



# MKT MANUFACTURING, INC.

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SERVICE, OPERATING AND MAINTENANCE  
MANUAL FOR  
V-5Esc/HP-200 HYDRAULIC VIBRATORY PILE  
DRIVER/EXTRACTOR SYSTEM

**CALIFORNIA  
PROPOSITION 65 WARNING**

DIESEL ENGINE EXHAUST AND  
SOME OF ITS CONSTITUENTS  
ARE KNOWN TO THE STATE OF  
CALIFORNIA TO CAUSE CANCER,  
BIRTH DEFECTS, AND OTHER  
REPRODUCTIVE HARM.

**OCCUPATIONAL HEALTH WARNINGS:**

1. Construction equipment frequently operates at very high sound levels. Such sound levels can be harmful to the human hearing system. Sustained exposure to such high sound levels can permanently impair one's hearing. **Hearing protection should be worn by anyone and everyone within close proximity to a Vibratory Pile Driver/Extractor System.**
2. Do not start or operate the V-5Esc/HP-200 until having thoroughly read this manual and having received instructions from an MKT factory authorized service representative or properly trained, experienced operator.

# **MKT MANUFACTURING, INC. STANDARD NEW PRODUCT WARRANTY**

## **EXPRESS LIMITED PARTS WARRANTY FOR NEW PRODUCTS**

MKT MANUFACTURING, INC. ("MKT") warrants to the first user ("User") of any new product (whether such new product is sold directly to the customer by MKT or through a distributor) that such new product will be free from defects in material or workmanship for a period of ninety (90) days beginning on the date that such new product is delivered to the User. This Express Limited Parts Warranty ("Warranty") applies only to the first User of the new product, and not any subsequent users, regardless of whether such subsequent user becomes the owner of the new product or uses the product within such ninety (90) day warranty period. In no event shall this Warranty extend for more than twelve (12) months from the date that MKT ships the product, whether to a User or to a distributor which may or may not use the product. This Warranty applies to new products only. This Warranty is subject to the following terms and conditions.

If User believes that the product has a defect in the materials or workmanship, User shall send notice of such defect in writing to MKT within the ninety (90) day warranty period. MKT shall have the right to inspect the product for defects, and any parts which appear to MKT upon inspection to have been defective in material or workmanship shall be repaired or replaced at MKT's option. MKT shall have no other liability to User except for such repair or replacement of those parts determined to be defective. Such repair or replacement parts shall be provided at no cost to the User at such location and during such hours as determined by MKT. This Warranty shall not apply to component parts or accessories of products not manufactured by MKT, or to normal maintenance of the product or to normal maintenance parts required therefor. Replacement or repair parts installed in the products covered by this Warranty are warranted only for the remainder of the Warranty as if such parts were original components of said product. **EXCEPT AS EXPRESSLY SET FORTH IN THIS WARRANTY, MKT MAKES NO OTHER WARRANTIES, AND FURTHER DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE.**

**THIS WARRANTY IS NOT APPLICABLE TO ANY ITEM WHICH MKT SELLS THAT IS WARRANTED DIRECTLY TO THE USER BY THE MANUFACTURER OF SUCH ITEM (IF SUCH MANUFACTURER OF SUCH ITEM IS NOT MKT).**

**MKT EXCLUDES ALL LIABILITY FOR OR ARISING FROM ANY NEGLIGENCE ON ITS PART OR ON THE PART OF ANY OF ITS EMPLOYEES, AGENTS OR REPRESENTATIVES WITH RESPECT TO THE MANUFACTURE OR SUPPLY OF THE PRODUCT.**

MKT shall not be liable to User or any third party for any loss of profits, loss of use, interruption of business, or any indirect, incidental, special, punitive or consequential damages of any kind whatsoever related to the product or the use or operation of the product. In particular, MKT assumes no liability for the results of User and its affiliates based on User's use of the products furnished by MKT. The maximum total liability of MKT shall be limited to the cost of those parts which MKT has agreed to repair or replace. This limitation applies to all causes of action in the aggregate, including without limitation, breach of contract, breach of warranty, negligence, strict liability, misrepresentations, and other torts. In any jurisdiction in which the above limitations of liability are restricted, MKT's liability is limited to the greatest extent permitted by law.

Notwithstanding anything in this Agreement to the contrary, MKT shall not be responsible for any costs or charges of User and/or any third party, including but not limited to transportation charges, shipping costs, cost of installation, duty, taxes or any other charges whatsoever including but not limited to any charges or damages due to any delays. If requested by MKT, products or parts for which a warranty claim is made are to be returned transportation prepaid to MKT at MKT's home office. Any improper use, including operation after discovery of defective or worn parts, operation beyond rated capacity, substitution of parts not approved by MKT, or any alteration or repair by others in such manner as in MKT's judgment affects the Product materially and adversely, shall void this Warranty.

NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY UNLESS SUCH CHANGE IS MADE IN WRITING AND SIGNED BY AN OFFICER OF MKT AT ITS HOME OFFICE.

## I. SAFETY INSTRUCTIONS

The following safety instructions are contained in the text of this manual. Read the entire manual before operating the hammer. Remember **SAFETY IS UP TO YOU!** Good safety practices not only protect you but also protect the people around you.

The following signal words will be found in this manual and may also be found in other manufacturer's manuals. These words are intended to alert the operator to a hazard and the degree of severity of the hazard.

**DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION** indicates a hazardous situation which, if not avoided, could result in minor injury or moderate injury.

