



## MP150 Hydraulic Strut



### Important Notes

All excavation work must be thoroughly planned and a risk assessment completed before work commences on site.

These instructions form guidance for the MP150 Strut. All stages of assembly, installation, pressurisation and removal must be supervised by a Groundforce engineer.

The equipment used in this manual must not be modified in any way without the express permission of Groundforce

All contractor's personnel involved the use of this equipment must be fully briefed and adequately supervised by a competent person.

All hires for this equipment will be accompanied by a scheme specific general arrangement drawing. This must be read in conjunction with these instructions.

**THIS USER GUIDE IS NOT CONTROLLED WHEN PRINTED**



A 3D video animation showing hydraulic strut typical installation methodology is available to [watch now](#) on our YouTube channel.

**IF IN ANY DOUBT SEEK FURTHER ADVICE:  
ON FREEPHONE - 0800 000 345**



Certification Number 14419  
ISO 9001 • ISO 14001 • ISO 45001

Rev	Date	Comments	Initial
2.3	19-05-23	Lock-off Valve tightening comments added	DSW








Groundforce, Central House,  
Beckwith Knowle, Otley Road,  
Harrogate, HG3 1UD




T: 0800 000 345  
E: [info@vpgroundforce.com](mailto:info@vpgroundforce.com)

## SAFETY

### Common Symbols and Meanings

**Safety Note:** It is recommended that hand and eye protection is used when operating hydraulic equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)	
	Use eye protection
	Use hearing protection
	Wear protective gloves
	Wear head protection
	Wear protective footwear

WARNING SYMBOLS	
	General warning
	Crushing of hands
	Hot surface or oil

## Introduction

The MP150 is a modular format medium-duty hydraulically activated strut consisting of a hydraulic ram unit with a 1100mm stroke for fine length adjustment. Swivel end bearing units allow for various strutting alignments within an excavation with or without waling beams.

Using extension pieces, the MP150 has a practical operating range of 3.6m to 20.0m without intermediate support and can withstand working loads up to 150 tonnes.

The hydraulic extension and retraction of the ram is made using a hand operated or motorised pump with two hoses connected to the ram via quick release couplings located to one side of the hydraulic unit. **Note:** this equipment should only be in the temperature range -20°C to +40 °C unless otherwise stated.

## Equipment Identification

### Important Note on Motorised Pumps

It is important to note that there are two types of motorised pump that may be delivered to operate with MP150 systems. One type of pump is operated using 'Shoring Fluid' and the other is operated using 'Hydraulic Oil'. **IT IS ESSENTIAL THAT THE CORRECT FLUID IS USED FOR EACH TYPE OF PUMP.** Using the wrong fluid or swapping between types of pump may cause irreparable damage. Typically, the Hydraulic Oil version will be used in very cold environments. For identification of each type of pump, see images below:

**Note:** For details on use of each type of Motorised Pump, see the relevant user guide which you can [download as a pdf](#) from the GF Technical Library.

