THE CRANE CORNER

Navy Crane Center Technical Bulletin

http://portal.navfac.navy.mil/ncc ***52nd Edition – December 2006***

Editor: (757) 967-3816/DSN 387-3816/m_nfsh_ncc_crane_corner@navy.mil

A WORD FROM TOPSIDE

Sam Bevins

Fiscal Year 2006 was busy and productive for the Navy Crane Center as we executed our primary mission of promoting safe weight handling operations at the global Navy shore activities, while executing a smooth transition of our headquarters operations to Portsmouth, VA at the Norfolk Naval Shipyard.

Navy shore activities managed to improve on the excellent safety record established over the past several years despite an increased intensity of lifting and handling operations in support of the Fleet. The number of significant accidents (those involving injuries, dropped loads, overloads, and two blocking) decreased by 18 percent in FY06. Only six of the accidents reported met the OPNAV classification threshold and all six were Class C mishaps. This positive decrease in accident significance is a testament to each shore activity's hard work. The record has shown that maintaining our stringent accident definition, i.e., virtually any unplanned event, regardless of injury or damage, helps prevent the serious accidents. In addition, the Navy Crane Center continues to promulgate accident lessons learned and crane safety advisories. While the shore activities' efforts are commendable, we continue to strive for our mutual goal of ZERO weight handling equipment accidents.

Activity compliance with NAVFAC P-307 requirements improved in FY06. The shore activities' emphasis on these requirements and continued hard work resulted in an increase from 83 percent substantial compliance in FY05 to 92 percent this year. This is a positive indicator of the importance of well-maintained, safe equipment operated in a safe manner.

Navy shore activities continued to improve on the high standard of equipment condition established in previous years. In FY06, 80 percent of the audited cranes were found fully satisfactory, compared to 76 percent in each of the past three years. This metric is a key indicator of equipment readiness at Navy shore activities to meet Fleet weight handling requirements.

In the training arena, we completed the conversion of two additional courses to web-based format for delivery on Navy Knowledge Online. These courses should be available from NKO in January 2007. Conversion of our courses from instructor lead to web-based will generate substantial cost avoidance for the Navy. In FY04, we developed and distributed a film on mobile crane operations safety. Since then, the percent of accidents involving mobile cranes has steadily decreased. This improvement is particularly noteworthy since mobile cranes are involved in the majority of serious accidents in the weight handling arena. This positive accident trend is a credit to the diligent oversight and operational awareness of those individuals involved in the weight handling program.

Inside This Issue

Navy Crane Center accepted one 60-ton and one 151-ton state of the art portal cranes and awarded the delivery for the tenth and final 60-ton portal crane under the current requirements contract. We continued to provide technical consultation and field support for the Navy Lighterage program and procured a 500-ton mobile boat hoist.

We procured or provided technical support for procurement of 17 new and 2 reconstituted bridge cranes of various capacities ranging from 7.5 tons to 100 tons, and one monorail system.

Various situations around the world mandate an ever changing and increasing Navy mission. Navy Crane Center assists supported commands and Navy shore activities to accomplish their missions through effective lifting and handling criteria management, acquisition, engineering, inspection, safety, and training. Safe and effective weight handling is an essential enabler of Fleet Readiness.

HYDRAULIC TENSIONER FAILURE

Activity personnel were tensioning a slewing bearing fastener on a portal crane during the annual maintenance cycle. As shop personnel brought the tensioner up to approximately 15,000 psi, it failed catastrophically and threw parts into the air. The hydraulic tensioner failed due to a fatigue of internal components. There were no personnel injuries on this occasion but the potential for a serious incident was there. Similar incidents have occurred with both failed equipment and failed fasteners during tensioning.

Crane personnel are exposed to a wide variety of hazards as they perform their everyday duties. Stored energy, in the form of hydraulic pressure, spring tension, electrical power, and many others are present in almost every crane system and the tools of the trade. However, the hazards specific to bolt tensioners are notable in the forces present and the potential for personnel injury or equipment damage. Where possible, activities should attempt to mitigate risks associated with bolt tensioners. The activity noted above designed a cage surrounding the bolt and tensioner to prevent personnel injury in the event of tensioner or fastener failure.

Navy Crane Center reminds everyone to remain diligent and practice Operational Risk Management (ORM) while on the job to help prevent accidents and avoid injures when an unexpected event occurs.