**NOTICE** indicates a property damage message.

1. **DANGER:** For each lift the operator must review the excavator lifting capacity chart to determine that the weight of the hammer/ Rototilt assembly plus the load being lifted is within the rated capacity of the excavator.
2. **WARNING:** Check that all personnel are clear of the V-5Esc unit prior to start up and that they remain clear while unit is in operation.
3. **WARNING:** Keep hands clear of all three clamps at all times. While performing maintenance disable hydraulic circuit to avoid the possibility of injury due to clamp closure.
4. **DANGER:** Always use pile handling/ safety line to attach the pile to the hammer.
5. **DANGER:** Leave the pile handling/ safety line attached to the pile at all times if the pile is not stuck securely in the ground.
6. **DANGER:** The V-5Esc side clamp attachment is designed to handle a single pile with a **MAXIMUM** weight of 2 tons. Appropriate pile handling rigging should be supplied by the end user to handle the pile in a safe manner. Attach safe handling cable(s) to lifting eye(s) on the hammer to allow for pile placement in the jaws as shown in figure 1 (page 11).

## **I. SAFETY INSTRUCTIONS (CONTINUED)**

- 7. CAUTION:** Before closing the jaws of the bottom clamp, assure that the pile head is firmly against the clamp housing. Gripping the pile with merely the lower end of the jaws will damage the jaws, the clamp slide and/ or other clamp assembly components.
- 8. DANGER:** Stand a safe distance away from the pile and from below the V-5Esc hammer during vibrating operations. Any unobserved or unconnected, loose nut or other fastener may fall.
- 9. DANGER:** Do not unclamp the jaws from the pile while the hammer is vibrating.
- 10. DANGER:** Do not pull in excess of the rating of the V-5Esc hammer's suspension assembly or excess stresses will be put on the suspension assembly damaging one or more parts. Extreme care must be taken during the extraction process due to the high force applied by the pulling excavator or crane as the reaction due to a sudden loss of load may cause the excavator boom to lurch violently upward. A sudden loss of load could be caused by unexpected loss of clamping force or separation of the pile at the area held within the clamping jaws. (" Biting the top out of the pile")
- 11. CAUTION:** Whenever the V-5Esc hammer is observed "dancing or chattering" in place, it should be hoisted until the action stops. Failure to move a pile with the hammer "dancing or chattering" should be cause to promptly abandon the effort before serious damage is done to the hammer. To continue operations the obstruction must be removed or penetrated by switching to another driving system such as a larger vibro or a MKT diesel or air pile hammer.
- 12. CAUTION:** When the V-5Esc side clamp assembly is attached to the exciter, the maximum line pull is limited to 15 tons and the maximum downcrowd force is limited to 10 tons.

**NOTE:** use arrows on the motor side of exciter case when vibro is not equipped with a side clamp assembly. Use arrows on side clamp assembly when attached.

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## **I. INTRODUCTION**

The MKT V-5Esc/HP-200 Hydraulic Vibratory Pile Driver/Extractor System is used for installing or removing piling. The three major components of an MKT Vibratory Pile Driver/Extractor include rotating eccentric weights housed within a gear box which generates the vibratory forces to the pile, an elastomer suspension system to isolate the vibratory forces from the crane or excavator, and a hydraulic clamp system to grip the pile.

There are two rotating eccentric weights in the V-5Esc mounted in special heavy duty cylindrical roller bearings. A fixed displacement piston-type hydraulic motor is used to drive a pinion shaft and gear. The two eccentric weights are, in turn, gear driven and timed off the pinion shaft and gear.

When operating within its load capabilities, the V-5Esc vibratory is designed to deliver a driving force of about 53 tons to a pile at a rate of 1,700 vibrations per minute. The HP-200 Hydraulic Power Unit is correspondingly designed to maintain the necessary hydraulic flow and pressure to the V-5Esc Vibratory Hammer.

## II. SPECIFICATIONS FOR THE V-5Esc/HP-200 SYSTEM

### A. OPERATING DATA - V-5Esc DRIVER/EXTRACTOR

Free Hanging Frequency . . . . .	1700 CPM
Rated Drive Pressure . . . . .	3000 PSI
Rated Flow . . . . .	75 GPM
Free Hanging Amplitude . . . . .	.75 IN
Driving Force @ 1700 CPM. . . . .	53 TONS
Clamp Circuit Pressure . . . . .	2500 PSI
Clamping Force @ 2500 PSI . . . . .	62 TONS
Maximum Suspension Lift (8 Shear Blocks) . . . . .	30 TONS
Maximum Suspension lift with Side Clamp Assembly . . . . .	15 TONS
Maximum Suspension Crowd with Side Clamp Assembly . . . . .	10 TONS
Standard Clamp Jaw Opening . . . . .	1.25 IN
Clamp Cylinder Travel. . . . .	2 IN
Side Clamp Jaw Opening . . . . .	3 IN
Net Weight . . . . .	6,200 LBS
Net Weight with Side Clamp and Roto Tilt . . . . .	10,750 LBS

### B. OPERATING DATA - HP-200 LOW PRESSURE HYDRAULIC POWER UNIT

Diesel Engine . . . . .	CUMMINS QSB 6.7L
Engine Operating Speed . . . . .	2100 RPM
Electrical Control & Diesel Starting . . . . .	12 V.D.C.
Diesel Fuel Capacity. . . . .	75 GAL.
Hydraulic Fluid Tank Capacity . . . . .	150 GAL
Hydraulic Hose Capacity. . . . .	20 GAL
Net Weight With Oils . . . . .	7000 LBS.
Length. . . . .	136 IN
Width . . . . .	54 IN
Height . . . . .	90 IN

