THE CRANE CORNER

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

A WORD FROM TOPSIDE

Sam Bevins

Crane accidents in the private construction industry have recently made national news. The sudden and tragic results are stark reminders of the hazards and ever present risks of lifting and handling operations. Properly managing these risks is essential. For the Navy shore community, the purpose of NAVFAC P-307 includes ensuring that weight handling equipment is properly maintained and is safe for use; ensuring all personnel involved with lifting and handling operations are trained and qualified; ensuring that risks are identified and managed through the application of Operational Risk Management; and ensuring that lifting and handling operations are performed safely.

In addition to our regular accident "lessons learned" message, we issued two safety messages in the past two months. One message addressed the subject of lifting constrained loads, that is, lifts where the load may be subjected to additional friction or suction forces or where the load can get caught or bind at an obstruction. Each year we receive reports of overloads and occasional equipment failures due to bound loads of some sort. These conditions can significantly increase the force on the crane and in some cases, overloads can occur very suddenly. Strict attention to these conditions, including the use and close monitoring of load indicating devices, good communication, and careful and deliberate application of the lifting force frequently through the use of chainfalls or slow hoist operation, is essential.

The other message was one of our "seasonal" messages reminding shore activity lifting and handling managers of the distractions of the summer season (summer vacations, substitute personnel on crane teams, unfamiliar job assignments, etc.) and the need to manage these added risks, through increased surveillance, safety stand downs, situational awareness, and other applicable risk mitigation initiatives.

Also, in March, the Navy Crane Center hosted a 3-day Crane Accident Prevention Symposium. Approximately 65 personnel from the Navy and private shipyard weight handling communities were in attendance. The symposium discussed and identified improvement initiatives that will assist in reducing weight handling accidents. These improvement initiatives were assigned to various attendees for action. A follow-up meeting will be scheduled in the near future to ensure the initiatives gain momentum.

Every accident diminishes our support to the Fleet. Our goal remains ZERO Navy shore activity weight handling accidents!

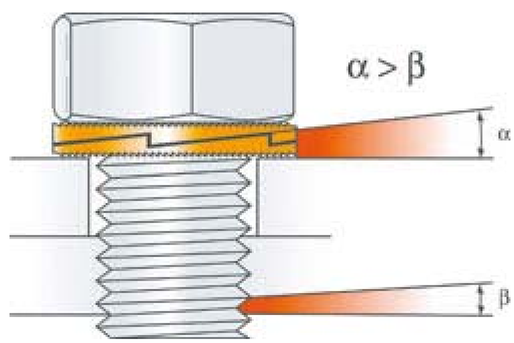
Inside This Issue

Operational Risk Management 5-Step Process

- Identify Hazards
- Assess Hazards
- Make Risk Decisions
- Implement Controls
- Supervise (Watch for Changes)

HAVE YOU HEARD ABOUT?

A bolt securing washer that features a unique wedge-locking system has been demonstrated to be superior in vibration and dynamic load resistance when used for captivation of fasteners. The new device uses the tension developed during fastener tightening, rather than friction, to make the bolt self-locking. Consisting of a pair of washers with mating wedge surfaces, the rise of the wedges is greater than the pitch of the secured fastener, preventing the locking device from being overcome. The locking function is reusable, is not affected by lubrication and can be disassembled by application of torque. The product is available in carbon steel with a proprietary protective finish or stainless steel in metric sizes from M3 (1.8 mm thick) to M130 (9.5 mm thick) and UNC sizes from #5 to 3". Results obtained in a Junker vibration test (DIN 65151) showed undiminished holding strength over the test time compared to nylon inserts and split rings, which loosened completely after 10 seconds or less.



FLOATING CRANE WEIGHTED UPPER LIMIT WIRE ROPE CABLE FAILURE

Environmental factors (wind, rain, wave activity, etc.) must be considered to ensure safe and reliable weight handling operations before, during, and after lift evolutions. Recently, an activity moored a Westmont 100-ton floating crane at a nearby naval facility where it experienced a failure of the whip hoist weighted upper limit switch wire rope cable. This cable attaches the weight to the limit switch. The cable parted causing the weight to fall along the whip hoist wire rope until it was stopped by contacting the headache ball. An attached U-bolt clamp retained the approximate 40 lb weight on the wire rope, keeping it from falling off the crane. The crane was idle at the time of component failure.

The cable parted due to excessive rubbing contact between the cable and a hard corner on the boom tip, induced by increased wave activity at the facility's berthing. The increased wave action resulted in more list and trim of the barge than is normally experienced at the activity's primary facility. Excessive barge motion can translate to unanticipated movement of crane hook blocks in a swinging motion, which in this case led to chafing of the limit switch cable, ultimately resulting in failure of the component.

