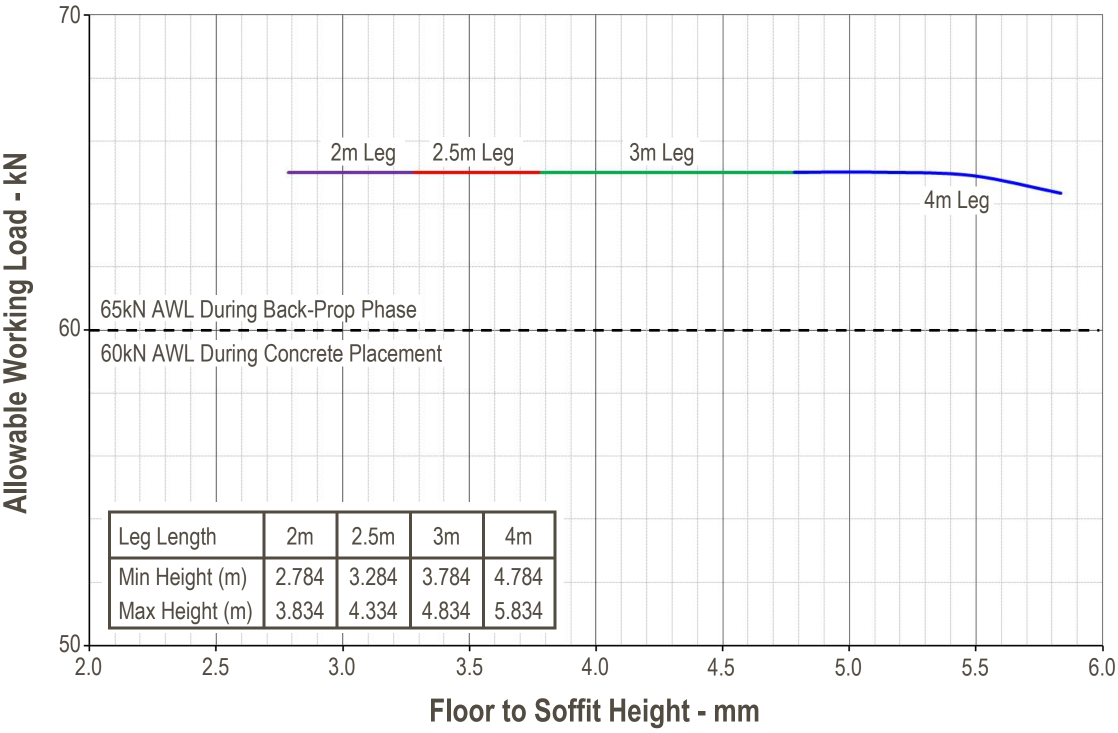
Leg Length	1.25m	1.5m	2m	3m	4m
Min Height (m)	2.034	2.284	2.784	3.784	4.784
Max Height (m)	3.084	3.334	3.834	4.834	5.834



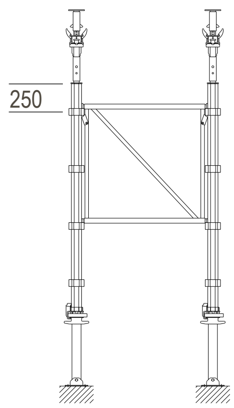
Allowable Working Load in Alshor Plus Tower Legs with Airodek Drophead Plus Adapter, Base Fixed in Rotation

812

1 Frame



Leg Length	2m	2.5m	3m	4m
Min Height (m)	2.784	3.284	3.784	4.784
Max Height (m)	3.834	4.334	4.834	5.834



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

ALSHOR PLUS

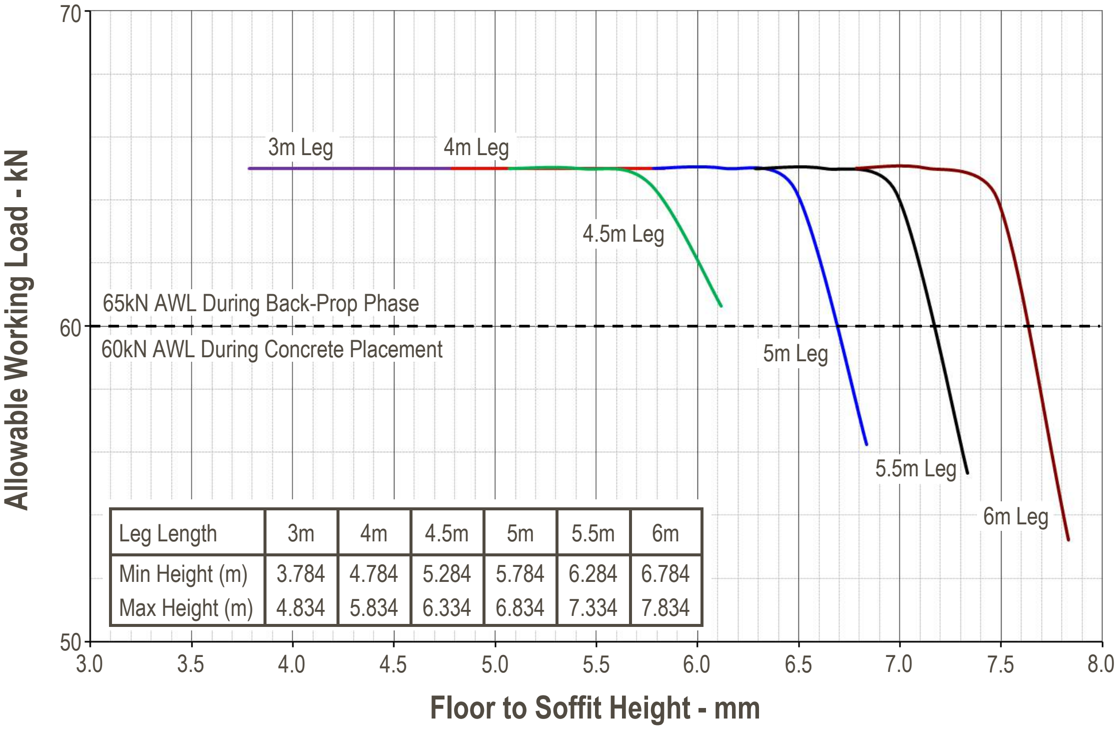
VERSATILE ALUMINIUM SHORING SYSTEM

R·M·D KWIKFORM

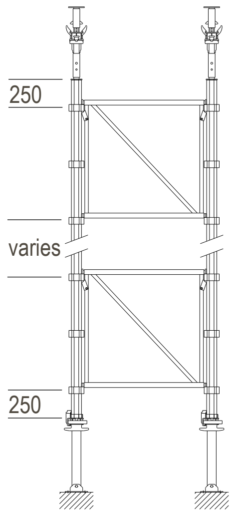
Allowable Working Load in Alshor Plus Tower Legs with Airodek Drophead Plus Adapter, Base Fixed in Rotation

813

2 Frames

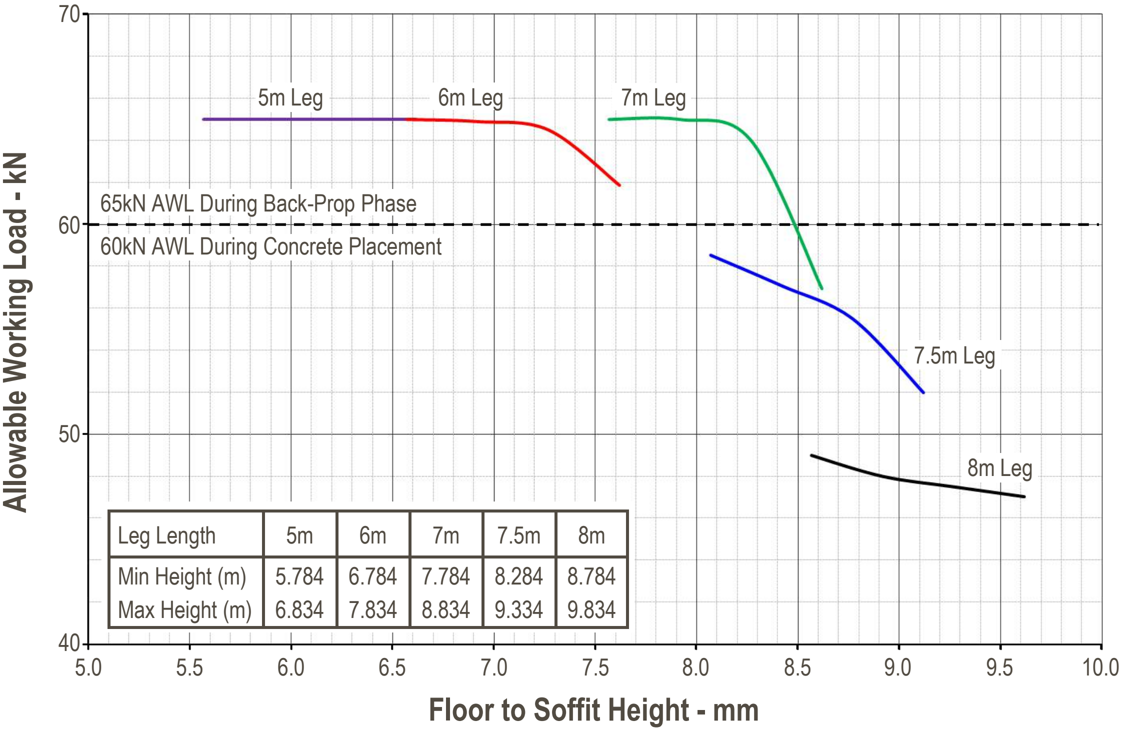


Leg Length	3m	4m	4.5m	5m	5.5m	6m
Min Height (m)	3.784	4.784	5.284	5.784	6.284	6.784
Max Height (m)	4.834	5.834	6.334	6.834	7.334	7.834