### C. OPERATING DATA - HP-200 HIGH PRESSURE HYDRAULIC POWER UNIT

Diesel Engine . . . . .	CUMMINS QSB 6.7L
Engine Operating Speed . . . . .	2100 RPM
Electrical Control & Diesel Starting . . . . .	12 V.D.C.
Diesel Fuel Capacity. . . . .	75 GAL.
Hydraulic Fluid Tank Capacity . . . . .	150 GAL
Hydraulic Hose Capacity. . . . .	20 GAL
Net Weight With Oils . . . . .	7500 LBS.
Length. . . . .	136 IN
Width . . . . .	54 IN
Height . . . . .	90 IN

### D. HOSE BUNDLE (100' TOTAL LENGTH)

4 Pieces - 50 ft.	1 1/4" I.D. Motor Line (4100404)
4 Pieces - 50 ft.	3/4" I.D. Clamp Line (4100415)
2 Pieces - 50 ft.	3/4" I.D. Drain Line (4100426)

**\*NOTE:** Frequency and engine RPM are set to maximize performance on a normal pile, and normal duty cycle. Should overheating occur to either exciter or engine due to high duty cycle, it is important that the unit be stopped and allowed to cool down. If overheating persists, reduce engine speed 100 to 200 RPM and monitor temperature. If exciter temperature remains above 180 degrees Fahrenheit, contact your Factory Authorized Distributor for assistance.

### III. V-5Esc/HP-200 SYSTEM COMPONENTS

The essential components of a complete V-5Esc/HP200 Hydraulic Vibratory Pile Driver/Extractor System are:

- A. HP-200 Diesel Driven Hydraulic Power Unit
- B. Hydraulic Hose Bundle with Five Hoses (normally 100 feet long)
- C. V-5Esc Exciter fitted with a Suspension Assembly and a Hydraulic Clamp Assembly
- D. Side Clamp Assembly/Rototilt assembly/wireless remote with pendant backup/hydraulic installation kit & shipping stand when running V-5Esc with excavator

**\*NOTE:** The Power Unit reservoir is factory filled with hydraulic oil meeting precise specifications for viscosity, viscosity index, pour point and inhibitors. The oil used, or its equivalent is readily available from most major oil companies.



## IV. SYSTEM SET-UP INSTRUCTIONS

### A. HP-200 HYDRAULIC POWER UNIT

The HP-200 Hydraulic Power Unit is assembled on a Skid Base which also serves as a fuel tank. The skid base is fitted with a steel lifting bail with a lifting eye. The power unit is thus designed to be lifted by a crane line using a chain of adequate strength. Locate the HP-200 Power Unit on firm ground with an unobstructed operator view to the intended operation of the V-5Esc hammer.

### B. CONNECTION OF HOSES

All V-5Esc hammers are thoroughly tested at the factory and consequently all hoses will be filled with hydraulic fluid. Generally, the hose bundle assembly filled with oil, is disconnected from the hydraulic power unit. Therefore, it is necessary when reconnecting to make the correct hose connections to the power unit. There are five hoses in the bundle, each 100 feet long, two 1-1/4" I.D. lines for the hydraulic motor, two 3/4" I.D. lines for the hydraulic clamp assembly and one 3/4" I.D. line for the case drain. Hose connections at the hydraulic power unit are made easily by quick disconnects with check valves. If hoses are replaced or are otherwise unfilled with oil, take necessary steps to fill them before starting the hammer (see page 11, item H)

1. When the hoses are attached to the vibratory unit, care should be made to have the bundle hanging free. Extreme care should be made at all times not to kink any of the hoses.

As an example, the motor line 1-1/4" I.D. hoses have a minimum bend radius of 16-1/2". Even though these hoses have a minimum bursting pressure of 12,000 PSI, a kink will weaken the multiple spiral wire wrap reinforcement and ruptures could result at high operating pressures.

**Any damaged hose within the hydraulic power unit hose bundle or vibratory hammer should be replaced with a hose of equivalent ratings.**

2. Before making any hydraulic hose connections, assure that the connectors are wiped clean of any dirt or contamination to prevent damage to the components in the hydraulic system.
3. Do not permit mobile equipment to run over the hydraulic hose bundle. The hydraulic hose in the bundle, even though filled with hydraulic oil, is not able to withstand external compression forces.
4. The ends of the hoses in the hose bundle should be carefully wiped clean and connected, according to size, to the short hoses which are part of the V-5Esc Assembly.
5. Make it a habit whenever hydraulic lines are subsequently disconnected to immediately cap or plug them to avoid becoming dirty and introducing contamination, into and damage to, the components of the hydraulic system. Assure that the caps and plugs are wiped clean of any dirt or contamination before using.

## **IV. SYSTEM SET-UP INSTRUCTIONS (CONTINUED)**

### **C. V-5Esc DRIVER/EXTRACTOR**

The V-5Esc hammer is factory fitted with its suspension assembly and is shipped flat on its side. It is designed to receive a 7/8" multiple loop wire rope sling properly sized and clamped to provide a factor of safety of five times the 30-ton maximum line pull capacity of the hammer, which in turn, can be slipped over a lifting crane hook. The V-5Esc hammer can be lifted from the horizontal to the vertical without danger of excessive stresses upon its connecting parts or structure.

