* TB 43-0142

TECHNICAL BULLETIN

SAFETY INSPECTION AND TESTING OF LIFTING DEVICES

This technical bulletin supersedes TB 43-0142, dated 30 August 1993, including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY
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DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

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SAFETY INSPECTION AND TESTING OF LIFTING DEVICES

Headquarters, Department of the Army, Washington, DC
28 February 1997

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

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TABLE OF CONTENTS

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1. Purpose. This bulletin prescribes responsibilities, procedures, and guidance for implementing the requirements of the Occupational Safety and Health Act (OSHA) of 1970, as amended to date, to be used in the accomplishment of safety inspections and testing of lifting devices.

NOTE

When specific Department of the Army (DA) inspection, load, and/or proof testing requirements have been published for designated lifting equipment, those requirements will take precedence over procedures in this bulletin. There may be instances where host nation standards may apply. In those cases the more stringent standards will be met.

2. Scope. This bulletin applies to Headquarters, Department of the Army Major Commands (Including subordinate commands, installations and activities) and separate installations and activities reporting directly to Headquarters, Department of the Army.

3. Definitions. For the purpose of this publication, the following definitions apply:

a. Lifting Devices. Any device or component used to raise, lower, hold, or position a load from one location or elevation to another. Examples of lifting devices include forklift trucks, cranes, manual or motorized pallet jacks, hoists, wreckers, A-frames, slings, ropes, wire ropes, hooks, O-rings, pear rings, spreader bars or lifting clamps, beams, jacks, safety stands, and jack stands.

b. Lifting Fixtures. Any device or assembly of devices used to facilitate attachment of a load to a lifting device. Examples of lifting fixtures include an H-beam with nylon slings, wire rope with spreader bars or rope with lifting clamps.

c. Periodic. As related to inspections, a period of one year or less, based upon the nature of the lifting device and the degree of exposure to wear, deterioration, or malfunction.

NOTE

On-vehicle equipment (jacks, winches, and towing equipment), commercial wreckers, and lifting devices that are a “special application” part of weapons systems and covered by other technical manuals (TMs)(i.e., lifting slings [beams] that are part of a warhead section, i.e., Pershing 1A) are exempt from requirements of this bulletin when covered by specific TMs.

d. Load Rating. The load rating is the maximum authorized load that may be lifted by a lifting device. The load rating may be less than or equal to, but shall not exceed the Manufacturer’s Rated Load. For fixtures, the smallest Manufacturers Rated Load component shall equal the fixtures rated load.

e. Manufacturer’s Rated Load. The Manufacturer’s Rated Load is the maximum load that a piece of equipment and/or its accessories are allowed to lift; based on the equipment’s capacity data plate or other guidance from the manufacturer.

f. Retrofit or Modification Work Orders (MWOs). A publication or directive authorizing rework modification.

g. Depot Maintenance Work Requirements (DMWRs). Precise criteria and definite instructions for the overhaul, repair, or reconditioning process and final operational test of equipment prior to the acceptance and certification for placement in service.

4. Requirements.

NOTE

A test load, when required by paragraph 4, may exceed the manufacturer's rated load as much as the applicable percentage in Table 1.

NOTE

The requirements of Title 29, Code of Federal Regulations, Parts 1915, 1917, 1918, and 1919 take precedence over this bulletin for lifting devices used in maritime application.

a. Testing.

(1) Prior to initial use, all new, extensively repaired, or altered lifting devices shall be given a rated load test. Manufacturers and repair activities should perform this test and provide written certification of load testing to the using activity. If load test certification is not obtained or available, using activities shall arrange for testing (refer to paragraph 4a(4)), through General Support (GS) or Direct Support (DS) maintenance activities. Manufacturer's certification or other records of rated load testing shall be maintained by the using activity.

(2) Prior to initial use, all new, extensively repaired, or altered lifting devices shall be given a functional test to determine operability of the equipment. Functional testing requirements are indicated in the applicable appendix of this bulletin. Before performing the functional test, the proper operation of brakes and limit, locking, and other safety devices shall be tested under no-load conditions.

(3) Lifting devices which have been idle for one year or more shall be functionally tested at 100 percent of the rated load prior to use.

(4) To determine the test load, refer to Table 1 unless other parameters are specified by the manufacturer. The load rating may be less than or equal to, but shall not exceed the Manufacturer's Rated Load. For fixtures, the smallest Manufacturer's Rated Load component shall equal the fixture's rated load.

(a) Test loads for all types of cranes and hoists may take the form of a calibrated load indicator, a calibrated dynamometer, weights that may be locally fabricated, or any available item of proper weight. All load testing devices, i.e., load indicator and dynamometer, shall have a valid calibration label affixed in a conspicuous place. All locally fabricated weights and available items used for load testing must be verified for proper weight by the use of a calibrated scale.

(b) Test loads for forklift trucks should be made from pallet loads with load center locations corresponding to Manufacturer's Rated Load data.

(5) Upon successful completion of the load test, the lifting device will be assigned the load rating chosen in (4) above. The load rating shall be clearly marked on the device. In addition, the load rating shall become a part of the maintenance records of the equipment in accordance with paragraph 6e.

(6) Preventive maintenance intervals and additional load testing may be established locally based on the type of materials handled, equipment utilization, local requirements or conditions, manufacturer's recommendations, and special requirements.

Table 1. Load Testing Parameters

Item	Test Load (Given as percentage of load rating)
Cranes, Mobile All Capacities	110%
Cranes, Fixed All Capacities	125%
Hoists, Powered or Manual All Capacities	110%
Forklift Trucks	100%
Jacks	100%
Metal Mesh Slings All Sizes	150%
Wire Rope*	. . . .
Wire Rope, Chain or Synthetic Web**	200%
Lifting Fixtures ***	200%
All other Lifting Devices	100%

* When tested as an integral part of a lifting device which is listed elsewhere in this table, use the Maximum Test Load for that device.

** When tested separately from other lifting device components.

*** When the rope, chain, or synthetic web is easily removed from a fixture, it should be tested separately.

b. Inspection.

(1) Prior to initial use of all new, extensively repaired, or altered lifting devices, visual inspection shall be performed in accordance with the criteria specified in (2) below, and the applicable appendix under both daily and periodic inspection criteria. This inspection shall be performed before, during, and after load testing (paragraph 4a).

(2) All lifting devices shall be inspected in accordance with the applicable appendix of this bulletin, applicable equipment TM, manufacturer's recommendations, and the following minimum criteria:

NOTE

Locally developed forms should be used to record the accomplishment of daily inspections. To provide operators of lifting equipment with daily safety inspection information, it is advisable to attach a card, placard, or other means of describing pertinent inspection criteria contained in the appendixes of this bulletin.

