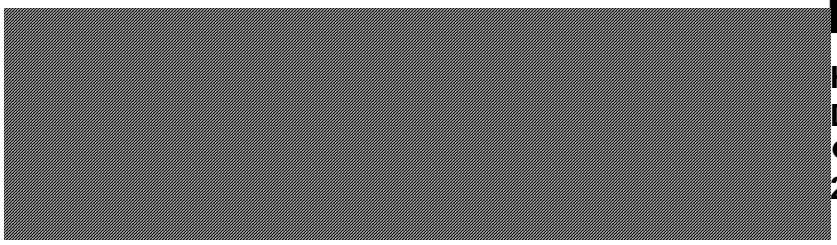
60

RULES ON SAFETY

Sixty rules for safe operation of power cranes and excavators



HEADQUARTERS
DEPARTMENT OF THE ARMY
●
20 DECEMBER 1973

TECHNICAL BULLETIN

HEADQUARTERS
DEPARTMENT OF THE ARMY

NO. 385-6

WASHINGTON, D. C. 20 December 1973

SAFETY MANUAL, POWER CRANES AND EXCAVATORS FOR OPERATING AND MAINTENANCE PERSONNEL

This manual is intended to illustrate only basic safety procedures. Additional precautions may be necessary for the safe operation of power cranes and excavators. The information contained in this manual is not intended to replace safety codes, rules and regulations.

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army,
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

DISTRIBUTION:

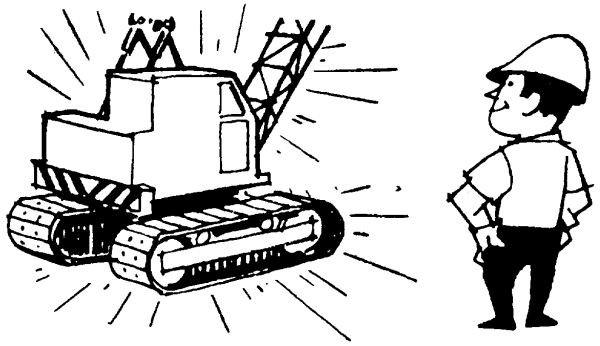
To be distributed in accordance with DA Form 12-25B operator maintenance requirements for Cranes; Crane-Shovel, Crawler, Crane-Shovel, Wheel, or Truck Mtd.

1 Think safety Follow a definite plan for inspection and safe operation Report or correct any unsafe conditions immediately Always put safety first.

2 Don't be a "cowboy:' It may look flashy and fast, but a real pro knows that a smooth, well-balanced work cycle gets more work done ... and prevents machine wear and regrettable accidents

3 Be alert... don't be distracted. Always keep your eyes on a moving load.. .and if you must turn your attention elsewhere, stop the machine first If you can't see the load, be sure to have a signalman in full view.

4 Be a good housekeeper. keep the deck clean, free of oil, grease, rags, cables, chains, buckets, barrels and other hazards Keep loose parts in a tool box Use only non-flammable solutions for cleaning Be sure your shoes are clean and dry before operating brakes



5 Inspect wire ropes daily and replace any worn, badly frayed, broken or kinked ones. Be particularly careful about boom hoist ropes and pendants. Check end connections for wear.

6 Inspect your machine daily ..check for loose, worn or damaged parts Report or correct any unsafe conditions immediately... and do not operate the machine until they have been corrected.

7 Replace all missing or broken guards and panels .they are put there to protect you.

8 Never tamper with safety devices.

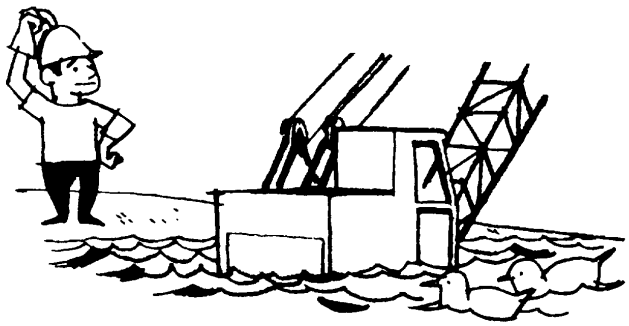
9 Always have a fire extinguisher on hand and know how to use it Check regularly-at least monthly to be sure it is In working order.

10 Test all controls at start of shift to be sure they are properly adjusted before beginning operation.

11 Make sure no one is working on or close to the machine before you start engine or begin to move Check inside outside. .and underneath.