1. Hanging in the air, the V-5Esc hammer should be hoisted, swung, and rotated to assure that the hose bundle hangs free of any loops or entanglements.
2. Manipulating the V-5Esc hammer in the air during the foregoing procedure, as well as later when setting the hammer upon a pile, will be made possible by fastening a ground handling rope to one of the V-5Esc Clamp Jaw Shields before hoisting the hammer aloft.

### **D. V-5Esc JAW SHIELDS**

The Jaw Shields are generally shipped connected to the V-5Esc Clamp Assembly. Before using the V-5Esc, assure that the Jaw Shields are tightly connected (each with four hex head cap screws and lock washers) to the V-5Esc Clamp Assembly. The Jaw Shields not only act as guides for positioning the V-5Esc on a standing pile, but are also necessary to protect the jaws and the clamp assembly from unnatural impact shock and resulting damage.

## V. START-UP PROCEDURES

### A. ENGINE FLUIDS

Make all lubricant, fuel, radiator, and preventive maintenance checks recommended in the Engine Manufacturer's Operating and Maintenance Manual before starting the diesel engine.

### B. HYDRAULIC FLUID

Check the level of the hydraulic fluid in the reservoir on the HP-200 Power Unit. Do not operate the HP-200 with the hydraulic oil level below the gauge. If hydraulic fluid must be added to the system, do not allow foreign matter to enter the hydraulic system and use proper hydraulic oil for the HP-200 system. See the lubricant and hydraulic fluid requirements for the V-5Esc/ HP-200 system. (Page 14 & 15)

### C. HYDRAULIC VALVES

The hydraulic valves in the HP-200 Power Unit have already been set for proper pressures during the factory break-in and operation of the V-5Esc/HP-200 system. **DO NOT MAKE ADJUSTMENTS TO THE VALVES WITHOUT THE ASSISTANCE OF A FACTORY TRAINED SERVICE REPRESENTATIVE.**

The hydraulic return line filter is located on the back side of the hydraulic reservoir. The filter has a full size bypass valve that protects the filter element and system with a minimum of pressure loss. Therefore, the filter, as it becomes clogged, will bypass contaminated oil to the tank. Frequent changes of the filter element will be required.

### D. HYDRAULIC SYSTEM CIRCUITRY

The repetitive functions to be performed hydraulically for the operation of the V-5Esc hammer are to clamp onto a pile, vibrate the pile, stop vibrating, and unclamp from the pile. A basic open loop hydraulic circuit has been used with a single pump performing both clamping and vibrating operations. The principle of using one pump is dependent on a clamping hydraulic cylinder that has an integrated holding pressure check valve, meaning once the pressure has been applied and immediately removed, the pressure will be locked into the cylinder. The hydraulic control valve consists of an inlet section with a pressure relief cartridge, a motor work section, a cylinder work section with work-port relief, and an outlet section.

The hydraulic fluid from the reservoir passes through the suction strainer and manual shutoff valve. **THE SHUTOFF VALVE SHOULD BE USED FOR MAINTENANCE PURPOSES ONLY.** The flow from the reservoir continues through a suction hose and enters the gear-type pump. After the flow leaves the hydraulic pump it enters the directional control valve which will be used to operate either the clamp circuit or vibrate circuit. A quick and full movement of the right-hand control lever will operate the clamp close cylinder in a short amount of time. This control lever will spring back to the neutral position and by the use of a pilot operated check valve, maintain clamping pressure. The second control lever will operate the vibrate circuit. This control lever is detented and may only be pulled toward the operator or pushed to the neutral position.

## **V. START-UP PROCEDURES (CONTINUED)**

### **D. HYDRAULIC SYSTEM CIRCUITRY**

Warm oil returning from the control valve back to the tank will be directed through an oil cooler then a return line filter before entering the tank. Cool oil will select a path which will bypass the oil cooler and enter the tank through the return line filter.

### **E. CHARACTERISTICS OF THE V5Esc/HP-200**

The dynamic force generated by the V-5Esc hammer will vary according to the operating frequency. The two eccentric weights in the hammer are fixed in size and the resulting dynamic force of the hammer is directly proportional to the square of the frequency. The power of the hammer is generally referred to as the hydraulic flow and pressure of the hydraulic motor. The drop in hammer frequency while driving a pile is mainly a result of both motor and pump losses at elevated pressures, some engine speed droop, and oil passing over the system relief valve.

The hydraulic power unit engine speed determines pump flow. The recommended engine operating speed is 2100 RPM, and the maximum operating drive pressure is 3000 PSI at the power unit. As the hammer resistance is increased calling for higher pressure, hydraulic oil may pass over the relief valve causing the hammer to slow down.

