



SERIAL NUMBER OF CRANE -
SERIAL NUMBER OF ENGINE -
SERIAL NUMBER OF TRANSMISSION -
SERIAL NUMBER OF TORQUE CONVERTER -

OPERATOR AND SERVICE INSTRUCTIONS

MODEL 30SCp, 36SCp & 40SCp

PETTIBONE CORPORATION
PETTIBONE NEW YORK DIVISION
ROME, NEW YORK 13440



TABLE OF CONTENTS

<u>SUBJECT</u>	<u>SECTION</u>
Introduction.....	I
Preparation for Use.....	II
Operation and Controls.....	III
Lubrication.....	IV
Power Train.....	V
Superstructure and Related Components.....	VI
Hydraulic System Components and Controls.....	VII
Air System and Components.....	VIII
Electrical System and Components.....	IX
Outriggers.....	X
Fuel Tank and Connections.....	XI
Frame.....	XII
Accessories.....	XIII



SECTION I

INTRODUCTION



TABLE OF CONTENTS

SECTION I
INTRODUCTION

<u>SUBJECT</u>	<u>PAGE</u>
Scope.....	1-1
Orientation.....	1-1
Serial Number Location.....	1-1
Supplementary Information.....	1-1
Model Designation.....	1-1
Ordering Parts.....	1-2
Preventive Maintenance.....	1-2
Description.....	1-2
Crane Specifications.....	1-3



SECTION I

INTRODUCTION

SCOPE

This Manual is published for "Operation, Maintenance and Repair". In order to become familiar with the various parts of the Crane, it is urged that the operator and maintenance personnel study the instructions and illustrations in this Manual and use it as a reference.

ORIENTATION

Throughout this Manual the use of the terms right, left, front, and rear indicate direction from the viewpoint of the operator sitting in the seat of the cab.

SERIAL NUMBER LOCATION

The Crane Serial Number is stamped at three different locations:

1. Front right hand side of frame.
2. Rear right hand top of frame.
3. Below cab door.

Always indicate the Crane model and serial number in all correspondence to properly identify the Crane and to insure that the correct parts are obtained when ordered.

SUPPLEMENTARY INFORMATION

When new models and/or assemblies are introduced which have features not covered in this Manual, supplementary information will be issued. Contact your dealer or distributor for the latest service information. Such inquiries should include model number, assembly number and serial number taken from the name plate.

MODEL DESIGNATION

- A. NAME PLATE - The Swing Cab Crane is identified by numbers on the name plate.
- B. USE NUMBERS IN CORRESPONDENCE - It is important that the model designation, serial number, and assembly part number be referred to when seeking service information or when ordering parts.



ORDERING PARTS

All replacement parts should be ordered from your dealer. The parts catalog list replacement parts, service kits and sub-assemblies. Furnish complete name plate information with each order.

PREVENTATIVE MAINTENANCE

MAINTENANCE

Your Swing Cab Crane requires periodic attention and servicing as necessary. Use only recommended oils and grease which is free of dirt.

MAINTENANCE INTERVALS

The type of service and the operating conditions will determine the maintenance intervals.

IMPORTANT

KEEP OIL AND FILTERS CLEAN - Because the hydraulic fluid is the basic medium of operating power, it must be kept clean. The area around the oil filler opening, as well as oil containers and pour spouts, must be kept free of dirt, mud, water and other harmful matter.

KEEP BREATHERS CLEAN - The breathers should be inspected frequently and thoroughly cleaned when necessary. Neglect of the breather will cause undue condensation in the system and rapid oxidation and sludging of oil. The breather should be cleaned with each oil change or more often if the equipment is operated under extremely dirty conditions.

KEEP ENGINE AIR CLEANER CLEAN - To assure maximum engine protection, the cleaner must be inspected frequently. Excessively thick oil or too high an oil level in Oil Bath Type Air Cleaners will cause improper functioning. Dry Type Air Cleaners should be inspected against the ravages of dust and leaks that can seriously affect the performance and life of the engine.

DESCRIPTION

This Crane is a self-propelled, diesel engine driven, four wheel drive and steer, rubber tired, rough terrain hydraulic crane. The Crane is capable of operating during a 360° continuous rotation of the upper structure. The operator's cab, located on the left side of the upper structure, contains all of the controls necessary to operate the Crane and drive the Crane from job site to job site.

Power, from the engine, is transmitted to a power shift transmission through a torque converter. The power shift transmission provides six speeds in the forward or reverse direction. Transmission gear ratio can be changed to provide high speed low torque, or low speed high torque operation. In low range, 4-wheel drive is employed. In high range, the rear axle is disconnected and only the front axle is driven (2-wheel drive).



Front wheel steering is controlled by a steering wheel connected to a manually operated rotary directional control valve and meter in a single body. When desired, the rear wheels can be steered in coordination with the front wheels or independently of the front wheels.

The outriggers are sliding beam-type with removable floats for storage. Four each, horizontal and vertical cylinders, provide for independent control of each beam.

Hydraulic pumps, driven by the torque converter, supply hydraulic fluid to all hydraulically powered Crane functions.

Air compressor, engine driven, supplies air for the operation of the service/parking brakes, engine throttle, transmission, outriggers, swing brake and hydraulic pump disconnects.

CRANE SPECIFICATIONS

A. PRINCIPLE DIMENSIONS

Wheel Base	10'-0"
Overall Height	12'-0"
Overall Width	8'-0"
Boom Pivot Pin to Centerline of Turntable	45"
Boom Elevation	75°
Outrigger Spread	17'-0"
Main Frame - Overall Length	21'-2-1/4"
- From Center of Rotation to Front Bumper	9'-8-3/4"
Overall Length with Boom Retracted	
Model 30-36 S.C. with 28' to 66' Boom	35'-2"
Model 40 S.C. with 30' to 72' Boom	37'-2"
Boom Length from Centerline of Pivot Pin	
Model 30-36 S.C.	
Boom Retracted	28'
Boom Extended	66'
Model 40 S.C.	
Boom Retracted	30'
Boom Extended	72'
Basic Vehicle Weight	54,500 lbs
Vehicle Turning Radius (Turning Ability)	
Turning Radius - 15'-0"	

B. ENGINE

Make - Detroit Diesel
Model - 6V-53N
No. of Cylinders - 6
Cycle - 2
Bore and Stroke - 3-7/8" X 4-3/4"
Displacement - 318 cu. in.
Horsepower Net - 176 @ 2600 RPM
Fan - 22 DIA., 6 Blade Suction
Air Cleaner - Wet Type



1-4

B. ENGINE - Continued

Oil Filter

Element - AC Part No. 5573014
Type PF-132

Oil Filter (Spin On)

Element Part No. 25010971

Primary Fuel Filter

Element - AC Part No. 25010776
Type T-915

Secondary Fuel Filter

Element - AC Part No. 25010778
Type TP-916

Radiator and Transmission Oil

Cooler - 7 PSI Pressurization, Tube and Fin Thermostatically Controlled

Electrical System - 12 Volt Start and Run - Negative Ground with (2) 4D
Batteries

Alternator - 12 Volt, 55 AMP

Air Compressor - 12 CFM @ 1250 RPM

C. TORQUE CONVERTER AND TRANSMISSION

Torque Converter

Make - Clark

Model - C-273.5-51 Offset Drive .965:1

Torque Multiplication - 1.82:1

Transmission

Make - Clark

Model - R-28621-9

D. AXLES

Front

Make and Model - Pettibone A-23255-53

Rear

Make and Model - Pettibone A-23255-51

Service Brakes - Front and Rear

Make and Size - Timken 17 X 4

Parking Brake - Front

Make - Timken TT-14-16; Size 14 X 3

Actuator - Spring Set, Air Released, Gustin - Bacon No. 40-45866-9

E. TIRES

Size - 16:00 X 24 X 16 Ply Sure Grip

Optional Size

17.50 X 25 X 16 Ply

20.50 X 25 X 16 Ply



F. FUEL TANK

Capacity - 60 Gallons

G. OIL RESERVOIR

Capacity - 141 Gallons

Filter, Return Line - Vickers 10 Micron

H. WINCH

Main

Make - Pettibone

Drum Size - 12" DIA. X 18" Long

Line Pull (Max.) - 8,500 Lbs, 1st Layer

Permissible Line Pull - 8,000 Lbs. Single Line

Line Speed (Max.) - 240 FPM

Drum Capacity - 354 Ft.

Wire Rope - 9/16" Diameter, 8 X 25 Extra Improved Plow Steel,
Right Lay, Formset, IWRC, Spin Resistant - 300 Ft. Long

Auxiliary - Optional

Make - Braden PD12A-36064-02

Drum Size - 9.63" DIA. X 13.75" Long

Line Pull (Max.) - 10,500 Lbs., 1st Layer

Permissible Line Pull - 8,500 Lbs. Single Line

Line Speed (Max.) - 256 FPM

Drum Capacity - 398 Ft.

Wire Rope - 9/16" Diameter, 8 X 25 Extra Improved Plow Steel,
Right Lay, Formset, IWRC, Spin Resistant - Length
Optional

I. SLEWING (SWING) UNIT

Make - Funk

Model - 63F13CHAS

J. FILTERS

Engine - Detroit Diesel 6V-53N

Oil Filter

Element - AC Part No. 5573014
Type PF-132

Oil Filter (Spin On)

Element Part No. 25010971

Secondary Fuel Filter

Element - AC Part No. 25010778
Type TP-916

Air Cleaner - Oil Washed

Manufacturer and Model - Donaldson FGA-14-4900

Oil Capacity - 5 QTS.



1 - 6

J. FILTERS - Continued

Air compressor Strainer

Manufacturer - Bendix Westinghouse

Element Number - 243009

Transmission Oil Filter

Manufacturer and Model - Clark Equipment 1533614

Element Number - 215502

Hydraulic Oil Return Filter

Manufacturer and Model - Vickers OFM-201-10

Element Number - 923070

H. HYDRAULIC RELIEF VALVE SETTINGS

Slewing (Swing) and Crowd #2	2000 PSI
Crowd #1 and Aux. Winch	2500 PSI
Main Winch	2500 PSI
Lift	2500 PSI
Outriggers	1500 PSI
Steering (Front)	1500 PSI
Steering (Rear)	1500 PSI

BOLT TORQUE VALVES

<u>Size</u>	<u>SAE Grade</u>	<u>Dry</u>	<u>Lube</u>
1/4 - 20	5	8 Ft. Lbs.	75 In. Lbs.
1/4 - 28	5	10 Ft. Lbs.	86 In. Lbs.
5/16 - 18	5	17 Ft. Lbs.	13 In. Lbs.
5/16 - 24	5	19 Ft. Lbs.	14 In. Lbs.
3/8 - 16	5	30 Ft. Lbs.	23 Ft. Lbs.
3/8 - 24	5	35 Ft. Lbs.	25 Ft. Lbs.
7/16 - 14	5	50 Ft. Lbs.	35 Ft. Lbs.
7/16 - 20	5	55 Ft. Lbs.	40 Ft. Lbs.
1/2 - 13	5	75 Ft. Lbs.	55 Ft. Lbs.
1/2 - 20	5	90 Ft. Lbs.	65 Ft. Lbs.
5/8 - 11	5	150 Ft. Lbs.	110 Ft. Lbs.
5/8 - 18	5	180 Ft. Lbs.	130 Ft. Lbs.
3/4 - 10	5	260 Ft. Lbs.	200 Ft. Lbs.
3/4 - 16	5	300 Ft. Lbs.	220 Ft. Lbs.
7/8 - 9	5	400 Ft. Lbs.	300 Ft. Lbs.
7/8 - 14	5	440 Ft. Lbs.	320 Ft. Lbs.
1 - 8	5	580 Ft. Lbs.	440 Ft. Lbs.
1 - 8	8	900 Ft. Lbs.	680 Ft. Lbs.
1 - 12	5	640 Ft. Lbs.	480 Ft. Lbs.



SECTION II

PREPARATION FOR USE



TABLE OF CONTENTS

SECTION II
PREPARATION FOR USE

<u>SUBJECT</u>	<u>PAGE</u>
General.....	2-1
Visual Inspections and Service Checks Prior to Use.....	2-1
Inspection, Maintenance, Operation Responsibility.....	2-2



SECTION II PREPARATION FOR USE

GENERAL

When a new or used Crane is received by an organization, service checks and inspection must be initiated.

VISUAL INSPECTIONS AND SERVICE CHECKS PRIOR TO USE

Each Crane has received a thorough inspection and complete operational check prior to factory shipment.

1. Visually inspect the Crane for evidence of physical damage and shortage.
2. Inspect Crane for loose or missing hardware. Bolts or nuts should be properly tightened or replaced.
3. Check to be sure that all tires are properly inflated and free of cuts and foreign material.
4. Check fluid level of batteries.
5. Check axle differential and planetary ends lubricant level.
6. Check engine lubricating oil and coolant for proper levels.
7. Be sure that fuel tank and hydraulic reservoirs are filled to the proper levels.
8. Check transmission oil level with engine running at idle and add quantity necessary to bring level up to full mark.
9. Check slewing (swing) gear case lubricant level.
10. Check winch lubricant level.
11. Check that all instruments are functioning.
12. Operate all controls and see that they operate properly.
13. Check lights and all warning and safety devices.
14. Check for fluid leaks and correct if necessary.
15. Check for air leaks and correct if necessary.
16. Be sure the Crane is properly lubricated per Crane Lubrication Chart.
17. Inspect wire rope for wear, kinking, or other damage; replace if necessary.



INSPECTION, MAINTENANCE, OPERATION RESPONSIBILITY

The most important area pertaining to the safe use of mobile hydraulic cranes are inspection, servicing and maintenance of the hydraulic crane. Since the hydraulic crane manufacturer has virtually no control over usage, safe and economical usage of the hydraulic crane is the responsibility of the operator and/or owner.

1. Many critical components on hydraulic cranes are subject to wear or damage and other deterioration which can reduce their normal useful life. When new, all parts have a margin of extra strength built in to components for unknown conditions and reasonable wear due to gradual deterioration. If replacement is neglected, these parts can reach a point where they become a safety hazard.
2. Failure to maintain correct adjustments of all mechanisms necessary to assure proper hydraulic crane operation can constitute a safety hazard. Hydraulic relief valves, being one of the most important safety features, should never be set to exceed manufacturer's recommended settings. Readjustments should be performed only by qualified personnel.
3. Written records of inspection and maintenance should be kept up-to-date by qualified personnel for each machine.

All hydraulic cranes in active service should be inspected at regular intervals, according to the manufacturer's recommendations, for proper adjustment of all mechanisms, excessive wear or deterioration of parts, illegible or missing signs and any other defects which might adversely affect safe operation. Any abnormalities noticed should be investigated completely and a determination made as to whether they constitute a safety hazard. Inspection is vital to safe operation and should be performed by competent personnel on a regular and systematic basis.

The frequency of inspection depend on numerous factors, such as hydraulic crane activity, severity of operations, susceptibility of the parts to wear and damage, and the extent to which the parts are critical to safety. Inspection frequency can be divided into two general categories:

1. Daily to monthly intervals, including observation during operation to discover any defects which might occur between inspections. All operating mechanisms, oil levels, hydraulic hoses and fittings, filters and strainers, brakes locking and safety devices, should be included in this category.
2. One to twelve month intervals. A complete hydraulic crane inspection, including items as in (1) above and in addition, the hydraulic crane basic structure, gearing, shafting, bearings, power plant, radiator, oil cooler, electrical equipment, etc.

For inspection frequency for the particular hydraulic crane component involved consult the manufacturer's Operators and Service Instructions.



All hydraulic hoses, and particularly those which flex in normal operation of the hydraulic crane, should be visually inspected at the beginning of every working day. A thorough inspection of all hoses, fittings, and rigid tube lines should be made at least once a month. Any deterioration must be carefully examined and decision made as to whether further use of the component would constitute a safety hazard. Conditions such as the following should be sufficient reason for replacement:

1. Any evidence of hydraulic oil leakage at the surface of the flexible hose or its junction with the metal end couplings.
2. Any blistering or abnormal deformation to the outer covering of the hydraulic hose.
3. Hydraulic oil leakage at any threaded or clamped joint that cannot be eliminated by normal tightening or recommended procedures.
4. Any hose, rigid tube or hydraulic fitting which shows evidence of excessive abrasion or scrubbing on the outer surface shall be replaced immediately. Means shall be taken immediately to eliminate the interference of the elements in contact or otherwise protect the components.

Preventive maintenance programs based on the manufacturer's recommendations shall be established. Due to the wide variation in job applications, severity of service, hydraulic crane activity and environment, it is impossible for the manufacturer to develop a single, complete standard procedure which will fit all applications. Therefore, an appropriate program should be developed by trained and experienced personnel, responsible for maintenance of the hydraulic crane by adjustment and application of the manufacturer's general recommendations, to suit the particular needs.

Any conditions, disclosed by the manufacturer's recommended inspection requirements which are considered to constitute safety hazards, shall be corrected before operation of the hydraulic crane is resumed, to assure that the equipment will always be in a safe condition with all guards and enclosures properly secured.

All replacement parts should conform to specification of the original manufacturer in order that the strength and quality of the original hydraulic crane may be preserved. Repairs should follow the manufacturer's recommended procedures.

Regular systematic lubrication shall be maintained on the hydraulic crane in accordance with the manufacturer's lubrication charts and general recommendations. All machinery should be stopped while lubricating. Any guards or panels which must be removed for access to some points for lubrication or inspection shall always be replaced before resuming operation. The boom shall be on its support at rest, and all hydraulic pressures relieved. Routine maintenance tools should be available at all times. Consult lubrication references listed in Section IV.



Safe operation finally depends on the operator and his actions. This is probably the most important area relative to safety since it involves the greatest frequency of exposure to hazards. The operator should be fully competent physically, mentally, and emotionally to understand and apply established operating safety rules. He should be able to exercise good judgment in dealing with the many situations which cannot be anticipated and covered herein. Since the manufacturer has no direct control over hydraulic crane application and operation, conformance with good safety practice and proper training in this areas is the responsibility of the user or his operating personnel.

Only hydraulic cranes of proper rated capacity and type should be assigned to the job to be done. Anything less constitutes a safety hazard.

In general, established operating safety rules, where applicable, should be observed in performing all operating functions. Operating safety rules are found in sources such as the following:

1. CIMA User's Safety Manual.
2. "Safety Considerations for the Operator", SAE J153.
3. Manufacturer's Maintenance and Operation Manuals.
4. Applicable OSHA Regulations.

It is recognized that written rules cannot cover all situations which might be encountered on the job. To meet such unanticipated situations, operating personnel must exercise good judgment to supplement written safety rules.

Manufacturer's ratings shall never be exceeded. The stipulations pertinent to these ratings shall always be carefully observed. For some conditions, such as soft, uneven or out of level supporting surface, or a load not freely suspended, capacity ratings shall be adjusted downward to compensate for these conditions.

Do not tip the hydraulic crane to determine lift capacity. Attach a load only at the load point as specified on the manufacturer's load rating chart.