12 Use caution when fueling Stop engine do not smoke .. never fill near an open flame Keep metal funnels in contact with filler tube to prevent static spark Turn off heater before fueling

13 Check your footing. Your machine should be on as sod and level a footing as possible situation. and you may have to build one in certain situations to get a good working foundation. Use heavy timber mats on soft ground where needed. Never leave your machine in a low spot where rains may wash out your footing.



14 When traveling your machine-
☐check bridges before crossing make sure they will support the weight of the machine
☐check river depths when fording by lowering dipper to gauge the depth. Stop and swing dipper side to side to detect any boulders before proceeding.

☐check clearances... under bridges... overhead lines . or any overhead obstruction. When side clearances are tight, post a lookout... and be sure there is clearance for tail swing.

☐when traveling with a load, snub the load to prevent swaying if possible. Never travel with near-capacity loads.

☐never travel a rubber-tired unit with a load over the side.

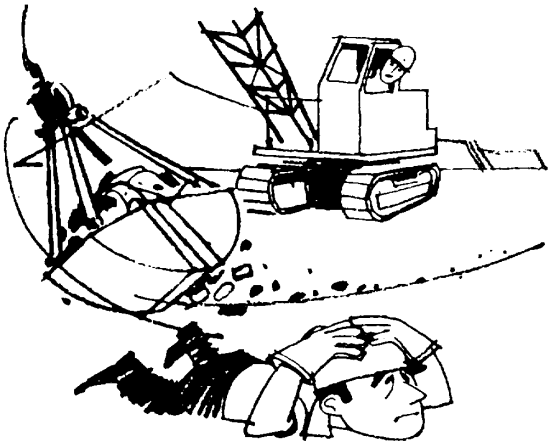
☐always move with the load behind in soft going... it helps to raise the leading end of the crawlers and make traveling safer.

☐always set swing brakes when unit is idle or holding loads for a period of time, especially on slopes If swinging during travel is necessary, engage swing jaw clutch before releasing brakes.

☐never backup until you're sure everyone is clear of the machine.

☐for long moves, position boom in direction of travel.

☐block treads when moving uphill. Be sure they are blocked to prevent downhill movement before shifting steering clutches.



15 Never swing over workmen

16 Never get on or off a moving machine and never jump off Use both hands to mount and dismount.

17 Take signals from only one person. and use the standard signals shown in this booklet. If other signals are going to be used, be sure you and your signalman agree on them beforehand

18 When making adjustments or repairs-
- ☐stop the machine
- ☐lower the boom or secure it against dropping
- ☐neutralize all controls.
- ☐lock starter and remove ignition key to make it inoperative
- ☐display proper warning signs on controls of machine
- ☐keep hands, feet, clothing away from gears, ropes, drums and sheaves
- ☐never put your hands on wire rope when climbing to the top of the cab.
- ☐use a bar or stick to guide wire ropes onto drums
- ☐keep hands well away from fan drive while engine is running
- ☐safeguard your oiler .. do not resume operation until he gives you a positive "all clear" signal
- ☐replace all guards and shields before resuming operation

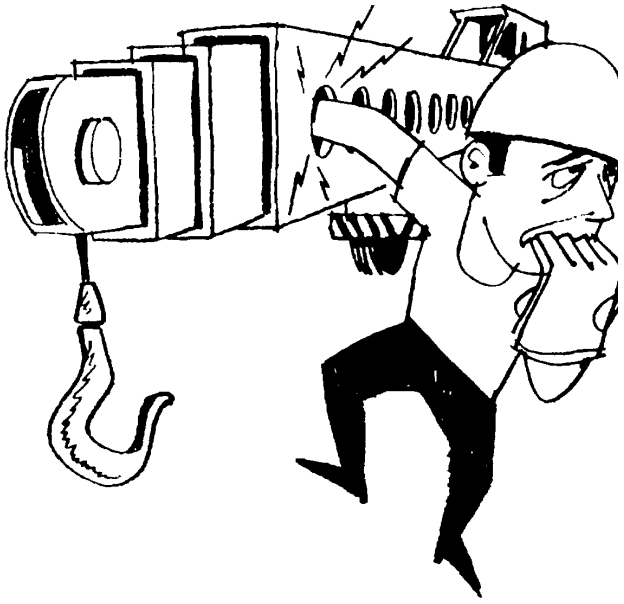
19 Block under boom before disassembling. Never stand on or under the boom during this work.