(a) Daily inspection of lifting devices shall be performed by the operator before use. Also, prior to use, lifting devices which have been idle for one month or more, but less than six (6) months, will be given an inspection in accordance with daily inspection criteria, plus a thorough, documented inspection of wire ropes, crane hooks, and crane hoist chains in accordance with the criteria in Appendix A, paragraph A-2. Daily inspections should comply with the criteria specified in the appropriate technical manual for the device or the applicable appendix of this bulletin. Manufacturer's manuals will also be used for commercial equipment as available.

(b) For cranes, monthly documented inspections shall be conducted on critical items in use such as hooks, wire ropes, brakes, and hoist chains. Operator or Unit Maintenance personnel who are technically experienced and qualified may be designated to perform these inspections. Specific inspection requirements are indicated in Appendix A of this bulletin.

(c) Periodic inspections shall be conducted by Unit Maintenance personnel, assisted by Operator/Crew personnel, at least every twelve (12) months and prior to the use of lifting devices which have been idle for six (6) months or more. Periodic inspection criteria in the appropriate appendix, manufacturer's documentation, and applicable equipment TMs shall be used to determine serviceability of the equipment.

(d) Periodic inspections of lifting devices for handling hazardous materials such as ammunition and explosives, molten metals, acids. strong caustics, and flammable and toxic materials shall include a functional test. The periodic inspection and functional test procedures shall be repeated before handling any load heavier than that lifted in the last functional test. The heaviest load shall never exceed the load rating of the lifting device.

(e) Inspection and test results, excluding daily inspections, shall become part of the maintenance record of the lifting device. Refer to paragraph 6e.

5. Responsibilities.

a. The director of Installations and Services, Headquarters, and Major Commands, is responsible for overall supervision and management of the program.

b. The commander of each DA Major Subordinate Command (MSC), installation, and activity is responsible for the inspection, testing, and maintenance of all authorized lifting devices which are authorized his/her command, and will designate the appropriate support activity to perform these services.

c. The Chief, Safety Office or the military equivalent, i.e., safety officer, will assist/advise the commander and equipment manager in establishing programs for inspection and testing of lifting devices.

d. Immediate supervisors of operations that use the lifting devices shall assure that the operators perform daily inspections as required by paragraph 4.b.(2)(a).

e. The Operator and/or Unit level of maintenance may inspect and test tool set components that are secondary items when required by paragraph 4. These include hydraulic jacks, rings, hooks, spreader bars, "A"-frames, lifting clamps, and inspection stands.

6. Procedures. At the installation level, the equipment manager shall:

a. Ensure that only qualified personnel are assigned to the inspection, testing, and maintenance of lifting devices.

b. Ensure that test operators are carefully selected, and thoroughly trained before they are permitted to test-operate powered materials handling equipment.

c. Ensure that signalmen/operator helpers, or personnel supervising load test lifts, are thoroughly knowledgeable of standardized hand signals.

d. Ensure that maintenance, inspection, and testing programs are initiated and conducted for all lifting devices in accordance with the requirements of this publication, or the applicable Department of the Army technical publications for special type or special use lifting devices, when appropriate. Tool set components such as hydraulic jacks, rings, hooks, spreader bars, "A"-frames, and lifting clamps are considered secondary items and their inspection and testing (when required by paragraph 4) may be accomplished at the Unit Maintenance level. (Testing will be accomplished by support maintenance when units are unable to because of lack of equipment or expertise.)

e. Ensure that maintenance records for each lifting device are initiated and maintained in accordance with DA Pam 738-750. Monthly (cranes only) and periodic inspections, and required tests should be scheduled on DD Form 314 (Preventive Maintenance Schedule and Record), or through Automatic Data Processing (ADP). The records should include:

(1) Nomenclature of the lifting device, including manufacturer's rated load.

(2) Identifying marks, i. e., serial number, date of manufacture, etc.

(3) Test certification (DD Form 314 entry signed by test operator or test director; or manufacturer's or repair contractor's certificate), attesting to the fact that a load test has been successfully passed.

(4) Location of stationary lifting devices or location of responsible organization for mobile or portable lifting devices.

(5) Schedule and record of inspections.

(6) Schedule of tests and records of result, including current load rating of the lifting device, and data describing the characteristic load (for lifting devices handling hazardous materials), etc.

(7) Schedule of maintenance services.

(8) Records of parts replaced.

(9) The critical dimensions of all features of lifting devices whose functional serviceability is determined by wear.

(10) Any additional data pertinent to identification or safe operation.

(11) Signature of the person who performed the inspection.

f. Establish a marking system and mark all equipment in accordance with requirements of AR 750-1 and this publication.

NOTE

Stenciling is not required on lifting devices seven or more feet above floor level.

(1) The load rating and date of the next periodic inspection shall be stenciled on crane booms and other basic units. The stencil should be of sufficient size and be located so it will be clearly visible from the ground and from the operator's position.

(2) Hoists, chains, slings, and hooks have permanently affixed durable identification number, load rating, and next periodic inspection date and shall be marked to indicate the item identification number, load rating, and updated to indicate the next periodic inspection date. This marking may be accomplished by means of color coding, pressure sensitive tapes, metal tags, or a combination of these methods. Hooks shall not be painted, as doing so would cover small cracks.

(3) "A"-frames, shop floor cranes, hoist beams, jack stands, and jacks, shall be stenciled with the load rating and date of the next periodic inspection.

(4) Forklifts shall be stenciled on the side of the mast to the operators left with load rating and the date of the next periodic inspection. Stenciled letters should be one inch or larger in size.

(5) Lifting fixtures shall be marked to indicate use of fixture, the load rating, source of load rating, and next periodic inspection date. This marking may be accomplished by means of color coding, pressure sensitive tapes, metal tags, or a combination of these methods. Hooks shall not be painted as doing so would cover small cracks.

NOTE

Under no circumstances shall these markings be painted over or removed, except for maintenance or inspection, or change of the forklift's load rating, at which time the item will be re-stenciled.

g. Ensure that daily and periodic inspections are performed in accordance with this publication or the applicable technical manuals for special type or special use lifting devices, when appropriate. Preventive maintenance should be scheduled and performed in accordance with applicable technical publications, and/or manufacturer's manuals, as available.

7. References.

a. Occupational Safety and Health Act (OSHA) of 1970 and the standards adopted therein, Department of Labor (OSHA Standards are available from the Superintendent of Documents, Government Printing Office, Washington, DC 20402).

b. ARs 385-10,385-40,750-1.

c. TMs 5-725, and 9-1300-206.

d. TBs 9-352,9-1100-804-15, and 43-0209.

e. DA PAM 738-750.

f. General Industry Standard 29 CFR Parts 1910.178 - 1910.184 and 1910.244.

g. American National Standards Institute (ANSI) Standards (ANSI Standards are available from the American National Standards Institute, 1430 Broadway, New York, NY 10018).

(1) B30.1, Safety Code for Jacks.