The maximum counterweight approved by the manufacturer for use on a given hydraulic crane shall never be exceeded. Addition of counterweight in the field constitutes a safety hazard in two ways. First, the higher resulting loading of hydraulic crane parts has not been taken into account in the design. Second, the backward stability margin built into the hydraulic crane for the user's protection could be reduced beyond safe limits and cause the unit to tip backwards.

All ratings are based on the hydraulic crane being stationary while handling loads; however, mobile hydraulic cranes may be utilized for pick and carry operations. Traveling with suspended loads involves many variables, such as ground conditions, working equipment positions, momentum in stopping, etc.; and it is not practical to devise a single standard rating procedure with any assurance of safety. For such operations, the user shall evaluate prevailing conditions and determine safe practices, exercising precautions, such as the following:

1. Travel speed reduced to suit conditions.



2. Maintain specified tire pressures.
3. Avoid sudden starts and stops.
4. Provide restraint lines to snub swinging of the load.
5. Provide a signal for all moves by using a signalman.

For operation near electric power lines consult references listed in Section III and applicable local codes.

Hydraulic crane operation requires the use of hand signals. The operator and the signalman shall understand a common set of hand signals before any movement of the hydraulic crane. A preferred set of uniform hand signals is given in Section III.

Before leaving his control station, it is vital that the operator shall rest the working equipment on the ground, place the controls in neutral position, and set all locking and safety devices as necessary to safely secure the hydraulic crane to prevent unauthorized operation. Consult the CIMA User's Safety Manual and the manufacturer's operator's manual for additional instructions.



SECTION III

OPERATION AND CONTROLS

TABLE OF CONTENTSSECTION III
OPERATION AND CONTROLS

<u>SUBJECT</u>	<u>PAGE</u>
General.....	3-1
Instruments and Controls.....	3-2
Safety Precautions.....	3-15
General.....	3-15
Set-Up.....	3-15
Operation.....	3-15
Hand Signals.....	3-19
Safety Rules.....	3-22
Operating Instructions.....	3-36
Pre-Operation Inspection & Checks.....	3-36
Starting the Engine.....	3-36
Starting the Engine at Temperatures Below 100°F....	3-37
Crane Travel.....	3-38
Preventive Maintenance Service Under Unusual Conditions	3-39
General.....	3-39
Extremely Hot and Dry Climate.....	3-39
Extremely Cold Climate.....	3-39
Dusty and Sandy Terrain.....	3-40
Saltwater Areas.....	3-40
Towing the Vehicle.....	3-40
General.....	3-40
Insert Instructions.....	3-41
Installing Wire Rope.....	3-44
General.....	3-44
Checking Groove Diameter.....	3-44
Unreeling Wire Rope.....	3-44
Starting Rope on Drums.....	3-45
Seizing Wire Rope.....	3-45
The Seizing Wire.....	3-46
Procedure for Anchoring Cable (Braden Winch).....	3-47
Procedure for Anchoring Cable (Pettibone Winch)...	3-49
Reeving.....	3-50
Installation of a No-Pinch Wedge Socket.....	3-51
Instructions for Attaching Poured Wire Rope Sockets....	3-52



SECTION III

OPERATION AND CONTROLS

GENERAL

There is no safety substitute for a well-trained, competent, experienced operator.

Be prepared before you start; read and understand this Manual.

This Manual is designed for you, the operator, as both a refresher course and a reference on basic safety. In this Manual you will find a series of safety tips suggesting precautions to help prevent accidents during normal everyday operation of your construction machinery.

This is by no means an all inclusive list of safety precautions and is not intended to be. Keep in mind that additional precautions may be necessary depending on conditions at your job site.

Above all, remember that the greatest insurance against an accident is a careful operator - you.

This section furnishes the operator with illustrations and information concerning the location and the use of the various controls and instruments to properly operate the Crane.

Before attempting to operate this Crane, the operator should carefully study all of the information in this section and become thoroughly familiar with the location and purpose of each control.

Familiarize yourself with the instruments and controls. A competent, experienced operator is the best insurance against accidents to the Crane and personnel in the area. The term "right hand" and "left hand", "forward" and "reverse", "push" and "pull", "up" and "down", used in these instructions are determined by sitting in the operator's seat.

All controls are identified and described in this section. Therefore, this section may contain controls or instruments which your Crane is not equipped with.

If your Crane is equipped with accessories, operator aids, supplied or manufactured by companies other than Pettibone, contact actual manufacturer for information regarding maintenance, parts replacement, calibration and operation.

WARNING

Careful planning and supervision offer better protection than any known device. Relying on any of these devices could be dangerous because operators may think the devices are providing protection when in fact they are not.



Some of the typical examples of operator aids are:

- Electronic Boom Angle Indicator
- Electronic Boom Length Indicator
- Overload Warning System
- Audible and Visible Back-Up Alarm
- High Water Temperature Low Lube Oil Alarm
- Emergency Load Lowering System
- Anti-Two Blocking Device
- Hydraulic Oil Temperature Gauge Kit
- Hydraulic Oil Pressure Check Kit
- Outrigger Visual Warning
- Rear Wheel Steer Indicator

Operator aids are not a substitute for a well-trained, competent, experienced operator, nor do they substitute for strict adherence to all safe operating procedures. Failure to follow just one safety precaution can cause that accident to man or machine.

INSTRUMENTS AND CONTROLS (Refer to Figure 3-1)

1. SLEWING (SWING) BRAKE PEDAL - Depress pedal to apply the slewing brake. Release pedal to release the brake. Braking force becomes greater as the pedal is depressed further.
2. BOOM LIFT PEDAL - This pedal provides for a separate control for raising or lowering the boom. Depress the front of the pedal to lower the boom. Depress the rear of the pedal to raise the boom.

DANGER

Never Two Block

Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.

3. WIPER SWITCHES (2) - Pull desired switch out to activate the windshield wiper (upper or lower). Push switch in to turn wiper off.
4. TOP WINDOW WIPER SWITCH - Pull switch out to activate wiper; push switch in to turn wiper off.
5. HORN BUTTON - Depress horn button to sound horn.
6. FRONT HI-RAIL SWITCH - Activate switch in a forward direction to lower front rail wheels. Activate switch in a rearward direction to raise front rail wheels.



7. REAR HI-RAIL SWITCH - Activate switch in a forward direction to lower rear rail wheels. Activate switch in a rearward direction to raise rear rail wheels.

WARNING

Extend front and rear outriggers two feet (2'0") before lowering or raising front and rear hi-rail drive wheels. Failure to heed this warning could cause serious injury to personnel or property damage.

WARNING

Front and rear hi-rails must be raised or lowered separately and only on level track. Failure to comply could cause loss of braking.

WARNING

Do not pick loads when crane is raised on rail wheels. Failure to heed this warning could cause serious injury to personnel or property damage.

WARNING

Pins for steering lock must be inserted at right hand side of front and rear axles to prevent turning when on hi-rail and operating in Third Rail Territory. Failure to heed this warning could cause serious injury to personnel or property damage.

CAUTION

Always operate hi-rail one at a time to the fully extended or fully retracted position. Operating both hi-rails at the same time can cause a free wheeling condition.

8. IGNITION SWITCH - This switch is a four position switch (off, on, start and accessories). Turn switch to the extreme clockwise position to start engine; release the switch which will return to the "on" position. Turn the switch to the "off" position to stop the engine.
9. ETHER START BUTTON - Momentarily depress button to activate the cold weather starting aid solenoid which injects a measured shot of starting fluid into the air intake of the engine.

WARNING

Do not activate the ether starting aid button more than once before starting the engine. Overloading the engine air box with this volatile fluid can result in an explosion.



10. ACCELERATOR LOCK OR WINDSHIELD WASHER SWITCH -

ACCELERATOR LOCK SWITCH - Use this switch to maintain the engine speed required.

To Lock:

- a. Push in button on switch and hold.
- b. Depress accelerator pedal to desired engine speed.
- c. Release button on switch.

To Release:

- a. Depress and release accelerator pedal.

CAUTION

If air pressure is below 60 PSI, accelerator pedal may not reduce engine speed. Air pressure will have to be restored to above level or higher to allow accelerator lock switch to release.

WINDSHIELD WASHER SWITCH - Momentarily depress button to release cleaning fluid.

11. WATER TEMPERATURE GAUGE - This gauge indicates the engine coolant temperature. Normal operating coolant temperature range is as follows:

<u>ENGINE</u>	<u>TEMPERATURE RANGE</u>
6V-53 & 4-53	160 ⁰ - 185 ⁰ F.
V-504C	165 ⁰ - 195 ⁰ F.

12. SLEWING (SWING) LEVER - Push lever forward to turn boom clockwise. Pull lever back to turn boom counterclockwise.

WARNING

When operating slewing lever, release lever slowly. Failure to heed this warning could cause serious injury to personnel or property damage.

13. EXTENSION CROWD LEVER - Push lever forward to extend boom extension. Pull lever back to retract boom extension.

DANGER

Never Two Block

Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.



14. BOOM CROWD LEVER - Push lever forward to extend boom. Pull lever back to retract boom.

WARNING

Both boom sections must be extended equally. Failure to heed this warning could cause serious injury to personnel or property damage.

WARNING

At all times, use caution when extending boom sections. Failure to heed this warning could cause serious injury to personnel or property damage.

15. ENGINE OIL PRESSURE GAUGE - This gauge indicates the engine oil pressure. Normal operating oil pressure range is as follows:

<u>ENGINE</u>	<u>OIL PRESSURE RANGE</u>
6V-53 & 4-53	18 PSI Min. @ 1200 RPM: 40-60 PSI @ Rated Speed
V-504	10-25 PSI @ 600 RPM: 45-75 PSI @ Rated Speed

16. VOLTMETER - Indicates the current rate at which the alternator is charging the batteries and the rate the batteries are being discharged when electrical items are used.
17. TACHOMETER - This instrument indicates the speed of the engine. Multiply the value indicated by the point by 100 for actual engine RPM.
18. OUTRIGGER SWITCH PANEL - The outriggers are controlled from the cab by self-centering toggle switches that require the simultaneous operation of a master switch and a specific operation switch which are controlled as follows:
- Hold the outrigger master switch in the desired position (toward the operator's seat) to extend the outrigger beams and to activate the vertical jack cylinders for outrigger down position; toward the windshield to retract the outrigger beams and to activate the vertical jack cylinders for outrigger up position.
 - Select the desired operation (left, right, front, rear, vertical or horizontal). Position the selected switch for desired condition (towards the operator's seat to extend the beams or activate the vertical jack cylinder for down condition; toward the windshield to retract the beams or activate the vertical jack cylinder for up condition).

The outriggers can be operated manually by controls located on the front center and left rear of the Crane. The hydraulic control valves are activated by levers attached to the valve spools. (Refer to Figure 3-2).



NOTE

Capacities are the maximum load capabilities covered by the manufacturer's warranty with crane standing on firm, level surface, tires properly inflated or with outriggers fully extended and Locked down.

19. TRNASMISSION CLUTCH PRESSURE GAUGE - This gauge indicates the transmission clutch charge pressure. Normal indication is 240 to 280 PSI during operation.
20. TRANSMISSION TEMPERATURE WARNING LIGHT - Signals that transmission is above maximum allowed operating temperature.
21. TRANSMISSION OIL TEMPERATURE GAUGE - This gauge indicates the transmission oil temperature. Normal indication is 180 to 200 degress fahrenheit. Maximum operating temperature allowed is 250 degress fahrenheit.
22. TURN SIGNAL LIGHT SWITCH - Position the turn signal lever down to activate the left turn lamps. Position the turn signal lever up to activate the right turn lamps. The lever must be manually reset to the center "OFF" position. Push handle in to activate the four-way emergency flashers.
23. FUEL GAUGE - This gauge indicates the quantity of fuel in the fuel tank. Keep the fuel tank full to prevent condensation from forming when the machine is not in use.
24. AUXILIARY WINCH LEVER - Push lever forward to lower cable. Pull lever back to raise cable.

DANGER

Never Two Block

Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.

25. MAIN WINCH LEVER - Push lever forward to lower cable. Pull lever back to raise cable.

DANGER

Never Two Block

Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.



WARNING

This crane was not designed to lift personnel on the load line. Therefore, no lifting, lowering, swinging or traveling shall be done while a worker is on the hook, line, load or lifting devices attached to the crane load line.

26. BOOM LIFT LEVER - Push lever forward to lower boom. Pull lever back to raise boom.

DANGER

Never Two Block

Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.

27. DEFROSTER - Control of the defroster is by a rotary switch on the pedestal base. Turning the switch clockwise will turn the defroster on. Increasing the rotation of the switch will increase the speed of the defroster motor. Turning the switch counterclockwise to the stop will turn the defroster off.
28. ANTI-TWO BLOCK CONTROL PANEL, KRUGER - With the ignition turned on, and while engine is running, magnet valves in the control valve linkage become engaged. When two blocking occurs, the boom lift, boom crowd and winch levers will become inoperable in the boom lowering, boom crowding out and winch up direction.

To release the two blocked condition, move the main winch lever and/or the auxiliary winch lever to the lowering position.

The control panel contains the following items:

- a. Red Warning Light - The light will go on when the load or hook is two blocked.
- b. Horn - When the by-pass key switch is in the "on" position, the horn will sound while the red warning light is on.
- c. Horn Switch - The switch may be moved to the "off" position to deactivate the horn, but the warning light will stay on if the machine is in a two block condition.
- d. By-Pass Key Switch - With plunger on, key switch in, and key vertical, key may be removed. The two block system is active.



With plunger on, key switch out, and key horizontal, key cannot be removed. The two block system is in the by-pass condition. The horn will sound and the red warning light will come on when two blocked, but the machine functions will still be operable because the magnet valves are still energized.

DANGER

Never Two Block

Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.

29. DRUM ROTATION INDICATOR - The wheel on each winch lever will brush against the operator's fingers when the applicable winch drum is turning. The faster the winch drum turns, the faster the wheel on the indicator will rotate against the operator's fingers.
30. LIGHT SWITCH (HEADLIGHTS, TAIL LIGHTS AND CLEARANCE LIGHTS) - Pull switch out to turn lights on. Push switch in to turn lights off.
31. UPPER AIR PRESSURE GAUGE - This gauge indicates the air pressure in the upper structure air system. Normal indication is approximately 105 to 125 PSI.
32. LOWER AIR PRESSURE GAUGE - This gauge indicates the air pressure in the lower (carrier) air system. Normal indication is approximately 105 to 125 PSI.
33. GEAR SELECTOR LEVER - Position control to desired range: 1st, 2nd, or 3rd. Position "1" puts the transmission in the lowest gear range. Position "2" provides an intermediate gear. Position "3" places the transmission in the highest gear range.
34. FORWARD AND REVERSE SELECTOR LEVER - Position control to "N" while starting the engine. Position control to "F" for forward movement. Position control to "R" for reverse movement of the Crane. Shift to forward or reverse only at engine idle. Bring the machine to a complete stop prior to shifting to different direction.

WARNING

Do not operate hydraulic system with transmission in gear. Failure to heed this warning could cause serious injury to personnel or property damage.

35. REAR STEERING LIGHT - With the ignition switch on, the light will go on when the wheels on the rear axle are parallel to the Crane lower structure frame rails. The light will go out when the wheels on the rear axle are on a bias from the lower structure frame rails.



36. REAR STEERING SWITCH - This switch selects the mode in which the rear wheels will steer. Move the switch to the left and the rear wheels will turn right. Moving the switch to the right will turn the rear wheels to the left. By operating this switch in sequence with the steering wheel, modes of unitized or crab steering may be controlled. Jog the switch for desired position of the rear wheels, from centered to full turn. The rear wheels must be centered before roading the machine.

WARNING

When traveling over the road, front steering must be used only to prevent loss of control of the vehicle, causing an accident.

37. TWO SPEED WINCH SWITCH - Move switch forward for high speed and low torque. Move switch rearward for low speed and high torque.

CAUTION

Both winch clutches are momentarily engage during the shift sequence. Excessive wear will result on the high speed clutch if the speed change is repeatedly made while the winch is in operation. The shift from one speed to another should be made only when the winch is not rotating.

38. HIGH-LOW RANGE SELECTOR SWITCH - Place the switch in high to disconnect the rear wheels (2 wheel drive) and operate the transmission in higher speeds and lower torque. Place the switch in low to engage the rear wheels (4 wheel drive) and obtain lower speeds and higher torques.

WARNING

Range shift from low to high or high to low must be made with the machine stopped. Serious transmission damage may occur if this practice is not observed.

39. HOURMETER - This is a totalization meter which indicates the total time the Crane has been operated, in hours.
40. PUMP DISCONNECT SWITCH - In cold weather, pumps may be disengaged before starting the engine by moving switch to "OU" position. After engine warms up, shut down engine and move toggle switch to the "IN" position. Restart engine.

CAUTION

Do not engage or disengage pumps while the engine is running. Jog the engine two or three times before starting.

41. PANEL LIGHT - Panel light is controlled by the panel light switch.



42. PANEL LIGHT SWITCH - Pull switch out to turn panel light on. Push switch in to turn panel light off.
43. BOOM FLOODLIGHT SWITCH - Pull switch out to turn floodlights on. Push switch in to turn floodlights off.
44. SPOTLIGHT OR DOMELIGHT SWITCH - Pull switch out to turn light on. Push switch in to turn light off.
45. PARKING BRAKE CONTROL - Push palm button in to apply the parking (spring) brakes. Pull palm button out to release the parking (spring) brakes.
46. SLEWING (SWING) BRAKE LOCK - To lock the slewing brake in the set position, depress the slewing brake pedal all the way down. Push the slewing brake lock control lever forward and release slewing brake pedal. To release the slewing brake, pull the lever up and to the rear.
47. HEATER - The heater controls are located on the heater behind the operator's seat.

