

# **NPK**

## **HYDRAULIC SHEET PILE DRIVER**

### **OPERATORS MANUAL**

**MODELS: C6CSD, C8CSD  
C10CSD**

*“Use Genuine NPK Parts”*

**NPK** *...attachments;  
designed, built  
and backed by NPK.*

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# CONTENTS

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SAFETY.....	3
FORWARD.....	5
SHEET PILE DRIVER APPLICATIONS.....	5
MAINTENANCE.....	6
STANDARD PRACTICES.....	6
CARRIER COMPATIBILITY.....	7
SPECIFICATIONS.....	8
C6CSD.....	9
C8CSD.....	10
C10CSD.....	11
SHEET PILE DRIVER STRUCTURE.....	12
C6CSD THROUGH C10CSD SHEET PILE DRIVERS.....	12
SHEET PILE DRIVER SERIAL NUMBER LOCATION.....	15
HYDRAULIC INSTALLATION.....	16
NPK HYDRAULIC INSTALLATION KITS.....	16
HYDRAULIC LINES.....	16
SHUT-OFF VALVES.....	16
RETURN OIL.....	17
PREVENTION OF CONTAMINATION.....	18
CHANGING THE FILTER ELEMENT AND HYDRAULIC OIL.....	18
CONTROL VALVES.....	19
CONTROL SYSTEM FOR CLAMP CYLINDER.....	20
HYDRAULIC QUICK DISCONNECTS.....	21
NPK APPROVED CONNECTION QUICK DISCONNECTS.....	22
PRECAUTIONS.....	22
MECHANICAL INSTALLATION.....	24
MAINTENANCE AND INSPECTION.....	25
DAILY MAINTENANCE.....	25
SEMI-ANNUAL MAINTENANCE.....	26
REPLACE BEARING LUBRICATION OIL.....	26
TWENTY HOUR INSPECTION.....	27
JAW TOOTH PLATE (CHUCK) INSPECTION.....	28
RUBBER MOUNT INSPECTION.....	28
HOSE CONNECTIONS.....	29
LUBRICANT TERMS AND DEFINITIONS.....	30
OIL CAPACITY SPECIFICATIONS.....	32
LOWER FRAME.....	32
BEFORE OPERATION.....	33
DECIDE IF SWIVEL LOCK FEATURE WILL BE USED.....	33
OPERATION.....	34
PRE-CHECKS.....	34
CHECK FASTENERS FOR PROPER TIGHTNESS.....	34
JAW TOOTH PLATE (CHUCK) INSPECTION.....	34
RUBBER MOUNT INSPECTION.....	34
HOSE CONNECTIONS.....	35
CHECK SHUT-OFF VALVE POSITION.....	35
SHEET/PILE DRIVING AND EXTRACTING.....	36
SWIVEL FEATURE.....	36
CHUCKING THE SHEET PILE.....	38
LIFT THE SHEET PILE.....	38
POSITIONING THE SHEET PILE.....	39
PILE DRIVING OPERATION.....	40
PULLING OPERATION.....	41

# CONTENTS

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OPERATIONAL PRECAUTIONS.....42  
STORAGE OF THE SHEET PILE DRIVER.....43  
WARRANTY REGISTRATION FOR NEW UNITS.....44  
WARRANTY STATEMENTS.....45  
NOTES AND RECORDS .....47

# SAFETY



Safety notices in NPK Instruction Manuals follow ISO and ANSI standards for safety warnings:



DANGER (red) notices indicate an imminently hazardous situation which, if not avoided, **will result in death or serious injury.**



WARNING (orange) notices indicate a potentially hazardous situation which, if not avoided, **could result in death or serious injury.**



CAUTION (yellow) notices indicate a potentially hazardous situation, which, if not avoided, **may result in minor or moderate injury.**



ATTENTION (blue) notices in NPK Instruction Manuals are an NPK standard to alert the reader to situations which, if not avoided, **could result in equipment damage.**



1. Operators and service personnel must read, understand and comply with the **NPK INSTRUCTION MANUAL.**
2. Keep personnel and bystanders clear of the SHEET PILE DRIVER while in operation.
3. Do not operate the SHEET PILE DRIVER without an impact resistant shield between the SHEET PILE DRIVER and the operator.
4. The SHEET PILE DRIVER must not be operated unless the operator is in full control of the carrier. Operate the SHEET PILE DRIVER from the operator's seat only.
5. Match the SHEET PILE DRIVER size to carrier according to NPK recommendations. See the CARRIER MACHINE COMPATIBILITY section of this manual.
6. Service personnel must be cautious handling pins and bushings when exchanging the bucket for the SHEET PILE DRIVER. The carrier machine operator must move the stick or boom only when directed by service personnel.
7. If it is necessary to hammer the boom pins in or out, beware of flying metal chips.  
**Eye protection be worn!**
8. Do not operate the SHEET PILE DRIVER if the hydraulic oil temperature exceeds 180° F (80° C), or at higher than specified flow rates.
9. Be especially cautious around hydraulic lines. Hydraulic oil can be extremely **HOT!**  
**Avoid skin contact with hydraulic oil! It can cause severe burns!**
10. Protect hands and body from hydraulic fluids under pressure. Escaping high pressure fluid can penetrate the skin, causing serious injury. Avoid the hazard by relieving the pressure from the hydraulic system before disconnecting any lines. Search for leaks with a piece of cardboard or other object. **If an accident occurs, seek medical attention immediately! Hydraulic fluid injected into the skin must be surgically removed immediately or gangrene may result!**

# **SAFETY**

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11. Make daily visual inspections of all fasteners, boom pins, hoses, etc.
12. Do not make any alterations to the SHEET PILE DRIVER without authorization from NPK Engineering.
13. Use only NPK supplied replacement parts. NPK specifically disclaims any responsibility for bodily injury or SHEET PILE DRIVER damage that results from the use of parts not sold or approved by NPK.
14. Be careful when you torque fasteners. An overstressed or damaged component may fail.
15. Use the proper lifting equipment and tools when handling or servicing the SHEET PILE DRIVER or components.
16. Important safety and operating decals are included with each SHEET PILE DRIVER and HYDRAULIC INSTALLATION KIT. Keep them clean and visible. NPK will replace decals free of charge as needed.

## **FORWARD**

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This manual has been written to give the necessary instructions for operating, maintaining, and servicing the NPK Sheet Pile Driver. Read this manual before start-up.

For help with any problems encountered, or additional information, contact your NPK authorized Distributor.

Use replacement parts sold by NPK only. NPK is not responsible for failures resulting from alterations not approved by NPK or substitution of parts not sold by NPK. Do not operate the Sheet Pile Driver underwater without instructions from NPK Engineering.

## **SHEET PILE DRIVER APPLICATIONS**

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The excavator mounted Sheet Pile Driver is a mobile, self-contained unit that operates anywhere a boom can reach. This versatile attachment reaches to the top of piling and sheeting for driving or extracting in the toughest of conditions and in rough terrain areas.

### **APPLICATIONS INCLUDE:**

- *DRIVING PILE, SHEET.*
- *EXTRACTION OF PILING AND SHEETING.*

# MAINTENANCE

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## STANDARD PRACTICES

### ATTENTION

Maintenance of and repairs to the SHEET PILE DRIVER should be performed by an experienced service technician, thoroughly familiar with all standard practices and procedures, and most importantly, all safety precautions. The following is a review of common standard practices to be followed when working with hydraulic equipment, and is not meant to be all-inclusive. Rather, this review is presented as a reminder as to some of the unique characteristics of hydraulic equipment.

- The prevention of foreign contaminant damage is critical when working with hydraulic equipment. Protect exposed holes and parts to guard against entry of contaminants. Install metal or plastic plugs/caps where applicable to prevent entry of debris into the hydraulic system.
- Mark the location and position of mating parts as an aid to re-assembly. Mark corresponding parts uniquely to reflect their relationship, including proper location, position, orientation, and/or alignment.

#### DO:

- During assembly, observe all markings made during disassembly, and all corresponding features of mating parts to ensure proper location, position, orientation and alignment.
- During disassembly of a sub-assembly, place removed components on a clean, dry surface, in proper relative position as an aid in re-assembly.
- Always inspect threaded areas on components. Repair or replace as required. Never apply uncured thread adhesive to a fastener that has cured adhesive on it. Clean the fastener and the threaded bore. A tap and die may be helpful for this task. Be sure to remove loose debris from the threaded bore.
- Use care to avoid scratches, nicks, dents, or other damage to machined surfaces of mating components.
- When securing a component, always tighten cap screws gradually in an opposing pattern, applying the specific torque.
- Grease can be used to temporarily hold a part in place while the abutting part is placed into position.
- Always use common sense and exercise standard safety precautions when working with all tools and equipment required to maintain, repair or troubleshoot the SHEET PILE DRIVER.

# CARRIER COMPATIBILITY

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These carrier weight ranges are intended as a guideline only. Other factors, such as stick length, counterweights, undercarriage, etc., must be taken into consideration.

## CAUTION

Mounting a Compactor that is too heavy for the carrier machine is inefficient. The result is an inadequate amount of downforce which can be dangerous and can damage the carrier. Verify the carrier stability with the Compactor before transport or operation. Mounting a Compactor that is too small for the carrier machine can damage the unit and void the Warranty.

Consult NPK, if there is uncertainty whether the compactor model is compatible.

COMPACTOR/DRIVER MODEL	RECOMMENDED CARRIER WEIGHT	
	lb.	(kg)
<b>C6CSD</b>	16,000 - 42,000	(7,000 - 19,000)
<b>C8CSD</b>	30,000 - 65,000	(14,000 - 29,500)
<b>C10CSD</b>	60,000 - 100,000	(27,000 - 45,000)

*(Specifications subject to change without notice.)*



# SPECIFICATIONS

MODEL	CYCLES PER MINUTE	OIL FLOW (standard)		OIL FLOW (low flow option)		OIL FLOW (high flow option)	
		gpm	(lpm)	gpm	(lpm)	gpm	(lpm)
<b>C6CSD</b>	2,200	33	(125)	25.5	(97)	N/A	
<b>C8CSD</b>	2,200	43	(160)	CONTACT NPK		N/A	
<b>C10CSD</b>	2,200	51	(210)	CONTACT NPK		N/A	

MODEL	IMPULSE FORCE		OPERATING PRESSURE <sub>1</sub>		RELIEF VALVE PRESSURE SETTING <sub>2</sub>	
	lbf	(kgf)	psi	(bar)	psi	(bar)
<b>C6CSD*</b>	16,000	(7,300)	1800-2300	(125-160)	2600	(180)
<b>C8CSD*</b>	24,000	(11,000)	2000-2500	(140-170)	2600	(180)
<b>C10CSD*</b>	34,000	(15,450)	2000-2500	(140-170)	2600	(180)

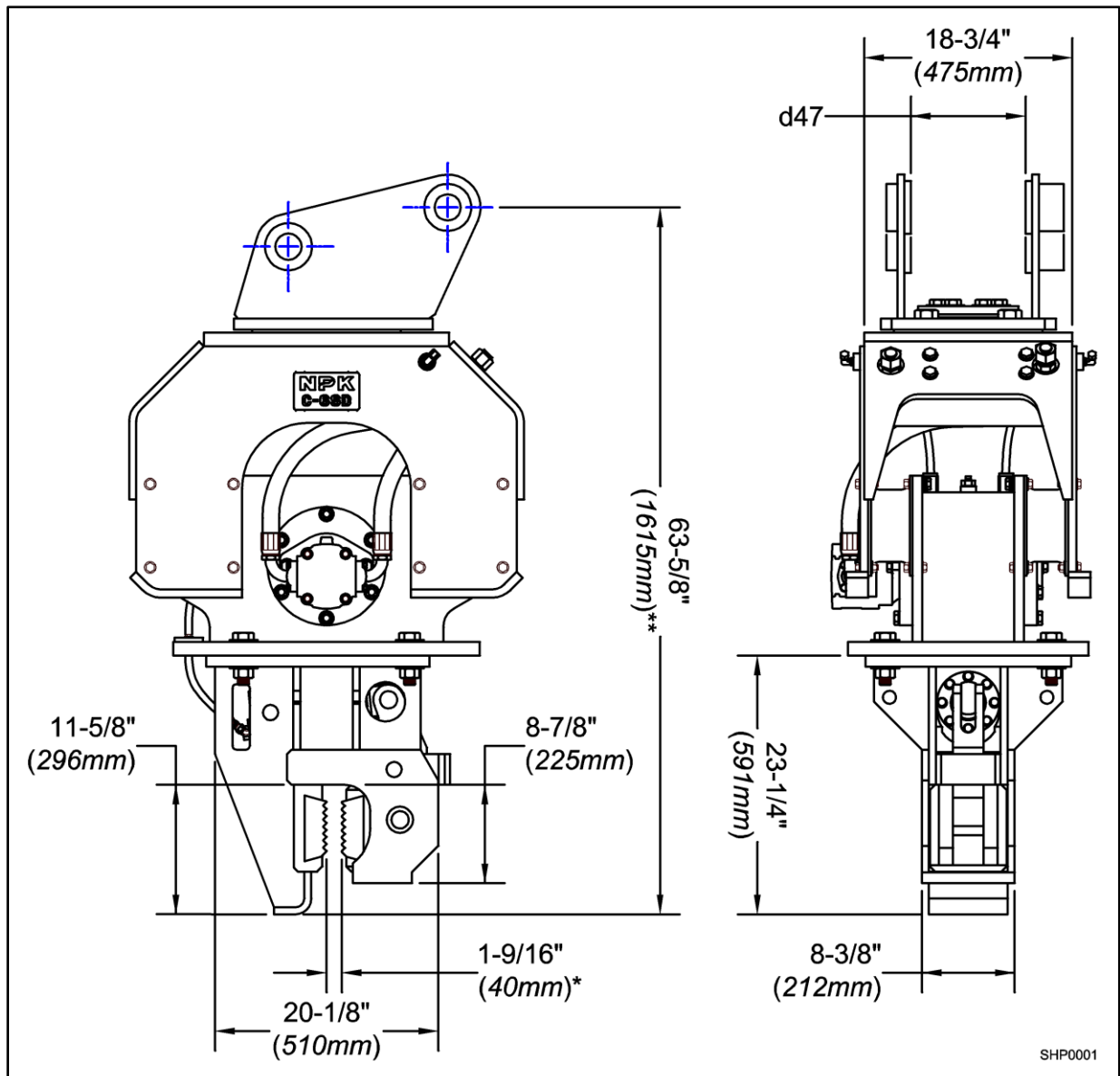
\* The carrier circuit relief valve settings should be a minimum of 200psi (14 bar) above the sheet driver relief settings.