20 Never leave your machine-
☐with a load in the air Land all loads before leaving
☐with engine running Shut power off set and lock brakes including swing brakes.. engage all ratchets lock all controls
☐before lowering high booms and engaging boom hoist pawl
☐without parking on level ground, parallel with bank or grade
☐before locking doors

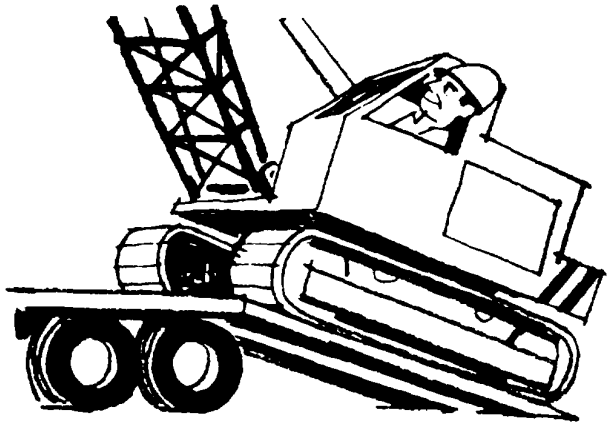
21 Before disconnecting oil lines, if machine has hydraulic controls, be sure to place boom on the ground or in the boom rest. Then move the pedals and control levers to equalize pressures within the cylinders. Always release any air supercharge on hydraulic reservoir, and shut off engine (or de-clutch pumps) before disconnecting oil lines.

22 Never exceed manufacturer's rating Remember that many machines have some ratings limited by factors other than machine stability

23 Don't reach into hydraulic boom holes unless the sections are securely anchored together.



24 Lock turntable before traveling on highway. Use house lock or swing brake, and lower boom into rack to prevent swing.



25 When loading machine on trailer, always use ramp, and if riot available, use blocking to build one.

26 When traveling on the highway-
- ☐operate truck with lights on
- ☐use proper traffic warning flags and signs.
  - ☐for large units, use front or rear flag vehicles, or two flag vehicles with 2-way radios.
- ☐check local laws

27 Know the rated capacity of your crane A safe load depends on boom lengths and working radius Follow these suggestions to avoid buckling the boom or tipping'

☐know the radius of the load . remembering that radius is measured from center of rotation not from boom foot pin

☐always operate within the rated capacity of your machine

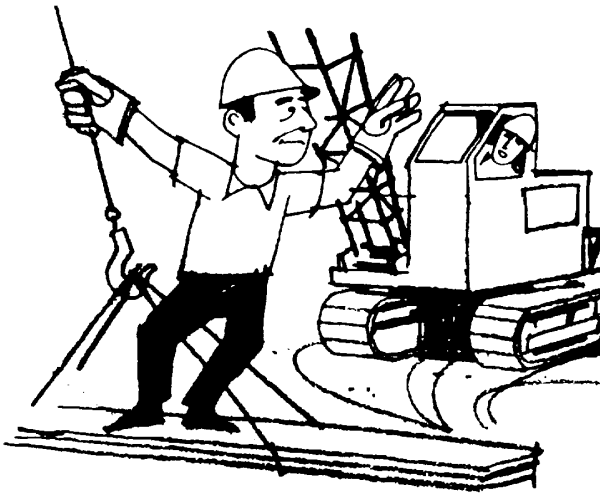
☐the safe rated capacity includes weight of hook, block and any materials handling devices such as concrete bucket, magnet, etc. Subtract the weight of all these to find the true weight of the load you can handle safely

☐safe ratings are based on operating the machine on firm, level ground . outriggers should be properly extended and/or lowered whenever possible

☐avoid fast swings, hoists or sudden braking these can cause overloads

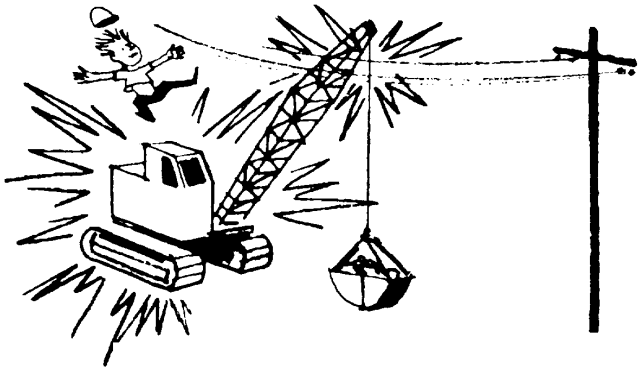
☐do not handle large, heavy loads in strong winds. The wind can catch the load and create an unstable condition.

