THE CRANE CORNER

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A WORD FROM TOPSIDE

Sam Bevins

While the mobility and versatility of mobile cranes make them indispensable in supporting the Navy's varied missions, these same attributes make this type of crane much more hazardous to operate than any other type of crane in the Navy's inventory. In the June 2001 issue of the Crane Corner, I emphasized both the high number and the potential seriousness of mobile crane accidents occurring at Navy shore activities. I noted that mobile cranes, which account for 8 percent of the Navy's total crane inventory, were involved in 32 percent of reported crane accidents and the trend was rising. The number of serious or potentially serious accidents, i.e., personal injuries, dropped loads, overloads, and two-block accidents, was much too high.

To summarize the past two years, we have made progress in reducing the number and severity of accidents but we still need to do better. In terms of numbers, mobile crane accidents still account for one-third of the accidents reported to the Navy Crane Center. In terms of severity, you have made significant improvement. There was only 1 reported personal injury in the past two years as opposed to 10 in the previous two-year period. There were 7 overload accidents compared to 17 in the previous period. There were 10 dropped load accidents compared to 15 in the previous period. And there were 15 two-block accidents compared to 18 in the previous period. I congratulate you and ask you to continue your efforts to drive down the number of mobile crane accidents.

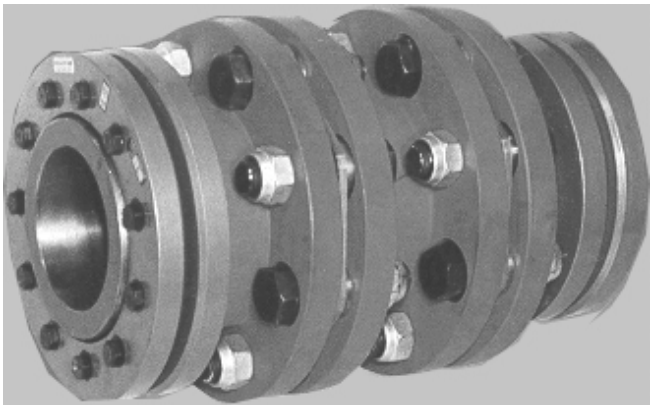
Newer mobile cranes are becoming more and more complex to operate, with many new features. Understanding the operation – and the limitations – of these new features is imperative. Load charts for some new cranes now exceed a hundred pages in length. Supplemental instructions, including weight deductions, counterweight configurations, winch performance, wire rope types and strengths, and optional equipment must be thoroughly understood. Weight deductions applicable to one model may not necessarily be the same for another model, even from the same manufacturer.

There are many tools to help ensure the safety of mobile crane operations, including proper training, a true crane team concept, risk assessment and mitigation, and lessons learned from previous accidents and near misses. We include your accident lessons-learned in quarterly messages as well as in each issue of the Crane Corner. Last year, to assist shore activities we distributed a training video on load testing mobile cranes. This year, we plan to produce a video on mobile crane operations safety. We plan to have it ready for distribution by the end of the year.

Inside This Issue

HAVE YOU HEARD ABOUT?

Crane keyless shaft couplings are available as direct replacements for the traditional keyed types. The keyless shaft couplings offer a number of desirable attributes - their installation does not require complicated precision machining and press-fitting; they are easy to install, remove, reposition, and adjust; and are free of backlash.



The hubs are equipped with shrink disc clamping devices that develop a friction lock with the shafts. Torque is transmitted through packs of thin stainless steel discs designed for infinite fatigue life. The flexible discs require no lubrication nor any other maintenance, and are well suited for supporting the weight of floating shafts. Semi-flexible and full-flexible designs are available for shaft diameters of 0.16 to 14.00 inches, with torque ratings of up to 1,000,000 pound-feet. The manufacturers also provide custom sized spacers (floating shafts) up to 16 feet in length.

These couplings may be used on the bridge and trolley drives of existing cranes (installed via Crane Alteration Requests) and on new cranes. When installed as replacements for keyed couplings, the shaft keyseats may be left empty.