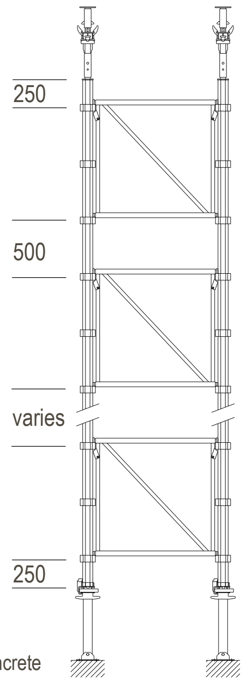


814

3 Frames



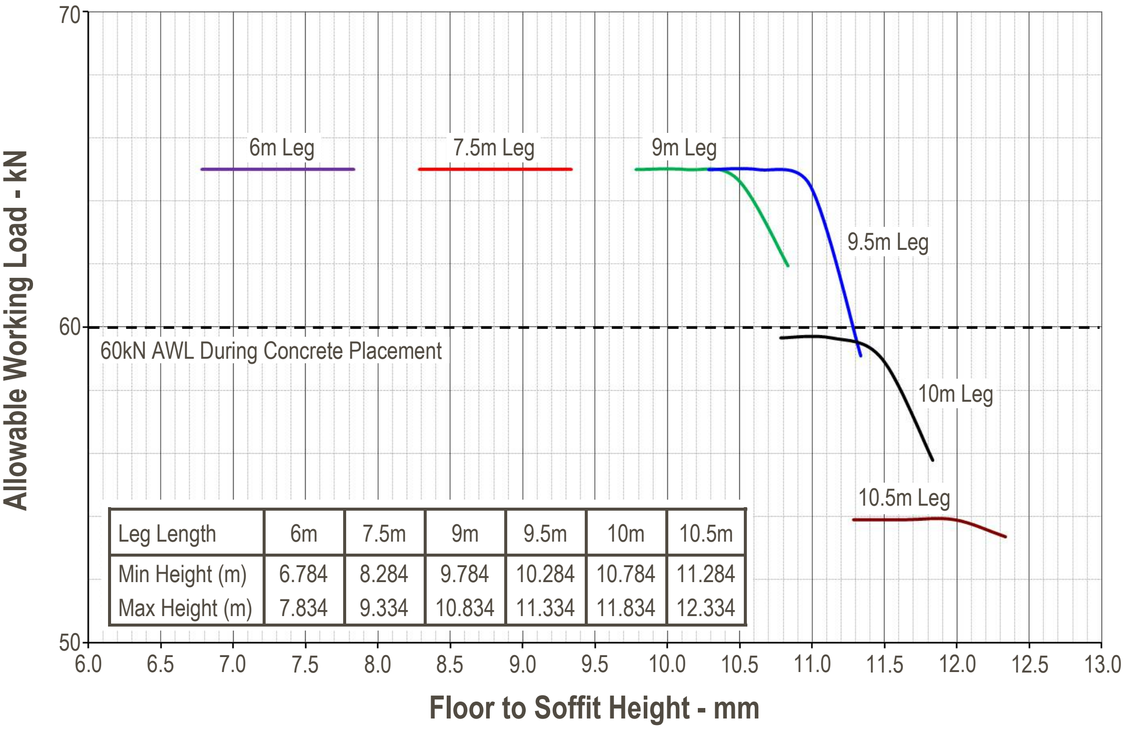
Leg Length	5m	6m	7m	7.5m	8m
Min Height (m)	5.784	6.784	7.784	8.284	8.784
Max Height (m)	6.834	7.834	8.834	9.334	9.834



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

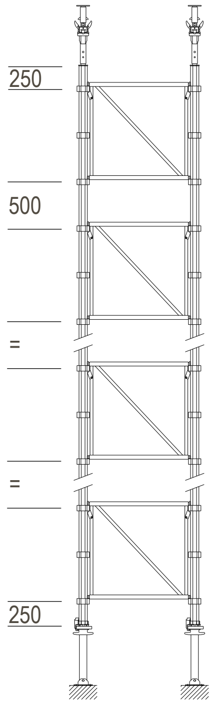
815

Allowable Working Load in Alshor Plus Tower Legs with Airodek Drophead Plus Adapter, Base Fixed in Rotation



Leg Length	6m	7.5m	9m	9.5m	10m	10.5m
Min Height (m)	6.784	8.284	9.784	10.284	10.784	11.284
Max Height (m)	7.834	9.334	10.834	11.334	11.834	12.334

4 Frames



Note: Ensure that the base jack bears on a foundation that is restrained against rotation, e.g. a concrete slab or railway sleepers haunched with concrete

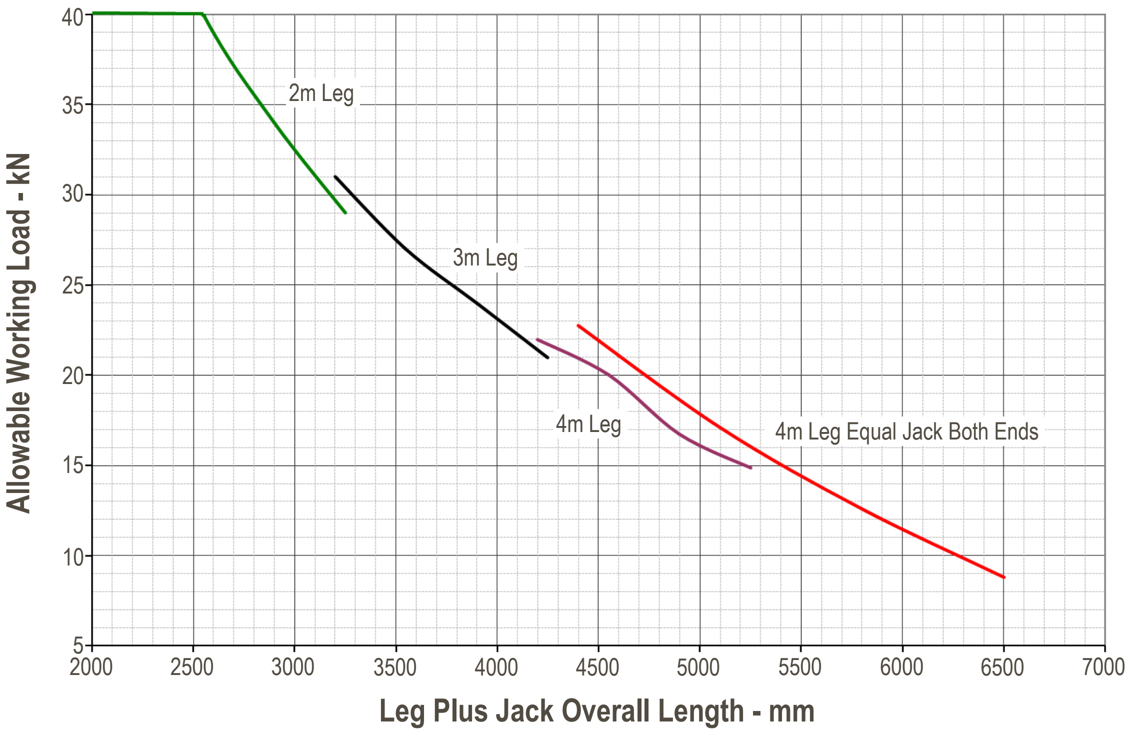
Series 900 Charts

Alshor Plus push pull props in either vertical or horizontal mode. Both ends of the prop are pin jointed.

(Future Development)

900

Allowable Working Load in Alshor Plus Push-Pull Props (fos = 2.0)
Load Applied Concentrically with Both Ends Pinned



Series 1000 Charts

Freestanding towers where the equivalent of 2.5% of the vertical load acting on the towers acts horizontally at the top and lateral restraint is provided by staggered frames with a spacing of 1m and base jack bracing.