### Shoring Fluid Model



The Shoring Fluid Motorised Pump is housed in a **YELLOW CAGE**

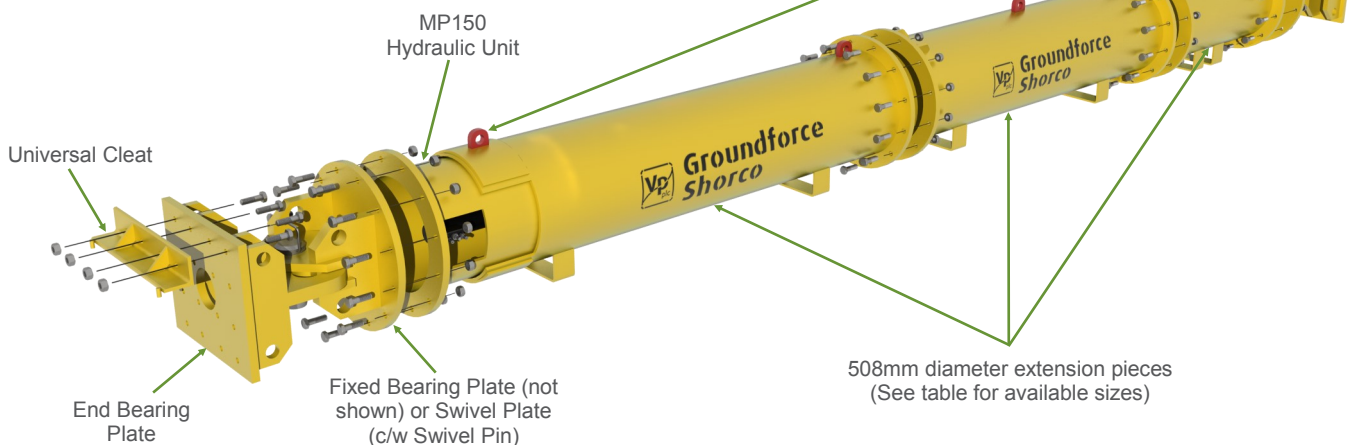
### Hydraulic Oil Model



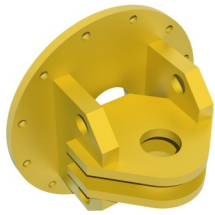
The Hydraulic Oil Motorised Pump is housed in a **BLUE CAGE**

Only lifting points are painted red, handling points are yellow

### General Arrangement of the MP150 Strut Components



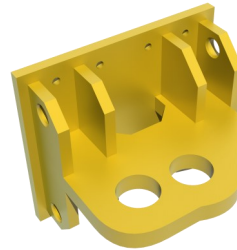
## Equipment Identification Cont...



Bolted Flange Swivel Plate  
(including Swivel Pin)



Multi-Angled  
End Bearing Plate



End Bearing Plate



Universal Cleat

## Equipment Specification

Item Code	MP150 Components	Weight (kg)
HS150.HU	MP150 Hydraulic Strut Unit	1450
HS150.HUL	MP150 Hydraulic Strut Unit (L/O)	1385
HS150.EBP	MP150 Hyd Strut End Bearing Plate	200
HS150.FP	MP150 Hyd Strut Bltd Flge Swvl Plate	180
HS.150MABP	MP150 Multi Angle End Bearing Plate	165
HS125.UC	MP150 Hyd Strut Universal Cleat	10

Item Code	MP150 Extensions	Weight (kg)
HS150.EX05	MP150 Hyd Strut Extn 0.5m	160
HS150.EX1	MP150 Hyd Strut Extn 1.0m	260
HS150.EX2	MP150 Hyd Strut Extn 2.0m	445
HS150.EX4	MP150 Hyd Strut Extn 4.0m	870
HS150.EX8	MP150 Hyd Strut Extn 8.0m	1610

## Notes on Lifting and Handling

**MP150 components are very heavy.** It is essential to have a detailed lifting and installation/removal plan in place prior to commencing work. Components must be lifted from the correct lifting points provided. All lifting equipment must have current test certificates and appropriate working load limit values.

**Note:** The weight of an assembled strut is concentrated towards the end incorporating the hydraulic unit. The slinging positions should be adjusted by trial lifts until a near horizontal lift is achieved. Consideration must be given to the capacities of the individual lifting points welded to the equipment when preparing the lifting plan.



**Safety Note:** It is ultimately the responsibility of the user to provide a safe method of access to and egress from excavations.



- Prepare a detailed lifting plan
- Ensure adequate capacity of the lifting equipment
- Know the weight of the load
- Adjust slings so that struts are lifted horizontally
- Ensure the lift angle of chains is not exceeded
- Do not exceed the capacity of individual lifting points

- Use clear and precise hand signals
- Be aware of personnel in the vicinity
- Use tag lines to control load
- Ensure all lifting equipment has valid certification
- Do not use damaged lifting points
- Report damaged lifting points and equipment



**Safety Notes:** Extreme care and adequate precautions must be taken to prevent trapping fingers throughout all stages of work.

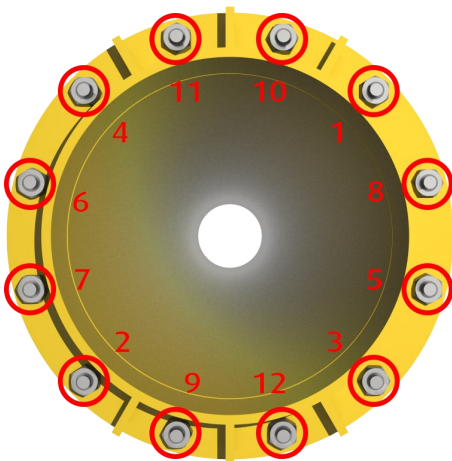




## Range and weight chart (standard configurations)

STRUT REF.	OPERATING RANGE (m)		WEIGHT (kg)	STRUT LENGTH BETWEEN BEARING FACES (m)																		
	MIN.	MAX.		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
0	3.55	4.7	2235																			
1	4.55	5.7	2460																			
2	5.55	6.7	2600																			
3	6.55	7.7	2825																			
4	7.55	8.7	2890																			
5	8.55	9.7	3115																			
6	9.55	10.7	3255																			
7	10.55	11.7	3480																			
8	11.55	12.7	3415																			
9	12.55	13.7	3640																			
10	13.55	14.7	3780																			
11	14.55	15.7	4005																			
12	15.55	16.7	4070																			
13	16.55	17.7	4300																			
14	17.55	18.7	4435																			