(2) B30.2, Safety Code for Overhead and Gantry Cranes.

(3) 830.4, Safety Standard for Portal, Tower and Pillar Cranes.

(4) 830.5, Safety Code for Crawler, Locomotive and Truck Cranes.

(5) 830.6, Safety Code for Derricks.

(6) 830.7, Safety Code for Base Mounted Drum Hoists.

(7) B30.8, Safety Standard for Floating Cranes and Floating Derricks.

(8) B30.9, Safety Standards for Slings.

(9) 830.11, Safety Standards for Monorail Systems and Underhung Cranes.

(10) B30.15, Safety Standards for Mobile Hydraulic Cranes.

(11) B30.16, Safety Standard for Overhead Hoist.

(12) 856.1, Safety Standard for Powered Industrial Trucks

h. Wire Rope Users Manual, Second Edition, American Iron and Steel Institute, l000-16th Street, N.W., Washington, DC 20036.

APPENDIX A
CRANES

A-1. Daily Inspection.

a. The following items shall be inspected daily or prior to use:

(1) All controls and operating mechanisms for maladjustments, excessive wear, or contaminated by leaking lubricants or foreign material.

(2) All safety devices for malfunction.

CAUTION

Raise and lower the hoisting mechanism very slowly when testing limit switches.

(3) All installed hoist and travel limit switches should be checked for failure by raising and lowering throughout the full range of the lifting device with no load other than that of the hoisting mechanism. The hoisting mechanism should be raised and lowered very slowly when testing limit switches.

(4) Air or hydraulic systems components for deterioration or leakage. Hydraulic fluid leakage is classified as follows:

(a) Class *I.* Seepage of fluid (as indicated by wetness or discoloration} not great enough to form drops.

(b) *Class II.* Leakage of fluid great enough to form drops but not enough to cause drops to drip from the item being checked/inspected.

(c) *Class III.* Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

(5) Crane load hooks for deformation, cracks, wear, damage or malfunctioning latch and hook attachment. Refer to paragraph A-2.b. for criteria.

(6) Electrical apparatus for malfunction, signs of excessive deterioration, dirt, and moisture accumulation.

(7) All rope and cables for improper rigging and excessive wear, or damage; refer to Appendix C, paragraph C-1 .a. for criteria.)

(8) Hoist chains for excessive wear, twist, distorted links, stretch, etc.; refer to Appendix C, paragraph C-1.b. for criteria.)

b. When any of the above items are found to exist, further operations of the crane will be discontinued until it has been corrected or determined to present no hazard. An exception is that equipment operation is allowable with Class I or II hydraulic leaks provided consideration is given to the fluid capacity of the equipment and fluid levels continue to be checked as normally required. This exception does not apply to leakage of hydraulic brake systems.

A-2. Monthly Inspections. Monthly inspections shall include the items of paragraph A-1 above and the following:

a. **Wire Rope** Make a thorough documented inspection of all ropes. Particular attention shall be given to inspection of rope sections subject to rapid deterioration, such as the following:

• Sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited;

Sections of rope at or near terminal ends; sections subject to reverse bends;

Sections normally hidden during daily visual inspections; and

Repetitive pickup points on drums.

Presence of any of the following shall be cause for removal from service:

(1) **Broken Outside Wires.** Those sections of the rope subjected to reverse bends and operation over small diameter drums or sheaves require particularly close attention; refer to Appendix C, paragraph C-2.a.(1) for criteria.

(2) **Reduction of Rope Diameter.** Measure for reduction of rope diameter. Several measurements shall be taken at locations subject to the most stress and wear; refer to Appendix C, paragraph C-2.a.(2) for criteria.

(3) **Worn Outside Wires.** Refer to Appendix C, paragraph C-2-a.(3) for criteria.

(4) **Corroded, Broken, or Frayed Wires at End Connections.** Refer to Appendix C, paragraph C-2.a.(4) for criteria.

(5) Corroded, cracked, bent, worn, improperly sized, or improperly applied end connection.

(6) Severe kinking, crushing, cutting, or unstranding.

(7) Evidence of damage due to welding arc or other heat sources.

(8) No less than two full wraps of rope remaining on the hoist drum is permitted when the hook is in it's extreme low position with the boom in it's most upright position. The rope end shall be securely attached to the drum by the clamp or socket arrangement approved by the crane or rope manufacturer. The same limit applies to the boom hoist drum rope when the boom is in its extreme low position.

b. **Hooks.** Perform a documented inspection of crane hooks for cracks, throat opening of more than fifteen percent in excess of normal, more than ten degree twist from the plane of the unbent hook or wear exceeding ten percent of the original dimensions. Remove hooks from service if they meet one or more of the above criteria. Remove hooks having any visual evidence of an increase in throat opening, twisting, or deformation of any sort from service when the original dimensions of the hook are not known.

c. **Hoist Chains.** Perform documented inspection of hoist chains for excessive wear, twist, distorted links, or stretch beyond manufacturer's recommendation. Refer to Appendix C, paragraph C-2.b., for criteria.

A-3. **Annual Inspections.** Complete inspection of cranes shall be performed at the intervals defined in paragraph 4. These inspections should include the items of A-1 and A-2 above, requirements of any applicable technical manuals, and the following:

a. **General.** Check for:

(1) Proper marking to include load ratings and date of next periodic inspection.

(2) Evidence of mishandling and/or damage.

(3) Deformed, cracked, broken, missing or corroded members in crane structure and boom.

(4) Loose bolts or rivets.

(5) Cracked or worn sheaves and drums

(6) Worn, cracked, or distorted parts such as pins, bearings, shafts, gears, rollers, and clamping devices.

(7) Electrical apparatus, for signs of pitting or any deterioration of controller contactors, limit switches and pushbutton stations.

(8) Excessive wear on brake and clutch system parts, linings, pawls, and ratchets.

(9) Load, boom angle, wind, and other indicators over their full range for any significant inaccuracies. For all of the above indicators, the indicated value shall be no greater than 119 percent, and no less than 97 percent of the actual (true) value. For any conversions required by the operation, such as converting boom angle degrees into radius feet, a conversion chart shall be provided.

(10) Gasoline, diesel, electric, or other power plants for improper performance or noncompliance with safety requirements.

(11) Steering, braking, locking, and travel devices for malfunction.

(12) Excessively worn or damaged tires or tracks, when applicable.

(13) Excessive wear of chain drive sprockets and excessive chain stretch.

b. Booms. Check for bends, distorted sections, broken welds, excessive corrosion, loose bolts or rivets, and operable weights and boom angle indicator.

NOTE

Usage and testing of repaired (rebuilt) and or modified lattice type booms is authorized only upon approval by the National Maintenance Point (NMP).

c. Drums, Sheaves, Pulleys. Check for:

(1) Smoothness and freedom from surface defects.