28 Keep a sharp eye on workmen in elevated areas be careful to keep clear with swinging or falling loads.



29 Never permit anyone to ride the load or the hook.

30 Keep boom away from all overhead lines Treat all wires as hot until you have reliable information to the contrary Watch your boom clearance when traveling uneven ground may cause boom to weave or bob into power lines If necessary to work near power lines, check local or state codes If you hit a power line'



☐stay inside the cab until line is cleared or power is shut off

☐if you must leave the cab, be sure to jump completely clear of the machine

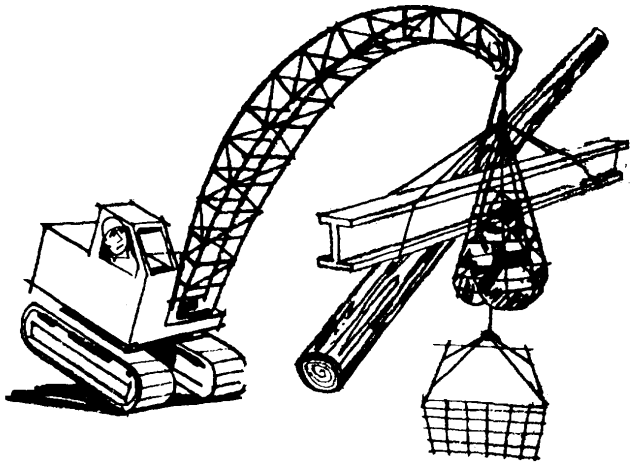
It is useless to ground a crane by driving a pipe into the ground

31 Make a "dry run" in tight areas it will help you determine the safest way to operate under existing conditions.

32 Check loads before moving them. First, determine the load weight and check against the capacity chart. Be sure the load is well secured ..lines are not kinked The hoist line should be vertical When lifting, avoid sudden starts and stops

33 Use power lowering whenever possible. When lowering heavy loads, keep hoist brake as reserve. Use safety pawl on the boom hoist drum when boom lowering is not used.

34 Do not hoist two or more separately rigged loads in one lift, even though the combined load is within the crane's rated capacity.



35 When using two machines to lift heavy or unwieldy loads-

☐use only one signalman.

☐coordinate lifting plans with the other operator before you begin.

☐know the load distribution. Arrange slings so machines correctly share the load.

36 Always use the shortest boom possible . . . and observe these precautions with any boom length:

☐make only vertical lifts ... never pull the load sideways.

☐keep speed slow in lifting and lowering loads.

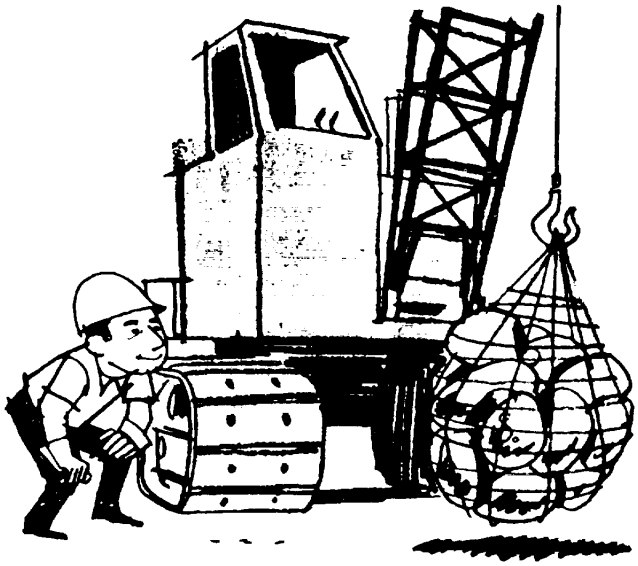
☐swing carefully, slowly . . and avoid boom or jib "whippings'"

☐don't let load strike boom or outriggers.

☐allow maximum clearance between hook block and head sheaves.

☐keep near-capacity loads as close to the ground as possible.

☐avoid hitting nearby structures with boom. If you do, inspect boom prior to next lift.

