THE CRANE CORNER

Navy Crane Center Technical Bulletin

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A WORD FROM TOPSIDE

Sam Bevins

In May of this year, the Secretary of Defense, citing an upturn in DOD accident rates, issued a challenge to all DOD agencies to reduce the number of accidents and accident rates by at least 50 percent in the next two years.

The Secretary of the Navy accepted the challenge and encouraged the Navy and Marine Corps to lead the way. For the Navy shore activity weight handling community, I believe this goal deserves our very best efforts. As the Secretary pointed out, "What better way to demonstrate that our sailors, marines, and civilian employees are truly our most precious asset!" In addition, safe and reliable weight handling operations significantly and directly affects fleet readiness.

This 50 percent reduction goal is a major challenge, especially since, unlike the overall upward trend within DOD, Navy shore activities have already achieved an outstanding 41 percent reduction in weight handling accidents since FY1999. The increased tempo of weight handling operations due to recent world events will pose an added challenge as we all work hard to achieve this goal.

SECNAV message 151652Z JUL 03 provided the following guidance to activity commanding officers:

"First, assume there may be a smarter way to do business and empower your best minds to develop and implement it. Ensure a sound approach to using effective processes, best practices, and available technologies.

- Second, ensure solid resources for safety. Safety programs are not discretionary – fully funding them should be a priority. To move forward, it is also imperative that we resource promising safety initiatives and new system safety technologies.
- Third, align support and infrastructure for safety. Leadership must be involved at all levels, ensuring senior supervision is present during high-risk evolutions and risk management is integrated into all endeavors. Additionally, leadership must ensure safety officers possess sufficient experience to assist the command and they must have access to the commander on all safety issues. Commanders should consider the following essential to success: awards and recognition; accountability; partnerships and coalitions both integral and external to the command; and mechanisms to monitor progress."

If each activity Commanding Officer and each activity crane team member, each supervisor, and all weight handling support team personnel take this as a personal challenge, I firmly believe the goal can be reached. As we drive toward this aggressive near-term goal of a 50 percent reduction in weight handling accidents over the next two years, we need to maintain our long-term goal of ZERO accidents.

Using FY2003 accident data as our baseline year, we will track progress over the next two years. I will periodically report our progress in future Crane Corners.

Inside This Issue

A Word From Topside, Page 1
Have You Heard About, Page 2
CSAs & EDMs, Page 2
Third Quarter FY03 Accident Report, Pages 3-5
NAVFAC P-307 Changes 1 & 2, Page 6
Disassembly and Maintenance of Auxiliary Contacts, Page 6
P-307 Questions & Interpretations, Page 7
Structural Insp. Mobile Crane Swingaway Jib Sections, Page 8

HAVE YOU HEARD ABOUT?

A recently introduced nut and bolt fastener system reportedly incorporates a positive self-locking, vibration-proof feature that is neither torque nor clamp-load dependent. The bolt has longitudinal grooves across the threads and the nut has one-way tines that seat in the grooves and prevent it from backing off. Each of the tines engages one of several grooves around the circumference of the thread. (See figure 1.) The bolt, nut, and tine ring are made of stainless steel. The tine ring is swaged in the nut bore and its scalloped edges secure it against rotation. This fastener system is intended for use on non-structural connections that are susceptible to loosening because of vibration or with limited access for inspection and tightening.

Figure 1

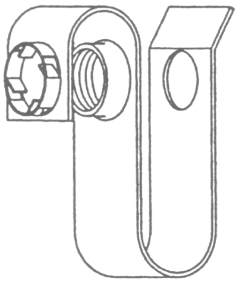

Figure 2

The fasteners are available in all sizes - both standard and made to order. Hangers in the forms of U-, J-, and S-shapes are also available for supporting electrical conductors and hoses. (See figure 2.)

A tool is provided for removal and re-use of the nut and bolt. It pries open the tines without marring the nut or the bolt.

The fastener system is also available in an all-plastic version, including the tines. ■

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-034A: Rotate Bearing Inspections on Westmont 100-Long Ton Floating Cranes.