AVAILABILITY OF PORTAL CRANES

Naval Munitions Command (NMC) Yorktown no longer has a need for their 25-ton and 40-ton portal cranes. Both cranes are located at the Naval Weapons Stations Yorktown, Virginia. Track gauge for these cranes is 30 ft. Anyone interested in obtaining these cranes should contact Naval Munitions Command Yorktown or NAVFAC Midlant.

The 25-ton crane (shown on right) is a Lindholm design manufactured by Star Iron in 1963. In 2002, the crane completed an extensive restoration that included installing electronic static stepless controls for hoists drives, installing electro-mechanical disc brakes, reconditioning the main engine generator set, painting the entire crane, and installing a new jib extension. The modifications to the crane were executed under a contract administered by the Navy Crane Center. The following information was taken from the crane's load chart:

Hoist	Capacity	Radius
Main	56,000-lb	77-ft
	39,390-lb	90-ft
Whip	16,800-lb	120-ft
	15,680-lb	139-ft

The 40-ton crane (shown on right) was manufactured by Intercontinental in 1992. In 2002, the rotate bearing was replaced and the crane was certified for operation annually until 2006. The following information was taken from the crane's load chart.

Hoist	Capacity	Radius
Main	89,600-lb	95 ft
	76,000-lb	115 ft
	56,000-lb	140 ft
Whip	16,800-lb	182-ft

SHARE YOUR SUCCESS

We are always in need of articles from the field. Please share your sea stories with our editor *m_nfsh_ncc_crane_corner@navy.mil*.

CRANE SAFETY ADVISORIES AND EQUIPMENT DEFICIENCY MEMORANDA

We receive reports of equipment deficiencies, component failures, crane accidents, and other potentially unsafe conditions and practices. When applicable to other activities, we issue a Crane Safety Advisory (CSA) or an Equipment Deficiency Memorandum (EDM). A CSA is a directive and often requires feedback from the activities receiving the advisory. An EDM is provided for information and can include deficiencies to non-load bearing or non-load controlling parts.

CRANE SAFETY ADVISORY

CSA 164, Plunger stops on Stearns 55,000, 57,500, and 65,300 Series Spring-Set Disc Brakes

An activity recently reported that during an operational check of a bridge crane, the crane drifted after the bridging was stopped. Initial investigation found the brake solenoid plunger stuck in the brake coil, causing the brake to remain open. the brake coil was also found slightly misaligned with the solenoid plunger. Further investigation revealed that current OEM parts lists shows a plunger stop installed over the top of the plunger preventing the plunger from over traveling when released from the coil. Over travel of the plunger could result in the plunger getting cocked. This along with coil misalignment could exacerbate the plunger getting stuck in the coil. The Stearns 55,000, 57,500, and 65,300 series brakes are all similar in design. The OEM stated that the addition of the plunger stop on production units can be traced to 1987 and that brakes manufactured from that time forward have this part installed. This part was added by the OEM as a product improvement based on life testing therefore no service bulletin was ever issued.

For Stearns 55,000, 57,500, and 65,300 series spring-set disc brakes used in hoisting applications, inspect within 30 days to ensure that the plunger stop has been installed in accordance with current OEM parts lists and no misalignment exists between the brake plunger and coil.

For the listed brakes used in other crane functions, inspect as described no later than the crane's next annual inspection. Crane Alteration Requests (CAR's) shall be submitted for NAVCRANECEN approval for installation of plunger stops.

EQUIPMENT DEFICIENCY MEMORANDUM

EDM 088, Grove Mobile Crane RT700E, RT750E, RT760E Frame Drain Hole Mods

The purpose of this EDM is to inform naval activities of potential frame damage on Grove RT700E series mobile cranes caused by water accumulation.

An activity reported frame damage to a Grove RT750E mobile crane caused by freezing water that had accumulated on both sides of the carrier frame located under the turntable. This may be avoided by implementing Grove service bulletin 03-004a which gives instructions on drilling drain holes in the bottom of the front and rear cross members.

Activities with Grove RT700E/RT750E/RT760E mobile cranes should have modifications performed as per Grove service bulletin 03-004a regardless of climate. Water accumulation will cause corrosion on frame surfaces.

As a reminder, NAVFAC P-307, Management of Weight Handling Equipment, paragraphs 2.2.2 and 10.3.1 require activities to obtain service bulletins for their cranes, particularly mobile cranes.