DIESEL HEATER

Starting the Diesel Heater:

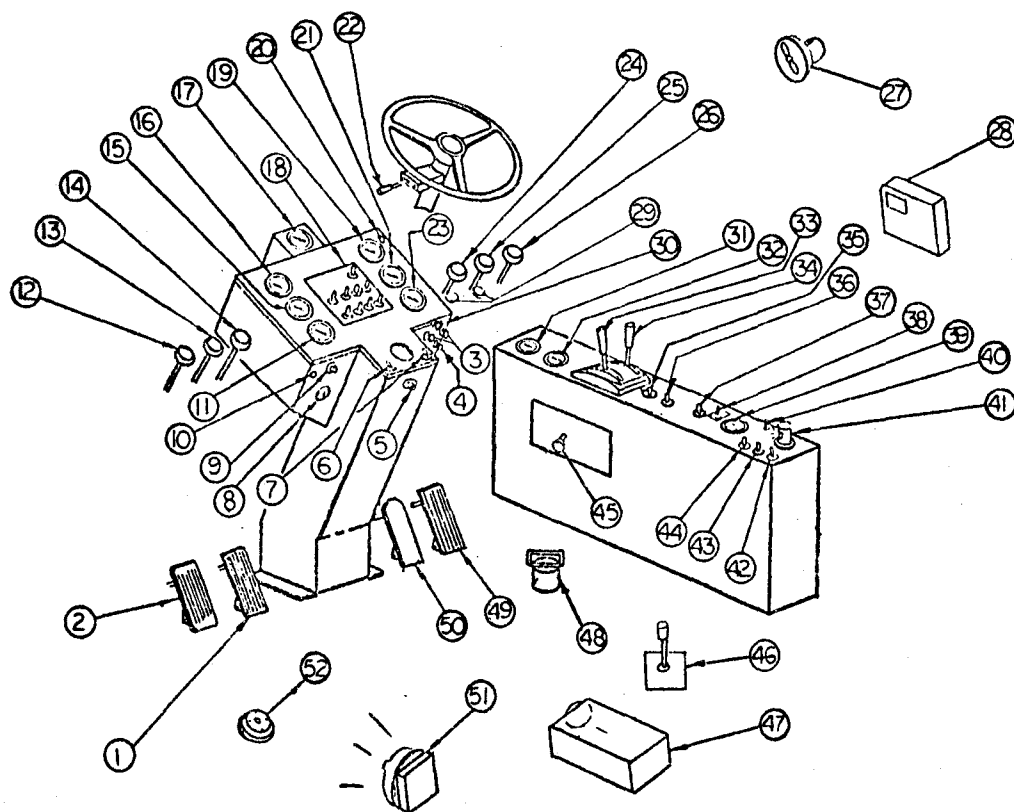
- a. Turn the Hi-Lo Switch to the "HI" position.
- b. Raise the Preheat/Choke Switch and hold in this position. Approximate preheat times are as follows:

<u>TEMPERATURE (°F)</u>	<u>APPROXIMATE PREHEAT TIME</u>
+40°	20 to 30 Seconds
+20°	1 Minute
0°	1-1/2 to 2 Minutes
-20°	2 to 2-1/2 Minutes
-40°	3 Minutes or More

- c. During the last 5 to 10 seconds of preheating time, move the Start-Run-Off Switch to the "Start" position and hold. The Green Heating Indicator must light immediately. Release the Preheat/Choke Switch at the end of the allotted preheat time.
- d. When the Amber Flame Switch Indicator lights, move the Start-Run-Off Switch to the "Run" position. Both lights must now be on. If the Amber Light goes out, repeat Steps b and c.

Heating:

- a. The heater will continue to run as long as fuel and power are provided to it, and the Flame Switch remains closed.
- b. The Hi-Low Switch controls heater cycling and blower motor speed. Turn the Hi-Low Switch to the position that gives desired temperature.



ITEM	DESCRIPTION	ITEM	DESCRIPTION
1	Slewing (Swing) Brake Pedal	28	Anti-Two Block Control Panel
2	Boom Lift Pedal	29	Drum Rotation Indicator
3	Windshield Wiper Switches	30	Light Switch (Headlights)
4	Top Window Wiper Switch	31	Upper Air Pressure Gauge
5	Horn Button	32	Lower Air Pressure Gauge
6	Front-Hi Rail Switch	33	Gear Selector Lever
7	Rear-Hi Rail Switch	34	Forward/Reverse Selector Lever
8	Ignition Switch	35	Rear Steering Light
9	Ether Starting Button	36	Rear Steering Switch
10	Accelerator Lock or Windshield Washer Switch	37	Two Speed Winch Switch
11	Engine Water Temperature Gauge	38	High-Low Range Selector Switch
12	Slewing (Swing) Lever	39	Hourmeter
13	Extension Crowd #2 Lever	40	Pump Disconnect Switch
14	Boom Crowd #1 Lever	41	Panel Light
15	Engine Oil Pressure Gauge	42	Panel Light Switch
16	Voltmeter	43	Boom Floodlight Switch
17	Tachometer	44	Spotlight or Dometlight Switch
18	Outrigger Switch Panel	45	Parking Brake Control
19	Transmission Clutch Pressure Gauge	46	Slewing (Swing) Brake Lock
20	Transmission Temperature Warning Light	47	Heater
21	Transmission Oil Temperature Gauge	48	Turntable Lock Pin
22	Turn Signal Light Switch	49	Accelerator Pedal
23	Fuel Gauge	50	Service Brake Pedal
24	Auxiliary Winch Lever	51	Engine Low Oil-High Temp. Alarm
25	Main Winch Lever	52	Level
26	Boom Lift Lever	53	Boom Angle Indicator(not shown)
27	Defroster		

FIGURE 3-1
Instruments and Controls



Stopping the Diesel Heater:

- a. Move the Start-Run-Off Switch to the "Off" position. The Green Heating Indicator should go out immediately.
- b. The heater should not shut off immediately, since the heater incorporates circuits for a purge cycle. The blower will run until all fuel in the burner is consumed and the heat exchanger cools sufficiently to open the flame switch. When this occurs, the blower motor will stop and the Amber Flame Switch Indicator will go out.

NOTE

Annual service checkout should be done before the heating season starts to ensure that the heater will be functional when required.

48. **TURNTABLE LOCK PIN** - The turntable lockpin must be disengaged prior to slewing (swing) operation. Pull pin up and turn 90° to disengage and store. In the event the turntable lockpin cannot be removed due to the upperstructure being shifted off center, momentarily operate the slewing control until the turntable lockpin can be removed. **EXTREME CARE MUST BE EXERCISED DURING THIS OPERATION.** Push slewing control forward to turn the upperstructure to the right. Pull the slewing control rearward to turn the upperstructure to the left. To engage the turntable lockpin, turn knob on handle 1/4 turn. Swing the upper into position until the lockpin drops into the hole on the carrier.
49. **ACCELERATOR PEDAL** - Depress to increase engine speed. Release pedal to return engine to idle speed.
50. **BRAKE PEDAL** - Depress pedal to engage brakes. Release pedal to disengage brakes.
51. **ENGINE LOW OIL-HIGH TEMPERATURE ALARM** - The alarm will sound if the engine oil pressure is below normal or the engine water temperature is above normal.

NOTE

The alarm will stay on while engine is being started and until oil pressure is up to normal. If, after engine starts, alarm still sounds after 15 seconds, shut down the engine and find the cause for low oil pressure.

52. **LEVEL** - Use this device to level the machine when operating on outriggers.
53. **BOOM ANGLE INDICATOR** - The boom angle indicator is of the pendulum type, mounted on the cab side of the boom. The scale is of the direct reading type. Boom angle is shown from 0° to 80° above horizontal.



3-14

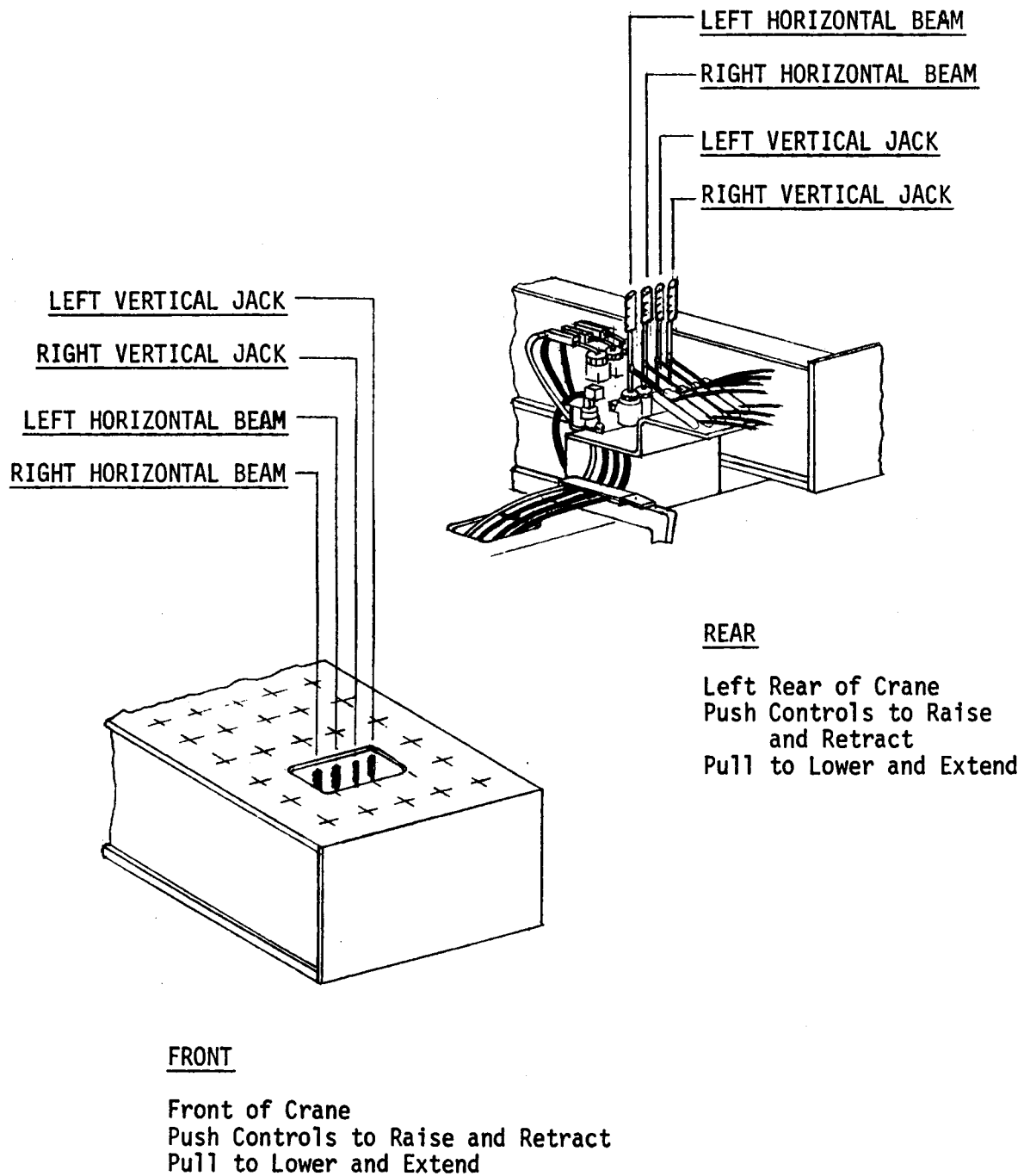


FIGURE 3-2 Manual Outrigger Controls



SAFETY PRECAUTIONS

GENERAL

1. Rated loads as shown on Lift Chart pertain to this machine as originally manufactured and equipped. Modifications to the machine or use of optional equipment, other than that specified, can result in a reduction of capacity.
2. Construction equipment can be hazardous if improperly operated or maintained. Operation and maintenance of this machine shall be in compliance with the information in the Operators, Parts, and Safety Manuals supplied with this machine. If these manuals are missing, order replacements from the manufacturer through the distributor.

SET-UP

1. The machine shall be leveled on a firm supporting surface. Depending on the nature of the supporting surface, it may be necessary to have structural supports under the outrigger floats or tires to spread the load to a larger bearing surface.
2. For outrigger operation, outriggers shall be fully extended with tires raised free of Crane weight before operating the boom or lifting loads.
3. If machine is equipped with extendable counterweight, the counterweight shall be fully extended before operation.
4. Tires shall be inflated to the recommended pressure before lifting on tires.
5. Axle lockouts shall be engaged before lifting over side on tires. Set wheel brakes for static lifts on tires.

OPERATION

1. Rated loads at rated radius shall not be exceeded. Do not tip the machine to determine allowable loads.
2. Rated loads do not exceed 85% of the tipping load as determined by SAE Crane Stability Test Code J-765A.
3. Rated loads include the weight of hook block. Slings and auxiliary lifting devices, and their weights, shall be subtracted from the listed rated load to obtain the net load to be lifted.
4. Rated loads are based on freely suspended loads; no attempt shall be made to move a load horizontally on the ground in any direction.
5. Rated loads do not account for wind on lifted load or boom. It is recommended when wind velocity is above 20 MPH (32 KM/H), rated loads and boom lengths be appropriately reduced.



3-16

6. Rated loads are for lift Crane service only.
7. Do not operate at radii or boom lengths where capacities are not listed; at these positions, the machine can overturn without any load on the hook.
8. The maximum load which can be telescoped is not definable because of variations in loadins and Crane maintenance, but it is permissible to attempt retraction and extension if rating is not exceeded.
9. When either boom length or radius or both are between values listed, the smallest load shown at either the next larger radius or boom length shall be used.
10. The user shall operate at reduced ratings to allow for adverse job conditions, such as soft or uneven ground, out of level conditions, high winds, side loads, pendulum action, jerking or sudden stopping of loads, hazardous conditions, experience of personnel, two machine lifts, traveling with loads, electric wires, etc. Side pull on boom or jib is hazardous.
11. Operation of this equipment in excess of rating configuration charts and disregard of the instructions is hazardous.
12. Power telescoping boom sections must be extended and retracted equally.
13. Handling of personnel from the boom is not authorized, except with equipment installed by Pettibone Corporation or Division manufacturing the Crane.
14. Lifting loads at close radii directly of the operator's compartment is not recommended.
15. Shaded areas or capacities above bold lines on Lift Chart shown structural limitations.
16. The Crane must be steered using only 2-wheel (front) steering when traveling over the road or at high speeds.
17. Death or serious injury can occur when working near power lines.
18. No less than two wraps of cable should remain on the hoist drum at all times.
19. Crane mounted devices which indicate load conditions by visual or audible signals are not a substitute for strict adherence to all safe operating procedures.
20. Load handling devices (including hook blocks) should be kept at a safe distance below the boom point when lowering or extending boom to prevent two blocking. Pay out cable from main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not hoist the hook block, lifting devices or any attachments against the boom head or jib point.



21. For clamshell or concrete bucket operation, weight of bucket and load must not exceed 90% of rated lifting capacities at that radius.
22. With some boom combinations, maximum capacities may not be possible with standard wire rope length.
23. With some boom combinations, the boom lift cylinders may not raise the load. However, operational safety is not affected by this condition.
24. Lifting over the front of carrier is not allowed and can cause an unsafe condition resulting in structural damage to carrier chassis (Truck Cranes only).
25. For cranes with beam outriggers, where beams cannot be fully extended use the "on rubber" capacities from Lift Chart.

REMEMBER - Failure to follow just one safety precaution can cause that accident, to man or machine.

- a. Danger: Never Two Block - Pay out cable from the main and/or auxiliary winch when extending the boom and/or lowering the boom. Do not permit the hook block, lifting devices, or any attachments to come in contact with the boom point or jib point.
- b. Caution: Always secure turntable before initiating any Crane travel.
- c. Caution: Be sure there is sufficient clearance overhead and on each side of the Crane.
- d. Warning: Know the rated capacity of Crane and do not overload it. Never pick up a load until certain it can be picked safely.
- e. Warning: Strictly adhere to all placards. Comply with all requirements set forth in safety and operation placards. Missing or damaged placards must be replaced.
- f. Note: Face in direction of travel.
- g. Note: Report any evidence of faulty Crane performance.
- h. Caution: Do not extend or retract outrigger horizontal beams while outrigger floats are in contact with ground.
- i. Caution: Engine must be off before engaging or disengaging pumps.
- j. Caution: Do not shift directional shift lever while Crane is in motion.
- k. Caution: Do not attempt to move Crane unless air pressure indicators show a minimum of 75 PSI as automatic spring brake may not be fully retracted.



3-18

- l. Note: All load chart capacities are based on level Crane.
- m. Caution: Never allow anyone to ride the hook on the load.
- n. Caution: Never leave the operator's cab with the engine running or with the load suspended.
- o. Caution: Tag line must be rigged for single part reeving. Maximum lifting capacity is 7,000 pounds.
- p. Caution: When using outriggers, always extend all beams or arms completely for maximum stability. Lift all tires clear of ground and level Crane in a horizontal plane in all directions.
- q. Note: Avoid sudden starting and stopping of Crane. Reduce speed when making a turn.
- r. Warning: Be alert for other workers to be sure that they are not in the way of the load or moving Crane.

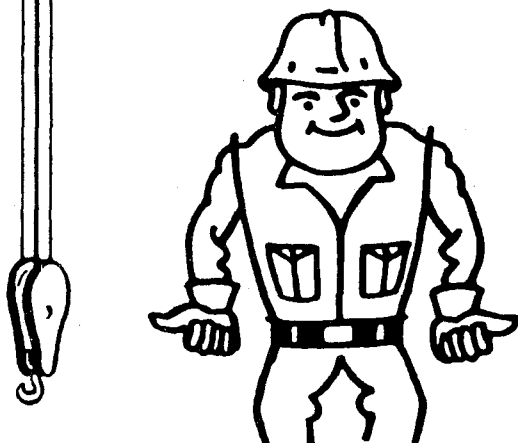


CRANE SIGNALS

FOR A TELESCOPING BOOM

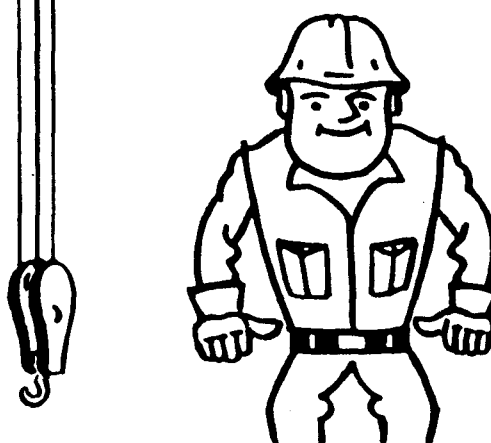
Published by CRANE & RIGGING SECTION
HEAVY SPECIALIZED CARRIERS CONFERENCE
In Accordance with U.S. of AMERICA STANDARDS INSTITUTE

