



THE CRANE CORNER

Navy Crane Center Technical Bulletin

<http://portal.navfac.navy.mil/ncc>

54th Edition – June 2007

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

A WORD FROM TOPSIDE

Sam Bevins

Thus far, in FY2007, Navy shore activities are showing a very positive trend in the reduction of crane accidents. Through the first seven months of this fiscal year, crane accidents are down by almost 25 percent over the same time period last year. If our activities can continue this positive trend through the always challenging summer months, we can have our best year yet for Navy lifting and handling safety.

One area of concern, however, is the percentage of accidents that involve the operation of mobile cranes. We keep a close watch on mobile crane accidents since they can have a greater potential for serious consequences than other types of cranes. Serious accidents, such as two blockings, contact with overhead power lines, and overloads (with the resulting loss of stability) are a frequent threat with mobile crane operations. For FY04, 05, and 06, the percentages of accidents that involved mobile cranes consistently decreased from 39 to 33 to 28 percent respectively. This year, this percentage has crept back to 37 percent. While our activities are reducing accidents with other types of cranes, we are not seeing similar reductions in mobile crane accidents.

Some types of accidents are more common with mobile cranes than with other crane types. Wire rope damage was reported on seven accidents. The wire rope may jump off a boom tip sheave or be damaged on the drum from mis-spooling due to improper operation. Two-blocking is an all too frequent occurrence, usually with no load on the hook as the crane is being set up for operation or shut down for transit at the end of the shift. Environmental conditions can have more of an effect on mobile cranes than other types of cranes. Wind and wave action were contributing factors in four of the accidents. Two common ship support lifts where mobile crane accidents occur are brow lifts and shore power cable lifts. Five of the reported accidents occurred during these lifts.

Operational risk management is vital for every mobile crane operation. Properly identifying and assessing all the risks associated with the crane itself, the lift site, the load to be handled, the crane team, environmental conditions, and other influencing factors can be a challenge.

Our video, *Mobile Crane Safety*, covers seven topics: laying a foundation for safety, teamwork, crane setup, understanding crane capacities, rigging considerations, safe operating procedures, and traveling and securing mobile cranes. The video is available at <http://dodimagery.afis.osd.mil/> (DAVIS/DITIS) (PIN 806721). This is a worthwhile training aid to help ensure mobile crane lifts are properly planned and executed.

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Mobile crane safety is critical to fleet readiness and to the personal safety of everyone in the vicinity of a mobile crane operation. Take the time to properly assess all the risks. Make the right risk decisions. Let's have our best year yet for mobile crane safety! ■

UFC 3-320-07N, Weight Handling Equipment

A revision to Unified Facilities Criteria (UFC) 3-320-07N, Weight Handling Equipment, was issued on 15 May 2007. You may be more familiar with this manual in its previous designations, MIL-HDBK 1038 and DM-38. The revision is posted to, and may be downloaded from, the Whole Building Design Guide (WBDG) website, <http://www.wbdg.org>. A bookmarked version is also available for download from the Navy Crane Center website.

This update to UFC 3-320-07N incorporates changes in crane design and utilization that have occurred since its original issue in January 2004. Extensive updating of superseded, renumbered, and re-titled referenced publications has occurred. Also included is a format change as directed by UFC 1-300-01, Criteria Format Standard. Other changes include:

- Added a statement of the importance of innovation to U.S. Navy crane design.
- Changed numerous “shall” and “required” statements to “may” and “should.”
- Clarified applicability to the design of new equipment and limited applicability to existing equipment unless safety and performance are in question.
- Stated the policy for overhead electric traveling (OET) crane design to be CMAA Class C, as a minimum.
- Added a section on packaged hoists.
- Added policy for design of new, large-span OETs, to include two girders with full length catwalks on each and cross-overs at end trucks.
- Added new sections to discuss advances in crane design and ensure that latest technology is utilized where reliability or safety improvements are achievable, particularly in the area of AC control.
- Modified and expanded areas where user feedback indicated items were out of date or lacking, including expanded sections on hydraulic system components, speed reducer types and cab glazing.
- Replaced “NCC” with “NAVCRANECEN.”
- Updated terms including: "hook block" is replaced with "load block"; “gear reducer” is replaced with “speed reducer”; “panic stopping” is replaced with “emergency stop”; and, added “existing cranes” to discriminate between new procurements and cranes currently in the U.S. Navy inventory.
- Added reference to commercial component specifications, such as ASME HST and MH 27.1.
- Added a section on fire protection systems to detail desired fire protection and fire protection components for new procurements.