Prevention of this condition can be achieved by securing hook blocks during expected severe weather events, or if necessary after daily operations. The crane's cognizant activity did not have procedures in place for securing hook blocks after daily operations, as the increased wave action at the nearby facility was not anticipated. At this facility, other weight handling activities secure crane hook blocks on floating cranes at the end of daily operations. Considerations should be made to mitigate environmental impacts on weight handling operations, including during periods of inactivity. A crane alteration was approved for the activity to add chafing material on the boom tip at the area of contact to eliminate wear to the wire rope cable. Activities should inspect for damage to the wire rope cable attaching the weight to the limit switch during MISR inspections as required by NAVFAC P307 Appendix C Item 64: limit and bypass switches.

CRANE GUIDE SPECIFICATIONS

Three new crane specifications applicable to facility procured cranes and monorails have been electronically issued on the Whole Building Design Guide website, www.wbdg.org. Published in both .pdf and SpecsIntact formats, and listed under Division 41 - Material Processing and Handling Equipment, the new guide specifications are: UFGS 41 22 13.14, Bridge Cranes, Overhead Electric, Top Running; UFGS 41 22 13.15, Bridge Cranes, Overhead Electric, Under Running; and, UFGS 41 22 23.19, Monorail Hoists. The three standards are intended to be used by U.S. Navy activities for procurement of general-purpose cranes less than 10 tons rated capacity.

All three standards were drafted by representatives of the National Aeronautics and Space Administration and have been reviewed and approved by Navy Crane Center, as well as representatives of the Army Corps of Engineers and Air Force Civil Engineering Support Agency. Joint agency review and approval has eliminated the need for agency specific documents and resulted in increasingly uniform procurement requirements across Government facilities. Previously posted NAVFAC 41 22 13.13 20, Cranes, Overhead Electric, Top Running (Under 20,000 Pounds); NAVFAC 41 22 13.14 20, Cranes, Overhead Electric, Under running; and USACE 41 22 15.00 10, Overhead Electric Cranes, are superseded as a result.

The new monorail guide specification supersedes three previously available Navy specifications: NAVFAC 41 22 03.13 20 Monorails with Manual Hoist; NAVFAC 41 22 03.16 20 Monorails with Air Motor Powered Hoists; and, NAVFAC 41 22 03.19 20 Monorails with Electric Powered Hoists. Requirements of these documents have been consolidated in the new specification.

Two additional standards are also posted. They are: UFGS 41 22 13.13 Bridge Cranes (10-ton to 30-ton capacity); and, UFGS 41 22 13.16 Gantry Cranes (10-ton to 30-ton capacity). These standards may not be used by U.S. Navy activities to procure cranes, but are available for information. Cranes with rated capacities of 10 tons or greater must be specified and procured by Navy Crane Center. UFGS 41 22 13.33, Portal Crane Track Instruction Installation has also been updated and reissued, superseding NAVFAC 41 22 23.23 20, Portal Crane Track Installation.

FESTOON SYSTEM END CLAMPS

Recently, an activity reported a festoon assembly end clamp dislodged from the C-track allowing the festoon, trolleys, and junction box to fall to the floor. Investigation determined that the end clamp and saddle assembly were not tightened properly during installation. The end clamp eventually failed to retain the festoon assembly due to inadequate tightening of the fasteners.

Activities are advised to ensure festoon system end clamps are properly installed per OEM instructions. These items are also required to be inspected for damage or loose fasteners during the maintenance inspection as required by NAVFAC P-307 Appendix C and D, MISR item 66 and 21 respectively.

Additionally, in a crane accident investigation, another activity reported a similar incident where the end clamp dislodged from the C-track. The investigation revealed that excessive force was required to move the pendant festoon assembly because the festoon wheels were corroded and difficult to move. The operator pulled the pendant station toward the desired end of the bridge when it became bound. The operator reversed direction and applied additional force several times before clearing the tight spot. This caused the festoon to move with high speed and force toward the end clamp. The end clamp failed to retain the festoon assembly, due to this excessive force applied by the operator.

NAVCRANCEN reminds activities that crane operators must perform a pre-use check and verify correct operation of weight handling equipment prior to usage and report any discrepancies to the proper personnel. This is required by NAVFAC P-307 Section 9, Paragraph 9.3.1.

OIL ANALYSIS II
KNOW WHERE YOU ARE GOING BEFORE YOU GET THERE

One of the most important parts of an oil analysis program happens before any samples are taken. Two questions should be asked, what are you looking for and how do you find it? Are you concerned about how much life your oil has remaining, how much contamination is getting into the system, how the internal gears and bearings are wearing, if the correct oil was added into the system at the last change out or top off, if that new barrel of oil is what it says it is, or all of the above? Knowing where you are going before you get there will direct your oil analysis program (what tests to run, where to take the sample, how many samples to take, etc.) and make future decisions much easier.