## VI. OPERATING INSTRUCTIONS

### A. OPERATING THE V-5Esc/HP-200 SYSTEM - DRIVING MODE

1. With a preset pile, the V-5Esc with the clamp jaw opened is hoisted above, centered over and lowered onto the pile head section which is to be gripped. **CAUTION: BEFORE CLOSING THE JAWS, ASSURE THAT THE PILE HEAD IS ENTERED COMPLETELY INTO THE OPENING BETWEEN THE JAWS. GRIPPING THE PILE WITH MERELY THE LOWER END OF THE JAWS WILL OVER STRESS THE JAWS AND CLAMP SYSTEM RESULTING IN POTENTIAL FAILURE OF THE JAWS, THE CLAMP SLIDE AND/OR OTHER CLAMP ASSEMBLY COMPONENTS.**
2. The clamp control lever need only be pushed or pulled, or held for several seconds to open or close the jaw, respectively. The clamp close pressure will be locked in the cylinder by a pilot operated check valve on the clamp cylinder. As an additional clamp safety, drive pressure will boost the clamp cylinder pressure through a cross-over line with a check valve.
3. The V-5Esc will vibrate with the jaws opened or closed. If vibrated with the jaws opened, the high dynamic forces could add stresses to the loosely connected jaw. The movement of the clamp and drive levers are in directions (pull to vibrate, pull to close jaws) Do not push to open the jaws while the hammer is running.
4. A pile is driven with the V-5Esc hammer by completely relaxing the hoist line after clamping the V-5Esc hammer to a supported pile. When a pile will move no further and the hydraulic fluid pressure is at a maximum, excess hydraulic flow of the V-5Esc/HP200 system may automatically dump over a relief valve and slow down the V-5Esc frequency.
5. Occasionally the inability of the V-5Esc hammer to continue to move a pile will be the result of the pile striking an impenetrable soil material or an obstruction. The observable action of the V-5Esc hammer and clamped pile will be to note a considerable fall-off of drive pressure and the exciter will "dance" in place often causing erratic interaction of the V-5Esc exciter and its suspension assembly. **WHENEVER THE V-5Esc HAMMER IS OBSERVED "DANCING OR CHATTERING" IN PLACE, IT SHOULD BE HOISTED UNTIL THE ACTION STOPS. FAILURE TO MOVE A PILE WITH THE HAMMER "DANCING OR CHATTERING" SHOULD BE CAUSE TO PROMPTLY ABANDON THE EFFORT BEFORE SERIOUS DAMAGE IS DONE TO THE HAMMER. TO CONTINUE OPERATIONS, THE OBSTRUCTION MUST BE REMOVED OR PENETRATED BY SWITCHING TO ANOTHER DRIVING SYSTEM SUCH AS A MKT DIESEL OR STEAM/AIR PILE HAMMER.**

## VI. OPERATING INSTRUCTIONS (CONTINUED)

### B. OPERATING THE V-5Esc/HP-200 SYSTEM - EXTRACTING MODE

1. A pile is extracted by merely tensioning the V-5Esc hammer hoisting line. The amount of pull which can be exerted on the V-5Esc hammer and extraction is limited by the rating of the suspension assembly and the strength of the pile. **(DO NOT PULL IN EXCESS OF THE RATING OF THE V-5Esc HAMMER SUSPENSION ASSEMBLY OR EXCESS STRESSES WILL BE PUT ON THE SUSPENSION ASSEMBLY DAMAGING ONE OR MORE PARTS.)**

**WARNING: DO NOT PULL IN EXCESS OF THE RATING OF THE V5C HAMMER'S SUSPENSION ASSEMBLY OR EXCESS STRESSES WILL BE PUT ON THE SUSPENSION ASSEMBLY DAMAGING ONE OR MORE PARTS. EXTREME CARE MUST BE TAKEN DURING THE EXTRACTION PROCESS DUE TO THE HIGH LINE PULL FORCE APPLIED BY THE PULLING CRANE. THE REACTION DUE TO A SUDDEN LOSS OF LOAD MAY CAUSE THE CRANE BOOM TO FALL BACKWARDS ACROSS THE CAB. A SUDDEN LOSS OF LOAD COULD BE CAUSED BY A PARTED CRANE LINE, UNEXPECTED LOSS OF CLAMPING FORCE, OR SEPERATION OF THE PILE AT THE AREA HELD WITHIN THE CLAMPING JAWS. ("BITING THE TOP OUT OF THE PILE")**

**WARNING: A SECOND CRANE LINE SHOULD BE ATTACHED TO AN ADJACENT PILE ("DEAD MAN") AND DRAWN TIGHT AS A PRECAUTIONARY MEASURE AGAINST A SUDDEN LOSS OF LOAD. CRANES USED FOR PILE EXTRACTION APPLICATIONS SHOULD ALWAYS BE EQUIPPED WITH BOOM STOPS.**

2. The ability of the V-5Esc hammer to switch instantly from driving to extracting mode by merely pulling on its hoist line is a procedure exclusive to vibratory usage. The hammer hangs from the number one crane line. A sheet pile, for example, is lifted from the ground on the number two line. The number two line pulls the head of the pile between the clamp jaws of the hammer. The jaws are closed, the number two line slacked, and both hammer and pile are then held by the number one line. The pile is stabbed into location with the hammer. The hammer is then allowed to vibrate and the pile worked into the ground. Usually out of plumb at the outset, the pile is alternately driven and extracted until it penetrates the soil sufficiently to be self-supporting. It is then pulled far enough to be straightened plumb and quickly driven. (Sheet piles are usually driven only a few feet and then adjacent piles are set.)
3. For pile extracting operations, the V-5Esc hammer is frequently fitted with a shackle and a short auxiliary line attached to the pad eye on the suspension housing. The V-5Esc hammer is clamped to a steel sheet pile to be pulled and the shackle is fastened into a lifting hole and the pile. The V-5Esc hammer is operated to extract the pile until the pile can be easily lifted out of place exclusively by the line pull of the crane. The V-5Esc hammer is then stopped by pushing the vibrate lever to neutral. The pile is pulled out of the ground and the hammer and pile are swung to where the pile will be stacked. The lower end of the pile is set on the ground and the V-5Esc hammer jaws are opened allowing the pile head to fall away from the jaws and hang by the line and shackle. The V-5Esc hammer and dangling pile are lowered to the ground where the shackle is disconnected from the pile.

