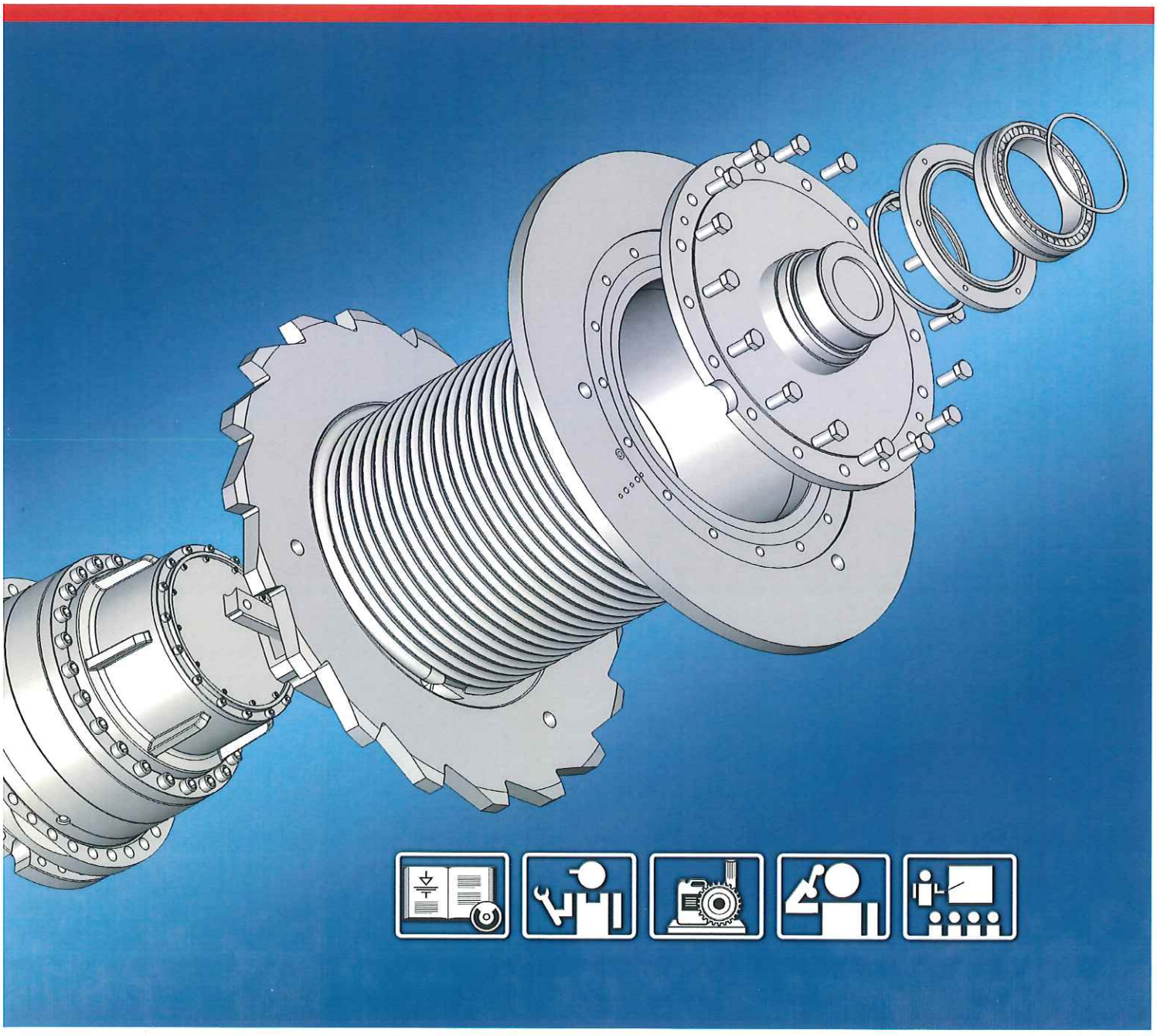
Manitowoc

Crane Care

GROVE

RT530E-2 – n° 258268 - GB

AEM BOOKLET



FOREWORD

Why is SAFETY important to YOU?

3 BIG REASONS

- **Accidents DISABLE and KILL**
- **Accidents COST**
- **Accidents CAN BE AVOIDED**

This safety manual is intended to point out some of the basic safety situations which may be encountered during the normal operation and service of your machine and to suggest possible ways of dealing with these conditions.

Additional precautions may be necessary, depending on attachments used and conditions at the work site or in the service area. The manufacturer has no direct control over machine application, operation, inspection, lubrication, or maintenance. Therefore, it is your responsibility to use good safety practices in these areas.

The information provided in this manual supplements the specific information about your machine that is contained in the manufacturer's manual(s).

Other information which may affect the safe operation of your machine may be displayed on safety signs or in insurance requirements, employer's safety programs, safety codes, local, state/provincial, and federal laws, rules, and regulations.

The following is a partial list of reference material on safe operation:

- SAE — Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096, publishes a list called "Safety Considerations for the Operator," SAE J153.
- PCSA (Power Crane and Shovel Association, Association of Equipment Manufacturers), 111 E. Wisconsin Avenue, Milwaukee, WI 53202-4879, publishes PCSA Standard No. 4 and other safety-related material.

- The Department of Labor, Occupational Safety and Health Administration, publishes safety and health regulations and standards under authority of the Occupational Safety and Health Act (OSHA). Its address is: Occupational Safety and Health Administration, U.S. Dept. of Labor, Washington, D.C. 20210.
- American National Standards Institute (ANSI), c/o The American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017, includes standards for safe operation, inspection, and maintenance in their ANSI/ASME B30.5.

Unauthorized modifying of machines creates hazards. Machines should not be modified or altered unless prior approval is obtained from the manufacturer.

DO NOT OPERATE any crane that has been modified without the manufacturer's written approval.

IMPORTANT: If you do not have the manufacturer's manual(s) for your particular machine, get a replacement manual from your employer, equipment dealer, or from the manufacturer of your machine. Keep this safety manual and the manufacturer's manual(s) with your machine.

CONTENTS

	Page	Section
A WORD TO THE USER	4	
PEOPLE MAKE THE DIFFERENCE	5	1
RESPONSIBILITY	6	2
BE PREPARED BEFORE YOU START	7	3
GET STARTED SAFELY	13	4
WORK SAFELY	16	5
PERSONNEL HANDLING	42	6
TRAVEL SAFELY	48	7
STOP WORK SAFELY	53	8
ROUTINE MAINTENANCE	55	9
HAND SIGNALS	71	10
SAFETY IS UP TO YOU	75	11
IF YOU DON'T KNOW, DON'T GO	76	12

This SAFETY ALERT SYMBOL means ATTENTION! Become Alert! Your Safety Is Involved!

PROMOTE SAFETY

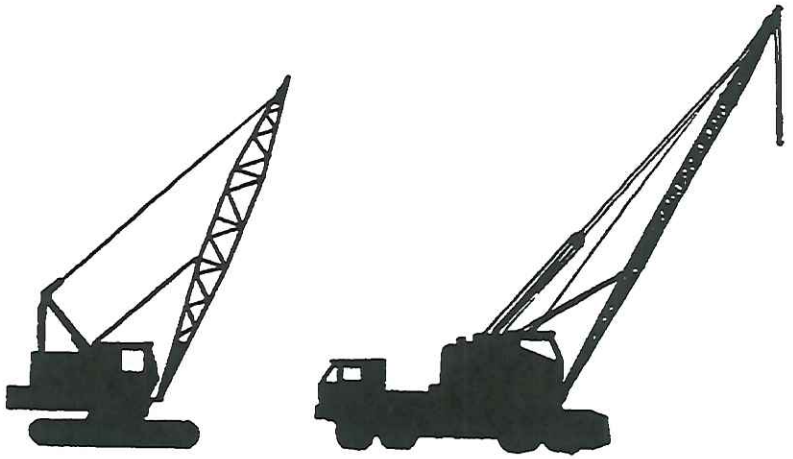
A WORD TO THE USER

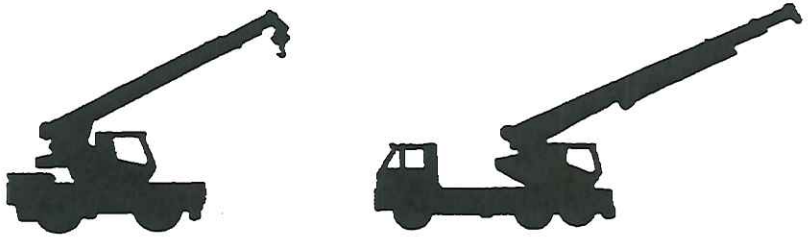
It is your responsibility to read and understand this safety manual and the manufacturer's manual(s) before operating this machine. This safety manual takes you step-by-step through your working day.

Remember that **YOU** are the key to safety. Good safety practices not only protect you but also protect the people around you. Study this manual and the manufacturer's manual(s) for your specific machine. Make them a working part of your safety program. Keep in mind that this safety manual is written for only this type of machine. Practice all other usual and customary safe working precautions, and above all —

REMEMBER — SAFETY IS UP TO YOU

YOU CAN PREVENT SERIOUS INJURY OR DEATH





PEOPLE MAKE THE DIFFERENCE

People who use or operate cranes must be:

COMPETENT

- Do not operate the crane while under the influence of alcohol, awareness altering drugs, or medications that would affect your ability to operate the crane safely.
- **Physically** — good vision, hearing, coordination, and capable of safely performing all functions required for the operation of the machine.
- **Mentally** — able to understand and apply established rules, regulations, and safe practices. Be alert, using good judgment for safety to themselves and others. Desire to do their job correctly and in a responsible manner.
- **Emotionally** — be calm and capable of withstanding stress and make judgments concerning their own physical and mental conditions.
- **Trained** — have read and understood the operator's instructional manual, the load rating chart, hand signals chart, and safety decals and be skilled and knowledgeable in all operational and maintenance aspects of the machine. (FIG. 1)
- **Licensed** — if required by law.

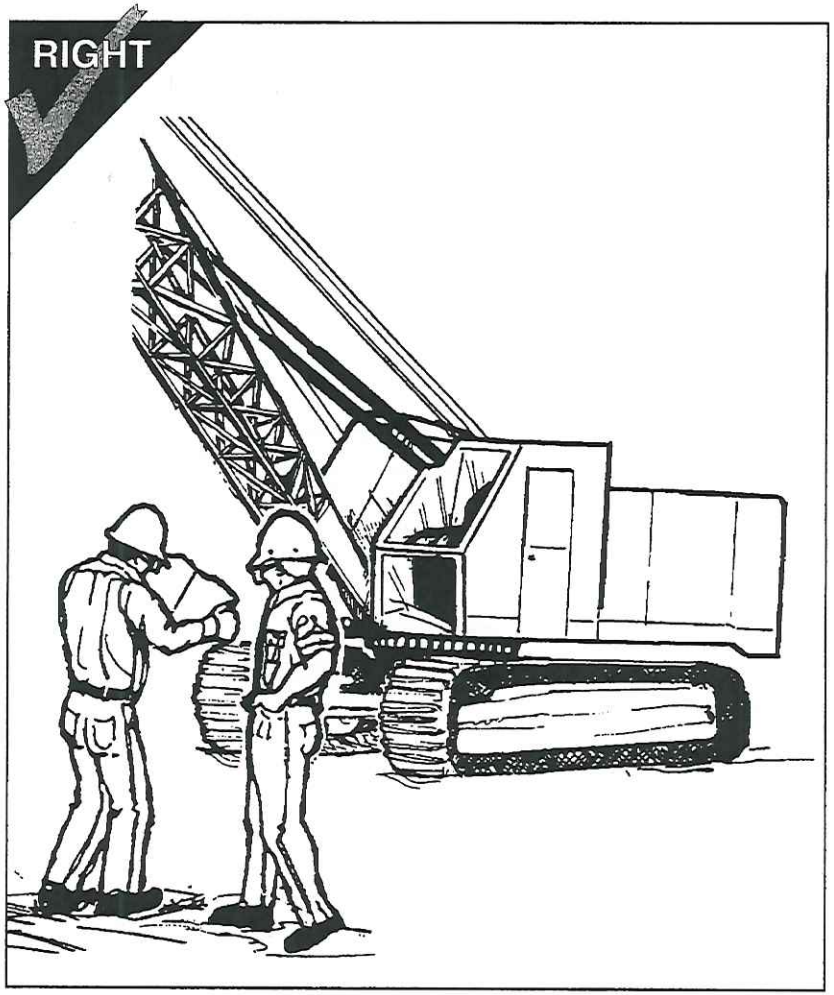


FIG. 1

RESPONSIBILITY

2

Operators must be safety conscious, responsible, and reliable. Sobriety and willingness to follow instructions are other essential characteristics. Pre-employment medical examination followed by periodic examinations is recommended for all machine operators.

Employer's safety programs should require that a person at each job site be assigned the responsibility and authority for safety. Know who that person is and what the job-site safety rules are. Cooperate with that person and carefully follow the rules. Do not violate any safety rules. (FIG. 2)

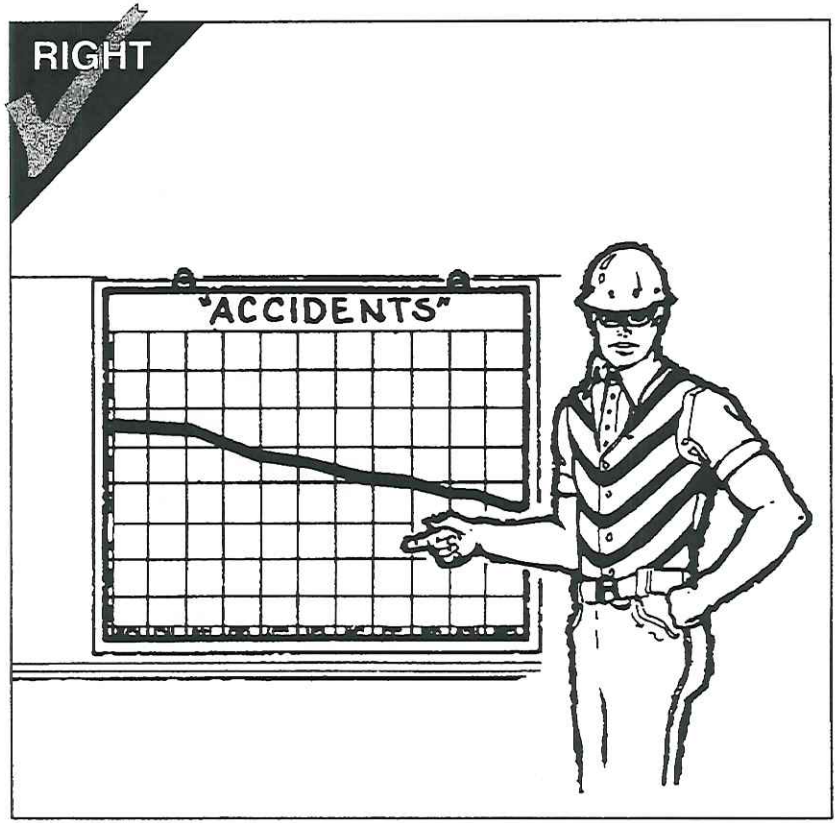


FIG. 2

Read and understand the manufacturer's operator manual, crane load rating chart, maintenance requirements, and information decals. Never take anything for granted. Don't assume that everything is all right at the start of work today just because everything seemed all right at the end of work yesterday. Before beginning operation, thoroughly inspect the entire machine for signs of wear or faulty operation. Carefully read and follow the instructions on all safety signs (decals) on the machine. Keep these signs in readable condition and replace missing or damaged signs.

Keep your machine clean including all instrumentation, windows, lights, and other glazed surfaces. (FIG. 3) Remove all oil, grease, or ice. Store tools and other necessary items in the tool box.

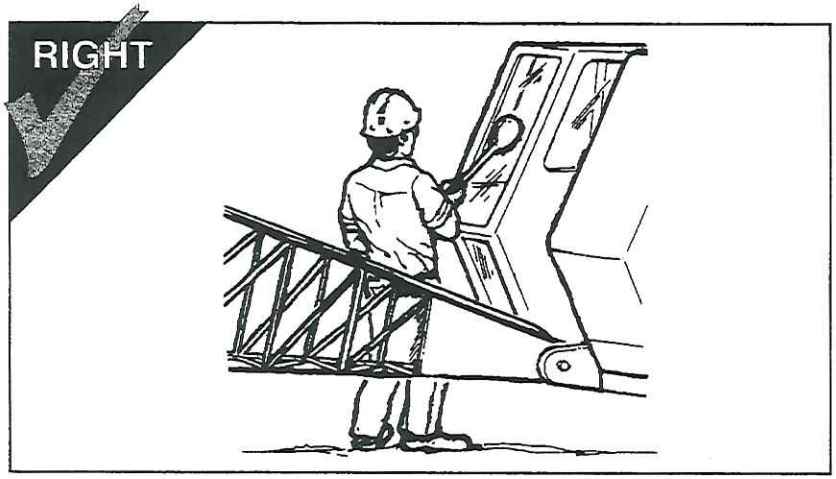


FIG. 3

Clean mud or grease from shoes, steps, and walkways before attempting to mount or operate the machine. Be sure the foot pedals are clean and dry to reduce the possibility of your shoes slipping off the pedals.

Your clothing should be relatively close fitting. Loose jackets, shirt sleeves, rings, and other jewelry should be avoided because of the danger of catching them in moving parts or on controls.

Always wear required protective items such as hard hats, safety glasses, reflective clothing, safety shoes, and ear protection as required. (FIG. 4)

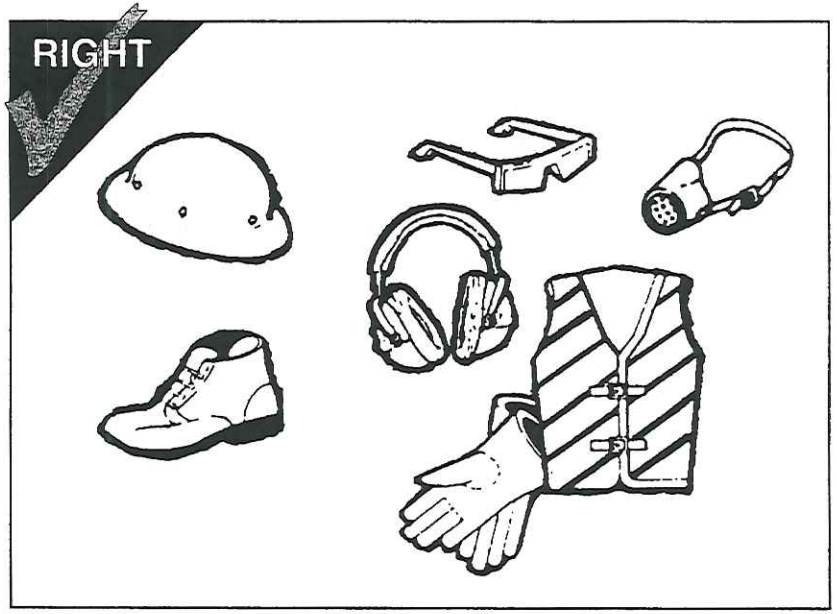


FIG. 4

BE PREPARED BEFORE YOU START

3

Never start or operate the machine without protective guards and panels in place.

Always check height, width, and weight restrictions for your locality and be sure the machine will not exceed these limitations.

Be sure that all safety devices provided are in place and in good operating condition. Be familiar with the use of all safety devices.

Plan ahead — work safely — avoid accidental damage and injury. If an accident or fire does occur, react quickly with the tools and skills at hand — know how to use a first aid kit and a fire extinguisher — and where to get assistance.

Remove all window vandal guards before operation.

Learn — beforehand — as much about your working area as possible. Be sure that exact locations of overhead and buried electrical power lines, gas lines and other obstructions or hazards are known. Such locations should be precisely marked by the proper authority to prevent accidents. Obtain shutdown or relocation of any such facilities, if necessary. (FIG. 5)

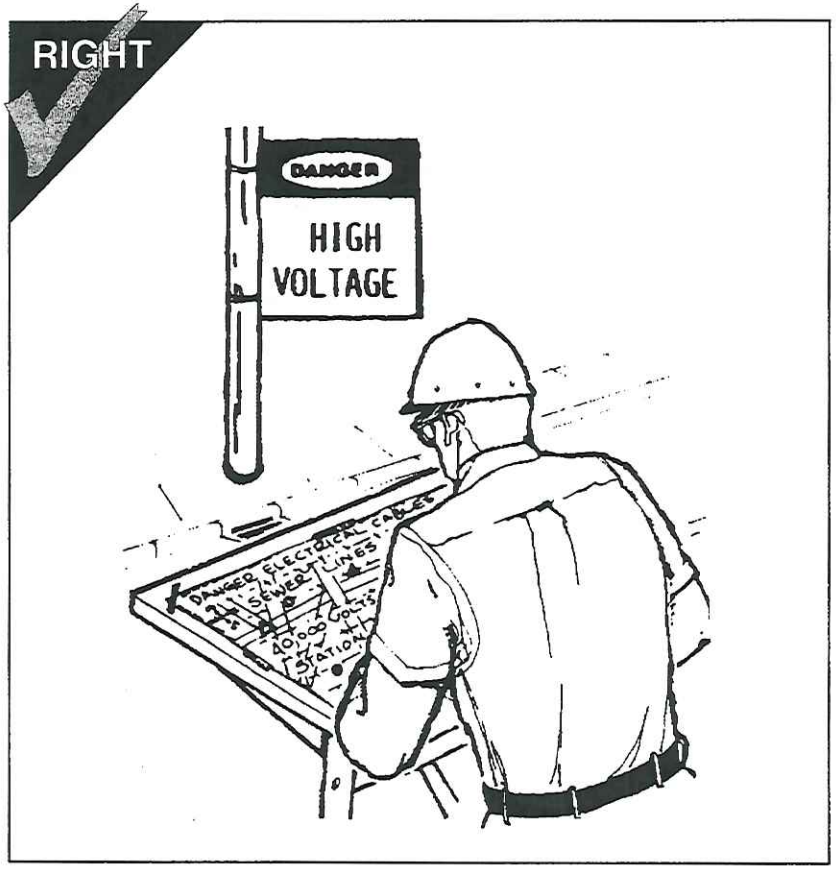


FIG. 5

Be sure the machine is properly lubricated. See that fuel, lubricating oil, coolant, and hydraulic reservoirs are filled to the proper levels according to the manufacturer's instructions.

Walk around the machine to check all safety related items, including guards or plates, and for any maintenance required. Use a user's supplied signed and dated inspection report and give it to the person in charge. Never operate a machine with unsafe conditions. (FIG. 6)

Visually inspect the machine for evidence of physical damage, such as cracking, bending, or deformation of plates or welds. Inspect carefully for cracking or flaking of paint, which may indicate a dangerous crack in the structure beneath. Do not operate the machine until repairs are made.

Loose or missing hardware, bolts, or nuts, should be properly tightened or replaced with manufacturer's specified hardware.

Check for fluid leaks. Hydraulic system leaks must be corrected before the machine is operated. Inspect all hydraulic hoses, especially those which flex in service, and replace if necessary. Secure all caps and filler plugs for all systems.

Inspect air system lines, valves, drain cocks, and other components. See that air pressure is correct and that there are no air leaks.

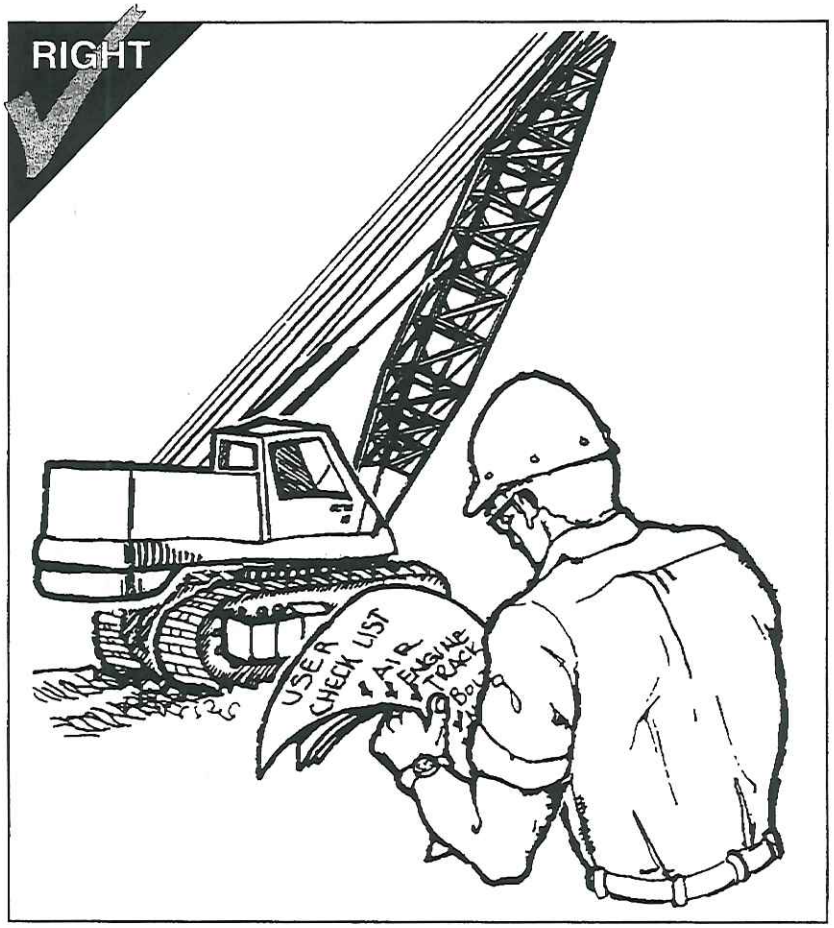


FIG. 6

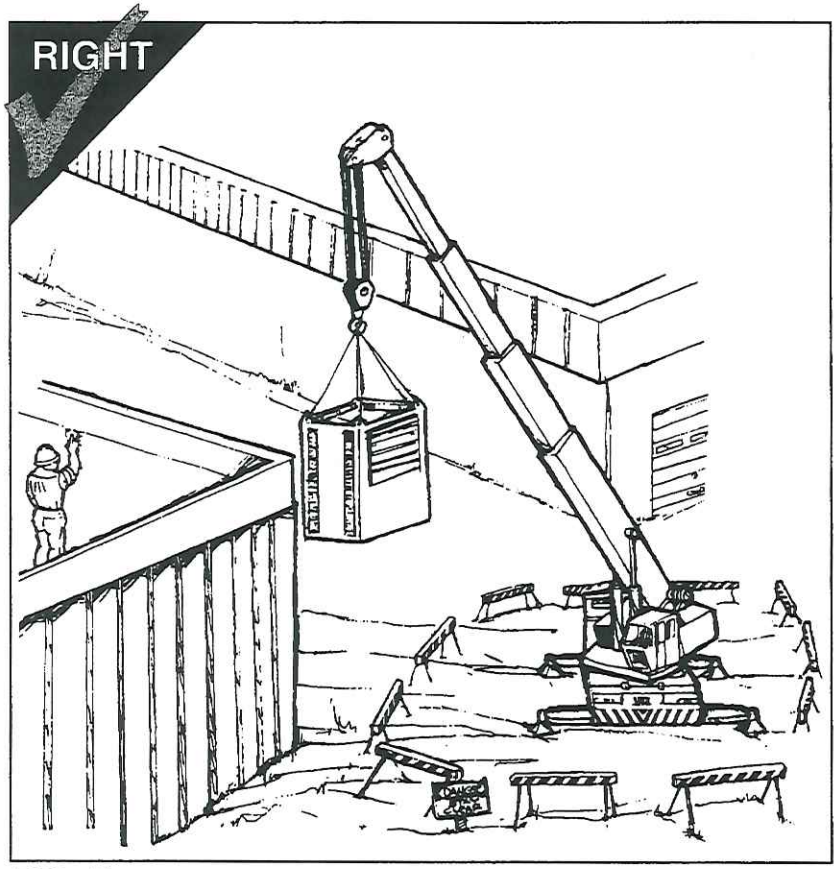


FIG. 7

On rubber tired machines, be sure that all tires are properly inflated for machine applications. Refer to the crane manufacturer's instructions for specified tire inflation pressures. Inspect tires for damage. See Routine Maintenance chapter for inflation and inspection procedures.

Inspect all wire rope for wear, kinking or other damage — replace if necessary — see Routine Maintenance chapter for details.

Water containers and materials used by others should be stored off the crane to keep unauthorized personnel clear of the crane.

Be sure there is adequate clearance for tail swing. Barricade the area to prevent entry. (FIG. 7)

NOTE: In the figures that follow, barricades have been omitted for sake of clarity in the illustrations.