DATA NOT TO BE USED WITH 900mm FRAME - REFER TO RMDKWIKFORM HEAD TECHNICAL OFFICE

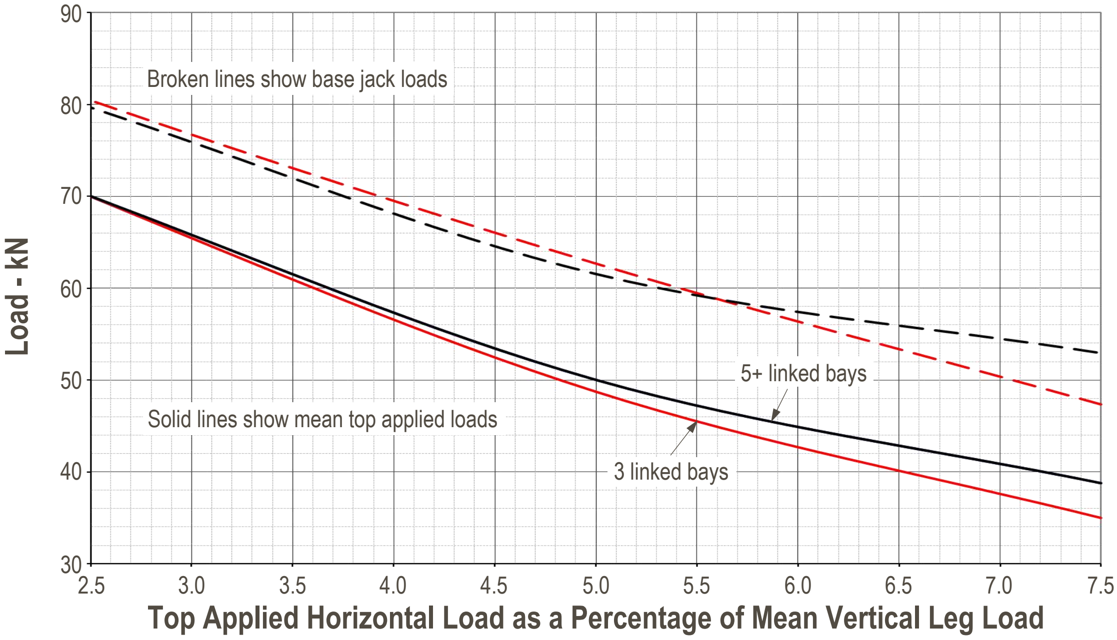
1000

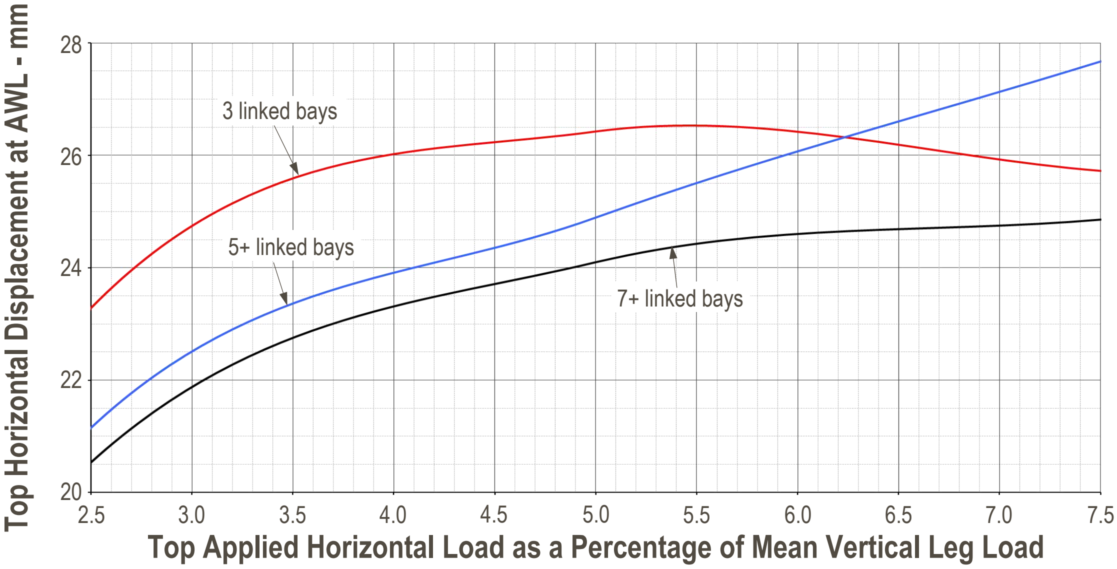
ALSHOR PLUS

VERSATILE ALUMINIUM SHORING SYSTEM

1000

Freestanding 2 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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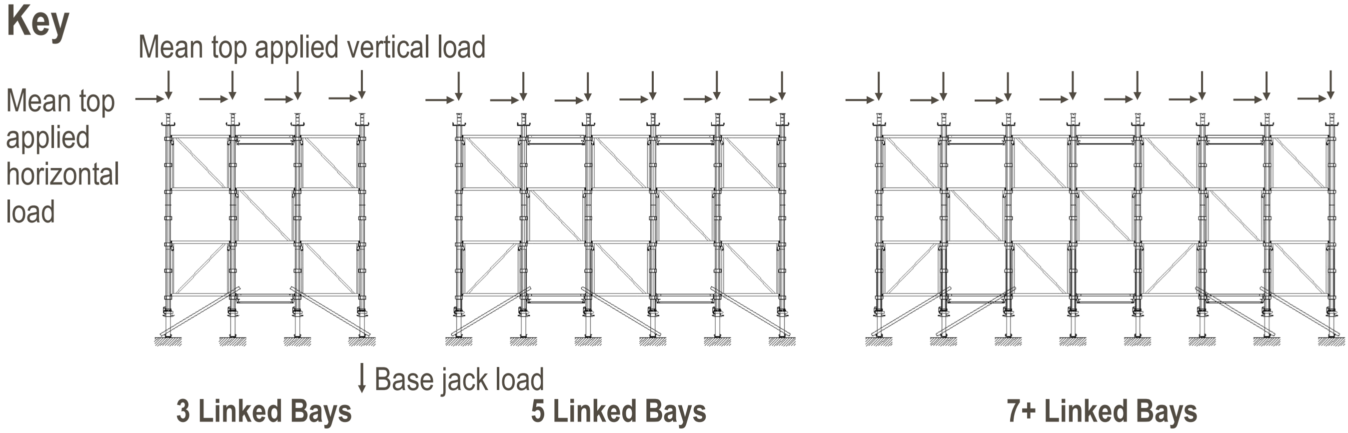
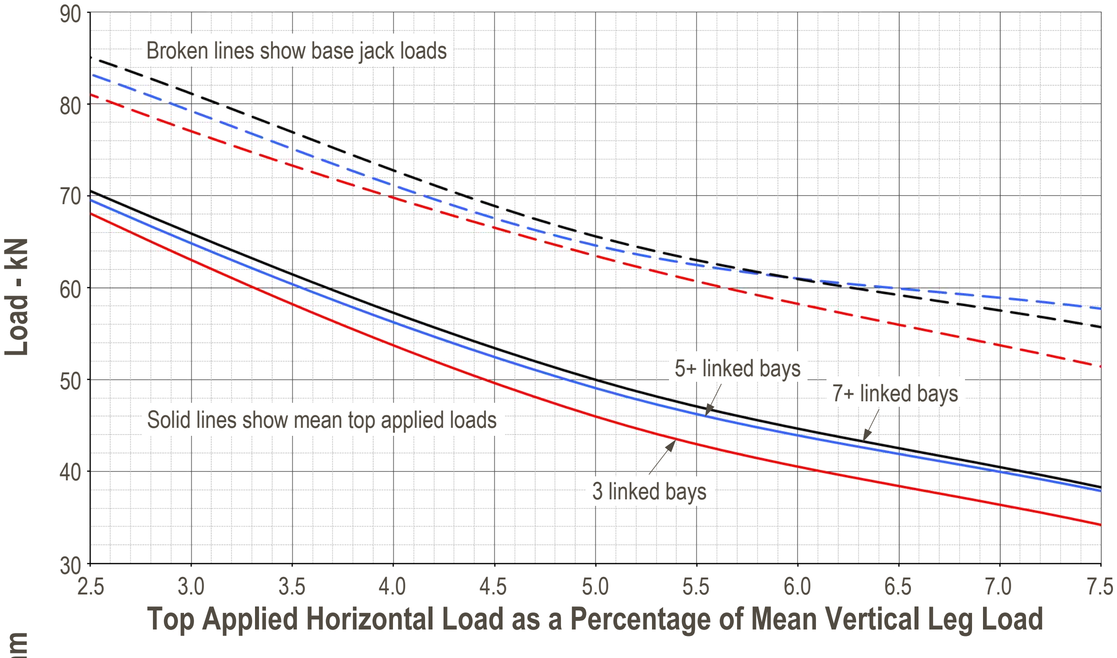
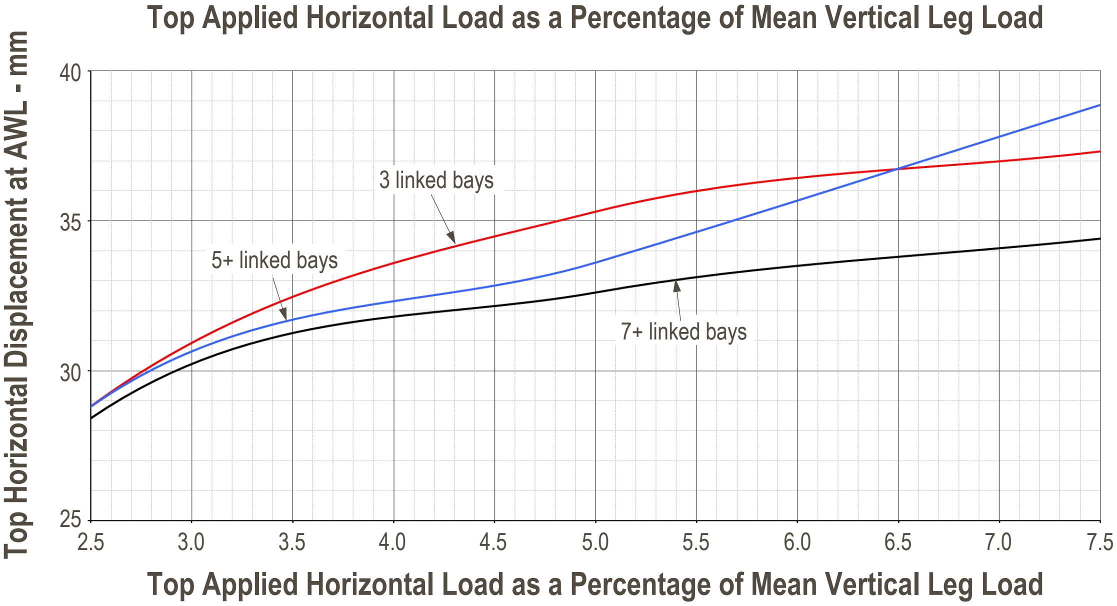


Freestanding 3 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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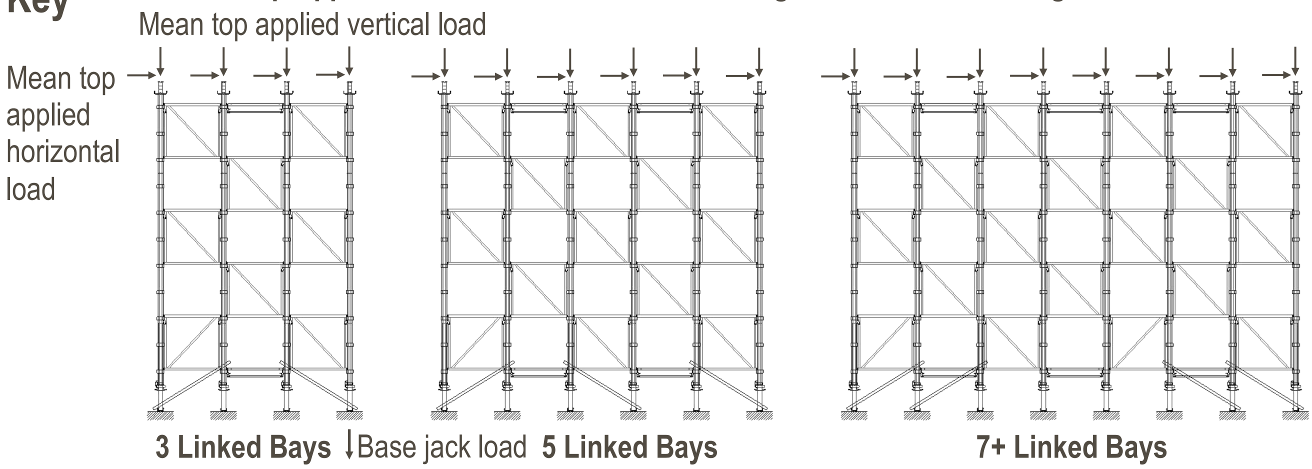
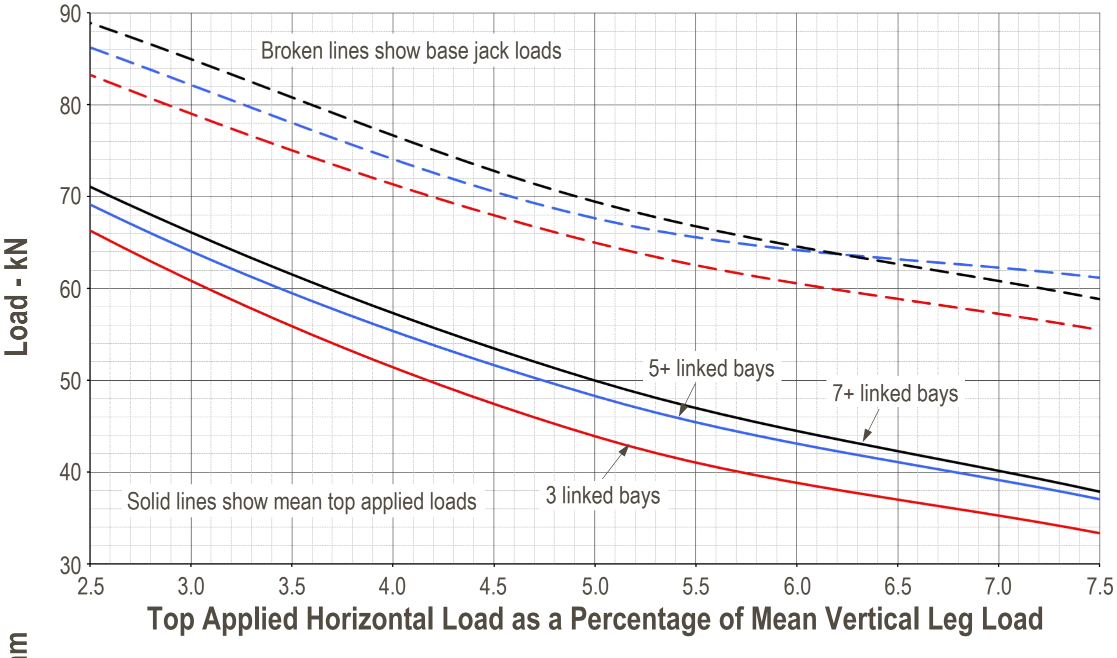
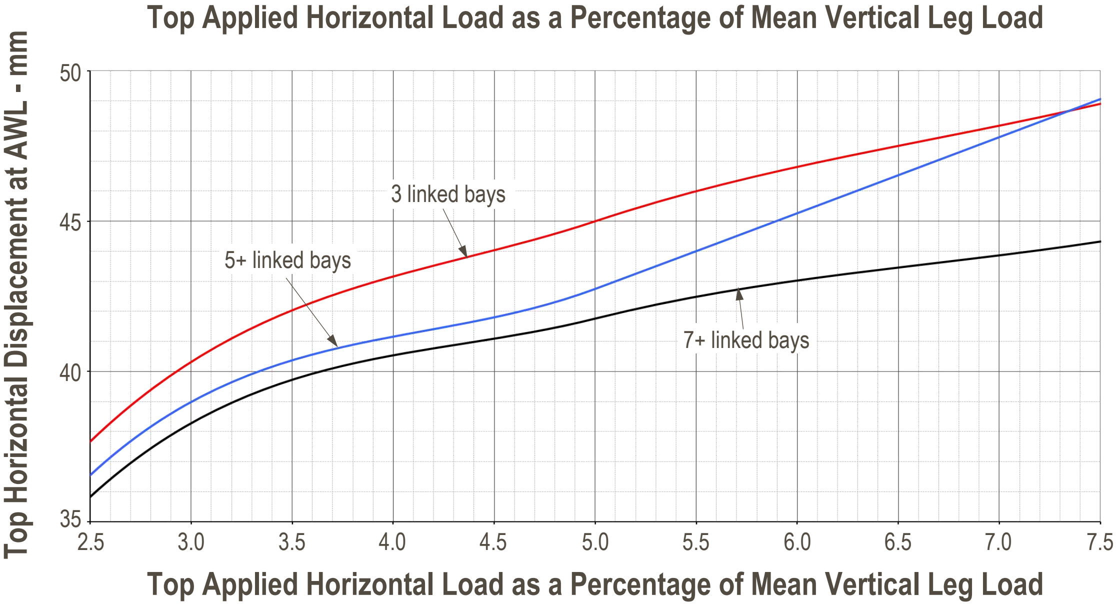