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 ADVISORIES

CSA-63B: Cracked A-Frame Welds on Craft 60-Ton Portal Cranes.

CSA-114: Retention of Screws on General Electric Shoe Brake Type 9528 and 5488.

CSA-115: Propane Heater Malfunction.

CSA-116: Support Bolts on Whiting Hoist Unit Gear Cases.

EQUIPMENT DEFICIENCY MEMORANDA

EDM-054: Rotate Drive Gearbox Bearing Failure on Grove Mobile Cranes.

EDM-055: Potential for Dillon Prolift or AP Dynamometer Pointers to Fall Off.

SHARE YOUR SUCCESS

We are always in need of articles from the field. Please share your sea stories with our editor, cranecorner@ncc.navfac.navy.mil.

WIRE ROPE ON MOBILE CRANES

CHOOSING THE CORRECT ROPE FOR THE APPLICATION

Navy activities should consult with the crane manufacturer in addition to NCC when unsatisfactory wire rope performance is encountered. A naval activity reported that boom hoist wire rope on a Link Belt Model HC-228H lattice boom mobile crane had crushed wire rope on the second layer from the drum. Although the crushed portions of wire rope had not reached rejectable limits, the activity correctly contacted the crane manufacturer for suggested replacement. The original wire rope was a type JB (6x26, preformed, IWRC, right alternate lay). Link Belt specified replacement with a type LB (6 strand, compacted strand, Seale or Warrington Seale, IWRC, preformed, right regular lay).

Wire rope manufacturers can provide wire rope that is best suited for a specific application given the history of the wire rope's performance. For example, if an activity reports that wire rope crushing is a continuing problem with the boom hoist rope, then the crane manufacturer may specify a more crush resistant wire rope. If, on the other hand, the activity reports that broken wires are a continuing problem, then the crane manufacturer may specify a wire rope that is more tolerant to the condition causing the broken wires. Past performance indicators are key to the proper selection of wire rope for a given application.

Activities are encouraged to consult with the crane manufacturer concerning unsatisfactory wire rope performance or when the need for replacement rope arises. Activities are reminded that crane manufacturers may issue technical/service bulletins specifying a superseded wire rope. It is the activity's responsibility to contact the crane manufacturer or authorized distributor for supplemental information applicable to their cranes as specified in NAVFAC P-307, paragraph 2.2.2. Replacement wire rope of different size, grade, or construction from the original wire rope and not identified as a superseded part on a technical/ service bulletin requires NCC approval as specified in NAVFAC P-307, section 4.

CERTIFYING OFFICIAL TRAINING

The Navy Crane Center (NCC) is offering a 16-hour Certifying Official training course. The course is intended for new, prospective, and recently assigned certifying officials. This course introduces the student to the Navy's shore activity weight handling program and explains in detail his or her specific responsibilities as a certifying official as prescribed by NAVFAC P-307.

The course is open to Navy military and civilian certifying officials and prospective certifying officials. A limited number of contractor certifying officials may be accepted on a space-available basis. There is no tuition for Navy personnel. Tuition for contractor personnel is $320.

Classes will be held as follows:

- 7-8 May 2003 in San Diego, CA.
- 17-18 June 2003 in Norfolk, VA.

To request a space in a course, submit an e-mail to training@ncc.navfac.navy.mil. The request must include the name, address, email address and phone number for the candidate. NCC will notify candidates of acceptance. Class size is limited to 25 to 30 students. Additional classes will be scheduled depending on demand.

FIRST QUARTER FY03 ACCIDENT REPORT

The Navy Crane Center (NCC) disseminates crane accident lessons learned to prevent repeat accidents and improve overall crane safety. NAVFAC P-307 requires commands to submit to the Navy Crane Center (NCC) a final, complete accident report (including corrective/preventive actions) within 30 days of an accident involving Navy-owned weight handling equipment, regardless of severity or type. In addition, contracting officers are required to forward to NCC and the host activity reports of all contractor accidents regardless of severity.

