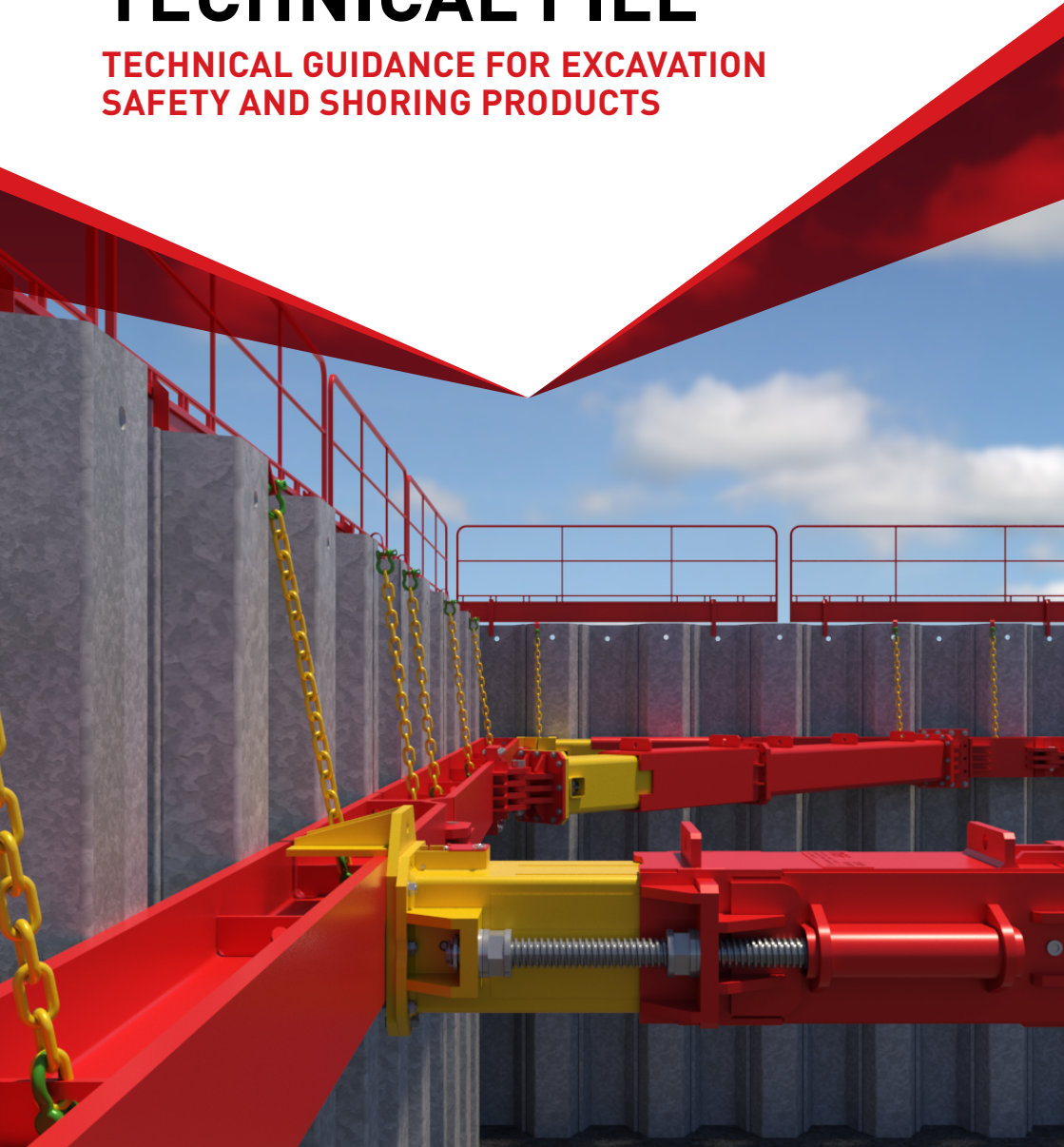




**NATIONAL
TRENCH SAFETY**
WHERE SERVICE MEETS EXPERTISE.

TECHNICAL FILE

**TECHNICAL GUIDANCE FOR EXCAVATION
SAFETY AND SHORING PRODUCTS**



HIGHLY VERSATILE, SIMPLE TO ASSEMBLE, HEAVY DUTY, MODULAR BRACING STRUT SYSTEM DESIGNED PRIMARILY TO BE USED AS INTERMEDIATE STRUTS WITH NTS 305 UC HYDRAULIC BRACING SYSTEMS.