UFC 3-320-07N is used predominantly as a guide for the technical description of new cranes during the procurement process. It is also used as a guide during repair and modification of existing cranes. The UFC provides comprehensive descriptions of the predominant crane types in service at Navy shore facilities and is therefore applicable to all Navy service elements and Navy contractors. Comments or requests for clarification can be addressed to Navy Crane Center, Design Division. ■

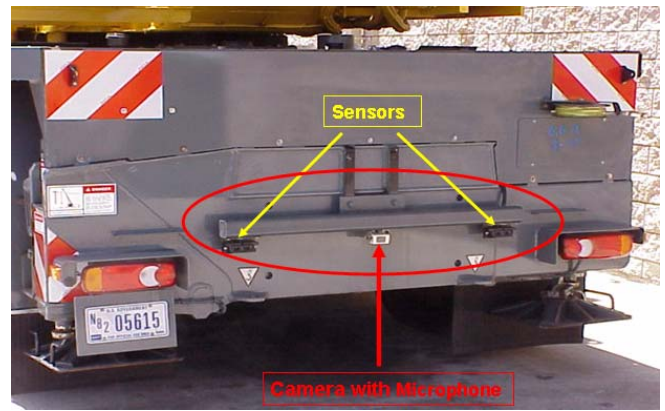
Back-up Monitoring System



When their new Grove GMK truck cranes arrived, NAVFAC Hawaii noticed that the cranes lacked visibility to the rear other than side mirrors, unlike some of their other truck cranes, which have a cab window to the rear. Deciding to be proactive and avoid a possible incident, they installed a backup monitoring system to one of these cranes for field testing. They are in the process of purchasing four more units for their other GMK truck cranes and are considering installing the system on all of their other truck cranes.

The system consists of a camera with microphone and ultrasonic sensor facing the rear of the crane, and a 7" LCD monitor with speaker mounted in the cab so the operator/driver can hear, see, and confirm what is behind the crane.

The camera has a built in microphone, can operate in temperature ranges from 22 to 140 degrees Fahrenheit, and has a heater, which prevents the lens area from fogging or icing over. The camera is connected to the LCD screen in the operators cab and allows the operator to see any obstacles in his path. The microphone allows the operator to hear any stop commands from pedestrians.



The ultrasonic sensor admits high frequency sound waves and when these sound waves hit an object, they bounce back to the sensor. The sensor can determine the time elapsed from when it sent the wave to when the wave returned and tell how far away the object is. The sensor installed by NAVFAC Hawaii has six detection zones, 9ft, 5ft, 4ft, 3ft, 2ft, and 1ft. The user can program the unit to alarm in any of these detection zones so if the crane is being used on a busy pier close to several obstacles, the unit could be set to alarm at a closer distance. The sensor has a detection area approximately 9ft across and, depending on the installed orientation, an angle of 15% below centerline and 35% above.

The units installed consist of a camera, monitor, and two ultrasonic sensors. The system can be outfitted with two additional cameras to provide side coverage but the monitor can only view one camera at a time.

Cost of the system itself is \$775 and installation took 24 man-hours. Total cost of the first installed system was \$2584 though this cost may decrease as the maintenance personnel become more familiar with the wiring and installation requirements. For more information, contact 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 170, Incorrect Oil Level Gauge Installed on Certain Caterpillar Diesel Engines

The oil level gauges, or dipsticks, on certain model 3508, 3512, and 3516 Caterpillar diesel engines with a shallow fabricated oil pan are incorrect and could lead to the engine having a low oil level. These engines typically have a low oil pressure sensor that shuts down the engine in the case of low oil pressure, so the incorrect dipstick should not lead to engine damage but may lead to an engine trip. The original dipstick part number (P/N) is 7C6369.