When sampling oil from a gearbox, a decision needs to be made on what you are looking for. For a simple, enclosed gearbox, this might not affect where you take the sample from, but will affect what tests are conducted on the sample. For a wet sump circulating system (a gearbox with an external pump and filter), it may affect where you sample (the tank, after the pump, after the filter, etc). If you sample after the filter you should not find much contamination (unless the filter is bad) and if you sample from the reservoir you will not get a true sample of particle concentration as the particles are diluted in a larger volume of oil. However, if you are only interested in how well the oil is holding up (viscosity, acid or base number, etc), then testing from the reservoir or right after the filter will be sufficient.

Hydraulic systems on mobile cranes are generally more complex than a gearbox but the same rationale applies. Do you want to determine how your pump is wearing, or the cylinder, or both? Are you only concerned with contamination getting into the system? Preparations may also need to be made at the sample point as some hydraulic lines may be pressurized which may require special fittings if a sample is taken while the system is operating.

Sampling from an engine (either diesel or gasoline) requires even more forethought as the system and contamination potential are more complex. There are also a number of different types of contamination you can look for including glycol (antifreeze), soot from the combustion process, fuel, and the normal water, dirt and wear particles.

One area often overlooked is how clean the oil you are putting into the system is. New oil may or may not be clean enough and you may need to test it before adding into a clean system. You will also be able to tell if the new oil has been properly manufactured by testing for the proper additives. There have been instances of oil being shipped plain (no additives were added even though the oil was ordered with additives) and with only additives in the barrel, no oil included. While these extreme cases are exceedingly rare, if proper oil preparation is critical to your component, then testing the oil as it is delivered may be prudent. Proper storage and handling also play key rolls in fluid cleanliness. If you need very clean hydraulic fluid in the system but the fluid is added using an old dirty funnel….you get the idea. Have you thought about how clean your oil sample bottle is?

After you have decided what you are looking for (large wear particles, smaller contamination particles, water, lubricant health, correct lubricant was added, etc.), you can determine the appropriate tests to run, and where and how to take the samples. More importantly, you can determine what levels of contaminants and particles should be cause for concern.

Many important decisions need to be made before taking an oil sample. Determining what you are looking for and where you are looking for it will dictate the rest of your oil analysis program. Making informed decisions about what you want out of an oil analysis program can improve your crane reliability and ensure you are getting the biggest bang for the buck.

I encourage you to seek information from informed sources and ask questions about your activity's oil analysis program. Look for the next installment, "What tests should be performed and how do these tests relate to NAVFAC P-307."

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 172A, <u>Structural Failure of 2-Ton Engine Lift (Portable Floor Crane)</u>

The purpose of this CSA is to alert activities of a structural failure of a portable floor crane during load test. An activity recently reported the failure of another portable floor crane in a similar manner to that described in CSA 172. The floor crane was being tested to 125 percent of the 2-ton capacity with the boom fully retracted and the front legs fully extended. Neither the operating instructions manual nor the floor crane marking was clear on the proper leg extension position for each corresponding boom position. The base buckled in the general area of the upright.

Direction:
Within 30 days, activities with portable floor cranes shall ensure that operating instructions and markings clearly identify the proper leg extension position for each corresponding boom position and that these instructions and markings are understood by users. Activities shall contact OEMs as necessary for proper operating instructions and marking requirements. Portable floor cranes where operating instructions and/or marking requirements cannot be obtained shall not be used.

CSA 181, <u>Hagglunds Hydraulic Motor and Pump Adjustments</u>

The purpose of this CSA is to disseminate information and actions required for Hagglunds hydraulic motors and Viking hydraulic pumps. The hydraulic system on the Westmont 100-ton floating cranes is designed such that adjustments to the hydraulic pump can result in a two-block condition on the main and boom hoists. Other types of cranes with Hagglunds hydraulic motors and Viking hydraulic pumps may also be affected.

A. During a recent maintenance evolution on a Westmont 100-ton floating crane, the hydraulic stroker valve for the boom hoist was adjusted with an up bias while the boom was at a low angle. The boom was then raised close to the upper limit switch and the operator's controller was brought to neutral. The brakes set but the boom hoist continued to hoist up through the brakes. The boom continued up through the primary and secondary upper limit switches. The operator noticed the condition and pressed the engine off button, shutting off the diesel engine and stopping the hoist before the boom two-blocked.