1. Operating pressures shown are with a standard hydraulic motor. Operating pressures will be different with optional hydraulic motors.
2. Relief pressure setting shown is for a standard hydraulic motor. For a relief with different motor options, contact NPK at 1-800-225-4379.  
(Specifications subject to change without notice.)

MODEL	CHUCK CYLINDER OIL FLOW		CHUCK CYLINDER OP. PRESSURE	
	gpm	(lpm)	psi	(bar)
<b>C6CSD</b>	3 - 5	(11 - 20)	3045	(210)
<b>C8CSD</b>	3 - 5	(11 - 20)	3045	(210)
<b>C10CSD</b>	3 - 5	(11 - 20)	3045	(210)

# SPECIFICATIONS

## C6CSD



DIMENSION d47: variable

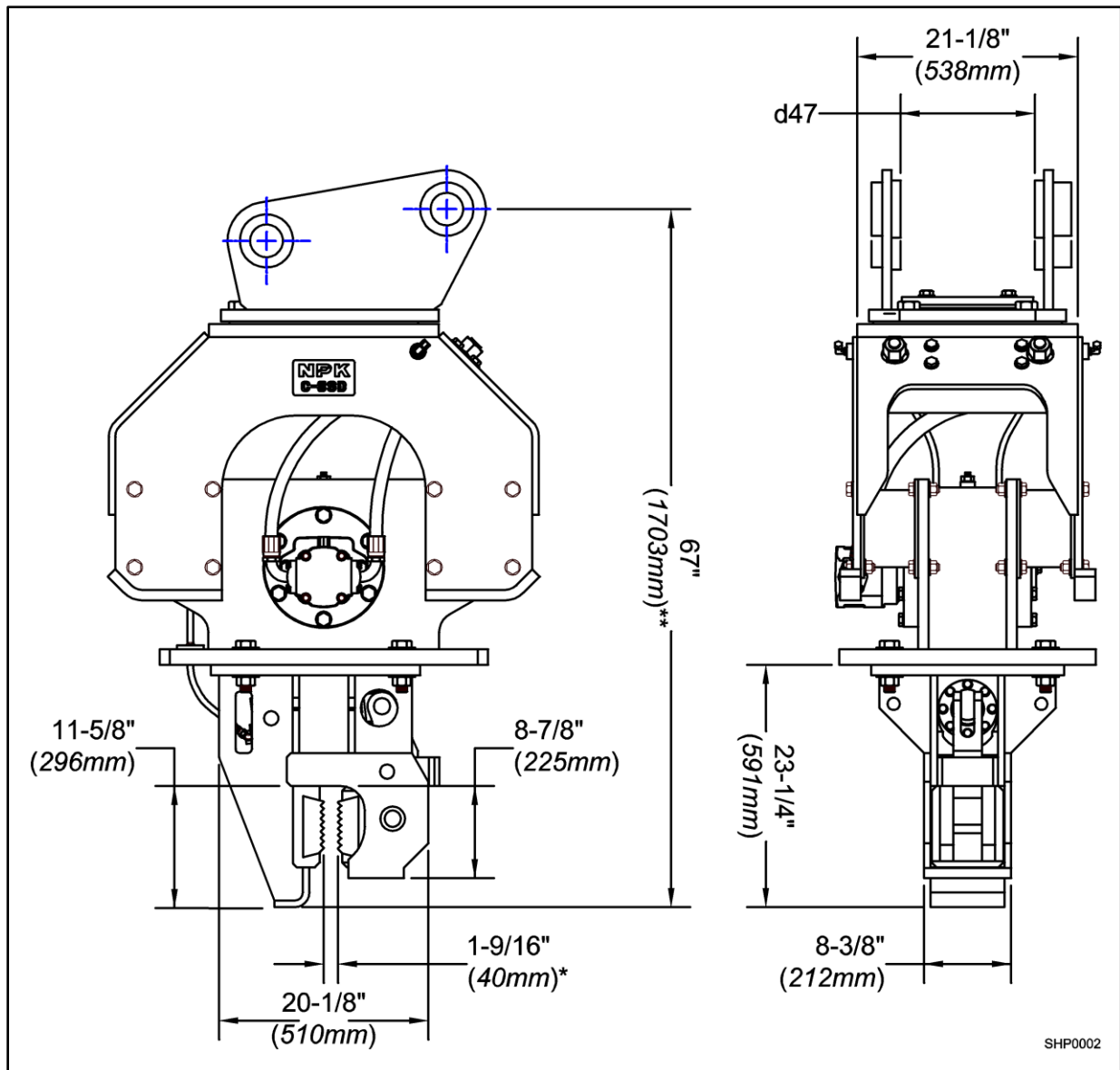
\* = Maximum opening

\*\* = Subject to change

WORKING WEIGHT: 2150 lbs. (975 kg)

# SPECIFICATIONS

## C8CSD



DIMENSION d47: variable

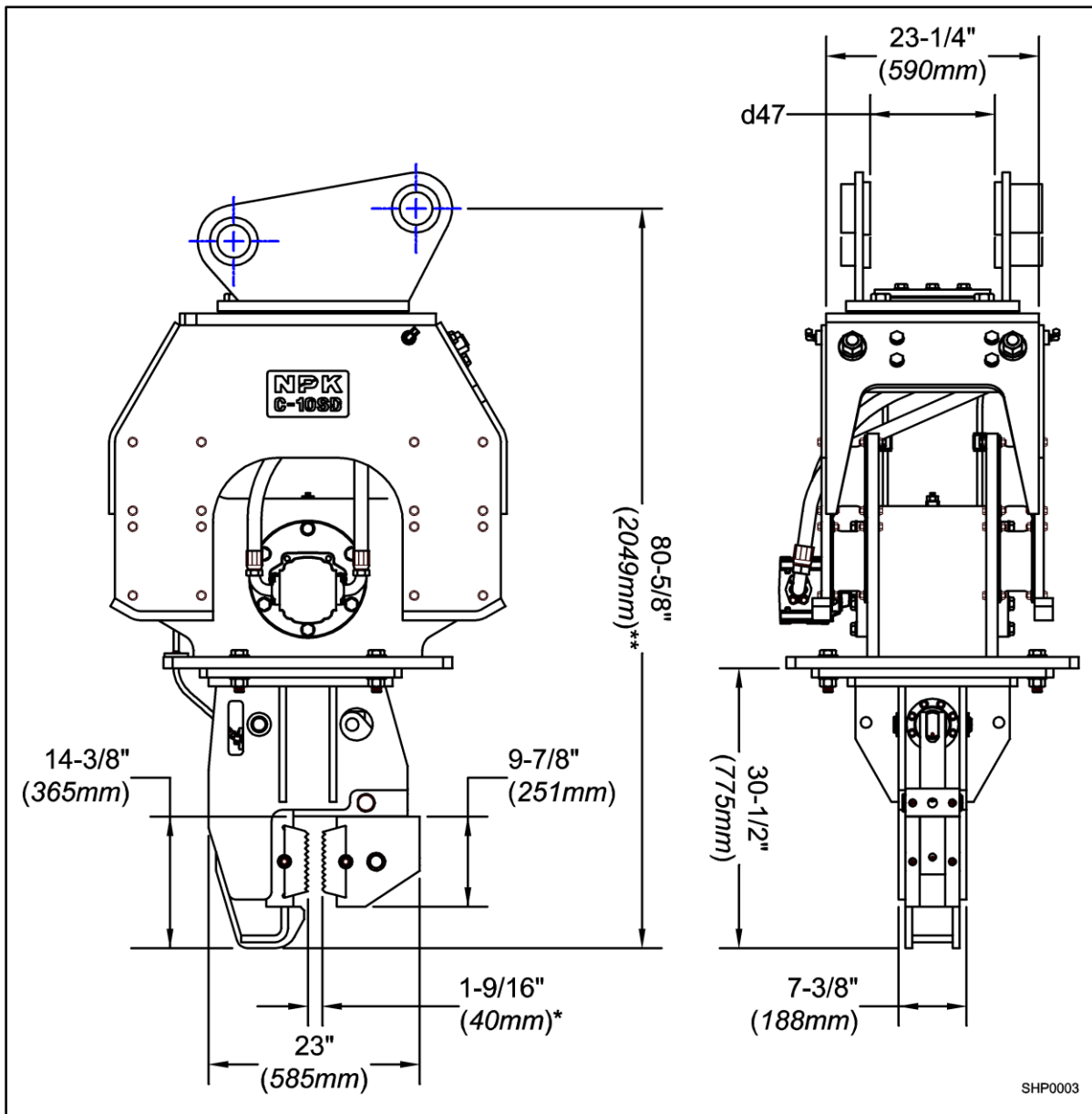
\* = Maximum opening

\*\* = Subject to change

WORKING WEIGHT: 2750 lbs. (1250 kg)

# SPECIFICATIONS

## C10CSD



DIMENSION d47: variable

\* = Maximum opening

\*\* = Subject to change

WORKING WEIGHT: 4130 lbs. (1875 kg)

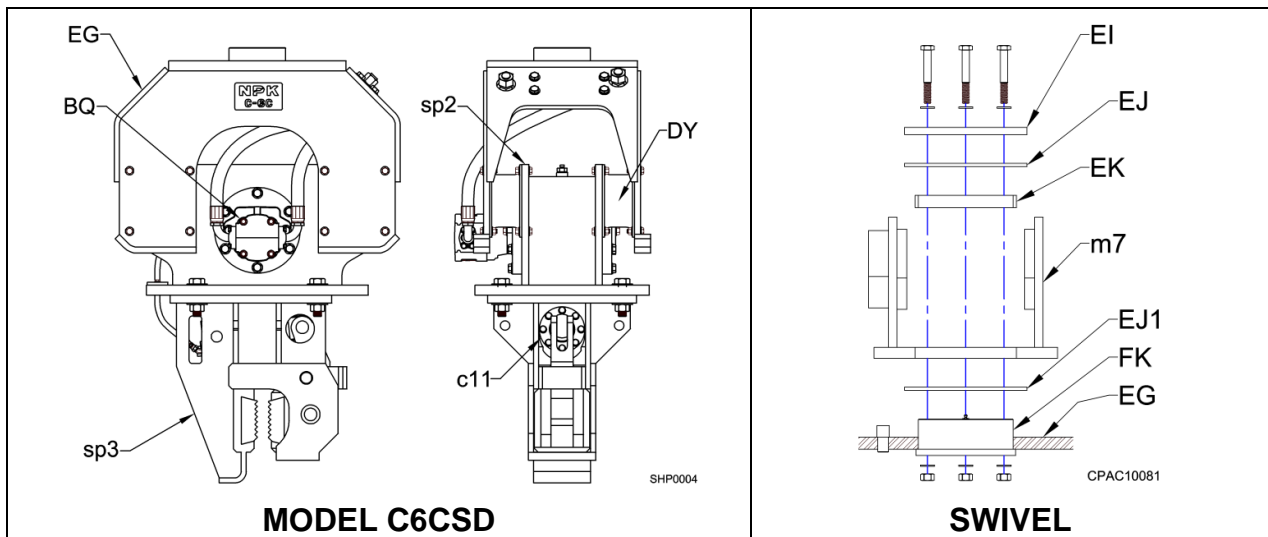
# SHEET PILE DRIVER STRUCTURE

## C6CSD THROUGH C10CSD SHEET PILE DRIVERS

The C6CSD through C10CSD SHEET PILE DRIVERS consist of a top bracket, an upper frame, a lower frame and a cylinder assembly. The C6CSD, C8CSD and C10CSD SHEET PILE DRIVERS are available with a fixed or a swivel top bracket.

The C6CSD and C8CSD upper frame is mounted to the lower frame with (4) bolt-on rubber mounts. C10CSD models use (8) rubber mounts. The rubber mounts reduce the amount of vibration being transmitted to the excavator.