1002

Freestanding 4 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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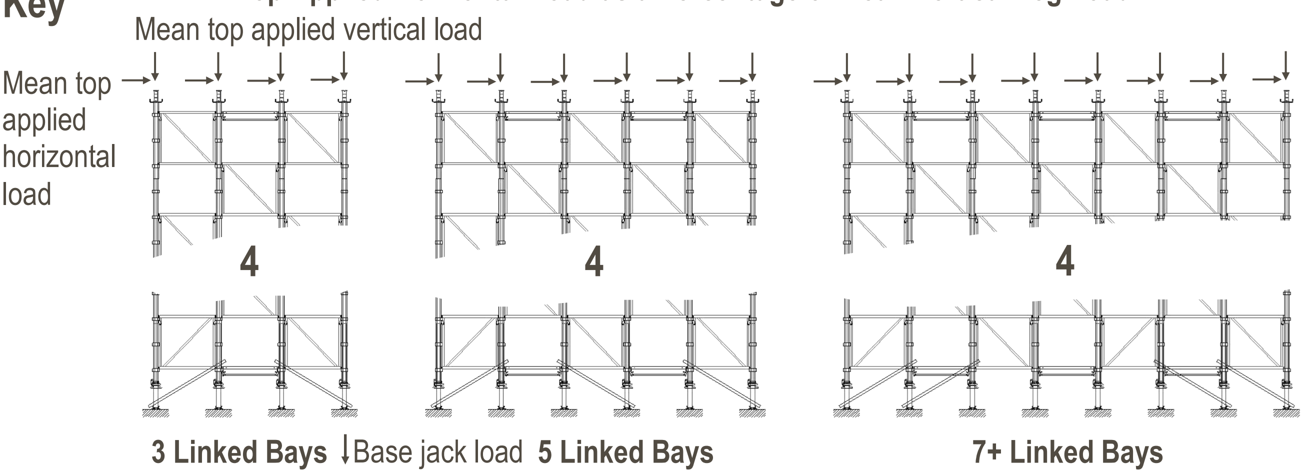
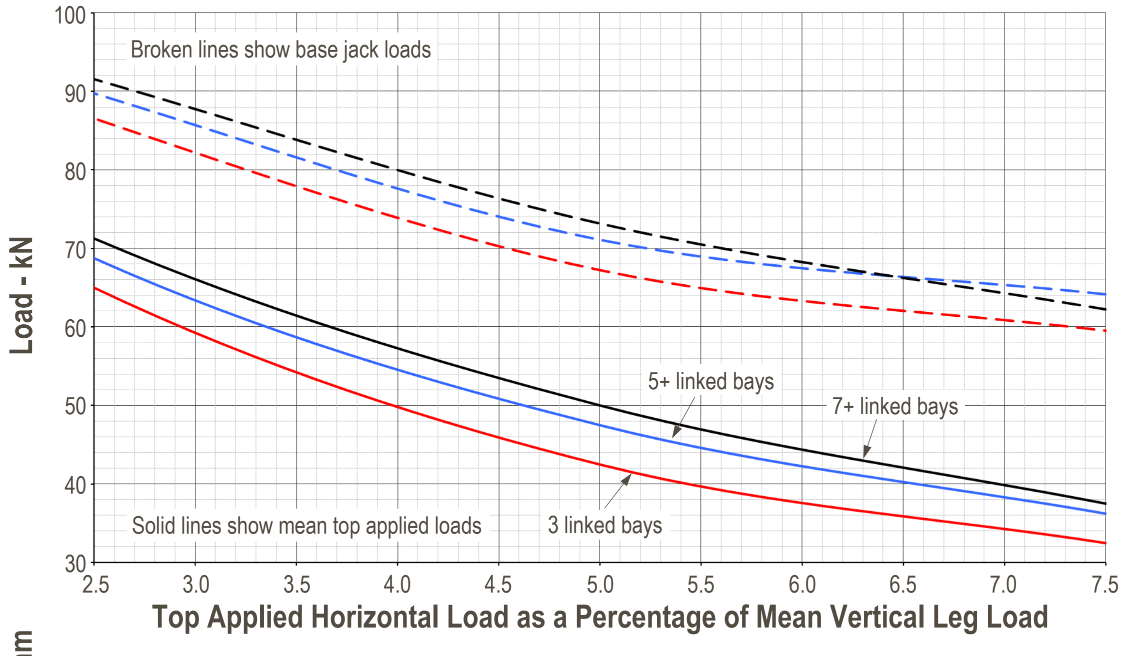
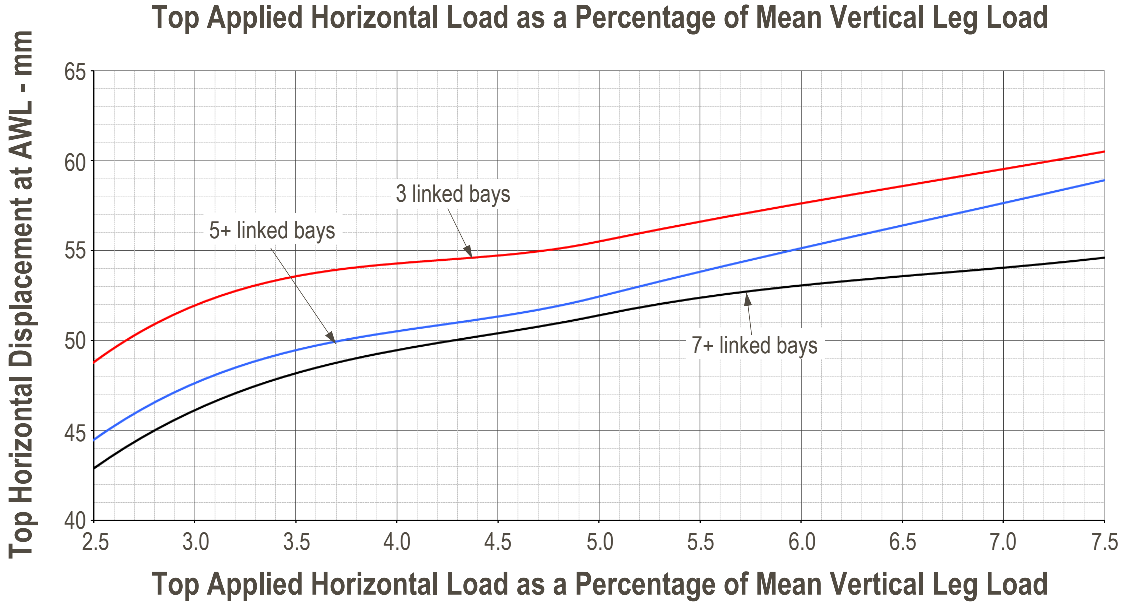


Freestanding 5 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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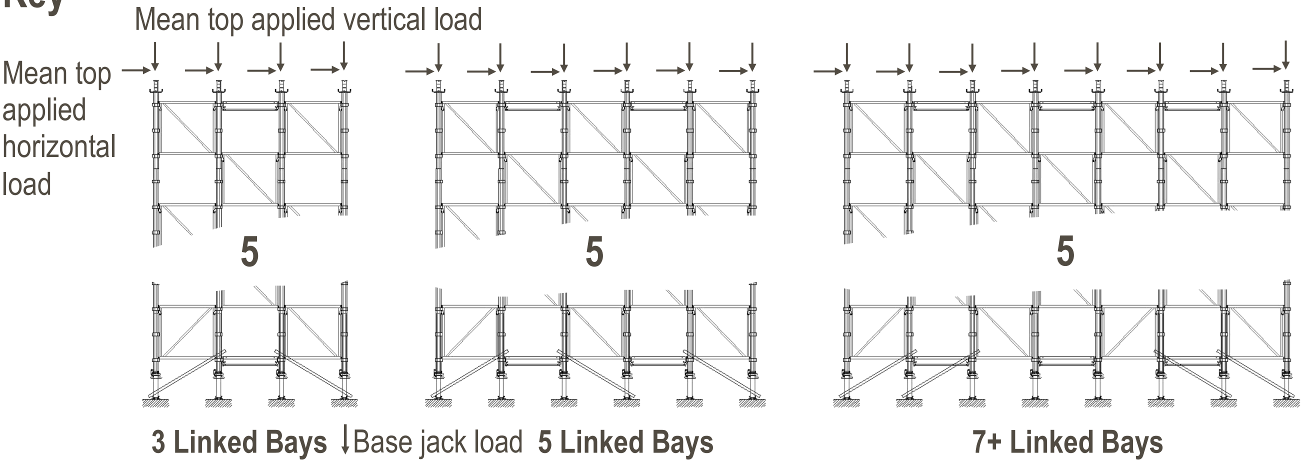
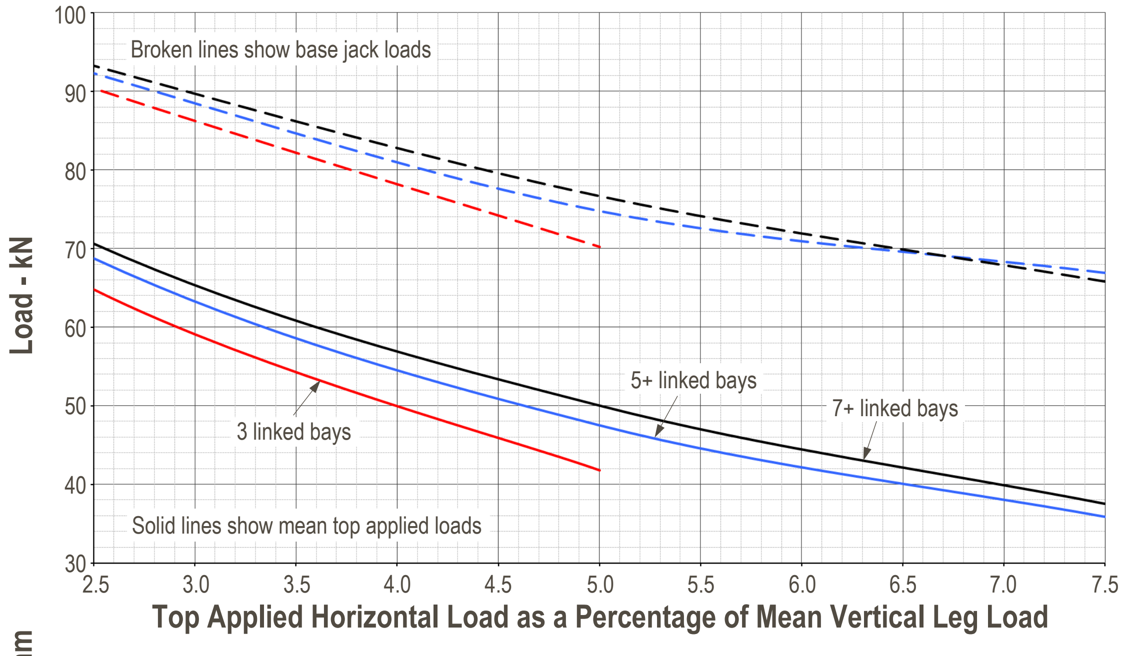
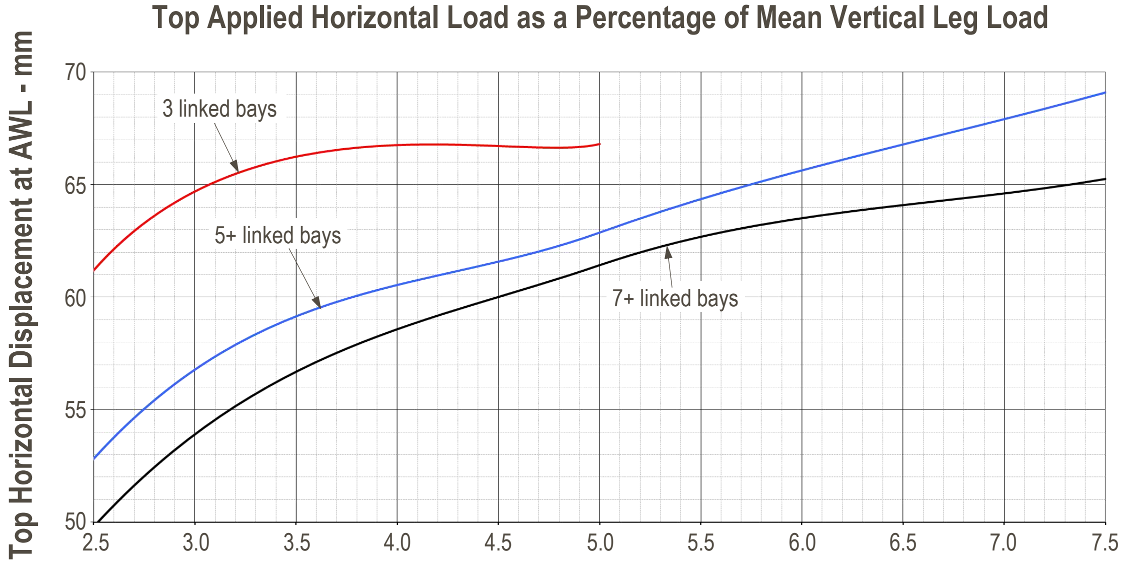