The system can also be used in any plane to prop steel, concrete or masonry structures. Each strut comprises hydraulic ram assemblies together with various length strut extension bars. The system can support loads of up to 2500kN and span from 1.6m to approx. 24.5m. Components are very heavy and are normally assembled on site prior to being lifted into place and installed within the excavation using either large excavators or cranes. A variety of end bearings are available allowing the struts to be used at a wide range of angles.

Fabricated from grade S355 400x400 steel box section the extensions are quickly assembled into the required strut lengths using flanged plates c/w bolt, nut and washer assemblies. Final length adjustment is provided by a double acting hydraulic ram providing up to 800mm of stroke. In addition the hydraulic ram steel casing features a pair of high strength screw jacks to provide a mechanical lock-off, as a back up in the event of a hydraulic failure. Once located at the correct line and level the struts are pre-loaded against the faces to be supported using a hydraulic pump on the ram. Once the hydraulics have been pre-loaded the mechanical lock off on the steel casing can be engaged, ensuring an equal gap of up to 20mm is left between the steel casing and the locking nut. Preloading of the legs ensures the strut cannot slip, takes up any slack or hogging in the system and minimises the extent of potential ground movements. Handling points are provided at regular intervals on each leg to assist assembly / removal.

NTS can supply the systems with a full range of suitable handling chains, hydraulic pump installation kits (including bio-degradable shoring fluid and hydraulic hoses) and confined spaces regime equipment.

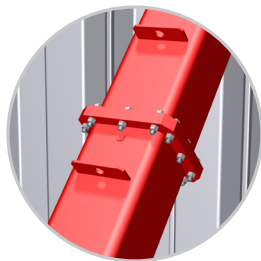
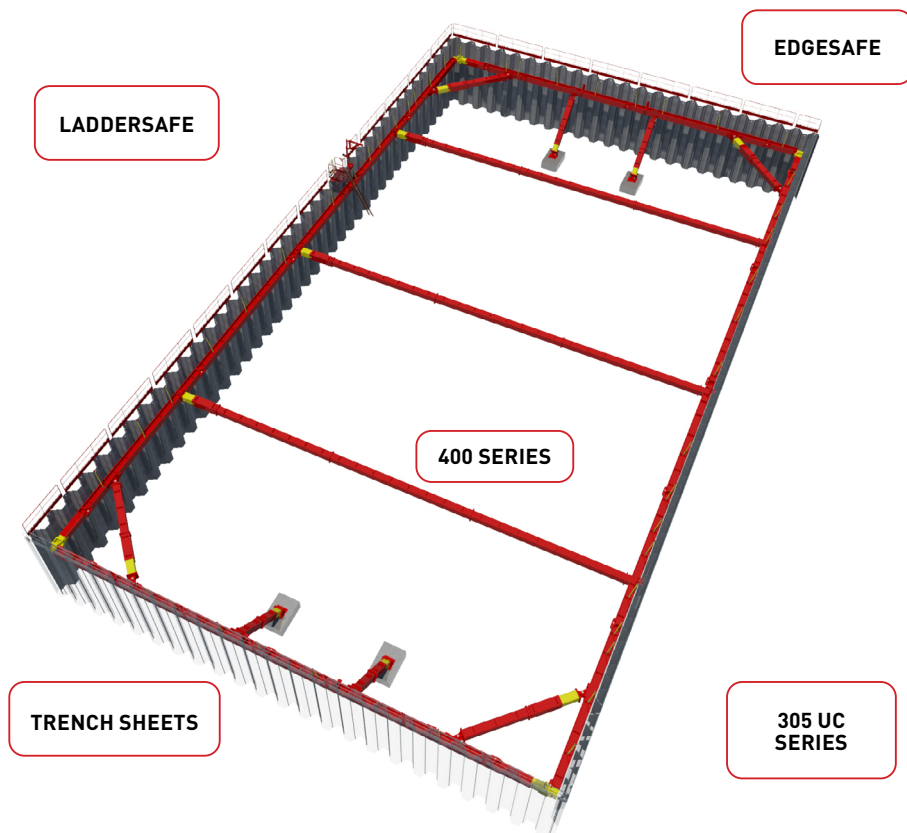
Manufactured and designed in accordance with BS EN 14653:2005 Parts 1 and 2 Manually operated shoring systems for groundwork support and BS 5975 (2019) Code of practice for temporary works procedures and the permissible stress design of falsework.