For the first quarter of FY03, 51 Navy and 3 contractor weight handling equipment accidents were reported. Serious accidents this quarter included one injury, five dropped loads, five overloads, and five two-blockings.

INJURY

- Accident: A machine shop supervisor was bridging a crane while performing the operator's monthly crane inspection. As the crane traveled on the rails, it collided with a ceiling-mounted heater duct that had recently been extended into the crane's travel path. The collision caused some particles to fall into the supervisor's eye, damaging a blood vessel.
- Lessons Learned: After installing new equipment in the vicinity of overhead cranes, the crane travel path must be checked carefully to verify that there are no interferences.

DROPPED LOADS

- Accident: In separate lifts at different locations during inclement weather, a category 4 crane with a power block cable reel assembly was used to place shore power cables onto two ships. During both of these lifts, the power cable slipped from the power block reel and fell onto the pier. A review of the activity's accident documentation revealed that the cables have a tendency to slip out of power block reel assemblies during wet conditions.
- Lessons Learned: Operating procedures for the use of power block reel assemblies for the placement or removal of shore power cables must be reviewed. If a power reel has a tendency to lose the cable during wet conditions, alternative means should be used whenever rain or inclement conditions are a possibility.

- Accident: A crane team was practicing the removal and reinstallation of a mock-up onto a stand. These lifts were assumed to be simple in nature so there were no pre-lift briefs conducted. Prior to the accident, the removal and reinstallation operation was conducted numerous times without incident. During the last practice run, the load shifted and fell when the operator landed the mock-up and released the tension on the hoisting and rigging lines. The activity's review of the accident revealed that the mock-up was not properly seated and aligned on the support stand. The crane team was unable the see the improper positioning due to obstructions in their line of sight.
- Lessons Learned: There are inherent hazards in every lifting operation. Prior to any lifting operation, devote time to assessing the hazards. One of the control elements in the lifting operation is the responsibility of making sure that there is an unobstructed sight line maintained between the load and supporting structure.

- Accident: A mobile crane was being used to lift a pump weighing 350 pounds. The cylindrically shaped pump was rigged in the vertical position. The operator was instructed to retract the boom. When the boom hit the first section of the boom stop, it shook the load. The load slipped through the slings and fell to the pier. Improper rigging allowed the pump to slip and fall to the pier during the lift.
- Lessons Learned: Take care to use the proper rigging configuration when hoisting cylindrically shaped objects. Objects of this type should be hoisted in the horizontal position when possible. Using a double choker hitch sling configuration will facilitate a better control of the load.

- Accident: During the lift of an axle onto a trailer, the axle became dislodged and dropped. The two-leg wire rope sling being used had a safety latch missing from one of the hooks. This allowed the hook to slip out of the shackle causing the axle to drop.
- Lessons Learned: Prior to any lifting operation, rigging gear must be checked for deficiencies. If the rigging is found to be deficient, it shall be replaced.

OVERLOADS

- Accident: Rigging gear was overloaded during the lift of a shaft dolly section and tilt table that weighed 8,500 pounds. The rigger assumed that the weight was 6,200 pounds. The rigger's information was obtained from the dolly's label plate, but the annotated weight did not include the weight of the tilt table. In addition, the rigging gear was incorrectly sized for the assumed weight of 6,200 pounds. The rigger did not consider the four-point lift requirement or the downgrade for the lift angle.
- Lessons Learned: When lifting a load having multiple sections, the rigger must verify the weight of each individual section.

- Accident: A mobile crane was overloaded on four different occasions as a result of the test director's misinterpretation of the original equipment manufacturer's load chart. The original hoist wire rope had been replaced with a rotation resistant wire rope. Although the rotation resistant wire rope has a higher breaking strength than the original rope, the required factor of safety is higher, resulting in a lower rated capacity than the original wire rope. The test director did not notice the lower rated capacity of the rotation resistant wire rope and tested the crane on four different occasions based on the rated capacity of the original wire rope.
- Lessons Learned: During the review of the load chart, the test director must note the type of wire rope used on the crane and calculate the test load based on the allowable load of that particular wire rope.