## Bolt Tightening Specifications



Diagonal tightening sequence for a 12 hole flange/tube connection.

**Safety Notes:**  
 All flange connections use M24 x 100mm grade 8.8 bolts c/w grade 8 nuts and 1 no. spring washer in every joint throughout its length and are torqued to 600Nm (450 ft lb) in a diagonal sequence as shown left.  
**Do not use bolts other than those supplied by Groundforce.**

**Note:** On shorter spans, there may be difficulty accessing nuts 9 and 12 when attempting to use a Torque Wrench and Multiplier. This is due to obstructions caused by the strut foot.

If access is difficult, it is permissible to use a 'Slogging Spanner' in conjunction with a lump hammer to tighten nuts 9 and 12.

**Always follow the diagonal tightening sequence wherever possible.**

Item No.	Description
SIA.SSW36	36mm Ring Slogging Spanner Wrench

## Installation



**Safety Notes:** Extreme care and adequate precautions must be taken to prevent trapping fingers throughout all stages of work.



### Important Notes:

It is recommended that the bearing areas on the waling beam be carefully selected, referring to the design drawings as necessary to avoid protrusions, e.g. bolts, bushes etc that would interfere with the seating of the strut. Ensure the seating area of the strut is clean and marked prior to strut installation.

**Note:** MP150 struts will usually be supplied with a Motorised Shoring Pump to speed and simplify installation. (see separate Motorised Shoring Pump user guide which is available to [download as a pdf](#) from the GF Technical Library).

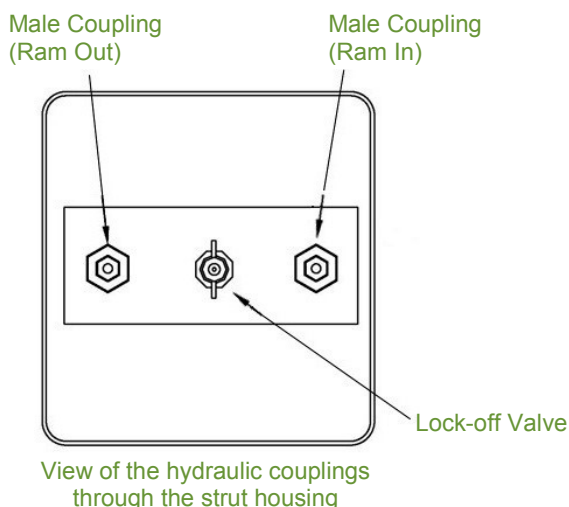
It is recommended that the strut be fully assembled outside the excavation prior to lowering into place. Alternatively, should site restrictions dictate, then the strut can be assembled from within the excavation.

**Steps 1 and 2 below apply only to struts delivered to site in component form or part assembled:**

1. Assemble the appropriate components in the correct order and orientation with the lifting points to the top. Ensure that the End Bearing Plate is assembled to the Bolted Flange Swivel Plate through the central swivel hole. Ensure that all mating flanges are clean and all bolts in every flange are fitted in a diagonally opposite sequence. (see page 4) Do not attempt to lift the assembled strut until this is done. The bolts should then be re-checked for tightness once the strut is off the ground.

**Note:** If strut assembly is to be carried out on site, use only bolts supplied by Groundforce

2. Attach the top angle cleat to the End Bearing Plate using the bolts supplied and fully tighten, ensuring that the axis of the struts acts within 25mm either side of the web for unstiffened single beams. If this condition cannot be met then please contact the supplying depot for further advice. Where struts bear directly against a concrete beam or similar, the End Bearing Plate / Adaptor Plate can be bolted directly to the beam through pre-drilled holes in either plate.
3. Open the cover of the hydraulic coupling protective housing and identify the couplings. (see below). Ensure the Lock-off Valve is open by two full turns using the tool provided. Wipe clean all coupling faces and connect both pump hoses to the strut cylinder block. Slide the retaining collar of the female coupling backwards whilst pushing the coupling onto the male coupling on the strut cylinder block; the retaining collar will snap forward to make the connection. It may be practical at this stage to disconnect the hoses from the pump until the strut is near to its intended location.