PRODUCT NOTES

1. Strut systems are very heavy and should only be assembled, installed and removed by competent persons in accordance with a site specific detailed design & installation sequence and NTS installation guidelines.
2. Installation is normally carried out by assembling the complete strut and then lowering into place (subject to crane / excavator capacity). Struts are normally long and unbalanced (due to the weight of ram / jack unit) and great care must be taken in preparing the lift / maintaining lift angle (tag lines strongly recommended). On the ram assembly max. pre-load pressure of 100Bar (1500psi) must not be exceeded unless design states otherwise.
3. Additional restraining chains or support brackets are normally provided to the brace at intermediate strut locations to carry the additional strut weight.
4. Ensure struts are fully pre-loaded or tightened, end fixings packed, all hydraulic ram isolation valves are closed and mechanical lock-offs are engaged prior to releasing the strut from lifting chains and commencing works. When assembling on site ensure that all pins and retaining clips are in place and secured and all flange plate bolts are installed and fully tightened / torqued with a minimum of two threads visible beyond the nut. Any gaps in bearing plates must be securely packed by using hardwood wedges or grout prior to final pre-loading of the hydraulic rams.
5. Both mechanical lock-off screws can now be moved to provide a gap of up to 20mm between the screw and steel casing (gap on both screw jacks must be the same). These act as a mechanical failsafe in the unlikely event of a hydraulic failure. Overall gap to be decided on a case by case basis, taking into account the extension of the hydraulic ram and any restrictions imposed on ground movement
6. Individual components should be visually inspected for damage, excessive deflection, loss of ram pressure prior to entering the excavation.
7. Safe access / egress, edge protection (for personnel) and barrier protection (for plant) should always be considered.
8. Prior to removal of systems the complete weight of the strut must be independently supported. Once this is accomplished the hydraulic rams must be released and retracted to avoid the need for excessive extraction forces.

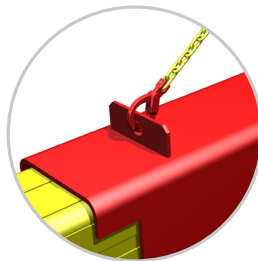


9. Prior to de-pressurising the hydraulic the mechanical lock-off must be fully unscrewed. If the hydraulic has compressed and is now bearing upon the screws then the hydraulic ram may require pressurising sufficiently to allow the mechanical lock-off to be undone by hand.
10. When installing struts at angles great care must be taken to ensure that the angles match the design, and all elements are supported / packed and capable of transmitting loads effectively.



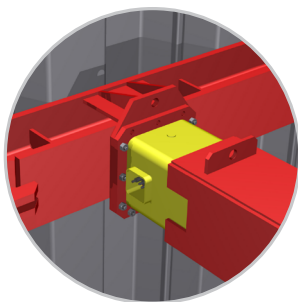
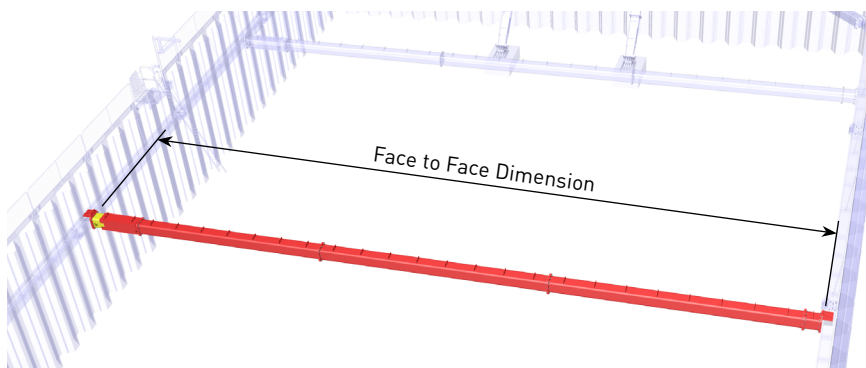
STRUT FLANGE CONNECTION DETAIL

400 Series Struts and extensions are connected to each other via a flange plate (520x520x30mm) using 12No. grade 8.8 M24x100 (min.) bolts c/w nuts and spring washers (recommended min. torque 400Nm).