- Accident: During a load test of a portal crane, the auxiliary hoist was overloaded. The test director failed to verify the test load's weight prior to hoisting the load.
- Lessons Learned: Test directors must verify that the test load is within the test load limitations as required by NAVFAC P-307, paragraph 3.7.1.

- Accident: A sling was overloaded when it was used to hoist a launch that contained water. During the pre-lift brief, the crane team was told that the weight of the launch was 24,000 pounds. Slings were selected based upon this weight. The actual weight was 36,000 pounds due to water being retained inside the hull. Several other errors occurred. The crane operator did not immediately set the load back down when the launch became unstable due to the shifting water inside the hull. The crane operator did not stop the operation after seeing that the crane's load moment indicator read more than 24,000 pounds. The rigger-in-charge did not verify the sling certification dates (one sling was not certified). The crane team members did not know that they could halt a lift if they suspected a problem. After the crane accident, the rigging supervisor did not preserve the accident site, nor did he wait for the investigation to be completed before continuing with the lifting operation.
- Lessons Learned: If a load becomes unstable, the crane operator must re-establish control of load before continuing with the lift. The operator must set the load down when an overload is suspected. The rigger-in-charge must inspect the rigger gear prior to use and verify that the gear has a current certification. During pre-lift briefings, members of the crane team should be reminded that any member of the team can halt a lift if they suspect a problem.

- Accident: When taking up the slack on a jib crane that was being tied down to a pier side cleat, the force applied overloaded the crane. The shackle attached to the cleat had breaking strength higher than the rated capacity of the crane.
- Lessons Learned: When tying down hooks, only enough tension should be applied that will hold the hook in place. A weak link connection shall be used to secure the crane's hook as prescribed in NAVFAC P-307, paragraph 10.17.

TWO-BLOCKINGS

- Accident: A monorail and a bridge crane were two-blocked at different Navy activities when construction contractors performing work in the buildings accidentally reversed the phase connection in the power panel that fed the monorail and bridge crane.
- Lessons Learned: When electrical work is completed in an electrical distribution panel box, the equipment energized by that panel box must be tested for proper operation. Such operations must be performed very slowly to avoid two-blocking the hoist.

- Accident: A mobile crane operator inadvertently activated the main hoist hoisting control lever while rotating the boom, which resulted in two-blocking. The operator stated that he felt pressure to complete the task at hand and to move quickly to the next assignment. This pressure may have diverted the operator's attention from the safe completion of the current assignment.
- Lessons Learned: Crane operators shall be alert when operating cranes, especially mobile cranes. The complexity of mobile crane operations makes the operator's attention to detail imperative. Operators should report to their supervisors any undue pressure to complete the job quickly.

- Accident: A pendant controlled bridge crane was two-blocked as a result of an unauthorized alteration, which inadvertently disabled the upper limit switch. The crane was manufactured with a 110 percent torque limit switch. The activity installed an override switch to permit the crane to be tested at 125 percent for the annual load test. However, this switch also deactivated the upper limit switch. The improper alteration was discovered before the accident but was not corrected.
- Lessons Learned: Alterations to operational safety devices require NCC review and approval. Crane operators must be aware of the operating characteristics of the cranes they operate. When the hook block approaches the upper block, operating speeds must be reduced.

- Accident: During the maintenance inspection of a mobile crane, damage to the boom tip sheaves and wire guide were found. The damage appeared to be caused by a two-blocking. A review of operators' ODCL's submitted after the accident showed that no deficient conditions were found during their inspections.
- Lessons Learned: Crane operators shall be trained that if a crane accident occurs, operations should be halted and the incident reported. Also, during the pre-use check, operators must inspect closely enough to find any damage to the crane and report the damage to supervision.