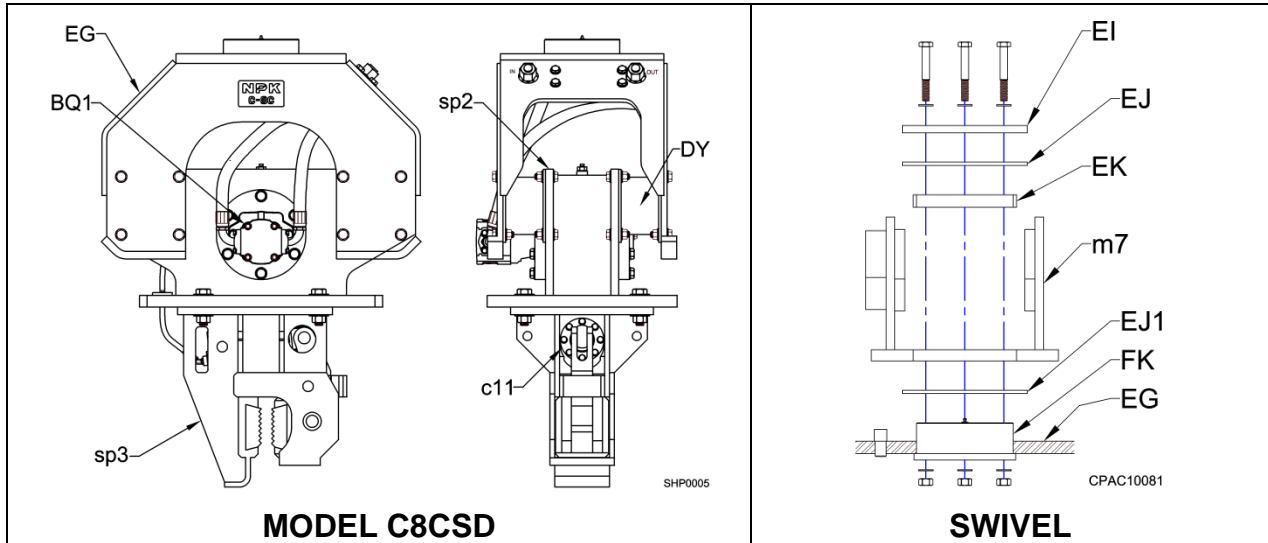
The lower frame contains an eccentric weight suspended on roller bearings and spun by a hydraulic motor. The cylinder assembly is bolted to the lower frame. The upper frame also contains a bolt-on hydraulic manifold.



ITEM	DESCRIPTION
<b>BQ</b>	HYDRAULIC MOTOR
<b>c11</b>	CYLINDER ASSEMBLY
<b>DY</b>	RUBBER MOUNT
<b>EG</b>	UPPER FRAME
<b>EI</b>	THRUST COVER
<b>EJ</b>	UPPER THRUST PLATE
<b>EJ1</b>	LOWER THRUST PLATE
<b>EK</b>	THRUST BEARING
<b>FK</b>	SWIVEL HUB (weld-on)
<b>m7</b>	TOP BRACKET
<b>sp2</b>	LOWER FRAME
<b>sp3</b>	CYLINDER CASE

# SHEET PILE DRIVER STRUCTURE

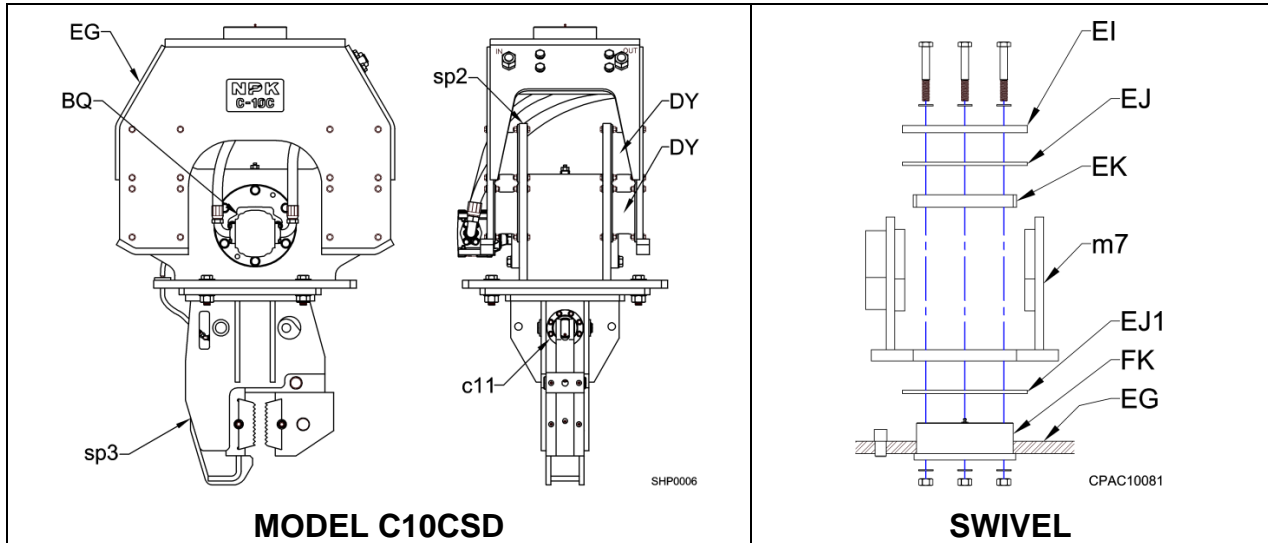
## C6CSD THROUGH C10CSD SHEET PILE DRIVERS



ITEM	DESCRIPTION
<b>BQ1</b>	HYDRAULIC MOTOR
<b>c11</b>	CYLINDER ASSEMBLY
<b>DY</b>	RUBBER MOUNT
<b>EG</b>	UPPER FRAME
<b>EI</b>	THRUST COVER
<b>EJ</b>	UPPER THRUST PLATE
<b>EJ1</b>	LOWER THRUST PLATE
<b>EK</b>	THRUST BEARING
<b>FK</b>	SWIVEL HUB (weld-on)
<b>m7</b>	TOP BRACKET
<b>sp2</b>	LOWER FRAME
<b>sp3</b>	CYLINDER CASE

# SHEET PILE DRIVER STRUCTURE

## C6CSD THROUGH C10CSD SHEET PILE DRIVERS



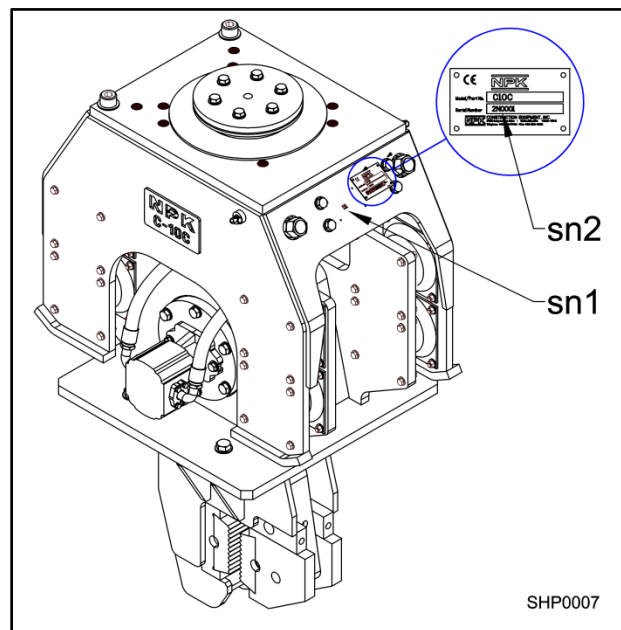
ITEM	DESCRIPTION
<b>BQ</b>	HYDRAULIC MOTOR
<b>c11</b>	CYLINDER ASSEMBLY
<b>DY</b>	RUBBER MOUNT
<b>EG</b>	UPPER FRAME
<b>EI</b>	THRUST COVER
<b>EJ</b>	UPPER THRUST PLATE
<b>EJ1</b>	LOWER THRUST PLATE
<b>EK</b>	THRUST BEARING
<b>FK</b>	SWIVEL HUB (weld-on)
<b>m7</b>	TOP BRACKET
<b>sp2</b>	LOWER FRAME
<b>sp3</b>	CYLINDER CASE

# SHEET PILE DRIVER SERIAL NUMBER LOCATION

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The serial number of your unit is required any time that you are placing a parts order or requiring technical assistance. Failure to use the serial number when ordering parts, may result in receiving the incorrect parts, resulting in additional cost and down time. The serial number will be comprised of the following sequence of numbers and letters: 0N-0000.

The location described below is between the inlet and outlet hydraulic ports on the upper frame.



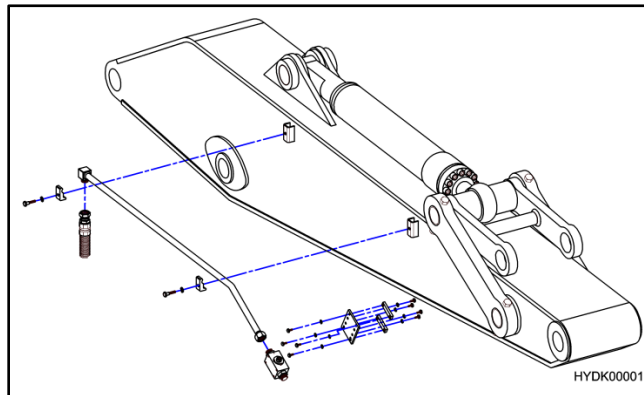
The serial number tag (sn2) can be found on the upper frame assembly. Additionally, the serial number (sn1) is stamped below the serial number tag on the upper frame assembly.



# HYDRAULIC INSTALLATION

## NPK HYDRAULIC INSTALLATION KITS

NPK Hydraulic Installation Kits are available for virtually all compatible backhoe and excavator models. The kits include all parts and complete instructions for the hydraulic installation, including valves, electrical or manual controls, hoses and fittings, boom and stick piping and clamps.



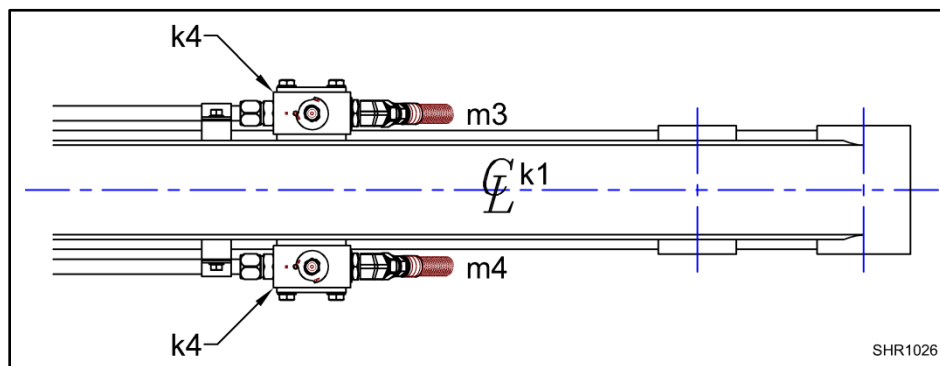
See your NPK dealer for details or call NPK direct at 1-800-225-4379.

## HYDRAULIC LINES

Typically, the pressure line is arranged on the left side of the boom and the return line is on the right side.

## SHUT-OFF VALVES

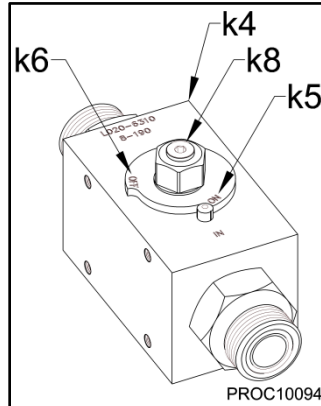
Most NPK Hydraulic Installation Kits use two shut-off valves (k4) on the dipper stick (k1) of the carrier. These valves control the hydraulic oil going to the pressure side (m3) and returning (m4) from the Compactor/Driver. **(NOTE: Some smaller carriers utilize a check valve on the return side.)**



# HYDRAULIC INSTALLATION

## SHUT-OFF VALVES

Pressure test ports (k8) are located in the shut-off valves (*and check valves*). Each shut-off valve has an “**ON**” (k5) and an “**OFF**” (k6) position.



### ATTENTION

**NOTE:** *When operating the NPK Compactor/Driver on a carrier with a return line shut-off valve, be sure the valve is turned to the “**ON**” position to prevent damage to the Compactor/Driver’s hydraulic motor.*

## RETURN OIL

The return line must be routed correctly and sized large enough to handle the oil flow without creating excessive back pressure. The return oil **MUST NOT** go through a control valve. It must be connected directly to the carrier’s hydraulic reservoir via the oil cooler and return filter (*or an NPK filter, if supplied*).

To prevent failure of the hydraulic motor shaft seals, motor shaft or motor thrust plates, the return line back pressure must not exceed 150 psi (10 bar). See the “**TROUBLESHOOTING**”, **MEASURING BACK PRESSURE** section of the **INSTRUCTION MANUAL**.