(2) Eccentric bores, cracked hubs, spokes, or flanges. (Any of these defects will cause the crane to be removed from service.)

(3) Size and configuration of grooves. A sheave or pulley with a ten percent increase in groove depth or internal flange width due to wear or distortion shall be replaced.

(4) Sheave pitch diameters:

(a) Boom hoisting sheaves shall have pitch diameters of not less than fifteen times the nominal diameter of the wire rope used.

(b) Load hoisting sheaves shall have pitch diameters of not less than eighteen times the nominal diameter of the rope used.

(c) Hook block sheaves shall have pitch diameters of not less than sixteen times the diameter of the rope used.

(5) Cracked or worn sheaves and drums.

(6) Proper sheave diameter. The minimum safe operating and the critical diameters given by rope manufacturers are in Table A-1, where “d” is the nominal diameter.

Table A-1. Sheave Diameters

Rope Construction	Minimum Diameter,[1]	Critical Diameter[2]
6 X 19 Scale	34d	20d
6 X 16 Filler Wire	30d	16d
6 X 19 Warrington	30d	16d
Flattened Strand	30d	
8 X 19 Scale	26d	16d
8 X 19 Filler Wire	26d	
8 X 22 Filler Wire	23d	
8 X 19 Wanington	21d	14d
8 X 37 Scale	18d	14d
8 X 41	18d	
6 X 6 X 7 Filler Rope	. . .	10d

[1]Measure sheave diameter between the bottom of the groves on opposite sides and not the overall flange diameter.

[2]Critical diameter is the diameter of the smallest bend for a given wire rope which permits the wires and strands to adjust themselves by relative movement while remaining in their normal position.

[3]Military specifications normally specify 16 by 37 inch wire rope with an 16d sheave at the time of end item procurement. (e.g., 6 by 37 by 1/2 inch diameter wire rope. [18 by 1/2 = 9 inch sheave diameter]).

(7) Rope properly secured to the drum. When the crane or hoist is in its extreme upright and extended position and the hook is touching the ground, there shall be two full wraps of cable remaining on the drum. The same limits prevail for the boom hoist drum rope when the boom is in its extreme low position. Pay particular attention to those positions of the rope subjected to reverse bends and operation over small diameter drums and sheaves.

NOTE

The continued use of wire rope of reduced diameter will cause sheave distortion.

(8) Compatibility with type of use. For example, rope used on ingot pouring cranes and cranes exposed to high heat must have a steel wire core. A corrosive resistant core and/or galvanized finish is required for an excessively corrosive exposure. Fiber core wire rope slings of all grades should not be exposed to temperatures in excess of 200 F.

(9) Excessive wear of chain-drive sprockets and excessive chain stretch.

d. Hydraulic Systems.

(1) Hydraulic Hoses, Fillings, and Tubing Inspection. All hydraulic hoses, fittings and rigid tube lines should be inspected. Particular attention should be given to those hoses which flex in normal operation of crane functions. Any deterioration should be carefully examined and

determination made as to whether further use of the component would constitute an undue hazard. Conditions such as the following should be sufficient reason for replacement:

(a) Any evidence of hydraulic oil leakage at the surface of the flexible hose or its junction with the metal end couplings.

(b) Any blistering or abnormal deformation to the outer covering of the hydraulic hose.

(c) Hydraulic oil leakage at any threaded or clamped joint that cannot be eliminated by normal tightening or recommended procedures.

(d) Evidence of excessive abrasion or scrubbing on the outer surface of a hose, rigid tube, or hydraulic fitting. Means should be taken immediately to eliminate the interference of the elements in contact or otherwise protect the components.

(2) Pumps and Motors. The following may be reason for replacement or repair:

(a) Loose bolts or fasteners.

(b) Leaks at joints between sections.

(c) Shaft seal leaks.

(d) Unusual noises or vibration.

(e) Loss of operating speed.

(f) Excessive heating of the hydraulic oil.

(3) Valves. The following may be reason for replacement or repair:

(a) Cracks in valve housing.

(b) Improper return of spool to neutral position.

(c) Leaks at spools or joints.

(d) Sticking spools.

(e) Failure of relief valves to attain correct pressure setting.

(4) Cylinders. The following may be reason for replacement or repair:

(a) Drifting caused by oil leaking across piston.

(b) Rod seals leaking.

(c) Leaks at welded joints.

(d) Scored, nicked, or dented cylinder rods.

(e) Dented case (barrel).

(f) Loose or deformed rod eyes or connecting joints.

(5) Filters. Evidence of rubber particles on the fitter element may indicate hose, O-ring, or other rubber component deterioration- Metal chips or pieces on the filter may denote failure in pumps, motors, or cylinders. Further checking will be necessary to determine origin of the problem before corrective action can be taken.

e. Wire Ropers. A thorough documented inspection of all ropes shall be made. Presence of any of the following shall be cause for removal from service:

(1) Broken outside wires. Those sections of the rope subjected to reverse bends and operation over small diameter drums or sheaves should be given particularly close attention; refer to Appendix C, paragraph C-2-a.(1) for criteria.

(2) Reduction of rope diameter below normal value. The continued use of wire rope of reduced diameter will cause sheave distortion; refer to Appendix C, paragraph C-2-a.(2) for criteria.

(3) Worn outside wires; refer to Appendix C, paragraph C-2-a.(3) for criteria.

(4) Corroded, broken, or frayed wires at end connections; refer to Appendix C, paragraph C-2.a.(4) for criteria.

(5) Corroded, cracked, bent, worn, improperly sized, or improperly applied end connections.

(6) Severe kinking, crushing, cutting, or un-stranding.

(7) Evidence of damage due to welding arc or other heat sources.

(8) No less that two full wraps of rope remaining on the hook line drum is permitted when the hook is in its extreme low position with the boom in its most upright position and the rope end is securely attached to the drum by the clamp or socket arrangement approved by the crane or rope manufacturer. The same limit applies to the boom hoist drum rope when the boom is in its extreme low position.

f. Hooks.

(1) Inspect for cracks, throat opening of more than fifteen percent in excess of normal, more than a 10 degree twist from the plane of the unbent hook, or wear exceeding ten percent of the original dimensions. Remove hooks from service if they meet one or more of the above criteria. (When original dimensions of hook are not known or when measuring devices are not available, hooks having any visual evidence of an increase in throat opening, twisting, or deformation of any sort will be removed from service.)

(2) Any questionable condition disclosed by visual inspection shall warrant the use of magnetic particle or other suitable crack detection or inspection methods.

(3) Swivelling type hooks should rotate freely. Repair or alteration of hooks by welding or reshaping is not recommended. Hooks shall have safety closure latches properly positioned and functional, except when the use of a hook with a safety closure may create additional hazards in operations. In these instances, the local commander may give written approval to deviate from this requirement. This approval should be reviewed annually to ensure that the need for the deviation is still valid.