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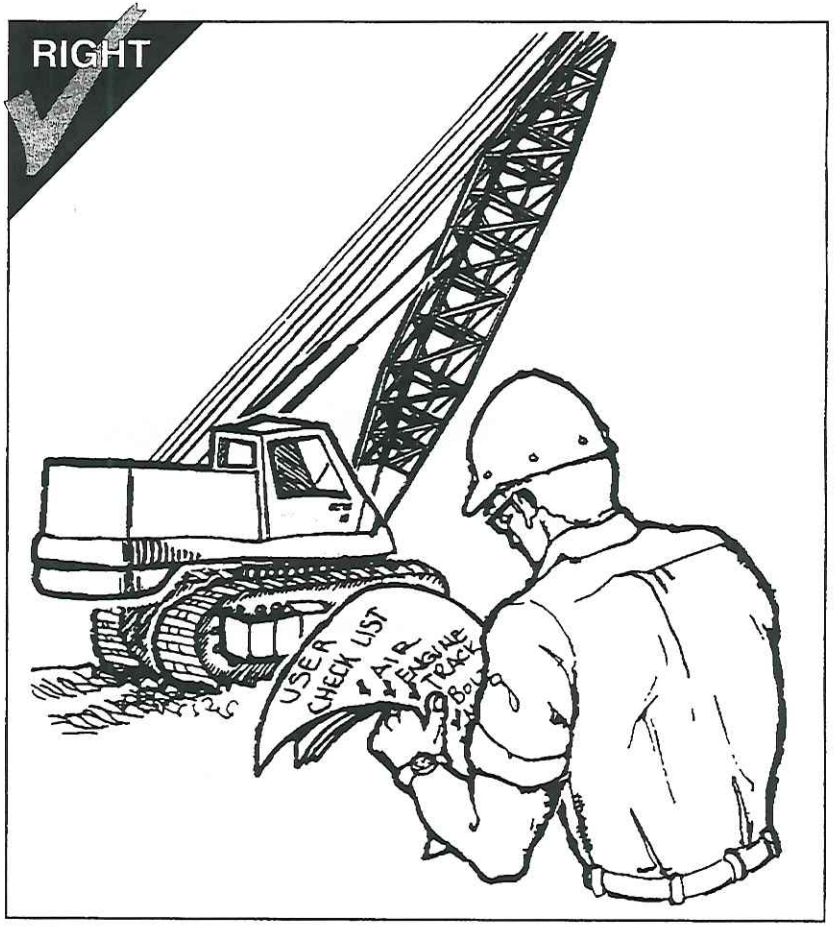
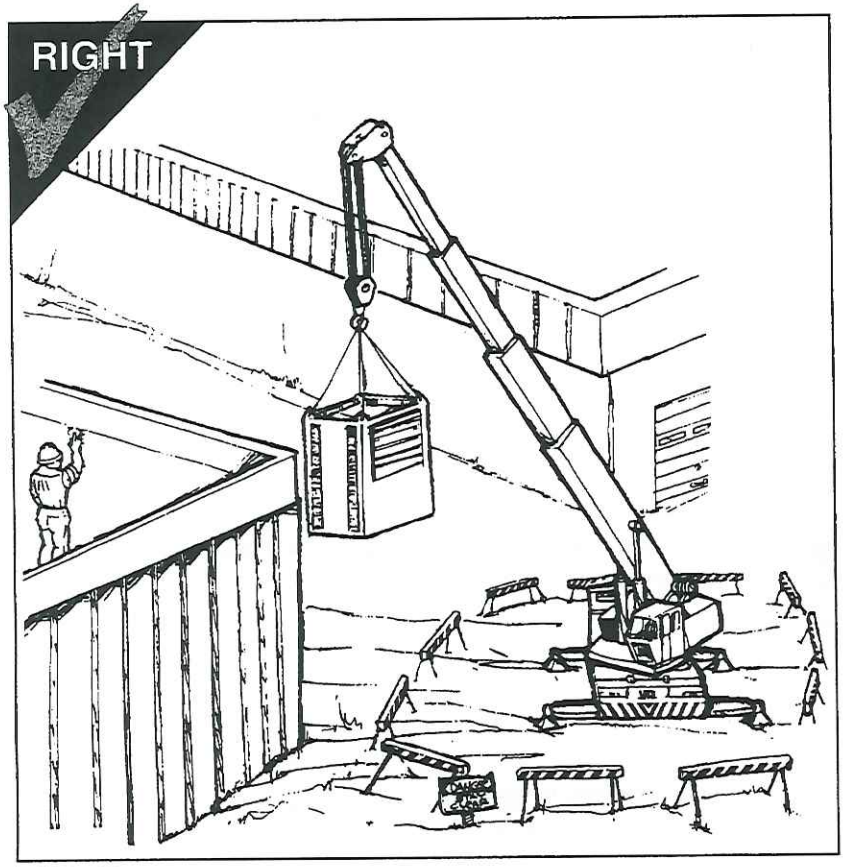


FIG. 6



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LOAD RATING CHARTS

Do not operate the machine *without the proper crane manufacturers load rating charts.* (FIG. 8)

Never use any other means, like a photostatic copy of a chart or sales literature, as a load rating chart. Your machine may be fitted with special equipment which would require a special load rating chart.

Never exceed crane manufacturer's load ratings. The stipulations noted on these charts must always be observed. Ratings noted are based on a number of conditions such as hydraulic, mechanical, structural, and/or stability.

Tipping the crane to determine capacity is a very dangerous practice which always overloads the crane and **is never approved.** It is always unsafe to lift or move any load which is greater than the rated load shown on your specific crane load rating chart.

Know the rated capacity of the machine. Only machines of proper rated capacity and type should be assigned to the job.

Never operate with other than manufacturer's recommended counterweight. Unauthorized reduction or addition of counterweight or ballast constitutes a safety hazard.

Check for warning tags before starting the crane — check around to know that the work area is clear.

Never exceed boom or boom and jib combination lengths published on the crane manufacturer's load rating chart.

Read and understand all the notes and warnings printed on the crane load rating chart before lifting a load.

Crane mounted devices which indicate load conditions by visual or audible signals are not a substitute for strict adherence to all safe operating procedures.

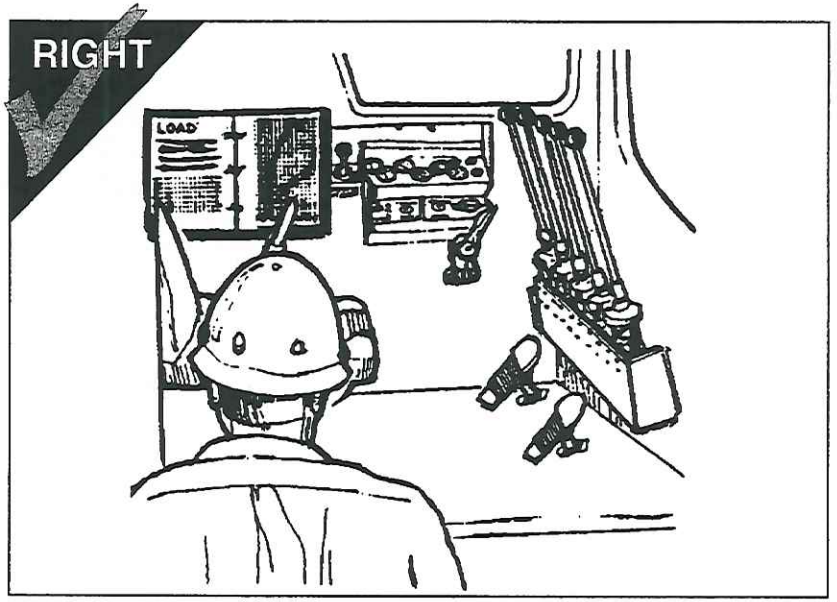

FIG. 8

HAND SIGNALS

A legible chart depicting and explaining the system of signals used should be conspicuously located on the outside of the operator's cab.

Do not begin operation until signals are clearly understood.

If non standard signals are going to be used, be sure you and your signal person agree on them beforehand.

The operator shall respond to operating signals only from the appointed signal person, but shall obey a stop signal at any time from anybody. A signal person, fully qualified by training or experience, shall be provided when the point of operation is not in full and direct view of the operator unless an effective signaling or control device is provided for safe direction of the operator. (FIG. 9)

The signal person must be in a sufficiently lighted area to be clearly visible to the operator during nighttime operations.

Signal systems other than manual shall be protected against unauthorized use, breakage, weather, or obstruction which will interfere with safe operation.

A complete set of standard hand signal illustrations can be found in Section 10 of this booklet.

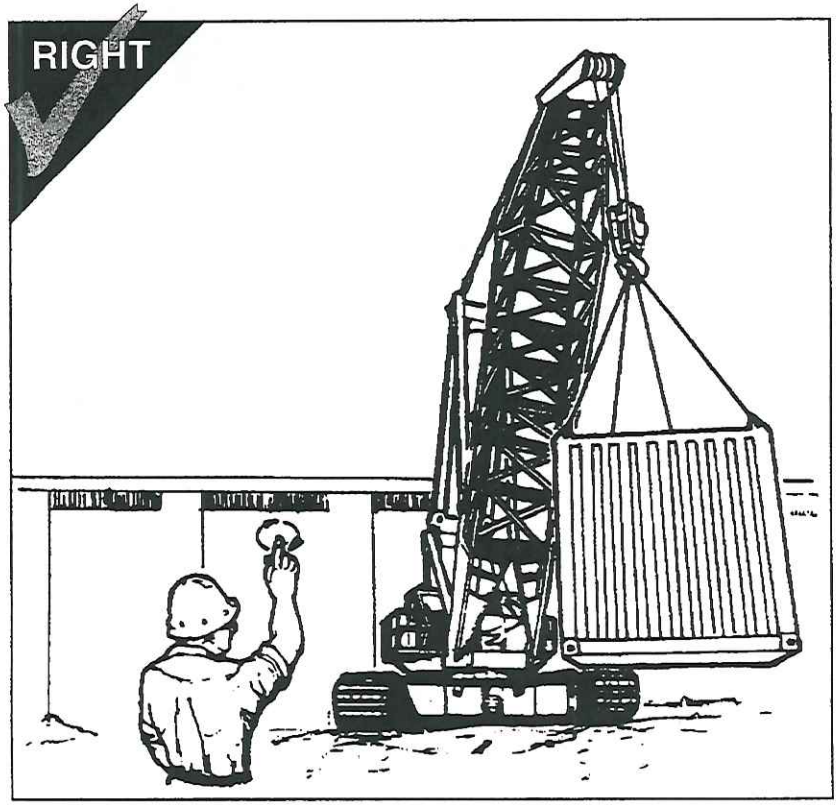

FIG. 9

Mount and dismount carefully using only grab irons and hand holds provided. Don't jump off. Watch for slippery surfaces or obstacles when mounting or dismounting. (FIG. 10)

Never use control levers as hand holds.

Never place hands on wire rope when climbing on the machine. A sudden movement of the wire rope may cause injury.

Check all controls to be sure they are in correct positions before starting the engine. Consult operator's manual and control labels.

DO NOT JUMP OFF OF A MACHINE.

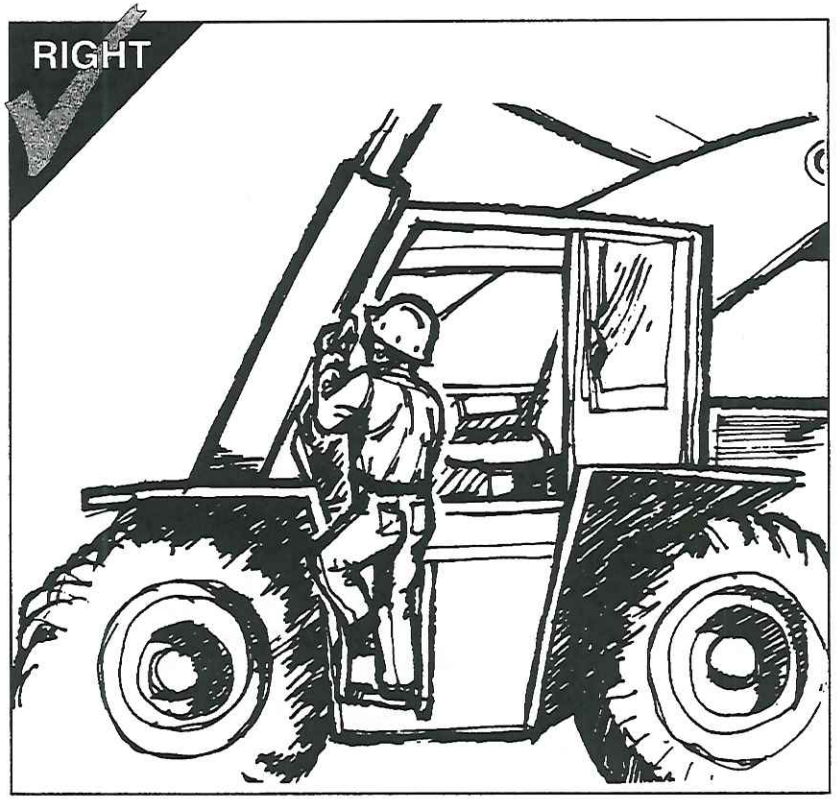

FIG. 10

Check for warning tags. If there is a warning tag on the starting switch or engine starting controls, **do not operate** the switch or start the engine until the warning tag has been removed by the person who placed it there, or by someone who is aware of the circumstances. (FIG. 11)

Before you start engine or begin to move, CHECK INSIDE, OUTSIDE, and UNDERNEATH, and make sure everything is clear.

4

Never start the machine unless you have read the manufacturer's operators manual and are thoroughly familiar with the operation of all control functions on the crane.

Never attempt to start the engine except from an approved operator's station.

Exhaust fumes can kill — If necessary to start an engine within an enclosed area, provide adequate ventilation.

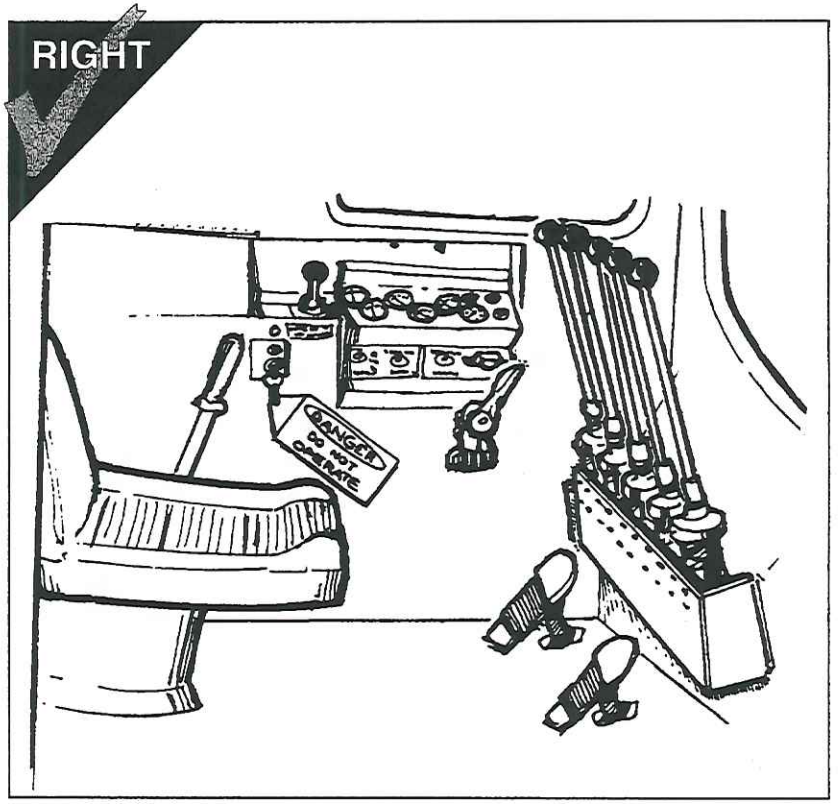

FIG. 11

ATTACHMENT ASSEMBLY AND DISASSEMBLY

Consult, understand, and follow the manufacturer's manual of your crane for proper attachment, assembly, and disassembly. If further clarification is required, consult with the manufacturer. (FIG. 12)

When putting booms and rigging together or taking them apart, stay out from under the boom sections and other rigging.

Make sure all parts are supported before removing any bolts or pins.

Before removing any pins, the boom must be properly supported with the crane's rigging or blocking in accordance with the manufacturer's recommendations.

If it is not properly supported, the boom will fall and **you can not move fast enough to get away from a falling boom or rigging.**

Block under or properly support the boom before dismantling. Never stand on or under the boom during this work.

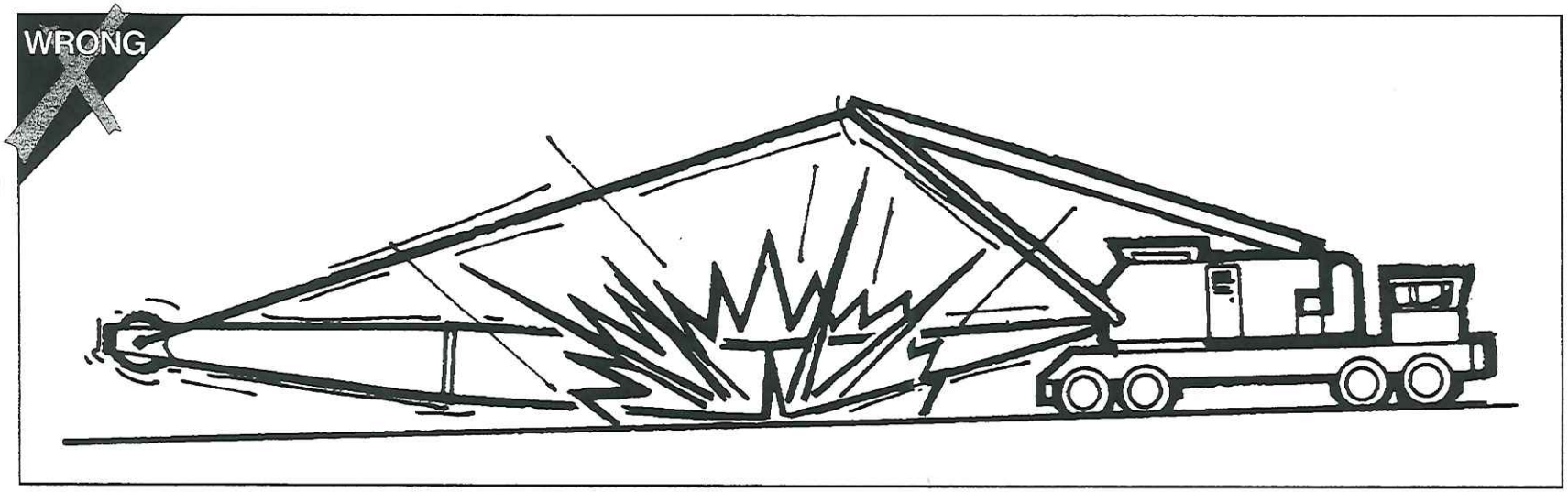

FIG. 12

IMMEDIATELY AFTER STARTING ENGINE
(FIG. 13)

- **Check** all gauges and indicators for proper readings.
- **Be sure** area is safe for operation.
- **Operate** all controls — see that they operate properly.
- **Listen** for unusual noises.
- **Test** engine speed control.
- **Check lights** — all warning and safety devices.
- **Report and record** in the crane log book all safety related defects for immediate correction — do not operate the crane until corrected.
- **Make sure all** operator aids and limiters are installed and operating properly.

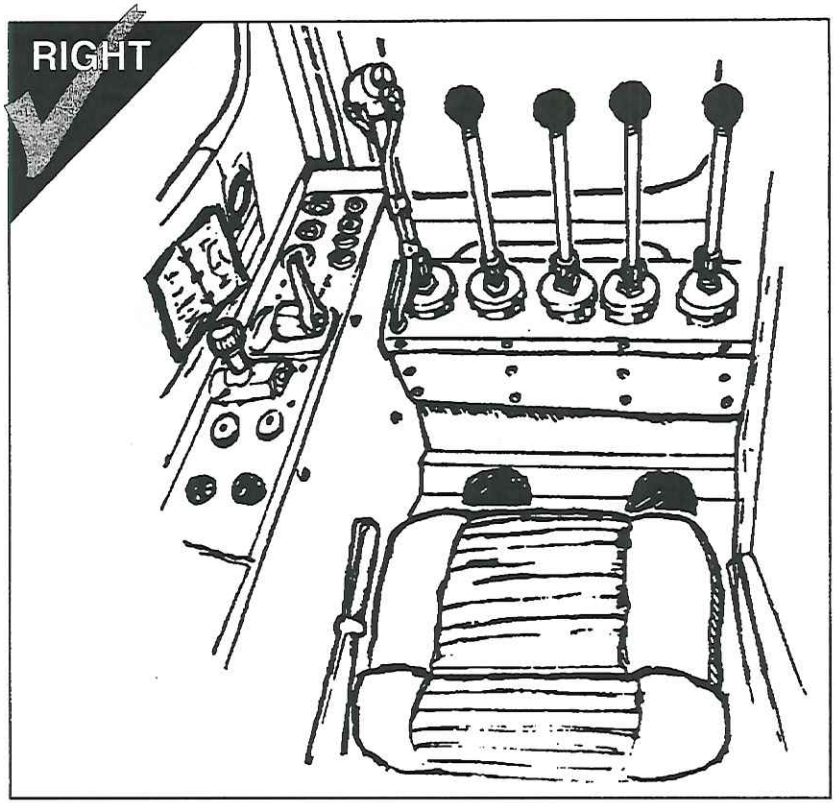

FIG. 13

IN COLD WEATHER (FIG. 14)

- Consult manufacturer's operating manual for proper starting procedure.
- Operate slowly until hydraulic oil is warmed to correct operating temperature.
- **Be sure** that sheaves and pins are not frozen.
- Be very careful to avoid impact (shock) loading.
- In severe cold weather, do not touch any metal parts of the machine with damp or wet exposed flesh, as the **flesh will freeze to the metal and cause severe injury.**
- Do not store loose cold weather starting aid containers or other flammable materials on the machine. Keep all such materials away from heat, sparks, or open flame. Do not puncture or burn containers. **They could explode.**
- Be sure load is not frozen to either the ground or to the supporting structure.
- Heater fuel containers should be handled in the manner prescribed by your supplier.
- Do not operate with a snow- or ice-covered boom, as the extra weight may cause overload and possible structural damage or tip-over.

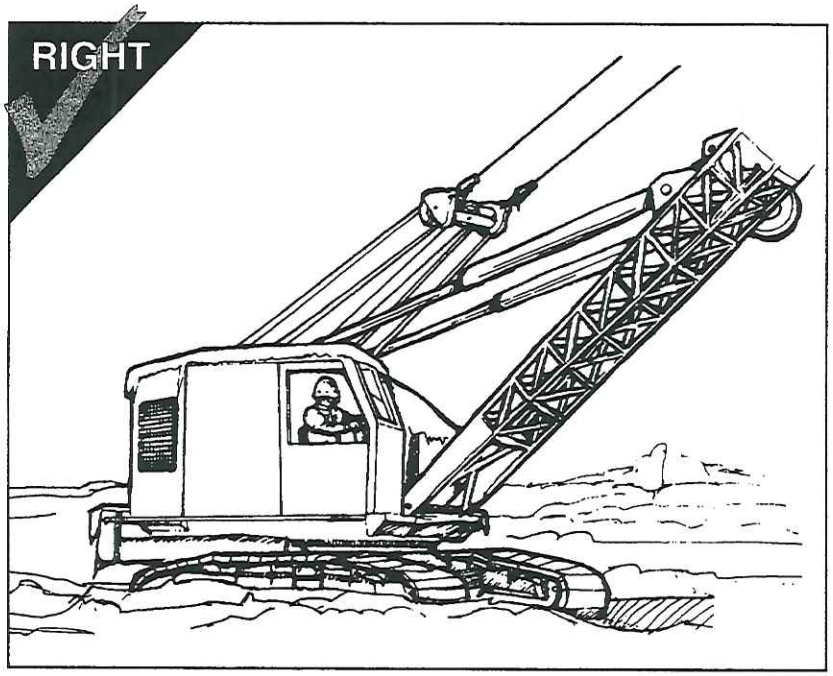

FIG. 14

BE ALERT WHILE OPERATING (FIG. 15)

- **Do not read.**
- **Do not drink.**
- **Do not eat.**
- **Do not operate the machine while** under the influence of **alcohol, awareness altering drugs or medication** that would affect your ability to operate the crane safely.
- **Always** keep your eyes on the moving load or signal person.
- **Pay attention to business.** If you must turn your attention elsewhere, **STOP** operations.
- **Do not work** if fatigue or excessive work requirements affect the safety of the operation.

THINK SAFETY!

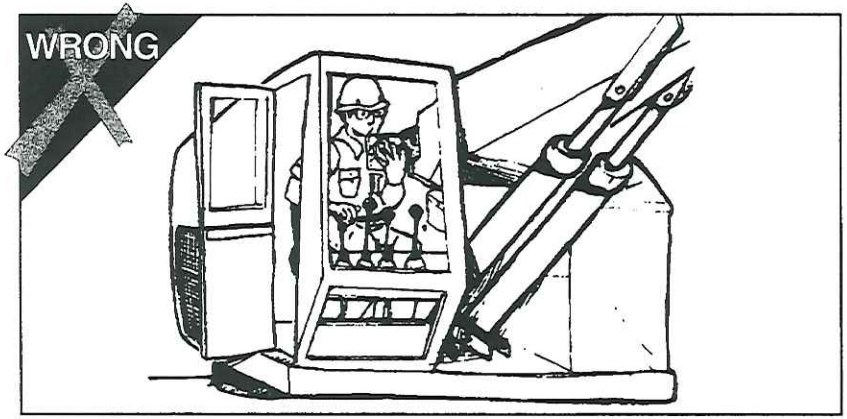

FIG. 15

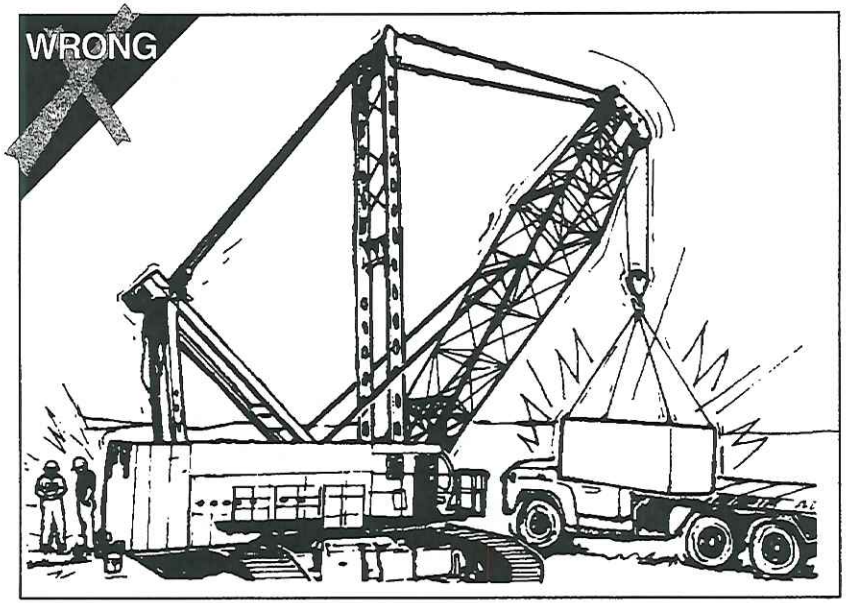

FIG. 16

KNOW THE WORKING RANGE OF THE MACHINE

Be sure the attachment, hook, or load doesn't catch on obstructions when swinging, raising, or lowering the boom or load.

Do not swing, brake, raise, or lower the boom or load unnecessarily fast. All can cause accidents.

Be sure everyone is in the clear before swinging or moving in any direction. NEVER swing or position hook or load over personnel or vehicle cabs. (FIG. 16)

LEVEL THE CRANE

The level of a crane is critical to every lift. All cranes must be leveled according to the manufacturer's specifications. If the machine is out-of-level, the load will cause side loads on the boom and the stability and structural integrity of the machine will be adversely affected.

Since outriggers provide greater stability than tires, machines with outriggers should have the outrigger beams extended and set for lifting operations; consult with the manufacturer's instructions for on-rubber operation.

When using outriggers, set the outrigger's beams to their fully extended position, always extending the beams equally. When using outriggers, be sure all tires are clear of the ground and level the machine in all directions, as specified by the manufacturer.

- If the machine is equipped with a load weighing or load limiting device, make sure the device settings match the machine configuration you are using and it is turned on and working.
- Set the outriggers to their fully extended position, unless the load rating chart for your crane permits partial outrigger extension. Partial outrigger extension is not allowed on all cranes.
- Make sure the outrigger pads are securely fastened to the outrigger beams when beams are in use.
- If blocking must be built (crib) up to obtain height to level a machine, make sure it is stable, covers sufficient ground, and won't topple, collapse, or sink into the ground when the machine is swung.
- Never block under outrigger beams inside the outrigger pads, since this reduces stability of the machine.
- Recheck outrigger pads between lifts and reset them if necessary. Machines can tip over when swung over an outrigger not properly set.
- The supporting surface under each outrigger pad must always be level and solid enough to support the loads that are being lifted.

To level a machine working on crawlers or on tires, the ground must be leveled or blocking must be used. Check the level of the machine in all directions before lifting. Don't lift if out-of-level of the machine exceeds the manufacturer's limits.

Check the level of the machine frequently during operation and relevel when necessary. (FIG. 17)

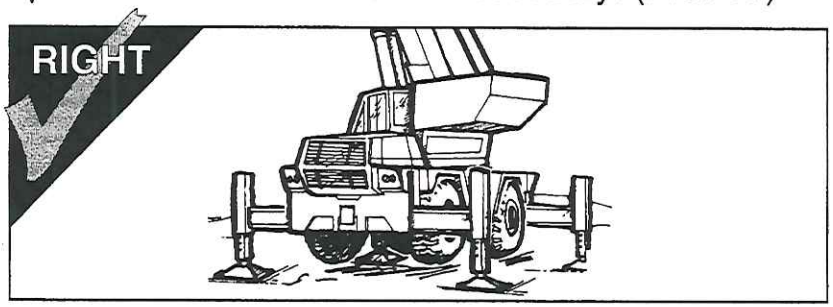

FIG. 17

GROUND OR SUPPORT CONDITIONS

The supporting surface underneath the machine must be level, firm, and stable to support the weight of the machine and its load. Yielding of the supporting surface can produce an out-of-level or tipping condition.

Where necessary, use timber mats or steel plates under the outrigger pads, the tires of rubber tired machines, and the tracks of crawler machines to distribute the load and ensure that the ground bearing capacity of the supporting surface is not exceeded.

The use of blocking and its adequacy is the responsibility of job-site management and is dependent upon job-site conditions. (FIG. 18)

The surface area of the blocking under the outrigger pad must be greater than that of the pad surface area. Material used for blocking must have sufficient strength to withstand the outrigger, tires or crawler loading without bending or cracking.