The affected diesel engines, equipped with a shallow fabricated oil pan, are as follows. Model 3508, identification numbers 1ZF001-555, 95Y00717-775, 96Y00795-1073, 23Z001768-3172, 68Z00739-759, 69Z00350-528, and 70Z00632-751. Model 3512, identification numbers 4KC0097-164, 3YF001-501, 49Y00518-572, 24Z002014-3337, 65Z00650-697, AND 67Z00599-762. Model 3516, identification numbers 3RC00118-226, 4XF001-314, 25Z001042-1951, 27Z00661-676, 71Z00259-289, and 73Z00222-341. Cranes with these diesel engine identification numbers and with a shallow fabricated oil pan, P/N PA2966 (3508 Engines), PL3089 & PL3090 (3512 Engines) and PL4093 (3516 Engines) are affected by this CSA.

During the next type "B" maintenance inspection, activities with cranes utilizing Caterpillar diesel engine as listed in paragraph 1.B shall replace the oil level indicator P/N 7C6369 with oil level indicator P/N 4P3784. Add oil as needed. In accordance with NAVFAC P-307, paragraph 4.4.2.c, Navy Crane Center alteration approval is not required.

CSA 171, Detroit Pneumatic Hoist Model PRV-2II Sluggish Limit Switch Operation

An activity reported where a change in OEM replacement parts resulted in a sluggish response to the upper and lower limit switches on a Detroit hoist. The hoist involved is a Detroit pneumatic hoist, model PRV-2II manufactured in 1984. The hoist was originally supplied with a 3/8" air hose between the control valve and the Schrader 2-way upper and lower limit switch valves. The activity replaced the 3/8" air line and control valve with the OEM recommended 1/4" air line and replacement control valve. The Schrader upper and lower limit switch valves were not replaced. The activity reported that when the limit switches were activated, the 1/4" air hose would not allow sufficient air flow (increasing back pressure to the control valve) resulting in continued hoisting.

The OEM has reported that the 3/8" air hose, the control valve (P/N TC-809), and the Schrader 2-way limit switch valves (P/N 1430255) were superseded by 1/4" air hose, control valve (P/N RCV-110), and Humphrey 3-way limit switch valves (P/N 1431888) sometime in the late 1980's. The OEM also reports that the 3/8" hose is the proper size hose to be used with the Schrader upper and lower limit switch valves and that industrial 3/8" hose (with proper pressure rating) obtained through local suppliers is acceptable. The activity has since replaced the 1/4" hose with the original 3/8" hose and reports satisfactory limit switch response.

During the next annual inspection, activities shall inspect Detroit model PRV-2II pneumatic hoists with Schrader 2-way limit switch valves (P/N 1430255) to ensure the proper 3/8" air line is installed. Models with Humphrey 3-way limit switch valves (P/N 1431888) installed are not affected.

EQUIPMENT DEFICIENCY MEMORANDUM

EDM 092, Fire Hazard with Improperly Maintained Nickel Cadmium Batteries

The purpose of this EDM is to inform activities of a fire hazard with improperly maintained nickel cadmium (NI-CD) batteries that are discharged and recharged with an onboard charging system.

An activity reported a NI-CD battery failed where the case melted, exposing the internal components and resulting in a fire. The battery manufacturer surmised the fire was caused by a low water level in the battery due to improper maintenance. Because of the low water level, the battery overheated causing the internal materials to oxidize, short circuit, and ignite.

Activities could replace NI-CD batteries with valve regulated lead-acid (VRLA) batteries where possible for additional safety and prevention of fire. VRLA batteries are sealed and do not require periodic monitoring of water levels to ensure proper operation.

If an activity decides to replace the NI-CD batteries with VLRA batteries, they should verify the installed charger is compatible with the replacement VLRA batteries. Any replacement/modification to the installed batteries and battery charger shall be approved locally or by the Navy Crane Center in accordance with NAVFAC P-307, section 4.