MODEL	MINIMUM LINE SIZE	
	in.	(mm)
<b>C6CSD</b>	1.00	(25.40)
<b>C8CSD</b>	1.25	(31.75)
<b>C10CSD</b>	1.25	(31.75)

# HYDRAULIC INSTALLATION

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## PREVENTION OF CONTAMINATION

### ATTENTION

1. A SHEET PILE DRIVER is harder on oil than using a bucket, so the oil is apt to deteriorate and breakdown sooner. Neglect of the oil system can not only damage the SHEET PILE DRIVER, but also cause problems in the carrier which could result in damaged components. Care should be taken to check for contamination of the oil and to change it if it is found contaminated. Oil sampling at regular intervals is highly recommended.
  - ❖ When the hydraulic oil shows low viscosity and bubbles, this indicates that the oil is deteriorated. If the oil is dark brown and gives off an offensive odor, it is severely deteriorated. ***Change the oil immediately!***
  - ❖ When the oil is clouded, or the oil filter often becomes clogged, it indicates that the oil is contaminated. ***Change the oil immediately!***
  - ❖ To change the contaminated hydraulic oil, drain the hydraulic system completely and clean components. ***Do not mix new oil with the old!***
2. Do not allow any contamination to mix with the oil. Take special care in preventing contamination from entering the hydraulic system through the hose or tube connection when changing the SHEET PILE DRIVER with the bucket.
3. Low oil level will cause heat build-up, resulting in deterioration of the oil. Also, it may cause cavitation due to air mixing with the oil, leading to a damaged compactor/driver and carrier components. Keep the oil at the proper level at all times.
4. Do not use the SHEET PILE DRIVER at an operating temperature higher than 180°F (80°C). The proper operating oil temperature range is between 120°F (50°C) and 180°F (80°C). Since contaminated cooler fins causes reduced efficiency of the cooler, keep the cooler fins clean at all times. Check the hydraulic oil cooling system to be sure it is working effectively. The use of a heat gun is the best way to evaluate if the cooler is working properly.
5. Water in the hydraulic oil will lead to damage of the SHEET PILE DRIVER and carrier. Drain off water and foreign matter from the hydraulic tank at specified intervals. When out of service, the SHEET PILE DRIVER should be stored indoors.

## CHANGING THE FILTER ELEMENT AND HYDRAULIC OIL

Change the filter element and hydraulic oil at the intervals described in the operation manual of the backhoe or excavator, when using a hydraulic implement. Another method is to set up an oil sampling schedule and change accordingly.

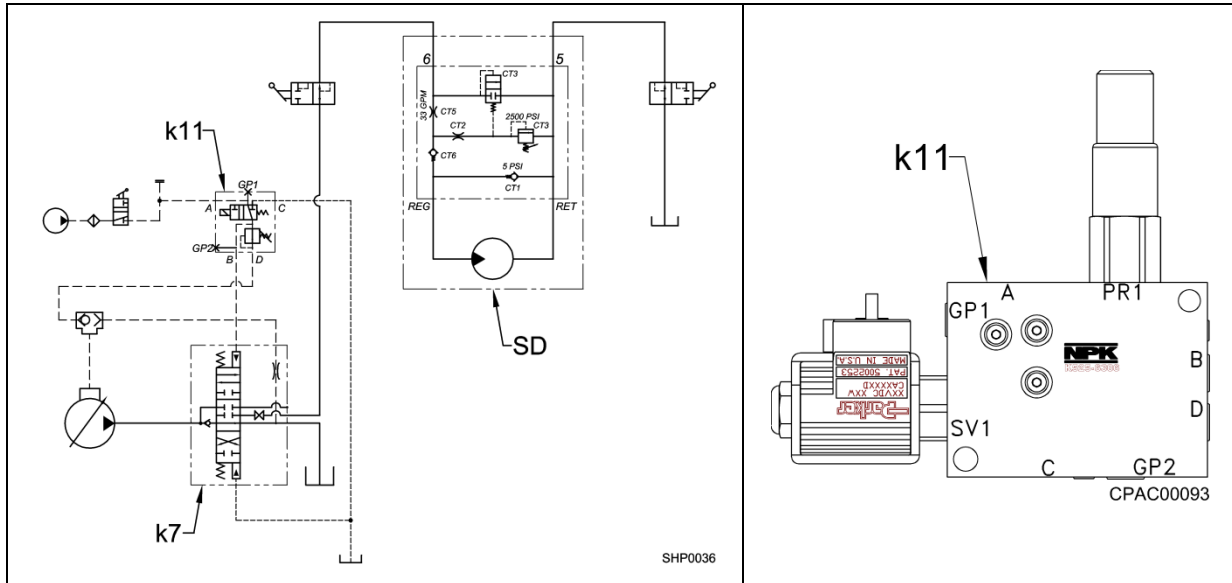
# HYDRAULIC INSTALLATION

## CONTROL VALVES

One of two types of control systems are used, depending upon the backhoe or excavator used:

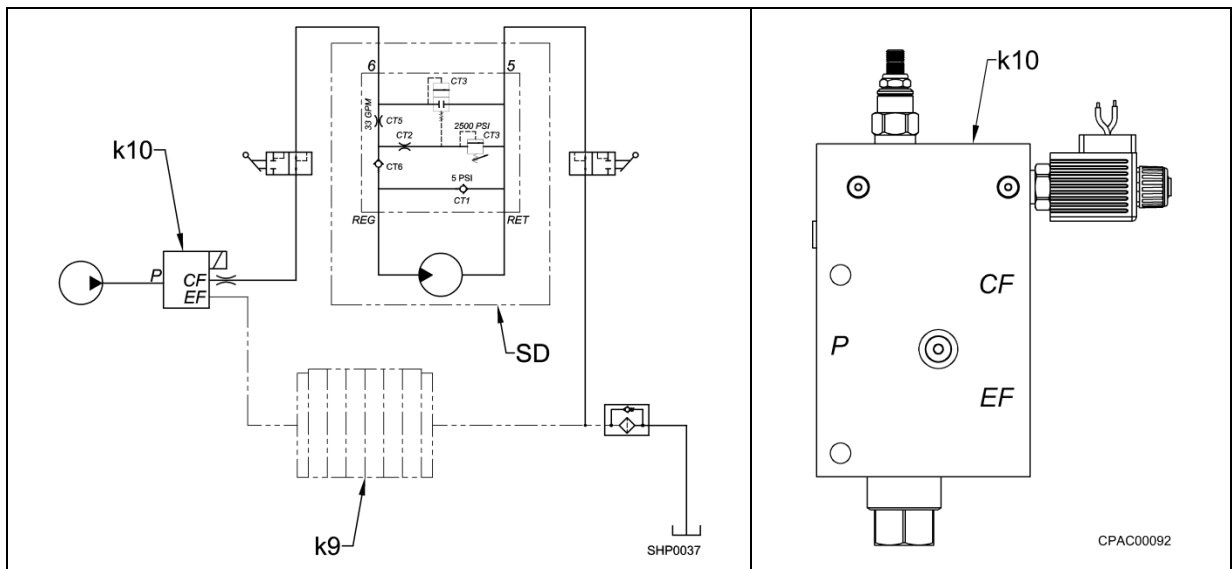
### 1. CONTROL SYSTEM USING THE EXCAVATOR AUXILIARY VALVE

This type of installation uses an existing excavator auxiliary valve (k7) to operate the NPK Sheet Pile Driver (SD). Additional parts, such as mechanical linkage, hydraulic pilot control valves (k11), etc., are furnished in the NPK HYDRAULIC INSTALLATION KIT.



### 2. CONTROL SYSTEM USING THE NPK MULTIVALVE

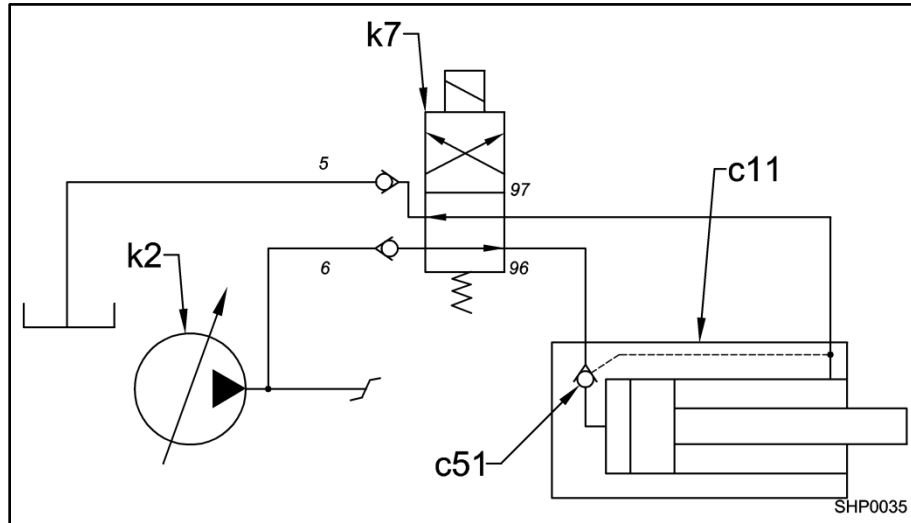
For excavators not equipped with an auxiliary or spare valve section as part of the control valve bank (k9), the NPK HYDRAULIC INSTALLATION KIT typically includes a solenoid operated, priority valve (k10) to operate the NPK Sheet Pile Driver (SD). The NPK MULTIVALVE is specifically designed for the operation of boom mounted attachments.



# HYDRAULIC INSTALLATION

## CONTROL SYSTEM FOR CLAMP CYLINDER

Below is a sample hydraulic circuit for the clamp cylinder.



<b>c11</b>	CYLINDER ASSEMBLY
<b>c51</b>	BALL CHECK VALVE
<b>k2</b>	HYDRAULIC PUMP
<b>k7</b>	CONTROL VALVE
<b>5</b>	RETURN PORT
<b>6</b>	PRESSURE PORT
<b>96</b>	EXTEND PORT
<b>97</b>	RETRACT PORT

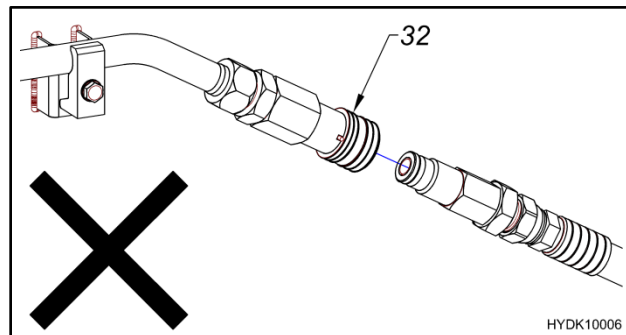
For further details or hydraulic kits, contact NPK for assistance at 800-225-4379.

# HYDRAULIC INSTALLATION

## HYDRAULIC QUICK DISCONNECTS

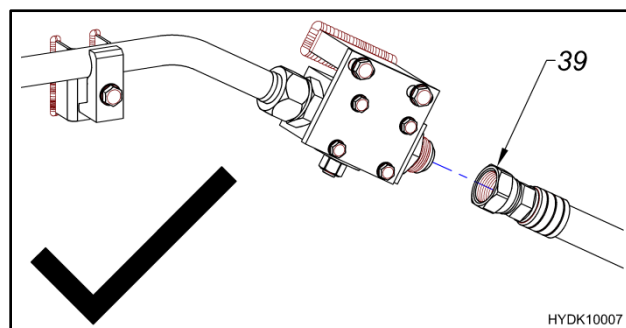
NPK recommends against the use of non-NPK quick disconnects on hydraulic circuits operating NPK Products, including Compactor/Drivers for the following reasons:

1. Compactor/Driver operation can cause internal pieces of a non-NPK quick disconnect (32) to disintegrate. These pieces can migrate into the Compactor/Driver hydraulic motor, causing damage.



2. If quick disconnects are used when the Compactor/Driver is removed from the carrier, the disconnects should be capped to keep them clean. If this is not done, contamination in the disconnect will be flushed into the Compactor/Driver when reconnected, also causing damage.
3. Quick disconnects create a restriction in the hydraulic circuit. NPK Compactor/Drivers are back pressure sensitive. Restrictions can cause damage to the hydraulic motor.
4. The pressure required to operate the Compactor/Driver, plus the restriction of the quick disconnects may push older, low pressure carriers to the limit of their hydraulic system, interfering with Compactor/Driver Operation.
5. Quick disconnect restrictions can cause unnecessary heating of the carrier's hydraulic system.

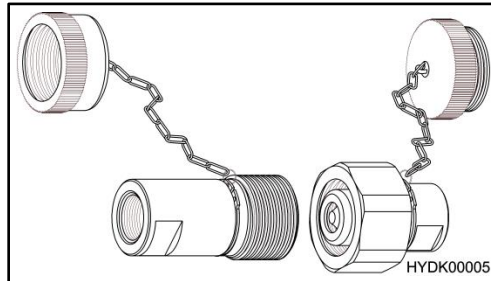
NPK encourages the use of a standard hose and fitting connection (39). It is recommended that when the Compactor/Driver is removed from the carrier, the tube ends and hose fittings should be capped and plugged to keep them clean.



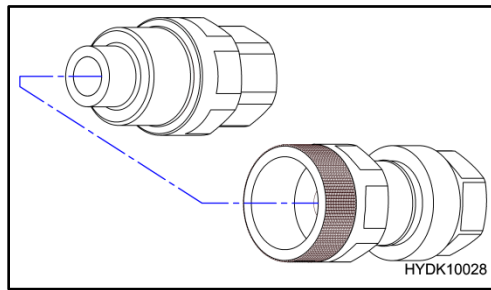
# HYDRAULIC INSTALLATION

## NPK APPROVED CONNECTION QUICK DISCONNECTS

NPK approved quick disconnects are available. They are properly sized for compactor operation.