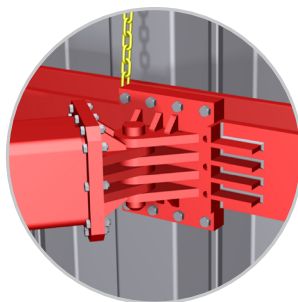
HANDLING POINT WLL = 7.0T

Strut assemblies are lifted and handled by attaching NTS lifting chains to the handling / restraining points as shown.



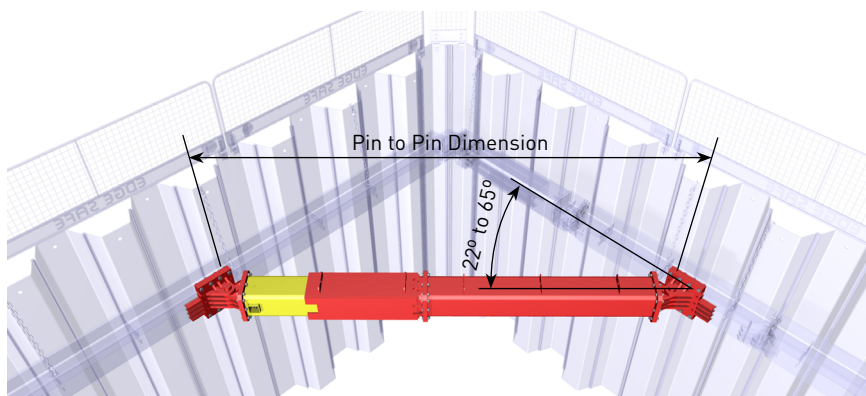
CLEAT END BEARING DETAIL

The end cleat is bolted to the strut or extension using 9No. grade 8.8 M24x100 (min.) countersunk bolts c/w nuts and spring washers. The cleat then sits on the UC section. When using this end detail, NTS recommend that restraining chains are used to lash the waler and strut together at each end to prevent the strut being dislodged if struck accidentally.