TELESCOPING BOOM
TWO HANDS



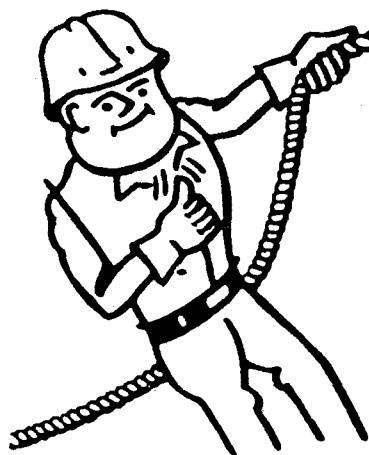
EXTEND BOOM
BOTH FISTS IN FRONT OF BODY
WITH THUMBS POINTING OUTWARD

TELESCOPING BOOM
TWO HANDS



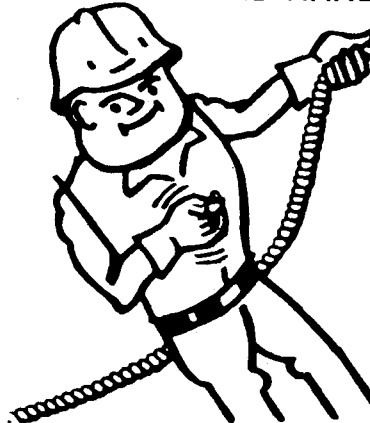
RETRACT BOOM
BOTH FISTS IN FRONT OF BODY
WITH THUMBS POINTING TOWARD
EACH OTHER

TELESCOPING BOOM
ONE HAND



EXTEND BOOM
ONE HAND SIGNAL: ONE FIST IN FRONT
OF CHEST WITH THUMB TAPPING CHEST

TELESCOPING BOOM
ONE HAND



RETRACT BOOM
ONE HAND SIGNAL: ONE FIST IN FRONT
OF CHEST, WITH THUMB POINTING
OUTWARD AND HEEL OF FIST
TAPPING CHEST

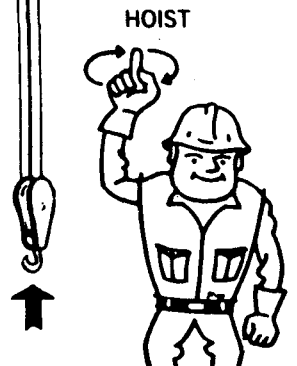
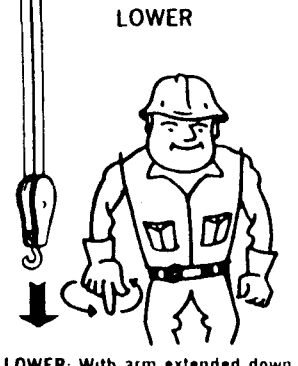
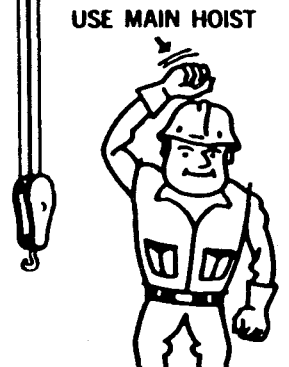
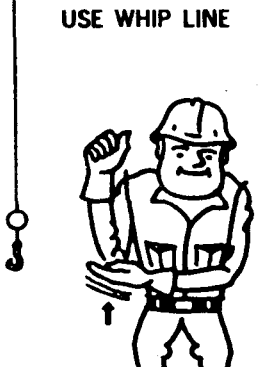
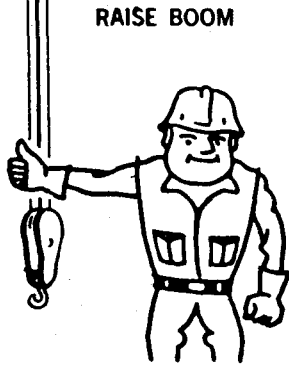
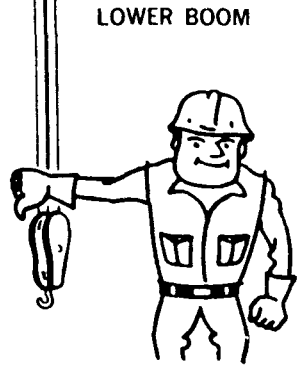
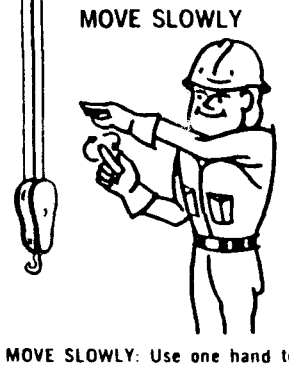
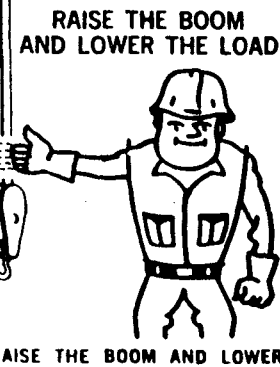
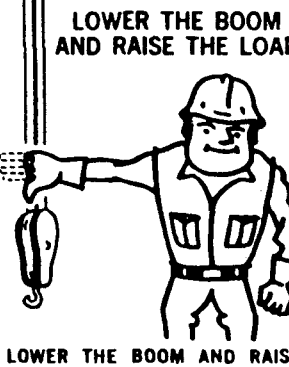
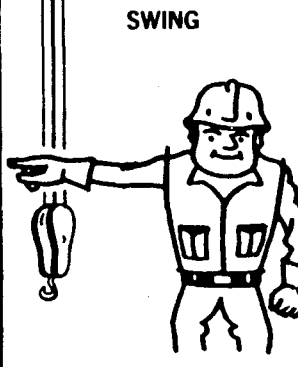
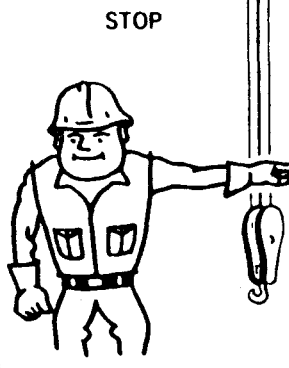
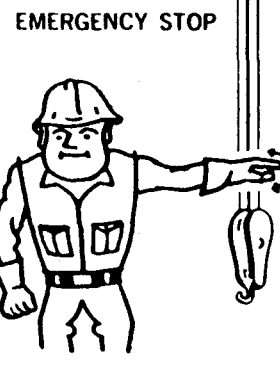
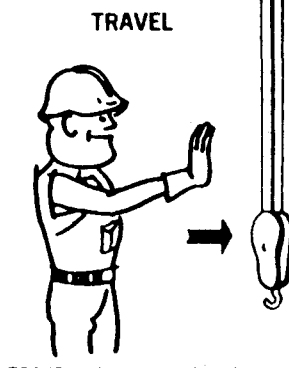
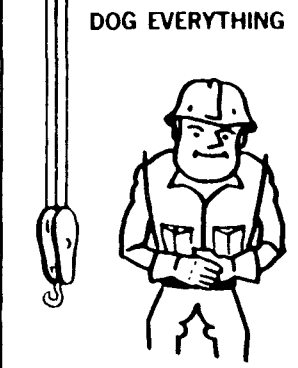


CRANE SIGNALS

**ALWAYS STAND IN CLEAR VIEW
OF YOUR CRANE HOIST ENGINEER**

**BE SURE TO STAY A SAFE DISTANCE
FROM HOOK, BLOCK OR BOOM**

Published by CRANE & RIGGING SECTION
HEAVY SPECIALIZED CARRIERS CONFERENCE
In Accordance with U.S. of AMERICA STANDARDS INSTITUTE

CRANE SIGNALS ALWAYS STAND IN CLEAR VIEW OF YOUR CRANE HOIST ENGINEER BE SURE TO STAY A SAFE DISTANCE FROM HOOK, BLOCK OR BOOM Published by CRANE & RIGGING SECTION HEAVY SPECIALIZED CARRIERS CONFERENCE In Accordance with U.S. of AMERICA STANDARDS INSTITUTE		HOIST  HOIST: With forearm vertical, forefinger pointing up, move hand in small horizontal circles.	LOWER  LOWER: With arm extended downward, forefinger pointing down, move hand in small horizontal circles.
USE MAIN HOIST  USE MAIN HOIST: Tap fist on head, then use regular signals.	USE WHIP LINE  USE WHIP LINE: (Auxiliary Hoist) Tap elbow with one hand; then use regular signals.	RAISE BOOM  RAISE BOOM: Arm extended, fingers closed, thumb pointing upward.	LOWER BOOM  LOWER BOOM: Arm extended, fingers closed, thumb pointing downward.
MOVE SLOWLY  MOVE SLOWLY: Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example)	RAISE THE BOOM AND LOWER THE LOAD  RAISE THE BOOM AND LOWER THE LOAD: With arm extended, thumb pointing up, flex fingers in and out as long as load movement is desired.	LOWER THE BOOM AND RAISE THE LOAD  LOWER THE BOOM AND RAISE THE LOAD: With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.	SWING  SWING: Arm extended, point with finger in direction of swing of boom.
STOP  STOP: Arm extended, palm down, hold position rigidly.	EMERGENCY STOP  EMERGENCY STOP: Arm extended, palm down, move hand rapidly right and left.	TRAVEL  TRAVEL: Arm extended forward, hand open and slightly raised, making pushing motion in direction of travel.	DOG EVERYTHING  DOG EVERYTHING: Clasp hands in front of body.



HAND SIGNALS

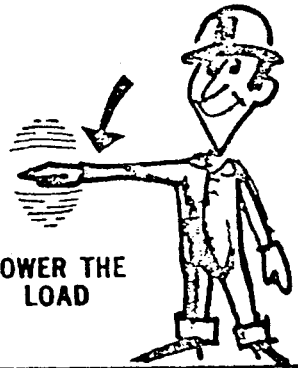
RAISE THE
LOAD



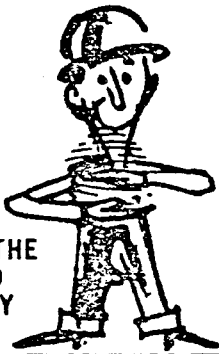
RAISE THE
LOAD
SLOWLY



LOWER THE
LOAD



LOWER THE
LOAD
SLOWLY



RAISE THE
BOOM



RAISE THE
BOOM
SLOWLY



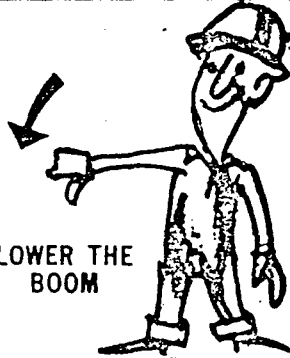
RAISE THE
BOOM
AND
HOLD THE
LOAD



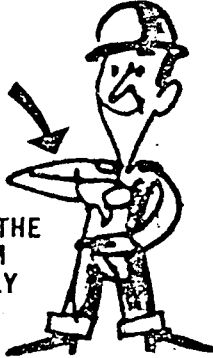
RAISE THE
BOOM
AND
LOWER THE
LOAD



LOWER THE
BOOM



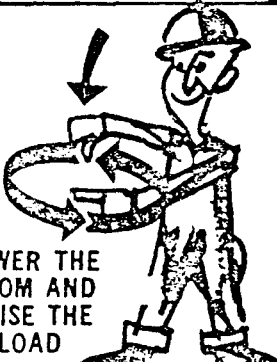
LOWER THE
BOOM
SLOWLY



LOWER THE
BOOM
AND
HOLD THE
LOAD



LOWER THE
BOOM AND
RAISE THE
LOAD



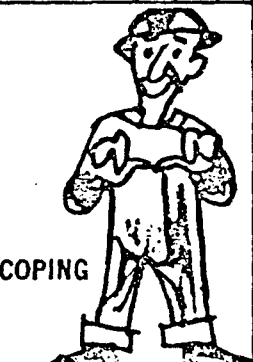
SWING THE
LOAD IN
DIRECTION
FINGER
POINTS



BOOM
TELESCOPING
OUT



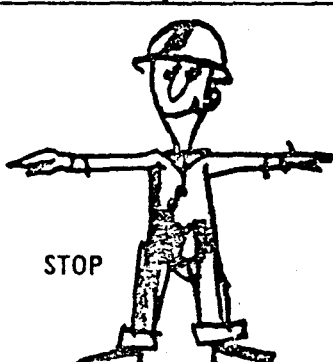
BOOM
TELESCOPING
IN



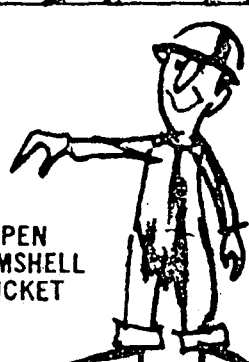
DOG
EVERYTHING



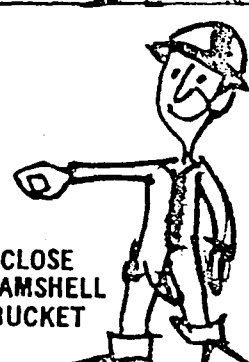
STOP

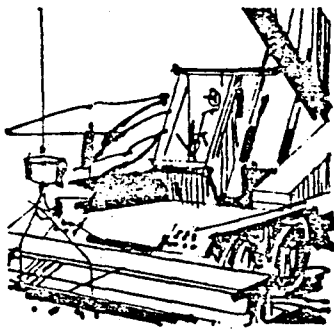


OPEN
CLAMSHELL
BUCKET

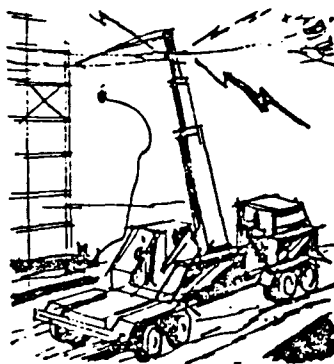


CLOSE
CLAMSHELL
BUCKET

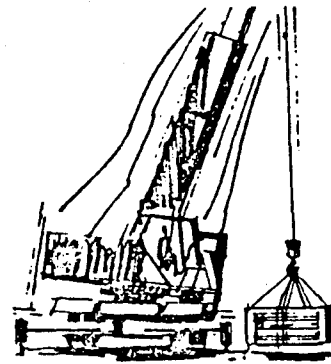




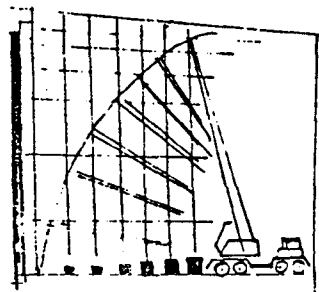
ALWAYS keep the load as near to the carrier and as close to the ground as possible.



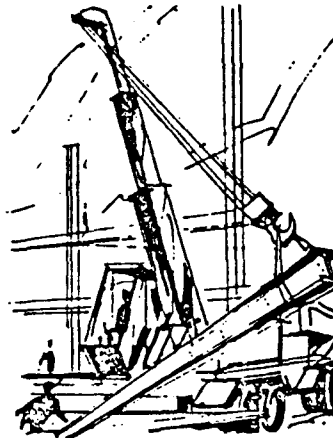
ALWAYS keep the boom and all parts of crane away from the electrical lines or equipment.



NEVER use stability of the machine to determine capacity. When you find out, it might be too late.



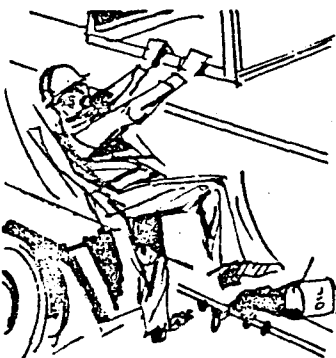
NEVER exceed the rated lift capabilities shown on the load chart. **ALWAYS** determine the weight of the load and check the capacity chart to determine that the load can be lifted at the desired radius within the rated capacity of the machine.



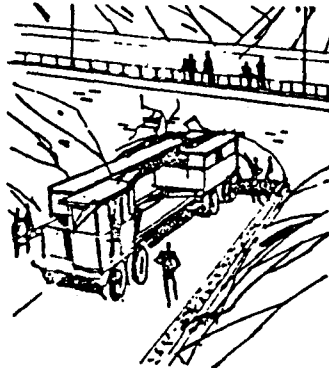
NEVER side-load the boom. It is for lifting only.



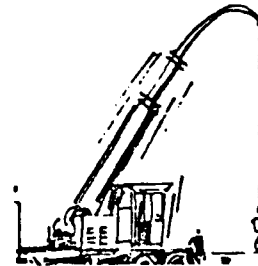
NEVER allow persons to stand or work under a load. Use tag lines for positioning loads.



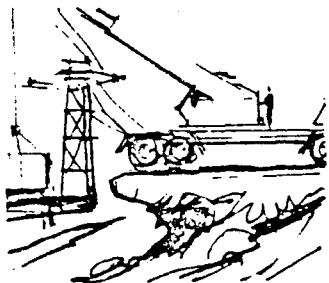
ALWAYS keep the machine clean and free from oil and grease at all times. Use the rule of two-hands at all times when climbing around the machine.



ALWAYS check height and width of clearances for traveling in your state. Check rated capacities of bridges. Check local restrictions covering axle weights.



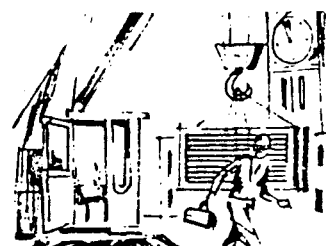
ALWAYS keep boom sections telescoped equally at all times for maximum boom strength. **NEVER** extend one section only leaving the other section retracted. Load charts are based on having equal boom sections.



ALWAYS stay away from dangerous banks that might give away under you.



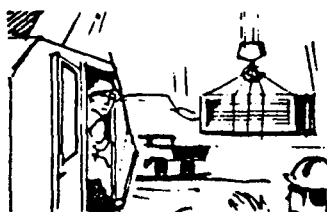
ALWAYS use sufficient parts of line for heavy lifts. DON'T take chances, use a good safety allowance.



NEVER leave the machine with a load up in the air. If you must leave the crane place the load on the ground.



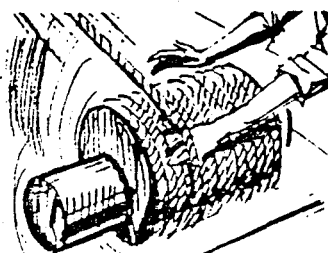
ALWAYS make sure you have enough clearance for tall swing of the upperstructure especially if there are cars or people in the area.



ALWAYS watch your load at all times. If you must look elsewhere, stop and hold the load still.



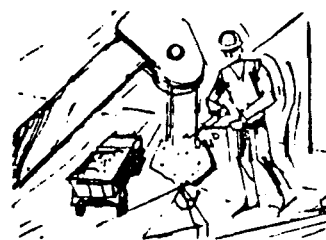
NEVER get on or off of a machine in motion.



ALWAYS be careful to keep your hands away from cable drums, sheaves and pulleys. Replace all guards.



ALWAYS make regular inspections of the cables and replace worn, rusty or frayed cables. Inspect the cable clamps often.

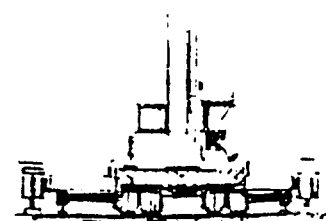


ALWAYS stop the crane with load on the ground and boom supported while lubricating or adjusting.



ALWAYS have load slings checked before lifting. When in doubt, check them yourself.

OBSERVING
SAFETY RULES
PLUS
COMMON SENSE
MAY SAVE
YOUR LIFE



ALWAYS set your outriggers firmly, keeping the machine level. Reset your outriggers frequently between heavy lifts.



DANGER

ELECTROCUTION HAZARD

KEEP ALL PARTS OF MACHINE AND LOAD AT
LEAST 15 FEET AWAY FROM ALL ELECTRICAL
POWER LINES, OR SUCH DISTANCE AS
SPECIFIED BY LOCAL SAFETY CODE.

CONTACT BETWEEN CRANES AND POWER LINES IS A DEADLY HAZARD WHICH CAUSES NUMEROUS DEATHS AND SERIOUS INJURIES TO WORKERS ON OR NEAR CRANES EVERY YEAR.

It is the responsibility of the user of the crane to set up the job and to operate the crane in a manner which will insure that crane contact with power lines is not possible and that minimum clearances between crane and power lines are always maintained. There are no second chances. The first careless moment which allows the crane to move too close to the wires can kill you or your fellow workers. Every worker on the job should be advised of the hazard and warned to be alert and aware of the crane and its position relative to power lines.