CSA-112B: Westmont 100-Long Ton Floating Crane Motor Mounting Flange Cap Screw Failures.

CSA-122: Wire Rope Terminations at Hoist Winches on Westmont 100-Ton Floating Cranes.

EQUIPMENT DEFICIENCY MEMORANDA

EDM-059: Grove Mobile Crane Equipment Deficiencies.

EDM-060: Motor To Speed Reducer Coupling Deficiency.

EDM-061: Enclosed Cab Glass Does Not Meet ANSI-ASME B30.2 Specification. ■

THIRD 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 third quarter of FY03, 38 Navy and 3 contractor weight handling equipment accidents were reported. Serious Navy accidents this quarter included 2 injuries, 4 dropped loads, 1 overload, 1 two-blocking, and 1 contact with an overhead power line.

INJURIES

- **Accident:** A portal crane was being used to install a propeller shaft pilgrim nut. While the pilgrim nut was suspended, the lead mechanic removed the bolt holding the pilgrim nut handling fixture together. This caused the pilgrim nut to fall bruising the leg of the mechanic and damaging the staging. Although personnel had been briefed on the process, no crane team member questioned the removal of the handling fixture bolt, even though the briefing did not say to remove the bolt.
- **Lessons Learned:** During any pre-lift briefing, and particularly for a complex lift, the person performing the brief must ensure that all personnel completely understand their responsibilities and procedures throughout the full scope of the lift. If any crane team member observes an improper step in the procedure, he/she should stop the operation and seek resolution.

- **Accident:** A monorail crane was being used to lower an aircraft transmission assembly onto a maintenance stand. While positioning the transmission, the crane power failed. The operator decided to place the load in a safe location and attempted to hoist it. In the initial attempt, the hoist would not operate. A second attempt was made. During the attempt to raise the load, one of the mechanics continued to refine the position of the transmission. When the hoist responded to the second attempt to hoist, the left thumb of the mechanic was injured.
- **Lessons Learned:** When a problem is experienced during a lift, the operator must immediately notify the supervisor, who, in turn, shall notify the inspection organization and, if necessary, the engineering organization. If it is safe to leave the load suspended, the operator should not attempt further operation. If the suspended load must be moved due to an impending danger, the operator should alert team members and require them to stand clear of the crane envelope until the load can be safely landed.

DROPPED LOADS

- **Accident:** While using a bridge crane to relocate a 3,100-pound pump-motor assembly from a test area, the assembly became unstable and fell to the floor. The assembly was rigged in the vertical position and the center of gravity was above the rigging attachment. This made it necessary to stabilize ("frap") the assembly to prevent it from rotating through the rigging. The plan was to remove the slack from the rigging gear so that the rigger in charge could install the frapping and check the stability of the rigging configuration. During this maneuver, the rigger in charge signaled the operator to stop when slack was removed from the slings. The operator did not stop in time to prevent the premature hoisting of the assembly, which caused the assembly to rotate out of the rigging configuration and fall to the floor.
- **Lessons Learned:** When lifting loads where the center of gravity is above the lifting point, conduct a thorough risk assessment of the procedure. In addition, operators should make every effort to execute the directions of the rigger in charge in a timely manner.

- **Accident:** A mobile crane was being used to off load two pallet trucks from a ship to the pier. During the off loading of the second pallet truck, the right side lifting lug became dislodged, which caused the pallet truck to fall on its side, just missing the pier side rigger. Investigation revealed that the lifting lugs were improperly attached. The lug engagement in the slot in the pallet truck should have been over one inch but the actual engagement was approximately three-eighths of an inch due to an interference in the slot. The rigger was not familiar with these lifting lugs, which were provided by ship's forces to the rigger with directions just before commencing with the lift. In addition, the lifting diagram that was attached to the equipment showed a four-point lift arrangement not the two-point lift arrangement that was employed.
- **Lessons Learned:** Riggers should be familiar with the lifting gear they are using. Riggers should make sure that all lifting attachments are properly installed. In addition, equipment lifting diagrams must be followed.