**DO NOT UNCLAMP THE HAMMER FROM THE PILE WHILE THE HAMMER IS VIBRATING.**

## **VI. OPERATING INSTRUCTIONS (CONTINUED)**

### **OPERATING THE V-5Esc/HP-200 SYSTEM - EXTRACTING MODE**

4. The amount of pull which can be exerted on the V-5Esc hammer is limited by the rating of the suspension assembly, the strength of the pile and your rigging. **DO NOT PULL IN EXCESS OF THE RATING (16 TON) OF THE V-5Esc HAMMER SUSPENSION ASSEMBLY OR EXCESS STRESSES WILL BE PUT ON THE SUSPENSION ASSEMBLY DAMAGING ONE OR MORE PARTS.**

**DANGER: DO NOT UNCLAMP THE HAMMER FROM THE PILE WHILE THE HAMMER IS VIBRATING.**

## V-5Esc SIDE CLAMP OPERATING INSTRUCTIONS

1. **WARNING:** KEEP HANDS CLEAR OF ALL THREE CLAMPS. When performing maintenance disable the hydraulic circuit to avoid the possibility of injury due to unexpected clamp closure.
2. **WARNING:** Leave the pile line attached to the pile at all times that the pile is not stuck securely in the ground.
3. **DANGER:** The V-5Esc side clamp attachment is designed to handle a single pile with a **MAXIMUM** weight of 4,000 lbs. Appropriate pile lifting rigging should be supplied by the end user to handle the pile in a safe manner. Attach an independent set of rigging to both shackles on the hammer to allow picking the pile and placing it in the jaws as shown in figure 1.

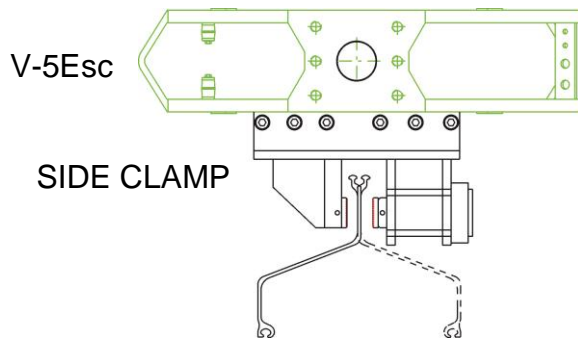


FIG. 1

4. Cut pile handling holes 3ft. or more above center of the pile on either side of center as required to position pile in jaws as shown in figure 2.

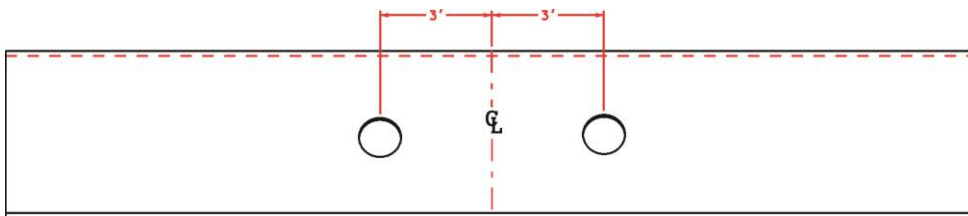


FIG. 2

5. The worksite needs to be level to maximize the speed of handling and driving the pile.
6. As soon as headroom allows, move the pile to the standard clamp to maximize driving speed.

**CAUTION:** When the V-5Esc side clamp assembly is attached to the exciter, the maximum line pull is limited to 15 tons and the maximum downcrowd is limited to 10 tons.



## VII. MAINTENANCE AND SERVICE INSTRUCTIONS

- A. The V-5Esc hammer and the HP-200 hydraulic power unit should be inspected regularly to help keep it in good operating condition. The time interval between necessary adjustments and repairs depends primarily on how much and how hard the machine has been used. Repair or replace broken or damaged parts as soon as they are discovered. Periodic cleaning and repainting will help keep all parts in better working order and prolong the machine's life.
- B. Maintenance procedures for the diesel engine in the HP-200 are described in the Engine Manufacturer's Manual.
- C. Properly maintaining the total V-5Esc/HP-200 system begins with cleanliness; assuring that no dirt or foreign material enters the hydraulic fluid circuit. Contamination of the components of the hydraulic system pumps, motors, valves, etc., will result in erratic operation, down-time, shortened equipment life, damaged parts and expensive repair or replacement parts costs.

Return to tank oil is passed through a ten-micron filter element. The factory installed filter element should be changed after first 50 hours of operation. During normal operation, the filter element change interval may range from 2 times per year or after 200 hours of operation in average atmosphere conditions.

The hydraulic oil in the reservoir passes through a suction strainer in the tank before entering the suction line and the pump. This strainer has a bypass valve and should be cleaned whenever the hydraulic tank is serviced.