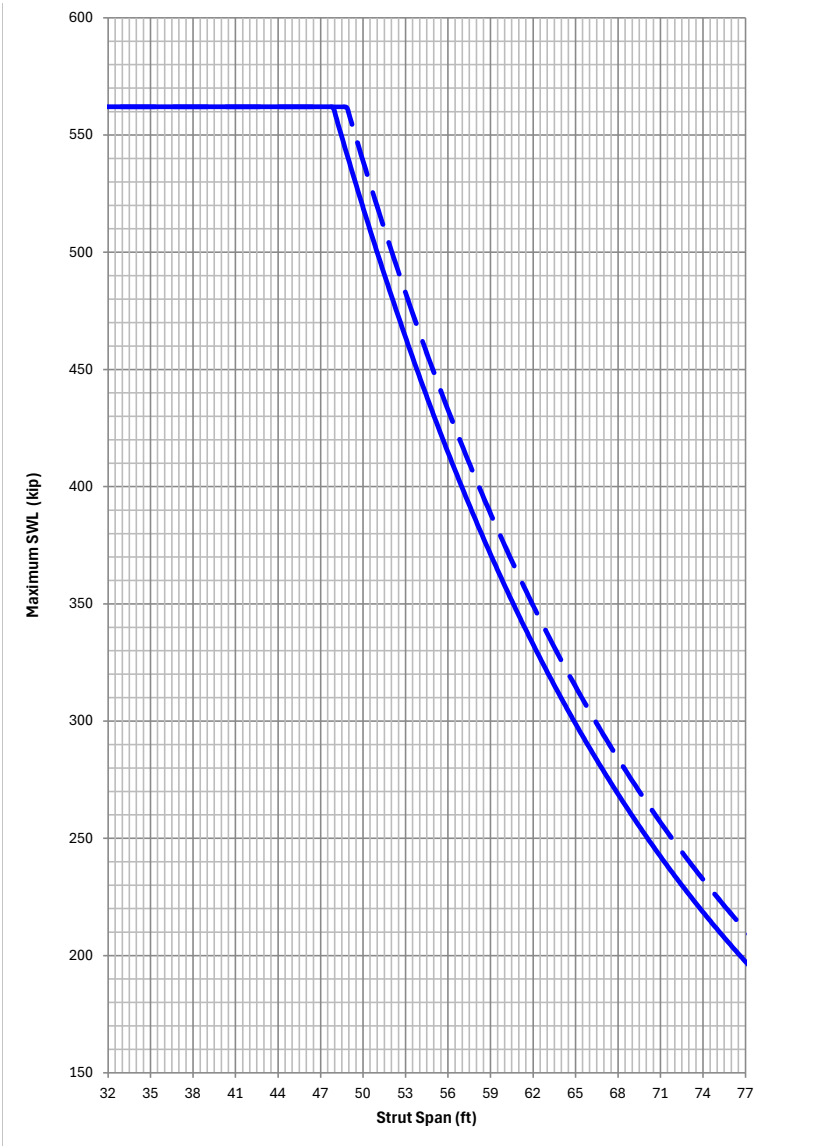


KNEE BRACE END BEARING DETAIL

The swivel is secured to the UC section using 2No. swivel clamps using 8No. grade 8.8 M30x140 (min.) bolts c/w nuts and washers.



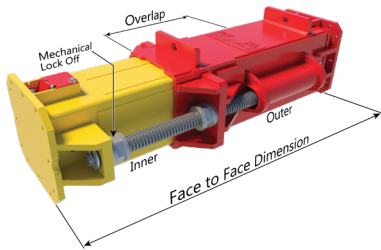
SAFE WORKING LOAD FOR NTS 400 SERIES (Kip)



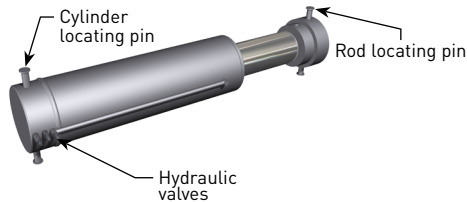
2500kN HYDRAULIC STRUT

- - - Axial load only
- Axial + 10kN accidental load

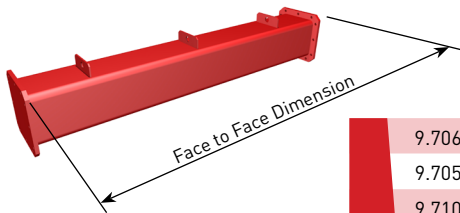
Curves include allowance for self weight deflection, eccentricity and fabrication tolerances.



2500kN Hydraulic Strut assembly comprises inner and outer sleeved steel box sections housing a double acting (DA) hydraulic ram to provide up to 800mm of leg adjustment.



Product ID	Product Description	Face to Face Dimension		Weight
		Min.	Max.	
		(mm)	(mm)	(kg)
8.500	2500kN Hydraulic Strut	1625	2425	1959



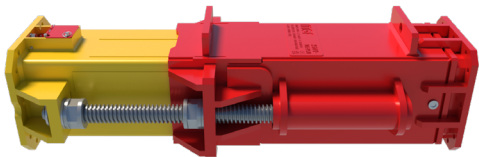
400 Series extension bars range in length from 0.25m to 10.0m and are connected to each other via 12No. grade 8.8 M24x100 (min.) bolts c/w nuts and spring washers.

		Product Description	Weight
			[kg]
Product ID	9.706	400 Series 0.25m Extension	165
	9.705	400 Series 0.5m Extension	214
	9.710	400 Series 1.0m Extension	310
	9.720	400 Series 2.0m Extension	505
	9.730	400 Series 3.0m Extension	697
	9.740	400 Series 4.0m Extension	889
	9.750	400 Series 5.0m Extension	1083
	9.760	400 Series 6.0m Extension	1275
	9.770	400 Series 7.0m Extension	1465
	9.780	400 Series 8.0m Extension	1849
9.799	400 Series 10.0m Extension	2048	

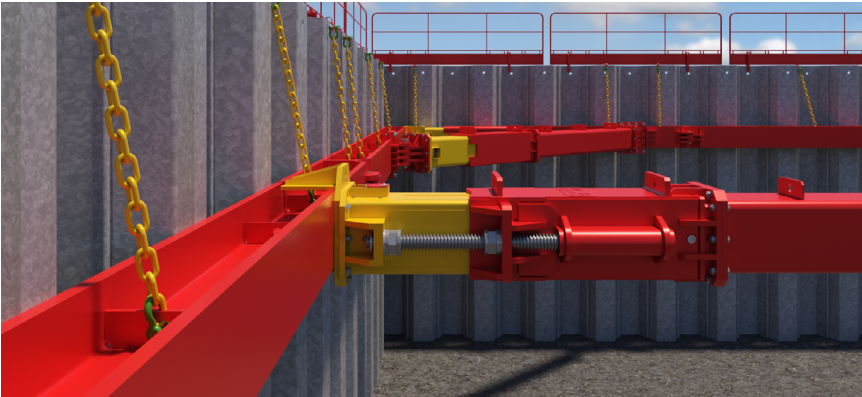


Extension Bar	Specification	400x400x16 SHS
	Material Grade	S355
	Unit Mass	191.0kg/m
	Axial SWL	2500kN
	Moment SWL	703kNm
	Joint Moment SWL	277kNm