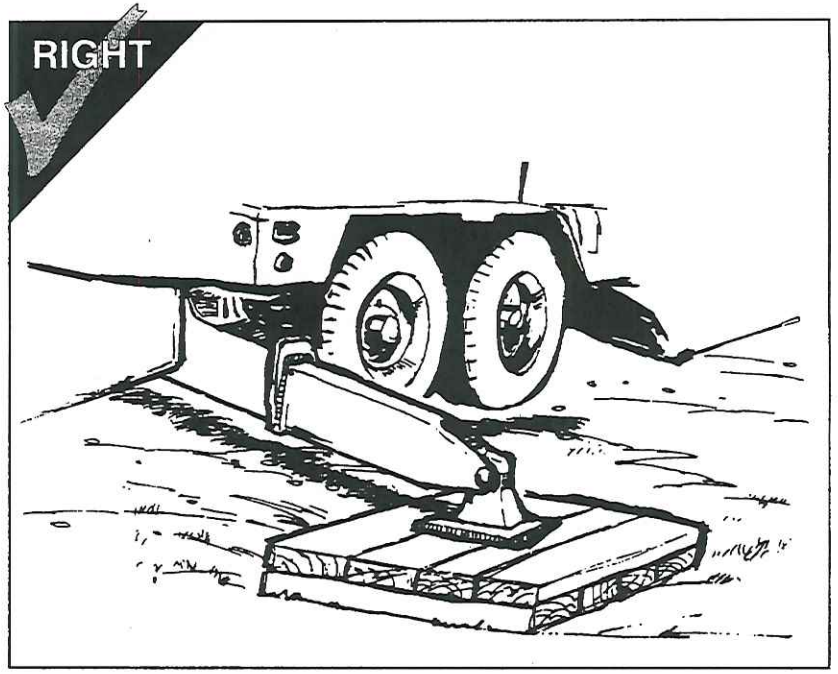

FIG. 18

BEFORE STARTING TO HOIST A LOAD, BE SURE:

- Only machines of **proper rated capacity and type** are assigned to the job.
- **The weight of load** is known and does not exceed the load rating chart.
- **The load is well secured** and properly balanced in the sling or lifting device before it is lifted more than a few inches. (FIG. 19)
- **A minimum of a three-point hitch** is used to prevent a top-heavy load from rolling or tipping.
- The hook is equipped with a properly functioning **safety latch**.
- **The load is attached** to the hook by means of slings or other approved devices of sufficient size and in good condition.
- **Multiple part lines** are not twisted around each other. The reeving must be in accordance with manufacturer's instructions.
- **The rope is properly seated** in the sheaves, tightly spooled and seated on the drum, and free of entanglements before a load or bucket is moved.
- The hoist line is **not** wrapped around the load in place of a sling or chain. (FIG. 19)

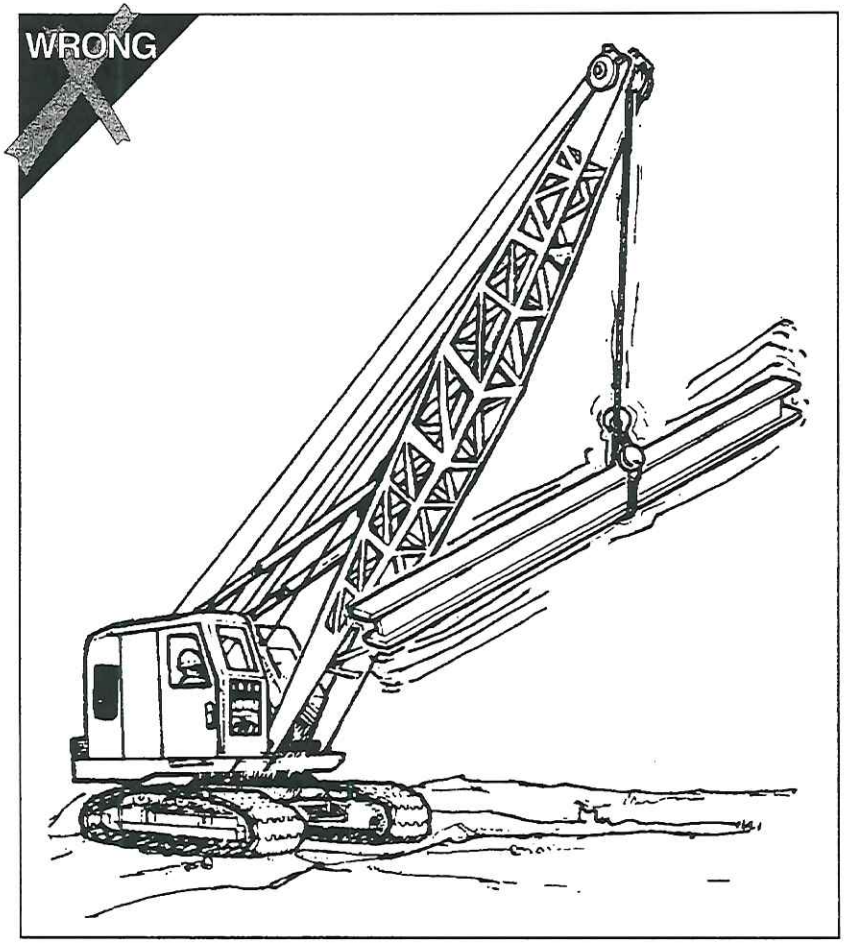

FIG. 19

BEFORE STARTING TO HOIST A LOAD, BE SURE:

- **Sufficient length of wire rope** is installed such that neither the load nor the boom can be lowered past the point where two full wraps of rope remain on the drums.
- **Capacity and wire rope length** are checked each time the rope or the boom length is changed.
- **A "dry run" in tight areas** is made with a signal person present. It will help you determine the safest way to operate under existing conditions.
- **The load is** within load chart rating for the boom length and load radius of the machine. Know the load radius. Load radius is measured from the axis of rotation to the center of vertical hoist line with load applied. (FIG. 20)
- **To add the weight** of the hook block, slings, and all material handling devices to the weight being lifted to determine the total weight.
- **To determine wind speed** and consider the effect of the wind on the load and attachment, since wind may adversely affect the lifting capacity of the machine.
- **The hoist line** is vertical before starting to lift. (FIG. 20)
- **All personnel are clear** before starting a lift. Make certain load is securely attached.
- **You do not attempt to start tipping** the machine to establish lifting capacity. Machine stability is never to be used to determine capacity.

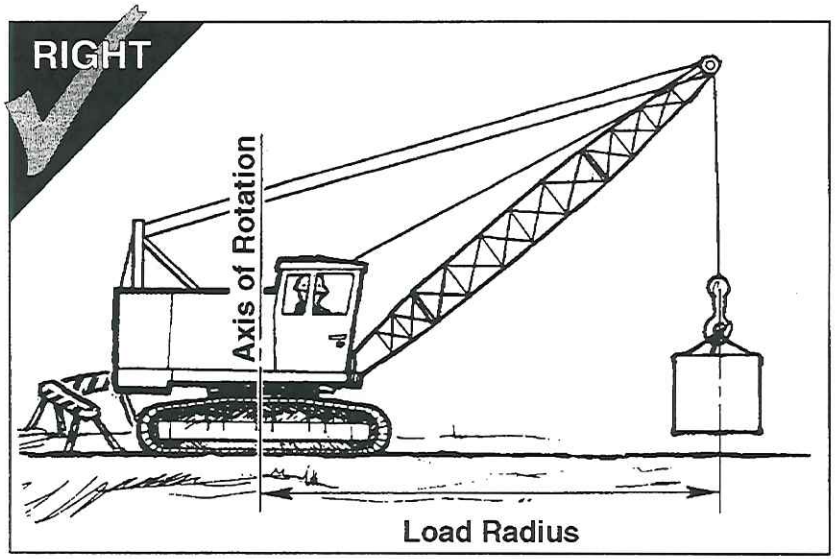

FIG. 20

BEFORE STARTING TO HOIST A LOAD, BE SURE:

- Only machines of **proper rated capacity and type** are assigned to the job.
- **The weight of load** is known and does not exceed the load rating chart.
- **The load is well secured** and properly balanced in the sling or lifting device before it is lifted more than a few inches. (FIG. 19)
- **A minimum of a three-point hitch** is used to prevent a top-heavy load from rolling or tipping.
- The hook is equipped with a properly functioning **safety latch**.
- **The load is attached** to the hook by means of slings or other approved devices of sufficient size and in good condition.
- **Multiple part lines** are not twisted around each other. The reeving must be in accordance with manufacturer's instructions.
- **The rope is properly seated** in the sheaves, tightly spooled and seated on the drum, and free of entanglements before a load or bucket is moved.
- The hoist line is **not** wrapped around the load in place of a sling or chain. (FIG. 19)

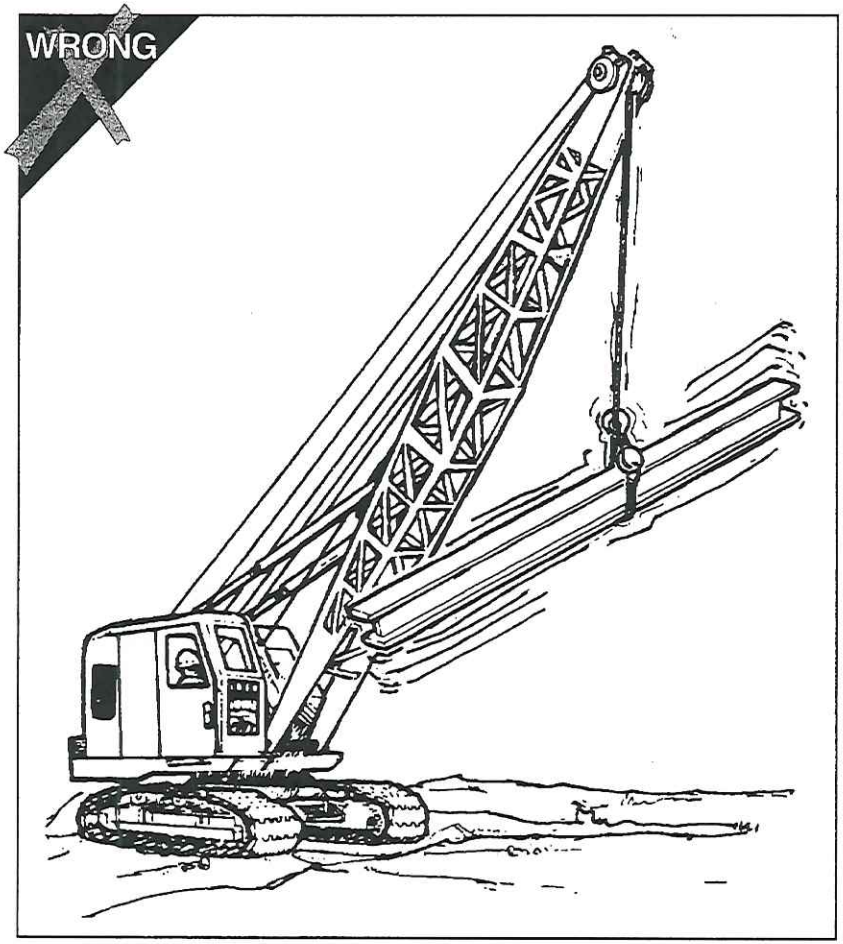

FIG. 19

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- **A "dry run" in tight areas** is made with a signal person present. It will help you determine the safest way to operate under existing conditions.
- **The load is** within load chart rating for the boom length and load radius of the machine. Know the load radius. Load radius is measured from the axis of rotation to the center of vertical hoist line with load applied. (FIG. 20)
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- **To determine wind speed** and consider the effect of the wind on the load and attachment, since wind may adversely affect the lifting capacity of the machine.
- **The hoist line** is vertical before starting to lift. (FIG. 20)
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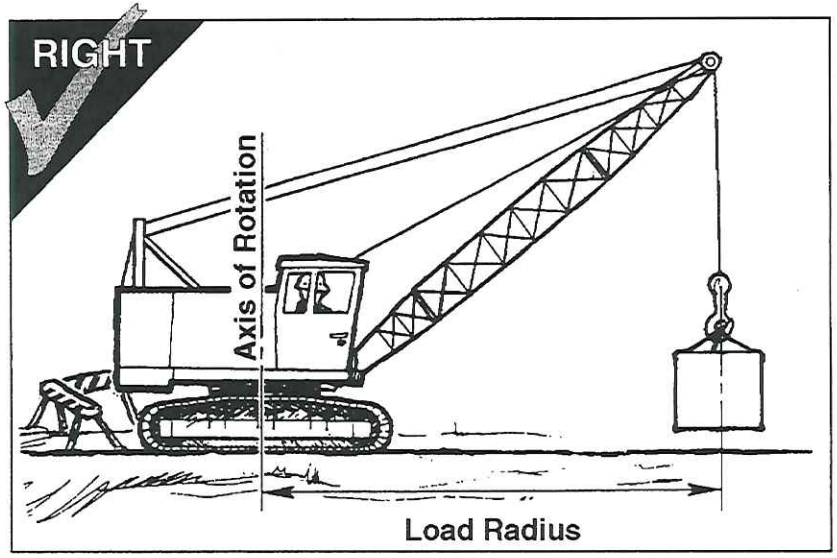


FIG. 20

FREELY SUSPENDED LOADS

All ratings are based on freely suspended loads. Side loading of the machine and load swing out may cause **structural failure or machine tip-over.** (FIG. 21)

NEVER USE A CRANE TO PUSH OR PULL A LOAD OR OBJECT.

EXCESSIVE SIDE LOADS CAN CAUSE ACCIDENTS AND MAY BE GENERATED BY:

- Lifting when not level.
- Swinging when not level.
- Dragging a load.
- Sudden acceleration or deceleration in swinging.
- Wind forces on load and boom structure.
- Pushing a load.

LOAD SWING-OUT

Rapid swinging of a suspended load causes the load to drift away from the machine. The increase in radius can cause the crane to **tip forward or collapse** the boom. The same effect can be generated by swinging long booms without a load or swinging from an over-the-end to an over-the-side position, especially when **operating on tires.**

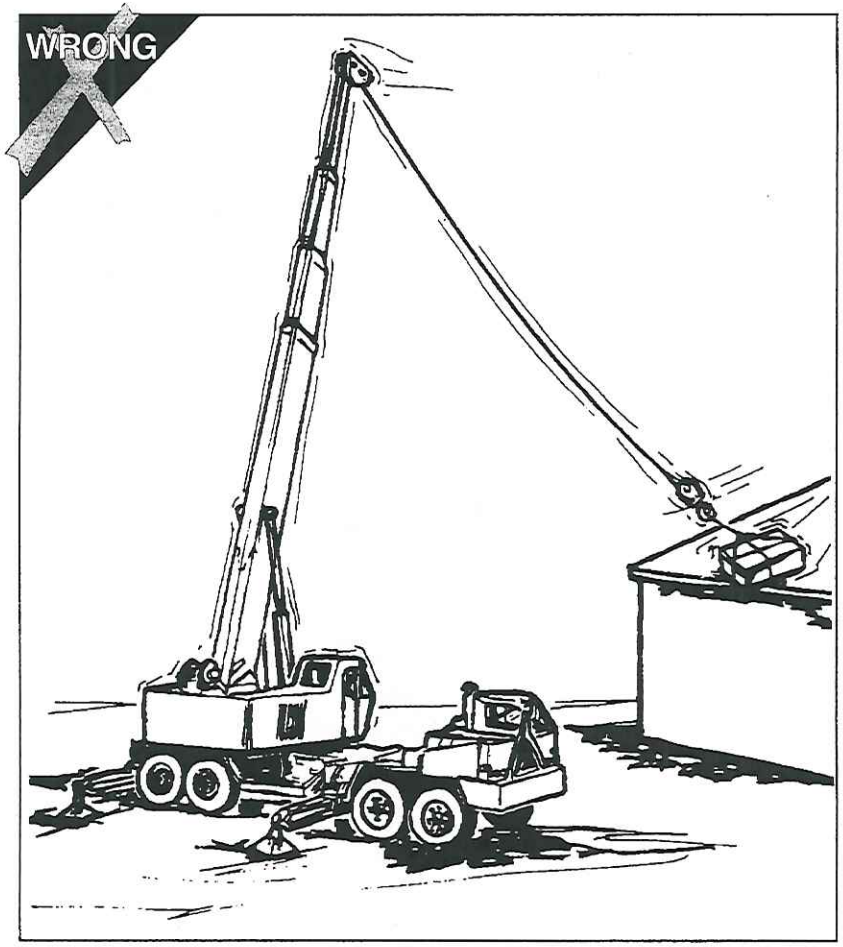


FIG. 21

BOOM AND JIB

Longer booms require additional care in accelerating and decelerating the swing motion and during boom up or down.

Never raise a boom and jib into the air unless jib stops, designed and approved by the manufacturer to restrain the jib from pivoting over backwards, are installed.

Boom and jib suspension must be reeved in accordance with manufacturer's instructions.

Adding a jib to the boom increases the working range but also **reduces the lifting capacity**. When using a jib, particularly on a long boom, greater care is required in accelerating and decelerating the swing in order to avoid "whipping" the jib sideways and damaging the boom or jib. (FIG. 22)

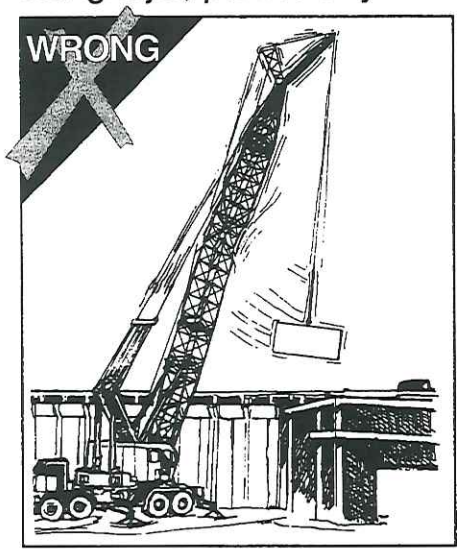


FIG. 22

All sections of a hydraulic telescoping boom shall be extended according to the manufacturer's specifications.

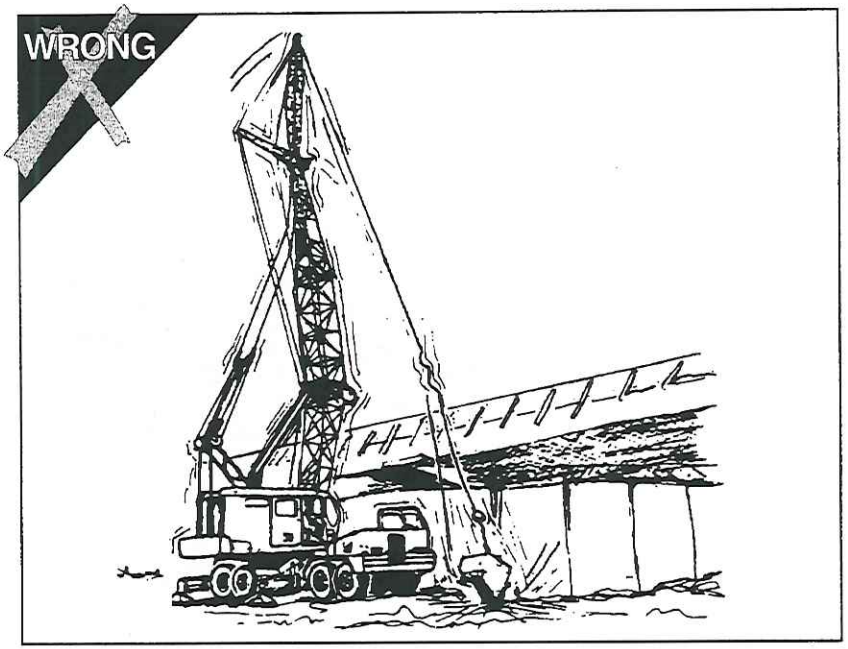


FIG. 23

WATCH FOR BOOM "KICKBACK"

With a loaded pendant suspended boom or jib near boom stops, **do not relieve boom of load.** Pendants stretch when loaded and return to their original length when unloaded. They have been known to pull booms over backwards and against boom stops when load is removed. **In severe conditions, a kickback can cause the boom (and/or jib) to collapse.** Both hoist machinery and boom mechanism must be used in setting down a load in this position. (FIG. 23)

The load block and/or ball hook may move closer to the boom/jib tip as the boom is raised or lowered.

Use power lowering whenever possible. When power lowering loads, keep drum brake as reserve.

On wire rope suspended booms, the boom hoist pawl must be engaged at all times except when raising or lowering boom.

WATCH OUT FOR TWO-BLOCKING

ANSI/ASME B30.5 require that cranes be equipped with fully functional anti-two-block device or two-block damage prevention device to avoid two-blocking.

Avoiding two-blocking. Two-blocking is when the hook block or headache ball makes contact with the sheaves at the boom tip. (FIG. 24) This is a very dangerous situation because the hoist rope can break, causing the hook and load to fall, or the boom can be pulled over backwards over the operator's cab or pull the jib back over the boom.

Two-blocking occurs when the load block contacts the boom point, this can be caused by:

- Extending the boom without lowering load blocks.
- Lowering boom without lowering load blocks.
- Raising load blocks into boom point.

Such contact between the load block and boom point can break the cable.

Make sure your damage prevention device or anti-two-block device and/or system is working properly.

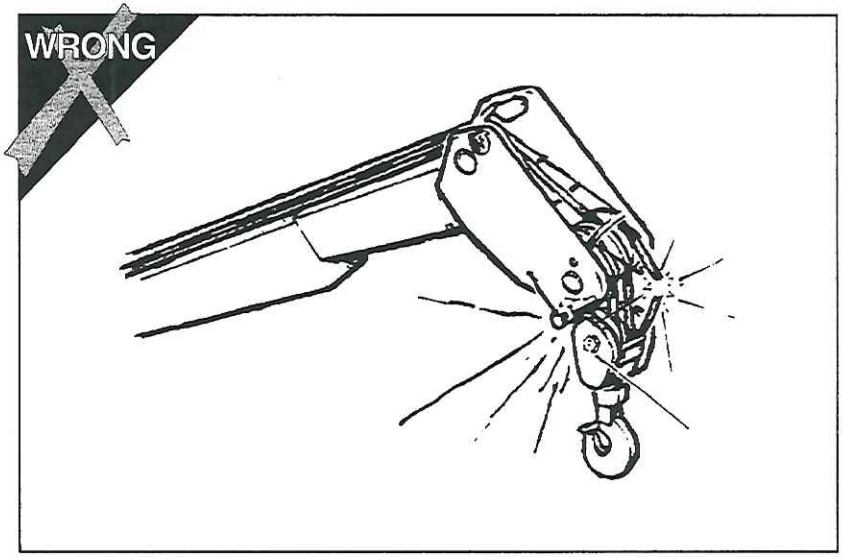


FIG. 24

PICK AND CARRY WORK

When cranes are sometimes used in "pick and carry" operations traveling with suspended loads **requires extreme caution** due to factors such as rough terrain, boom length, overhead obstructions, momentum in starting and stopping, and centrifugal force while turning.

If the user chooses to travel with a suspended load, he must evaluate the prevailing conditions and determine the safety precautions required in each individual case. **The following should be considered before attempting to "pick and carry" a load:**

- **Never "pick and carry"** unless authorized by the manufacturer's load rating chart and the operator's manual.
- Consult the manufacturer's load chart for instructions on capacity, travel speed, working area, tire pressure, and other instructions.
- Position the boom and load in line with direction of travel whenever possible.
- Care must be taken to avoid sudden starts and stops.
- Turn only when necessary at the slowest possible speed and at a very wide turning radius.
- Provide tag lines to prevent load from swinging.
- Use the shortest boom possible. (FIG. 25)
- Keep the load as close to the ground as conditions will allow.

Lifting loads while on tires or walking with a load may require different tire pressures than highway travel. Check your operator's manual for proper inflation requirements.

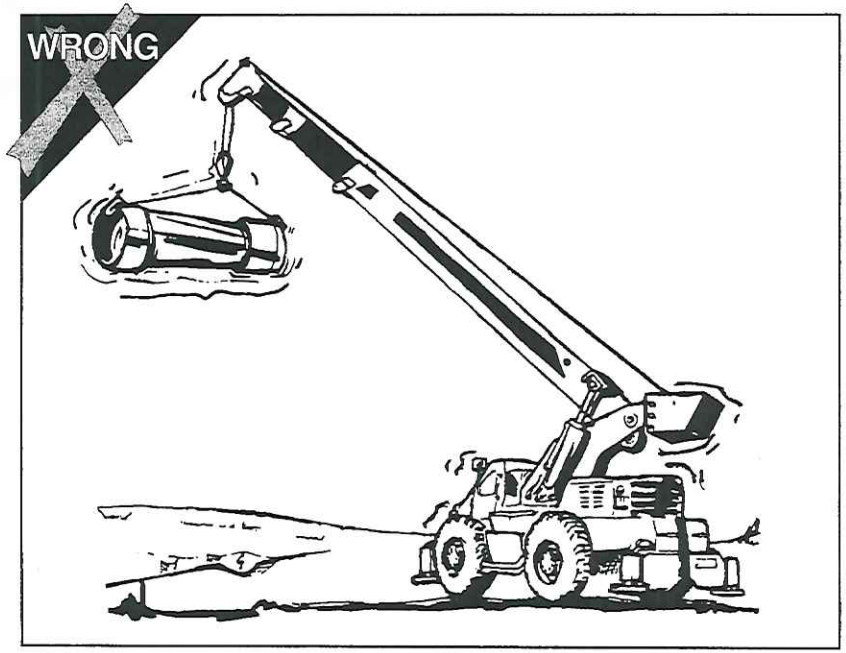


FIG. 25

MULTI-CRANE LIFTS

Such operations must be carefully planned well in advance and should only be attempted by skilled personnel experienced in such procedures.

Using two or more machines to lift one heavy or unwieldy load must be done per the crane manufacturer's instructions.

A multi-crane lift, if done incorrectly, can introduce dangerous elements which include side loading of the boom, overloading, operator error, differing ground conditions, and many other hazards not normally encountered in single crane lifts.

The user must **instruct all personnel** involved in the proper positioning, load rigging, and movements to be made.

- Each machine involved in the lift must have an experienced operator properly seated at the controls.
- Use **only one** lift coordinator. The person must coordinate lifting plans with all machine operators and signal person(s) before beginning the lift.
- The coordinator must know how much of the load will be carried by each machine, and be absolutely sure that the slings are positioned to divide the load as planned.
- Each crane's portion of the load (weight) must remain within that crane's rated capacity during all phases of the lifting operation. (FIG. 26)
- Bear in mind that machine capacity is based on freely suspended and balanced loads. To avoid side loading keep the load line vertical.

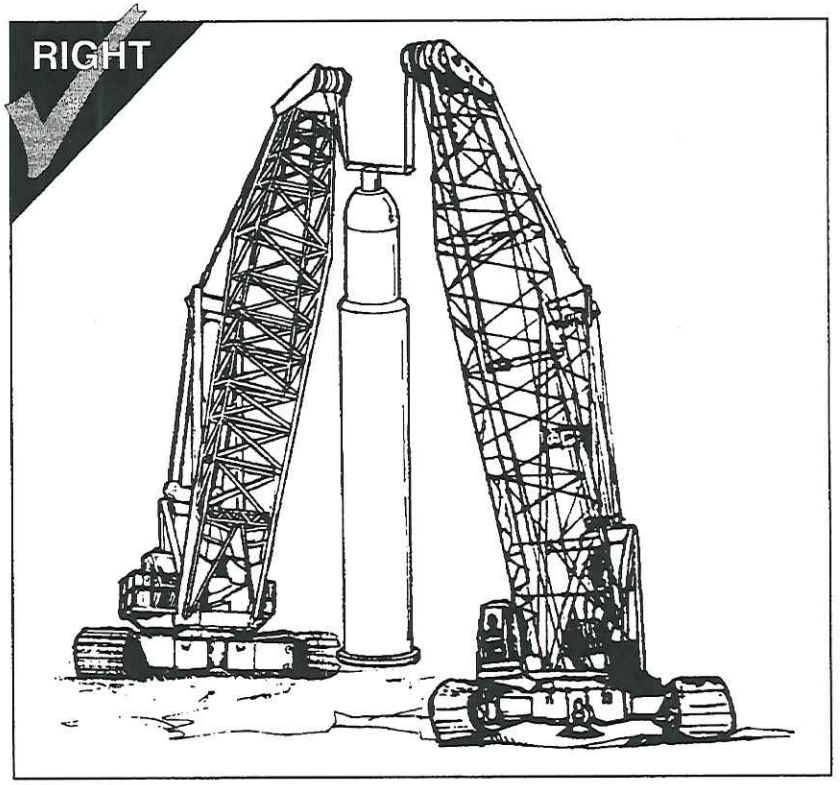


FIG. 26

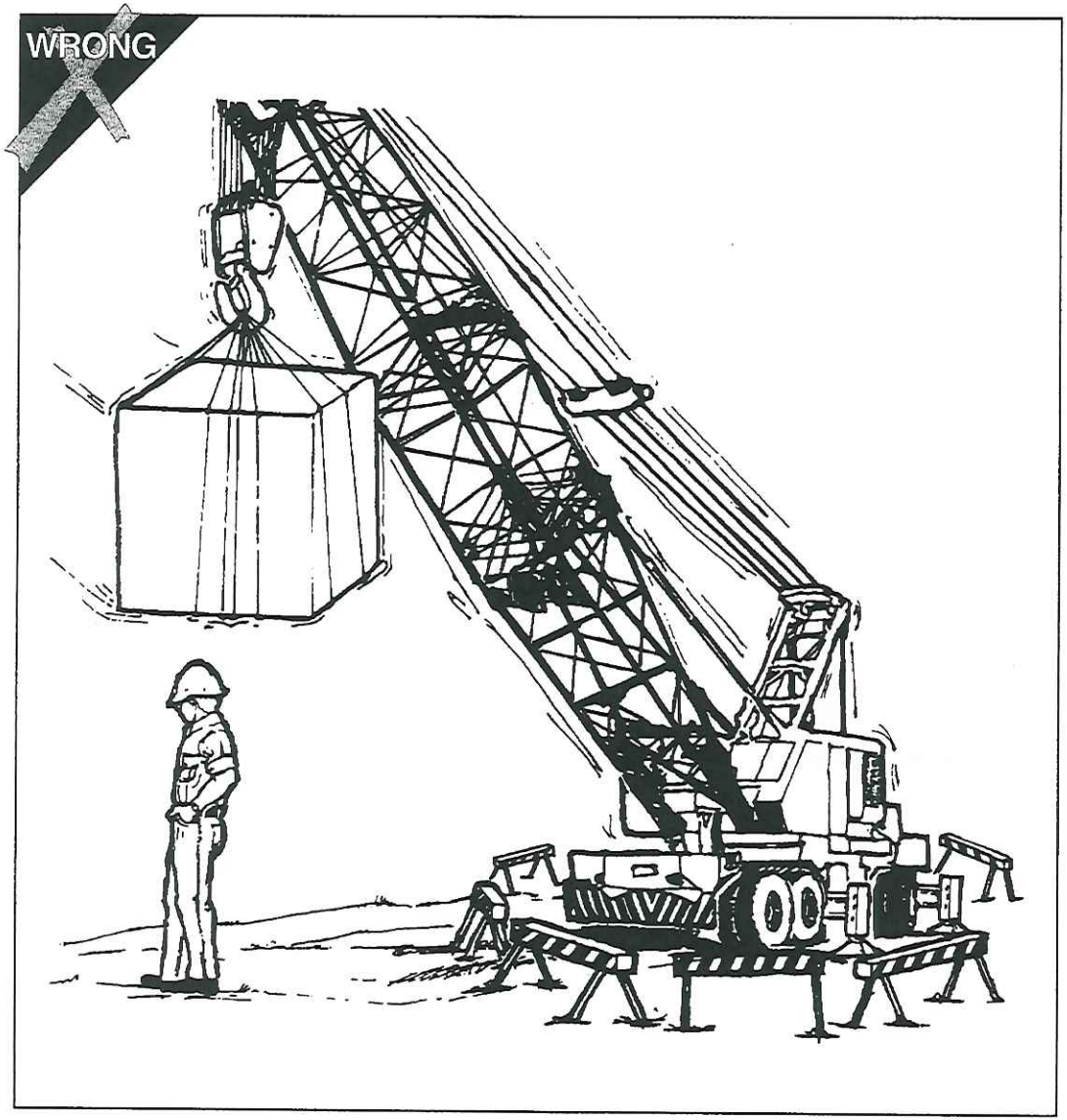


FIG. 27

LOAD HANDLING

- **Do not swing** a load over personnel. **Never** allow personnel to walk or work under any part of the machine or load. (FIG. 27)
- A **warning signal** shall be sounded when approaching personnel.
- Keep a sharp eye on personnel in elevated areas — be careful to keep clear of them.