When your job requires the crane to be operated near power lines, the following steps must be taken:

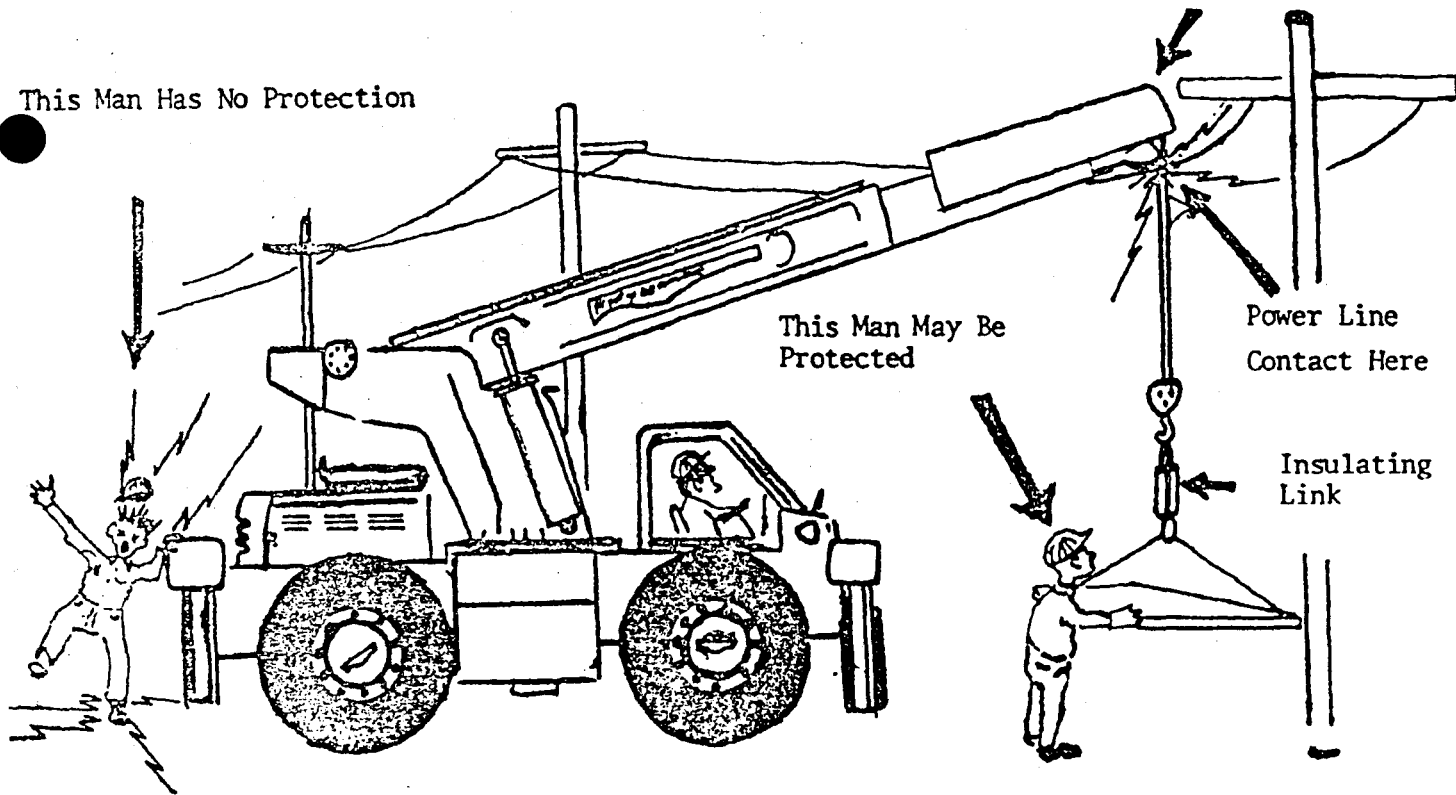
- (1) Advise the power company of your job and have them de-energize or temporarily relocate the power line.
- (2) If the line cannot be de-energized or relocated, have the power company insulate or barricade the lines.
- (3) Set up the job so that it is impossible for any part of the crane to come within 15 Ft. (or other distance specified by applicable code) of the power line.
- (4) Assign a signal man equipped with a loud and distinctive warning device whose sole purpose is to watch the clearance between the crane and the power line and to warn the operator and crew when clearance nears the minimum distance.
- (5) Keep in mind at all times that a moment's carelessness can mean death.

Insulated links, insulated boom point cage guards and proximity warning devices can be installed on your crane. Some local regulations may require the use of one or more of these devices when operating in the vicinity of a power line.

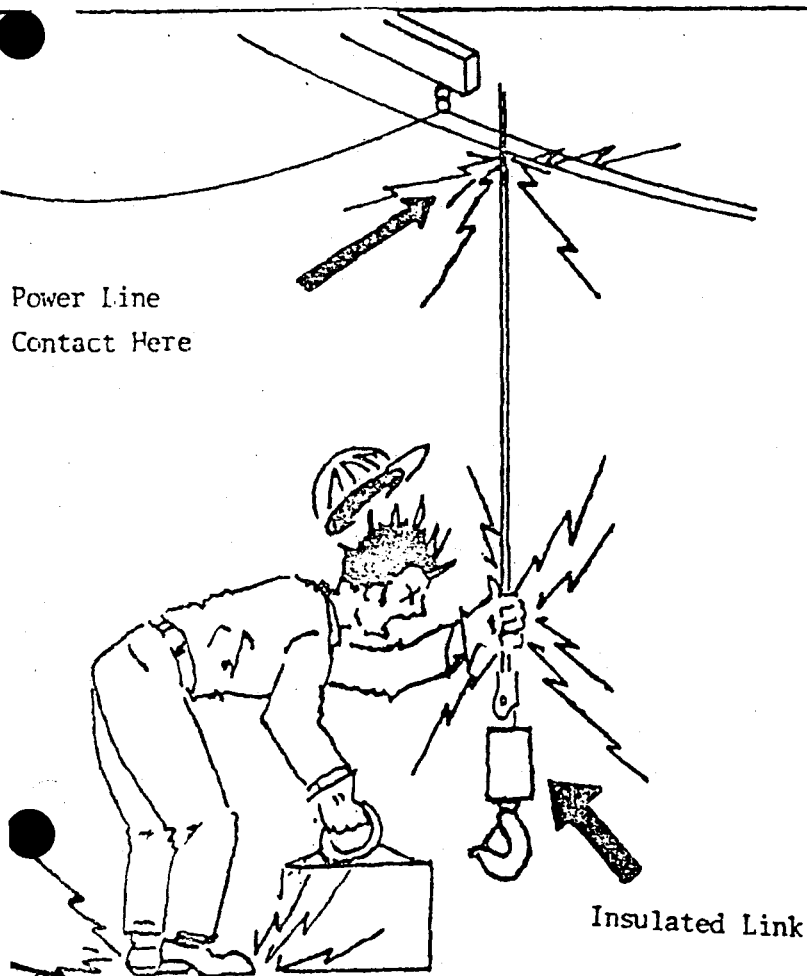
However, none of the above devices provides full protection. The previous five steps must be fully followed on all cranes even when the additional devices are used. Even when the crane is equipped with the above devices in perfect operating condition, full protection or warning is not provided as indicated by the following sketches which illustrate some of the limitations of these devices.



This Man Has No Protection



Crane Equipped With Both An Insulating Link And An Insulating Boom Point Guard



Crane Equipped with Insulating Link and Boom Peak Guard. In this Situation, The man is not Protected.



3-26

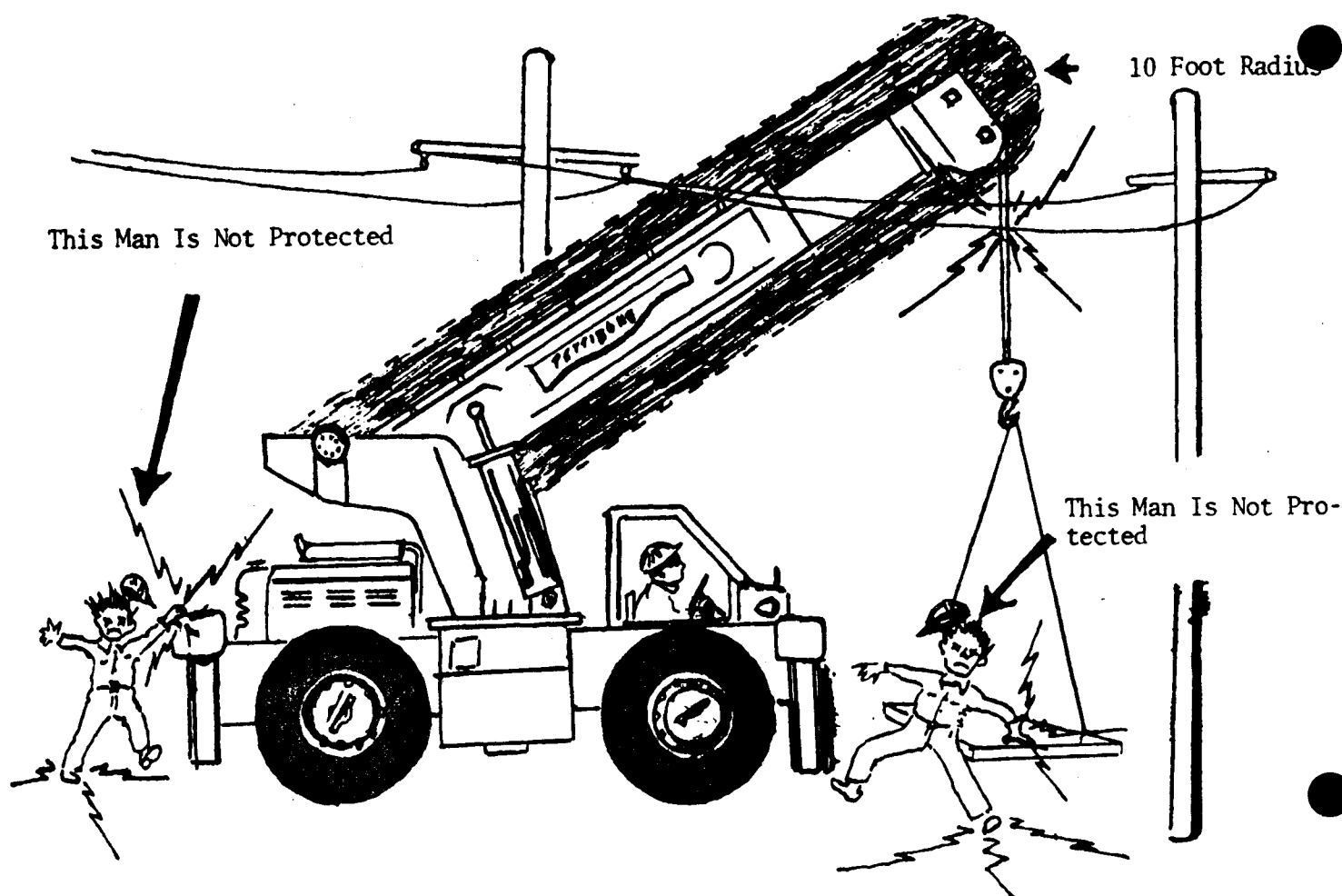


Fig. 3

Crane Equipped With Proximity Device

Shaded area shows "sensitivity zone" with full boom length sensor used, and adjusted for 10 foot clearance.

Contact can be made outside this zone by the fall lines, hoist ropes, cab, etc. Contact outside the sensitivity zone will not cause the alarm to sound, but the machine will be electrified and deadly.

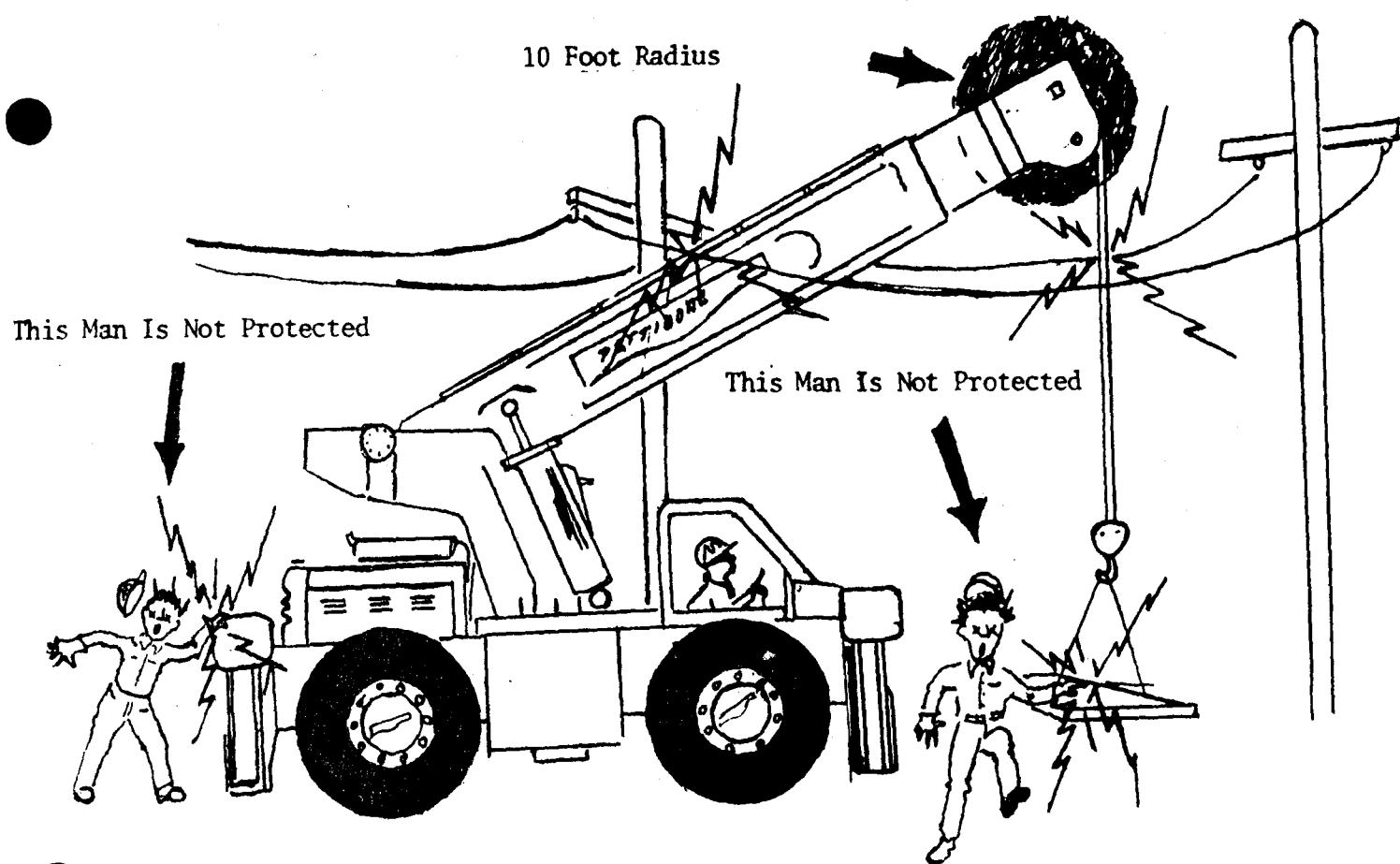


Fig. 4

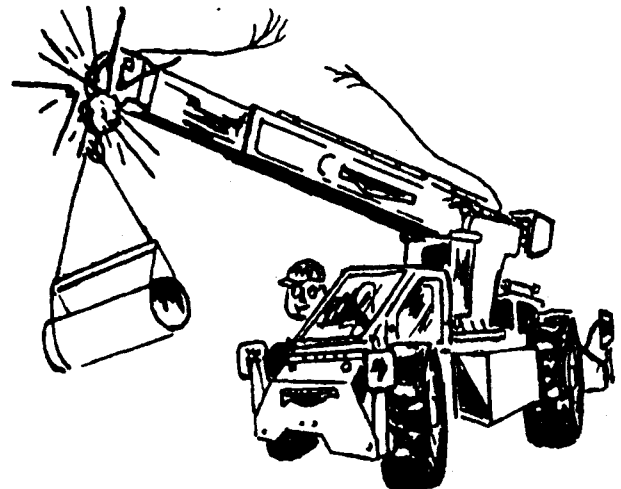
Crane Equipped With Proximity Warning Device

Shaded area shows sensitivity zone with probe near boom peak, and adjusted for a 10 foot clearance. Contact can be made outside this zone by the fall lines, hoist ropes, cab, boom, etc. Contact outside the sensitivity zone will not cause the alarm to sound, but the machine will be electrified and deadly.

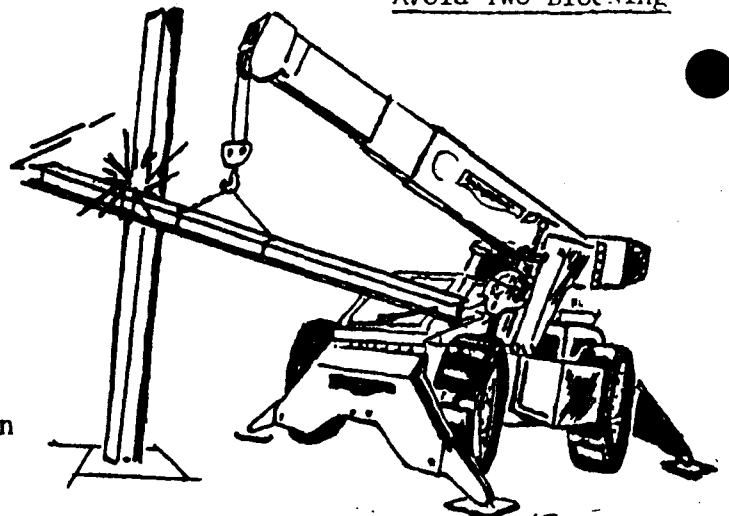
GENERAL SAFETY RULES

1. Read the operator's manual and heed!!! The manual contains important information.
2. ALWAYS SET OUTRIGGERS BEFORE SWINGING BOOM OVER THE SIDE.

3. When extending the boom the load will raise. The operator must let off on the hoist line in order to keep the load in place. Extending the boom without letting off on the hoist line will lead to two-blocking. This happens when the boom point sheave contacts the hook block or ball. Two-blocking will cause boom point damage, hook block damage and wire rope damage and breakage. Two blocking is one of the most common causes of crane accidents.

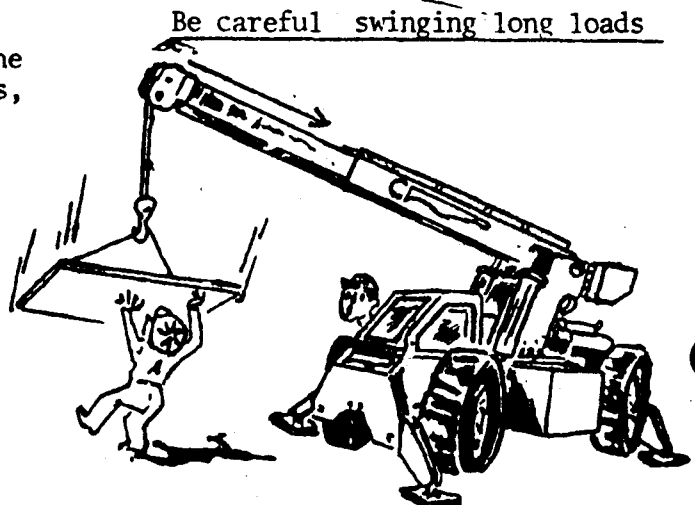
Avoid Two Blocking

4. Be careful when swinging a long load. It is important on hydraulic yard cranes because the operator sits in the cab. If one end of the load catches on an obstruction, the other end may hit the machine.