B. The hoist control system on the Westmont 100-ton floating cranes consists of a hydraulic pump and motor. The hydraulic pump is mechanically connected to the diesel engine. When the diesel engine is running, the pump is on. The swash plate is mechanically controlled by a stroker valve, which is in turn controlled by a force motor, which is controlled by an electrical signal. When a hoist up signal is received by the force motor from the operator's controller, it tells the stroker valve how the swash plate should be rotated to give the desired hoist action. The stroker valve can be biased in either the up or down direction. This adjustment ensures the hoist can lift the load as the hydraulic components wear.

C. The hydraulic motor reacts to the hydraulic flow provided by the pump, and is not controlled by an electrical circuit. The hydraulic system is such that any stop command, be it from the control stick, the primary limit switch, or the secondary limit switch, has the same affect on the hydraulic system. The stop command instructs the force motor to change pump flow to neutral and sets the brakes.

D. The main hoist and boom hoist hydraulic motors have a two-speed valve connected to the distributor. This two-speed valve is set up to either give full flow to the motor or bypass hydraulic flow away from the motor. This two-speed valve will not shift while the motor is turning, even with the upgrade mentioned in EDM 089. This is why the limit switch did not stop the motion of the main and boom hoists. The auxiliary and whip hoists have a separate bypass valve that is not located in the hydraulic motor.

E. The activity had replaced the force motor for the boom hoist. However, the force motor must not be replaced without also replacing the stroker valve and having the OEM calibrate both components as stated in the OEM tech manual. Replacing only the force motor could result in erratic control of the hydraulic system.

F. EDM 090 was issued to document a similar incident at another Navy facility on a sister Westmont floating crane on their main hoist. The stroker valve was adjusted with an up bias such that the motor hoisted up while the control stick was in neutral and the brakes set.

G. The band brakes on all four hoists are single acting in that they only develop full torque in the down direction. In the up direction, they only develop approximately 20% of their nominal torque value.

Direction:
A. Ensure all affected crane operators, maintenance, engineering, testing, certification, and inspection personnel who work on these types of cranes are familiar with their operating characteristics. Changes, repairs, or adjustments to the hydraulic system shall be done under controlled conditions in accordance with component OEM requirements and with the knowledge that these adjustments may result in two-blocking a hoist.

B. Whenever a stroker valve is adjusted, the hoist shall be tested to ensure that no hoist roll-up occurs (no load condition or the boom at high boom angle) and that the hoist can pick the load (fully loaded condition or the boom at low boom angle). Adjusting the stroker valve at one load or boom position (since the load on the boom hoist changes with boom angle) is not sufficient to ensure proper hoist operation.

C. It was also found that with the diesel engine running in manual mode, crane operation is permitted, but the engine off button in the operator's cab will not shut down the engine. Crane operation in this mode shall not be used for normal operating evolutions.

D. Hoist movement due to stroker valve adjustment may be extremely slow and not immediately discernable. Operators shall watch for additional movement of the hoist after returning the stick to neutral. Additionally, operators shall be prepared to take corrective action if a hoist does not stop when commanded. Shutting off the diesel engine will stop the hoist motion, but not immediately. Putting the control stick in the down direction if the hoist is creeping up may or may not reverse the direction of the hoist, depending upon activation of the secondary limit switch. The characteristics described in this paragraph shall be posted in the operator's cab and be included in operators training. The posting shall include clear direction to the operator detailing the steps to be taken when he or she notices continued hoist movement after a stop command or a limit switch engagement.

E. Cranes other than the Westmont 100-ton floating cranes may have this same hydraulic control system. Hydraulically controlled cranes with Hagglunds hydraulic motors shall be reviewed to determine how the hydraulic system is affected by changes in the pump or stroker valve adjustments. The Navy Crane Center will assist in the review as required.

As additional information or design changes become available, the Navy Crane Center will revise this CSA.

CSA 182, Deficiencies Noted on Yale CE Series Electric Hoist Brake

The purpose of this CSA is to alert activities of several deficiencies identified on Yale Cable King CE Series hoist brakes.

A. An activity reported that the brake solenoid plunger and linkage assembly was found bound and not allowing the brake to fully set. Inspection revealed that one side of the solenoid linkage had disengaged from the linkage pin. The ends of the linkage pin are peened to retain the linkage and one end had worn allowing the linkage to disengage. Inspection also revealed excessive solenoid plunger travel, and that the solenoid plunger balance spring was installed on the wrong (bottom) side of the plunger. This style of brake solenoid plunger and linkage assembly is utilized on Yale Cable King CE Series (Chassis C, D, and E). All of the affected hoists are equipped with mechanical load brakes. This CSA applies to hoists classified as Category 2 or 3 cranes, and hoists classified as Section 14 equipment.

B. As discussed with Yale, the peening process that is involved in the assembly of the plunger and linkage assembly has been improved by the factory for replacement assemblies. Some solenoid plunger balance springs have been installed incorrectly (balance spring installed on the bottom side of the plunger) at the factory. The correct installation of the balance spring is on the top side of the plunger.