- D. The hydraulic fluid level in the system should be maintained at all times. Leaks in the hydraulic system, particularly noticeable after transport and re-set-up of this system, should be eliminated by checking, tightening or replacing leaking parts. Hose connections may leak as a result of manipulating and straightening the lines and should be promptly tightened. **THE CAUSE OF HYDRAULIC LEAKS WHICH CANNOT BE CORRECTED SHOULD BE ELIMINATED BY CALLING FOR FACTORY AUTHORIZED DISTRIBUTOR SERVICE ASSISTANCE.**
  - 1. Check the hydraulic fluid level on the HP-200 tank gauge before and during operation of the V-5Esc/HP-200 system. **DO NOT OPERATE THE V-5ESC/HP-200 IF THE HYDRAULIC FLUID REGISTERS BELOW THE TANK FLUID GAUGE.**
  - 2. In normal, safe operation of the V-5Esc/HP-200 system, the hydraulic fluid temperature should remain in its normal range of 115 degrees Fahrenheit to 165 degrees Fahrenheit. The temperature can be read on the thermometer which is integral to the reservoir fluid level gauge. **IF THE HYDRAULIC OIL TEMPERATURE BECOMES EXCESSIVE (ABOVE 180 DEGREES FAHRENHEIT), STOP OPERATIONS AND CONSULT WITH THE NEAREST FACTORY AUTHORIZED SERVICING DISTRIBUTOR.**

If the hydraulic oil approaches 170 degrees Fahrenheit when operating at maximum hammer load, just run the power unit without load and the temperature should lower.

## VII. MAINTENANCE AND SERVICE INSTRUCTIONS (CONTINUED)

- E. Daily check all hoses in the hydraulic line hose bundle for cuts or other damage. Hoses are sometimes cut or bruised by dragging them across the pile heads while setting the V-5Esc hammer. Stop V-5Esc hammer operations that may damage hoses and redirect the hose bundle to avoid dragging and damage. Damaged hose sections must be replaced to eliminate failure and down-time during operations.
- F. Inspect the V-5Esc hammer for normal hanging posture and tightened fasteners, particularly on the suspension and clamp assemblies before and during operation. **SAFETY WARNING: STAND AWAY FROM THE PILE AND FROM BELOW THE V-5Esc HAMMER DURING VIBRATING OPERATIONS. ANY UNOBSERVED, UNCORRECTED, LOOSE NUT OR OTHER FASTENER MAY FALL.**
- G. Assure that the proper lube oil level is maintained in the V-5Esc exciter case. If the level of oil is above the sight gauge or the lube oil volume is increasing, this will indicate that the hydraulic motor is leaking hydraulic fluid through the motor drive shaft seal. The seal leakage must be corrected immediately. Exciter lube oil must be changed if seal failure occurs. (Page 14)
- H. The V-5Esc/HP-200 system normally has the HP-200 hydraulic reservoir, the hose bundle, and the V-5Esc hammer lines and components filled with hydraulic fluid. Whenever the system has been completely or partially drained (as when a new hose section is replaced in the hose bundle), the hydraulic lines must be purged of air. To purge the motor lines, connect the hoses to the V-5Esc and HP-200. Run the engine at an idle speed of about 800 to 1000 RPM while pulling the hammer handle for the vibrate mode. Hydraulic fluid may have to be added to the hydraulic tank after this procedure is completed. To purge the clamp lines, bleed the hydraulic clamp cylinder at the high pressure side of the cylinder. It is not necessary to run the engine at full speed when bleeding the clamp cylinder with the clamp control lever engaged.
- I. Daily Maintenance Check Lists - Check the entire unit prior to and during start-up each shift.
1. Prior to starting the engine at each shift, check as follows:
    - a) Make all daily lubrication and preventive maintenance checks indicated in the Engine Manufacturer's Operating and Maintenance Manual.
    - b) Check the hydraulic fluid level before starting the engine. Recheck this level after filling the lines to be sure it remains in the safe operating range. Do not operate the unit with the hydraulic fluid level below the gauge.
    - c) Visually check all hoses for signs of damage or cuts that might cause hose failure during operation. Be sure all connections are tight, especially the quick disconnects.
    - d) Look for any damage to the unit, in general that might cause it to fail when put into operation.
    - e) Be sure there is fuel in the tank.
    - f) Be sure there is cooling fluid in the radiator.
    - g) Check the V-5Esc exciter case lube oil level. With exciter cold, lube level should be mid level of sight glass.
    - h) Check the V-5Esc clamping jaws for excessive wear, cracks or loose fasteners. If it is necessary, the removal of the movable jaw is done by pushing out the 3/4" roll pin either up or down. The single vertical roll pin captivates the movable jaw. The fixed jaw is held tight against the housing with two one-inch bolts. Also, operating the V-5Esc on piling without the Jaw Shields could result in jaw damage if the hammer is dropped onto the pile.

## VII. MAINTENANCE AND SERVICE INSTRUCTIONS (CONTINUED)

2. After start up and the V-5Esc is vibrating, check as follows:
  - a) Inspect the hydraulic lines for leaks.
  - b) Inspect the oil seal areas in the pump drive and control valves for leaks.
  - c) Allow hydraulic oil temperature to come up slightly above the oil pour temperature, preferable to 30 degrees Fahrenheit before starting the hammer.
  - d) Before attaching to pile, open and close clamp jaws to verify fast and positive action. (Page 16, item 7)
  - e) Be sure that there are no kinks in the lines and that they hang uniformly. (Page 4, section B)
  - f) Always maintain a close check on the lifting cable to assure no fraying has occurred.
  - g) Check for overheated bearing housings. **(Page 2)**
  
- J. The HP-200 hydraulic reservoir and V-5Esc exciter case have been filled with the proper fluids at the factory. Use the following list for adding fluids which are compatible with those used at the factory:
  1. **V-5Esc Exciter Lube Oil**  
SHELL OMALA RL 220 SYNTHETIC . . . . . Capacity - 8 Gallons
  
  2. **HP-200 Hydraulic Fluid**  
SHELL TELLUS 32 S . . . . . Capacity - 150 Gallons
  
  3. **HP-200 H. P. Pump Drive**  
Sunfleet FL-5-90 or equivalent . . . . . Capacity – 5 Gallons
  
  4. **HP-200 DEF**  
Fleetguard . . . . . Capacity – 10 Gallons  
  
or diesel exhaust fluid that meets ISO22241 specifications
  
  5. **Main hydraulic filter**
    - a) Change after initial 50 hours of driving time or after the hydraulic oil has been changed, sooner if contaminated or discolored.
  