Freestanding 6 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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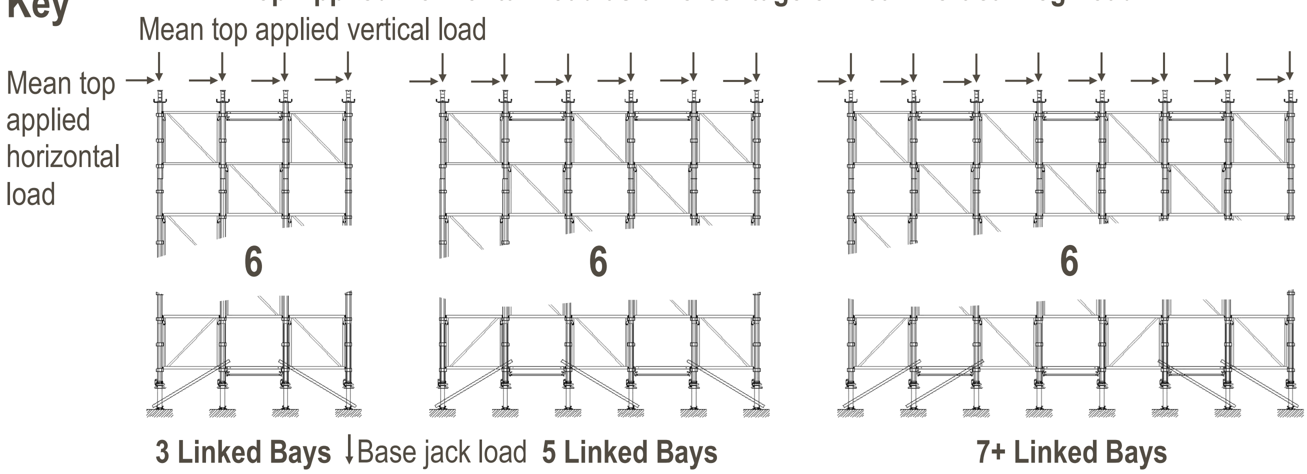
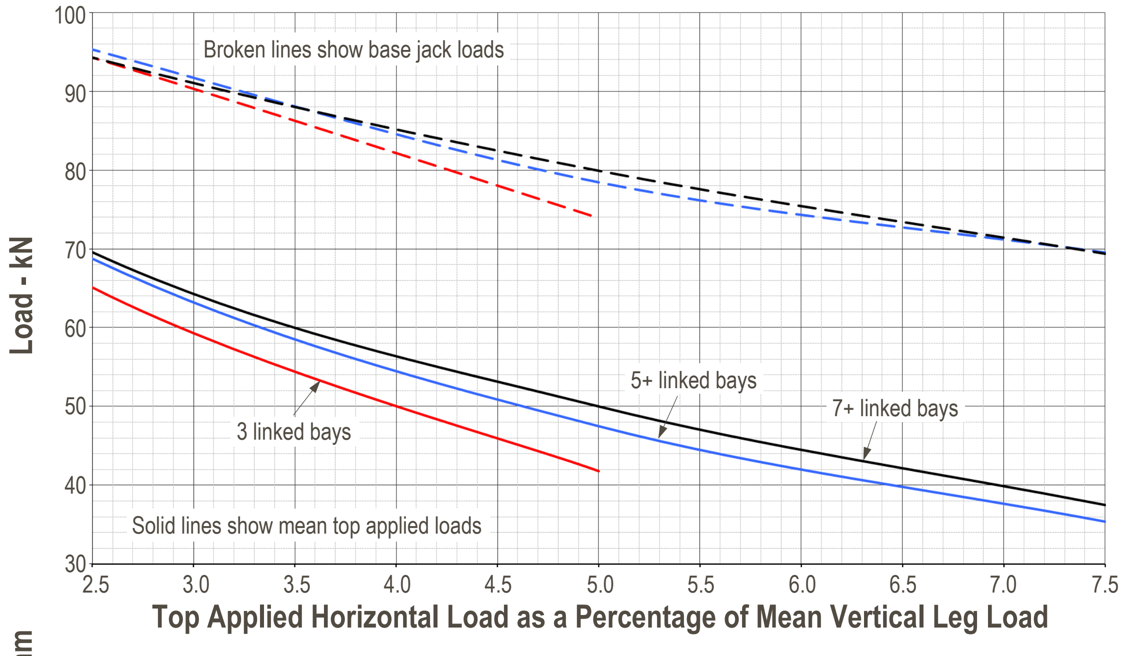
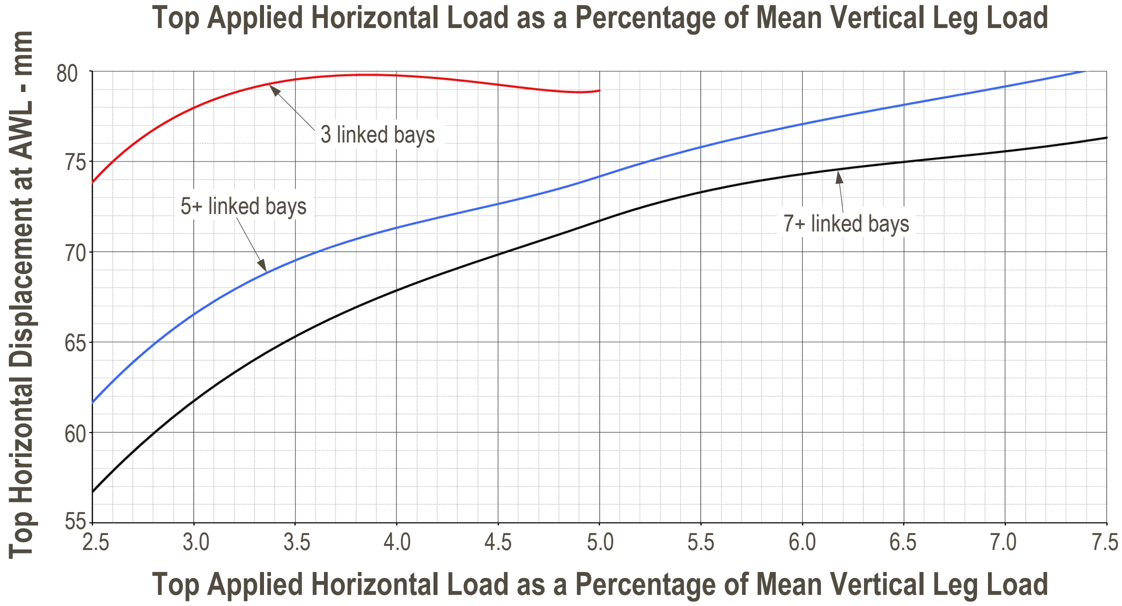