CONTRACTOR CRANE ACCIDENTS

- Accident: A contractor recently had a serious crane accident involving a crawler/ringer crane mounted on a barge. While lifting the upper works of a shipyard portal crane, the barge crane's boom collapsed and the lifted load landed in the river. The barge crane operator's cab was crushed but fortunately no one was seriously injured.
- Lessons Learned: See NCC message 171842Z DEC 02, Contractor Operated Mobile Cranes Mounted on Barges.

- Accident: A contractor was hoisting a crate of transformers that was hoisted with pallet bars rigged on the outside of the crate. When the operator hoisted the crate approximately 20 feet into the air, the bottom of the crate failed. The transformers fell onto a dishwasher unit staged on the pier.
- Lessons Learned: Crates should be placed on lifting pallets. This will ensure that the bottom of the crate is properly supported.

- Accident: A mobile crane was being used to remove a wooden pallet loaded with a hose reel when the pallet-lifting beam disengaged from the rigging gear causing the hose reel to slide off the pallet and fall approximately 40 feet. The accident investigation revealed that two of the sling hooks' safety latches

were damaged and did not work properly, the hose reel was not properly secured, shackles were not used between the pallet lifting beam attachments and the sling hooks, and the rigger failed to thoroughly check the rigging connection.

- Lessons Learned: Palleted loads should be properly secured.

Weight handling program managers and safety officials are encouraged to consider the potential risk of accidents occurring at your activity similar to those highlighted above and apply the lessons learned to prevent similar accidents. OPNAVINST 3500.39, Operational Risk Management, prescribes methods for assessing hazards and controlling and minimizing risks in hazardous operations. Navy activities should incorporate these principles into both training and day-to-day weight handling operations.

E-mail submission of reports of accidents, unplanned occurrences and near misses is encouraged. Our e-mail address is accident@ncc.navfac.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 a specific description of the component and the resulting effect or problem caused by 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, P-307, figure 1-1. They are also listed on our web page, http://ncc.navfac.navy.mil. Click on P-307 and then on P-307 Questions and Interpretations. The issues are arranged by the applicable section or appendix to the P-307.

Question: Monorail Crane. Clarify the term monorail crane.

Answer: Monorail cranes are units that are attached to a trolley (mechanical or powered) and that traverse a single structural beam. These units are eligible for the biennial load test program as outlined in NAVFAC P-307, paragraph 3.4.1.

Bridge cranes are units with a single or double girders attached to end trucks. The end trucks and the trolleys may be either top running or underhung. Single girder bridge cranes (mono-bridge) are still considered bridge cranes and are not considered eligible for the biennial load test program. Refer to NAVFAC P-307, appendix B, for illustrations of each type of crane.

Question: NDT Quality Assurance Requirements. Request clarification on the new NDT quality assurance requirements of NAVFAC P-307, appendix E, paragraph 1.4.4.

1. Is it intended that the NDT agency for brand new hooks, including hooks on new or contractor upgraded cranes, meet these new requirements?

2. Would it be necessary, in these cases, that the certification of compliance with ASTM E543 be provided, without the requirement for submittal and review of procedures and techniques?

Answer: 1. It is the intent of NAVFAC P-307 that the NDT vendors for all brand new hooks meet the new NDT requirements.

2. The vendors shall provide a certification that the vendor meets the requirements of ASTM E543. NAVFAC P-307, paragraph 1.4.4.b, also applies in that the vendors providing the new hooks shall develop and submit for review, procedures, including technique sheets specific to the types, shapes, and sizes of the parts being examined. The procedure shall adequately describe the orientation of the hook, nut, or pin with the magnetizing equipment. The vendor shall provide the procedure and technique sheets to an independent certified level III examiner for review.

NCC is currently working with a number of crane hook manufacturers/suppliers to pre-approve procedures and techniques sheets.