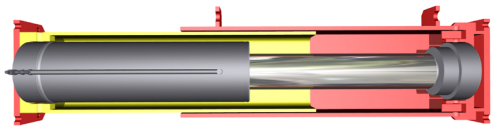
2500kN HYDRAULIC RAM



	Inner Section	Outer Section
Hydraulic Ram	Specification	400x400x16 SHS
	Material Grade	S355
	Unit Mass	191kg/m
	Axial SWL	2500kN
	Moment SWL	277kNm

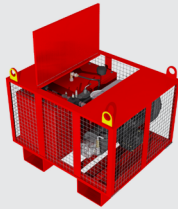
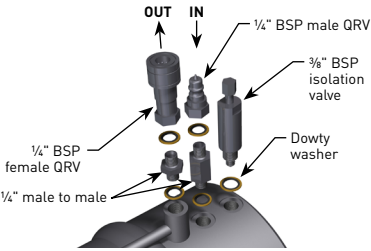


2500kN DOUBLE
ACTING HYDRAULIC
RAM ASSEMBLY



		2500kN Double Acting
Hydraulic Cylinder	Material	Steel
	Bore	250mm
	Max. Working Pressure	500 Bar (7250 psi)
	Test Pressure	500 Bar (7250 psi)
	Approx. Working Stroke	800mm
	Axial SWL	2500kN
	Min. FOS	2 (by test)
	Working Temp Range	-50°C to +50°C
	Approx. Pre-Load	500kN
	Approx. Pre-Load Pressure	100 Bar (1500 psi)
	Locating Pins	Ø30

Shoring fluid is pumped into the full bore side of the piston through the male quick release valve (QRV) to extend the ram. At the same time fluid from the return side of the piston is returned to the pump via the female QRV. Retraction is a reverse of extension. Ensure isolation valve is closed to maintain pre-load pressure and before release / connection of QRVs.

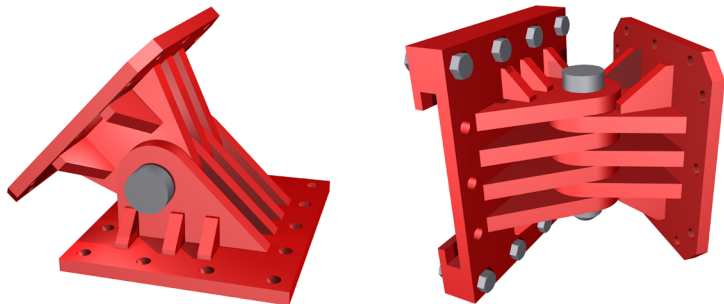


MOTORISED PUMP UNITS

The motorised pump is used to extend and retract the 400 Series double acting hydraulic rams. The pumps contain neat bio-degradable Houghto Safe SF25 shoring fluid. Maximum recommended installation pressure 1500 psi (100 Bar).

		Petrol Motorised Pump
Component	Product ID	8.4007 (DA)
	Fluid Capacity (L)	70
	Weight (kg)	270
	Shoring Fluid	Houghto Safe SF25
	Working Pressure (psi)	0-1500

2500kN TYPE A SWIVEL ASSEMBLY



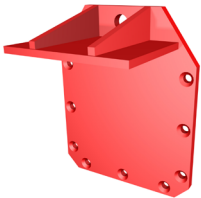
These swivels can be connected directly to concrete structures or 305 UC Brace systems by bolting on the associated clamp assemblies.