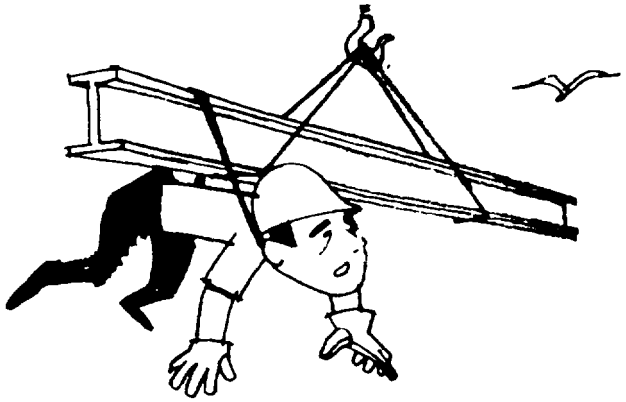


37 Test stability before lifting heavy loads. Check outrigger footing. Lift load slightly off the ground and stop ... check machine for movement and check to be sure the brakes hold with the load elevated. Never use machine stability to determine capacity. Load capacity is determined before tipping. If there are any indications of tipping, the machine is already overloaded.

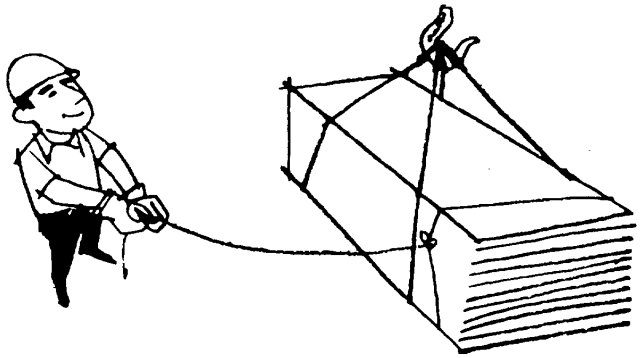
38 When swinging, watch out for "old man" centrifugal force. Swing crane slowly to avoid outward swing of the load. If necessary, attach a tagline device to the load to control the swing.

39 Watch for boom "kickback: ' Never operate with boom at a higher angle than shown on the capacity plate Know what controls give you emergency stopping.

40 Check your hitcher... be sure he's clear before starting lift. Make certain he securely attaches the load.



41 Control load at all times. To prevent excess motion during travel, use hand lines to guide or snub the load.



42 Don't use hoist lines for sling around the load and never use discarded rope to make slings.

43 Don't back crane carrying maximum load away from load. ..you may tip.

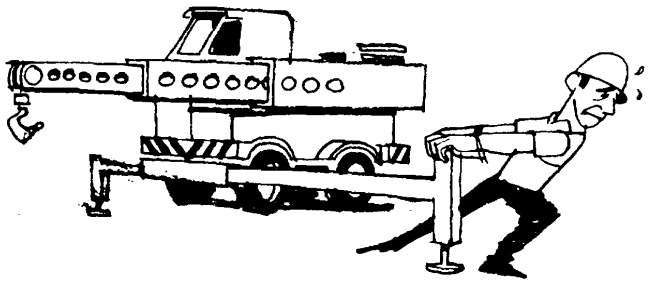
44 Look out for "two-blocking"... caused when hook block collides with boom point sheaves Continuous pull on hoist lines can break the cable or pull boom over cab on some types of booms. On hydraulically telescoping booms, be sure to pay out hoist line when extending and reel in hoist line when telescoping.

45 When using a magnet-

- ☐be especially careful of workmen.. never permit them to touch magnet or load.
- ☐sound warning signal on every load move ... and keep sounding it until workmen clear out of your path.
- ☐never move loads over workmen ... never permit anyone to be underneath magnet or load.
- ☐don't permit workmen to come between magnet and any steel object.
- ☐watch electromagnet power. . . keep terminal box cover tightly closed
- ☐open magnet switch before connecting or disconnecting magnet leads
- ☐if necessary to position a load, make sure a dry, wooden stick is used.

46 Always use outriggers to make any lifts except light loads with pick and carry units. and never lift a load forward of front outriggers unless shown on manufacturer's rating chart.