Freestanding 7 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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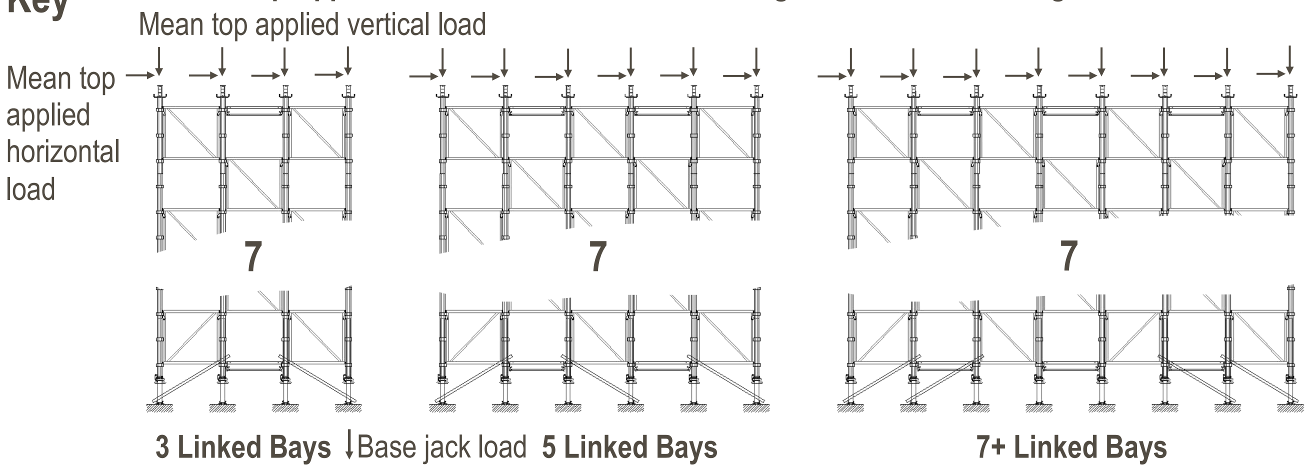
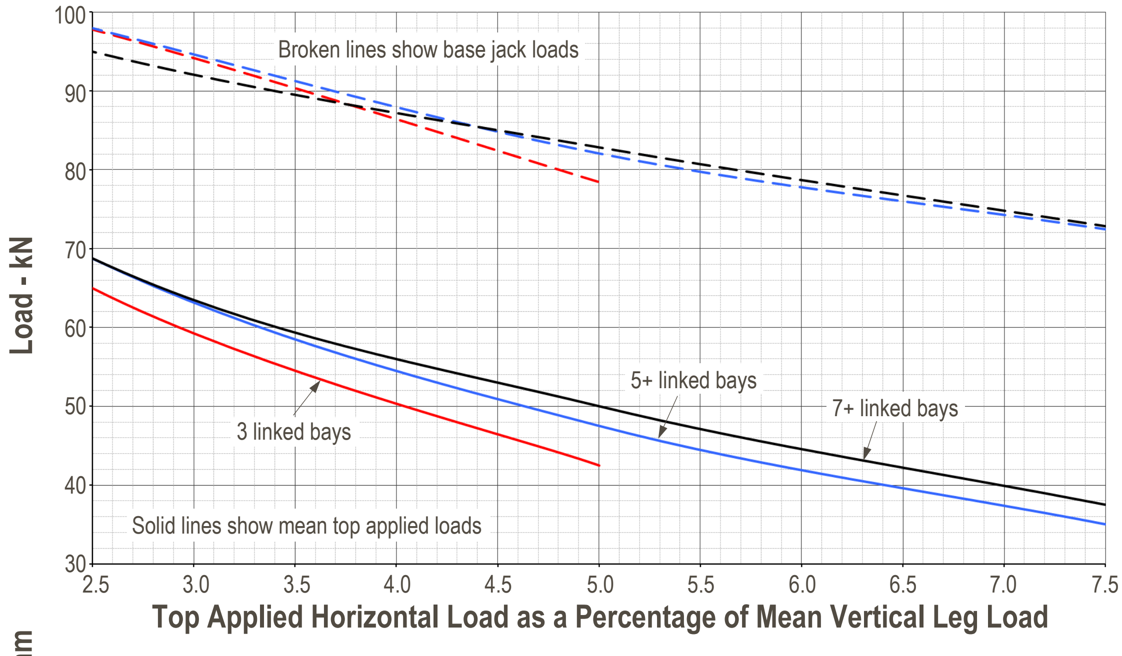
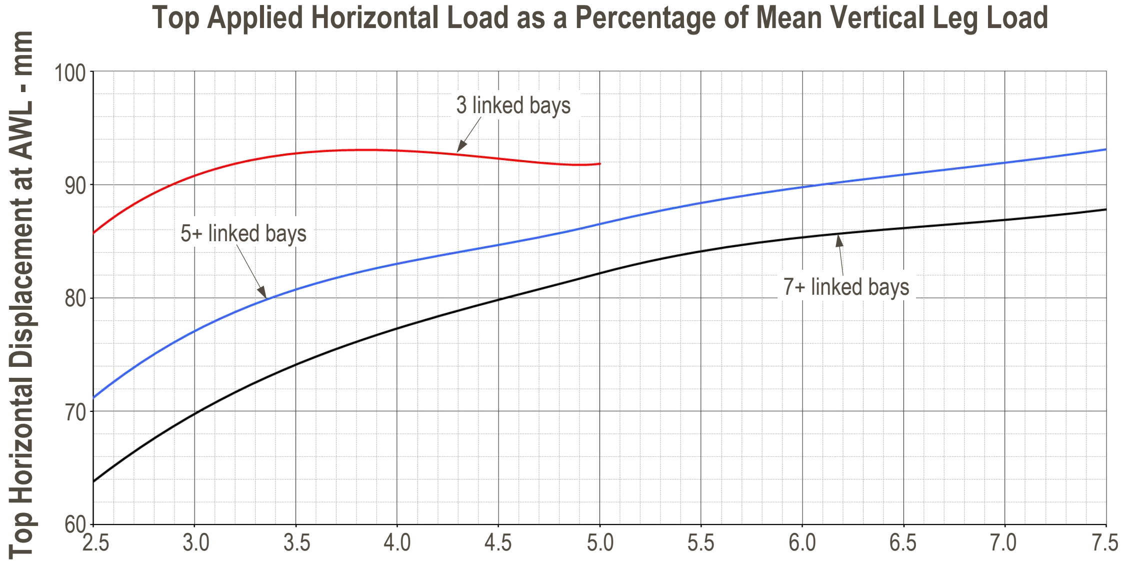


Freestanding 8 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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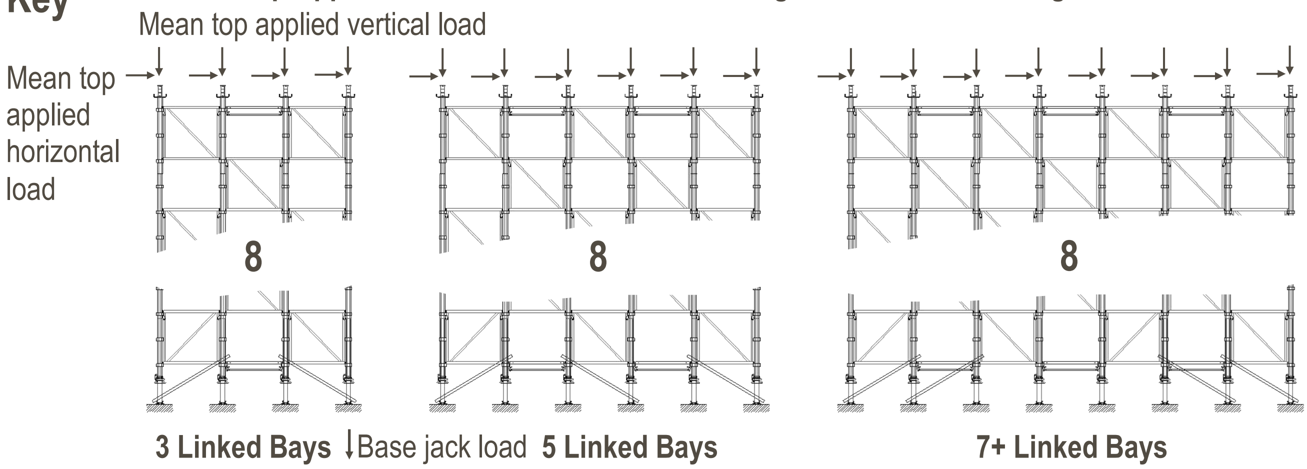
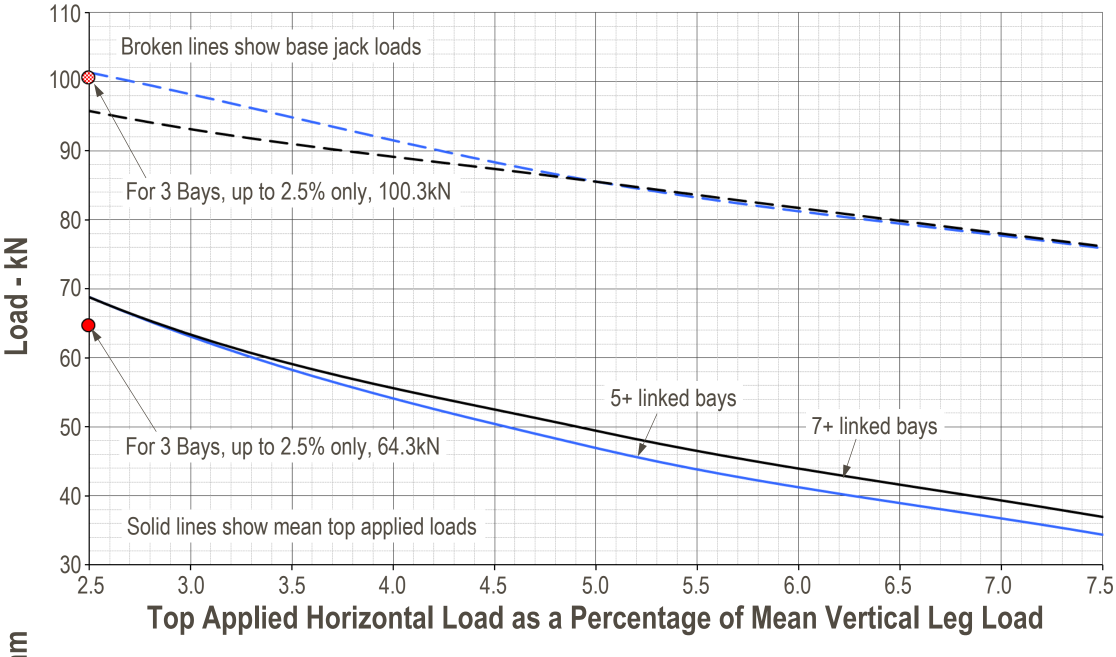
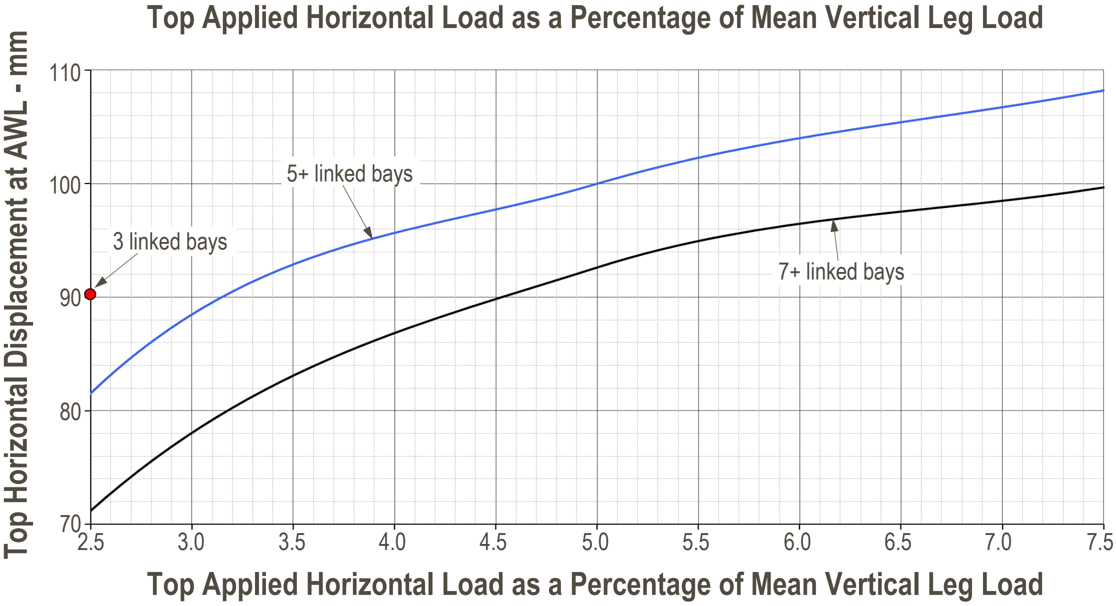