5. Hydraulic machines are easy to operate. So easy in fact, that almost anyone can do it. This very "ease of operation" leads to careless operation, or operation by unqualified personnel. Either of the above can result in an accident.

6. When lowering or retracting the boom, the load will lower. To compensate for this, the operator must take up on the hoist line. Otherwise, movement of the load may cause an accident.

When boom retracts load will lower



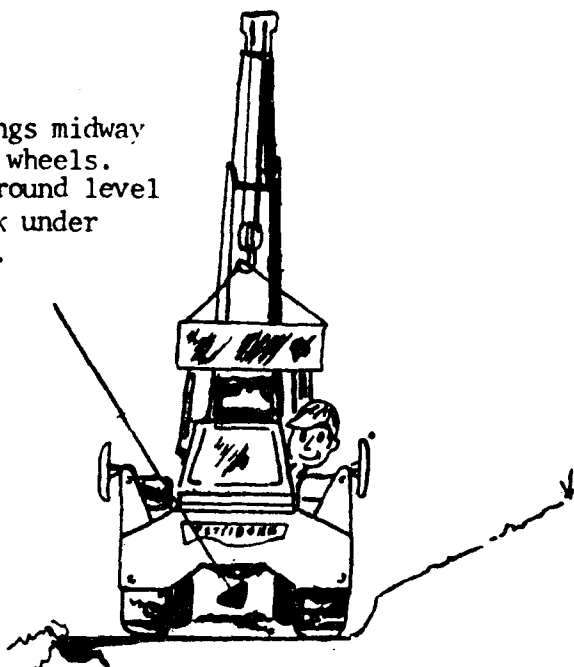
7. When you pick a load with any crane, the load radius will increase. Due to the design of hydraulic crane booms (cantilever boom, supported by cylinders, overlapping sections) this increase is much more pronounced. The increase or outswing of the load can overload the boom, and lead to boom failure or tipping. Also, movement of the load can cause it to hit something. Make sure the load being lifted will remain within capacity as it is lifted and the boom deflects.

CRANE BOOM SAFETY

8. The operator, supervisor, or person in charge of the load must observe the following rules.
- Loads must be well secured before lifting. Be sure that the rigging can't slip off or pull away from the load, or get out of position on the load. Be sure load is rigged so it won't fall over.
 - Chains and slings must be adequate size, in good condition, and not twisted around each other.
 - The load must not catch on an obstruction when lifting or swinging. Be sure load, fall lines or any other part of machine does not snag or strike any obstruction.
 - Avoid sudden starts and stops. Lift carefully, swing gently, brake smoothly, lower and set loads carefully. Jerking the load, swinging roughly, lowering the load rapidly, and slamming on the brakes, will put shock loadings and possible side loading on the boom. Unnecessary abuse labels the operator as a beginner. Be a professional.
 - Never wrap the hoist line around the load. Never use discarded, worn, or damaged rope for slings. It may break and drop the load.
 - The machine must be level before making a lift. Use levels if the machine is so equipped. Use outriggers to level crane on uneven ground. Remember, a 3 degree side tilt can reduce capacities by 50% or more. (See example below)

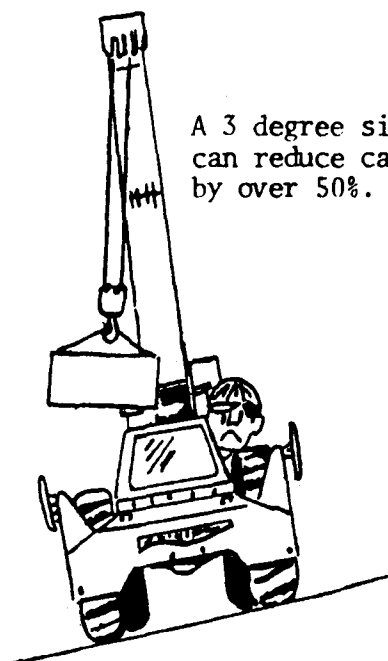
RIGHT

Load hangs midway between wheels. Grade ground level or block under machine.



WRONG

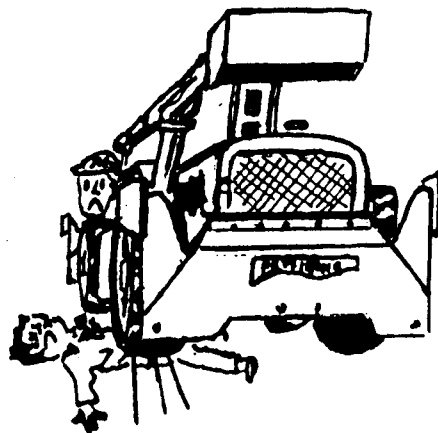
A 3 degree side tilt can reduce capacities by over 50%.



Level the machine

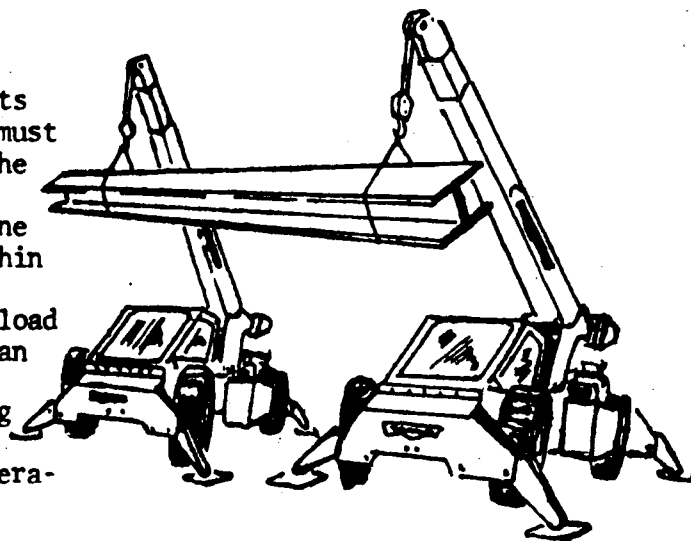


9. Make sure there is a latch on the hook, and that it works properly. Without a latch, it is possible for slings or chains to come off the hook and fall.
10. Always look before you back up, and post a signal man to guide you. If your machine is equipped with a back up alarm, make sure it is working properly. If not, use the horn as a signal.



Back the Machine Safely

11. Lifts where two or more cranes work together can be hazardous and should be avoided. Such lifts should be made only under the direction of a qualified engineer. If a multiple crane lift is unavoidable, observe the following rules.
 - a. Cranes must be level and located on firm surfaces.
 - b. Cranes should be the same size and capacity, use the same boom length and be reeved similarly.
 - c. Crane must be positioned so that each boom point is directly over its load attaching point. Fall lines must be vertical during all phases of the lift.
 - d. Rigging must be placed so each crane lifts a share of the load well within the crane's capacity.
 - e. During handling be sure that more load is not transferred to any crane than it can handle.
 - f. Don't attempt to travel when making multiple crane lifts.
 - g. Coordinate plans with the other operator before beginning the lift.
 - h. Use only one signal man.
 - i. Use of an operable load and angle indicating system is desirable.



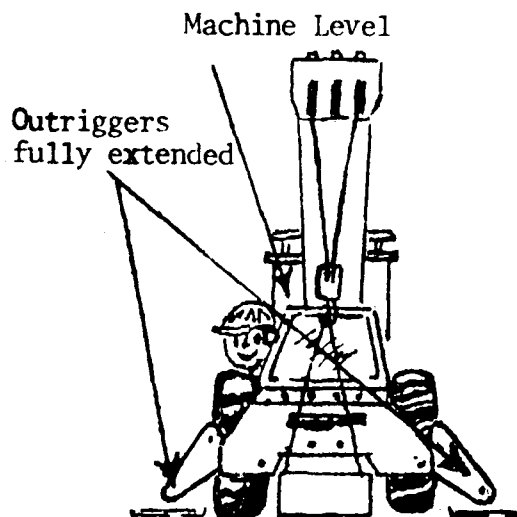
Avoid using multiple cranes on a lift



12. Don't exceed the rated capacities of the machine under any circumstances. While a crane has more stability when lifting over a corner (as compared to straight over the side) the machine capacity is not increased. Any time you exceed the rated capacities listed on the capacity chart in the operator's cab, you are overloading the machine. Overloads can damage the machine and such damage can cause failure and accidents.

13. Avoid working with only front outriggers extended. If you swing over the side, the machine may tip over, or the boom may be damaged from side loading because the machine is not level.

14. Capacities are based on outriggers fully extended. Working with outriggers partially retracted will reduce capacities and machine stability considerably and may cause an accident. If it is absolutely necessary to operate a machine with outrigger beams partially retracted, reduce capacities to those shown on the chart for "on rubber". Remember-the machine must be level.



Use of Outriggers

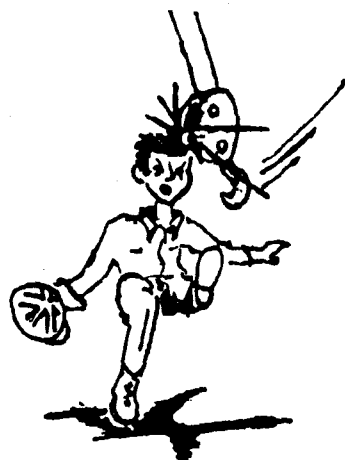
15. Never tamper with safety devices. Keep them in good repair and properly adjusted. They were put on the machine for your protection.

16. Never get on or off a machine in motion. Use both hands when climbing onto a machine. If a ladder is provided, use it.

17. Keep your machine clean, in good repair and in proper adjustment. Oil or grease on the decks may cause falls. Improper adjustments can lead to machine damage, load dropping, or other malfunction.

18. When using jumper cable to start an engine be sure to connect negative post to negative post, and positive post to positive post. Always connect the two positive posts together first, and the two negative posts last to prevent a spark when the cables are connected. This spark could cause the battery to explode.

19. Always wear hard hats, safety glasses, steel toe shoes, and any other safety equipment required by local or job regulations.

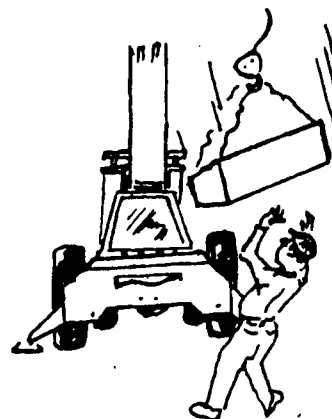


Dress Properly on the Job.



20. Whenever an operator leaves the control station for any reason.
 - a. Lower the bucket, grapple, load, etc., to the ground.
 - b. Never suspend a load unless the operator is at the controls, alert and ready to handle the load. Vandalism and mechanical malfunctions may cause the load to drop if left unattended.
21. An operator must not eat, read or otherwise divert his attention while operating a machine. Remember - operating is a full time job.

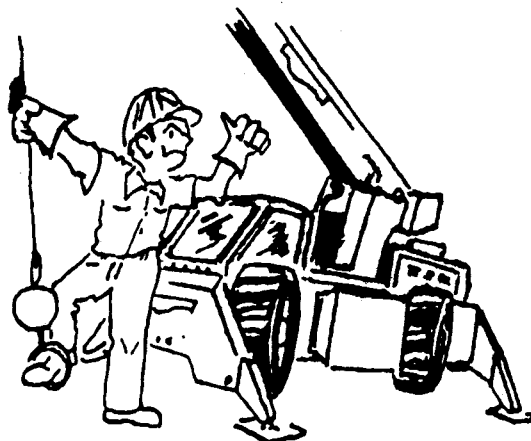
22. Don't allow crane loads, buckets, etc. to pass over people, or endanger their safety. Remove all loose objects from load. All non-operating personnel should leave the immediate area when machine is operating.



Never leave
load in the air
It may fall.

23. Inspect the machine daily. Don't operate a damaged or poorly maintained machine. Pay particular attention to hoses, brakes, attachments, and wire ropes. If a component is worn or damaged replace it before operating. Remember parts are cheaper than people.

24. Don't let anyone ride the hook block, bucket, grapple, etc. These machines are intended to lift objects - not people. They are not elevators.

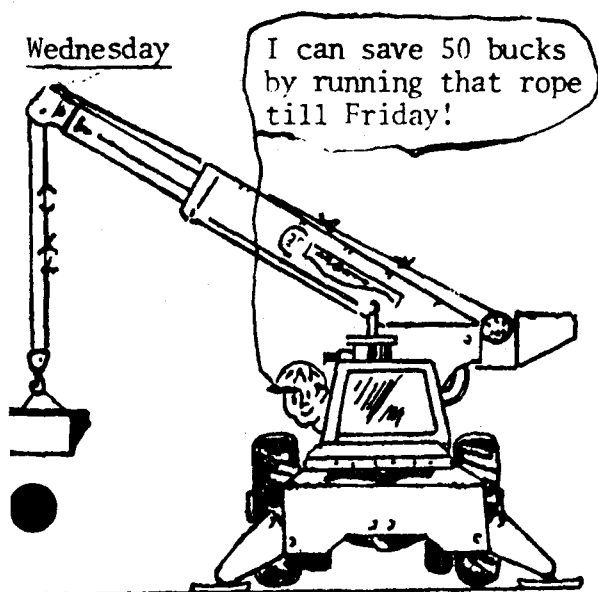


Don't let anyone hitch a ride

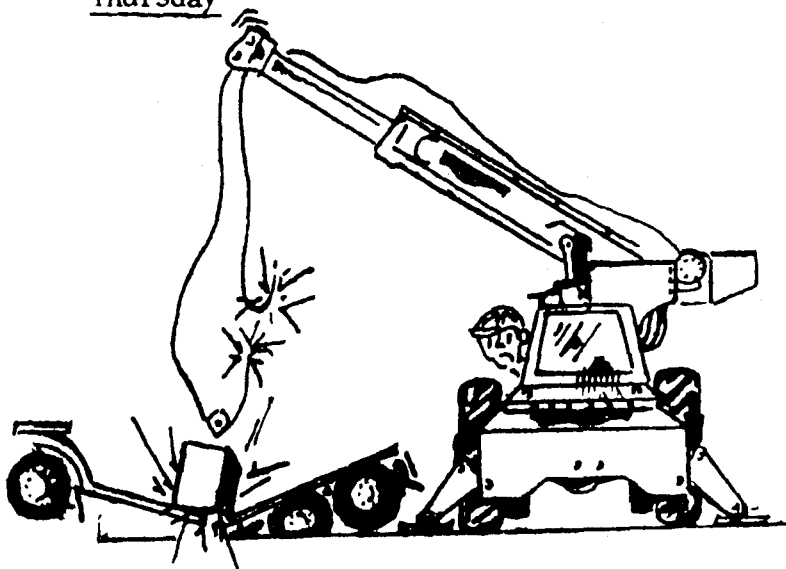


25. OSHA (Occupational Safety and Health Act) regulations state; " a thorough inspection of all ropes shall be made once a month and a full written, dated and signed report of rope condition kept on file where readily available." Replace any worn or damaged rope. Pay particular attention to boom hoist ropes and pendants. Check end connections (pins, sockets, wedges, etc.) for wear or damage.

Wednesday



Thursday



Don't work with worn or damaged rope

26. If necessary to work crane "on rubber" be sure to engage axle lockouts on oscillating axles.

BE AWARE OF LOCAL SAFETY CODES

BE AWARE OF OTHER COMMON SENSE SAFETY PRACTICES

ALL CONCERNED MUST BE AWARE OF ALL OSHA REGULATIONS



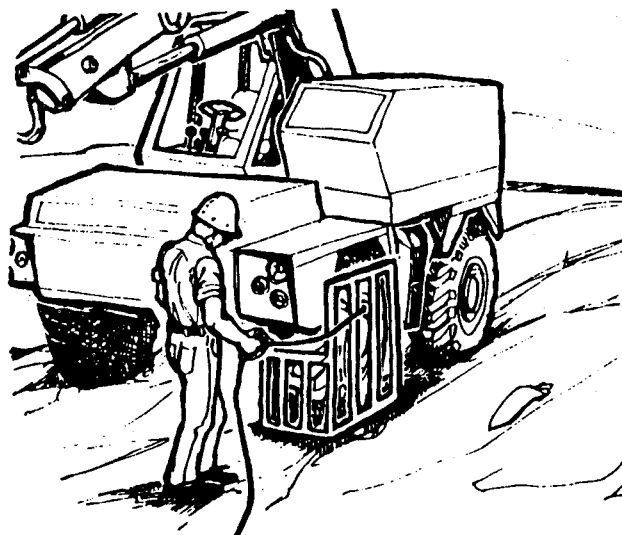
TIRE PRESSURE

Changing tires can be a hazardous business. Under pressure, a tire and rim assembly packs the potential explosive power of TNT. Special tools and procedures are required for changing truck and off-highway tires. To do it safely, it must be done correctly. Follow the step by step instructions given in a tire repair manual. Changing tires is a job better done by your tire service company.

A certain air pressure rise during operation is normal and should not be reduced. Overloads or overspeeds may produce increased tire pressures due to heat. Never bleed tires. Reduce your load...or speed...or stop until tires cool.

ADD AIR---

From a distance...with air chuck clipped on the tire valve--and with extension hose that permits you to stand behind tread. Always use a tire cage or equivalent for protection.





TIRE INSPECTION

Recommended air pressure must be maintained in every tire. Daily checks assure that inflation is correct. If your periodic check discloses a tire that is continuously losing air, a leak is indicated and must be repaired.

During your pressure checks, also inspect for--

- Objects wedged between duals or imbedded in tires.
- Mismatched duals. Diameters should be equal as well as amount of tread wear.
- Missing valve caps and wheel lugs.
- Cuts, tears, and breaks that may need repair.
- Abnormal or uneven wear.
- Damaged or poor fitting rim or rim flanges.
- Projecting body hardware, loose fender bolts, spring clips-- anything that could contact a tire.

Do not burn or weld on wheels or rims.



OPERATING INSTRUCTIONS

PRE-OPERATION INSPECTION & CHECKS

Before actually operating the Crane each day, perform the daily inspection and service checks as listed below. To insure a long and effective service life, a daily regular schedule of inspections and service checks should be maintained. Such a program should also include a systematic pre- and post-operational inspection and servicing of the equipment.