(4) Hooks shall not be painted. Paint will cover small stress cracks from metal fatigue due to repeated usage. New hooks shall have all paint removed prior to being placed in service.

g. Hoist Chains. Perform documented inspection of hoist chains for excessive wear, twist, distorted links, or stretch beyond manufacturer's recommendations. Refer to Appendix C, paragraph C-2-b., for criteria.

A-4. Tests. When required by paragraph 4a, perform a functional test to determine operability of the equipment. Functional testing shall consist of lifting a characteristic load (determined locally), holding it at an appropriate height for one minute, maneuvering it in a manner which will simulate the operation of the lifting device in the working environment, and towering it to its original position. For lifting devices used to handle hazardous materials, conduct the function test as above, using an inert item equal in weight to or heavier than (not to exceed the manufacturers load rating of the device) the heaviest item normally lifted by the devices as its characteristic load. A visual inspection will be performed prior to and after functional test is performed. Record pretest and post-test findings, actions taken, and test date in the end item's historical records.

A-5. Standby Cranes. Cranes used for standby service shall be inspected at least semi-annually in accordance with the criteria in paragraph A-3. Such cranes which are exposed to adverse environment should be inspected more frequently.

APPENDIX B
HOISTS

B-1. Daily Inspection. Hoists shall be visually inspected daily or before use using the criteria specified in Appendix A, paragraph A-1.

B-2. Periodic Inspections. Complete inspection of hoists shall be performed at the intervals defined in paragraph 4-b.(2)(c). Hoist inspections can make use of the criteria in the other appendices as well as technical manual requirements (where applicable), plus the following:

a. General.

(1) Check for proper markings.

(2) Check for evidence of mishandling and or damage.

(3) Perform normal preoperational maintenance, inspections, and checks.

(4) Refer to paragraph A-3.a. for additional inspection criteria.

b. Structural Members. Check for bends, distorted sections, broken welds, excessive corrosion, and loose bolts and rivets.

c. Hooks. Refer to Appendix A, paragraph A-3.f.

d. Power Systems. Check for satisfactory operation and compliance with applicable preventive maintenance and safety requirements.

e. Safety Equipment. Inspect all safety equipment, including limit stops, for wear or damage and to insure proper affixment and functioning.

f. . Wire Rope. Refer to Appendix A, paragraph A-3.e.

g. Chains. Refer to Appendix C, paragraph C-2.b.

B-3. Tests. When required by paragraph 4a, perform a functional test to determine operability of the equipment. Functional testing shall consist of lifting a characteristic load (determined locally), holding it at an appropriate height for one minute, maneuvering it in a manner which will simulate the operation of the lifting device in the working environment, and lowering it to its original position. For lifting devices used to handle hazardous materials, conduct the function test as above, using an inert item equal in weight to or heavier than (not to exceed the manufacturers load rating of the device) the heaviest item normally lifted by the devices as its characteristic load. A visual inspection will be performed prior to and after functional test is performed. Record pretest and post-test findings, actions taken, and test date in the end item's historical records.

APPENDIX C
SLINGS

(Wire rope; Chains; Metal mesh; Rope: Natural and synthetic fiber; Synthetic web: Nylon, polyester, and polypropylene.)

C-1. Daily Inspection. Visual inspection of slings and all fastenings and attachments shall be conducted daily or before use using the following minimum criteria. Where a degraded condition is found to exist, paragraph C-2 should be checked for further reject/accept criteria. Damaged or defective slings shall be immediately removed from service.

a. Wire Rope Slings. Check for:

(1) Reduction of rope diameter below nominal value.

(2) Broken outside wires.

(3) Worn outside wires.

(4) Corroded, broken, or frayed wires at end connections.

(5) Corroded, cracked, bent, worn, improperly sized, or improperly applied end connections.

(6) Severe bending (Figure C-1), kinking (Figure C-2), crushing (Figure C-3), caging (Figure C-4), or a popped core (Figure C-5).

(7) Evidence of damage due to welding arc or other heat sources.

Figure C-1. Bending

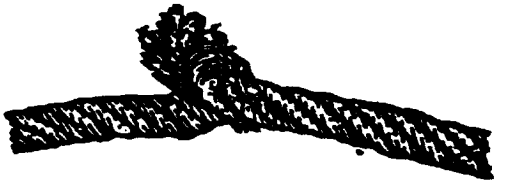


Figure C-2. Kinking

Figure C-3. Crushing

Figure C-4. Caging

Figure C-5. Popped Core

b. Chain Slings. Check for:

(1) Excessive wear or stretch.

(2) Bent or twisted links

(3) Defective welds.

(4) Nicks and gouges.

c. Metal Mesh Slings. Check for:

(1) Unpadded sharp comers.

(2) Evidence of twisting or kinking.

(3) A broken weld or brazed joint along the sling edge.

(4) A broken wire in any part of the mesh.

(5) Reduction in wire diameter.

(6) tack of flexibility due to distortion of the fabric.

(7) Distortion of handle.

(8) Evidence of heat damage.

d. Rope (Natural and Synthetic Fiber) Slings. The existence of any of the following conditions will require that the sling be immediately removed from service:

(1) Abnormal wear.

(2) Powered fiber between strands.

(3) Broken or cut fibers.

(4) Variation in the size or roundness of strands.

(5) Discoloration or rotting.

(6) Distortion of hardware in the sling.

(7) Fiber rope slings shall not be used if end attachments which are in contact with the rope have sharp edges or projections.

e. Synthetic Web Slings.

(1) Each sling shall be marked or coded to show the rated capacities and type of synthetic web material.

(2) Synthetic webbing should be of uniform thickness and width and selvage edges should not be split from webbings width.

(3) Fittings should be free of all sharp edges that could in any way damage the webbing.

(4) Sling surface should have no evidence of melting or charring from acid, caustic, or other burns.

(5) In addition, check for the following:

(a) Snags, punctures, tears, or cuts.

(b) Broken or worn stitches.

(c) Distortion of fittings.

f. Hoisting Beam Slings. This type sling is commonly used for removing engines or power packs from aircraft and combat vehicles. Inspect these slings for the following conditions:

(1) Proper assembly.

(2) Cracked or broken welds.

(3) Bent or loose bolts, rivets, pins and other attachment devices.

(4) Excessive wear or corrosion.

(5) Distortion of hoist attachment or terminal ring.

(6) Defects associated with wire rope, chain, metal mesh, or synthetic web components (refer to paragraphs C-1.a. through C-1.e. for specific inspection requirements.)