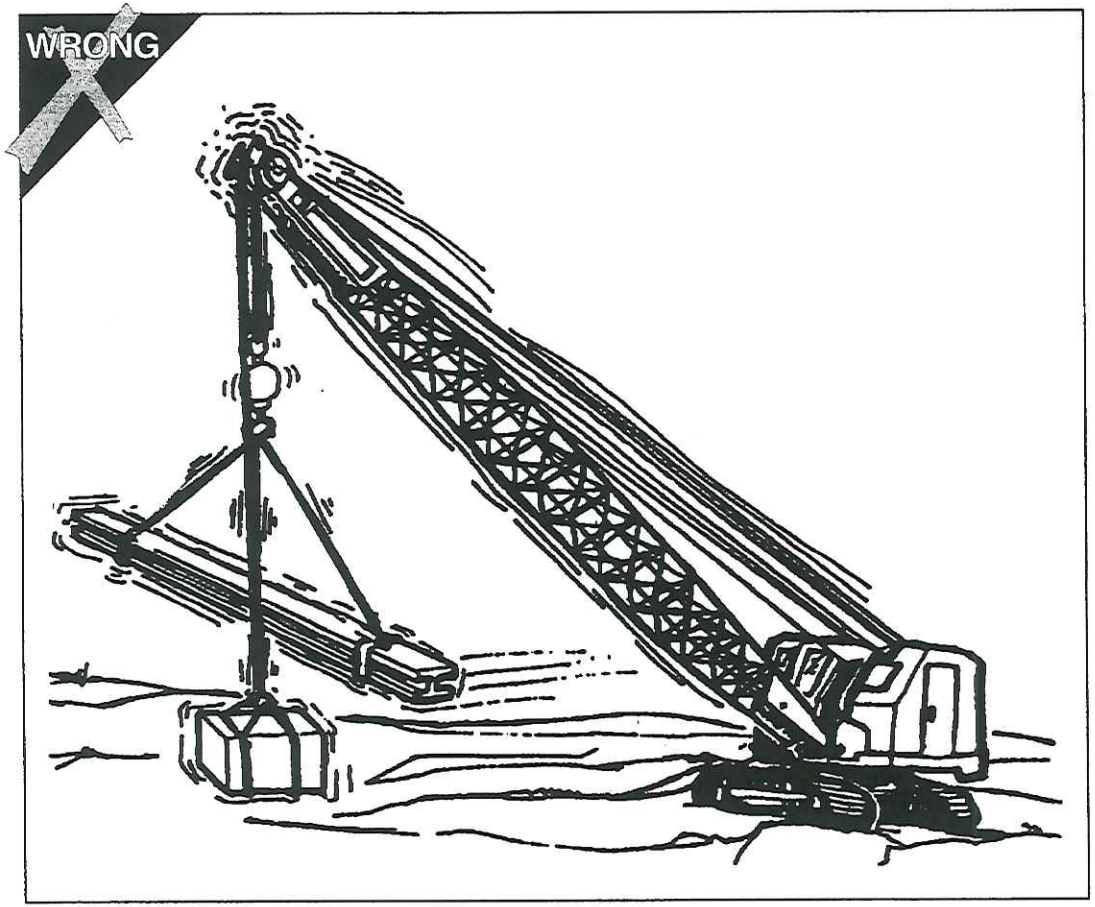


FIG. 28

Never hoist two or more separately rigged loads in one lift, even though the combined load is within rated capacity, as rigging may become fouled, causing damage or load shift which is hazardous. (FIG. 28)

Always apply the travel brakes to hold crawler crane in position while working.

Always apply service and/or parking brakes on wheel mounted cranes to hold machine in position when working on tires.

Know the load, the boom length, and loaded radius prior to lifting a load.

Do not allow any part of machine or load to contact or strike an obstruction when lifting or swinging. If boom is struck by load or swung into building or is damaged in any way, stop work immediately.

Control load at all times. To prevent excess motion, use tag lines to guide or snub the load. (FIG. 29)

When using tag lines to guide or snub a load, do not wrap the line around any part of your body or clothing. You may have to release the line quickly to avoid injury.

For night operation, the job site should be adequately lighted so the operator and ground personnel can see all movements of the crane, boom, jib, and load.

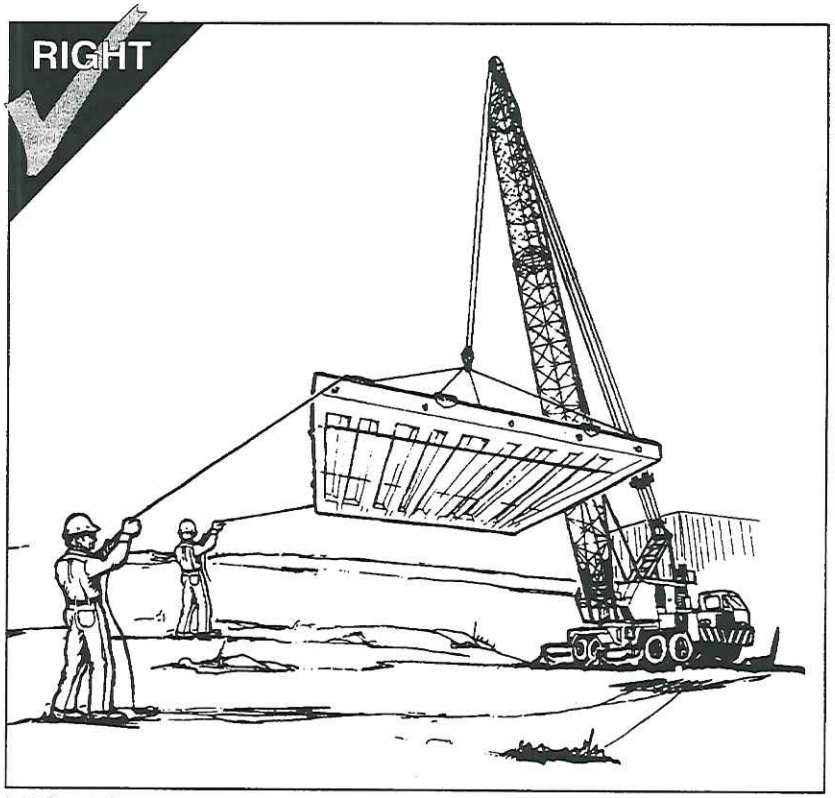


FIG. 29

PINCH POINTS

"Pinch points," which result from relative motion between mechanical parts, are areas of the machine that can cause **personal injury or death**. Do not allow personnel to be in a pinch point area either on the machine or external to the machine. Care must be taken to prevent motion between pinch points when performing maintenance and to **avoid such areas** when movement is possible.

Keep clear of all moving parts. (FIG. 30)

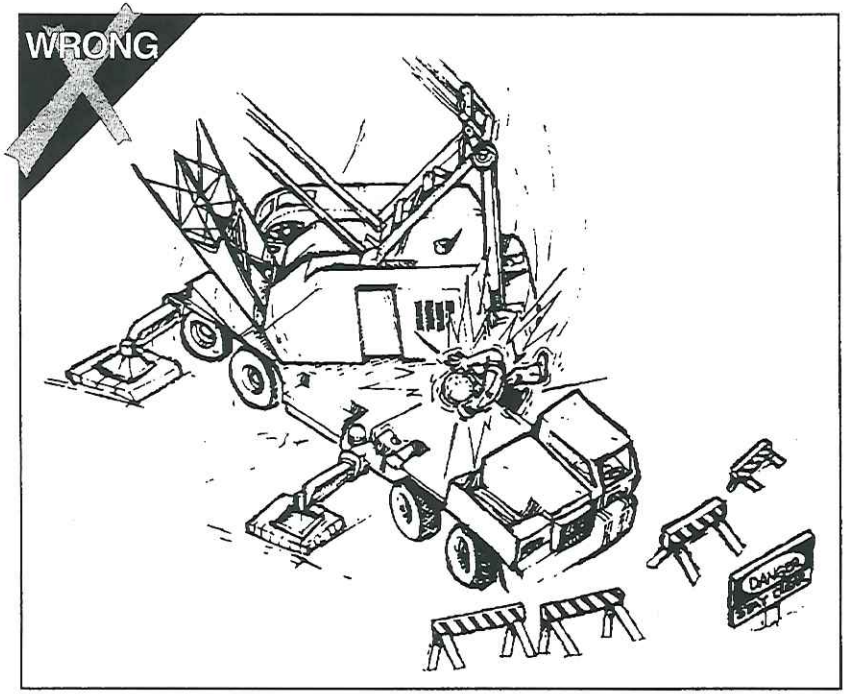


FIG. 30

Special care must be taken to keep hands and clothing clear of sheaves and drums during crane operation, assembly/disassembly, and maintenance.

Never reach into telescoping components unless the sections are securely anchored together and power is shut off. (FIG. 31)

FIG. 31

WATCH OUT FOR THE CARRIER (FIG. 32)

- Do not lower or swing the boom into the carrier's cab. (FIG. 32)
- When traveling, the upper-works should be secured to prevent rotation of the boom into the cab.

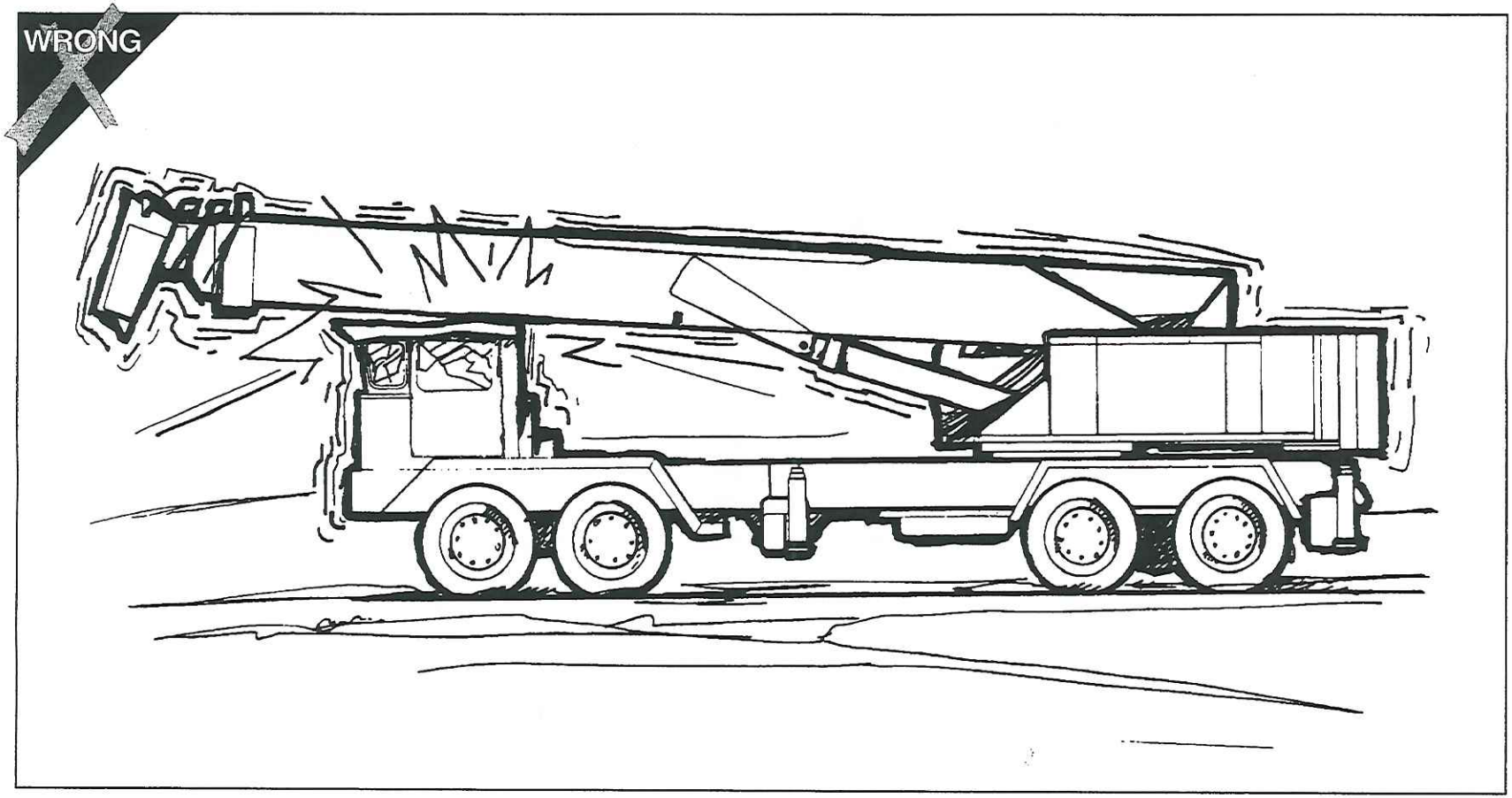


FIG. 32

BEFORE WORKING IN THE VICINITY OF POWER LINES

- **Always contact the owners of the power lines** or the nearest electric utility before beginning work. Look them up in your local telephone directory.
- **You and the electric utility representative** must jointly determine what specific precautions must be taken to ensure safety.
- **Consider all lines to be power lines and treat all power lines as energized** even though it is known that the power is shut off and the line is visibly grounded.
- **It is the responsibility of the user and the electric utility to see that necessary precautions are taken.** (FIG. 33)

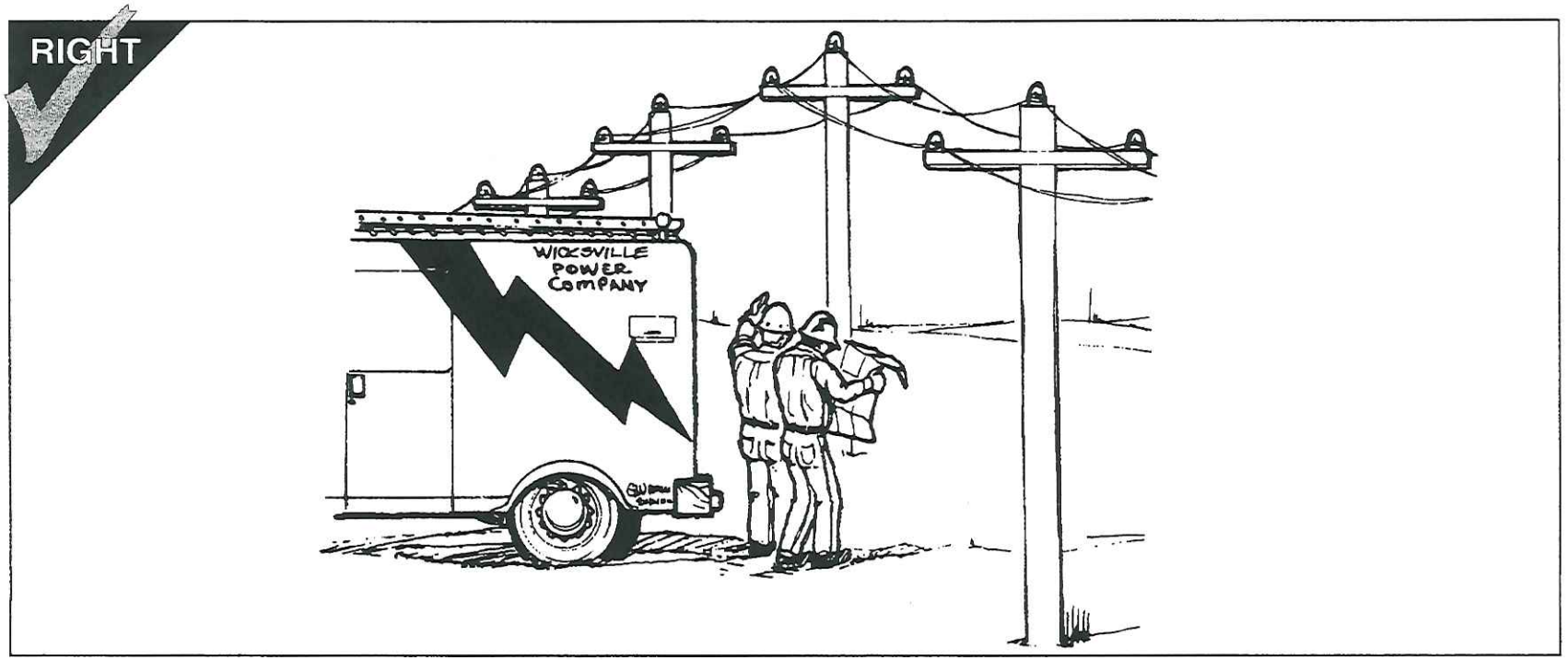


FIG. 33

ELECTRICAL POWER LINES

Keep boom away from overhead lines. Treat all wires as hot until you have reliable written information to the contrary. Watch your boom clearance when traveling... uneven ground may cause the boom to weave or bob into power lines. If necessary to work near power lines, check Local or State codes. (FIG. 34)

You are considered to be working in the vicinity of power lines when the attachment or load of your crane, in any position, can reach the minimum prohibitive zone specified by Local, State and Federal regulations.

Crane mounted cage-type boom guards, insulating links, and proximity devices have limitations. The use of such devices is not a substitute for strict adherence to all safe operator practices and procedures.

REQUIRED CLEARANCE FOR NORMAL VOLTAGE IN OPERATION NEAR HIGH VOLTAGE POWER LINES AND OPERATION IN TRANSIT WITH NO LOAD AND BOOM OR MAST LOWERED

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance, ft. (m)
Operation Near High Voltage Power Lines	
to 50	10 (3.05)
Over 50 to 200	15 (4.60)
Over 200 to 350	20 (6.10)
Over 350 to 500	25 (7.62)
Over 500 to 750	35 (10.67)
Over 750 to 1000	45 (13.72)
Operation in Transit with No Load and Boom or Mast Lowered	
to 0.75	4 (1.22)
Over 0.75 to 50	6 (1.83)
Over 50 to 345	10 (3.05)
Over 345 to 750	16 (4.87)
Over 750 to 1000	20 (6.10)

Reprinted from ANSI B30.5

FIG. 34

WHEN WORKING IN THE VICINITY OF POWER LINES

- **Caution** all ground personnel to stand clear of the machine and the load at all times. If the load must be guided into place, consult your local electric utility company for specific precautions that must be taken.
- Make a "dry run" in tight areas... it will help you determine the easiest way to operate under existing conditions. The signal person must be in direct communication with the operator, and the operator must pay close attention to the signals. Refer to the hand signal chart in back of this manual.
- **Use a signal person.** The sole responsibility of the signal person is to observe, from the best vantage point, the approach of any part of the crane or load to the power line. The signal person must be in direct communication with the operator, and the operator must pay close attention to the signals. (FIG. 35)

HIGH FREQUENCY

CAUTION — Equipment may become electrically charged when working in the vicinity of high frequency transmitters.

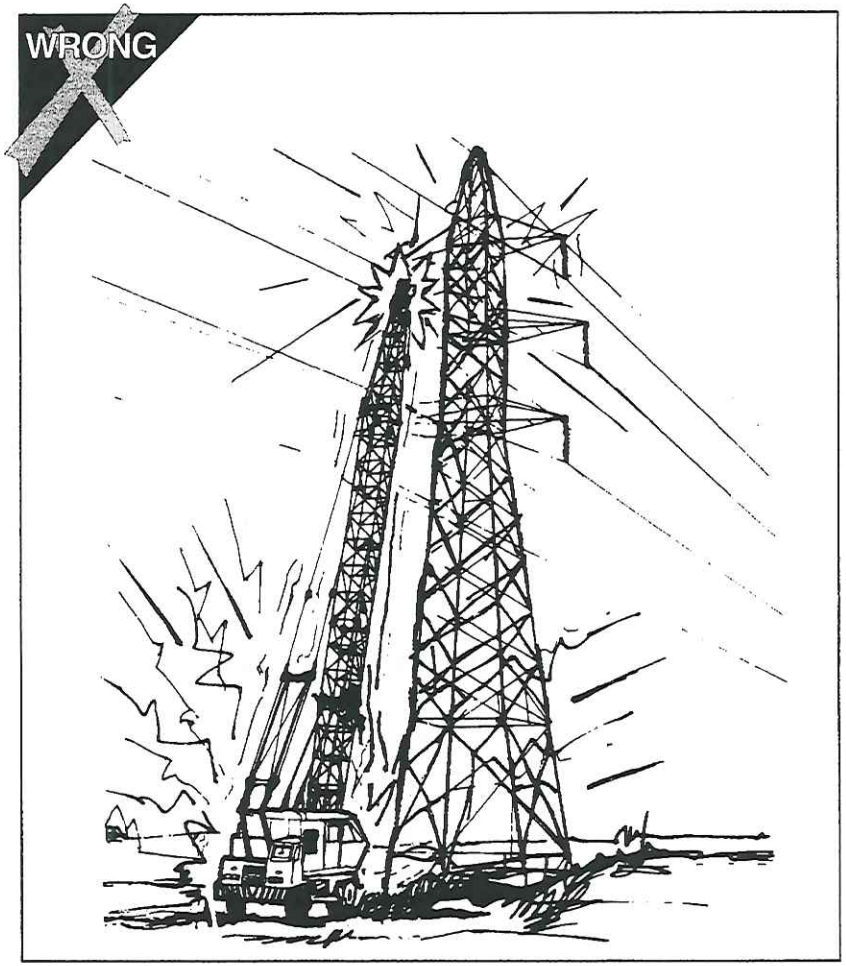


FIG. 35

REMEMBER — **DEATH OR SERIOUS INJURY** CAN OCCUR WHEN WORKING NEAR POWER LINES OR DURING ELECTRICAL STORMS.

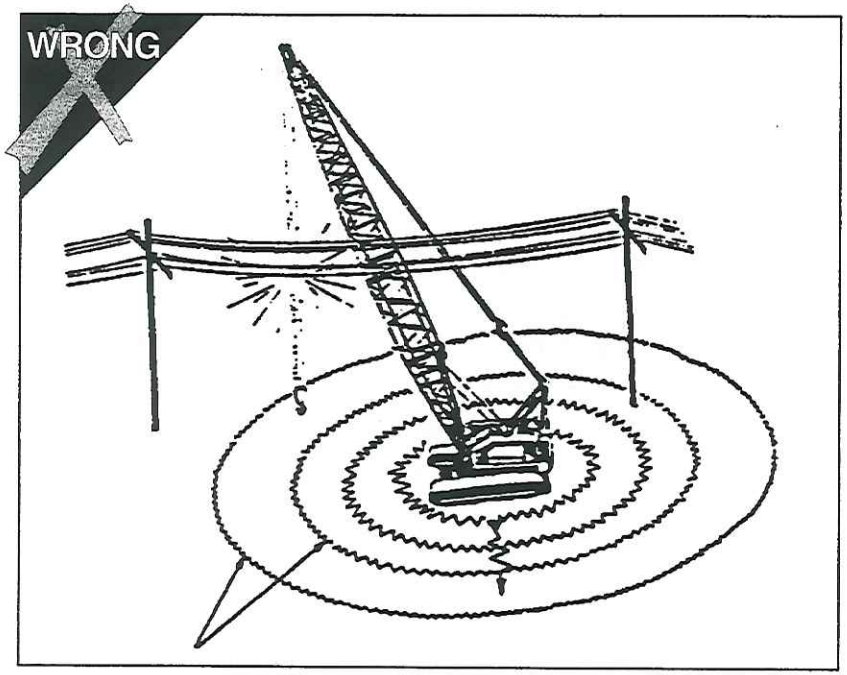


FIG. 36

High voltage contact will result in electrical current flowing down the boom and through the crane to ground. The ground will then be energized with a high voltage near the crane and lower voltage farther away. (FIG. 36)

WARNING — If crane is charged by the contact of power lines stay in the operator's seat, if at all possible, until the lines can be neutralized. The surrounding ground about the equipment is also electrically charged.

BAILOUT PROCEDURE

If the operator decides to leave the machine, the person must **jump** clear of the machine. The person must never step down allowing part of their body to be in contact with the ground while any other part is touching the machine.

Because of the hazardous voltage differential in the ground, the operator should jump with feet together, maintain balance and shuffle or hop slowly across the affected area. Do not take large steps because it is possible for one foot to be in a high voltage area and the other to be in a lower voltage area. The different between the two can kill.

When working in the vicinity of power lines:

- **Caution all ground personnel** to stand clear of the machine and the load at all times.
- **Use a signal person.** The sole responsibility of the signal person is to observe, from the best vantage point, the approach (encroachment) of any part of the crane and/or load to power line.
- Safe operating practices require that you maintain the maximum possible distance from the lines and never violate the minimum clearances.

Never store or place material under or near overhead power lines (refer to prohibited area). (FIG. 37)

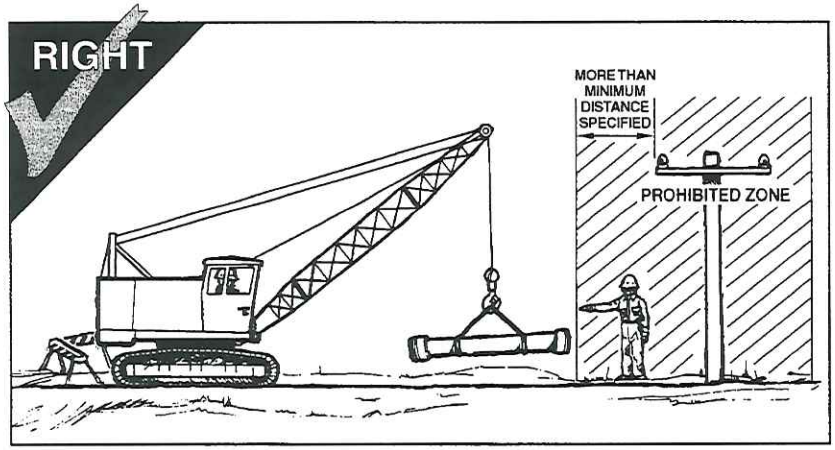


FIG. 37

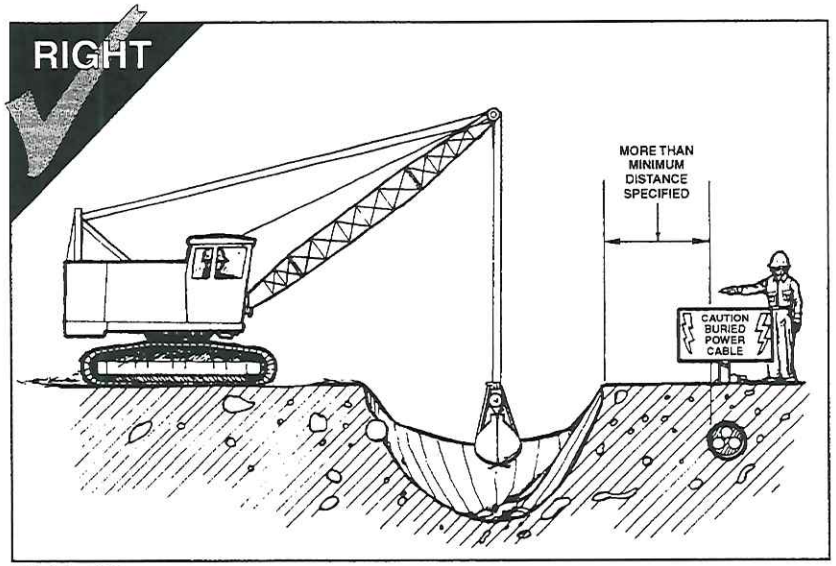


FIG. 38

- **Safe operating practices** require that you maintain the maximum possible distance from the lines and never violate the minimum clearance. (FIG. 38)
- **Be certain to comply** with all Local, State and Federal regulations regarding working in the vicinity of power lines.