- **Accident:** A 4,000-pound capacity jib crane was used by an untrained crane team to lower a submersible electric pump into a pool. While lowering the pump, the wire rope, which was not long enough to reach the bottom of the pool, spooled completely off the crane dropping the pump and the rigging gear into the pool. Neither the crane team nor their supervisor was aware that the crane was to be used only for lifting from floor level and not for lowering items into the pool. There were no warning signs to this effect on the crane.
- **Lessons Learned:** Supervisors must ensure that personnel assigned to operate cranes are qualified to do so. Where a crane may be subject to improper operation beyond its design limits, warning signs should be clearly posted to alert the operator of the applicable limits. In addition, the activity engineering organization should evaluate installing lower limit switches on cranes where loads could drop due to such improper operation.

OVERLOAD

- **Accident:** A shop mechanic was preparing to lift a load that he thought weighed 6,000 pounds with two cranes. After realizing that the lift would be a complex lift, he requested the assistance of a rigger and rigger supervisor. The supervisor noted that the cranes that were to be used had capacities of 4,000 pounds each. After further investigation, the supervisor discovered that on two different occasions the load had been lifted by a single crane. The item was weighed and the actual weight was 4,500 pounds. The operator and rigger who made the previous lifts were told by a technical representative that the load weighed between 2,500 and 3,000 pounds.
- **Lessons Learned:** Weights of loads should be known and not casually estimated. See NAVFAC P-307, paragraph 10.5, for requirements when estimated weights exceed 50 percent of the hoist's capacity.

TWO BLOCKING

- **Accident:** An operator trainee was performing hook block operations with a mobile crane when he two-blocked the crane. The trainee was instructed to pick up a weight and practice swinging and placing the load on numbers that were written on the ground. The trainee was on the fourth number getting ready to set the load down. While he was simultaneously booming down and hoisting up (to keep the load off the ground), he wasn't paying attention to the position of the hook which struck and then pulled the anti two-block device up into the sheave guard. The trainee heard the two-blocking horn and was told by the instructor to stop raising the hook. The trainee did not stop raising the hook right away and subsequently two blocked the crane.
- **Lesson Learned:** Instructors must provide close supervision of operator trainees to ensure the safety of the operation is not jeopardized. Whenever simultaneous operations are performed, they should be performed slowly enough to enable the operator to react to an impending problem.

OVERHEAD POWER LINE CONTACT

- **Accident:** A category 4 mobile crane was being used by a public works center utility crew to remove a valve from a steam pit. The crane was positioned out of the roadway so as to not impede traffic, but this placed it beneath an 11kV power line and communication lines. No one noticed the overhead lines. A mechanic signaled the crane operator to lift the valve out of the steam pit. Upon clearing the pit, the crane operator, without direction, raised the crane's boom in order to place the valve onto the bed of a nearby truck. At that time, the boom made contact with the communication and power lines causing the crane to catch on fire. The crane was in contact with the energized power line for more than 30 minutes. There was extensive damage to the crane, but, fortunately, there were no personnel injuries.
- **Lesson Learned:** Contact with overhead power lines is the number one cause of fatalities with mobile crane operations in private industry. Recently, three workers were electrocuted as a result of crane boom contact with overhead power lines at a private industrial site. Crane teams must be aware of their surroundings at all times. When operating near overhead transmission lines, the crane team must be alert to this special hazard. If any part of the crane, load, or rigging gear could approach the distances as noted in figure 10-3 of NAVFAC P-307, the special requirements of paragraph 10.11.1, must be followed. Operators must be trained to operate only under the direction of the rigger in charge. Crane teams that operate category 4 cranes must be fully qualified.