    - b) Change at least two (2) times per year or after every 200 hours of driving time, sooner if contaminated or discolored.

6. **V-5Esc exciter case lube oil**

- a) Change after every 50 hours of driving time, sooner if contaminated or discolored.

K. Normal gauge reading during operation of the HP-200 Hydraulic Power Unit:

1. Engine Speed - 2100 RPM
2. Drive Pressure - 1200 to 3000 PSI
3. Clamp Pressure - 2500 PSI
4. Hydraulic Oil Temperature - 115 degrees Fahrenheit to 165 degrees Fahrenheit

L. Replacement Filter Part Number Listing:

	<u>DESCRIPTION</u>	<u>MKT PART NUMBER</u>	<u>QUANTITY</u>
1.	Engine Oil Filter	945 04 04	1
2.	Engine Fuel Filter Primary	945 04 05	1
3.	Engine Fuel Filter Secondary	945 04 06	1
4.	Engine Air Filter Primary	945 04 07	1
5.	Engine Air Filter Secondary	945 04 08	1
6.	Hydraulic Return Filter	931 05 19	2

### III. SERVICE TROUBLE SHOOTING

#### A. HYDRAULIC POWER UNIT

1. **Hydraulic Fluid Overheating**  
Running the V-5Esc overloaded for long periods of time (drive pressure at 3000 PSI) dumps oil over the relief valve generating heat. Simply keep the V-5Esc operating but relax the load below the 3000 PSI level and the temperature should drop.
2. **Clamp Will Not Open Or Close**  
Clamp line quick disconnects may not be engaged completely or their check valves may be locked closed. There also may be too much air in the line to overcome clamp cylinder friction.
3. **Clamp Or Drive Pressure Will Not Register**  
There may be either a defective gauge, air in the gauge line or the hydraulic pump may be malfunctioning.
4. **Engine Drops Below 2000 RPM At Full Load**  
With the maximum relief pressure setting at 3000 PSI and the V-5Esc frequency at 1700 cycles per minute free hanging, the engine is not overloaded. Check both the V-5Esc frequency and the maximum drive pressure setting. It is possible that the fuel filter is clogged or that the fuel filter is not sealing correctly, causing fuel to bypass. Possible engine service is required if the problem lies with the injectors, speed control rack or fuel pump.
5. **Engine Will Not Come Up to 2100 RPM**  
Engine service is necessary to adjust the rack governor or other problem. (Ref. Cummins Engine Manual)

#### B. V-5Esc VIBRATORY HAMMER

1. **Increase In Exciter Lube Oil Level**  
This is a sure sign that the hydraulic motor has a shaft seal failure. If submerged under water, water may have seeped into the exciter case. (Page 14)
2. **Exciter Overheating In Specific Local Areas**  
Checking the side covers for the bearings will give an indication of an overheating bearing. This bearing should be checked for excessive binding or wear. Make sure the oil level is correct. It is not unusual for the temperature of the exciter housing to go up to 200 degrees Fahrenheit if the V-5Esc is run at full frequency over a long period of time. Check the lower magnetic plug for metal which might indicate excessive wear of gears or bearings

## VIII. SERVICE TROUBLE SHOOTING

### B. V-5Esc VIBRATORY HAMMER (CONTINUED)

3. **Internal Noise In Exciter**  
Unusual noise in exciter generally means something is wrong - either a bearing is starting to fail, gear train restriction, or a hydraulic motor problem causing excessive drive loading. Lube oil level should be checked.
4. **V-5Esc Frequency Fluctuation**  
Frequency is a function of pump flow and motor speed. If the pump flow is not even or a hydraulic motor is failing, it is possible the frequency will not be constant especially as the load goes a little higher (before going over relief). Check for exciter hotspots which may indicate a bearing is failing. (Page 15, Item B #2)
5. **Erratic Suspension Movement**  
High blow count soil conditions or underground obstructions may cause the hammer energy to rebound into the suspension and affect the suspension isolation. The suspension will bounce out of sync with the frequency, that will eventually cause the elastomers to overheat and fail. (Page 8 #5)
6. **Slow Clamp Movement**  
Generally, slow clamping is caused by air in the hydraulic hoses. Bleed both clamp close and clamp open bleeders of the clamp cylinder. (Page 23)
7. **Jaws Slipping on Pile**
  1. If jaws are worn too much there may be a lack of clamping jaw travel. The clamp jaw travel is two and one half inches.
  2. Check clamping pressure.
  3. Air may be in the clamp line requiring cylinder bleeding. (Page 14 Item #k-3 & Page 23)
8. **No Vibration But Drive Pressure at 3000 PSI When Put In Vibrate Mode**  
Assuming the drive quick disconnects are not faulty and connected fully and correctly, there may be a locked bearing, gear, or motor.
9. **V-5Esc Not Coming Up To Speed And/Or Pressure Very Low**  
Relief valve in the directional control valve may be clogged. May have a worn out pump or motor.
10. **V-5Esc Frequency Low But Pressure High**  
The motor seal might have blown filling the V-5ESC Exciter Case with oil. Check the lube oil level. Might have a bearing failure. Check for excessive exciter case heat. (Page 2)