1007

Freestanding 9 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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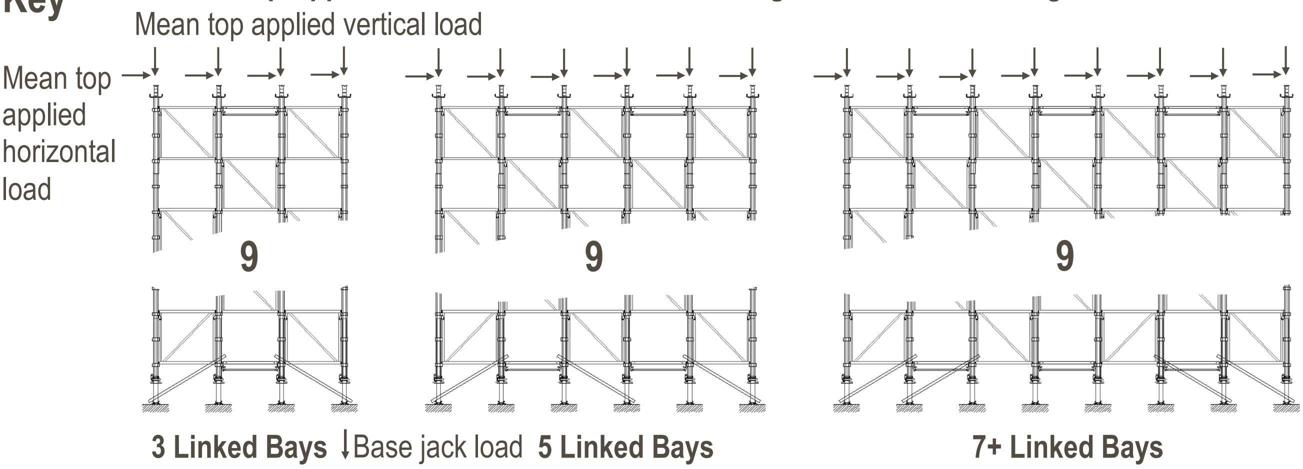
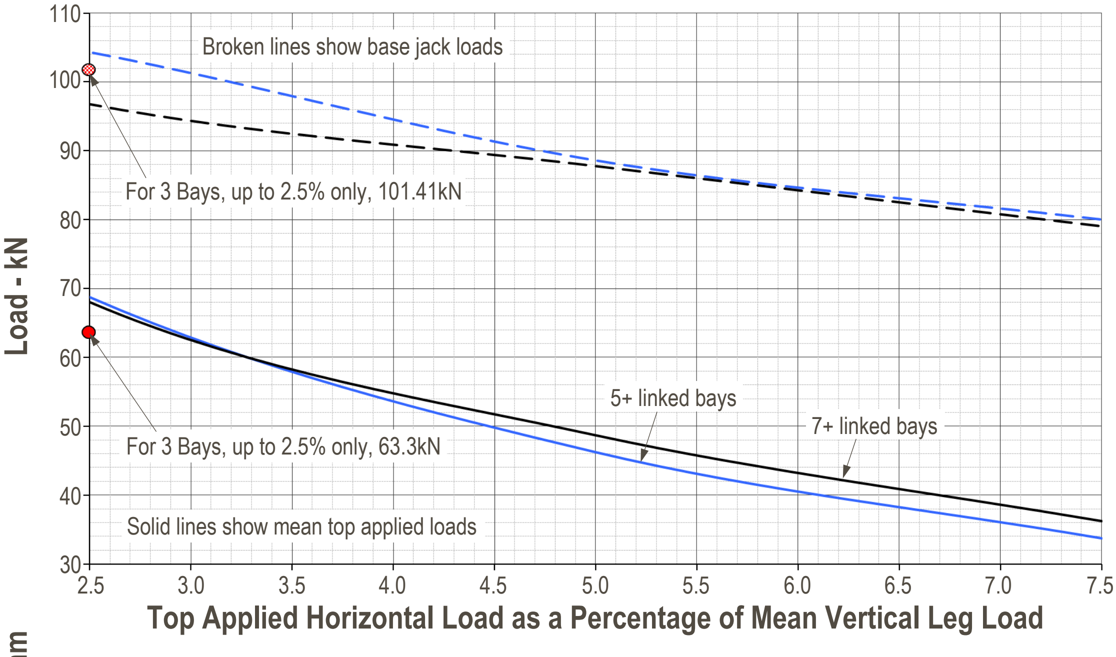
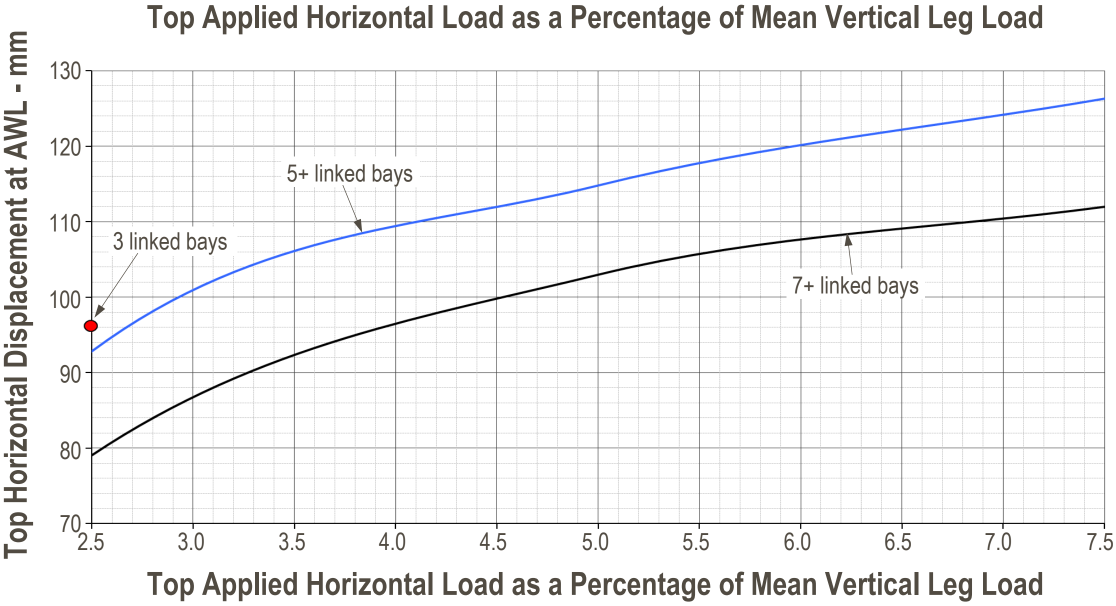


1008

Freestanding 10 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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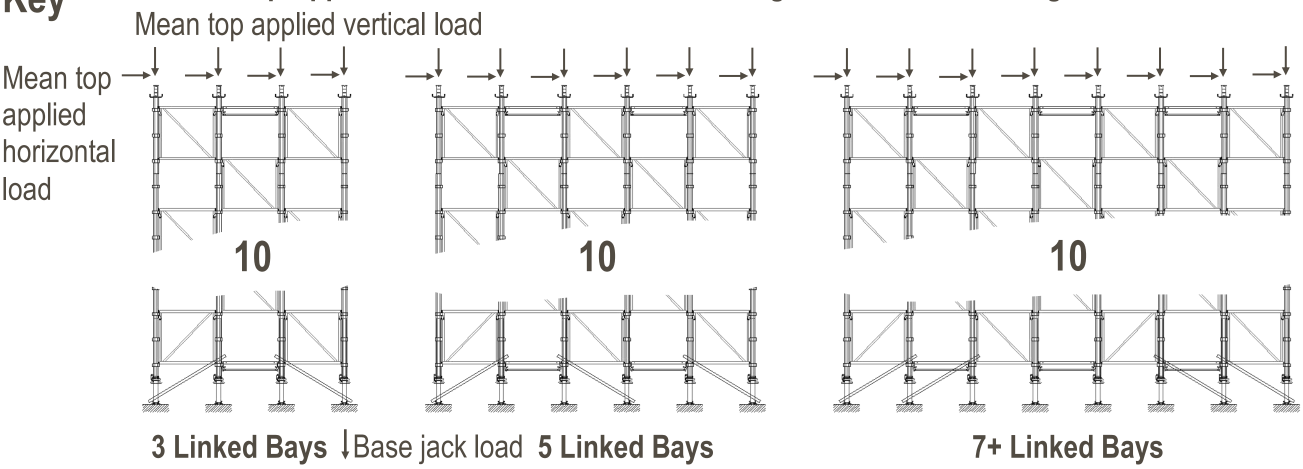
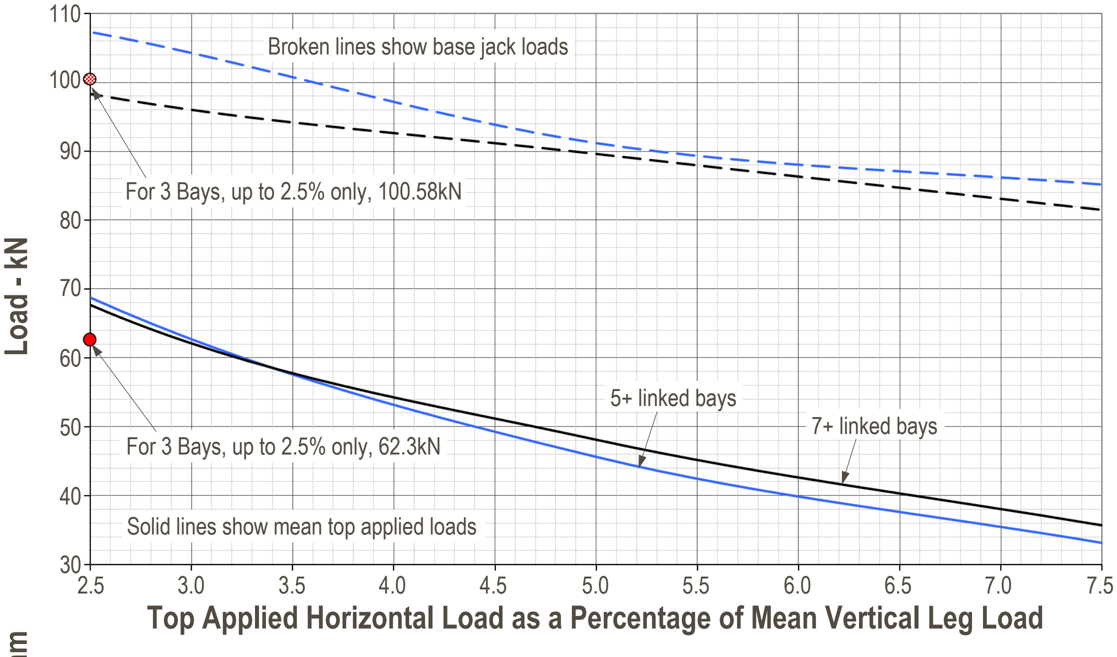
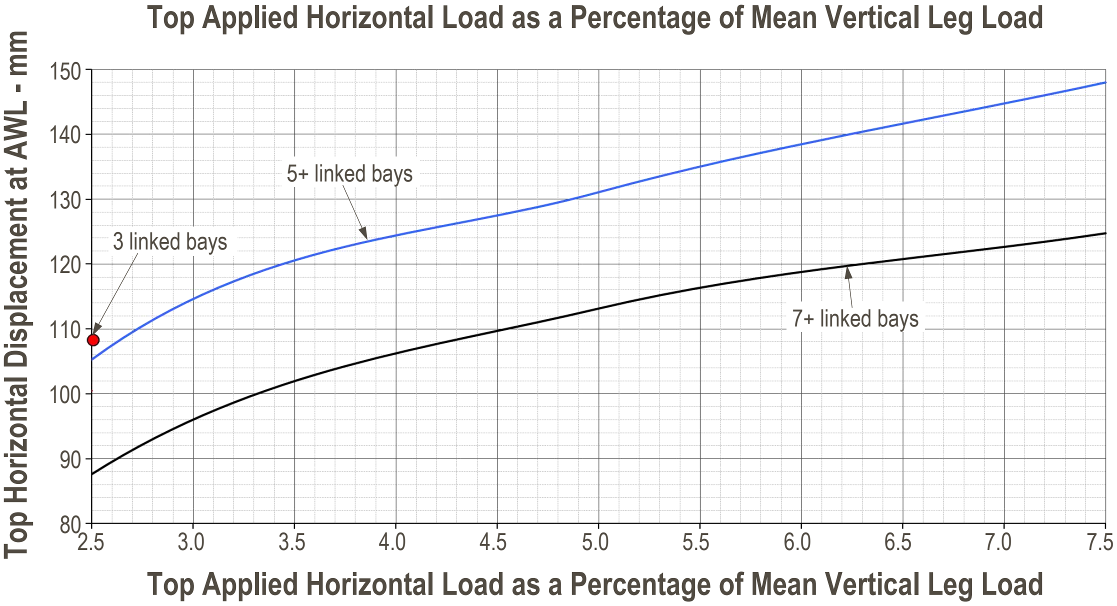