Question: Wire Rope End Connection Load Test Requirement for Swaged Connections. Request approval to use the crane load test in NAVFAC P-307, appendix E, as the load test specified for swaged connections in NAVFAC P-307, paragraph 11.4.2. NAVFAC P-307, paragraph 11.4.2, requires installed swaged connections be load tested but no criterion is provided for this load test. The strength of swaged and poured sockets are equal to 100 percent of the wire rope breaking strength (MIL-HDBK-1038, paragraph 5.3.13.2). Per NAVFAC P-307, paragraph 11.4.1, the load test for installed poured socket end connections shall be the crane load test in NAVFAC P-307, appendix E. NAVFAC P-307, paragraph 11.4.2, specifies that the swaged end connection shall be load tested but the load test requirements are not specified. Since the strength of poured and swaged sockets are the same and the poured socket is load tested using the crane load test, request to use the crane load test per NAVFAC P-307, appendix E, for swaged sockets. Additionally, load testing the swaged end connection separately from the crane load test in NAVFAC P-307, appendix E, requires special test equipment that is not available.

Answer: NCC approves.

OVERSIGHT OF CONTRACTOR CRANES – A SUCCESS STORY

Reports of serious contractor crane accidents continue to flow into the Navy Crane Center. Ensuring the safety of contractor crane operations at naval activities is a challenge both for activity commanding officers and for contracting officers. At one naval activity, the Navy tried a new approach, which has shown good results.

The three Navy bases in one metropolitan area are host activities to dozens of agencies that have contracting authority, and contractor cranes are a common sight at the activities. Understanding and meeting the requirements of NAVFAC P-307 for ensuring the safety of contractor crane operations was a major problem. Policies at the different bases varied. Contract requirements varied. Oversight by contracting administrators was ineffective.

The area activity officers met with the contracting officers to formulate a uniform strategy. It was quickly recognized that one major activity in the area had the expertise necessary to oversee contractor crane operations and should be involved in the program. As this issue involved multiple bases and tenant activities, the regional office provided funding to support the program. The regional office delegated some of the contracting officers' oversight responsibilities to support this effort.

An instruction for each of the three naval bases prescribing the access requirements for contractor cranes was developed. After obtaining concurrence from the base commanding officers, briefings were held with contracting officers and contractors and training provided to base security personnel. At each base, access is restricted to cranes that have valid entry permits. In addition to the certificate of compliance noted in NAVFAC P-307, an access permit requires a review of crane condition and operation by the major activity representative. When reviewing the crane, the major activity representative uses a checklist that identifies OSHA, ASME, and special contract requirements, such as the Army Corps of Engineers safety manual EM-385-1-1, which is invoked in construction contracts. The permit is issued for the duration of the job or 30 days, whichever is less. For long-term stays, a complete re-inspection and a new permit are required every 30 days.

On a daily basis, oversight is provided for contractor crane operations at all three bases. A checklist, which includes the questions noted on page P-2 of NAVFAC P-307, is used. Discrepancy reports are sent to the cognizant contracting officer with a five-day response time identifying corrective action. These reports provide the contracting officer with performance documentation that may be used in evaluating the contractor and crane supplier for future contracts.

On a monthly basis, a status report is provided to the base commanding officers. Chronic noncompliance by a crane supplier on one base resulted in barring that particular contractor from future work on the base. A monthly and quarterly trend data is also developed for contractor cranes. One significant trend was the number of cranes found with inoperable safety devices. These trend data focused attention on specific potential deficient conditions when inspecting the cranes.

Although this program is relatively new, by most measures it has been very successful. There has been significant improvement in the condition and operation of contractor cranes in the metropolitan area. From November 2002 to the present, the percentage of cranes found with deficiencies has dropped 36 percent from the previous five-month period. Contractors and crane suppliers are now aware of the expectations when working on Navy property. The single point of contact in the region facilitates crane inspection and access. Contracting officers can rely on inspection and oversight by knowledgeable personnel. Two knowledgeable personnel can manage the whole program, which includes 30 to 55 crane inspections per month and daily oversight of contractor crane operations. The base commanding officers wholeheartedly support this initiative.