1. Engine
 - a. Check lubricating oil level
 - b. Check coolant level.
2. Hydraulic Reservoir - Check oil level.
3. Fuel Tank - Check fuel level.
4. Transmission - Check lubricating oil level.
5. Tires - Check to be sure that all tires are properly inflated.
6. Wire Rope - Inspect all rope for wear, kinking, or other damage; replace if necessary.
7. Structural - Inspect for evidence of physical damage, such as cracking, bending, or deformation of plates or welds. Inspect for cracking or flaking of paint, which may indicate a dangerous crack in the structure beneath. Do not operate until repairs are made.
8. Missing Items - Visually check for missing guards, plates or decals and for any maintenance required.
9. Fluid - Check for fluid leaks.
10. Operator Aids - Check that all controls, instruments, lights and warning devices operate properly.

STARTING THE ENGINE

- a. Place the forward-reverse selector lever in the neutral (N) position.
- b. Apply the parking brake.
- c. Depress accelerator pedal slightly and turn ignition switch to start position; release switch when engine starts.

CAUTION

Do not engage starter motor for more than 30 seconds at one time. If engine does not start within this period, wait two minutes before trying to start the engine again.



STARTING THE ENGINE AT TEMPERATURES BELOW 10°F

- a. Place the forward-reverse selector lever in the neutral (N) position.
- b. Apply the parking brake.
- c. Turn ignition switch to the "On" position.
- d. Activate pump disconnect switch.
- e. Push ether start button and release.

WARNING

Do not activate ether start button more than once before starting the engine. Overloading the engine air box with this volatile fluid can result in an explosion.

- f. Depress accelerator pedal slightly and turn ignition switch to start position; release switch when engine starts.
- g. After the engine reaches its normal operating temperature, turn ignition switch off to shut down engine. With engine turned off, turn ignition switch to the "On" position and engage hydraulic pumps. Restart the engine in the normal manner.

CAUTION

Check all gauges immediately after starting the engine. If after suitable warm-up time the gauges do not read normal, stop the engine immediately.

NOTE

Emergency Engine Shut-Down

Knob located on outside surface of engine compartment. Pull to kill engine.

If emergency engine shut-down is used, the engine air flap latched, located on engine, must be reset manually before engine is restarted.



CRANE TRAVEL

To move the Crane around the job site or from one site to another, proceed as follows:

WARNING

- a. Secure hook block and other loose gear.
 - b. Set upper house lock pin and swing lock.
 - c. Make sure outriggers are retracted and pads secured.
 - d. Travel with lights on.
 - e. Obey State and local laws, use proper warning flags and signs.
1. Start engine as previously discussed and allow air pressure to reach normal, 105 to 125 PSI.
 2. Position transmission Hi/Low toggle switch in the desired position.

CAUTION

The Crane must be stopped and in neutral before switching from LOW to HIGH or HIGH to LOW.

3. Depress brake pedal and pull the parking brake valve knob out to release parking brake.

CAUTION

When air pressure drops below 70 PSI, emergency brake (spring applied) will begin to apply. Emergency brake will become fully applied when air pressure drops to 40 PSI. Do not attempt to travel while low air pressure buzzer is actuated.

4. Place forward-reverse selector lever in either position for desired direction of travel.
5. Place gear selector lever (1-2-3) in the desired gear range position.
6. Release brake pedal and accelerate by depressing accelerator pedal.

NOTE

Gear selector lever (1-2-3) may be moved to the next higher or lower range while Crane is moving.

WARNING

The Crane must be steered using only front 2-wheel steering when traveling over-the-road or at high speeds.

7. Front and rear wheels are steerable. The steering wheel controls the direction of the front wheels. Rear wheel steering is controlled by a toggle switch on front console.



- a. Front Steering - Turn steering wheel clockwise for right turn. Turn steering wheel counterclockwise for left turn.
- b. Crab Steering - Crane will travel in an oblique manner. Actuate rear wheel steer toggle in an opposite direction to steering wheel direction.
- c. Unitized Steering - Front wheels are turned in an opposite direction to rear wheels. Actuate rear wheel steer toggle in same direction as steering wheel.

PREVENTIVE MAINTENANCE SERVICE UNDER UNUSUAL CONDITIONS

GENERAL

When Crane is operated under unusual conditions, extra care must be taken to maintain Crane in good operating condition. Certain additional services must be performed, and some of the regular maintenance services must be performed more often.

EXTREMELY HOT AND DRY CLIMATE

1. Lubrication - Use lubricants that are recommended for this type climate.
2. Check engine crankcase oil level frequently.
3. Check radiator coolant level frequently.
4. Keep the water pump fan belt and alternator belt adjusted properly.
5. Keep external parts of radiator clean.
6. Check hoses, clamps and gaskets.
7. Check electrolyte level frequently, add distilled water as necessary.
8. Keep air intake and exhaust openings clear. Keep engine clean, allow air to circulate freely around engine.
9. Keep fuel tanks as full as possible.
10. Avoid idling the engine unnecessarily; shut the engine down during a lull in the operation.

EXTREMELY COLD CLIMATE

1. Use recommended lubricants for cold weather operation.
2. Check engine crankcase oil level frequently.
3. Check radiator coolant level frequently.

NOTE

When freeze protection is required, an ethylene glycol base permanent antifreeze should be used, 50-50 mixture.



4. Check hoses, clamps and gaskets frequently.
5. Keep the batteries fully charged at all times and check electrolyte level frequently.
6. Keep battery posts and cable connectors clean and free from snow or ice.
7. Keep fuel tank as full as possible at all times to minimize condensation.
8. Disengage hydraulic pumps and jog start the engine; allow engine to warm up. Engage hydraulic pumps and jog start the engine and run it to a speed of about 1200 RPM (avoid high speed start-up). Actuate cylinders and control valves repeatedly for warm up. Do not allow cylinders to travel to the end of their stroke, or pressure to build up to the relief valve setting. Cold fluid makes relief valves sluggish in operation. It can add 500 to 1000 PSI to the maximum pressure setting of the relief valve. When all components are warm to the touch, the vehicle can be placed in service.

DUSTY AND SANDY TERRAIN

1. All lubricants and lubricating equipment must be kept clean. Service breathers and air cleaner frequently.
2. Service fuel filters frequently.
3. Service hydraulic oil tank breather and filters frequently.
4. When Crane is not in use, keep all cylinder rods retracted.

SALTWATER AREAS

1. Wash Crane frequently.
2. Lubricate all polished surfaces with a film of oil.
3. Remove all rust and corrosion; paint immediately.
4. Keep lifting cables lubricated.
5. When Crane is inactive, storage, see that a regular schedule of exercising the Crane is adhered to.

TOWING THE VEHICLE

GENERAL

If Crane must be towed, shift transmission into neutral and run engine at idle. If engine cannot run, disconnect drive shafts between transmission and front and rear axles.



There is an additional brake, used in conjunction with the service brakes on the axle planetary ends, to stop and hold the vehicle on an incline. This brake is mounted on the input shaft of the front axle. Whenever the parking brake valve, in the cab, is used the auxiliary parking brake is actuated.

The parking brake consists of two opposed brake shoes facing the inner and outer surfaces of the brake drum and controlled by a brake lever. The brake lever is applied or released by a single spring applied, air-released actuator. When the brake lever is actuated, the inner and outer brake shoes are drawn together simultaneously, gripping the brake drum between them. Releasing the brake lever moves both brake shoes free of the brake drum, permitting it to rotate freely.

NOTE

The parking brake must be released before crane may be towed. Parking brake is spring applied and air released.

Parking brake release procedure:

1. Connect outside air source to brake actuator.
2. With brake actuator in a released position, remove nut from yoke end of actuator.
3. Loosen setscrew and remove collar from pin that secures brake arm and shoe assembly. Remove brake arm and shoe assembly.
4. Disconnect air source from brake actuator.

INSERT INSTRUCTIONS

Cranes equipped with a manual insert will increase the maximum length of the main hydraulic boom assembly. The manual insert is stored within the telescoping boom and is extended and retracted with the aid of the crowd extension cylinder.

To extend the manual insert, proceed as follows:

1. Position the Crane so that there is a clear area of 60 feet in front of the frame.
2. With the boom in the front travel position and turntable lockpin engaged, place Crane on outriggers and level.
3. Secure extension to boom with holding pin.
4. Remove slider box anchor pin from front of extension and place anchor pin into hole in insert.



3-42

5. Actuate crowd extension control lever until hole in extension lines up with rear hole in insert.
6. Remove anchor pin from insert and retract extension cylinder until hole in slider box aligns with holes in extension and insert; secure with anchor pin.
7. Remove holding pin that secures boom to extension and store pin in pocket. Insert is now fully extended and pinned. Operate hydraulic sections, boom and extension, in the normal manner.

To retract the manual insert, proceed as follows:

1. Place Crane on outriggers and level. Make sure that turntable lockpin is engaged and hydraulic operated sections are fully retracted.
2. Secure extension to boom with holding pin.
3. Remove slider box anchor pin from front of extension.
4. Actuate crowd extension control lever until front hole in slider box aligns with hole in boom point; secure with anchor pin.
5. Retract crowd extension control until holes in extension align with holes in insert and slider box.
6. Remove slider box anchor pin from insert and install through holes in extension.
7. Remove holding pin that secures boom to extension and store pin in pocket. Insert is now fully retracted and pinned. Operate hydraulic sections, boom and extension, in the normal manner.

WARNING

Strictly adhere to all placards. Comply with all requirements set forth in safety and operation placards.

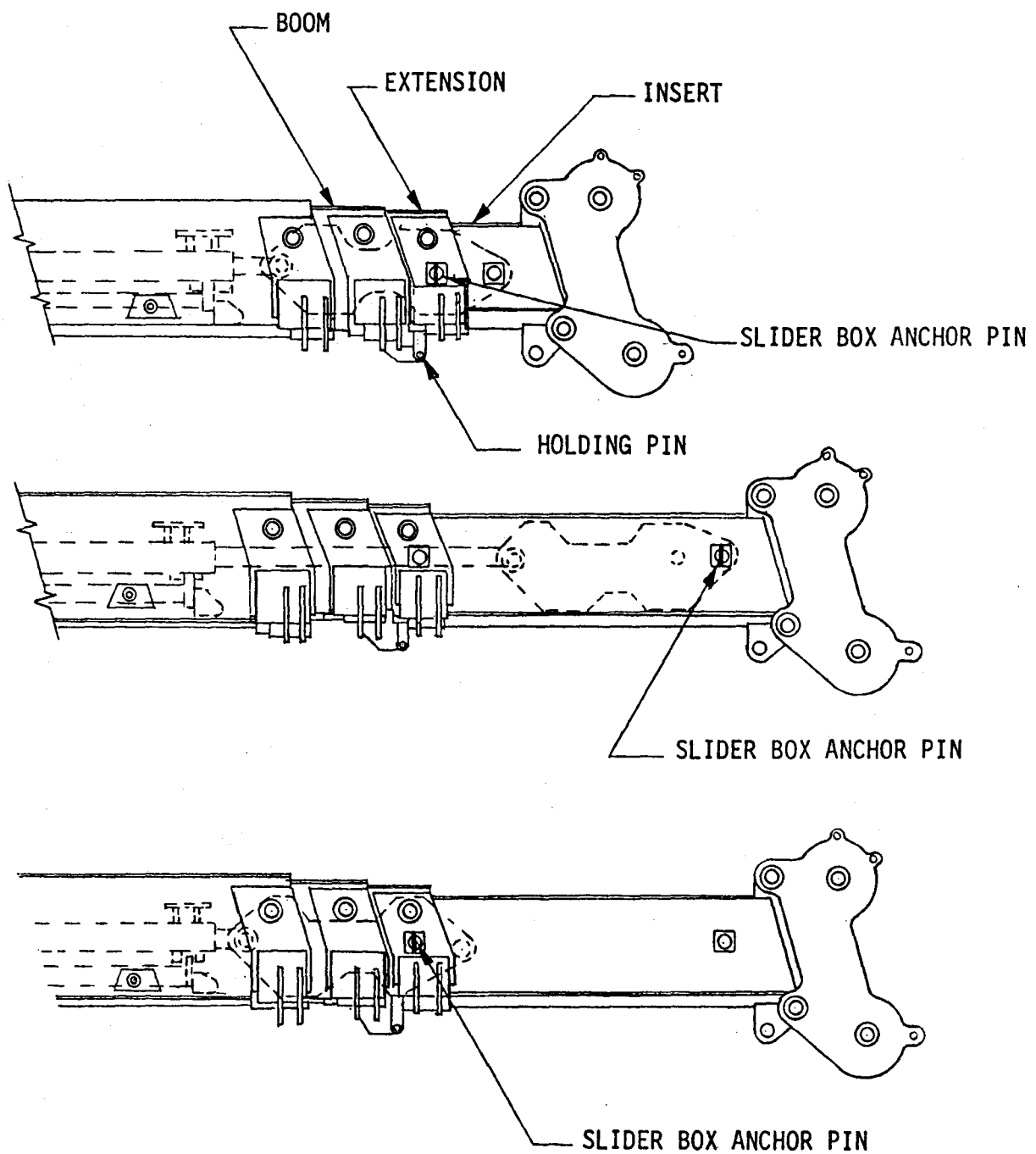


FIGURE 3-3



INSTALLING WIRE ROPE

GENERAL

It is the purpose of this section to discuss the proper methods of rigging and replacing of wire rope to increase the life and receive better service through proper handling. When given reasonable treatment, wire rope is about the toughest and most durable steel product made. The contents of this section will be of help to obtain longer life and better service from wire rope.

CHECKING GROOVE DIAMETER

1. Before new wire rope is placed in service, it is important to inspect the grooves in sheaves and the surfaces of guide rollers and drums. New rope is larger in diameter than the old rope it replaces. Grooves in sheaves will tend to wear to the smaller diameter of the old rope. Surfaces of drums or rollers may become grooved with score marks due to pickup of foreign particles on the wire rope.
2. Check grooves in sheaves to be sure new wire rope will not be pinched, and bind the strands, which will cause excessive abrasion and rope fatigue, leading to rapid deterioration of the rope. Replace sheaves if necessary.

UNREELING WIRE ROPE

1. To unreel wire rope from a heavy reel, a shaft should be placed through the center of the reel and the reel lifted by means of jacks, so that the reel is clear of the floor and will revolve easily. Then one man, holding the end of the rope, walks straight ahead, while a second man regulates the speed of the turning reel by holding a wood block against the flange to act as a brake. Care should be taken so that slack will not get into the turns on the reel and bend around the shaft. If this happens a kink is formed, the rope is ruined at that point.
2. When the rope is run onto the winch drum, it should bend in the same way it did when coming off the reel. Otherwise, a reverse bend is caused. When unreeling wire rope from the reel to rewind on the winch drum, the rope should be unwound from the top of the full reel to the top of the winch drum. Unreeling the rope in this way will eliminate any possibility of causing a reverse bend.



FIGURE 3-4 Unreeling Wire Rope



STARTING ROPE ON DRUMS

Wire rope should be attached at the correct location on a flat or smooth-faced drum, so that the rope will spool evenly, with the turns lying snugly against each other in even layers. If the wire rope is wound on a smooth-face drum in the wrong direction, the turns in the first layer of rope will tend to spread apart on the drum. This results in the second layer of rope wedging between the open coils, crushing and flattening the rope as successive layers are spooled.

Locate the rope anchorage point on the winch drum in the direction of lay of the rope, as follows:

If you are installing a RIGHT lay rope, visualize yourself as being behind the winch drum, facing the boom; make a fist with your RIGHT hand to simulate the drum and extend your forefinger to simulate the rope.

FOR OVERWIND ON WINCH DRUM

Keep the back of your fist up (see how your extending finger is simulating the rope coming off the top of the drum). Your extended finger points to the flange to which the rope must be secured.

FOR UNDERWIND ON WINCH DRUM

Turn your palm up and your finger simulates the rope coming off the bottom of the drum. Your extended finger points to the flange to which the rope must be secured.

When installing new rope it is important that all turns of the first layer on the drum be tight and true. Open or wavy winding will result in serious damage to multiple windings. Adjacent turns should be tapped against each other with a soft metal or wooden mallet, but not so that the strands interlock. The succeeding layers of rope should wind in the groove formed between adjacent turns of the preceding layer of rope. Wire rope must never be allowed to cross-wind.

SEIZING WIRE ROPE

Before cutting a wire rope, the rope must be seized. A portable cable cutter is the preferable tool used in conjunction with a sledge hammer to cut wire rope. Proper seizing and cutting operations are not difficult to perform, and they ensure that the wire rope will later do its job. When wire rope is carelessly or inadequately seized, especially in anticipation of cutting, ends become distorted and flattened, and the strands loosen back within the rope. Later, when the rope is put to work, the load is unevenly distributed to the strands and the life of the rope is significantly shortened.



Method No. 1 - Place one end of the seizing wire in the valley between two strands. Then turn its long end at right angles to the rope and closely and tightly wind the wire back over itself and the rope until the proper length of seizing has been applied. Twist the two ends of the wire together, and by alternately pulling and twisting, draw the seizing tight.



Sketch of Method No. 1 for applying seizings. At "A" the turns of the seizing wire are spread apart to illustrate method of applying them. Completed seizing is shown at "B".

Method No. 2 - Twist the two ends of the seizing wire together at the approximate center of the seizing, alternately twisting and pulling until the proper tightness is achieved.



Sketch of Method No. 2 for applying seizings. At "A" the turns are spread apart to show method of applying them. Completed seizing is shown at "B".

THE SEIZING WIRE

A soft, annealed wire should be used in seizing. The diameter of the seizing wire, and the length of the seize, depends upon the diameter of the wire rope.

TABLE OF SUGGESTED SEIZING LENGTHS
AND WIRE DIAMETERS FOR PREFORMED ROPE

Rope Diam; in.	Seizing Wire Diam, in.	Seizing Length, in.
1/8 to 5/16	.032	1/4
3/8 to 9/16	.048	1/2
5/8 to 15/16	.063	3/4
1 to 1-5/16	.080	1-1/4
1-3/8 to 1-11/16	.104	1-3/4
1-3/4 to 2-1/2	.124	2-1/2
2-9/16 to 3-1/2	.124	3-1/2



PROCEDURE FOR ANCHORING CABLE
(BRADEN WINCH)

1. Clean working surfaces of the cable, wedge and pocket of oil, grease, tar or other materials which may effect the friction between the parts.
2. Pull end of cable through cable hole and pocket in drum.
3. Form kink or sharp bend in cable as shown in Figure 3-5. This can be formed by bending cable over and beating it with a large rubber hammer. The free end should be cut to length (L). (See Table 1 for L)

NOTE

If bottom of the cable hole is flush with the bottom of the cable pocket, refer to Figure 3-6 for installed configuration. If the top of the cable hole is flush with the top of the cable pocket, refer to Figure 3-7 for installed configuration.

4. Place Part 1 of the cable wedge into the kink and pull cable and wedge into cable pocket as shown in Figure 3-6. Drive cable and wedge into pocket by hitting at point "A" until wedge no longer moves into pocket.
5. Position shaft extending from Part 1 of cable wedge so Part 2 can be installed.
6. Place Part 2 of the cable wedge onto shaft as shown in Figure 3-6 and install self-locking nut. Tighten nut to clamp free end of cable and draw wedges together.
7. To assure proper seating of the wedge, a load should be applied to the live end of the cable. The greater the load the better the seating.
8. After a load is applied to the cable, the nut should be checked to assure it is still tight.