**ROFLEX COUPLING**



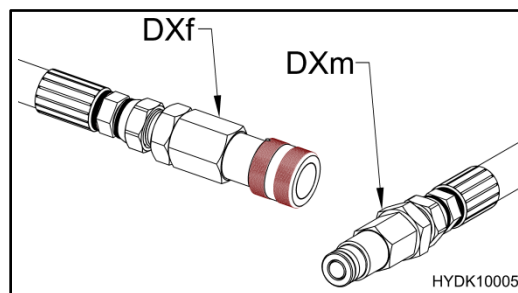
**STUCCHI COUPLING**

*Contact your dealer for additional information.*

## PRECAUTIONS

If hydraulic quick disconnects are used with the NPK Compactor/Driver, it is recommended that the following precautions be followed:

1. Make sure the quick disconnects are sized properly for your application.
2. Periodic inspection of both male and female ends is recommended to ensure that the quick disconnects are in good working condition. Failure to inspect couplers may result in pieces from a damaged or failed quick disconnect to be injected into the Compactor/Driver hydraulic motor or the carrier's hydraulic system.
3. Check for dirt, dust and debris on both the male (DXm) and female (DXf) ends of the quick disconnect before coupling them together.

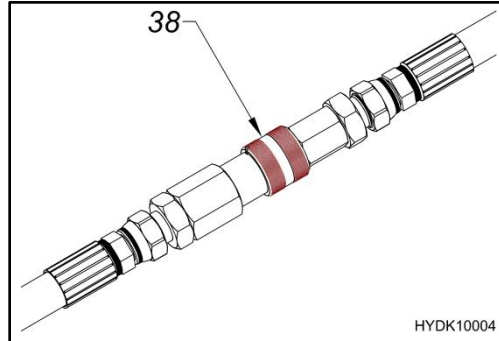


# HYDRAULIC INSTALLATION

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## PRECAUTIONS

4. Be sure that the couplers are completely seated together (38).

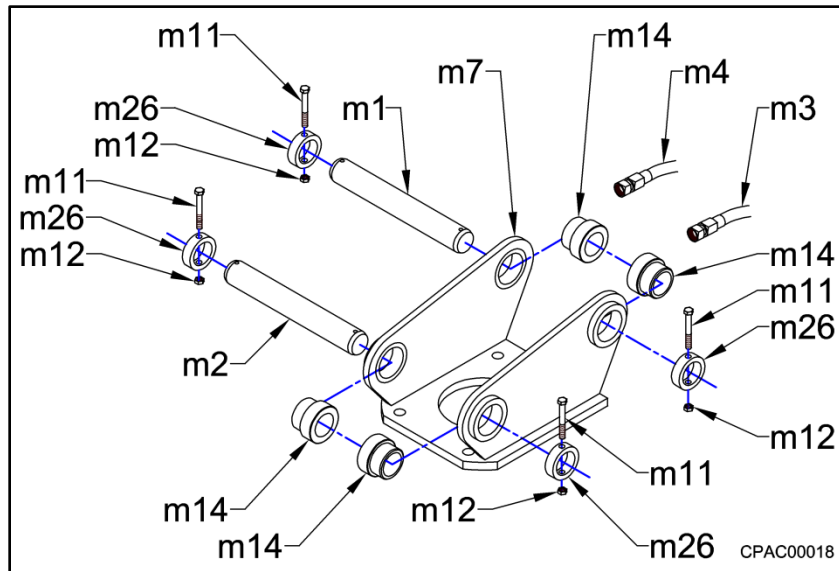


5. When replacing couplers, be sure that the couplers are replaced as a set (*male and female*). **Do not** use one new end and one used end.



# MECHANICAL INSTALLATION

NPK MOUNTING INSTALLATION KITS include the parts required to adapt the NPK Sheet Pile Driver to the stick or arm of the carrier. Custom adapter brackets and quick attach brackets are available. Shown below is a typical NPK mounting kit. Mounting kits are machine specific. Contact the NPK Sales Department for additional information.



See the FASTENER TORQUE section of the NPK Instruction Manual for top bracket bolt torque.

ITEM	DESCRIPTION
m1	STICK PIN
m2	LINK PIN
m3	HYDRAULIC HOSE ASSEMBLY ( <i>pressure</i> )
m4	HYDRAULIC HOSE ASSEMBLY ( <i>return</i> )
m7	TOP BRACKET
m11	HEX HEAD CAP SCREW
m12	HEX NUT
m14	BOOM PIN BUSHING
m26	BOOM PIN COLLAR

## ATTENTION

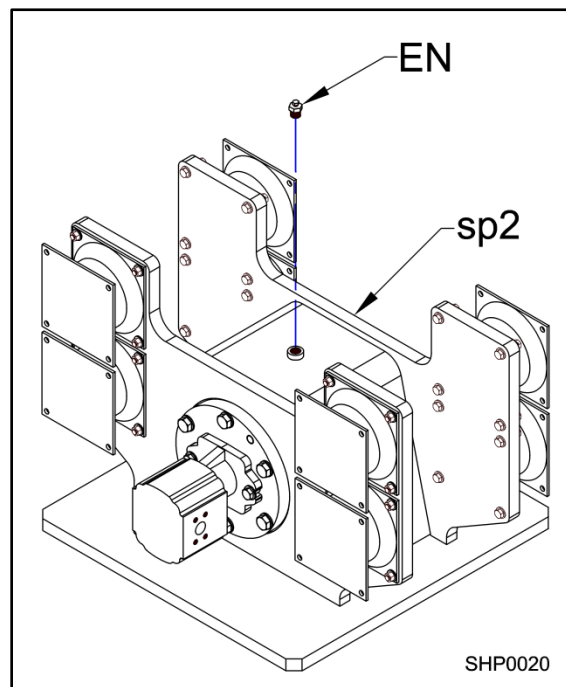
When mounting or removing the Sheet Pile Driver from the carrier, the hydraulic lines must be handled carefully and sealed to prevent contamination from entering the compactor or the carrier hydraulic system.

# MAINTENANCE AND INSPECTION

---

## DAILY MAINTENANCE

- **C6CSD, C8CSD and C10CSD** Sheet Pile Drivers use oil lubrication for the bearings, which may require semi-annual maintenance.
- Periodically check all fasteners and tighten as necessary. The hydraulic motor bolts require thread adhesive.
- Periodically check the rubber mounts for deterioration or cracking. Wash oil or grease from the rubber surface.
- Oil leakage out of the eccentric housing (sp2) or lower frame vent (EN) is an indication of hydraulic motor shaft seal failure.



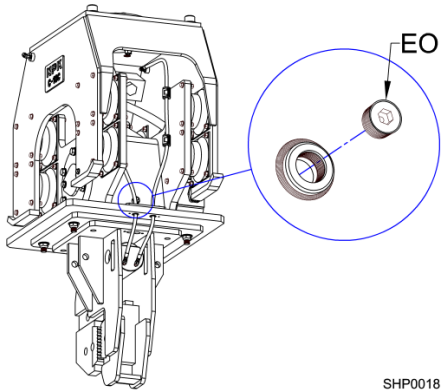
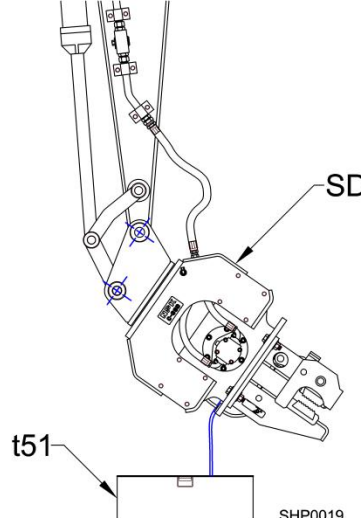
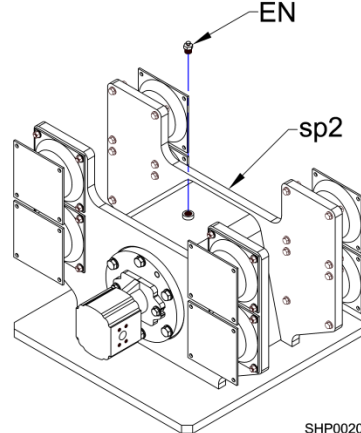
- Inspect eccentric (roller) bearings if they become noisy. Noisy bearings could be an indication of insufficient lubrication.
- Do not operate the Sheet Pile Driver if the carrier hydraulic reservoir temperature exceeds 180°F (80°C).

# MAINTENANCE AND INSPECTION

## SEMI-ANNUAL MAINTENANCE

### REPLACE BEARING LUBRICATION OIL

C6CSD, C8CSD and C10CSD Sheet Pile Drivers:

<p>1. Remove the drain plug (EO) from the eccentric housing (lower frame).</p>	 <p>SHP0018</p>
<p>2. Tip the Sheet Pile Driver (SD) up on end and pour the oil into a container (t51) suitable for disposal.</p>	 <p>SHP0019</p>
<p>3. Set the Sheet Pile Driver flat. Remove the fill plug (EN) from the top of the eccentric housing or lower frame (sp2).</p>	 <p>SHP0020</p>

# MAINTENANCE AND INSPECTION

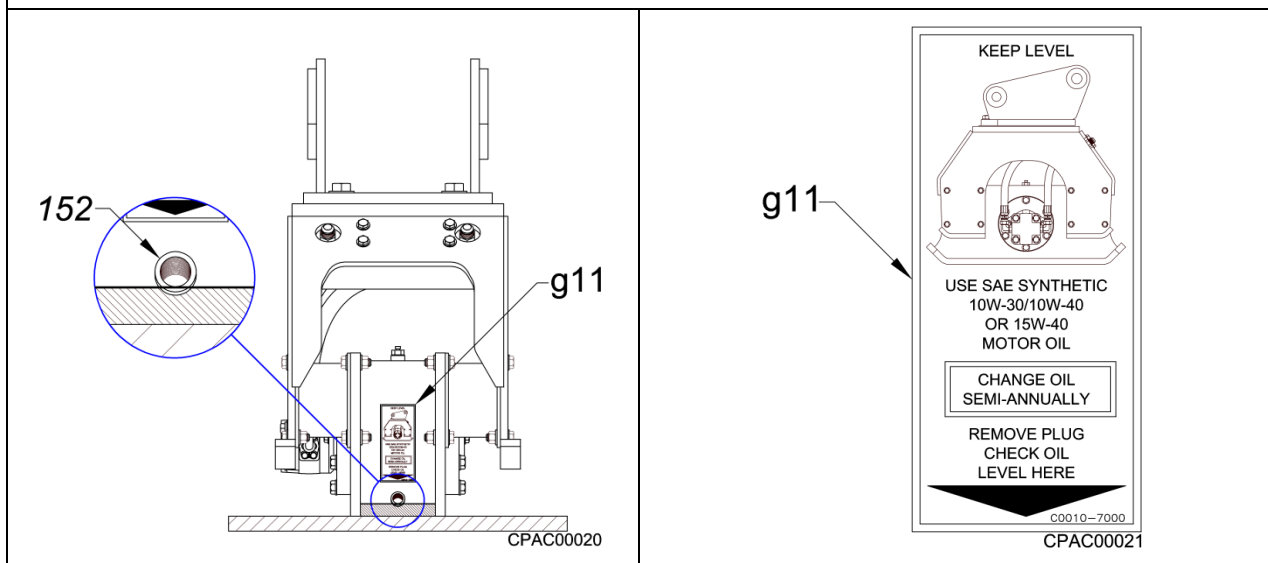
## SEMI-ANNUAL MAINTENANCE

### REPLACE BEARING LUBRICATION OIL

C6CSD, C8CSD and C10CSD Sheet Pile Drivers:

4. Fill the Sheet Pile Driver to the bottom of the oil drain port (152). Use 10W-30 or 10W-40 synthetic motor oil. The use of a 15W-40 motor oil is also acceptable. See the oil level decal (g11) below. Re-install the drain plug.

See "OIL CAPACITY" – LOWER FRAME", page 32.



## TWENTY HOUR INSPECTION

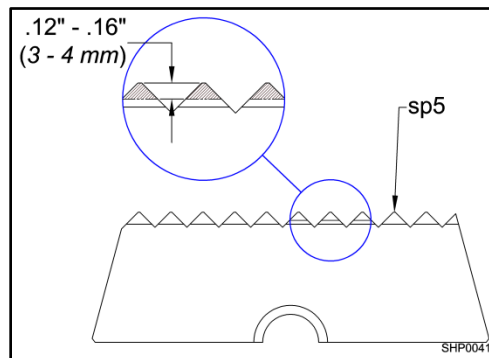
1. Complete and send the warranty registration to NPK when the unit is delivered to the customer (see warranty registration instructions).
2. After the first 20 hours of operation, inspect all fasteners and tighten as needed.

# MAINTENANCE AND INSPECTION

## JAW TOOTH PLATE (CHUCK) INSPECTION

Check for jaw tooth wear.

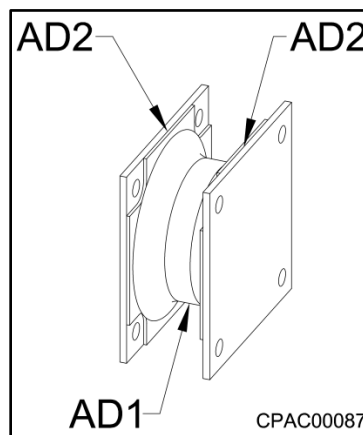
If the chuck (sp5) is worn more than .12" to .16" (3 – 4 mm) and the sheet pile slips out easily, replace the chuck jaws.



## RUBBER MOUNT INSPECTION

The rubber mounts will eventually need replacing due to the hours of use or operator abuse. The mounts are designed to work in a temperature range of 0° to 160°F (-18° to 70°C). Below 0°F (-18°C), the rubber mounts become very stiff and not as effective in reducing vibration. Above 160°F (70°C), the rubber mount material becomes too soft and wears fast. Excessive down force on the Sheet Pile Driver, overstretches the rubber and can lead to early mount failure. Petroleum products and solvents will degrade the rubber.