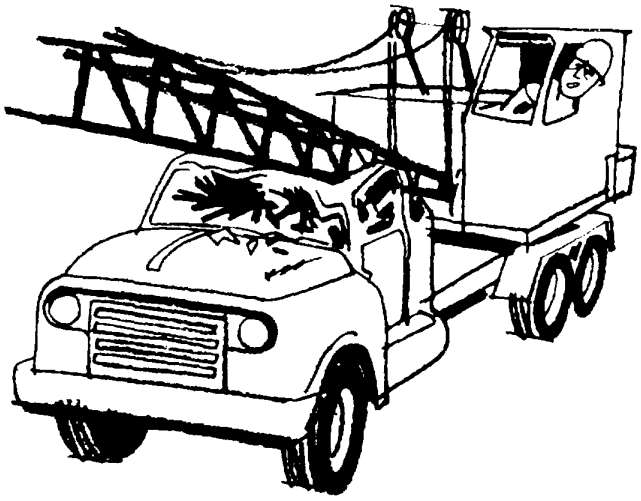
47 Lower outrigger jacks to completely. remove all {machine weight from tires and level unit to safely reach machine's full capacity. Recheck and if necessary reset outriggers between heavy lifts.



48 Always extend outrigger beams completely.

49 Lock carrier air brakes "on" when operating... and check air brakes' pressure frequently.

50 Watch out for the carrier cab on truck-mounted units when swinging the boom. Keep boom high enough to swing clear of cab.



51 When working in pit or high banks-

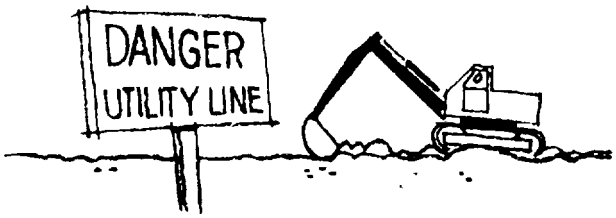
☐keep check on pit men. be quick to alert them if a cave-in appears imminent.

☐beware of caving edges and overhanging banks... undercut edges may give way... banks may slide.

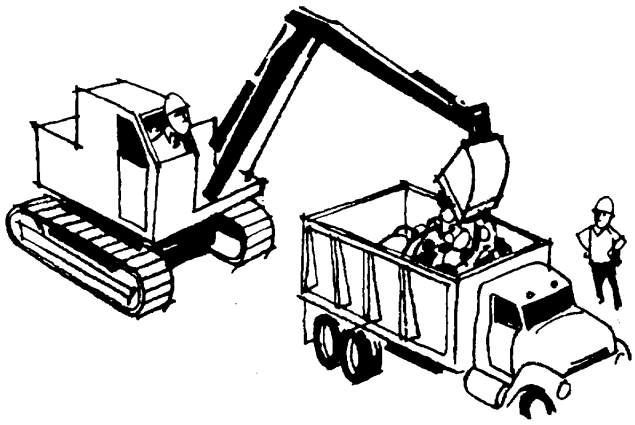
☐always position machine to let you get away quickly when digging high banks a slide may start.

☐pull machine away from high banks or edges before shutting down.

52 Know the exact location of buried utility lines... mark them clearly.



53 Load trucks from the rear. Never swing over the truck cab... and make sure the driver remains out of the truck during loading.



54 Use caution on slopes ... tipping can occur if you:

☐swing to the side when no boom is attached.

☐suddenly start or stop swing when boom point is elevated at high angle and load is near the boom point.

☐travel with load beyond safe operating radius.

☐swing load without raising boom to compensate for changed radius.