EDM 093, Environmental Contamination with Hydraulic Fluid

During the load test of a Westmont 100-ton floating crane, the hydraulic system developed a severe leak and approximately 200 gallons of hydraulic fluid spilled into the engine compartment, 100 gallons of which continued to flow into the surrounding environment.

The engine compartment of the Westmont 100-ton floating crane has a ¾” drain hole near the rear wall. With the crane positioned such that the boom is over the reinforced deck, the drain hole is approximately 1-2 feet inboard of the rear edge of the barge. The hydraulic fluid flowed through the drain hole directly into the environment. A drain plug was not installed at the time of the incident. After the incident, the activity installed a drain plug and caulked between the walls and floor to ensure any future hydraulic spills would be contained within the engine compartment.

The Navy Crane Center recommends that all activities that operate or maintain floating cranes, or mobile cranes mounted on barges review spill path potential from fluid holding tanks to the environment in the event of a failure. For mobile cranes mounted on barges, activities should investigate options to contain fluid leaks on the barge. ■

SECOND QUARTER FY07 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 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 NAVFAC P-307 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 second quarter of FY07, 51 Navy WHE accidents (43 crane accidents and 8 rigging gear accidents) were reported and 2 contractor crane accidents were reported. Ten of the 43 crane accidents were significant. Four of the significant crane accidents this quarter are discussed herein.

DROPPED LOADS

Accident: During a crane lift, a pallet of steam hoses fell into the water after the load was impacted by a gust of wind. A mobile hydraulic crane was used to lift pallets of steam hoses from the pier to the deck of the ship. It was a clear day with the wind speed at 15 to 18 miles per hour. The ship’s deck was 60 to 80 feet above the pier where the crane was set up. Each pallet consisted of five boxes of Steam hoses that were wrapped in plastic but not secured to the pallet. The lift was uneventful until the load cleared the top deck of the ship. Once clear, a gust of wind estimated at 30 mph, caught the pallet of steam hoses and flipped the pallet up to a 90 degree angle. The five unsecured boxes of hose slipped off the pallet and fell into the water. The ship provided a wind barrier to the load until such time that the load cleared the top deck of the ship. The principles

of operational risk management (ORM) were not employed to mitigate the risks associated with possible wind gusts on a day when the reported sustained wind conditions exceeded 15 mph.

Lessons Learned: Environmental factors (wind, rain, etc) must be considered prior to and during crane operations. The operator and personnel performing rigging functions are responsible to ensure the load is safe to lift, properly secured, and properly controlled. If there is doubt, stop the operation until conditions improve or request assistance.

PERSONAL INJURY

Accident: During removal of a brow, a rigger was struck in the head by a hinged walk ramp. A crane team was assigned to remove a brow and shore power cables from a ship that was preparing to get underway. Time constraints increased the operational tempo of the crane team. After successfully removing the shore power cables, the crane team used a four point pick to lift the brow. The brow had a hinged walk ramp on one end. An individual on the ships deck raised the walk ramp and held it until the brow was raised and rotated away from the ship. As the brow was lowered to the ground, the walk ramp opened and struck one of the riggers in the head. The ramp was not secured to the brow to prevent movement and the crane team did not check the condition of the ramp prior to lifting the brow. Tag lines were not used. The injured rigger was standing in close proximity to the suspended load. Personal protective equipment (hard hat) was worn and it likely prevented serious injury.

Lessons Learned: Rigging personnel must make sure all latches, ramps, and other attachments are secured before the crane moves any equipment. Crane team personnel should avoid placing themselves in unsafe positions near suspended loads. The use of taglines reduces the need to be near a suspended load. Wearing of personal protective equipment is an effective tool in reducing the potential for serious injury. Crane team supervision must ensure that work tempo does not degrade operational safety.

TWO-BLOCKINGS

Accident: During the operation of a category 4 truck mounted boom crane, it was two-blocked. The crane was positioned with the boom to the rear and over the truck bed. The hook block was in the OEM designed stowed travel position which deactivated the anti-two block function. In order to make a lift, the operator had to reposition the boom over the front of the truck. The operator raised the boom approximately 30 degrees and then rotated the boom 180 degrees. During the movement, the operator two-blocked the crane. The subsequent investigation determined that the operator inadvertently operated the extend boom control when he intended to operate the hoist down control. The force applied by the extension of the boom, damaged the wire rope. The qualified operator had not operated the equipment for some time and failed to reacquaint himself with the controls or operational characteristics prior to starting the work or prior to any form of an operational check.