BURIED UTILITY LINES

Before working in the vicinity of utility lines:

- **Always contact the owners of the utility lines** or the nearest utility before beginning work. Look them up in your local telephone directory.
- **Determine jointly** what specific precautions must be taken to ensure safety.
- **Slow down the operating cycle.** Reaction time may be too slow and distances may be misjudged.
- **Use a signal person.** The sole responsibility of the signal person is to observe, from the best vantage point, the approach of any part of the machine or attachment to a utility line. The signal person must be in direct communication with the operator, and the operator must pay close attention to the signals. (See hand signal illustrations in Section 10.)

It is the responsibility of the user and the utility to see that necessary precautions are taken. (FIG. 39)

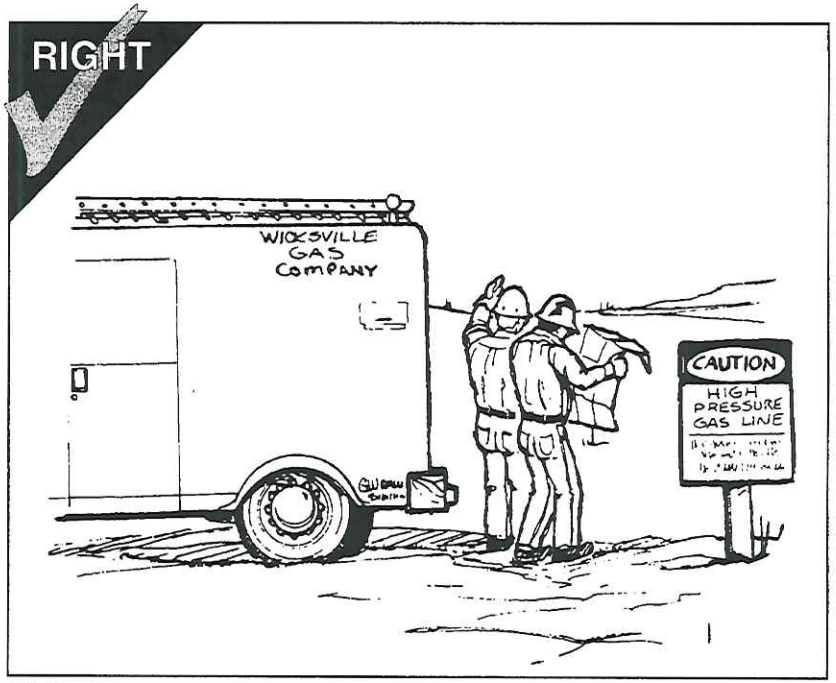


FIG. 39

WHEN WORKING IN A PIT OR ON BANKS

- Job site personnel should beware of caving edges and overhanging banks — undercut edges may give way — bank may slide. (FIG. 40)
- Always maintain a safe work position.
- Keep machine away from banks or edges at all times.

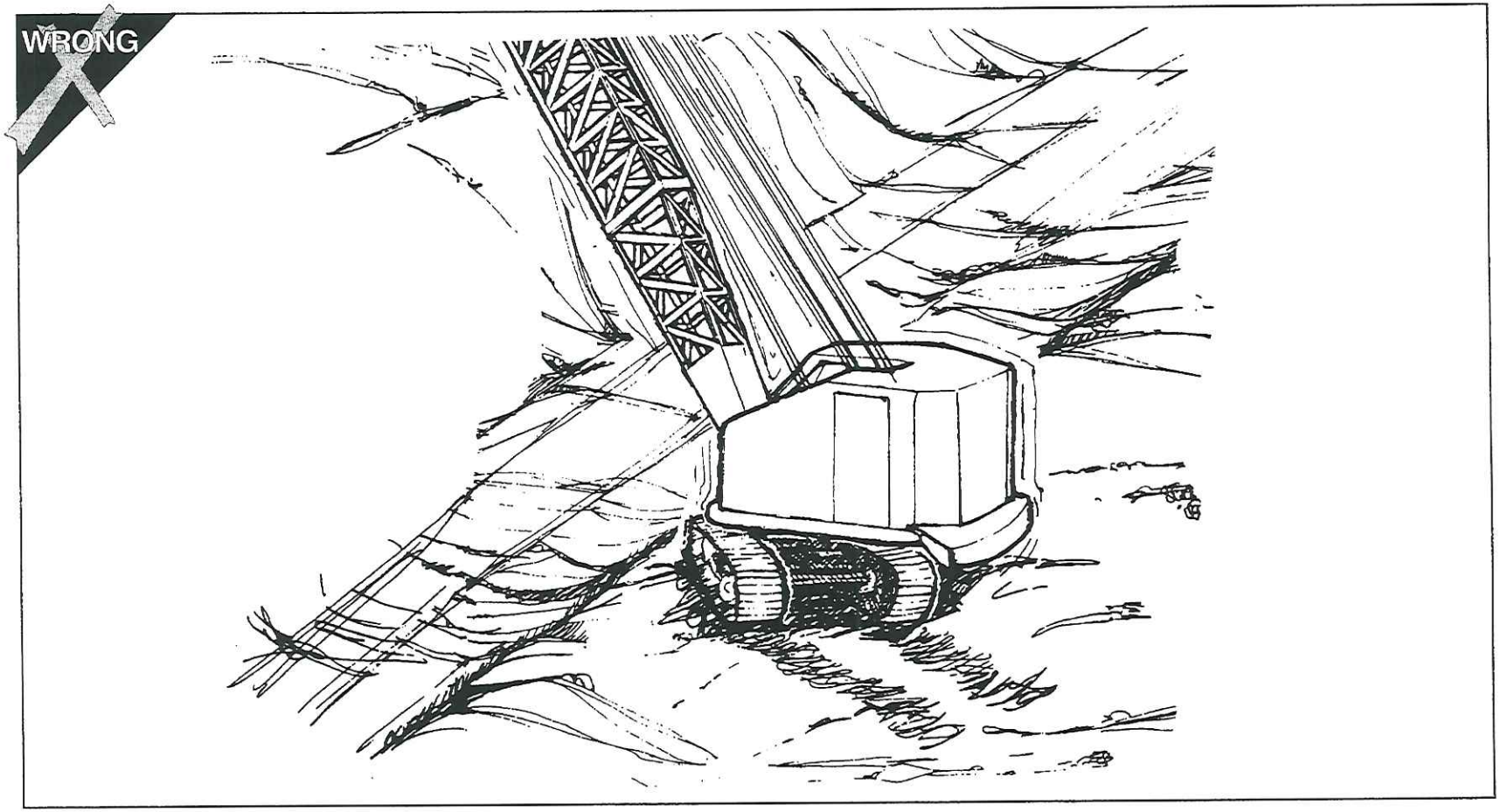


FIG. 40

WHEN USING A MAGNET

Never exceed the manufacturer's specifications for maximum boom lengths.

- **Electromagnet power is high voltage** and can be **dangerous.** Keep terminal box cover tightly closed.
- Be especially careful of personnel. **Never** permit them to touch magnet or load.
- Open magnet switch and **shut off all power** before connecting or disconnecting magnet leads.
- If necessary to position a load, make sure a **non-conductive** device is used.
- **Sound warning** signal prior to every load move and keep sounding it until personnel are clear of your path. (FIG. 41)
- **Never** move loads over personnel. Never permit anyone to be under loads or between loads and magnet.
- **Never** leave the operator's station before landing the magnet securely on the ground or supporting platform and turning off the power source.

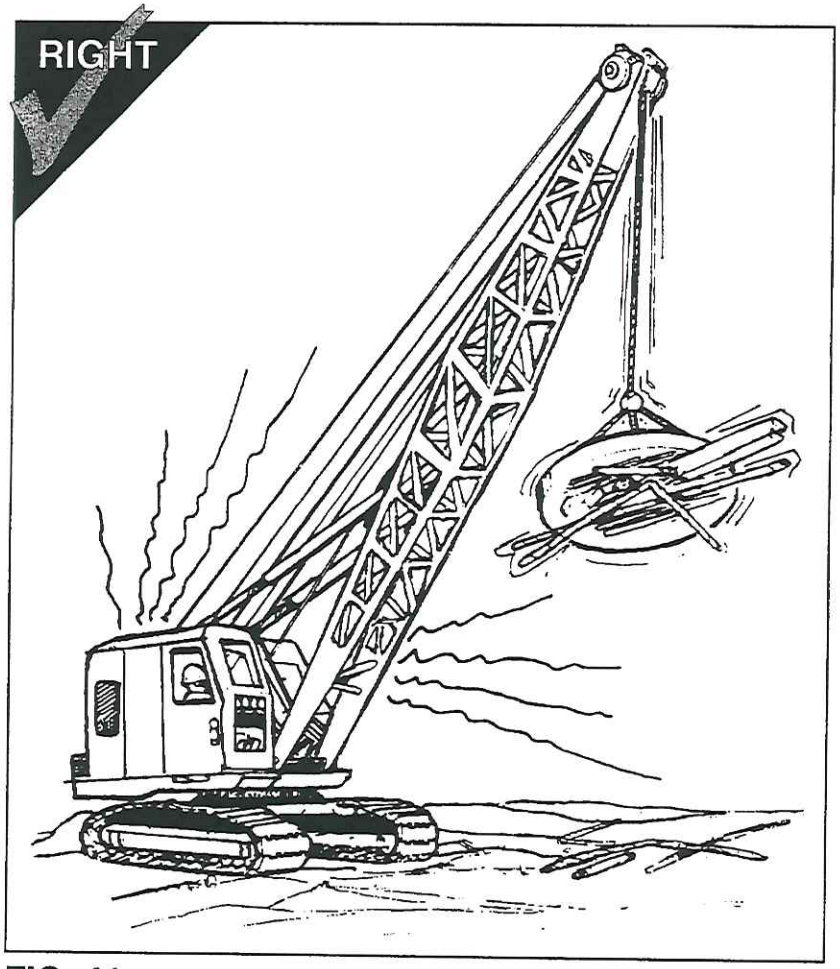


FIG. 41

DRAGLINES AND CLAMSHELLS

In a dragline or clamshell operation, **keep** the boom length to a minimum for maximum stability.

Never exceed the manufacturer's specifications for maximum boom lengths and bucket size.

Keep a tight closing line when hoisting a clamshell bucket. Never release the closing line until you are ready to dump.

Bucket should not be overfilled to avoid spillage and consequent danger to personnel. (FIG. 42)

Weight of bucket and contents should not exceed manufacturer's recommendations.

Never load a truck until the driver is in a safe place.

Trucks should be loaded evenly so that nothing overhangs the sides. (FIG. 42)

Do not pass the load over front of truck.

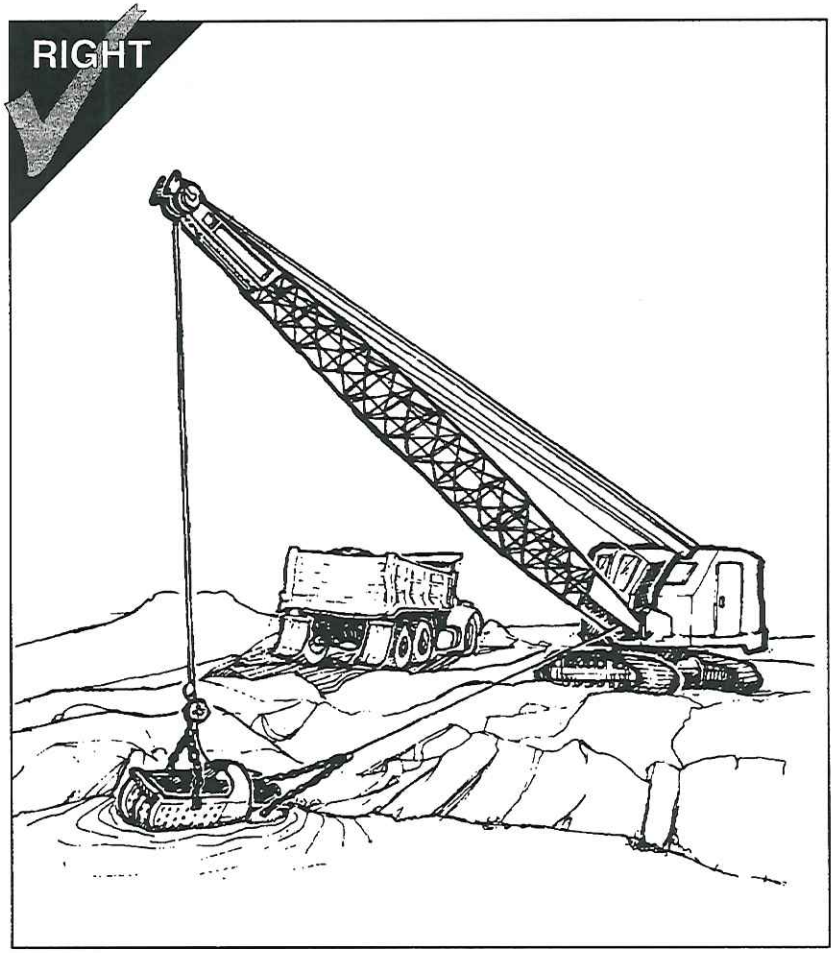


FIG. 42

Never allow anyone to ride the hook or load. This is an unlawful and an extremely dangerous practice. (FIG. 43)

OSHA regulations prohibit the handling of personnel with cranes, unless it is the least hazardous way to perform the operation. If a crane is utilized to handle personnel, it should be equipped and in compliance with OSHA regulations 29CFR1926.550 and manufacturer's requirements as well as State and Local regulations.

Never attempt to operate the machine except from the operator's station. Operating from any other position, such as reaching in a window or a door, constitutes a safety hazard. Serious injury to personnel can result.

Set and lock all brakes, and engage all locking devices when holding a load.

Never leave the operator's cab with the engine running or with the load suspended.

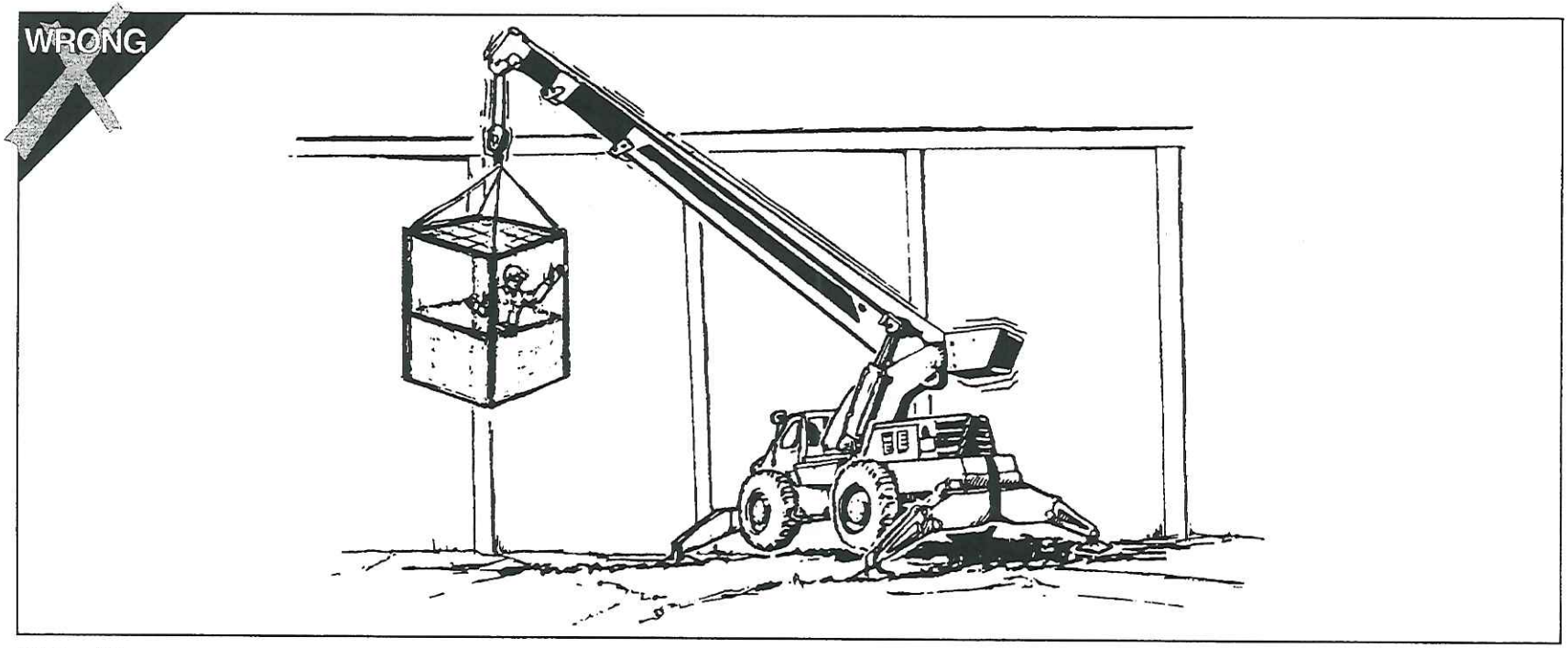


FIG. 43

PERSONNEL HANDLING

General Precautions:

Mobile cranes are designed and intended for handling materials and not personnel. Mobile cranes are not elevators.

- Personnel platforms are to be supported by the crane load line attachment. This does not preclude use of boom mounted baskets. Always follow the crane manufacturer's instructions for either system.
- Hoisting of the personnel platform shall be performed in a slow, controlled, cautious manner. The lifting or lowering speed shall not exceed 100 ft/min (0.51 m/s).
- Load lines shall be capable of supporting, without failure, at least seven (7) times the maximum intended load. Rotation resistant rope, if used, shall have at least ten (10) times the capacity for the maximum intended load.
- Load and boom hoist drum brakes, swing brakes, and locking devices shall be engaged when the occupied platform is in a stationary working position.
- The load line hoist drum shall have controlled load lowering. Automatic brake shall apply in neutral position. **Free fall is prohibited.** (FIG. 44)
- The crane shall be uniformly level within one percent (1%) of level grade and on firm footing. Cranes equipped with outriggers shall have them all fully deployed, following the manufacturer's specifications, and on firm footing.
- The total weight to include personnel platform, rigging, occupants, and tools or materials shall not exceed fifty percent (50%) of the rated crane capacity for the radius and configuration used.

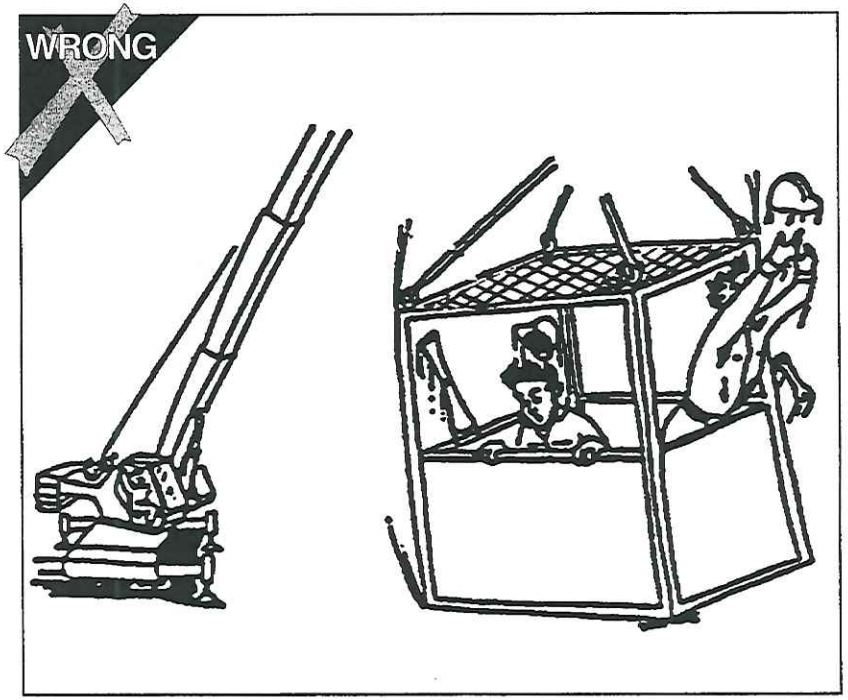


FIG. 44

- The use of machines having live booms (those in which lowering is controlled by a brake only) is prohibited.
- Cranes with variable angle booms shall be equipped with a boom angle indicator.
- Cranes with telescoping booms shall be equipped with a device to indicate the boom's extended length.
- An accurate determination of the load radius to be used during lift shall be made prior to hoisting personnel.
- An anti-two-blocking device shall be used, which prevents contact between the load block and boom tip.
- Hooks shall be of a type that can be closed and locked, eliminating the hook throat from opening.

THE TRIAL LIFTS

- A trial lift with the unoccupied personnel platform loaded with ballast at two (2) times the intended load, including personnel, is to be performed at each location at which the personnel platform is to be hoisted and positioned.
- The operator shall ensure the crane is reeved such that the crane's hoist is under fifty percent (50%) of its capacity.
- A trial lift shall be performed for each location that is to be reached from a single setup position.
- The trial lift shall be repeated prior to hoisting employees whenever the crane is moved and set up in a new location or returned to a previously used location. (FIG. 45)

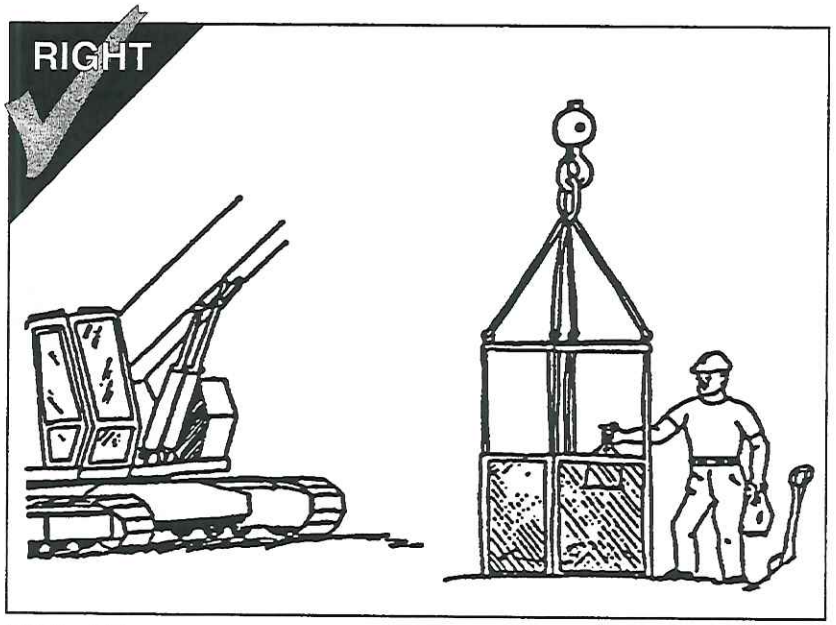


FIG. 45

INSPECTION

- After the trial lift, and just prior to hoisting personnel, the platform shall be hoisted a few inches and inspected to ensure that it is secure and properly balanced.
- Employees shall not be hoisted unless the following conditions are determined to exist:
  - Hoist ropes shall be free of kinks;
  - Multiple part lines shall not be twisted around;
  - The primary attachment shall be centered over the platform;
  - The hoisting system shall be inspected if the load rope is slack to ensure all ropes are properly seated on drums and in sheaves; (FIG. 46)
  - All safety devices and position indicators are functioning correctly.
- A visual inspection of the crane, rigging, personnel platform, and the crane base support and/or ground shall be conducted by a competent person immediately after the trial lift to determine whether the test has exposed any defect or produced any adverse effect upon any component and/or structure.
- **Any defects found during inspections which create a safety hazard shall be corrected before hoisting personnel.**

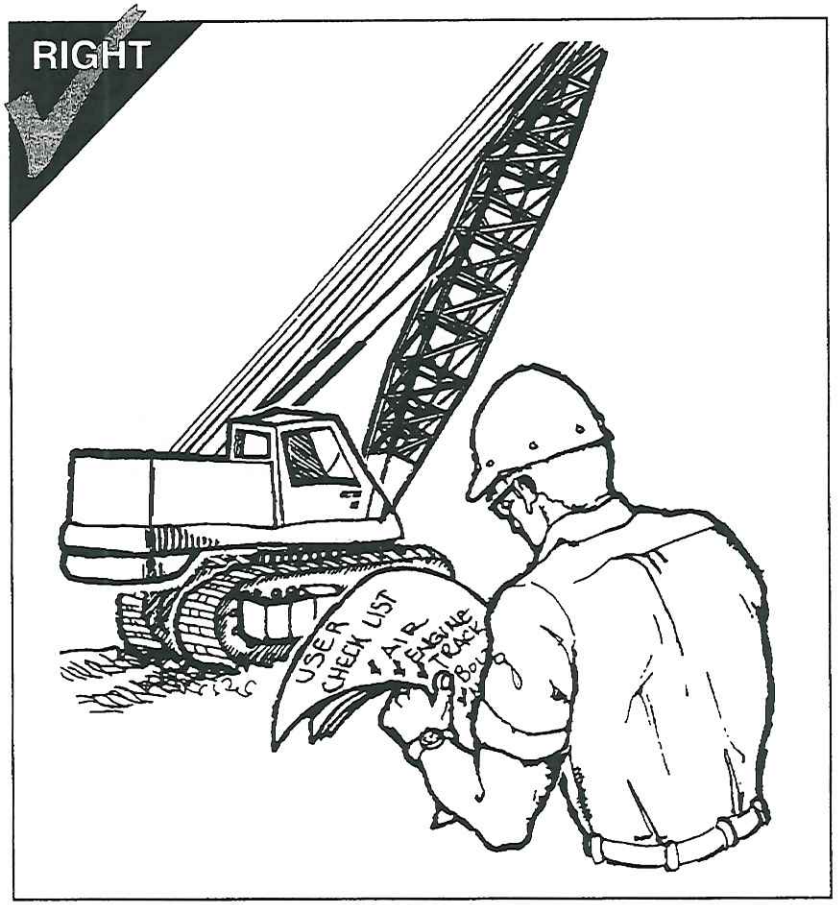


FIG. 46

LIFTING WITH PERSONNEL

- Tag lines shall be used unless their use creates an unsafe condition.
- The crane operator shall remain at the controls at all times when the crane engine is running and the platform is occupied.
- Hoisting of employees shall be promptly discontinued upon indication of any dangerous weather conditions or other impending danger.
- Employees being hoisted shall remain in continuous sight of and in direct communication with the operator and/or signal person.
- Employees shall always stand firmly on the floor of the basket, and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work platform.
- **Except over water** a body harness shall be worn and lanyard attached to the boom or the basket when working from an aerial lift.
- **No lifts shall be made on any other of the crane's load lines while personnel are suspended on a platform.**
- **Hoisting of personnel while traveling is prohibited.**
- A meeting attended by the crane operator, signal person(s) (if necessary for the lift), employee(s) to be lifted, and the person responsible for the task to be performed shall be held to review the appropriate requirements and the procedures to be followed. (FIG. 47)
- This meeting shall be held prior to the trial lift at each new work location and shall be repeated for any employee newly assigned to the operation.

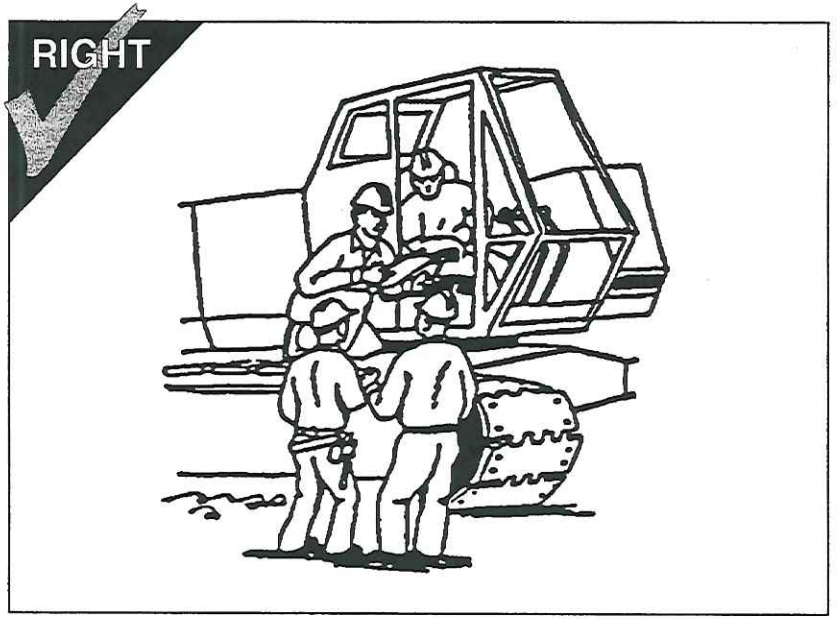


FIG. 47

WORK PLATFORM (STEEL BASKET) — GRAVITY TYPE

- Brake or lock mechanism must be released during travel to and from work location to ensure the basket remains level.
- Belting off to an adjacent pole, structure, or equipment while working from an aerial lift shall not be permitted.
- Safety harnesses and lanyards shall be used only for employee safeguarding. Any safety harness or lanyard actually subjected to in-service loading, as distinguished from static load testing, shall be immediately removed from service and shall not be used again for safeguarding.
- The safety harness and lanyard shall be inspected before each use and shall be in good condition with no cuts, abrasions, burns, or chemical damage. The snaps, rivets, grommets, threads, and buckets must be examined for broken, looseness and cut damage, or evidence of cuts and cracks.
- They must be removed from service if any damage is apparent, and replaced before the basket is used again.
- No modifications or additions which affect the mechanical, hydraulic, or electrical integrity or the safe operation of the crane shall be made without the written approval of the manufacturer or an equivalent entity.