		Type A
400 Series Swivel	Product ID	9.704
	Weight	264kg
	Raking Prop Operating Range	22° - 40°
	Knee Brace / Cross Strut Operating Range	22° - 65°
	Axial SWL	2500kN
	Swivel Base Plate	500 x 600 x 30mm thk. (S355)
	Base Plate Hole Details	14 No. Ø32 holes
	Pin Detail	Ø90 (817M40 / EN24T)

400 SERIES ANCILLARIES

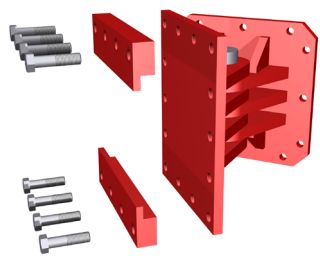
400 SERIES END SEATING PLATE

Component	Product ID	9.703
	Weight	102kg
	Material	30mm thk. flat, S275
	Bolting Details	9No. grade 8.8 M24x100 (min.) countersunk bolts c/w nuts and spring washers
	Bearing SWL	2500kN



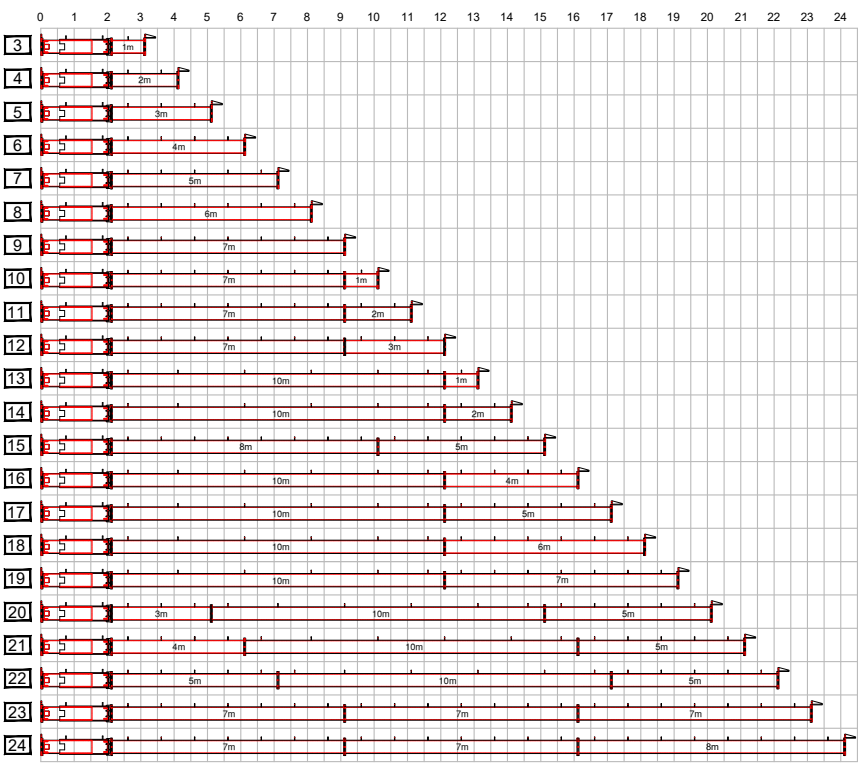
2500kN SWIVEL CLAMPING PLATES TYPE A

Swivel Clamp Type A is to be used on 3500kN Swivel Type A, when used on a knee brace connected to 305 UC.



		Swivel Clamp Type A
Component	Product ID	8.303
	Weight (kg)	34
	Material	30mm & 25mm thk.
	Bolting Details	8No. grade 8.8 M30x140 (min.) bolts c/w nuts and washers
	Bearing SWL	2500kN

400 SERIES RECOMMENDED EXTENSION COMBINATIONS



N.B. Single 0.25m and 0.5m extensions should be added to these combinations for intermediate dimensions. The strut assemblies are shown at mid-stroke, so each length can vary by up to 400mm in either direction.

	2500kN Hydraulic			
	Min. Length	Max. Length	Leg Weight	
	(mm)	(mm)	(kg)	
Face to Face Dimension (m)	3	2685	3485	2269
	4	3685	4485	2464
	5	4685	5485	2655
	6	5685	6485	2848
	7	6685	7485	3042
	8	7685	8485	3232
	9	8685	9485	3424
	10	9685	10485	3734
	11	10685	11485	3929
	12	11685	12485	4121
	13	12685	13485	4317
	14	13685	14485	4512
	15	14685	15485	4702
	16	15685	16485	4896
	17	16685	17485	5090
	18	17685	18485	5280
	19	18685	19485	5472
	20	19685	20485	5787
	21	20685	21485	5979
	22	21685	22485	6173
	23	22685	23485	6354
	24	23685	24485	6740