C-2. Periodic Inspections. A thorough periodic inspection of slings shall be made on a regular basis, to be determined by frequency of sling use, severity of service conditions, nature of lifts being made, and experience gained on the service life of slings used in similar circumstances. Such inspections shall in no event be at intervals greater than once every 12 months. Criteria in paragraph C-1, and the following should be used:

a. Wire Ropes Wire Rope Slings. Check for:

(I) Broken wires, Replace the wire rope when six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay are found. Broken wire count should be made of the worst strand at the worst section of the wire rope and confined to the distance required for one strand to make one complete turn around the rope. Broken wire count wilt be entered on the test record.

(2) Reduction In diameter. Marked reduction in diameter of wire rope may indicate loss of core support. Replacement should be made when reductions are more than:

1/64 inch for diameters up to and including 5/16 inch.

1/32 inch for diameters 3/8 inch up to and including 1/2 inch.

3/64 inch for diameters 9/16 inch up to and including 3/4 inch.

1/16 inch for diameters 7/8 inch up to and including 1-1/8 inch.

3/32 inch for diameters 1-1/4 inch up to and including 1-1/2 inch.

(3) Wear. Replace when wear of one-third the original diameter of outside individual wires is observed.

(4) Condition of end attachments.

(a) Special attention should be given to end attachments. Ropes should be examined frequently at socketed fittings, and upon the development of one broken wire adjacent to this point, the rope should be r-e-socketed or replaced. Re-socketing should not be attempted if the resulting rope length will be insufficient for proper operation.

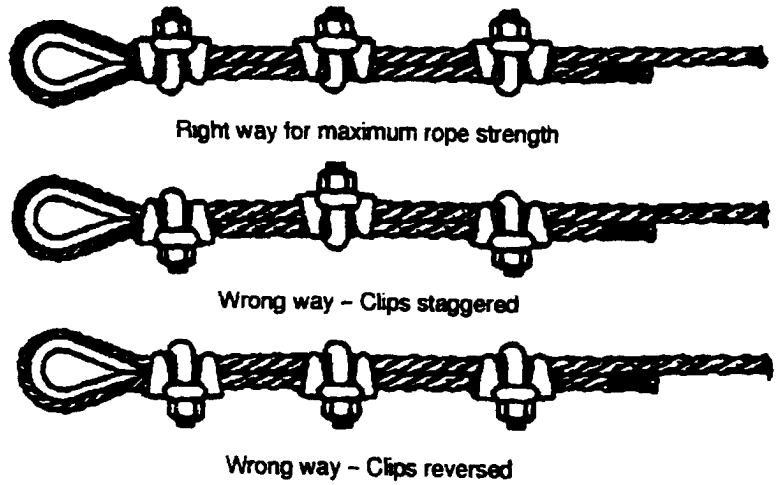


Figure C-6. Slings

(b) When eyes are formed using wire rope clips, the clips will be spaced six diameters of the rope apart. The clips U-bolts will be installed on the dead end of the rope with the base against the live end; see Figure C-6. Nuts on U-bolts should be checked after initial use and re-tightened, if necessary, to the torque specifications in Table C-1. The number of clips and the proper torque necessary to assemble wire rope eye-loop connections with a nominal efficiency of 80 percent is as follows:

Table C-1. Wire Rope Clip Specifications*

Rope diameter (inches)	Torque to be applied to nuts to clips (ft-lbs)	Number of clips	Nominal size of clips (inches)
5/16	25	3	3/8
3/8	25	3	3/8
7/16	40	4	1/2
1/2	40	4	1/2
5/8	65	4	5/8
3/4	100	4	3/4
7/8	165	5	1
1	165	5	1
1-1/4	250	5	1-1/4
1-3/8	375	6	1-1/2
1-1/2	375	6	1-1/2
1-3/4	560	6	1-3/4

l When using Crosby Rope Clips, caution should be used to ascertain that the saddle is of the proper rope lay, i.e., Right or Left, as a rope can be cut by using the wrong saddle.

NOTE

To assemble a satisfactory end-to-end connection, the number of clips indicated in the table above should be increased by two, with the torque remaining unchanged. Replace thimbles which are distorted or excessively worn.

(c) One of the more popular end attachments for wire ropes is the wedge socket. There should be no rough edges or burrs on the wedge or socket when installed. If the end of the rope is welded, the welded end should be cut off. This will allow the distortions of the rope strands, caused by the sharp bend around the wedge, to adjust themselves at the end of the line. The dead end of the rope should extend from the socket for a distance of 6 to 9 times the rope's diameter. The dead end of the wire should be clamped to a short extra piece of rope as dose to the wedge as possible. The dead end of the wire should never be clamped to the live end. The U-bolt bears against the tail and the saddle of the clip should bear against the short extra piece; see Figure C-7.

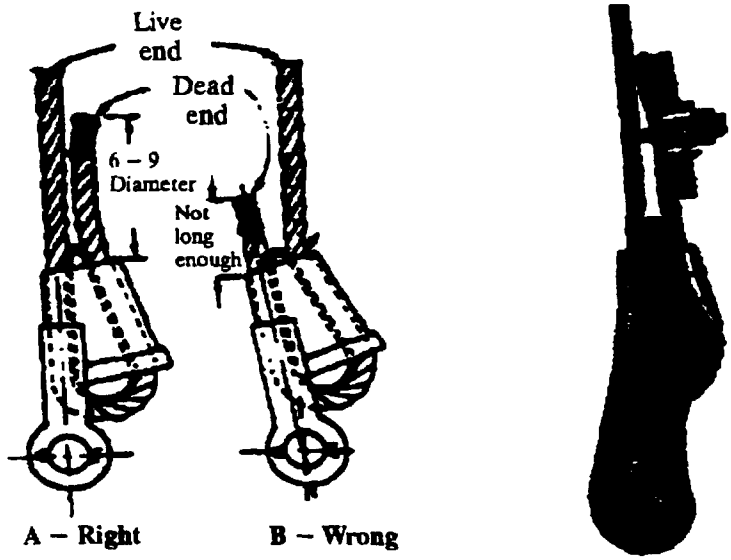


Figure C-7. Wedge Sockets

(6) Minimum sling length. Between splices, sleeves, or end fittings, cable laid slings and 6 x 19 and 6 x 37 wire rope slings shall have a minimum clear length of rope ten times the rope diameter. Between loops or end fittings, braided slings shall have a minimum clear length of rope forty times the component rope diameter. Grommets and endless slings shall have a minimum circumferential length of 96 times the body diameter of the grommet or endless sling.

(6) Rated capacity. Rated capacities for slings shall be as shown in Tables 1910.184.1 through 1910.184.22 of 29 CFR Part 1910.184 of the General Industry Standards-

(a) Nominal wire rope breaking strength.

(b) Splicing or end attachment efficiency.

(c) Number of parts of rope in sling.

(d) Type of hitch, e.g., straight pull, choker hitch, or basket hitch.

(e) Angle or Loading

(f) Diameter of curvature around which the sling is bent.