**Note:** It is important that the Lock-off Valve is not tightened in excess of 10Nm, therefore only use the Lock-off Tool provided to hand tighten.



Lock-off Valve Tool



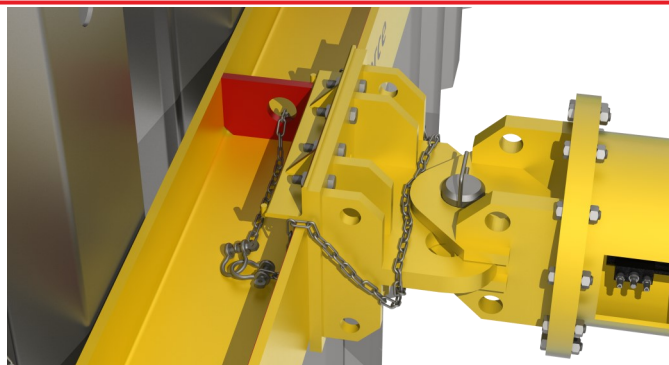
## Installation Cont...

4. If not already done, connect both pump hoses to the pump block and move the lever on the pump to the 'Ram Out' position to expand the strut.
5. Adjust the overall length of the strut to suit the required span between walings (or to within approximately 150mm of this dimension).
6. Attach the lifting chain to the appropriate strut lifting eyes, maintaining the safe stated angle between the chain legs and offer the strut into position. **Note:** The centre of gravity of the strut is towards the hydraulic end.
7. Gradually lower the strut onto the waling member, ensuring that it seats flat on the beam flange and the strut is perpendicular to the waling. With the strut still suspended by chains, hydraulically extend the strut length so that the top angle cleat engages over the beam flange and the End Bearing Plate contacts the beam.
8. Once positive contact is made between the beam and strut, use the pump to expand the strut to the specified pre-load, typically 1000 to 1500psi (~70 to ~100bar<sup>#</sup>) as indicated on the pump pressure gauge. **Do not exceed 1500psi (~100bar<sup>#</sup>).** Close the Lock-off valve using the tool provided by turning clockwise. **DO NOT OVER TIGHTEN THE LOCK OFF VALVE** (see note on page 6) **Note:** the valve is fully closed when the lock nut is seated on the body of valve. **Note:** Pre-load is not a critical part of the structural capacity and governed by the limitations of the pumping equipment.
9. Release the pressure in the hoses by moving the lever on the pump block to the central neutral position; the pressure gauge drops to zero. Remove the hoses from the strut cylinder block by sliding the retaining collars on the female couplings backwards. Close the protective housing cover.
10. It is strongly recommended that Restraining Chains are used as a secondary support measure. These should be attached around the End Swivel Plate at both ends of the strut. (see below)
11. Remove the lifting chains.

## Restraining Chains



**Safety Note:** Restraining chains act as a back up means of support in the unlikely event of hydraulic failure. It is essential that certified lifting chains are used to take the weight of equipment before depressurising the hydraulic rams.



Connection must be made by securing to the waler beam or other suitable point. Struts must be securely supported by means other than the restraining chains before installation or during removal.

Restraining Chain Assembly	
Item Code	Weight (kg)
MG.REST	7.0

**Note:** Restraining chains are not certified and must not be used for any lifting operations.

<sup>#</sup> 1 bar = 100 kPa



## Removal (Strut Retraction)

**Important Note:** Do not open the Lock-off Valve until the hoses are reconnected.

1. Upon completion of the permanent works, ensure the excavation is back-filled to the underside of the strut and the surround material is fully compacted and a competent person has given authorisation to remove the strut.
2. Make provision for adequate support to the strut before attempting removal, preferably slung by the lifting chains.
3. Working from a safe area, open the hydraulic coupling protective cover and reconnect both hoses to the strut cylinder block by sliding the retaining collars as previously described.

**Note:** If the hoses are difficult to connect, it is likely that the Lock-off Valve has been opened prematurely. Proceed as follows: ensure that the Lock-off Valve is closed using the tool provided. Position the hollow end of the tool over the end of the male coupling and gently tap the other end of the tool to release the residual pressure; the hoses should then connect easily.