Cracks may appear in the body of the rubber (AD1) or where the rubber bonds to the metal plates (AD2). Light surface “checking” due to age is acceptable. If cracks propagate into the body of the rubber, the mount must be replaced immediately. If the crack is located at the rubber to metal plate bond, and is over 4 inches (100 mm) long, or 1-1/2 inches (38 mm) deep, the mount must also be replaced.



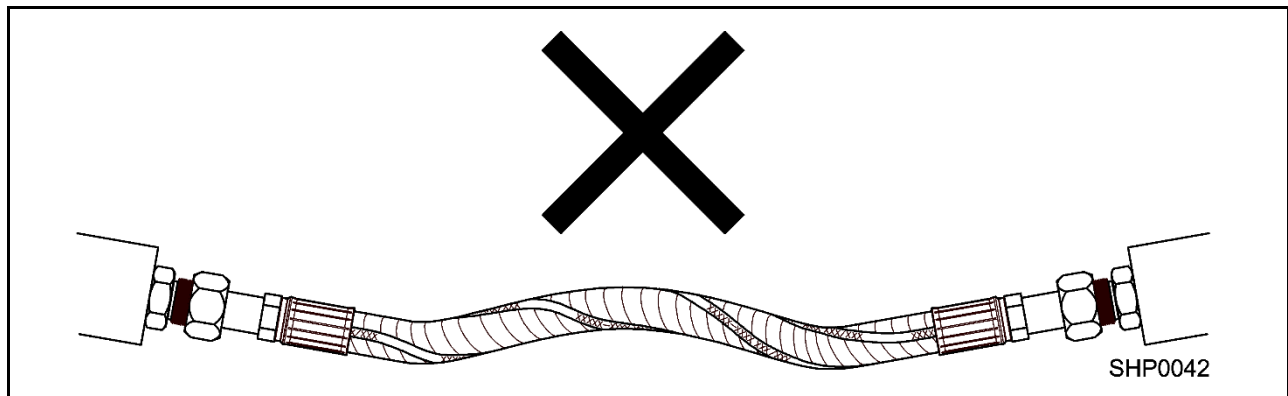
# **MAINTENANCE AND INSPECTION**

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## **HOSE CONNECTIONS**

Check the hose connections.

Make sure the hose connections are torqued properly and that the hoses are not twisted.



# LUBRICANT TERMS AND DEFINITIONS

<b>TERM</b>	<b>DEFINITION</b>
<b>ADHESIVE</b>	<i>The ability of grease, gear lubricant or oil to cling to metal.</i>
<b>ANTI WEAR AGENTS</b>	<i>Used to help combat metal-to-metal contact, thus reducing wear.</i>
<b>CAVITATION</b>	<i>Air pockets in the oil circuit (as at the pump inlet).</i>
<b>COHESIVE</b>	<i>The ability of grease, gear lube or oil to cling to itself, thus resisting tearing apart.</i>
<b>CONSISTENCY</b>	<i>Consistency of grease is its hardness or firmness. It is determined by the depth in millimeters to which the cone of a penetrometer sinks into a sample under specified conditions. Consistency of grease may be influenced by the type and amount of thickener, viscosity of oil, working and other factors.</i>
<b>CONTAMINATION</b>	<i>Foreign material that could damage a part.</i>
<b>FILM STRENGTH</b>	<i>Film strength is defined as the tendency of oil molecules to cling together. It is the ability of those molecules to resist separation under pressure between two metals and to hold these metal surfaces apart.</i>
<b>FORCE</b>	<i>A push or pull acting upon a body. In a hydraulic cylinder, it is the product of the pressure on the fluid, multiplied by the effective area of the cylinder piston. It is measured in pounds or tons.</i>
<b>FRICITION</b>	<i>The resistance to fluid flow in a hydraulic system. (An energy loss in terms of power output.)</i>
<b>GALLING</b>	<i>Surface damage on mating, moving metal parts due to friction. A severe form of adhesive wear.</i>
<b>LUBRICATION</b>	<i>Use of a substance (grease, oil, etc.) to reduce friction between parts or objects that move against each other.</i>
<b>NLGI</b>	<i>A rating given to a grease from the National Lubricating Grease Institute. This rating determines the hardness of the grease and goes from a 000 to a 6 rating. Most greases are NLGI #2 rated.</i>

# LUBRICANT TERMS AND DEFINITIONS

<b>TERM</b>	<b>DEFINITION</b>
<b>OILINESS</b>	<i>Oiliness is measured of the coefficient of friction of a lubricant. Oiliness or lubricity depends on the adhering characteristics of an oil. It is determined by the attraction between the molecules of the oil and the molecules of another material. Of two oils having the same viscosity but different degrees of fluid friction, the one with the lower friction index has the higher degree of oiliness.</i>
<b>PITTING</b>	<i>(Gears or Bearings) A type of surface damage occurring under repeated loading of two parts in rolling or sliding contact. A form of surface fatigue.</i>
<b>PUMP</b>	<i>A device which converts mechanical force into hydraulic fluid power. Basic design types are gear, vane, and piston units.</i>
<b>RACE</b>	<i>A channel in the inner or outer ring of an anti-friction bearing in which the balls or rollers roll.</i>
<b>RESERVOIR</b>	<i>A container for keeping a supply of working fluid in a hydraulic system.</i>
<b>ROLLER BEARING</b>	<i>An inner or outer race upon which hardened steel rollers operate.</i>
<b>SPLINE</b>	<i>Splines are multiple keys in the general form of internal and external gear teeth, used to prevent relative rotation of cylindrically-fitted parts.</i>
<b>VIBRATION</b>	<i>A quivering or trembling motion.</i>
<b>VISCOSITY</b>	<i>Is the actual SAE weight of the product. Example: motor oils come in 10, 20, 30, 40, 50 and 15/40 SAE weight. The viscosity designation of a lubricant indicates its internal resistance to flow.</i>



# OIL CAPACITY SPECIFICATIONS

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## LOWER FRAME

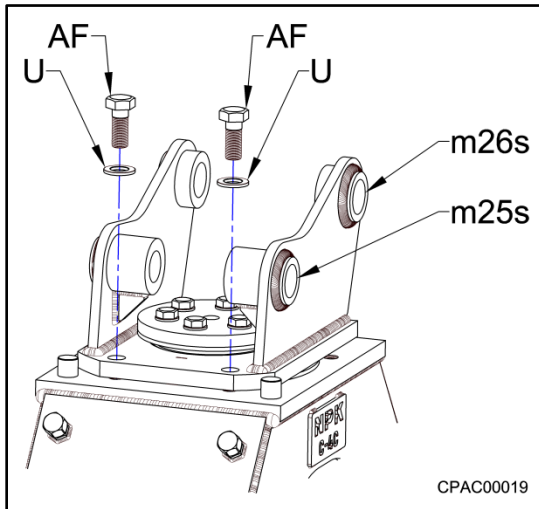
MODEL	quart	<i>(liter)</i>
<b>C6CSD</b>	3.2	<i>(3.0)</i>
<b>C8CSD</b>	3.6	<i>(3.4)</i>
<b>C10CSD</b>	9.6	<i>(9.0)</i>

Capacities shown are approximate.

# BEFORE OPERATION

## DECIDE IF SWIVEL LOCK FEATURE WILL BE USED

The swivel lock bolts (AF) and washers (U) that are found on models equipped with the swivel feature are factory assembled hand tight only. If using the swivel lock feature, these bolts must be loosened then tightened to the specified torque below (also see the “**FASTENER TORQUE**” section of the NPK Instruction Manual) before operating the Compactor/Driver in the “*fixed mode*”.



MODEL	TOP BRACKET SWIVEL LOCK		
	BOLT DIA.	TORQUE	
		ft. lbs.	(Nm)
C6CSD	1-1/4"	1350	(1830)
C8CSD	1-1/4"	1350	(1830)
C10CSD	1-1/4"	1350	(1830)

### ATTENTION

If these bolts are overtightened, the stick pin (m26s) and link pin (m25s) bores may become misaligned. Loosen these bolts and torque to the proper value. Also, these bolts must be installed on the stick pin side of the bracket or the link pin side of the bracket. **DO NOT** install one at each pin side of the bracket.

# OPERATION

## PRE-CHECKS

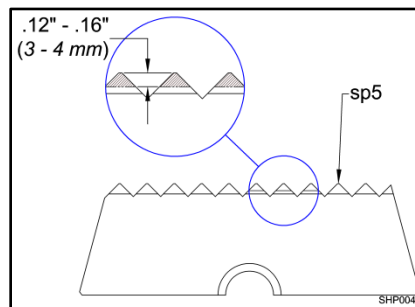
### CHECK FASTENERS FOR PROPER TIGHTNESS

See “NPK Sheet Pile Driver Instruction Manual” for proper fastener torque.

### JAW TOOTH PLATE (CHUCK) INSPECTION

Check for jaw tooth wear.

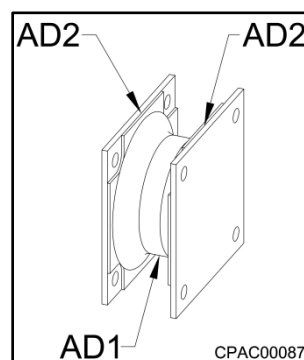
If the chuck (sp5) is worn more than .12” to .16” (3 – 4 mm) per side and the sheet pile slips out easily, replace the chuck jaws.



### RUBBER MOUNT INSPECTION

The rubber mounts will eventually need replacing due to the hours of use or operator abuse. The mounts are designed to work in a temperature range of 0°F to 160°F (-18°C to 70°C). Below 0°F (-18°C), the rubber mounts become very stiff and not as effective in reducing vibration. Above 160°F (70°C), the rubber mount material becomes too soft and wears fast. Excessive down force on the Sheet Pile Driver, overstretches the rubber and can lead to early mount failure. Petroleum products and solvents will degrade the rubber.

Cracks may appear in the body of the rubber (AD1) or where the rubber bonds to the metal plates (AD2). Light surface “checking” due to age is acceptable. If cracks propagate into the body of the rubber, the mount must be replaced immediately. If the crack is located at the rubber to metal plate bond, and is over 4 inches (100 mm) long, or 1-1/2 inches (38 mm) deep, the mount must also be replaced.



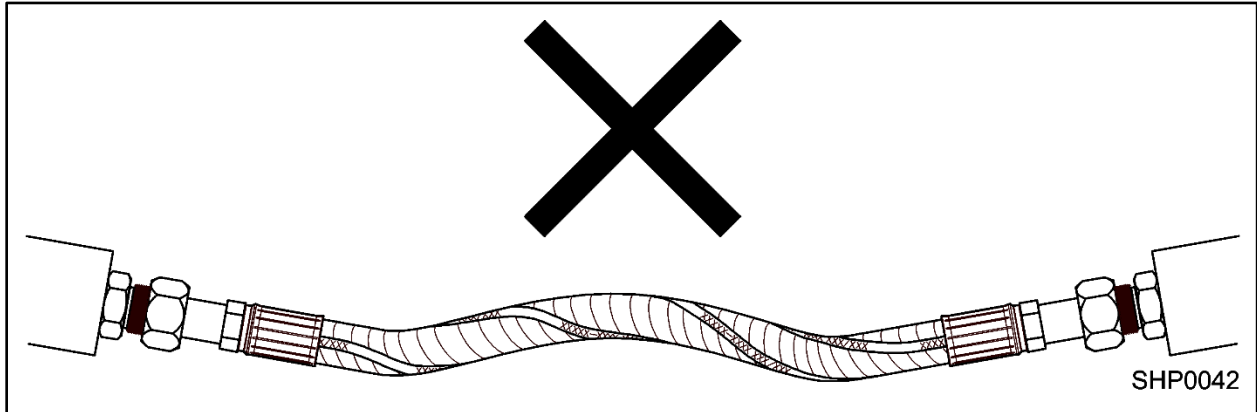
# OPERATION

## PRE-CHECKS

### HOSE CONNECTIONS

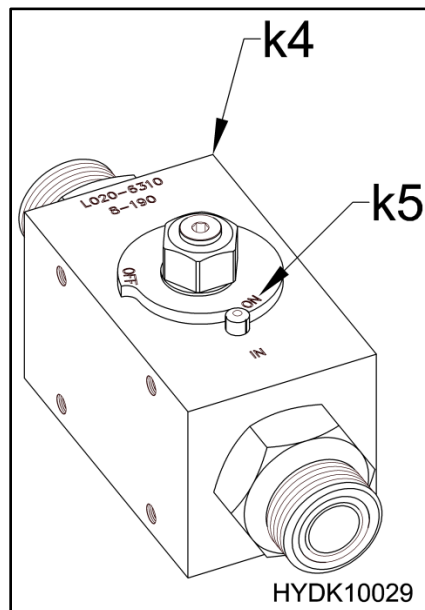
Check the hose connections.

Make sure the hose connections are torqued properly and that the hoses are not twisted.