NEW STANDING CRANE ALTERATIONS FOR REPLACEMENT HOISTS

Navy Crane Center has updated the five Standing Crane Alterations for replacement hoists. These Standing CARs are now available on the Navy Crane Center web site under the CraneAlt web page. The five Standing CARs numbers and there subjects are:

N3258A-07-001, manual chain hoists
N3258A-07-002, pneumatic chain hoists
N3258A-07-003, pneumatic wire rope hoists
N3258A-07-004, electric chain hoists
N3258A-07-005, electric wire rope hoists

FOURTH QUARTER FY06 ACCIDENT REPORT

The purpose of this report is to disseminate shore activity weight handling equipment (WHE) accident and near miss lessons learned to prevent repeat accidents and improve overall safety.

NAVFAC P-307 requires commands to submit to the Navy Crane Center (NAVCRANECEN) a final, complete accident report (including corrective/preventive actions) within 30 days of an accident, regardless of severity or type. This reporting requirement includes rigging gear accidents, i.e., gear covered by section 14 of ref a used by itself in a weight handling operation and other unplanned occurrences with lessons to be learned. In addition, contracting officers are required to forward to NAVCRANECEN reports of all contractor accidents, including contractor caused accidents with navy owned cranes.

For the fourth quarter of FY06, 50 Navy WHE accidents (38 crane accidents and 12 rigging gear accidents) were reported and 6 contractor crane accidents were reported. Significant Navy crane accidents this quarter include 2 injuries, 3 dropped loads, 3 two-blockings, and 3 overloads.

INJURY

Accident: A worker was struck in the face when the hook of a sling assembly snagged and then suddenly released during a lift. Personnel were removing a 1250-lb. stainless steel window mounting plate. Only one sling leg of the four-leg sling assembly was used to lift the window plate; the other three legs remained free hanging and unrestrained. The first window plate was removed without incident. During removal of the second window plate, a hook from one of the loose sling legs lodged under an adjacent section of angle iron. This condition went un-noticed and as hoisting continued the hook dislodged, snapped back, and struck an employee. The employee sustained a fractured cheek bone, loss of one front tooth, and a cut to the upper lip. The activity's investigation determined that the rigger used improper rigging techniques by not securing the unused slings legs.
Lessons Learned: The rigger-in-charge is responsible to ensure the load is safe to lift. This includes observing that unused slings, tag lines, or other rigging gear is clear prior to lifting. Additionally, the rigger-in-charge is responsible to select appropriate lifting gear for each lift; in this case a single leg sling should have been used.

DROPPED LOADS

Accident: During the test of a 20-ton chain hoist, an overloaded sling parted, allowing the load to fall. A cab operated bridge crane with a ½" wire rope sling on the hook was used to off load and pre-position a 20-ton capacity chain hoist from a storage cradle to a test site. Once in position for the load test, the ½" sling was to be removed and replaced with a 1 ¼" grommet. The rigger however, failed to remove and replace the ½" sling with the grommet. Other assist riggers and the crane operator did not recognize this error. As the crane began to tension the load, the sling parted causing the chain hoist to drop to the floor. Fortunately, assist personnel working in the vicinity where the chain hoist fell were not injured.
Lessons Learned: The rigger-in-charge must ensure that the load is properly rigged and the crane operating envelope (test area) remains clear. The operator should actively observe the rigging process and report any noted concerns. The operator is often in the best position to watch the entire operation and ensure that the briefed plan is being followed. All team members have the responsibility to remain focused, ensure jobs proceed as planned, and stop operations anytime there is a concern about safety.

TWO-BLOCKINGS

Accident: A crane hoist was two-blocked causing the wire rope to part and the hoist block to fall. An activity experienced an electrical storm, which caused electrical damage and power loss to a number of buildings and bridge cranes. Repairs were completed; however, the correct electric power phasing was not verified. The repairs resulted in reversal of all motor rotation on the bridge cranes. This condition was not immediately recognized. A bridge crane operator on an affected crane realized the crane functions were reversed but rather than stop and report this condition, continued to operate the crane. The operator raised the hoist block into the limit switch, which, because of the phase reversal condition, did not work. The hoist two blocked, the wire rope parted, and the hoist block fell to the floor. Investigation concluded that the operator erred by not immediately stopping operations and reporting the abnormal condition, by continuing to operate a malfunctioning crane, and by relying on the limit switch to stop the upward movement of the hoist.
Lessons Learned: Crane operators are responsible to secure crane operations when any adverse or unusual operating condition is observed and report all abnormal conditions to the supervisor. Operation of a malfunctioning crane is an unsafe act that can cause damage to equipment or injury to personnel.