SIGNIFICANT NEAR MISS

- **Near Miss:** A portal crane was being used to transfer two enclosure roof sections from a trailer onto the enclosure. The operator at the controls was an operator in training being trained by a journeyman operator. After the rigging had been attached, the trainee and the journeyman operator were exchanging positions to allow the journeyman operator to make the lift. During this movement, the hoist controller was inadvertently engaged. The roof section with the rigger still standing on top of it raised approximately two feet in the air. The rigger stepped off the roof section onto the trailer and disconnected his fall protection harness from the lanyard that was connected to the whip hook of the crane.
- **Lesson Learned:** Instructors must assess potential risks when training evolutions take place. This crane has a "deadman" feature which prevents this type of inadvertent operation, however the deadman feature was switched off at the time. In addition, except for use with personnel platforms, a crane hook shall not be used as an anchorage for fall protection unless the hoist is secured in position so that it cannot be accidentally engaged.

CONTRACTOR CRANE ACCIDENT

- **Accident:** A mobile crane was being used to load test a ship's lifeline with a 3,000- pound test weight. The test weight was a rectangular plate approximately 4 inches thick. The test weight was oriented vertically (i.e., on edge) for the lift. As the test was being conducted, one of the lifeline fittings failed causing the test weight to drop on its 4 inch edge and then start to topple over. A crane team member instinctively tried to steady the weight as it was falling over. The load continued to fall, crushing the person's leg.
- **Lessons Learned:** During load tests, crane team members must stand clear of the loads being lifted. In addition, test directors and riggers should assess the stability of test loads should an unforeseen event occur. In this case, a different orientation of the test load may have prevented this injury.

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.

Accident 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.

NAVFAC P-307 CHANGES 1 & 2

CHANGE 1

NAVFAC P-307, paragraph 14.13.f, is revised as follows: "Forged steel wire rope clips shall be used to secure the ends of wire rope lashing. The rated load shall be reduced by 20 percent or by the D/D efficiency factor whichever is greater. Properly tied standard knots or hitches (square knots backed up with half hitches, bowlines, clove hitches, etc.) may be used to secure synthetic rope and webbing lashing. When knots are used, the rated load of the lashing shall be reduced by 50 percent."

CHANGE 2

The biennial load test program referenced in paragraph 3.4.1 of NAVFAC P-307 allows for certain type category 3 cranes to be load tested every other year unless defects found during off-year inspections are associated with components that impact the holding strength of the crane. Currently, this biennial load test option is not permissible for category 3 bridge, wall, or gantry cranes.

Historical data provided by various activities for category 3 bridge, wall, and gantry cranes indicate that these cranes should be included in the biennial load test program. Navy Crane Center concurs.

Therefore, effective immediately, paragraph 3.4.1 of NAVFAC P-307 is revised as follows: "Annual Certification. The certification is valid for one year from the date of signature of the certifying official. A crane shall not be used in service without a valid certification. The certification process shall include a condition inspection and appropriate tests. For category 1, 2, and 4 cranes, the annual tests shall include a load test. Category 3 cranes shall be inspected, operationally tested (without load), and certified annually, however, a load test shall be performed at every second annual certification, as a minimum. The certification shall so indicate when a crane is in the biennial load test program. For floating cranes (including mobile cranes mounted on barges), as a condition for certification, the barge shall be determined fit for further service as evidenced by a current material inspection report and documentation of a current depot availability or an approved deferral of depot availability as required by OPNAVINST 4780.6."

DISASSEMBLY AND MAINTENANCE OF AUXILIARY CONTACTS

Some facilities have reported failures of auxiliary contact blocks that are attributable to the periodic maintenance (contact disassembly for cleaning) and the high number of cycles during operation. These auxiliary contacts are encased in a plastic housing that is held together with two screws. The periodic disassembly to clean the contacts and the ensuing reassembly has led to the stripping of the threads in the plastic housing causing a failure due to either a separation of the assembly or a faulty performance during subsequent actuations of the auxiliary contacts.

In many cases, it is possible to clean the auxiliary contacts without disassembling the plastic enclosure. In one particular case, an activity changed its maintenance procedure and eliminated the requirement of contact housing disassembly for cleaning.