### CHECK SHUT-OFF VALVE POSITION

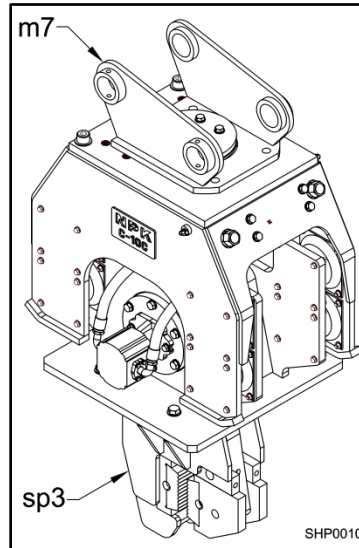
Make sure the shut-off valves (k4), if supplied, are in the "ON" (k5) position.



# OPERATION

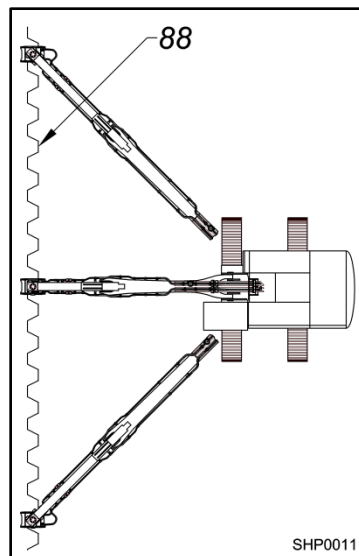
## SHEET/PILE DRIVING AND EXTRACTING

### SWIVEL FEATURE



A free-turning swivel top (m7) is provided on models C6CSD, C8CSD and C10CSD NPK Sheet Pile Drivers. The self-aligning swivel feature minimizes carrier repositioning. The cylinder clamp assembly (sp3) can align to the job from any carrier position, over a wide range of boom positions. The excavator can be positioned over, parallel or perpendicular to the trench if necessary.

The swivel can be locked in place either parallel or perpendicular to the boom.



**88 – Line of Sheeting**

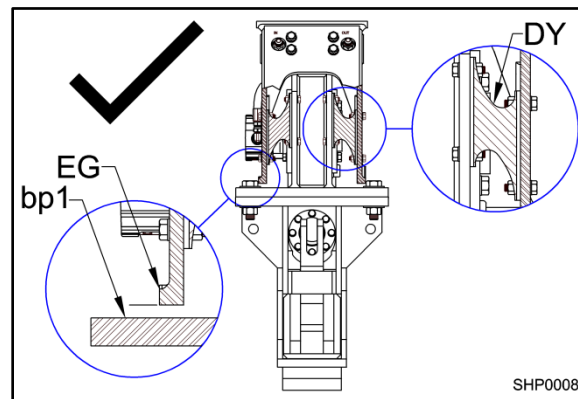
# OPERATION

The NPK Vibratory Sheet Pile Driver derives its power source from the excavator on which it is mounted. High efficiency is achieved through a combination of forces developed by the sheet pile driver and carrier machine: impulse force, vibration and downforce. A direct drive hydraulic motor rotates an eccentric mass at high speed to produce ***impulse force and vibration***.

Static downpressure from the excavator, plus the weight of the sheet pile driver, produces downforce into the sheet being driven. As the compactor is pressed against the material, the hydraulic pressure to the motor will rise.

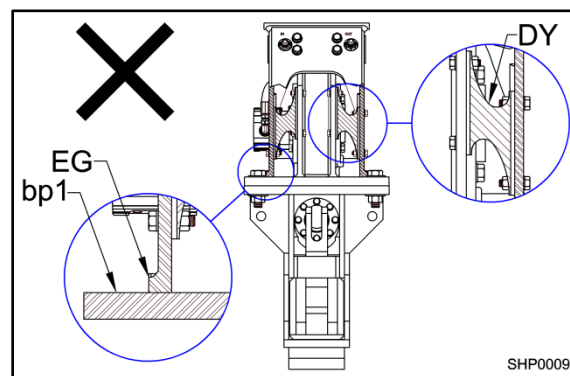
For best results, the rubber mounts, which isolate the lower frame from the upper frame, should be deflected no greater than one-half diameter, see below.

***The rubber mounts (DY) should not be deflected so far that the upper frame (EG) contacts the baseplate (bp1) of the lower frame. Do not overstress the rubber mounts by applying heavy down pressure and pulling or pushing (ironing) with the stick.***



**Fig. 1**

(Deflection less than one-half of the rubber mount diameter.)



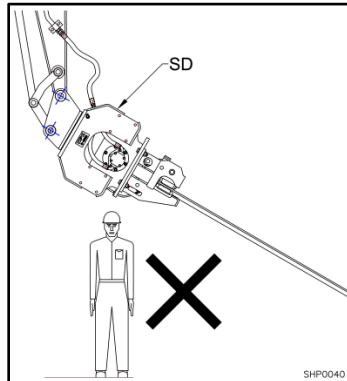
**Fig. 2**

(Upper frame hitting baseplate.)

# OPERATION



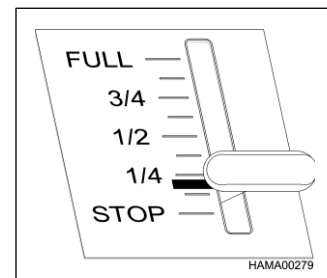
Keep personnel and bystanders clear of the SHEET PILE DRIVER (SD) while in operation. **NO ONE** should be under the unit!



## CHUCKING THE SHEET PILE

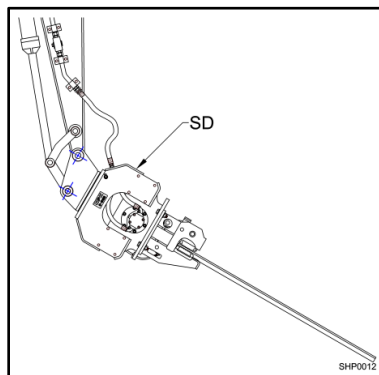


1. Turn the sheet pile driver frame manually until it is positioned in parallel to the sheet pile. Then chuck the sheet pile.
2. Attempting to chuck a sheet pile quickly at full throttle, will cause a jerky, unsmooth movement of the Sheet Pile Driver. It is much safer and more efficient to chuck a sheet pile slowly at low throttle until the sheet pile is securely clamped.



## LIFT THE SHEET PILE

1. Do not lift the sheet pile too fast, as it may cause bending.

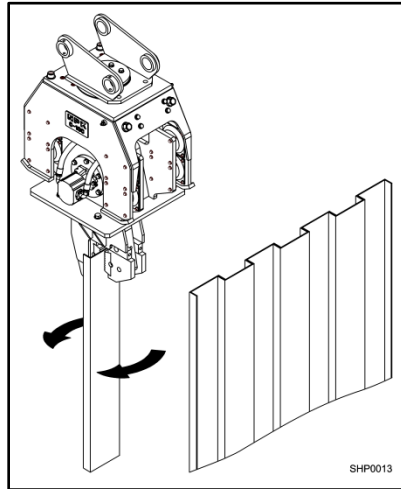


# OPERATION

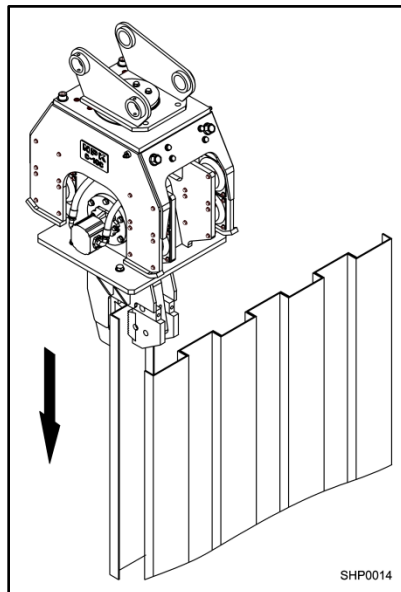
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## POSITIONING THE SHEET PILE

1. Using a pipe that is approximately 6 ft. (1.5 m) long or other suitable means, turn the sheet pile into position.



2. Insert the sheet pile into the last one installed, then drive it vertically with appropriate force.



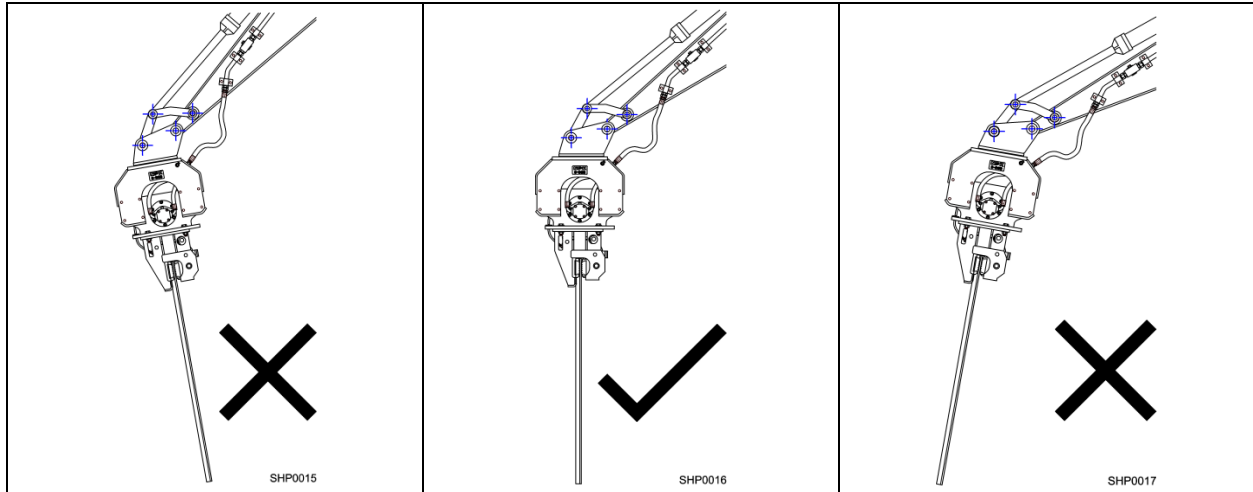
**NOTE:** Before starting to push a sheet pile, make sure it is securely chucked.



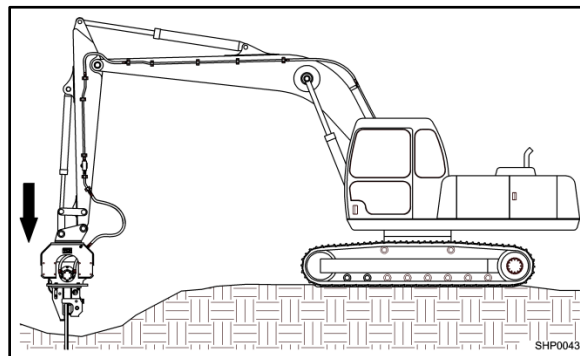
# OPERATION

## PILE DRIVING OPERATION

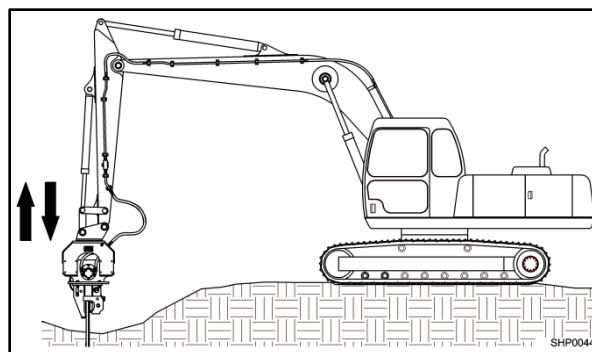
1. Make sure the sheet pile is in a vertical position.



2. If the speed of the sheet pile slows as it is going into the earth, give it proper pressing force in the vertical direction by operating the excavator to give it the vibrating speed that suits the nature of the soil so as to force the pile to drive into the soil faster.

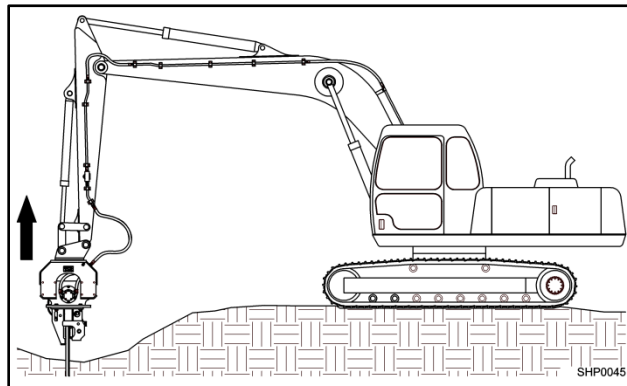


3. If the sheet pile will not go in after being driven half way into soil, pull it up some, then try to drive it again. By repeating this cycle a few times, the sheet pile can be driven through in most cases.