Make sure there is adequate clearance between the machine and bridges, power lines and obstacles.

Never travel a machine on a job site, in a congested area, or around people, without a signal person to guide you. The signal person shall be responsible for determining and controlling speed and safety of movement. See hand signal illustrations in Section 10.

Know the weight of your crane and the load limitations of the (safe) travel route.

Never allow a crane to be used to transport personnel.

Never travel or swing the crane without first making certain no person or property will be endangered.

Never get on or off a crane when it is in motion.

Signal your intention to move or stop by sounding the horn — one blast for stop, two blasts for a forward move, and three for a reverse move.

Watch for narrow spots and low clearances. (FIG. 48)

- Use a signal person when maneuvering in tight quarters and/or clearances are close.
- Know your crane's height and width.
- Know bridge load limits — and don't exceed them.
- Know your slope and ground support limitations.
- Be sure of tail swing clearances in narrow spots.
- Reduce travel speed when maneuvering in tight quarters.

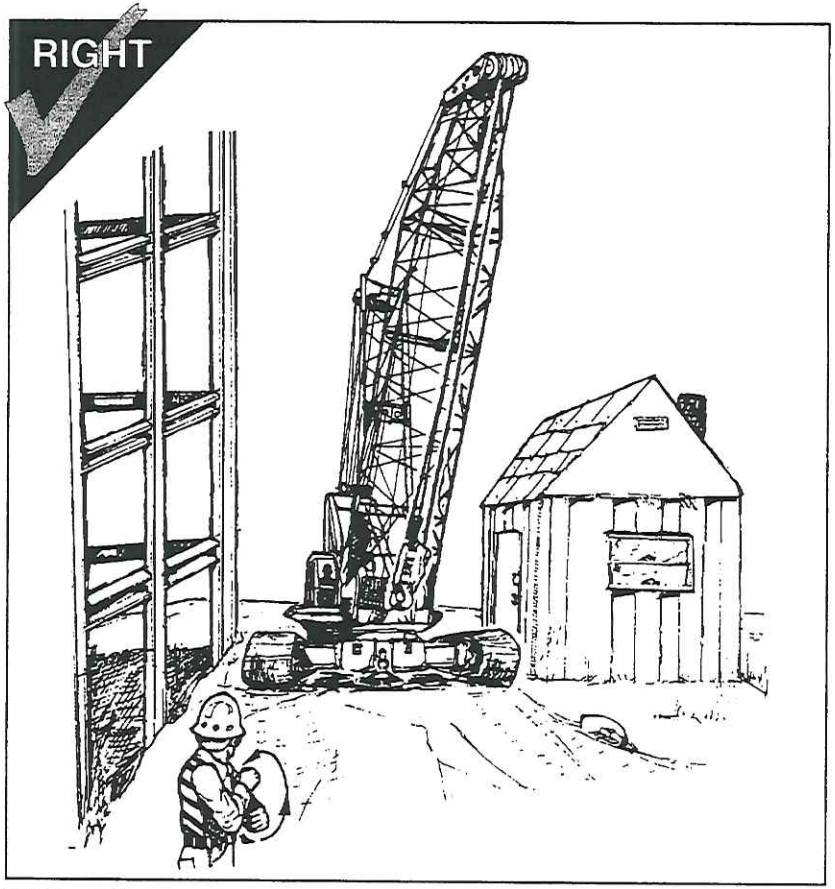


FIG. 48

If swinging is required during traveling with a **friction (mechanical) machine** without independent swing, engage swing clutch before releasing brakes. Always release swing brake as you engage swing lever.

Be sure crawlers are **blocked** to prevent downhill movement before shifting steering clutches if crane is not equipped with automatic traction brakes.

When propel mechanisms are disconnected for towing, there are no brakes to stop the machine if it begins to roll. Therefore, block crawler **before** disconnecting the propel mechanisms. (FIG. 49)

Travel with the boom in the direction of travel whenever possible.

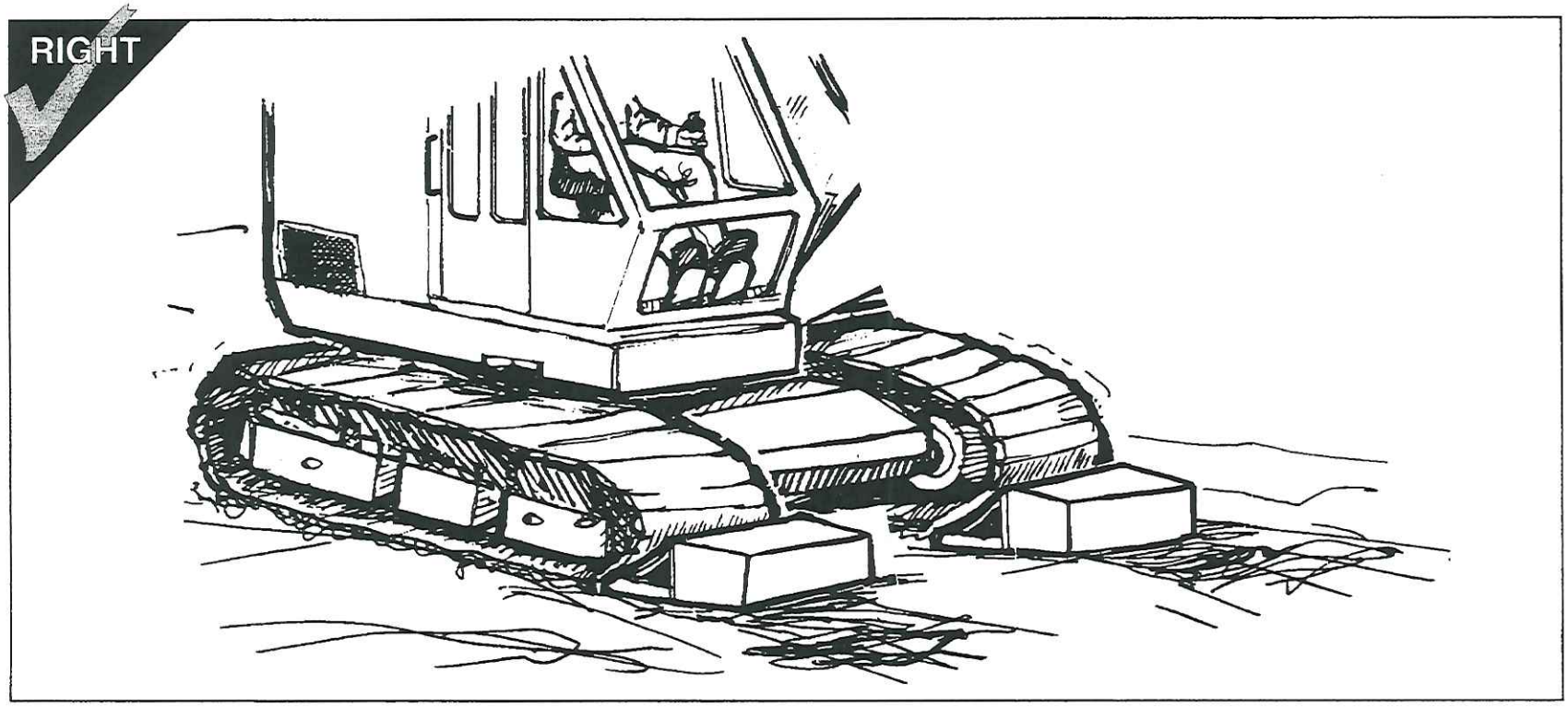


FIG. 49

Make sure there are no obstructions and keep the boom as low as possible.

Watch boom clearance when traveling or transporting. Uneven ground may cause the boom to bob or weave enough to contact power lines or other obstructions. (FIG. 50)

Cross obstacles at an angle and at slow speed. Be alert for the jolt when "center of gravity" of your crane crosses the obstacle.

When starting up a **steep grade** or **passing over the crest of a hill**, keep the boom lowered as close to the ground as practical. But be sure there is enough clearance beneath boom to compensate for overtravel when breaking over a rise.

Do not travel with the boom so high that it can bounce back over the cab.

If the machine must travel with the boom elevated, if possible, extend outriggers and keep pads close to the ground. The ground surface is to be uniform and free of obstacles. This will help stabilize the machine should tipping occur. **Be alert** of obstacles.

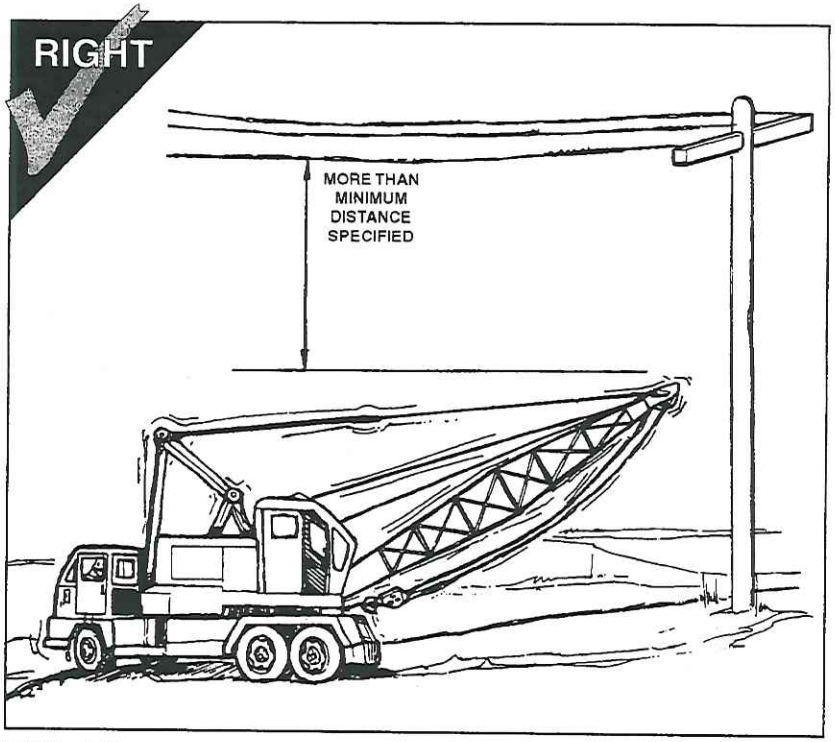


FIG. 50

When loading or unloading a crane on a trailer or railroad car, always use a ramp. If a ramp is not available, use blocking to build one. The ramp must be solid and of sufficient size and strength to support the weight of the machine. Always load and unload on the level.

Before transporting, make sure the tracks or wheels are blocked and the machine is secured against movement. (FIG. 51)

Make sure the crane's upper swing lock is set. If the upper does not have a swing lock, secure the upper to the carrier to prevent accidental swinging of the upper during transport.

It is recommended to use a tow bar with a **three-point hitch** when towing a machine without brakes.

Be sure the towing vehicle has sufficient brake capacity to stop both units.

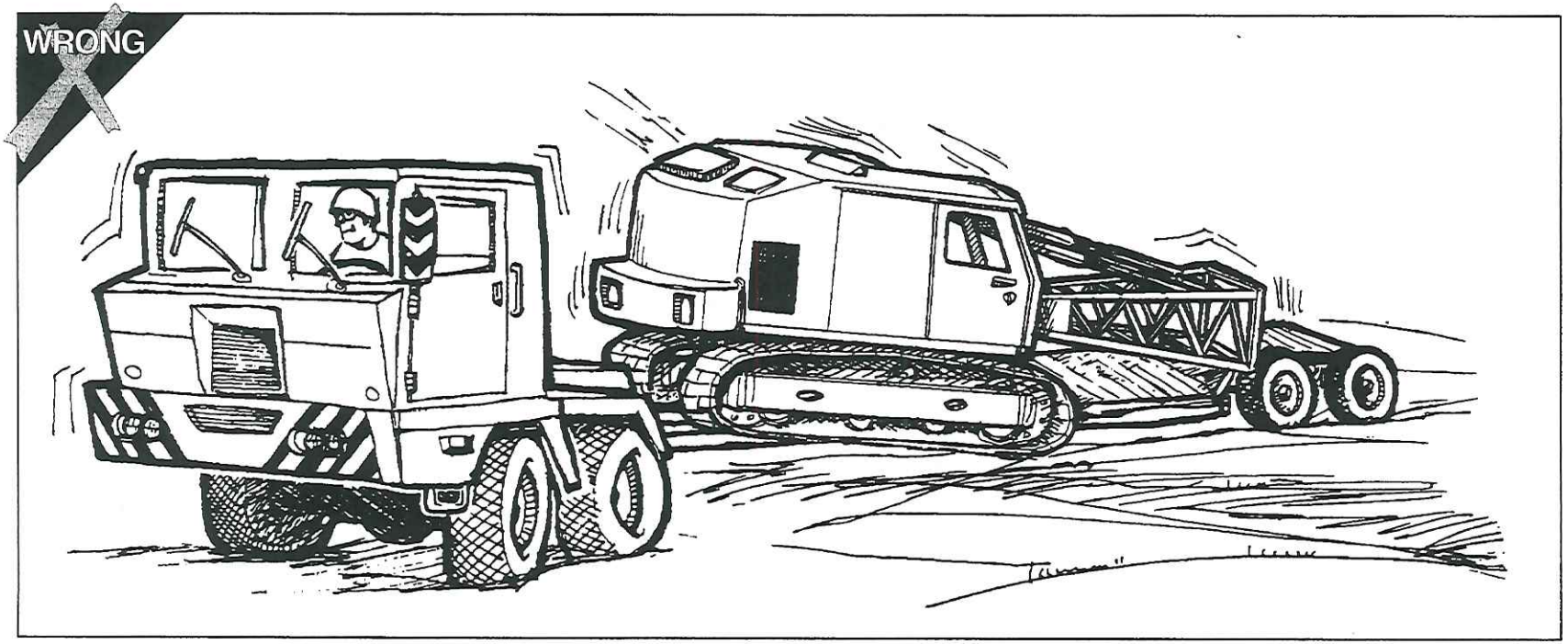


FIG. 51

TRAVEL SAFELY

WHEN TRAVELING

- If a tire blows out while traveling, **do not apply brakes hard**. Correct steer to maintain control and slow down gradually.
- **Be aware** of machine height, bridge heights and axle loads.
- Use proper traffic **warning flags and signs**.
- **With large units,** use front or rear flag vehicles, or two flag vehicles with two-way radios.
- Know and **obey** all applicable laws and regulations.
- When **cornering**, be aware and allow for boom overhang and structure clearances. (FIG. 52)
- **Use** the manufacturer's recommended travel configurations.

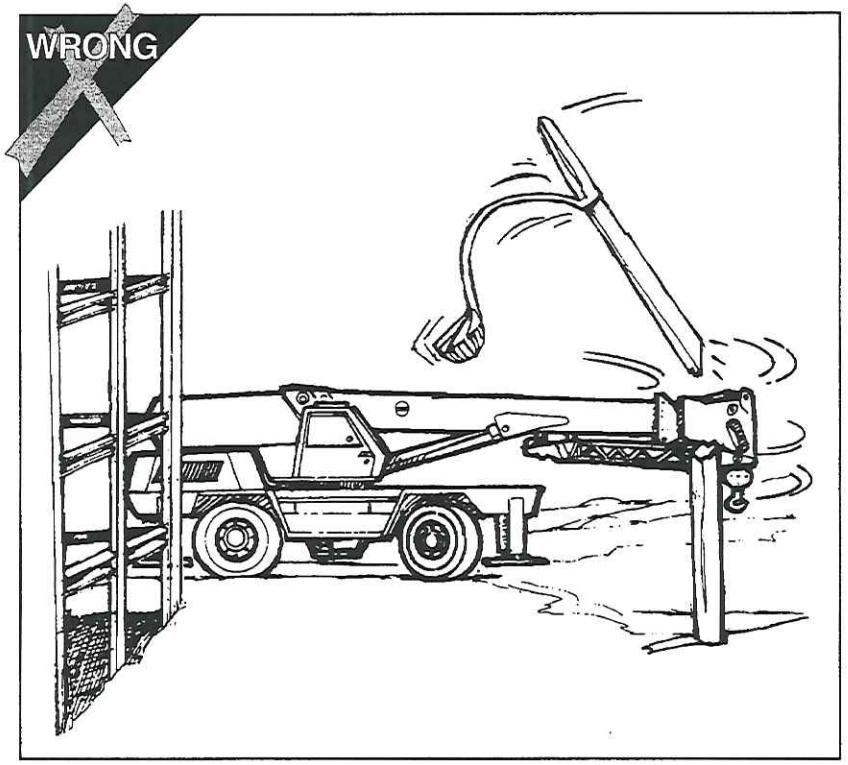


FIG. 52

SHUT DOWN SAFELY

The **shutdown procedure will vary** for different machines; always follow the manufacturer's instructions for shutting down.

Be careful where you park your machine. **Do not** leave it where there is a chance of a bank caving in or a low spot where heavy rains may wash out the footing. (FIG. 53)

Avoid parking on an incline. When parking on an incline can not be avoided, carefully block the machine wheels or tracks to prevent movement.

Always ground the load.

Do not leave blocks, balls, or rigging tackle in a position where the wind may swing them to cause damage to the boom, jib, or nearby objects.

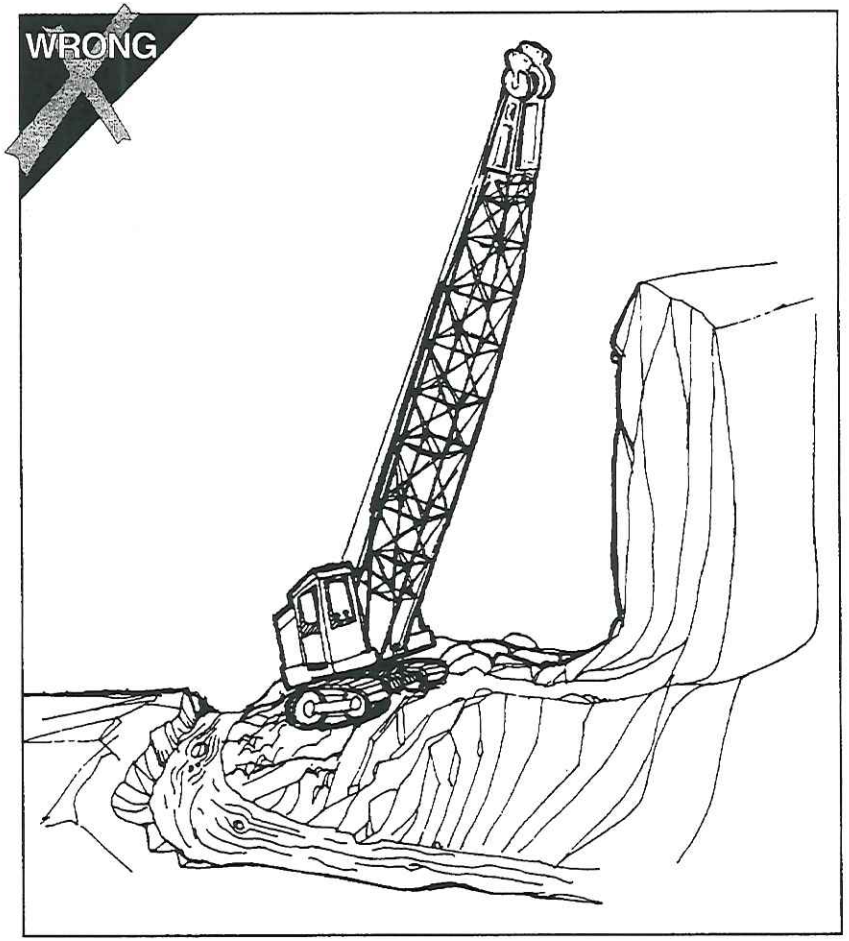


FIG. 53

Lower or secure the boom. Be sure all controls have been relieved so that all elements are at rest. Consult the manufacturer's operating manual.

Place all controls in the neutral or parking condition. Set the swing lock or brake and the parking or traction brake or lock to prevent machine movement.

Disengage the master clutch, when provided, and shut off the engine.

Never leave the operator's cab when the engine is running or with a load suspended.

Lock the ignition or starting circuit to prevent unauthorized starting and REMOVE THE KEY.

Lock the machine cab and install vandal guards, when available. (FIG. 54)

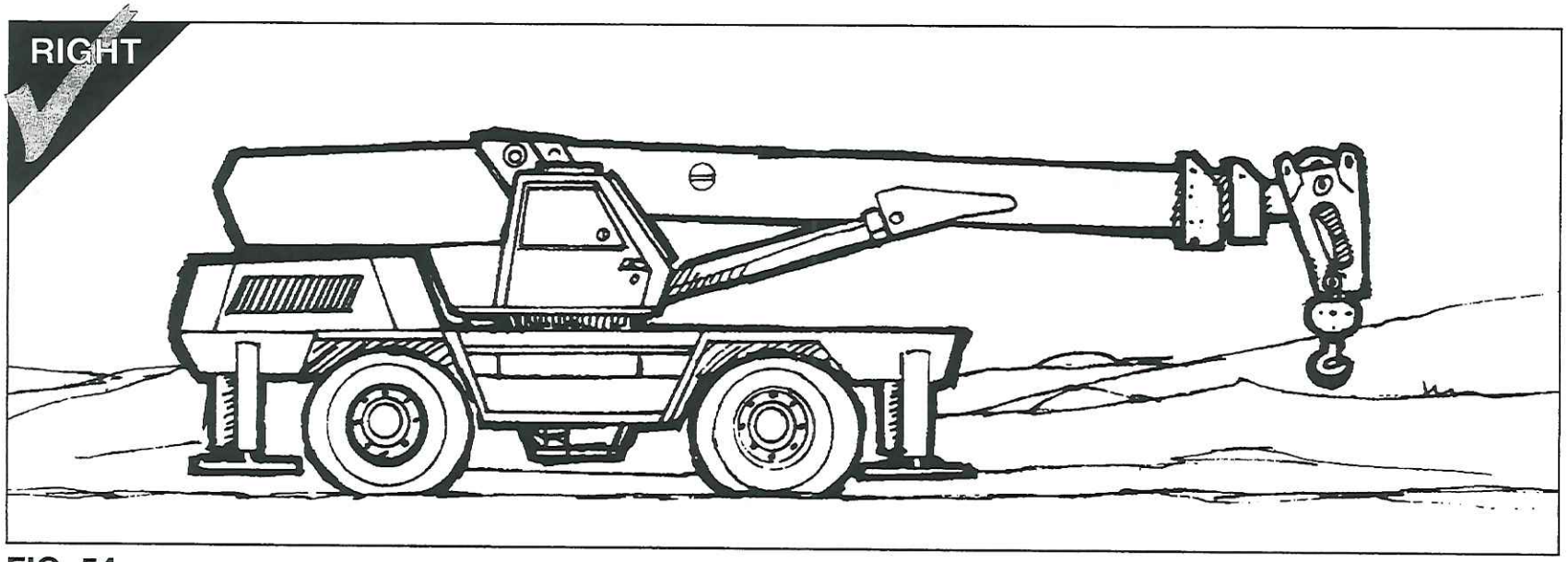


FIG. 54

GENERAL

- Maintenance work can be **hazardous** if not done in a careful manner. All personnel should realize the hazards and strictly follow safe practices.
- Do not perform any work on the equipment unless authorized to do so.
- Before performing any maintenance or repair work, **consult** the instruction manual. Follow manufacturer's recommended procedures.
- **Replace** all missing or broken guards and panels.
- While maintenance work is being done, the starting controls should be **tagged**. The tag should be removed only by someone who is aware of the circumstances, and who can assure that it is safe to do so. (FIG. 55)
- Always keep brake and clutch linings **free** from oil and grease.
- **Use proper** nonflammable cleaning solvents. Follow solvent manufacturer's instructions for use.
- **Always remove** all flammable material in the vicinity of welding and/or burning operations.
- Burning or welding in the vicinity of acoustical material may release **hazardous fumes**.
- **Ground on the item being welded on. DO NOT GROUND** through the machinery as this may damage computers, bearings, and/or other components. The computer and grounds may need to be disconnected, contact the manufacturer for the correct procedure.
- Keep hands and clothing well away from fan and moving parts while engine is running.

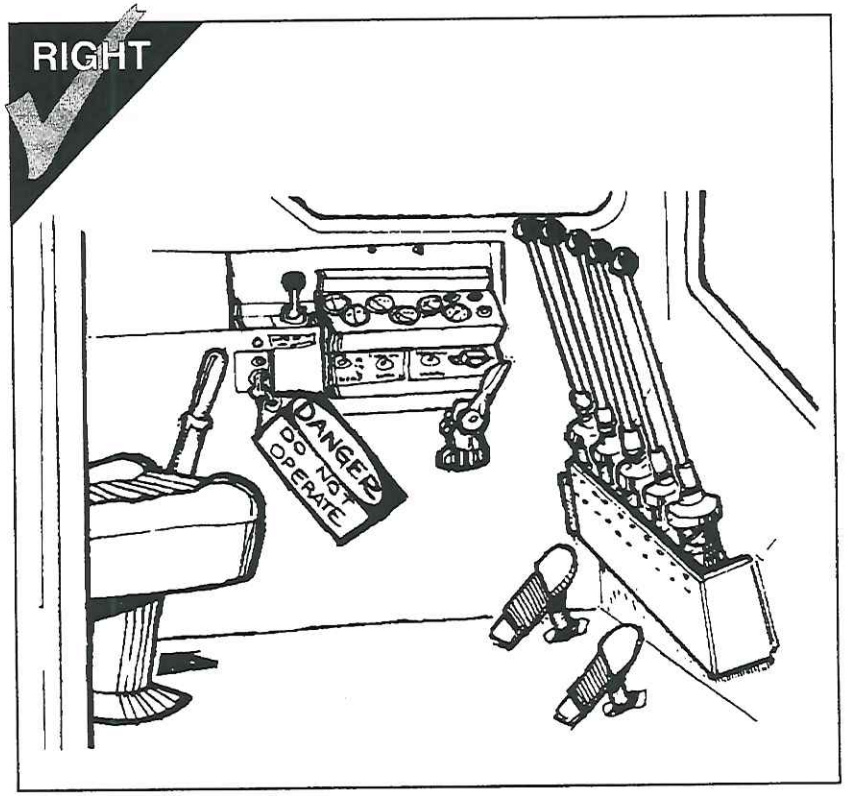


FIG. 55

- Keep machine in proper **adjustment** at all times. Serious injury could result if adjustments are neglected.
- Except for specific adjustments which must be made while the machine is running, do not work on engine or machine while in operation. **Stop the engine** and disengage the master clutch when performing maintenance or repair.
- **After adjustments/repairs** have been made to brakes or clutches **a lift test shall be done** to assure that the adjustments/repairs are correct.
- Personnel can be caught by moving parts when the **guards are removed** for access in making repairs. A repair or maintenance job is not complete until guards, plates, and other safety devices have been replaced.
- If gears, clutches, brakes, sheaves, drums, or similar parts must be in motion in order to lubricate or make proper adjustments, the parts should be **turned manually**.
- **Keep hands, feet, and clothing well away from all moving parts. Never put fingers** in open gears or through the spokes of a gear or under a rope that may tighten or move. (FIG. 56)
- **Remove and store** all tools before resuming operation.
- **Use only** manufacturer's approved replacement components and repair procedures.

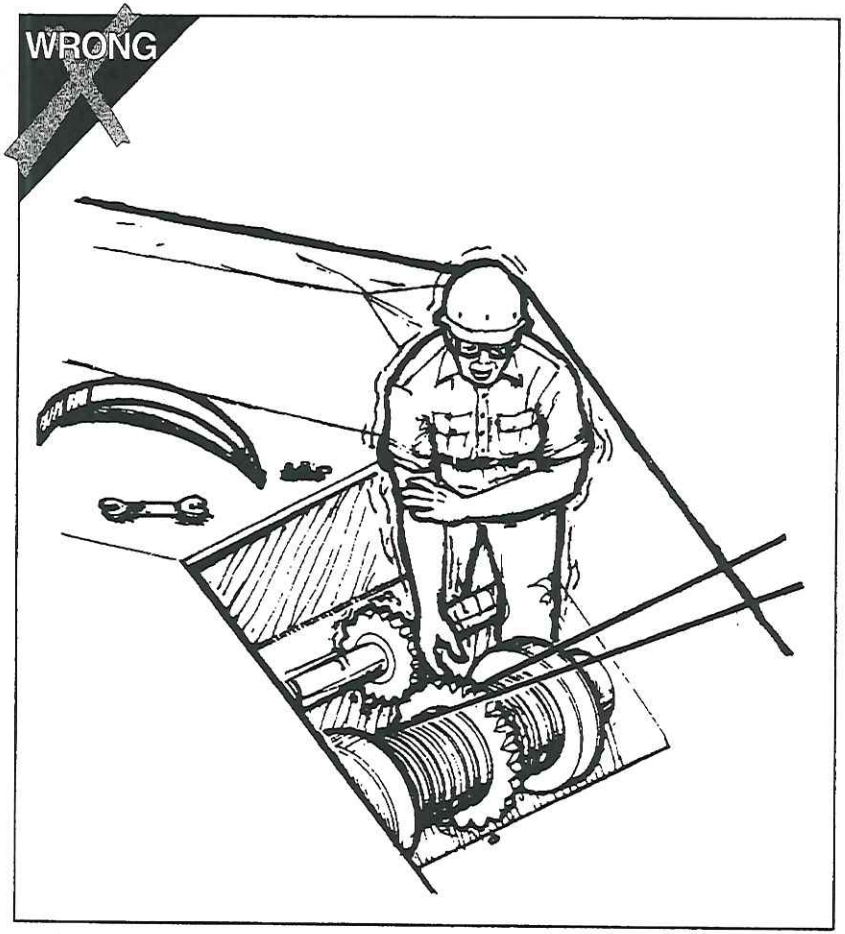


FIG. 56

HYDRAULIC SYSTEMS

NOTE: Hydraulic cranes have "special features". Some of them which affect your safety are listed below.