4. If not already done, reconnect both pump hoses to the pump block by sliding the retaining collars backwards following the same procedure as described earlier. Move the lever on the pump to the 'Ram In' position and gradually open the Lock-off Valve with the tool provided by turning anti-clockwise to release the pressure from within the strut. After the pressure has been released, unscrew the Lock-off Valve by two full turns. With the weight of the strut being taken by the lifting device, retract the strut by pumping until the strut is clear of the walings and can be lifted clear of the excavation.
5. Before finally lowering the strut to the ground, fully retract the strut, ensuring that the hydraulic coupling housing cover plate lines up with the hydraulic outer sleeve cut out to prevent damage to the plate. If this cannot be easily achieved then do not fully retract the strut. Disconnect the hoses from the strut cylinder block by sliding the retaining collars backwards on the female couplings. Close the protective cover and secure with the clips provided.

**Note:** See the following pages for instructions on fitting the optional Mechanical Lock-off system



## Appreciation of Excavation Safety

The theoretical safety course is mapped to both EUSR and the National Occupational Standards and introduces the learner to the basics of working around excavations. Designed as an awareness course, particular emphasis is provided to key aspects of managing and/or overseeing excavation work. [Visit the course page](#) for more details.

The one day course can accommodate up to 20 delegates per day

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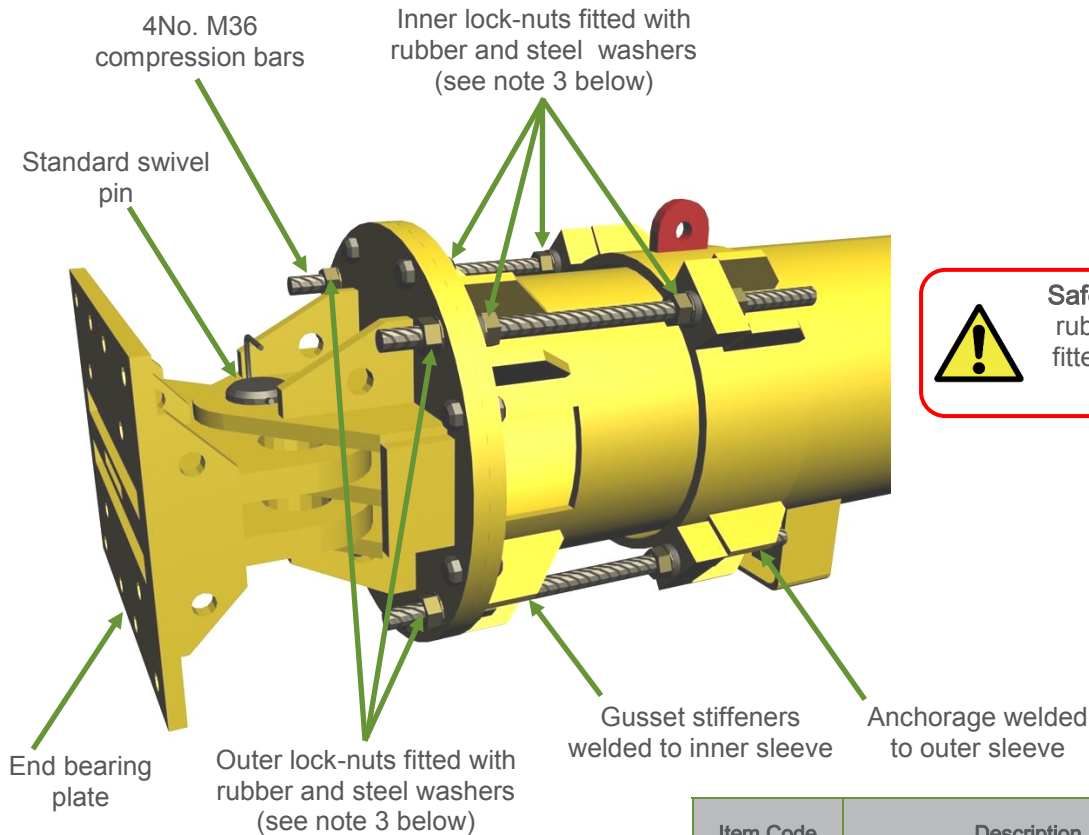


## Mechanical Lock-Off (optional)

The Mechanical Lock-Off system is designed to act as a fail-safe in the unlikely event of hydraulic failure.