C. Yale also provided the following supplemental brake adjustment information: 1) Consult the parts and instruction manual and adjust shoe clearance first. 2) When the correct shoe clearance has been obtained, the solenoid plunger travel should be in the range of 3/8-inch to 11/16-inch. 3) The OEM had previously authorized the shimming of the spring guide pin to limit plunger travel. Yale has since stated that the spring guide pin should not be shimmed to limit plunger travel (i.e. the guide pin should be installed shouldered to the frame).

Direction:
A. Within 30 days, activities shall inspect all Yale Cable King CE Series hoist (chassis C, D, and E) brakes by removing the brake cover and inspect (without brake/brake wheel disassembly) for satisfactory condition of the solenoid plunger and linkage assembly, the proper installation of the solenoid plunger balance spring, and proper solenoid plunger travel as discussed in B and C above. Any questionable conditions shall be investigated by further disassembly.

B. At the next annual maintenance inspection with load test (annual inspection and test for Section 14 portable hoists), activities shall disassemble brakes to the extent necessary to inspect all brake components for excessive wear or binding and verify all proper adjustments as discussed in paragraphs B and C above. Any questions concerning satisfactory condition of brake components or brake adjustments shall be referred to Yale.

CSA 183, Vertical Launch System Gas Management Lift Precautions

The purpose of this Crane Safety Advisory (CSA) is to notify activities of the potential to exceed the safe working loads marked on slings and related equipment during removal of canister adapters, sill assemblies, and plenum cell covers in support of shipboard vertical launch systems (VLS) gas management.

Background: An activity recently reported an incident with the MK-169 sling during a canister adapter removal lift supporting VLS preparations. Investigation into this incident identified that binding conditions during canister adapter removal can induce loads that exceed the safe working loads established for the handling gear. Furthermore, although the procedure used for canister adapter removal addresses the potential for binding, it does not provide provisions to monitor the applied loads and does not provide guidance on corrective action should binding occur.

In response to this incident, the activity was instructed to install a load indicating device (LID) per NAVFAC P-307 guidelines. The activity was requested to record actual loads applied during a recent canister adapter removal evolution. These data values were collected during normal ship to pier operations using a land based mobile crane under supervised conditions.

These tests confirmed that actual loads applied during canister removal sometimes exceed the marked safe working load of the MK-169 sling and the MK-50 canister adapter lift beam. It was also determined that the mobile crane's load monitoring system, commonly used as a means to measure and limit the load on the handling gear, was not effective with these relatively light loads. Furthermore, the reaction time inherent with the use of hand signals and delays associated with the crane's hoisting function did not provide adequate reaction time to prevent overloads.

VLS cell preparation lift procedures are governed by NAVSEA OP-5, Seventh Revision, and do not currently specify the use of a LID in the rigging assembly to monitor loads during VLS canister adapter lifts. NAVCRANECEN PORTSMOUTH VA message P181935Z APR 08 was issued to re-emphasize the risks associated with lifting constrained loads, e.g., raising loads subject to suction or friction or lifting loads from confined spaces where the load can get hung up on obstructions in the load path. NAVFAC P-307, paragraph 10.5 requires the use of a LID during binding type lift conditions and the identification and monitoring of stopping points to ensure the safe working load of the crane or rigging gear are not exceeded.

Direction: During VLS canister adapter, sill assembly, and plenum cover lifts, a LID shall be used as part of the rigging assembly. Crane teams must be able to know immediately when a load binding occurs and particularly when a load becomes obstructed. LIDs that use a power supply must be HERO approved if used in an area with ordnance. Actions necessary to mitigate the binding condition should it occur must be included in the pre-job brief. This includes immediate action to return an obstructed load back to the "free hanging weight" prior to proceeding. The LID must be carefully monitored and stopping points shall be established to ensure the safe working load of the rigging gear or the crane will not be exceeded. It is critical to have the LID reader properly positioned to monitor the LID. To optimize the risk mitigation, a chainfall or small hoist may be inserted below the crane hook to provide increased control of load movement should a binding situation occur. If the crane cannot react fast enough or hoist slow enough to prevent binding conditions from exceeding the safe working load of the rigging gear or crane, then a chainfall or small hoist shall be used below the crane hook. In addition, effective communication among all members of the crane team is essential. Radio communication is strongly recommended for these lifts. Performing a prior to use inspection of the handling equipment shall be emphasized.

Naval PHST Center will be issuing additional guidance on lift procedures and equipment allowable loads for these gas management lifts.