Lessons Learned: Trained operators must reacquaint themselves with the controls or operational characteristics of the equipment, especially. After periods of non-operation. For mobile cranes that do not provide protection against two blocking or when anti-two block functions are bypassed to stow or travel, activities must develop crane specific procedures to minimize the possibility of two-blocking.

SIGNIFICANT CONTRACTOR ACCIDENT

Accident: During the installation of a new double girder bridge crane, a girder was dropped after a rigging gear failure. Several contractor employees sustained serious injuries. A contractor was utilizing a mobile hydraulic crane to set the girder in place. The 22.5k pound girder was rigged with two 20 ft polyester round slings, each with a rated capacity of 17k pounds. After the girder had been suspended in a static position for approximately 10 minutes, one of the two slings failed. The other sling likely failed due to overload. Both slings were

believed to have been protected by rubber matting that was used as chafing material. Based on the break location and the condition of the chafing material, the most probable cause of the sling failure was due to inadequate protection of the sling from the sharp edges of the girder.

Lessons Learned: Synthetic slings can be easily cut at sharp corners or edges. Adequate chafing protection is required for synthetic slings where there is a possibility of the sling being cut or otherwise damaged by the load. In the accidents noted above, the protection was inadequate. Chafing material must be of sufficient thickness and strength to prevent sling damage. Synthetic rope slings and alternate yarn synthetic round slings require a specific radius of curvature around sharp cornered objects (see NAVFAC P-307, section 14). This requirement also applies to the minimum radius of curvature at corners of objects being lifted. With high stresses on the slings, soft chafing material may not maintain the minimum required radius or provide the required protection. Harder materials, such as split piping sections or special rounded shoes, are recommended. Sling manufacturers also provide wear protection products that protect slings from sharp corners or edges. Also, ensure the rigging configuration is stable and slings cannot slide off the chafing protection. In addition, ensure synthetic slings are not excessively bunched in the bowl of the hook or in shackles. This can cause uneven loading on the synthetic fibers and failure of the sling. Finally, synthetic slings must be properly cared for and stored. Navy crane center auditors find more synthetic slings in poor condition than any of the other types of slings.

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 3500.39B 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. ■

NAVFAC P-307 Web Based Training

Two courses have been added to Navy Crane Center's growing list of web-based training courses: Crane Rigger and Rigging Gear Inspection. This brings the total number of web-based training courses to five, which also includes: General Crane Safety Refresher, Category 2 Crane Safety Refresher, and Category 3 Crane Safety. Four more courses [General Crane Safety, Category 2 Crane Safety, Category 4 Crane Safety, and Load Test Director] are scheduled to be converted to web-based format and made available online during the next several months. Maintenance courses will be converted over the next 1-2 years. Web-based courses are available online through eLearning on Navy Knowledge Online (<https://www.nko.navy.mil>). Training information including course summaries, schedules, billeting, and online information can be viewed on Navy Crane Center's web site at <https://portal.navy.mil/ncc> (click on training). ■

CRANE AWARENESS FOR THE SUMMER MONTHS

As we approach the summer months, I again ask weight handling managers and supervisors to place a special focus on safe crane and rigging operations. Overall, the navy shore based crane accident statistics have been trending downward as compared to last year and we have an opportunity to make FY07 the safest year on record. However, the summer months bring us a real challenge to maintain this downward trend. With the added distractions associated with the warmer weather, maintaining a sharp focus on the critical job at hand during weight handling operations will be challenging. Surveillance of lifting and handling operations by experienced personnel has proven to be an effective tool in accident prevention. During surveillances, look for

warning signs of complacency or taking shortcuts, and include operations where there is no load on the hook. Approximately one-third of the accidents reported this year occurred with no load on the hook. Consider a preemptive safety awareness briefing to reinforce management's expectations for adherence to safe lifting and handling requirements and practices. Recognize safe practices and achievements where warranted. Management should consider and address the impact of the summer vacation season on your crane teams. The team make up is often changing to support vacation schedules. A consequence may be a degradation in communications or process unfamiliarity among the team.