The boom is held in position by a trapped column of hydraulic fluid under high pressure. The same is true of a machine supported on hydraulic outriggers. It is most **important** to lower the boom or the crane to the ground, or block it in position before attempting maintenance or repair.

Remember — If the hydraulic fluid escapes, the boom or the crane can fall immediately, endangering anyone or anything below. (FIG. 57) Make sure the ground or blocking (not the hydraulic fluid) is actually supporting the boom (or crane). Consult the manufacturer for correct procedures.

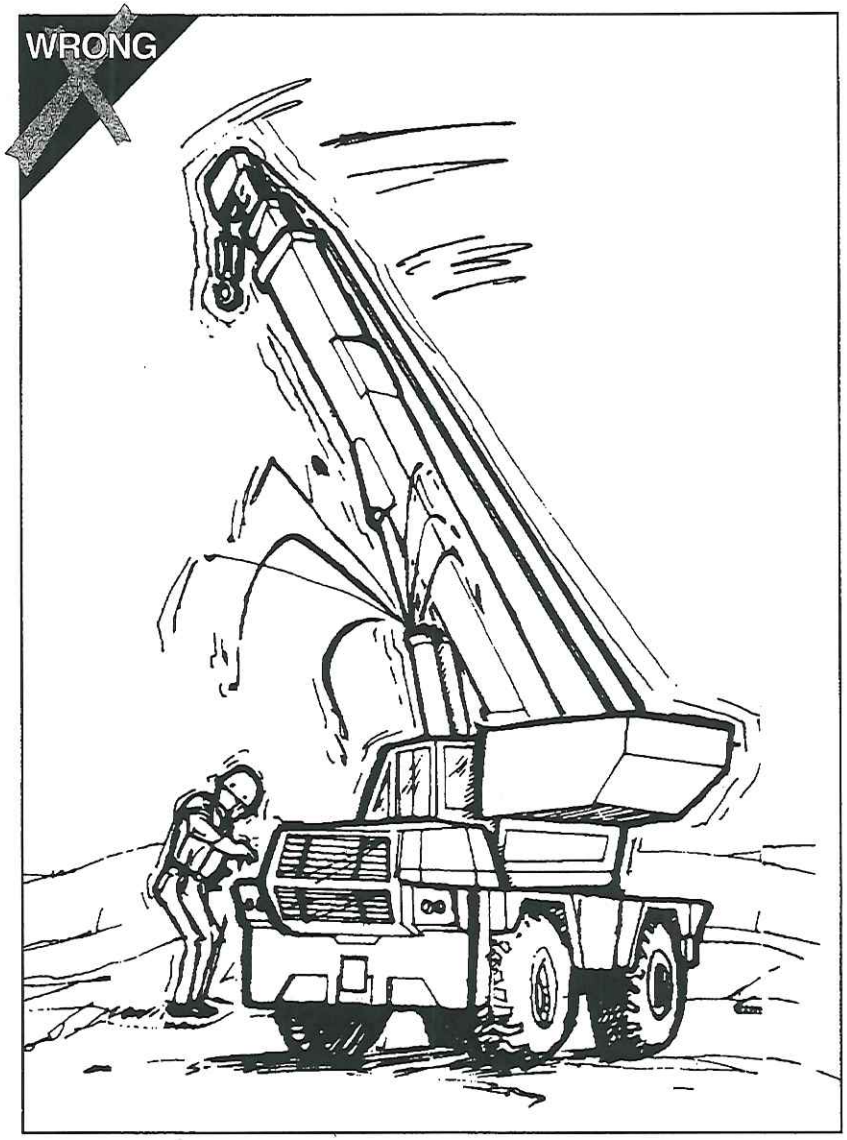


FIG. 57

Pressure can be maintained in hydraulic and air circuits long after the engine has been shut down. This pressure can cause hydraulic fluid or items such as pipe plugs to "shoot out" at high speed if pressure is not released correctly. (FIG. 58) **Release system pressure** before attempting to make adjustments or repairs.

Consult the manufacturer's instructions for correct procedure.

Before disconnecting **hydraulic fluid** lines on a hydraulic machine, be sure you:

- Place boom on the ground or have it supported.
- Shut off engine.
- Always release any air pressure (supercharge) on the hydraulic reservoir.
- Move pedals and control levers repeatedly through their operating positions to relieve all pressures.

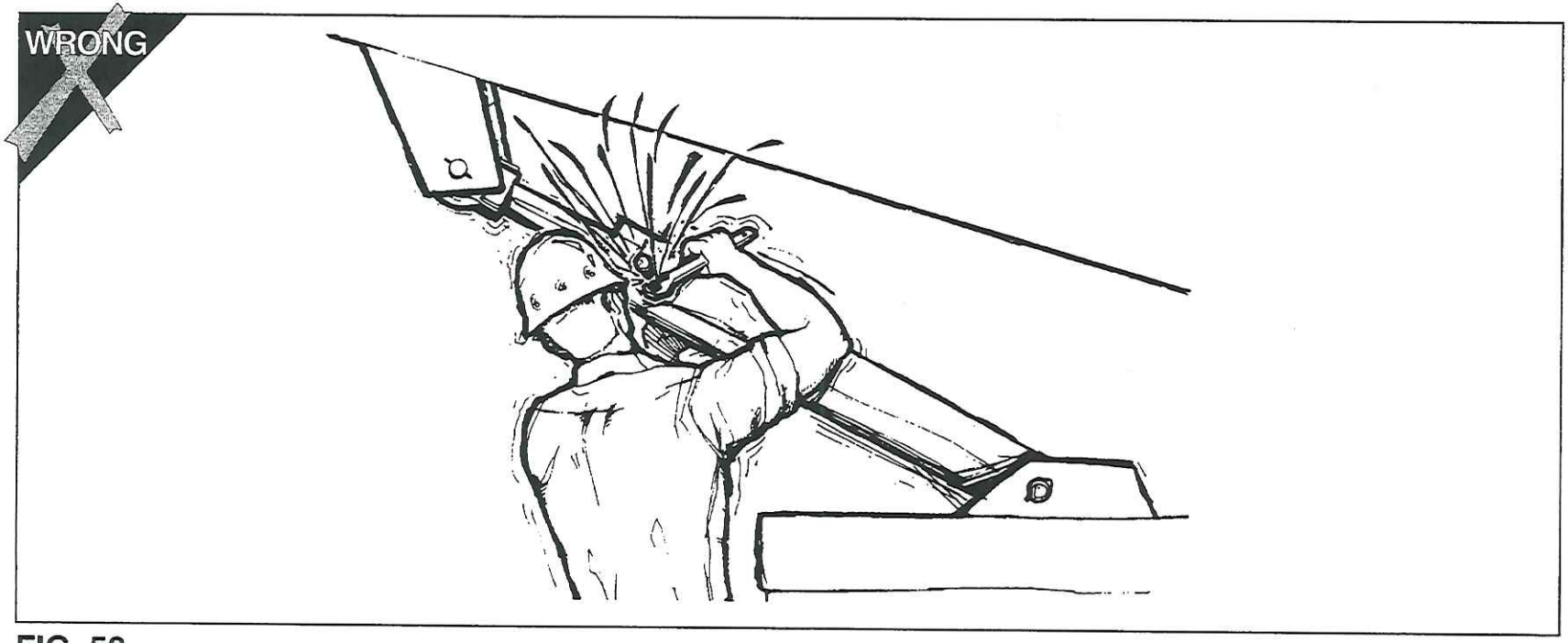


FIG. 58

Pressurized hydraulic fluid can penetrate the skin and **cause serious injury**. Therefore, be sure all connections are tight and that lines, pipes, and hoses are in good condition before starting the engine.

Fluid escaping from a small hole can be almost invisible. Use a piece of cardboard or wood, instead of your hands, to search for suspected leaks. (FIG. 59)

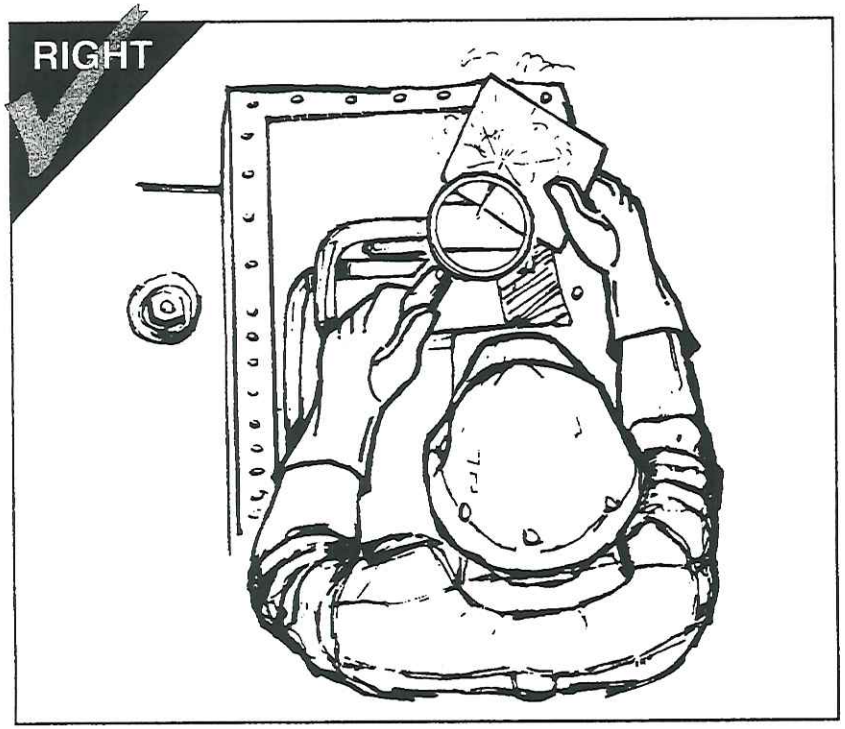


FIG. 59

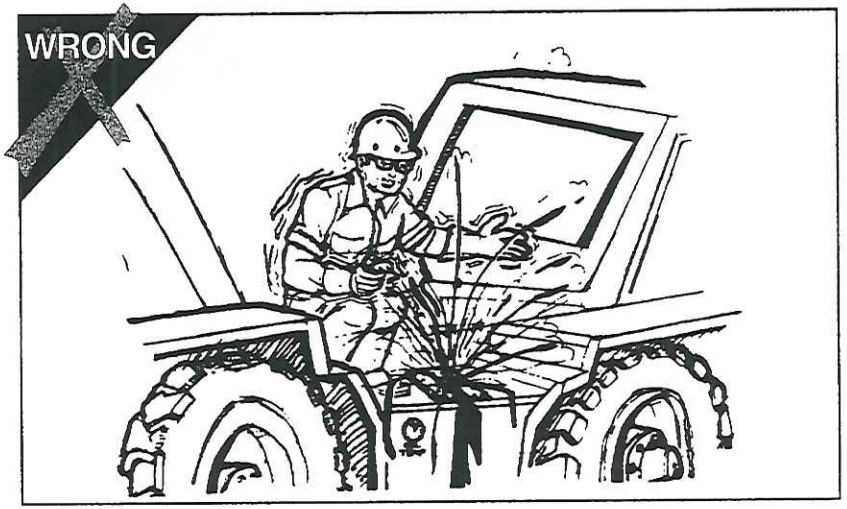


FIG. 60

If you are struck by escaping **hydraulic fluid under pressure**, serious reactions can occur if proper medical treatment is not administered immediately.

During operation, hydraulic fluid and air in an **unvented hydraulic tank** becomes heated and will tend to expand. This will raise the pressure inside an unvented hydraulic tank. If the filler cap is removed rapidly, the pressure in the tank can force the oil out of the tank very rapidly. **The hydraulic fluid may be very hot and may cause severe burns.** Always relieve tank pressure before removing the cap completely. (FIG. 60) Consult the manufacturer's instructions for the correct procedure.

Keep hydraulic relief valve settings set to the manufacturer's recommendations. **Excessive pressures** could result in structural or hydraulic failures. Low pressure could result in loss of control. Either condition could cause **personal injury or death**.

Be sure the engine is stopped before working on a machine except when it is essential, as in the case of pressure adjustments, lubrication, or tests. Follow the manufacturer's recommendations when making adjustments. Never resume operation until satisfactory adjustments have been made. **The operator must** follow the mechanic's instructions when adjustments are being made or machine is being serviced.

When adding fluid to any system, be sure to use the fluid recommended by the manufacturer. Certain fluids, when mixed, may destroy seals, causing loss of control and possible personal injury.

If controls, brakes, or other hydraulic systems feel **"spongy"**, have the machine checked to see if the system needs to be bled. Air in hydraulic systems can cause erratic or **"spongy" performance**, which could result in an accident. (FIG. 61) Consult the manufacturer's instructions for correct air removal procedures.

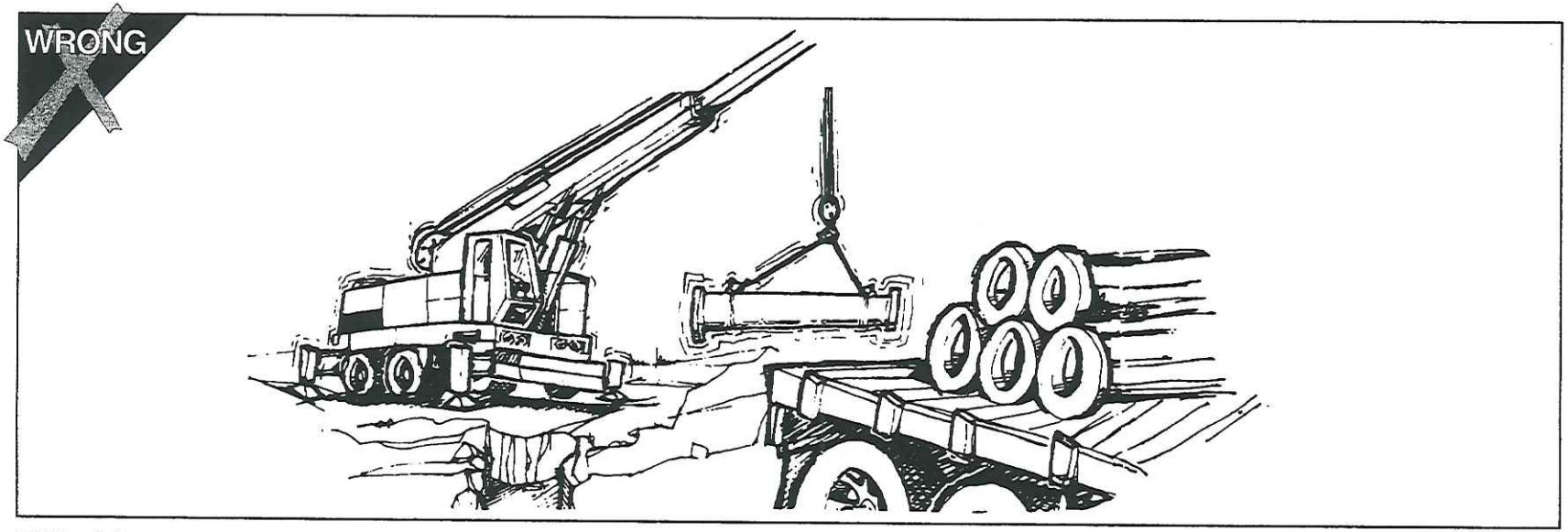


FIG. 61

PRECAUTIONS

When refueling, the following precautions must be followed:

- Add fuel only when machine is **not** running and machine is parked with no one in the cab.
- Fuel in a well-ventilated area.
- Turn off all electrical switches.
- Turn off cab heaters.
- Open lights, lighted smoking materials, flames, or spark producing devices shall be kept at a safe distance while refueling. (FIG. 62)
- Keep fuel nozzle in contact with tank being filled, or provide a ground to prevent static sparks from igniting fuel.
- Do not spill fuel on hot surfaces.
- Any spillage shall be cleaned immediately.
- Do not start engine until fuel cap is secured to the fuel tank and people are clear of the machine.

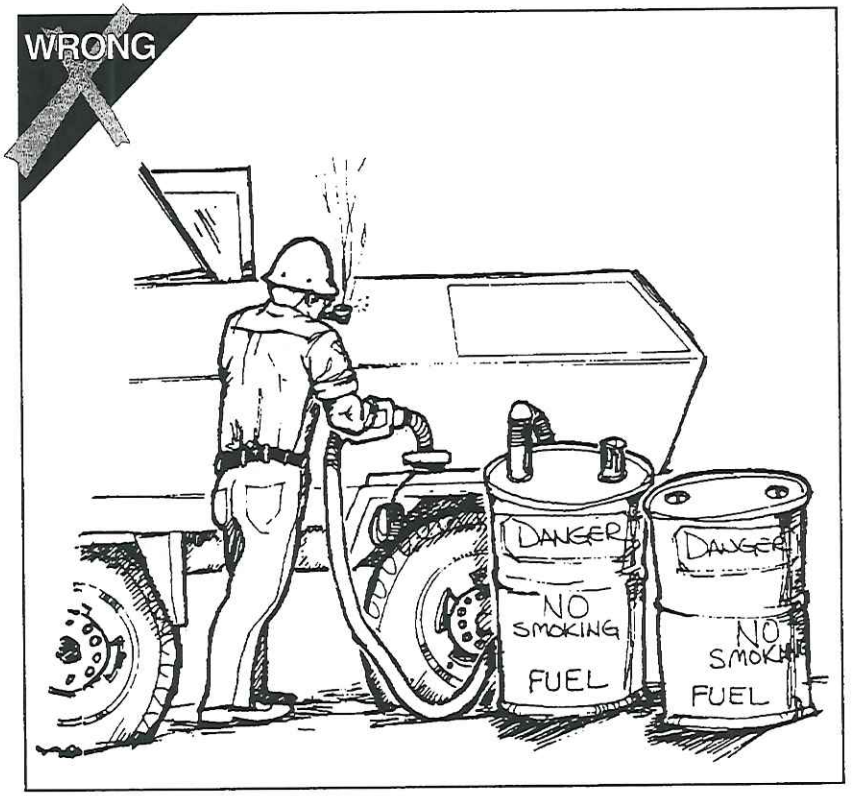


FIG. 62

When checking coolant level:

- Stop the engine and let the engine and radiator cool before checking. (FIG. 63)

If an overheated engine requires a shutdown:

- Wait for the radiator to cool. The hot pressurized coolant can cause burn injuries. Never add coolant to an overheated system.
- **Overheating is a symptom of trouble.** Stop the engine and have the trouble corrected before serious damage occurs.

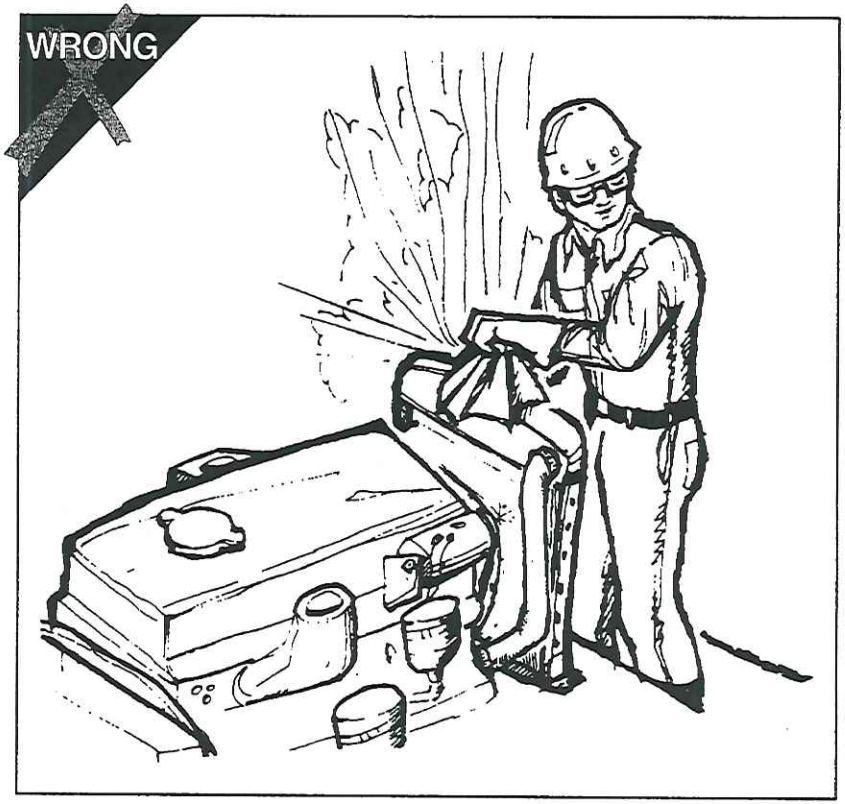


FIG. 63

SERVICING BATTERIES

Before removing a battery, turn off all electrical equipment, then disconnect the ground battery clamp. Before installing a battery, turn off all electrical equipment, then connect the grounded battery clamp last.

To prevent sparking at the posts when using a battery charger, always turn the charger off or disconnect it from its power source before connecting or disconnecting charger leads to battery posts. (FIG. 64) Caps on all cells should be left on and the vent caps should be covered with a wet cloth.

Battery acid will **burn skin**, eat holes in clothing, and **cause blindness** if splashed into eyes. If you spill acid on yourself, flush skin immediately with lots of water. Apply baking soda to help neutralize the acid. If acid gets in your eyes, flush immediately with large amounts of water and seek proper medical treatment immediately.

When servicing batteries, remember that a lead-acid storage battery generates (when charging or discharging) hydrogen and oxygen — a very explosive mixture. A spark or flame could ignite these gases.

Always wear safety glasses and gloves when working with batteries.

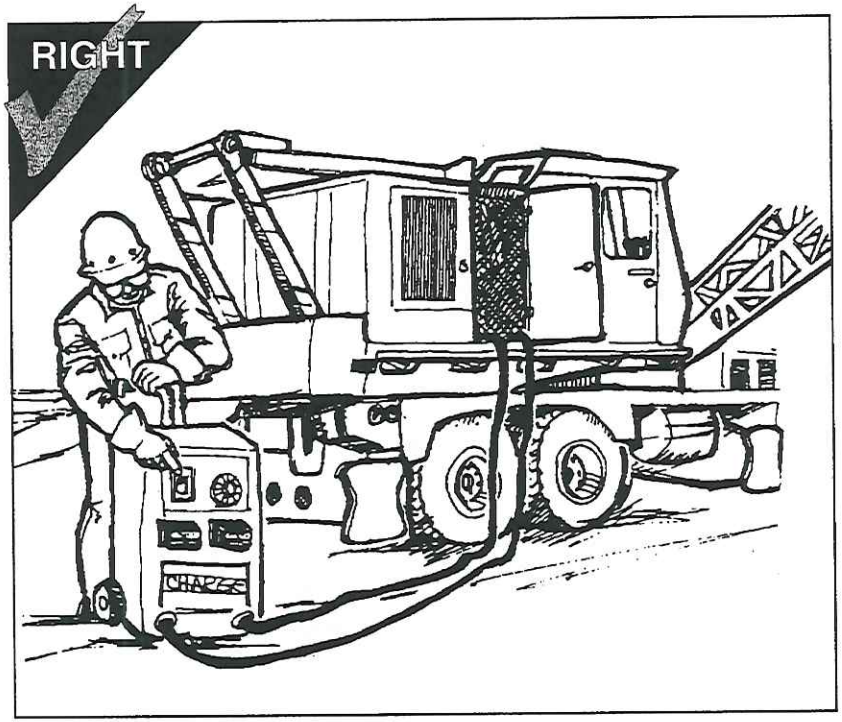


FIG. 64

To prevent a battery explosion:

- **Maintain** the electrolyte at the recommended level. Check level frequently. Add distilled water to batteries only when starting up, never when shutting down. With electrolyte at the proper level, less space is available for gases to accumulate in the battery.
- **Use a flashlight** to check the electrolyte level. Never use a flame. (FIG. 65)
- **Do not short** across the battery terminals. The spark could ignite the gases.

BOOSTER CABLE INSTRUCTIONS

1. Connect positive (+) cable to positive post of discharged battery wired to starter or solenoid.
2. Connect other end of same cable to same marked post (positive) or booster battery.
3. Connect second cable negative (–) to other post of booster battery.
4. MAKE FINAL CONNECTION ON ENGINE BLOCK OF STALLED VEHICLE AWAY FROM BATTERY. STAND BACK.
5. Start vehicle and remove cables in reverse order of connection.

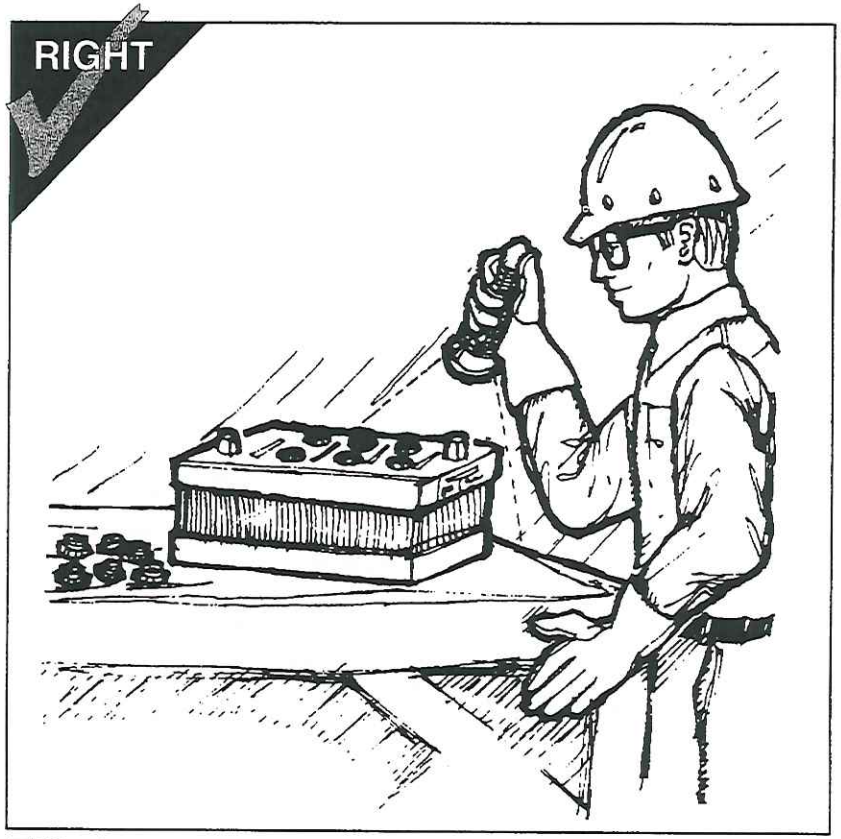


FIG. 65

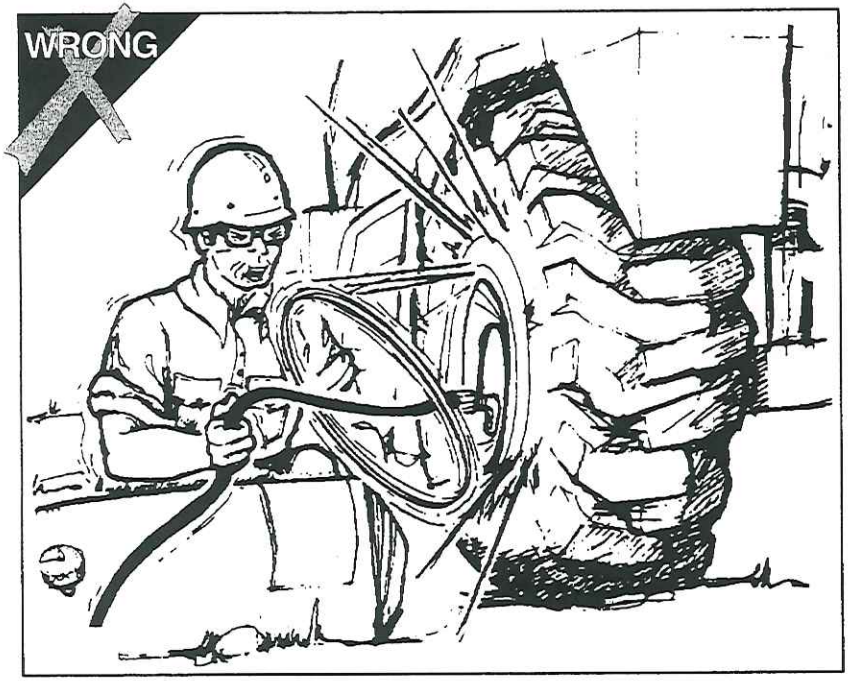


FIG. 66

TIRE PRESSURE

Changing tires or adding air can be a hazardous business. Under pressure, a tire and rim assembly packs the **potential explosive power** of **TNT**. (FIG. 66) 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.

TIRE PRESSURE

Check tire pressure before starting operation. 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. (FIG. 67) Always use a tire cage or equivalent for protection.

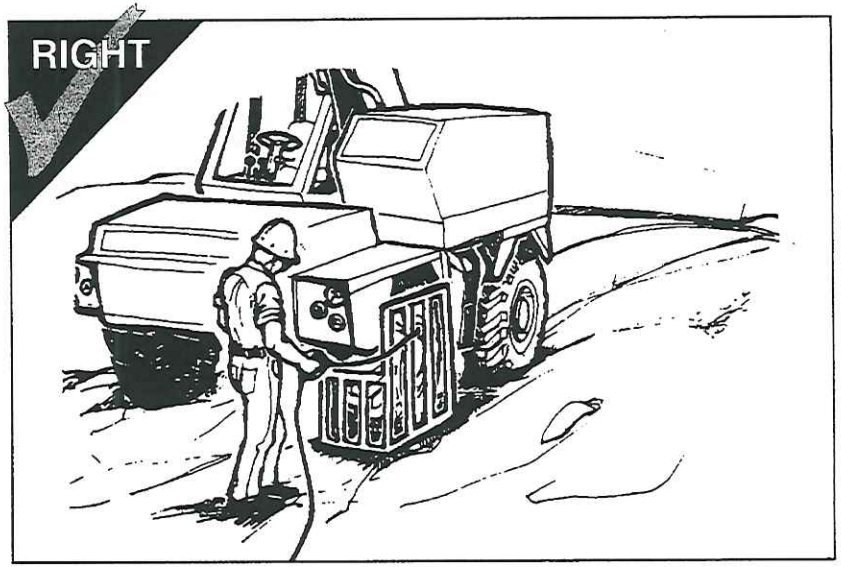


FIG. 67

Protect your wire rope. With proper handling and routine lubrication, it will last much longer. Your rope supplier can provide more lubrication information.