EXCAVATOR OPERATION

55 If a clutch sticks while digging release the engine clutch quickly.

56 Keep crawlers back from the edge of the hole when you're digging with a hoe.

57 When loading truck with a hoe, raise the boom at the same time you extend the dipper arm.

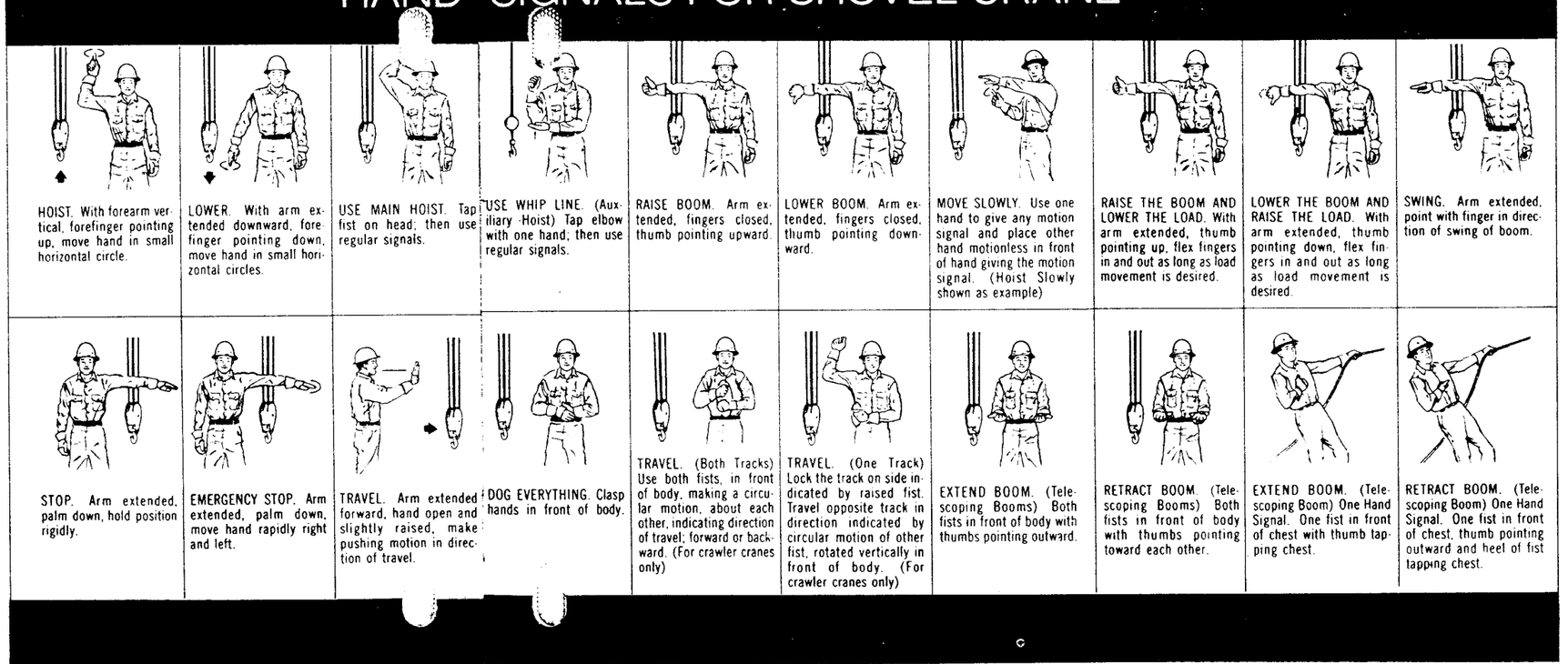
58 Watch slack lines. On a cable-operated hoe, prevent excessive hoist line slack when digging with the inhaul line.

59 Keep a tight closing line when hoisting a clamshell bucket. Never release the closing line while a bucket is being hoisted.

60 In a dragline operation, keep load radius and boom length to a minimum for maximum stability.

☆ GPO : 1973 O - 526-909

HAND SIGNALS FOR SHOVEL CRANE



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.

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, hold position rigidly.

EMERGENCY STOP. Arm extended, palm down, move hand rapidly right and left.

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 crawler cranes only)

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

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.

TEAR ALONG PERFORATED LINE

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO	TABLE NO.

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE:

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.—IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

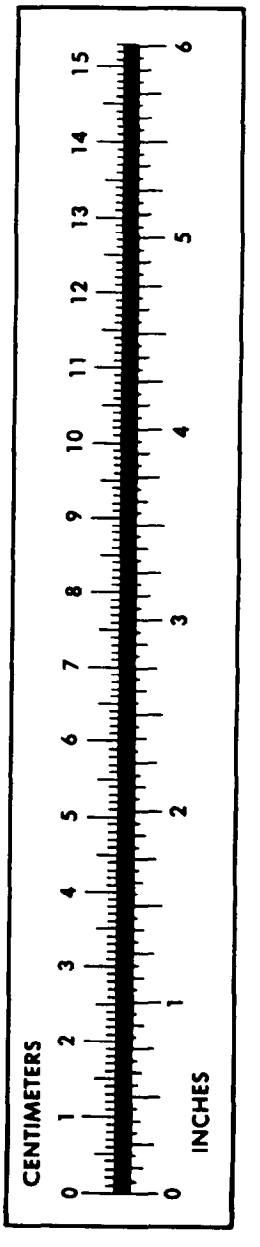
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN: 009466-000