The principles of OPNAVINST 3500.39B should now be standard practice for each and every weight handling operation. Increased safety awareness by all personnel involved in weight handling operations and consistent application of ORM principles will help prevent crane accidents. This fiscal year, collision related accidents have been identified in 39% of crane accident reports. Collision related accidents have involved the load striking an object (22%) or the crane itself striking an object (17%). Attention to detail and can prevent these accidents. Prior to moving a load or the crane, have a clear understanding of its travel path (including destination) and ensure that the crane and load are clear of any obstructions. Take extra precaution to avoid unplanned contact when working in confined areas. Make sure the load is properly balanced and securely rigged. Unstable loads and inadequate clearances have been common causes of load related collisions.

Ensure all personnel involved in the weight handling program understand our comprehensive crane and rigging gear accident definitions and report all events that meet those definitions. Our philosophy of reporting, and learning lessons from, the small events to help prevent more serious events has shown itself to be effective.

Each weight handling accident diminishes support to the fleet. A safe and reliable navy weight handling program is an essential enabler for fleet readiness. Commanding officers of navy shore activities are strongly encouraged to intensify their efforts to raise the level of safety awareness in their weight handling operations and continue to strive for the goal of zero weight handling accidents. ■

2007 Weight Handling Improvement Conference

The Navy Crane Center organized a Weight Handling Improvement Conference (WHIC) on May 15&16 at the Virginia Advanced Shipbuilding and Carrier Integration Center in Newport News, VA. Approximately 60 personnel from 16 different activities attended and topics included a new back-up monitoring system installed on a truck crane, the Navy crane procurement process, rotate bearing fastener tightness checks, and program safety. The goal of the WHIC is to improve weight handling operations through an exchange of ideas, best practices, and lessons learned.

Inspection requirements in NAVFAC P-307 are derived from various sources including industry standards, OEM requirements, Navy experience, and best practices. The Navy Crane Center continually monitors these requirements to determine if the inspection periods may be relaxed or if additional inspections are required. Obtaining inspection field data from activities is critical in making informed decisions. Three specific inspection requirements were discussed during the WHIC, at which time the Navy Crane Center requested field data to evaluate current requirements. To broaden the sample data, the Navy Crane Center would like activities to submit data on the following P-307 inspection requirements. The data may be submitted to m_nfsh_ncc_crane_corner@navy.mil.

- 1) Inspection of internal extension/retraction cables – Since 2000, NAVFAC P-307 (Appendix C, item number 51) requires disassembly of the booms on mobile cranes with telescoping booms and internal extend/retract cables at every second “C” inspection. Activities are requested to submit data on the

condition of the wire rope inspected from this disassembly and if this condition differed from inspection done through inspection ports.

- 2) Rotate Bolt Tensioning – Based on analysis of data from Craft and Westmont portal crane rotate bearing fastener checks over many years and consultation with bearing OEM’s, some relaxation in P-307 periodicity requirements for tightness checks for these specific cranes was provided. Activities are requested to submit data on rotate bearing fastener tightness checks for portal, floater, and mobile cranes. NCC will analyze the data to determine the validity of the current inspection criteria and whether the existing periodicity can be extended for other cranes. Activities are requested to submit the following data:
 - a. How tightness checks are accomplished for each type of crane.
 - b. The crane OEM, model number, and year of manufacture.
 - c. Rotate bearing OEM and size.
 - d. All data on number of rotate bearing fasteners that were found loose (including torque values if available) and location of loose fasteners.

- 3) Load Indicator Accuracy Requirements – The 2006 revision of NAVFAC P-307 requires load indicators meet the requirements of SAE J-159 for testing and tolerance. Data is requested on actual accuracy on all load indicating devices. This data should indicate the accuracy at the shutdown or overload setting for the crane. ■

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. ■