WIRE ROPE

Wire rope replacement may vary according to Federal, State and/or Local codes and in accordance to the type of rope used. For specific information on the care, inspection, and replacement of wire rope, refer to the crane manufacturer's recommendation.

Some general guidelines for wire rope replacement using steel sheaves are the following:

- **In running ropes**, six randomly distributed broken wires in one lay or three broken wires one strand in one lay.
- **Broken wires, in rotation resistant ropes,** two randomly distributed broken wires in six rope diameters or four randomly distributed broken wires in thirty rope diameters. For special conditions relating to rotation resistant rope, refer to ANSI/ASME B30.5 Crane Safety Standard paragraph 5.3.2.1.1(d)(1)(b).
- **One outer wire broken** at the point of contact with the core of the rope which has worked its way out of the rope structure and protrudes or loops out from the rope structure. Additional inspection of this section is required.
- **Wear of one-third the original diameter** of the outside individual wires.
- **Kinking, crushing, birdcaging,** or any other damage resulting in distortion of the rope structure.
- **Evidence of any heat damage** from any cause.
- **Arc strikes.**
- **Rust** which is pitting the individual wires.

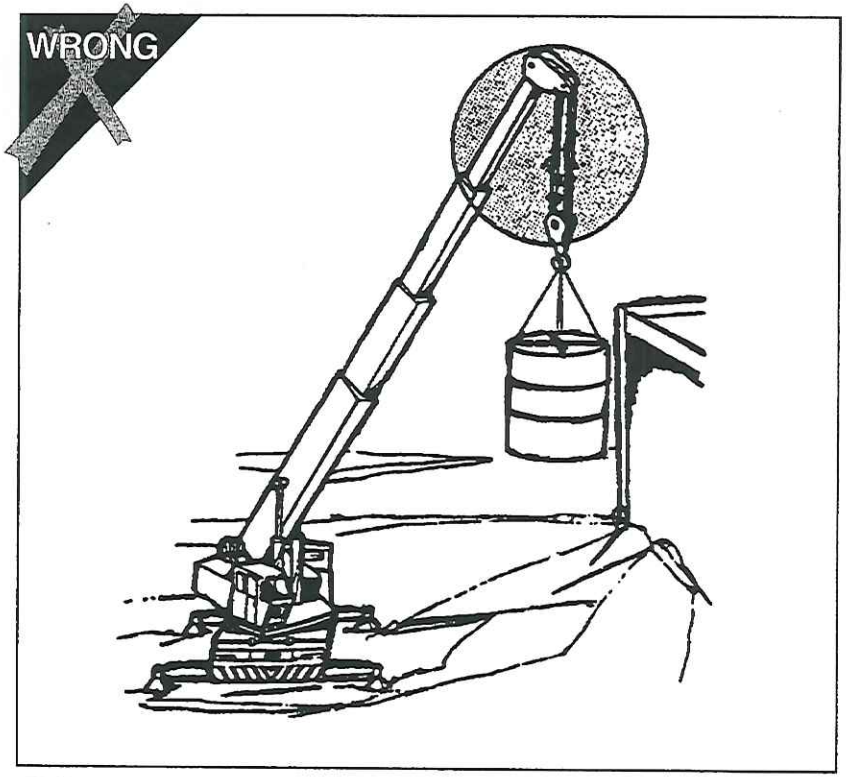


FIG. 68

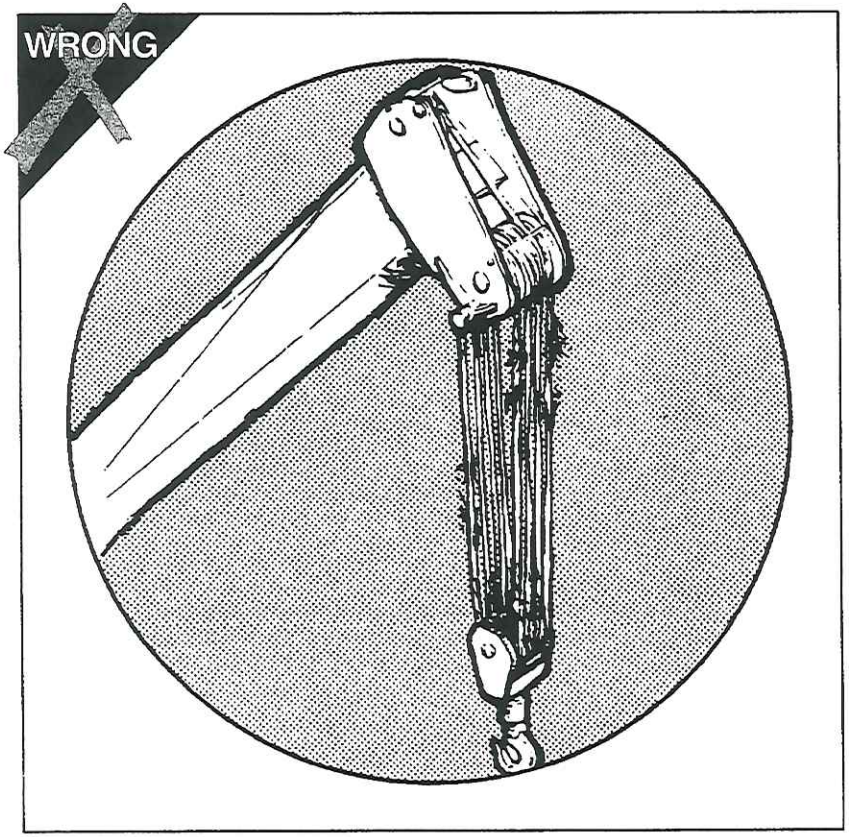


FIG. 69

- **Reductions** from nominal diameter of more than:
  a. 1/64 in. (0.4 mm) for diameters up to and including 5/16 in. (8.0 mm).
  b. 1/32 in. (0.8 mm) for diameters 3/8 in. (9.5 mm) to and including 1/2 in. (13.0 mm).
  c. 3/64 in. (1.2 mm) for diameters 9/16 in. (14.5 mm) to and including 3/4 in. (19.0 mm).
  d. 1/16 in. (1.6 mm) for diameters 7/8 in. (22.0 mm) to and including 1-1/8 in. (29.0 mm).
  e. 3/32 in. (2.4 mm) for diameters 1-1/4 in. (32.0 mm) to and including 1-1/2 in. (38.0 mm).
- In standing ropes, more than two broken wires in one lay in sections beyond end connections or more than one broken wire at an end connection. (FIGS. 68 and 69)
- When evidence of core failure in rotation resistant ropes is recognized by a **lengthening of the lay** and a localized reduction in diameter.
- Inspect sheave grooves for excessive wear.

UNREELING WIRE ROPE

When unreeling wire rope, it is imperative that the **coil or reel rotates** as the rope unwinds. If the coil or reel does not rotate, the wire will be twisted as it is uncoiled and kinking will result. A kinked rope is severely damaged and unsafe for service. Figure 71 shows the correct methods for unreeling ropes from coils or reels.

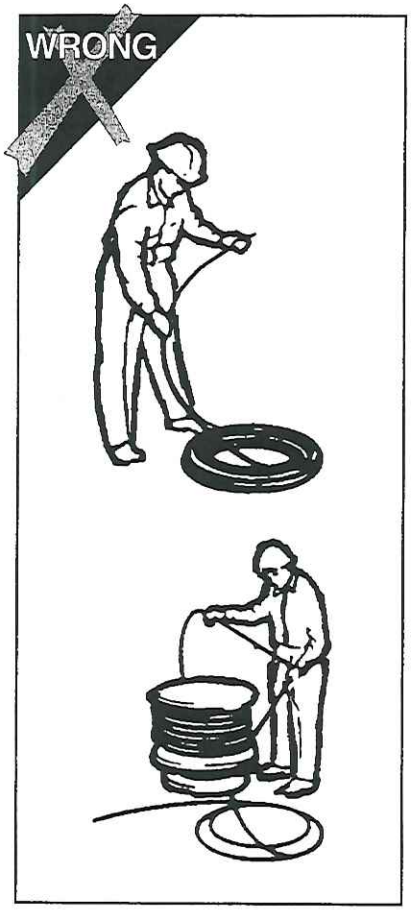


FIG. 70

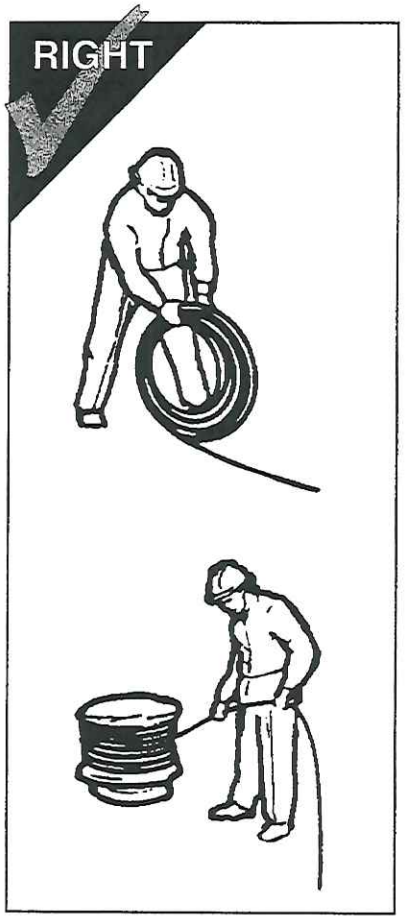


FIG. 71

INSTALLING WIRE ROPE

ONLY WIRE ROPE RECOMMENDED BY THE MACHINE MANUFACTURER SHALL BE USED.

When installing wire rope sockets correctly, the live end must be in a straight line pull with the eye of the socket and a clip correctly installed on the dead end. (FIG. 72)

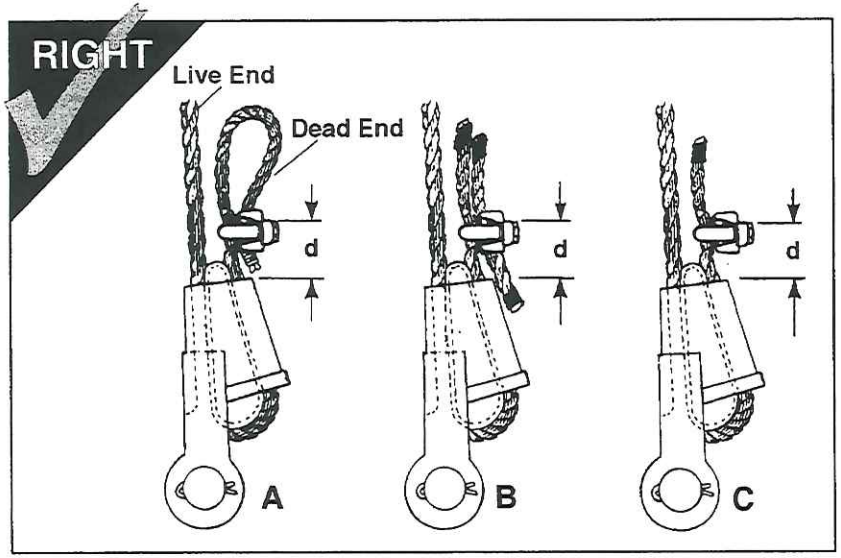


FIG. 72

- Dimensions "d" between the socket and the clip should be such that the wedge cannot loosen in the socket.
- This does not preclude the use of devices specially designed for the dead end of wire rope.

If the wire rope is put in backwards (entering the wrong side) or a clip is installed around both the live end and dead end (FIG. 73), a kink will develop and rope strength will be reduced.

Always wear gloves when handling wire rope.

Do not guide wire rope on drums with your hands.

After a new wire rope is installed, operate first with a light load to let wire rope adjust itself.

For lubricating instructions, refer to rope manufacturer's recommendations.

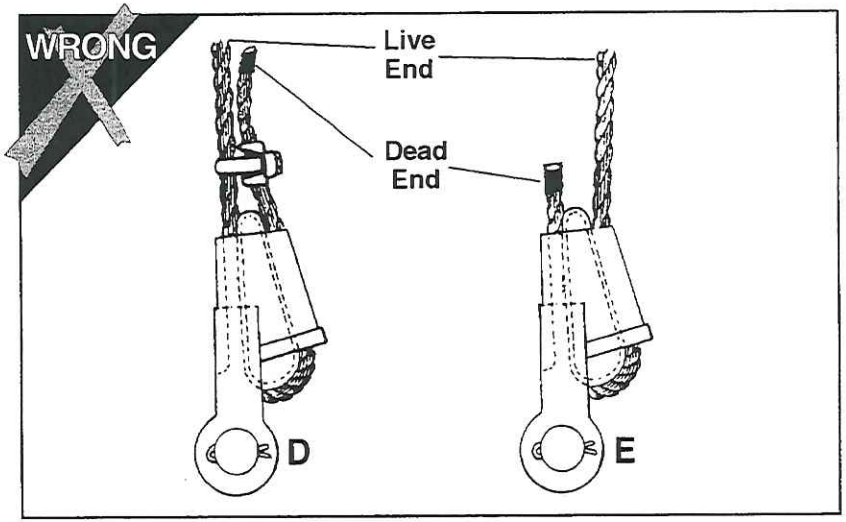


FIG. 73

FIRE PREVENTION (FIG. 74)

- Remove debris such as rags, coal dust, oil, leaves, and pine needles.
- Check and repair fuel and hydraulic leaks.
- Check and repair damaged wiring.
- Prevent hose and electrical wire harness abrasion.
- Tighten loose clamps and fittings.
- Secure loose wiring.
- Make sure guards and protective covers are in place.
- Make sure fire extinguisher is available and operable.

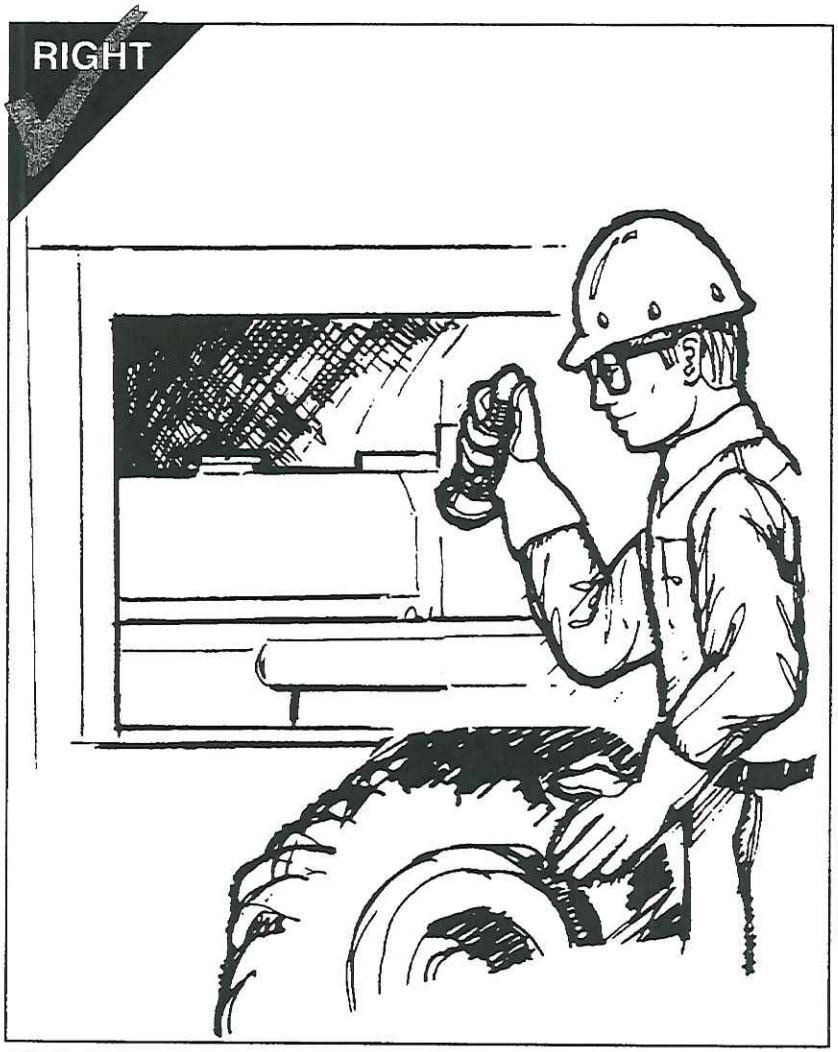
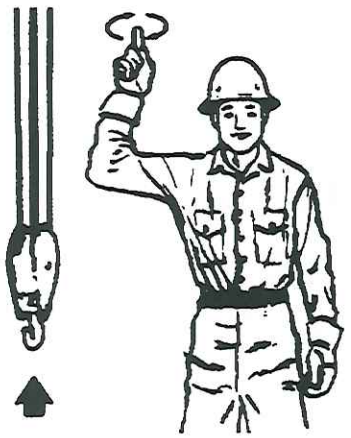
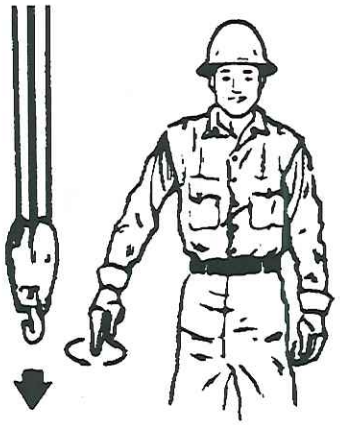


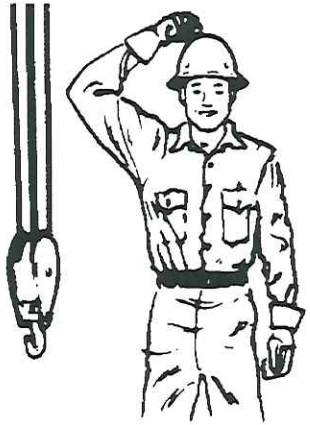
FIG. 74



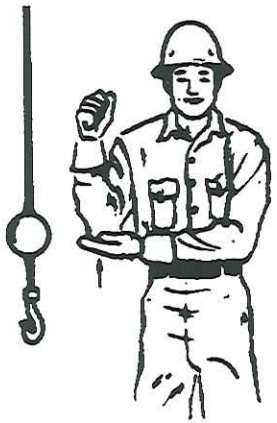
HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.



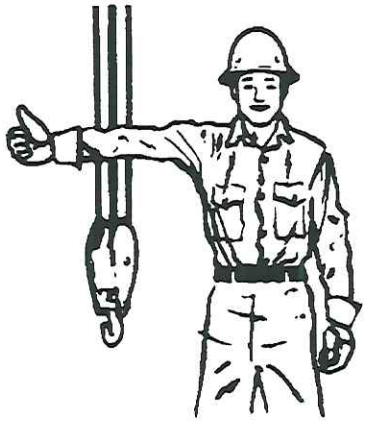
LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.



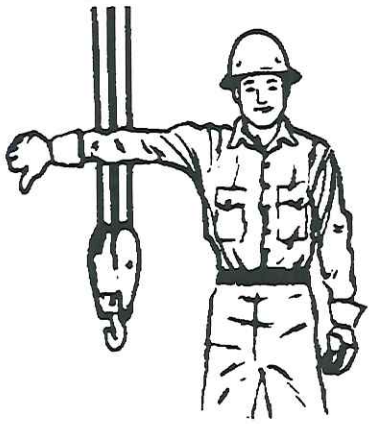
USE MAIN HOIST. Tap fist on head; then use regular signals.



USE WHIP LINE. (Auxiliary Hoist) Tap elbow with one hand; then use regular signals.

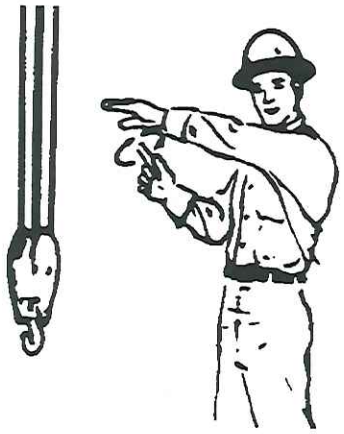


RAISE BOOM. Arm extended, fingers closed, thumb pointing upward.

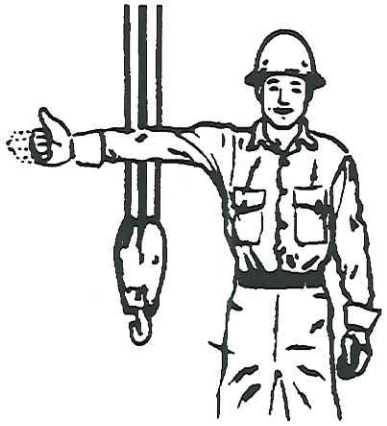


LOWER BOOM. Arm extended, fingers closed, thumb pointing downward.

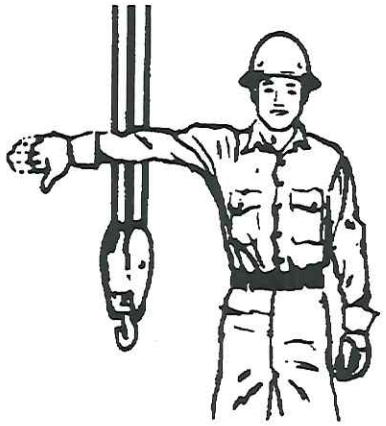
HAND SIGNALS



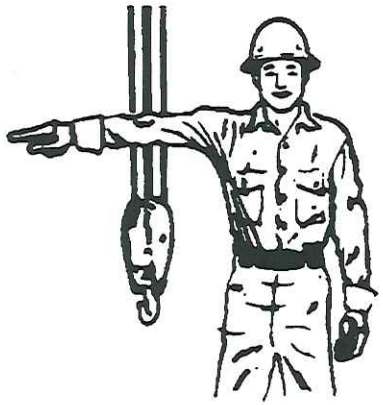
MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example.)



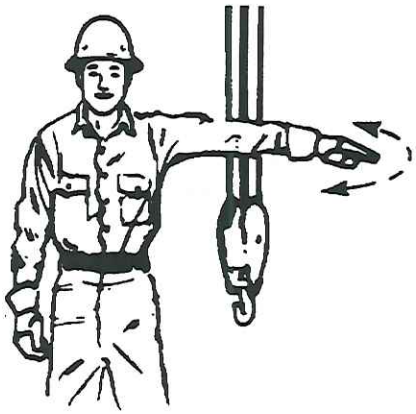
RAISE THE BOOM AND LOWER THE LOAD. With arm extended, thumb pointing up. Flex fingers in and out as long as load movement is desired.



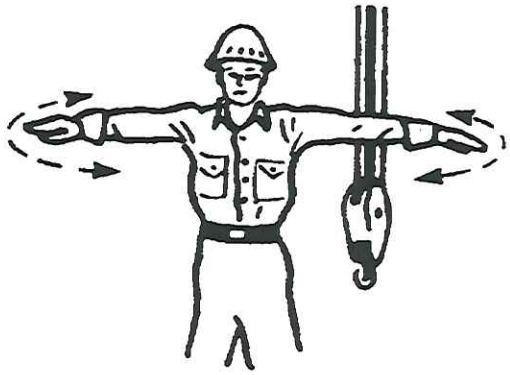
LOWER THE BOOM AND RAISE THE LOAD. With arm extended, thumb pointing down, flex fingers in and out as long as load movement is desired.



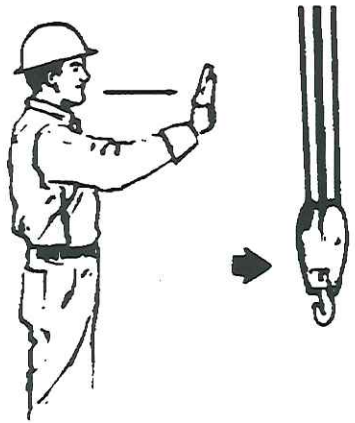
SWING. Arm extended, point with finger in direction of swing of boom.



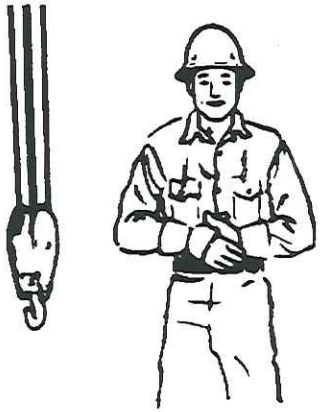
STOP. Arm extended, palm down, move arm back and forth horizontally.



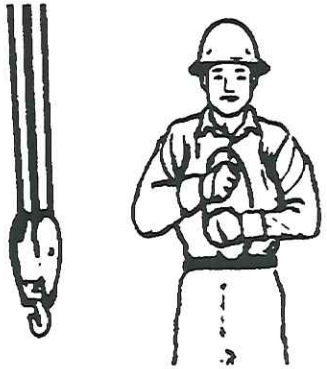
EMERGENCY STOP. Both arms extended, palms down, move arms back and forth horizontally.



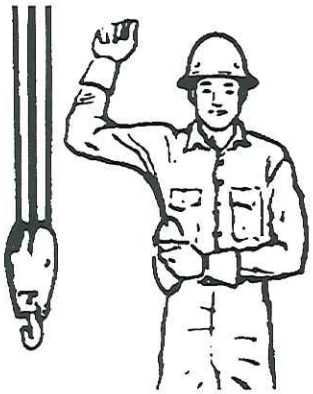
TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.



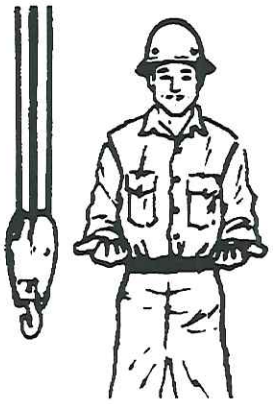
DOG EVERYTHING. Clasp hands in front of body.



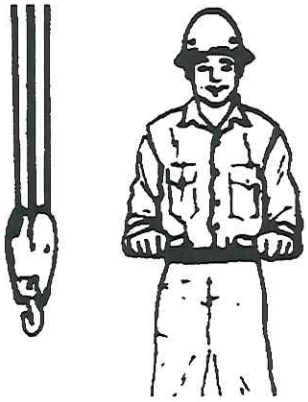
TRAVEL. (Both Tracks) Use both fists in front of body, making a circular motion, about each other, indicating direction of travel; forward or backward. (For land cranes only.)



TRAVEL. (One Track) Lock the track on side indicated by raised fist. Travel opposite track in direction indicated by circular motion of either fist, rotated vertically in front of body. (For land cranes only.)

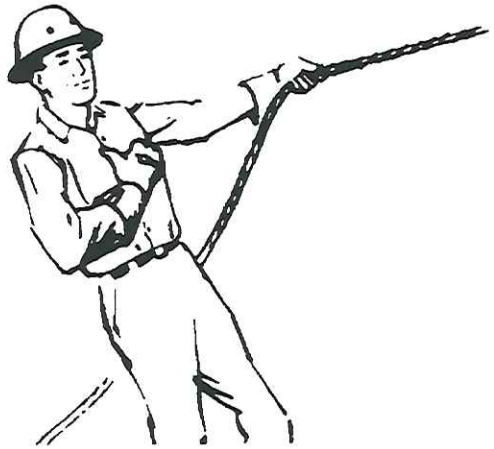


EXTEND BOOM. (Telescoping Booms) Both fists in front of body with thumbs pointing outward.

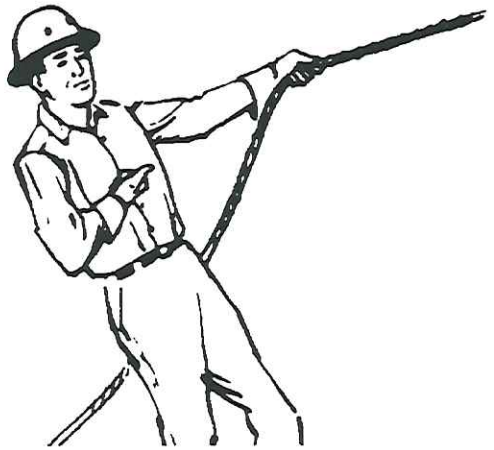


RETRACT BOOM. (Telescoping Booms) Both fists in front of body with thumbs pointing toward each other.

HAND SIGNALS



EXTEND BOOM. (Telescoping Boom) One Hand Signal. One fist in front of chest with thumb tapping chest.



RETRACT BOOM. (Telescoping Boom) One Hand Signal. One fist in front of chest, thumb pointing outward and heel of fist tapping chest.

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SAFETY IS UP TO YOU

You have now read the CIMA Crane Safety Manual. Although it is impractical to try to cover every possible operating or maintenance situation, the safety precautions recommended here should help the user develop good safety habits and promote safe operation. Follow your company's safety instructions and those covered by the manufacturer's manual.

YOU WILL THEN DISCOVER THE GREATEST SAFETY DEVICE THERE IS — THE CAREFUL OPERATOR! — AND GOOD JOB-SITE MANAGEMENT.

Be a member of the SAFETY TEAM —

REMEMBER — Safety is up to you!

IF YOU DON'T KNOW, DON'T GO

Now that you have read the AEM Crane Safety Manual and the manufacturer's manual for the specific machine that you will be operating, if you have any questions about the operation of the machine, YOU SHOULD REREAD THE MANUALS AND CONSULT WITH YOUR SUPERVISOR BEFORE OPERATING THE MACHINE.