Activities should be aware of the possibility of stripping internal threads in plastic contact block assemblies. Ensure that when reassembling components of this type, the screws are not over tightened. When in doubt, activities should contact the OEM for guidance. Activities should minimize disassembly when possible, and consult OEM instructions for recommended preventative maintenance procedures.

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: Retention Requirements for Certificate of Compliance and Contractor Crane Operation Checklist (P-1 and P-2). Clarify retention requirements for Certificate of Compliance for contractor cranes (NAVFAC P-307 form P-1) and Contractor Crane Operation Checklist (NAVFAC P-307 form P-2).

Answer: NAVFAC P-307 requires that the P-1 form be posted in the crane's cab (or on the vehicle for cranes with open operator's areas, i.e., category 4 cranes). It must be present and legible for the entire length of the crane's presence at the activity.

The P-2 form is the form provided for surveillance of contractor crane operations and must be filled out for each visit by the contracting officer's oversight personnel. The contracting officer must retain the completed forms for a period of one year. See NAVFAC P-307 paragraph 1.7.2.1.a.

Question: Oil Analysis Requirement for Category 2 Down Rated to Category 3 Hoists. Request clarification of the oil analysis requirement for category 2 package hoists, which have been administratively down rated and are currently being certified as category 3 hoists.

Answer: Category 2 package hoists that are down rated to category 3 hoists are not required to have an oil analysis performed. Follow the maintenance inspection specifications of NAVFAC P-307, appendix D, item 8b, for category 3 package hoists.

Question: Crane Accident or Rigging Gear Accident. The June 2003 NAVFAC P-307 provides clarification on WHE accidents and defines the elements that classify accidents as either crane or rigging gear accidents. Crane hooks are sometimes used as anchor points for chainfalls, portable hoists, and other rigging gear where the crane is used to position the chainfall/hoist over an item to be lifted and then the lift is made by the portable hoist. If an accident were to occur during the lift, should it be reported as a crane accident or a rigging gear (section 14 gear) accident?

Answer: If, after positioning the portable hoist/rigging gear, the crane is made inoperable, an accident occurring during the lifting evolution is considered a rigging gear accident, unless the accident results in an overload or damage to the crane, in which case it shall be reported as a crane accident.

Question: Requirement for Pins Uniquely Identified to a Specific Crane. Our activity has two portable gantries that we have chosen to certify as category 3 gantry cranes. One of these gantry cranes has a captivated gantry frame extension pin and the other has a ball-lock pin with a lanyard that attaches it to the gantry frame.

The intent of NAVFAC P-307 requirement to serialize pins is to ensure that the original load-tested pins are retained with the associated gantry. The two pin configurations on our gantries ensure the pins are inseparable from the gantry frame. They preclude the use of alternate (unload tested) pins.

Request deviation from NAVFAC P-307, paragraph 3.5.3.1.3, requirement to serialize pins. Our gantry pins have a means of making the pins inseparable from the gantry frame (e.g., lanyard or captivated).

Answer: Deviation is approved. NCC will address the need to change the NAVFAC P-307, paragraph 3.5.3.1.3 at the next major revision.

STRUCTURAL INSPECTION ON MOBILE CRANE SWINGAWAY JIB SECTIONS

An activity reported measurable depressions on the main chords of the swingaway jib sections of four Grove mobile cranes. The depressions were the result of abrasion from the brackets that secure the jib section to the main boom in the stowed position. The probable cause was metal-to-metal contact between the main chord section and the keeper pin causing abrasion of the main chords as the crane travels over the road. There may be some alignment problems with the mounting brackets.

All of the cranes with this problem were manufactured between 1983 and 1988. As corrective action for these cranes, wear plates were installed as recommended by the manufacturer, Grove. All activities with Grove mobile cranes manufactured between 1983 and 1988 should pay particular attention to this potential problem on the main chords of the swingaway jib sections.

According to Grove, this design has been modified on newer cranes to eliminate the possibility of metal-to-metal contact.

It should be noted that the June 2003 revision of NAVFAC P-307 now requires mobile crane booms to be inspected at every "B" type inspection instead of every "C" type inspection. ■

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. ■

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