EDM 095, Johnson Industries SMAA Type Shoe Brake Deficiencies

A. The purpose of this EDM is to inform activities that during the brake inspection required by CSA 169, activities have reported finding cracks in the potting material of the magnetic coil, magnet electrical leads (pigtails) not lining up with the hole provided in the housing, the potting material and metal sleeve sitting too high in the housing, and evidence of arcing from the coil windings to the armature plate.

B. Cracking in the potting material has been identified on several Johnson shoe brakes. Discussions with Johnson Industries determined that minor cracking is not unusual and does not affect the operation of the brake. However, one brake had two longer cracks running circumferentially around the potting material, one of which ran approximately 120 degrees around the magnet coil. This was of concern as it may indicate that the magnet was not securely fastened to the housing and was pulling out of the potting material. If this failure had occurred, the brake would not have released properly. The magnet in question was replaced.

C. Due to manufacturing tolerances, the electrical leads may not line up with the hole in the housing. This can cause cracking of the wire installation, exposing the wire. The exposed wire can then contact the brake housing causing a short. If the electrical leads on replacement magnets do not line up with the hole, the hole can be enlarged and silicon or other chafing protection installed to prevent the wire insulation from rubbing on the housing.

D. Two activities reported that the potting material and metal sleeve sat too high in the housing, causing the potting material or sleeve to contact the armature plate. This contact caused cracking in the potting material. The magnet winding coils are close to the surface of the potting material and the cracking allowed arching to occur between the coils and the brake armature plate. The design of the brake should be such that the housing, and no portion of the potting material, contacts the armature plate.

E. Two brakes have shown evidence of arcing between the magnetic coil and armature plate. The potting material had black scorch marks and the armature plate had corresponding white marks. This arcing could have been caused by the coil windings being close to the surface of the potting material as detailed in paragraph C. Any evidence of arcing should be reported to Johnson Industries and may be cause for replacement of the magnet.

F. The brake maintenance manual has an annual inspection requirement that the magnet gaiter (dust cover) be removed and the magnet gap opened. The magnet should then be inspected for cracks or other damage and cleaned of any dust build-up. For cranes in the biennial load test program, the magnet should be opened during the load test year in accordance with the maintenance manual. During the non-load test year, the magnet gaiter should be removed and the magnet surface inspected to the maximum extent possible.

G. Any replacement magnets should be inspected prior to installation to ensure the electrical leads line up with the hole in the housing and that the potting material and metal sleeve height is such that the metal sleeve does not contact the armature plate.

H. Any questionable conditions of the magnet, potting material, or operation should be reported to Johnson Industries for resolution and Navy Crane Center for information.

SUMMARY OF WEIGHT HANDLING EQUIPMENT ACCIDENTS SECOND QUARTER FY08

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

NAVFAC P307 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 NAVFAC P307 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. To ensure adequate time to react to negative or undesirable accident trends, NAVCRANECEN requests initial notification of any crane or rigging gear accident within 3 days of its occurrence. Accidents involving a fatality, in-patient hospitalization, overturned crane, collapsed boom, or other major damage to the crane, load, or adjacent property continue to require a NAVCRANECEN notification as soon as practical but not later than 24 hours of the event.

For the second quarter of FY08, 52 Navy WHE accidents (44 crane accidents and 8 rigging gear accidents) were reported. Thirteen of the 44 crane accidents were significant (four dropped loads, two crane overloads, three rigging overloads, two two-blocked cranes, and two injuries). Approximately 30% of the crane accidents this quarter were crane or load collisions while 25% were related to crane equipment damage. Some of the more significant crane accidents this quarter are discussed below.

TWO-BLOCKING ACCIDENT

Accident. Upon completion of an annual weight test of a mobile crane, the crane was two-blocked as the operator was retracting the boom and raising the whip hook. The whip line headache ball struck the boom nose sheave and traveled over the tip of the boom. During the operation, the rigger in charge attempted to pass on information about the next phase of the procedure and diverted the operator’s attention away from the operation of the crane. The whip line headache ball contacted the anti-two blocking weight, (the anti-two blocking system was working properly). The inertia of the headache ball allowed it to stay in motion. It went past the anti-two blocking weight, struck the upper sheave and dislodged the upper whip line retaining pin. The headache ball came to rest on top of the boom.

Lesson learned. Adequate distances must be maintained between the whip hook and the boom tip. A vast majority of crane accidents are the result of personnel error and can be avoided. Crane team distractions contribute to a number of crane accidents. This can be avoided by focusing on the task at hand and stopping operations when that focus is lost. The investigation also suggested that the hoist control speed was a contributing factor. A crane must be operated at speeds that are safe for the conditions at hand.