OVERLOADS

Accident: A synthetic web sling was damaged and the crane's overload protection activated during a lift of a storage locker. Crane team personnel were tasked to lift a storage locker. The locker weight discussed during the briefing was 10,000 lbs. A visual inspection of the load revealed a stenciled weight of 23,500 lbs. The

actual weight of the locker was not verified nor was the disparity between the briefed weight and the stenciled weight investigated. The locker was rigged using two synthetic web slings in a basket configuration. Chafing material was used to protect the synthetic web slings. The rigger-in-charge directed the crane operator to lift the locker. As the lift progressed, the crane's overload alarm sounded at approximately 16,000 lbs. (hoist capacity 20,000 lbs.) The lift was stopped, rigging gear removed, and the crane secured. No post-inspection of the rigging gear was accomplished. A larger capacity crane and additional rigging gear were obtained and used to complete the lift. After the lift, post-inspection of the original rigging gear revealed damage to one of the synthetic web slings. The activity's investigation identified numerous problems including: failure to perform a locally required post-inspection of the rigging gear, use of inadequate chafing gear, failure to determine or verify the actual weight of the storage locker, and not stopping the lift when the 10,000-lb. pre-job briefing weight was reached.
Lessons Learned: The rigger-in-charge must know or have a reasonable estimate of the weight to be lifted. Paragraph 10.5 of NAVFAC P-307 outlines requirements to avoid overload conditions; paragraph 14.7.4 provides use criteria for chafing material when using synthetic slings.

Accident: Sling capacity was potentially exceeded when pre-lift calculations were not performed and an incorrect load weight was provided. Riggers were assigned to lift and position a car ramp using four slings attached to a portal crane hook and shackled directly to four lift points on the ramp. The stenciled weight on the ramp was 70,000 lbs. Prior to the lift, personnel questioned the capacity of the gear, however, the rigger-in-charge considered the capacity of the gear to be adequate. Additionally, prior to the lift the supervisor informed the crane team that modifications to the ramp had reduced the ramp's weight to 62,000 lbs and that the slings currently on the crane hook were adequate. The ramp was lifted. A rigging general foreman who observed the lift approached the crane team (after lift off) and questioned the capacity of the slings. It was discovered that down rating calculations for sling angle had not been performed. It was also noted that the four point lift rule was not considered. An investigation revealed that the riggers did not perform as trained, the rigging gear was not sized correctly, the potential overload of the rigging gear was not recognized and the supervisor directed the lift to proceed rather than ensuring the correct ramp weight. Engineering later determined that the individual slings were not overloaded.
Lessons Learned: Prior to lifting, the rigger-in-charge must know the weight of the load and select and size rigging gear accordingly. When the weight of a load is unknown or uncertainty exists, the weight shall be verified. Supervisors must correctly respond to concerns raised by personnel. Additionally, supervisors and other observers performing oversight must not wait for an unsafe condition to exist before questioning the adequacy of lift plans.

SIGNIFICANT CONTRACTOR ACCIDENTS

Accident: A mobile crane was overloaded by more than 200 percent of its rated capacity. Contractors were load testing a boat's davit hoist fittings as part of repair work on a Navy ship at a Navy facility. The contractor used a 22-ton capacity barge mounted mobile crane to test the boat's fittings. The activity's oversight personnel observed and questioned the weight on the crane and the test was secured. Initial investigation revealed that personnel performing the test did not know the weight of the boat prior to lifting, did not review the crane's load chart for radius or capacity, did not have the required test procedure on site, and did not complete a critical lift plan. The total weight of the load on the crane was 27,860-lbs. The capacity of the crane at the radius of the lift was 13,470-lbs. The contractor‘s initial accident report did not adequately address root cause(s) or actions to prevent recurrence. This accident report was rejected by the activity. The revised accident report concluded that the accident was caused by inadequate supervision, improper planning, failure to use the approved process, and urgency to meet contract time constraints. The report further indicated that the operator "exhibited total disregard for all direction and process, ignored load limit signals and alarms, and continued to lift." The contractor terminated the employment of the operator.
Lessons Learned: Contractor's pre-lift planning must identify all critical/complex crane lifts. Accurate weights and crane capacities must be confirmed and appropriate lift plans submitted, approved, and followed.