(7) Corrosion. Corrosion will often occur internally before there is any visible external evidence on the rope surface. Pitting of wires is a cause for immediate rope removal. A slight discoloring of rust merely indicates a need for lubrication. By contrast, severe rusting is grounds for immediate rope replacement.

(8) Kinks. Kinks are permanent distortions caused by loops drawn too tightly. Ropes with kinks must be removed from service.

(9) Basketing. In some cables with longer lays or smaller diameter wires, the outer layer of wires or strands can loosen when bent with no load applied. In many instances the rope can be gently worked back and forth to resume its original configuration. If the rope does not resume its original shape with a load heavy enough to straighten the rope, the rope must be replaced.

(10) Heat Damage. Extended exposure to a fire can result in loss of internal lubrication or even a loss in strength of the rope. Obvious scorching is grounds for rope replacement.

(11) Protruding Core. If, for any cause, the rope core protrudes from an opening between the strands, the rope is unfit for service and should be replaced.

(12) Electric Arc. Rope that has been in contact with a live power line or lightening may have wires that are fused, discolored, and/or annealed; any of the preceding is justification for rope replacement.

b. Allow Steel Chain Slings.

(1) All chains shall be manufactured and tested by the chain manufacturer in accordance with ASTM Specification for Alloy Steel Chain A391 -65 (ANSI G61 .1-1966). Other grades of proof tested steel chain include Proof Coil, BBB Coil, and Hi-Test Chain. These grades are not recommended for overhead lifting and therefore are not covered by this bulletin.

(2) Hooks, rings, oblong links, pear shaped links, welded or mechanical coupling links, and other attachments shall have a rated capacity at least equal to that of the alloy steel chain with which they are used. Homemade links, makeshift fasteners formed from bolts, rods, etc., and other such attachments shall not be used. Mechanical coupling links or low carbon steel repair links shall not be used to repair broken lengths of chain.

(3) Inspection shall be made on a link by link basis with the chain collapsed. If any link does not hinge freely with the adjoining link, or if obvious signs of stretch are detected, the assembly shall be removed from service. If wear at any point of any chain link exceeds that shown in Table C-2, the assembly shall be removed from service. Sharp transverse nicks should be rounded out by grinding. If the depth of the gouge or rounded out portion exceeds the values shown in Table C-2, the assembly shall be removed from service.

(4) When new, chains should be calibrated for length in sections of from 1 to 3 feet long (section should have a minimum of 5 links). At each inspection, the increase in length of the chain section shall be measured and entered into the maintenance records; refer to paragraph 6e(s). Reduce the rated capacity by 2 percent for each I percent increase in length. Hoist chains shall be removed from service when a 5 percent increase in length occurs and sling chains shall be removed from service when a 10 percent increase in length occurs.

Table C-2. Load Testing Parameters.

Chain Sizes (Inches)	Maximum Allowable Wear (Inches)
1/4	3/64
3/8	5/64
1/2	7/64
5/8	9/64
3/4	5/32
7/8	11/64
1	3/64
1-1/6	7/32
1-1/4	1/4
1-3/8	9/32
1-1/2	5/16
1-3/4	11/32

c. Metal Mesh Slings.

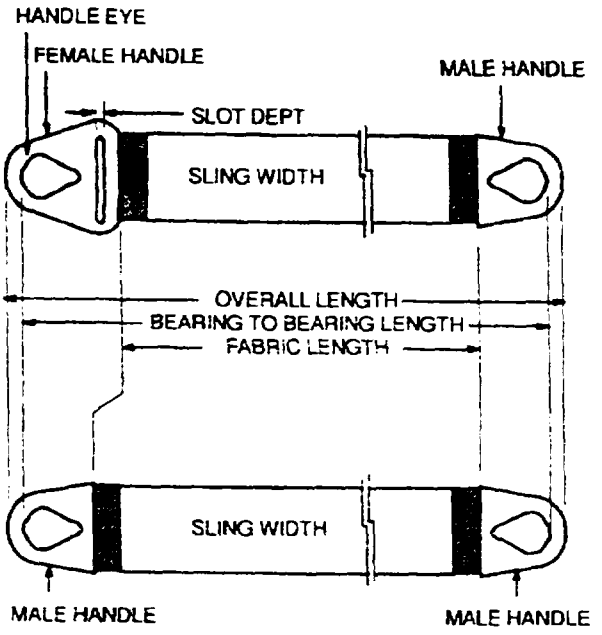
(1) All slings shall have permanently affixed durable identification showing the rated capacity of vertical basket hitch and choker hitch slings and the next periodic inspection date.

(2) Reduction in wire diameter of 25 percent due to abrasion or 15 percent due to corrosion.

(3) Distortion of the female handle so that the depth of the slot is increased more than 10 percent; see Figure C-8.

(4) Distortion of either handle so that the width of the eye is decreased more than 10 percent; see Figure C-8.

(5) A 15 percent reduction of the original cross sectional area of metal at any point around the handle of the eye; see Figure C-8.



[1]Definitions of peculiar terms can be found in either ANSI 630.9-1971 or the General Industrial Standards 29 GFR Part 1910.184.
[2]These tables are taken from ANSI Standard 830.9-1971, "Slings".

Figure C-8. Metal Mesh Sling Showing Characteristic Parts.

d. Rope. Natural and Synthetic Fiber Slings. Fiber rope slings made from conventional three strand construction fiber rope shall not be used with loads in excess of the rated capacities prescribed in Tables 16 through 19 of the General Industry Standards 29 CFR Part 1910.184.

e. Synthetic Web Slings. Synthetic web slings should not be used with loads in excess of rated capacities prescribed in Tables 20 through 22 of the General Industry Standards 29 CFR Part 1910.184. Types of slings and types of hitches, etc., are illustrated in the General Industry Standards and ANSI Standard 830.9.

f. Hoisting Beam Slings. Refer to inspection criteria in paragraph C-1.f. In addition, refer to paragraphs C-2.a. through C-2.e. for inspection criteria associated with wire rope, chain, metal mesh, or synthetic web components.

C-3. Tests. Conduct the function testing of slings and cables concurrently with the corresponding inspection and test of the lifting device system of which they are integral part. Working load limits of the lifting ropes, chains, slings, or combinations should never be less than the load rating of the hoisting device. Keep individual records for each sling. Record pretest and post-test findings, actions taken, and test date in the historical records of the sling or lifting cable.

C-4. Hooks. Hooks used with slings shall be inspected concurrently with the slings. Check for deformation, distortion, cracks, wear, damage, or malfunctioning latch and hook attachment. Visual examination may be supplemented with magnetic particle or other non destructive type testing whenever apparent conditions indicate the need for more in-depth inspection. Hooks shall be removed from service if they are cracked, have throat openings of more than fifteen percent in excess of normal, more than a ten degree bend or twist from the plane of the unbent hook, or wear exceeding ten percent of tne original dimensions.