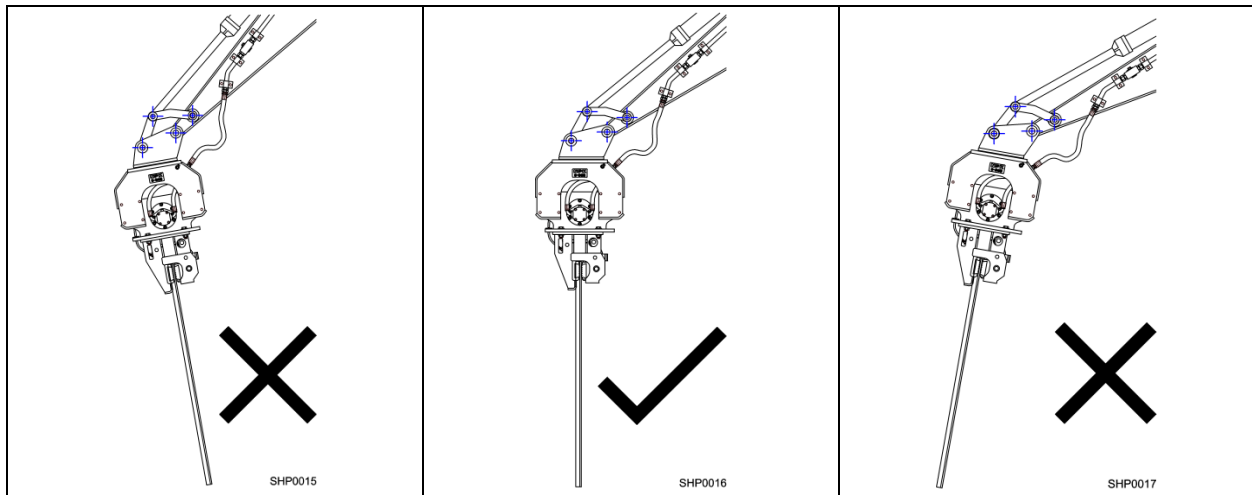


# OPERATION

## PULLING OPERATION



Piles can be pulled out, in a way similar to that for driving, by giving an appropriate pulling force to the sheet piles in the vertical direction. Do not use excessive or unevenly distributed pulling force as the sheet pile in the chuck may be damaged. Make sure the sheet pile is in a vertical position.



Make sure the sheet pile is securely chucked. Slipped pile during the pulling operation can be very dangerous. If a longer pulling time is required, recheck the pile as needed for safety.

## **OPERATIONAL PRECAUTIONS**

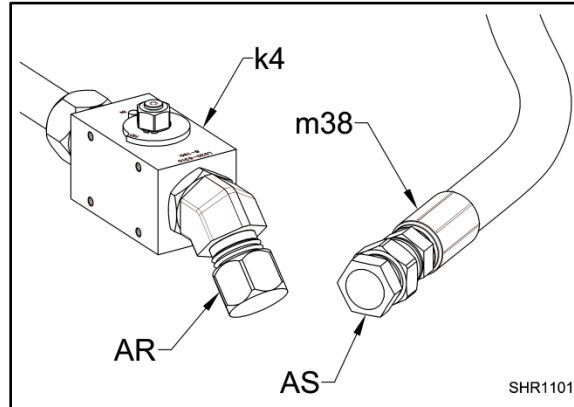
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1. Before starting operation, level and sufficiently compact the operation ground to prevent the excavator from falling down.
2. Do not touch the Sheet Pile Driver and hydraulic hoses during operation.
3. Do not use the Sheet Pile Driver for loading.
4. Hold a single sheet pile at a time. Holding more than one sheet pile simultaneously is hazardous.
5. Do not operate the hydraulic motor in other cases than sheet pile driving and pulling.
6. Watch for oil leaks.

## STORAGE OF THE SHEET PILE DRIVER

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1. Make sure all whip hoses that connect the Sheet Pile Driver to the carrier are plugged (AS) and all hose (38) connections are capped (AR). Turn the shut-off valves (k4) to the “**OFF**” position.



2. If the unit is stored outdoors, cover with a waterproof tarp.

# WARRANTY REGISTRATION FOR NEW UNITS

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Complete and send to NPK after installation or complete on line at [www.npkce.com](http://www.npkce.com).  
Online warranty registration can be done by the dealer or the end user.

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The registration can be done in any of the following ways:

1. Mailed to:  
NPKCE  
7550 Independence Dr.  
Walton Hills Ohio 44146
2. Faxed: 440-232-6294(U.S.) (+1)(440)232-6294(outside U.S.)
3. Completed online at :  
[www.npkce.com](http://www.npkce.com)

The online registration can be done by the dealer or the end user.

## Dealers:

- In the tool bar click on DEALERS.
- Using your user name and password, log into the system.
- At the left of the next page click on REGISTRATION.
- Complete the fields with an orange diamond next to them.
- At the bottom of this area, click the START REGISTRATION box and continue.
- If the registration is completed online, there is no need to mail or fax the warranty registration.

## End users / non NPK dealers

- In the tool bar click on DEALERS
- You do NOT need to fill in user name and password.
- In the left column, click on the REGISTRATION.
- Complete the fields with an orange diamond next to them.
- At the bottom of this area, click the START REGISTRATION box and continue.
- If the registration is completed online, there is no need to mail or fax the warranty registration.

# WARRANTY STATEMENTS

## **NPK** WARRANTY

"Use Genuine NPK Parts" 3/17

### BOOM MOUNTED SHEET PILE DRIVER

APPLICATION FOR WARRANTY MUST BE MADE WITHIN 30 WORKING DAYS OF FAILURE / REPAIR.

#### BASE WARRANTY (12 months)

NPK CONSTRUCTION EQUIPMENT, INC. ("NPK") warrants that new Boom Mounted Sheet Pile Drivers sold by NPK, excluding **MOTOR SEALS** and **RUBBER MOUNTS** which are covered by the PARTS LIMITED WARRANTY, will be free from defects in material or workmanship for a period of twelve (12) months, starting from the date of delivery to the first user.

#### MAIN COMPONENT EXTENDED WARRANTY (18 months or 1,500 operating hours)

The MAIN COMPONENT EXTENDED WARRANTY covers failure of the MAIN HOUSING, and the ECCENTRIC (excluding BEARINGS), resulting from defects in material or workmanship in those parts under normal use and service for the period starting with the expiration of the BASE WARRANTY and ends eighteen (18) months or 1,500 operating hours, whichever occurs first, from the date of delivery to the first user. NPK MAIN COMPONENT EXTENDED WARRANTY does not cover labor, travel expenses or the replacement or repair of any other part damaged due to MAIN HOUSING or ECCENTRIC failure or repair thereof.

#### LIMITED WARRANTY (30 days)

The **MOTOR SEALS** and **RUBBER MOUNTS** are covered by the LIMITED WARRANTY to be free from defects in material or workmanship for a period of thirty (30) days, starting from the date of delivery to the first user. NPK LIMITED WARRANTY *does not* cover labor or travel expenses.

#### THIS WARRANTY DOES NOT APPLY TO:

- REPLACEMENT PARTS, HYDRAULIC and MOUNTING INSTALLATION KIT PARTS, and HOSES, which are covered by other warranties.

#### NPK RESPONSIBILITY

NPK will, at its option, repair or replace with a new or reconditioned part, any warranted part that fails by reason of defective material or workmanship, free of charge delivered at a place of business of an NPK Dealer. Note: Parts replaced under warranty become the property of NPK.

During the twelve (12) month BASE WARRANTY period, NPK will pay the cost of labor at 75% of the posted shop rate that is necessary to install any repaired or replacement part during normal working hours. Overtime rates and travel expenses will not be reimbursed.

#### USER RESPONSIBILITY

- *Photos must accompany all warranties submitted to NPK. These photos can be 35mm, polaroid, or digital.*
- The installer, user, operator, repairer, assumes responsibility to read, understand and comply with NPK's written INSTALLATION, OPERATOR and SERVICE INSTRUCTIONS.
- Returning Warranty Registration to NPK at the time of installation.
- All costs associated with transporting the boom mounted sheet pile driver, or equipment to which the boom mounted sheet pile driver is installed, to an authorized NPK Dealer or other authorized location. NPK is not responsible for any expense incurred in field repair.

#### THESE WARRANTIES DO NOT COVER FAILURES RESULTING FROM:

- Installation, alteration, operation, maintenance, repair or storage which NPK judges improper.
- Not performing DAILY VISUAL INSPECTIONS and/or 20 HOUR INSPECTION AND RETIGHTENING as specified in the NPK MANUALS.
- Return line pressure exceeding 150 psi.
- Inadequate bearing lubrication.
- Operation after discovery of defective or worn parts.
- Unreasonable delay in making a repair after being notified of a potential product problem.

#### THESE WARRANTIES SPECIFICALLY EXCLUDE:

- Installations not approved by NPK.
- Replacement due to normal wear.
- Repairs by other than an authorized NPK Dealer.
- Use of parts not sold by NPK. **THE USE OF "WILL FIT" PARTS WILL VOID ALL NPK WARRANTIES.**
- Labor charges that are deemed excessive by NPK.
- Parts shipping charges in excess of those which are usual and customary. (Air freight, unless pre-approved, will not be covered.)
- Duties, brokerage fees, and local taxes.

**WARRANTY REPAIRS DO NOT EXTEND THE STANDARD WARRANTY PERIOD.**

#### LIMITATIONS AND EXCLUSIONS

Violation of any federal, provincial, state or local laws, ordinances, rules or regulations, or removal or alteration of product serial numbers void NPK's written product warranties. *Application for warranty must be made within 30 days of failure / repair.*

**THIS PRODUCT MUST BE USED IN A SAFE AND LAWFUL MANNER IN COMPLIANCE WITH APPLICABLE OSHA REGULATIONS.**

The written product warranties made by NPK set forth NPK's only obligations with respect to any claims of failure, defects or deficiencies in products sold by NPK. **NPK MAKES NO OTHER WARRANTIES OR REPRESENTATIONS WHATSOEVER, EXPRESS OR IMPLIED, OF THE QUALITY, PERFORMANCE, DURABILITY, MATERIALS, WORKMANSHIP, SUITABILITY, CONDITION, DESIGN OR UTILITY OF PRODUCTS SOLD BY NPK, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, ALL SUCH OTHER WARRANTIES AND REPRESENTATIONS BEING HEREBY EXPRESSLY EXCLUDED. NPK SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, COSTS, LOSSES OR LIABILITIES ON ACCOUNT OF DELAY OR DOWNTIME.**

#### DISCLAIMER REGARDING OTHER REPRESENTATIONS OR WARRANTIES

No person is authorized to grant any other warranties or to assume any other liability on NPK's behalf unless made or assumed in writing by an officer of NPK. No person is authorized to grant any warranties or to assume any liabilities on the seller's behalf unless made or assumed in writing by the seller.

Internet: [www.npkce.com](http://www.npkce.com)

As used in this warranty the term NPK means NPK CONSTRUCTION EQUIPMENT, INC., WALTON HILLS, OHIO, U.S.A.

# WARRANTY STATEMENTS

"Use Genuine NPK Parts" 6/08

## **NPK** WARRANTY REPLACEMENT PARTS

**APPLICATION FOR WARRANTY MUST BE MADE WITHIN 30 WORKING DAYS OF FAILURE / REPAIR.**

### REPLACEMENT PARTS WARRANTY (90 days)

NPK CONSTRUCTION EQUIPMENT, INC. ("NPK") warrants that new Replacement Parts sold by NPK will be free from defects in material or workmanship for a period of ninety (90) days, starting from the date of installation. NPK Replacement Parts Warranty **does not** cover labor or travel expenses. Note: Unexpired New Product Warranty has priority over Replacement Parts Warranty.

### THIS WARRANTY DOES NOT APPLY TO:

- Wear items such as upper and lower tool bushings, impact ring, retaining bars and pins.
- Tools (covered under separate Tool Warranty).

### NPK RESPONSIBILITY

NPK will, at its option, repair or replace with a new or reconditioned part, any warranted part that fails by reason of defective material or workmanship, free of charge delivered at a place of business of an NPK Dealer. Note: Parts replaced under warranty become the property of NPK.

### USER RESPONSIBILITY

- **Photos must accompany all warranties submitted to NPK. These photos can be 35mm, polaroid, or digital.**
- The installer, user, operator, repairer, assumes responsibility to read, understand and comply with NPK's written INSTALLATION, OPERATOR and SERVICE INSTRUCTIONS.
- All labor costs.
- Any expense incurred by field repair.
- Supplying a hydraulic oil sample from the carrier machine upon request by NPK.

### THESE WARRANTIES DO NOT COVER FAILURES RESULTING FROM:

- Installation, alteration, operation, maintenance, repair or storage which NPK judges improper.
- Not performing DAILY VISUAL INSPECTIONS and/or RETIGHTENING of fasteners after initial 20 operating hours after repair.
- Exceeding the tool and/or tool bushing wear limit.
- Underwater operation.
- Operation after discovery of defective or worn parts.
- Unreasonable delay in making a repair after being notified of a potential product problem.

### THESE WARRANTIES SPECIFICALLY EXCLUDE:

- Installations not approved by NPK.
- Replacement due to normal wear.
- Use of parts not sold by NPK. **THE USE OF "WILL FIT" PARTS WILL VOID ALL NPK WARRANTIES.**
- Parts shipping charges in excess of those which are usual and customary. (Air freight, unless pre-approved, will not be covered.)
- Duties, brokerage fees, and local taxes.

**WARRANTY REPAIRS DO NOT EXTEND THE STANDARD WARRANTY PERIOD.**

### LIMITATIONS AND EXCLUSIONS

Violation of any federal, provincial, state or local laws, ordinances, rules or regulations, or removal or alteration of product serial numbers void NPK's written product warranties. **Application for warranty must be made within 30 days of failure / repair.**

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Internet: [www.npkce.com](http://www.npkce.com)

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# NOTES AND RECORDS

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NPK COMPACTOR/DRIVER MODEL NUMBER \_\_\_\_\_

SERIAL NUMBER \_\_\_\_\_

NPK INSTALLATION KIT NUMBER \_\_\_\_\_

CARRIER MANUFACTURER	
MODEL NUMBER	
SERIES	
SERIAL NUMBER	

DATE OF INSTALLATION \_\_\_\_\_

DATE OF 20 HOUR INSPECTION \_\_\_\_\_ WARRANTY REGISTRATION SENT