The contractor is required to provide and post a certificate of compliance (figure P-1 of NAVFAC P-307) that provides certification that operators are qualified in the operation of the crane and have been trained not to bypass safety devices during lifting operations.

Accident: The main hoist wire rope pulled loose from the terminal end wedge socket connection allowing the load and the hoist block to fall to the ground. A 60' triple-laced column weighing approximately 55,125-lbs. was being prepared for installation. The crane was used to upright the column. When the load was vertical, the load dropped. Personnel were in the vicinity of the load but were able to move to a safe area. As the load came down, the wire rope un-spooled through the reeving and came down with the load and the hoist block. Investigation revealed that when the crane's hoist block was reeved the wire rope was not properly seated in the wedge socket. On further inspection, it was determined that the wedge socket becket was damaged from misuse and the wedge would not fully engage into the becket.
Lessons Learned: Wedge socket end connections are subject to wear and must be inspected for faulty component fit and damage from frequent change outs. NAVFAC P-307 provides special precautions pertaining to the use of wedge socket connections.

Weight handling program managers and safety officials are encouraged to review the above lessons learned with personnel performing lifting and handling functions and consider the potential risk of accidents occurring at your activity. OPNAVINST 3500.39 prescribes methods for assessing hazardous operations, which should be used in the planning and preparations of all WHE lifts.

E-mail submission of reports of accidents, unplanned occurrences and near misses is encouraged. The e-mail address is nfsh_ncc_accident@navy.mil. The reports must include a complete and concise situation description, corrective and preventive actions, probable cause and contributing factors, and an assessment of damage. For equipment malfunction or failure include specific description of the component and the resulting effect or problem caused by the malfunction or failure. ■

P-307 QUESTIONS & INTERPRETATIONS

The questions and interpretations listed below are based on crane program issues that arose and Requests for Clarification, Deviation, or Revision, NAVFAC P-307, figure 1-1. For the official RCDR, please visit Navy Crane Center's web site and navigate to the P-307 Questions and Interpretations Section of interest. Please note that NAVFAC P-307, June 2006 Revision, paragraph 1.11 contains specific guidance on the use of previously approved RCDR's.

Question: Please clarify how to read and interpret NAVFAC P-307, Appendix C, Item 25b, (the Maintenance Inspection and Record (MISR) for Category 1 cranes).

Answer: Due to a formatting and conversion error, the 2006 revision of the NAVFAC P-307 contains an error in Item 25b of Appendix C. Item #25b should appear as below:

MAINTENANCE INSPECTION SPECIFICATION AND RECORD
FOR CATEGORY 1 CRANES

SHEET____ OF _____

Crane

Item No	Inspection Type A	B	C	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition S	U	C	NA
25b	X	X	X	Hydraulic Brake System (Caliper Brakes on Wire Rope Drums)	Inspect system for damage, for evidence of binding, loose, and worn components, and for proper lubrication. Inspect brake linings for wear, and braking surfaces for smoothness and for evidence of overheating. Inspect brakes for proper settings and for alignment of calipers. Inspect for proper hydraulic brake fluid level. Inspect system (pumps, accumulator, gauges, and lines) for damage or leakage, and for evidence of loose connections. During operation, verify proper release and engagement and stopping action in both directions of motion and timing of release and engagement. For brakes with Belleville torque springs, record the number of cycles as shown on the brake cycle counter. Compare the total number of cycles applied to each brake actuator's Belleville springs to the allowable maximum number of cycles specified for that actuator and ensure that none of the springs have exceeded the maximum value. Record Belleville spring cycle limit and number of cycles in the equipment history file. (For brakes without cycle counters, the activity shall conservatively estimate the brake usage and ensure that the springs are replaced before their fatigue life is reached.)					
25b Cont		X	X	Brake Linings	Disassemble as required to inspect brake linings for wear, debonding, and glazing. For brakes that stop the movement of the load under normal operating conditions, disassembly, as required, shall be done annually. For other brakes (e. g., holding brakes), disassemble as required at every second “C” inspection.					