Pettibone has no control over the actual installation of the cable on a winch and, therefore, does not take the responsibility for cable and anchor performance.



3-48

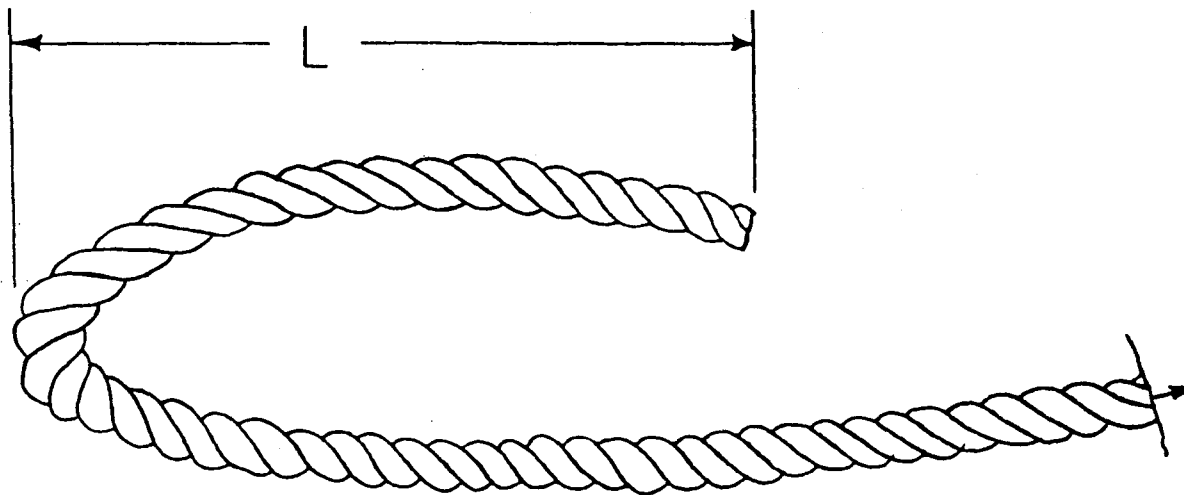


FIGURE 3-5

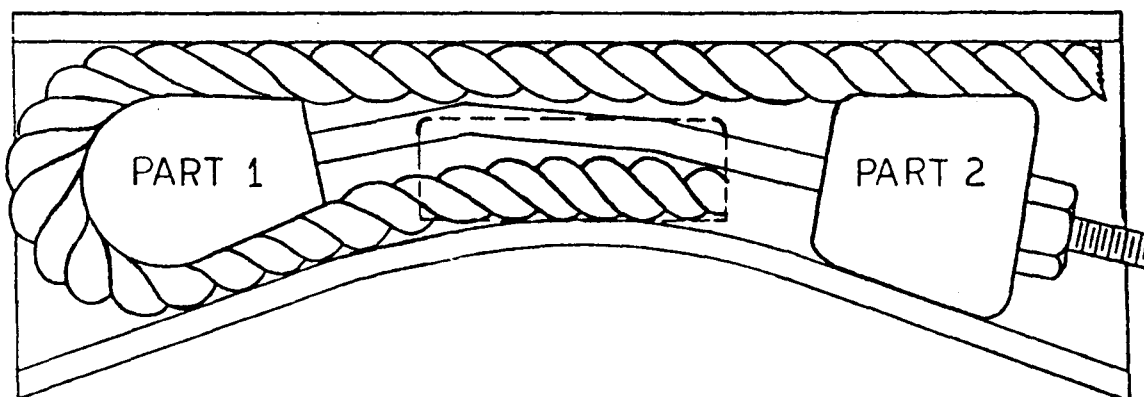


FIGURE 3-6

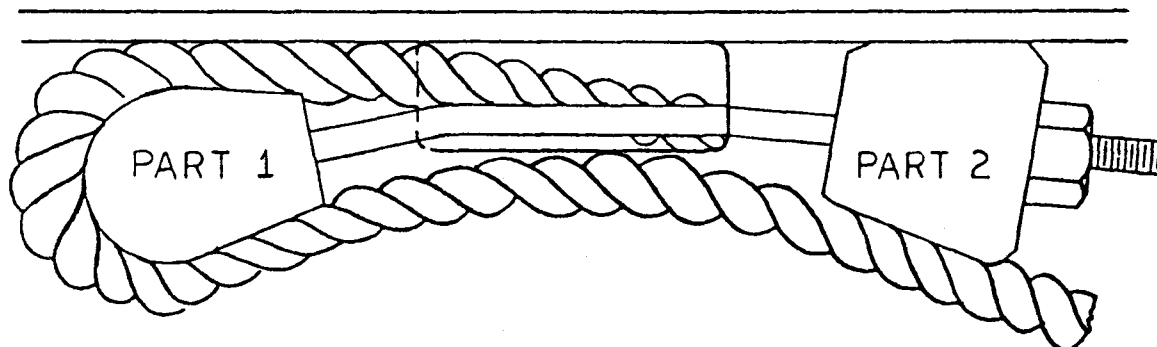


FIGURE 3-7

TABLE 1

<u>WINCH MODEL</u>	<u>CABLE SIZE</u>				
	<u>7/16 L</u>	<u>1/2 L</u>	<u>9/16 L</u>	<u>5/8 L</u>	<u>3/4 L</u>
PD10	10	10	10	10**	
PD10D	10	10	10	11	
PD15	10	10	10	10**	
CH10		12	12	12	14
C2H10 & C2H10D		10	11	11	12
CH12.5		11	11	11	12
C2H16 & C2H16D		11	11	11	14

L - Denotes Length

**Should Only be Used on 9-5/8 Inch Drums

PROCEDURE FOR ANCHORING CABLE
(PETTIBONE WINCH)

1. Secure the proper sized zinc-type ferrule, socket, for your wire rope.

WIRE ROPE DIA.FERRULE PART NO.

9/16"

A-43871-1

5/8"

A-43368-7

2. The wire rope should be securely seized before cutting.
3. Place socket over end of wire rope.
4. Measure from the end of the wire rope a length equal to the length of the socket. Make at least two seizings starting at this point working away from the end of the wire rope.
5. The end seizing on the wire rope must be removed and the wires unlaid or "broomed out".
6. The "broomed out" wires should be carefully cleaned with benzine, or good cleaning solvent for the entire distance they are to be inserted in the socket. Shake off excess and wipe dry.



7. The wires, for a distance of not more than $\frac{3}{4}$ of the cleaned length, should then be dipped into a bath of commercial muriatic acid. Keep wire brush in acid bath until clean dull gray steel color is observed, usually one-half to three minutes. Care should be taken: 1) to keep the surface of the acid clean and free of grease at all times, and 2) to prevent the acid from coming in contact with any portion of the rope other than the broomed ends.
8. The acid should then be neutralized by dipping the wires into hot water.
9. Slip socket over "broomed out" wires and flush with top. Be sure socket is in line with axis of rope. Place fire clay, putty or asbestos wicking around bottom of socket. Preheat socket to approximately 850°F. Add small amount of Sal ammoniac Crystals to socket.
10. Heat zinc to a range of 850°F to 1000°F. Zinc must not be too hot or it will anneal the wires. Skim off any dross which may have accumulated on the surface of the zinc bath. Pour pure molten zinc into preheated socket basket. When the zinc has congealed, the socket can be plunged into cold water.
11. Remove all seizings. After cooling, apply lubricant to rope adjacent to socket to replace lubricant removed by heat of socketing.
12. Place the end of wire, with nut attached, into the cavity of the winch drum. Draw the cable up into the slot which opens into the tapped cavity.
13. Install the 1" N.P.T. flush plug into the winch drum.

Pettibone has no control over the actual installation of the cable on a winch and, therefore, does not take the responsibility for cable and anchor performance.

REEVING

The number of parts of line used in reeving the main hoist line will depend on the load to be lifted. Refer to the rating chart in the cab to determine reeving requirements for various loads. Hoisting and lowering speeds decrease as the number of parts of line increase.

NOTE

Jib, tagline and swingaway reeving is limited to a single part of line. The main or auxiliary winch line can be used to reeve the jib. The auxiliary winch line cannot, however, be used for reeving the main hoist line.



INSTALLATION OF A NO-PINCH WEDGE SOCKET (Refer to Figure 3-8)

No-pinch wedge sockets provide efficient end attachments suitable for field assembly. Installation is rapid even with extremely large diameter ropes.

A simple procedure to follow for installing this type of socket is listed here as a guide. Variations can be made to suit individual conditions.

1. Place socket in upright position as shown in View A, and bring the rope around in a large, easy to handle loop.
2. Dead end of rope should extend from the socket for a distance of at least one rope lay, permitting the strands to adjust around the wedge and keep the rope in balance. Insert wedge as shown in View B.
3. Secure ears of socket to a sturdy support and carefully take a strain on the live side of the rope. Pull wedge and rope loop into position tight enough to hold wedge in place during handling. Final wedge positioning takes place under full operating loads.
4. After final pin connections are made, increase loads gradually until wedge is seated. Avoid applying any sudden shock loads before wedge is in final position. View C shows general operating appearance of the assembly with wedge pulled into socket and end of wedge showing.

Dismantling a wedge and socket can be accomplished by striking a series of sharp blows on the small end of the wedge. Another method uses a simple frame to straddle the socket while holding a small hydraulic ram against the wedge. Either method is fast and positive, requiring a minimum of equipment and manpower.

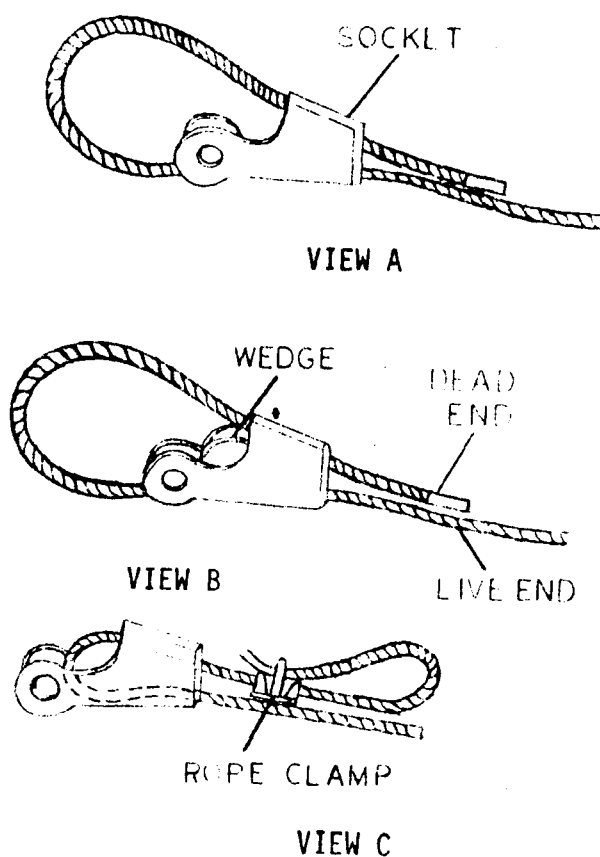


FIGURE 3-8



INSTRUCTIONS FOR ATTACHING POURED WIRE ROPE SOCKETS

1. The wire rope must be securely seized before cutting, to prevent loss of lay when the rope is opened. This is to insure equal tension in the strands when a load is applied. Measure from the end of wire rope a length equal to the length of the basket of the socket. Make seizings with soft iron wire, located as shown in Figure 3-9. Use as many seizings as necessary to prevent the wire rope from unlaying.

The end seizing of the wire rope must be removed. Steel wire cored rope should be separated and "broomed out" in the same manner as the wire in the main strands of the rope in Figure 3-10.

The wires should be carefully cleaned with a suitable solvent for the distance they are to be inserted in the socket (Figure 3-11). Then, dip the wires into commercial muriatic (hydrochloric) acid. The depth of immersion in acid must not be more than 3/4 of the cleaned length. Keep the surface of the acid clean and free of grease at all times. The time in the acid depends on the rope size, whether wires are bright or zinc coated and the condition of the acid itself. Normally, one to three minutes is ample time for bright ropes through one-inch diameter. Over-exposure to the acid is harmful. Experience will determine the proper cleaning time. On zinc-coated ropes, the wires should remain in the acid only until the zinc is removed - no longer. After the cleaning, the broomed wires should be dipped in clean, hot water.

2. Installing Socket - The rope should now be placed in a vise, as shown in Figure 3-12, and a temporary seizing attached to hold the wires of the rope together so the socket can be placed over them.

Preheat the socket to approximately 200°F. Slip socket over ends of wires (Figure 3-13). Distribute all the wires evenly in the basket, and flush with top of basket. Seal the base of the socket with clay, asbestos or tape.

Be sure that the socket is in line with the axis of the wire rope. The wire should not protrude beyond the pouring level.

3. Pouring Zinc - Use only zinc not lower in quality than "high-grade" per ASTM Spec B-6 (Zinc Metal). Heat zinc to a range of 850°F to 1000°F. Skim off any dross which may have accumulated on the surface of the zinc bath. Pour pure molten zinc into the socket basket in one continuous pour, if possible (Figure 3-14). Tap the side of the socket with a light hammer, while pouring, to jar the zinc into the crevices between the wires. A small quantity of sal ammoniac crystals put over the wires just prior to pouring the zinc will help the flow of the zinc into the smaller crevices at the bottom of the socket.

Permit the socket to cool at room temperature. Remove the seizing bands and seal. Relubricate the rope at the base of the socket. The finished socket will appear as shown in Figure 3-15.

NOTE

The primary function of a zinc socket is to form a metallurgical bond or alloy between the zinc metal and the broomed out wires of the rope. No attempt is made to form a bond between the zinc metal and socket basket itself.

Since the zinc cone is not bonded to the socket basket, it may be possible to rotate the socket slightly. However, after being subjected to operating loads, the zinc cone seats firmly in the socket basket and usually no further movement is possible.

Slight movement in a socket is no indication of improper attachment, and tensile loading serves to further seat the zinc cone in the socket.

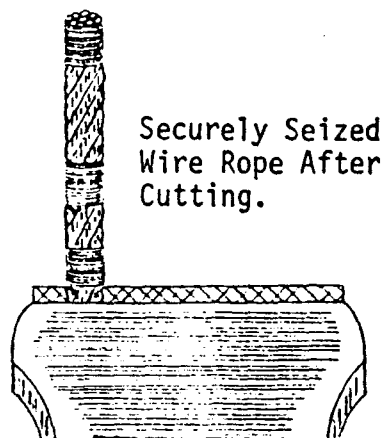


FIGURE 3-9

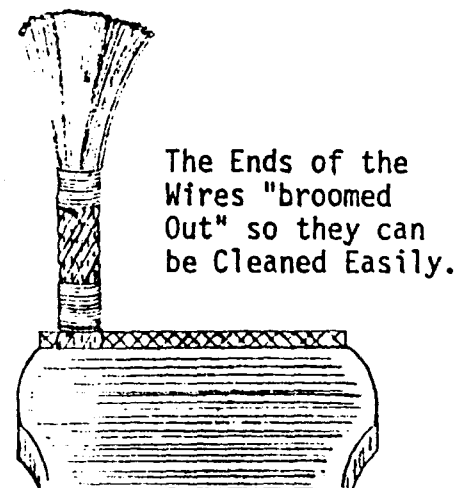


FIGURE 3-10

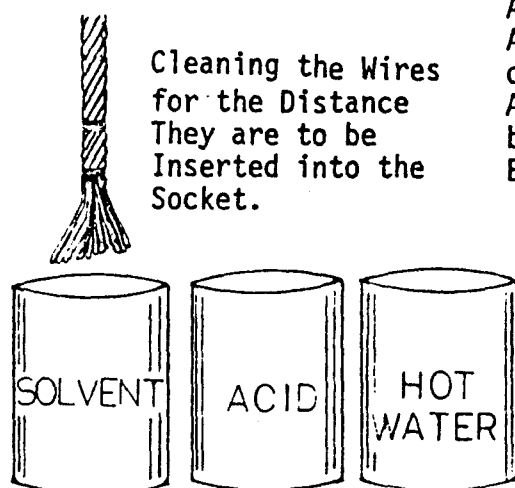


FIGURE 3-11

A Temporary Seizing Applied at the End of the Wire Rope to Allow the Socket to be Placed over the End of the Wire Rope.

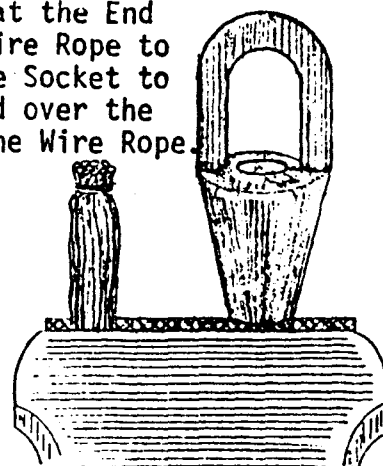


FIGURE 3-12



3-54

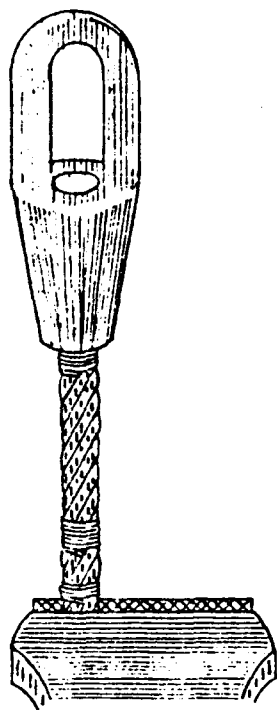


FIGURE 3-13

The Socket Placed over the End of the Wire Rope. The Temporary Seizing is then Removed and the Socket Pushed Down until the Ends of the Wires are at the Upper End of the Basket of the Socket.

The Finished Socket.

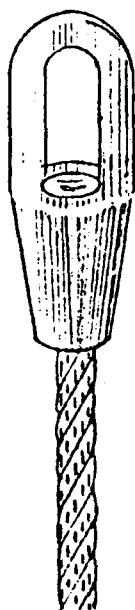


FIGURE 3-15

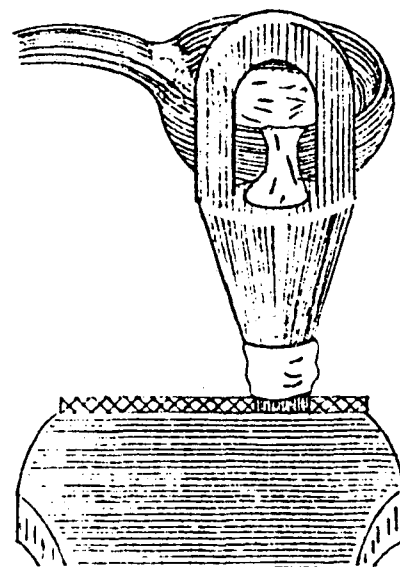


FIGURE 3-14

Pouring the Molten Zinc Into the Basket of the Socket. Make Certain the Socket is Lined up With the Wire Rope, so Eccentric Loading of the Rope will not Occur.