Freestanding 11 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension





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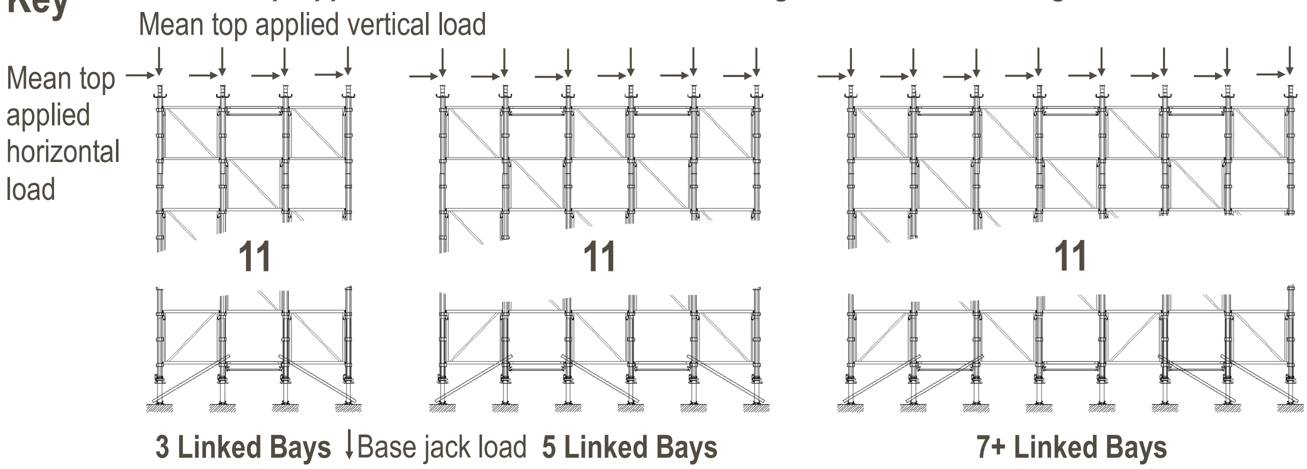

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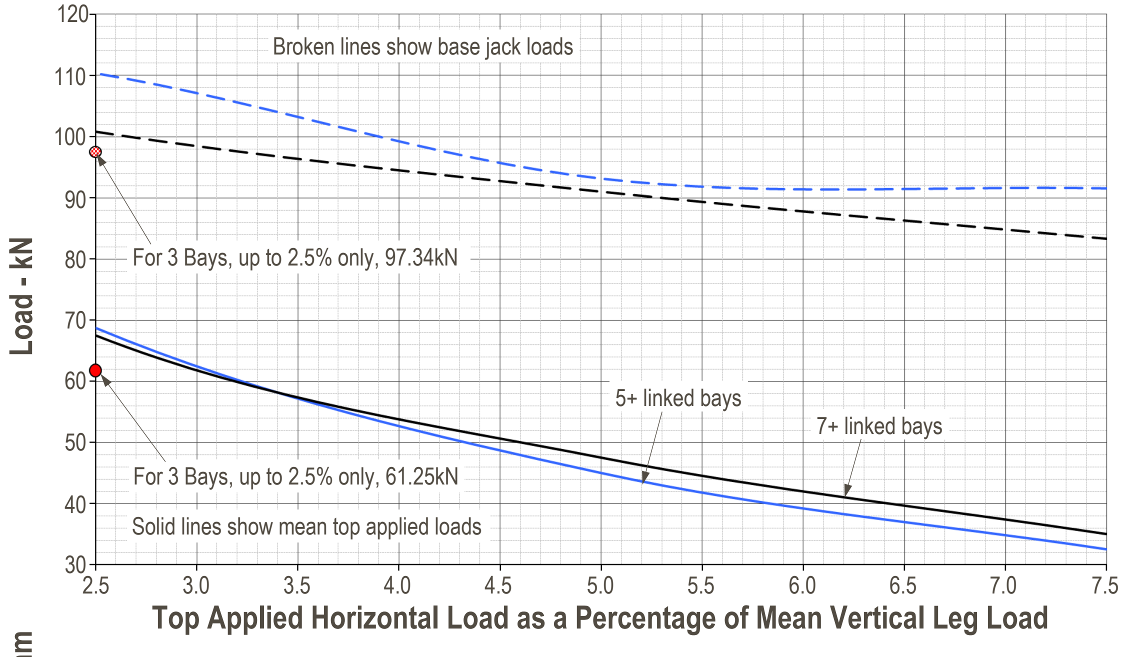
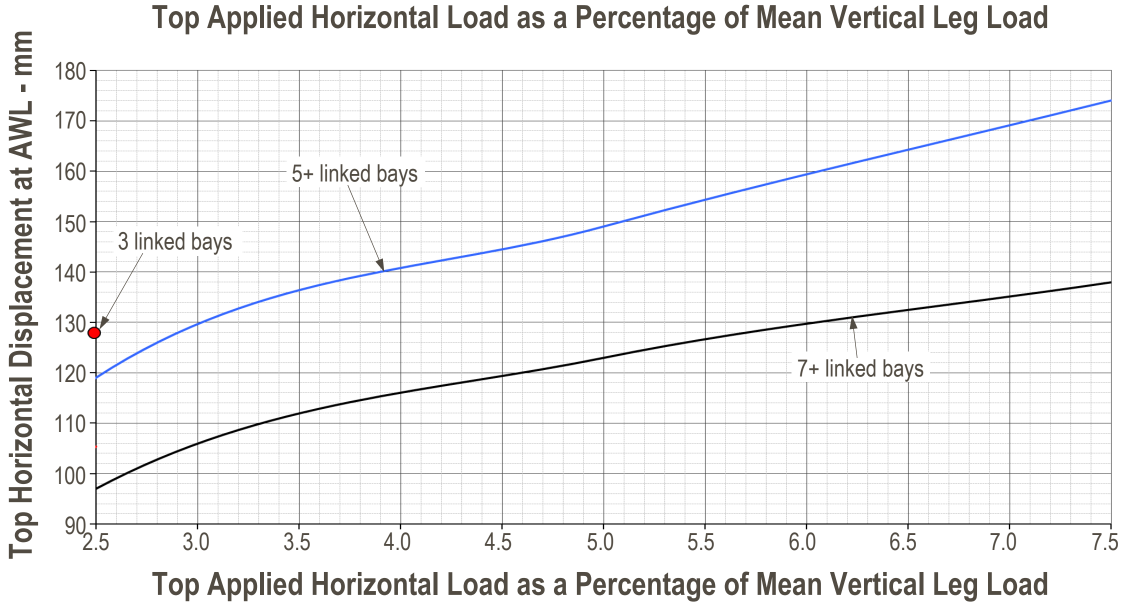
Freestanding 12 Frame High Linked Towers with 1m Staggered Frame Separation and Braced Base Jacks of Any Extension

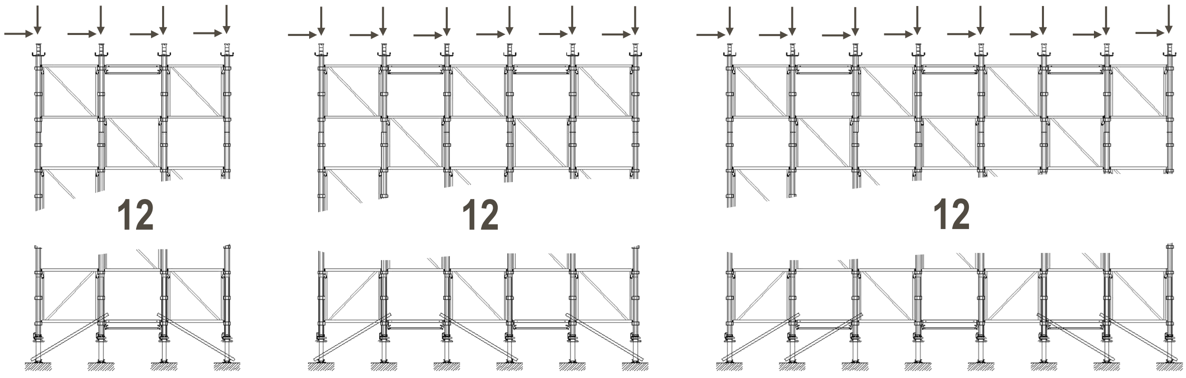




Key

Mean top applied vertical load

Mean top applied horizontal load



3 Linked Bays ↓Base jack load 5 Linked Bays 7+ Linked Bays

CDM Compliance - User Guides and Risk Assessments

For detailed user guidance regarding the use of Alshor Plus equipment refer to the following user guides and risk assessments as appropriate. Relevant documentation will be supplied to site with the delivery of equipment and on issue of Working Status drawings.

Equipment Gudance Notes:

- UIX10203 - Alshor Plus Falsework
- UIX10205 - Airodek Decking
- UIX10602 - Alshor Plus C-Frame
- UIX10606 - Alshor Plus Folding C-Hook
- UIX10604 - Alshor Plus Trolley
- UIX10605 - Flying Tables with Slings

Application Risk Assessments:

- UIX20200 - Falsework
- UIX20600 - Lifting Accessories

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