APPENDIX D
TRUCKS, FORKLIFT

D-1. Daily Inspection.

a. Check for proper marking

b. Check for evidence of mishandling or damage.

c. Perform normal daily preoperational preventive maintenance inspections and checks as prescribed in applicable technical manuals for the equipment.

d. Carefully inspect all safety devices including specialized features of forklift trucks approved for handling explosives end ammunition.

D-2. Periodic Inspection. Complete inspection of forklift trucks shall be performed at the intervals defined in paragraph 4. Criteria in paragraph D-1, requirements of any applicable technical manual, and the following should be used.

a. Check all mechanical controls for proper adjustments and check the entire control mechanism for excessive wear of components and contamination by leaking lubricants or foreign matter.

b. Check hydraulic system seals, hoses, lines, fittings, pumps, and valves for deterioration, leaks, and wear.

c. Check the mast and lift carriage assembly, including forks and chains, for cracks, broken welds, distortion, improper fit, and excessive wear.

d. Check the brake and steering systems for excessively worn or defective moving parts to include seat switches, parking brakes, and brake interlock switches.

e. Check electrical, gasoline, and diesel systems for signs of malfunction, excessive deterioration, dirt or moisture accumulation, and compliance with applicable safety regulations.

f. Check protective motor control circuit devices, battery cable connectors, battery compartment insulation, thermo protectors, compartment covers, filters, and emergency switches. Insure that type EE (Electrical equipment enclosed to prevent emission of sparks in potentially hazardous atmospheres) electric trucks have static electricity discharge straps properly installed, immediately adjacent to the drive wheels, to effect contact with road or floor surfaces, when such trucks are used in areas where an explosive dust potential exists. Specification MIL-T-21 969 (refer to latest revision) provides procedures for testing the discharge straps and requires a resistance between chassis and floor, through the straps, of no more than 250,000 ohms.

(1) Ensure that all electrical cables are appropriately mounted and protected to prevent damage by abrasion, cutting, or catching on stationary objects.

(2) Ensure that batteries are securely fastened in place to prevent spillage of electrolyte onto electrical cables.

(3) Ensure that battery compartments provide ample ventilation and have openings properly guarded to prevent contact of foreign objects with cell terminals.

(4) Equipment must be clean and free of excessive oil and grease accumulations, particularly within the confines of the motors and on electrical contacts.

g. All deficiencies observed shall be corrected and repairs made prior to testing.

D-3. Tests. When required by paragraph 4a, perform a functional test to determine operability of the equipment. Functional tasting shall consist of lifting a characteristic load (determined locally), holding it at an appropriate height for one minute, maneuvering it in a manner which will simulate the operation of the fifting device in the working environment, and lowering it to its original position. For lifting devices used to handle hazardous materials, conduct the function teat as above, using an inert item equal in weight to or heavier than (not to exceed the manufacturers load rating of the device) the heaviest item normally lifted by the devices as its characteristic load. A visual inspection will be performed prior to and after functional test is performed. Record pretest and post-test findings, actions taken, and test date in the end item's historical records.

APPENDIX E
JACKS AND STANDS

E-1. Daily Inspection. The following items shall be inspected daily or before use:

a. Check for proper marking, i.e., rated load (sustaining and lifting, if appropriate).

b. Check for cleanliness and proper lubrication.

c. Check for broken, cracked or distorted mechanical parts or housings, loose bolts or rivets, and other evidence of mishandling.

d. Check for hydraulic leaks; worn, bent, or damaged screw threads; cracked or broken rack teeth; scored or damaged ram; improperly functioning swivel heads and caps; improper engagement or extreme wear of pawl and rack, as appropriate to type of jack.

e. Check that handle is free from grease and oil.

f. Other items as specified in technical manuals or manufacturer's instructions, which may affect operation.

E-2. Periodic Inspection. Complete inspection of jacks and stands shall be performed every 6 months. Periodic inspections shall include the items of E-1 above, requirements of any applicable technical manual, manufacturers recommendations, and the following:

a. Check for corrosion of metal parts.

b. Jack should be disassembled for cleaning and examination for internal wear or damage if external appearance indicates there may be internal difficulty.

E-3. Tests. When required by paragraph 4a, perform a functional test to determine operability of the equipment. Functional testing shall consist of lifting a characteristic load (determined locally), holding it at an appropriate height for one minute, maneuvering it in a manner which will simulate the operation of the lifting device in the working environment, and lowering it to its original position. For lifting devices used to handle hazardous materials, conduct the function test as above, using an inert item equal in weight to or heavier than (not to exceed the manufacturers load rating of the device) the heaviest item normally lifted by the devices as its characteristic load. A visual inspection will be performed prior to and after functional test is performed. Record pretest and post-test findings, actions taken, and test date in the end item's historical records.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army
03086

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The following format must be used if submitting an electronic 2028. The subject line must be exactiy the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

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To: mpmt%avma28@st-louis-emh7.army.mil

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19-OCT-93
8. ***Pub no:*** 55-2840-229-23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04-JUL-85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123-123-1234
17. ***Problem:*** **1**
18. Page: 2
19. Paragraph: 3
20. Line: 4
21. NSN: 5
22. Reference: 6
23. Figure: 7
24. Table: 8
25. Item: 9
26. Total: 123
27. ***Text:***

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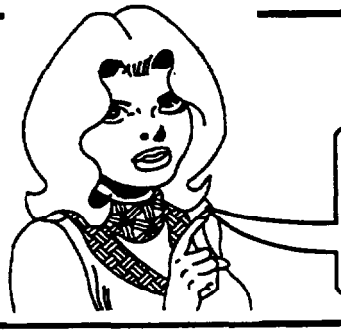

THEN . .JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC John DOE
CO A 3rd Engineer Bn
Ft. Leonardwood, MO 63108

DATE SENT
22 August 1992

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 1-1520-250-10	15 June 1992	Operator's manual MH60K Helicopter

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	

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

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.

Callout 16 on figure 4-3 is pointed at a bolt. In key to figure 4-3, item 16 is calle a shim. Please correct one or the other

EXAMPLE

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

JOHN DOE, PFC (268) 317-7111

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JOHN DOE John Doe

DA FORM 1 JUL 79 2028-2

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DRSTS-M verprint2, 1 Nov 80

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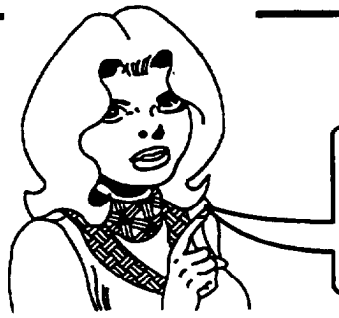

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TB 43-0142	28 February 1997	Safety Inspection and Testing of Lifting Devices

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:

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature

PIN: 020130-000