Providing that the hydraulic unit has been appropriately modified, it is possible to isolate the integral hydraulic ram after installation by installing four M36 high yield compressions rods and locknuts through housings attached to the inner and outer sleeves of the hydraulic ram unit. Please note that this feature is only available by prior agreement with Groundforce.

## Equipment Identification



**Safety Note:** Steel and rubber washers to be fitted on all inside and outside faces.

Item Code	Description	Quantity
M36.TB	M36 Threaded Bar G10.9	4
M36.HN	M36 Hex Full Nuts G10	16
M36.SW	M36 Flat Hardened Washer	16
M36.RW	M36 Rubber Washer	16

## Installation

**Note:** All four rods, inner nuts and washers must be located through the holes in the housings prior to pumping out the strut. If this is not done, the holes may twist out of alignment making it difficult to insert the rod.

1. If the rods have been supplied loose, pass a threaded rod through one of the locating holes and attach two nuts, two plain steel washers and two rubber washers. Screw down towards the centre of the rod. Note: it is essential that these are assembled in the correct order (see above enlarged view). Repeat for all four rods.
2. Install and pressurise the strut as described in the relevant user guide. Ensure that the nuts are positioned on the rods to prevent the strut expanding fully.
3. Adjust the *inner* nuts and washers so the bar is positioned approximately central between the housings before tightening the nuts to lock the bar into place. **Note: Do not overtighten - a light 'nip up' is all that is required to slightly compress the rubber washers.**
4. Attach two rubber washers and two plain steel washers and tighten the *outer* nuts onto the housings using only moderate force. **Note: Do not overtighten - a light 'nip up' is all that is required to slightly compress the rubber washers.**
5. Apply grease and Denso tape, or a similar method of protection, to the threads over the full length of the bar in order to aid removal.
6. Repeat for all four rods.

## Removal

### Important Note:

The rods must be released before depressurising and the ram must be retracted with the rods in place.

1. Remove the protective tape and using the spanners provided in the installation kit, loosen the 'external' locknuts by a couple of turns.
2. Gradually slacken the 'internal' locknuts on both rods in turn until they become free.
3. Screw the 'internal' nuts towards the centre of the bars until they meet.
4. De-pressurise and remove the strut in the normal manner.



### Safety Notes:

Any sign of damage or fluid loss or hydraulic systems failure during use must be notified to Groundforce immediately.



**Note:** Waste fluids should be disposed of safely with due regard to local regulations

## Do

- ✓ Have a lifting plan in place before installation
- ✓ Prepare a detailed site specific method statement before installation and removal
- ✓ Visually check all safety critical parts as listed below prior to each use and replace if necessary:
  - Lifting eyes, Handling points
  - Hydraulic couplings and Lock-off valve
  - Lifting equipment (e.g. chains and slings)
- ✓ Ensure the strut is adequately located onto the bearing surface and always use a designed and approved connection to support both ends of each strut
- ✓ Clean and oil the hose couplings before making connections
- ✓ Only use this equipment in temperature range -20°C to +40°C
- ✓ Only use the red painted points for lifting
- ✓ Inspect struts regularly and check overall strut alignment after installation
- ✓ Adequately support strut sub-assemblies during installation and removal
- ✓ Ensure all flange joint bolts are of the correct grade and are torqued to the specified value
- ✓ Take care to protect the strut from accidental strikes, concrete accumulation, etc
- ✓ Take care to avoid trapping fingers at all stages of work
- ✓ Ensure you are using the correct fluid for the Motorised Shoring Pump being used
- ✓ Store all equipment in a safe manner when not in use or when ready for collection. Ensure equipment stability and protection from damage, away from site activity

## Do Not

- ✗ Laterally load the strut from the side
- ✗ Use bolts other than those supplied by Groundforce for any flange connection
- ✗ Strike or impact the strut
- ✗ Allow debris to accumulate on the strut
- ✗ Exceed the stated installation pressure
- ✗ Use Shoring Fluid or Hydraulic Oil other than supplied by Groundforce
- ✗ Use uncertified lifting equipment
- ✗ Attempt to remove the strut under load
- ✗ Relocate the equipment once it is installed
- ✗ Suspend or store materials on the struts
- ✗ Over-tighten the Lock-off valve (see note on page 6)
- ✗ Over-tighten the inner locknuts against the rubber washers on the Mechanical Lock-off System (if fitted) light nip only required
- ✗ Swap between different types of Motorised pump (the shoring/hydraulic fluid will be cross-contaminated)

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