PERSONNEL INJURY

Accidents. Injuries were reported in two crane accidents during the quarter. Both injuries occurred when employees placed their hands into a pinch point between a fixed and stationary object. While using two hoists to lower an odd-shaped component, one hoist continued to lower (drift) after the operator released the down hoist controller. The additional movement resulted in the component becoming wedged between two fixed objects and the rigging to become slack. In an attempt to free the component, the operator placed his hand in a pinch point. When the component became dislodged, his finger was caught in the pinch point, which resulted in serious injury. In another case, a crane maintenance mechanic sustained a finger injury during the mounting and alignment of a balancing weight on a mobile crane. To verify for pin alignment the mechanic placed his hand through an access hole and used his finger to check the alignment of the holes. As the mechanic attempted to feel for alignment the suspended weight drifted and his finger was pinched between the alignment holes and the balancing weight. The mechanic suffered a laceration and contusion to his finger.

Lesson learned. Placing your hands or other parts of your body in between a fixed and stationary object must be avoided. If a person or body part occupies that space during the pinching movement, there is a high probability of injuries such as lacerations, fractures, amputations, or even death. Focus on objects that move or possibly could move. Apply the principles of operational risk management and ask yourself, "What will happen if this moves? Will I be in the path of that movement? How can I do this job safely?" Discuss and point out pinch point hazards as part of your risk assessment and pre-job briefing.

DROPPED LOAD

Accidents. (1) A category 4 crane was being used to remove a battery from a forklift. Upon raising the battery out of its stowed position, the operator attempted to rotate the crane and load away from the forklift. As the battery was being rotated, it contacted the frame of the forklift. This contact unloaded one of the hooks on the single tree rigging attachment causing it to disengage from the battery lifting eye. The operator did not notice that one of the hooks became disengaged and continued rotating the load. Once the battery cleared the forklift frame, the battery tipped and disengaged the remaining single tree hook causing the load to fall to the deck.

Lessons learned. The operator or a spotter should have been in position to safely guide the battery out of the forklift without making contact. When the battery made contact with the forklift frame the operator should have ceased operation and made an assessment. If the chain sling to the battery lifting attachment was equipped with safety latching hooks the load would not have come loose from the rigging. The application of operational risk management during the planning of this task would have identified several opportunities to prevent this mishap. Planning includes the identification of sources of hazards or problems. Identify actions to mitigate the undesired condition. Consider the travel path of the crane and the load. Where close tolerances exist, mitigate the potential by considering alternate routes, removal of obstructions, additional manning, etc. When operating in congested or in tight areas, operate the crane at a pace conducive for the conditions. OPNAVINST 3500.39b prescribes methods for assessing hazardous operations. The principles of OPNAVINST 3500.39b should be used in the planning and preparations of all WHE lifts.

NEAR MISS

During annual preventative maintenance on a floating crane, a trouble call was initiated as a result of an inoperative boom hoist. After repairs, the boom hoist was being operated in support of operational checks of the boom hoist pump control. The operator was instructed to begin raising the boom to the upper limit switch (primary). When the boom approached the primary limit switch, the crane operator noticed that the boom speed began to increase and passed through the primary limit switch, which did not stop the boom from rising. The crane operator returned the boom controller to the neutral position. This did not stop the boom from rising. The boom continued rising into and through the secondary limit switch, until the crane operator pushed the diesel engine stop button, completely shutting the crane down.

Lessons learned. The operator’s actions during this event demonstrate why situational awareness is a good method of preventing accidents. Upon realizing that the boom movement was not responding to the boom controller or limit switches, the operator reacted properly to shut down the crane via the crane engines emergency stop. The operator knew exactly where the emergency stop was located and it was easily accessible. The quick actions of the prepared operator likely prevented a major crane accident.

Weight handling program managers and safety officials are to review the above lessons learned with personnel performing lifting and handling functions and consider the potential risk of accidents occurring at your activity. This is also a good time to reinforce the principles of operational risk management.

E-mail submission of reports of accidents, unplanned occurrences and near misses is desired. The e-mail address is nfsh_ncc_accidents@navy.mil. Per section 12 of NAVFAC P307, the report 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 the specific description of the component and the resulting effect or problem caused by the malfunction or failure.

BOTTOM LIFT FIXTURE TO LIFT CONTAINER BOXES PROMOTING OUR EMPLOYEES HEALTH AND HELPING ALLEVIATE INJURIES

NAVFAC Southwest crane operations improved safety with the purchase of new equipment. The bottom lift fixture for container boxes is a newly acquired item that greatly reduced the possibilities of injury to our employees. This apparatus is designed to pick up 20’ and 40’ containers from the bottom lugs. This design eliminates the need for employees to rig these boxes from the top and therefore removes the possibility of a fall from heights over four feet. The top of a typical container box is about eight feet. Benefits of this apparatus are:

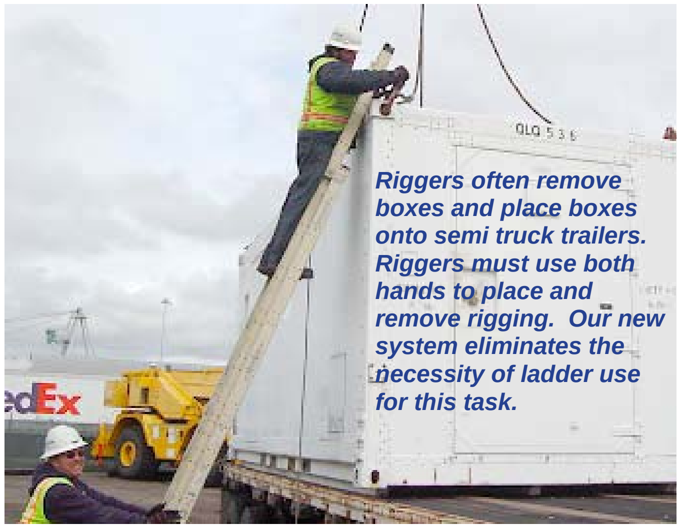
- No need for employees to use fall protection.
- No need for employees to use a heavy and cumbersome ladders ladder to hook up rigging to box.
- No need for extra employees to hold ladder.
- No danger of ladder slipping or falling.
- Eliminates the possibility of wire getting tangled from crane hook and therefore reduces container movement.
- Positive design locking lug mechanisms that are in full view of personnel; this eliminates the use of shackles and hooks.
- Load leveling abilities making container very stable during movements.

In the past, our employees climbed on top of container boxes and hooked up rigging gear to lift them. There are no appropriate places to hook fall protection on the top of these boxes; therefore, we stopped this practice. Our riggers switched to hooking up the rigging to top corners of container boxes from a ladder.

Our riggers were required to balance on a ladder, pull wire rope with a hook or shackle, attach it, and then connect to a corner of the box. While the rigger is pulling these heavy wires, he pulls shackles and hooks across his body in a twisting motion to hook them up. The rigger had a difficult time maintaining balance during this evolution and we have had several close calls due to the rigger losing his balance.

The cost of the unit is approximately $11,250. This lifting fixture is a good design and will continue to allow our riggers to work in a safer environment while accomplishing the task of moving container boxes.

OLD METHOD



Riggers often remove boxes and place boxes onto semi truck trailers. Riggers must use both hands to place and remove rigging. Our new system eliminates the necessity of ladder use for this task.

NEW METHOD

When placing or landing onto trailer, a rigger can safely and easily attach and remove fixture.

Attachment point at bottom of box eliminates the need for ladders.

Fixture attaches to bottom of container.

This story was originally published in the NAVFAC Southwest Connection newsletter.

CRANE SAFETY 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 slightly downward as compared to last year. We have an opportunity to make FY08 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-fourth 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, similar to last fiscal year, collision related accidents have been identified in 39% of crane accidents reported. Of these, 26% involved the load striking an object and the crane itself striking an object accounted for 13%. Attention to detail and ORM 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. Do not become complacent or comfortable with your environment. Workplace conditions can change quickly. As such, maintaining situational awareness is critical. Even when operating a bridge crane, be aware of potential travel path obstructions. Over 40% of the crane/load collisions this year have involved a bridge crane.

Seven crane accident prevention videos are available to assist activities in raising the level of safety awareness among their personnel involved in weight handling operations. These videos provide a very useful mechanism for emphasizing the impact that the human element can have on safe weight handling operations. In addition to the seven, three other videos are available (Mobile Crane Safety, Weight Handling Program for Commanding Officers, and Load Test Director) to assist commands in crane safety awareness. All can be ordered from or viewed on the Navy Crane Center website https://portal.navfac.navy.mil/ncc

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.

SAFETY PRECAUTIONS WHEN LIFTING CONSTRAINED LOADS

In the past few years, there have been an increasing number of Navy shore activity crane accidents associated with lifting constrained loads, e.g., raising loads subject to suction or friction forces or lifting loads from confined spaces where the load can get hung up on obstructions in the lift path. Accident reports note unforeseen forces being applied to the crane and/or rigging gear and load.

If not controlled properly, lifting constrained loads in these circumstances can result in sudden increases in the loading on the crane or rigging gear and the load can exceed the capacity of the crane or the safe working load of the rigging gear. Lifting items aboard ship with a pier side crane can increase the risk of overload due to both the possibility of relative motion between the ship and crane hook, and to the possible delay in signaling the crane operator and the operator's reaction to the signal.

When lifting potentially constrained loads, crane teams must be able to know immediately when suction or friction forces are greater than planned or when a load is hung up (binding) and is not freely suspended. As noted in NAVFAC P307, paragraph 10.5, a load-indicating device (LID) is required when these types of binding conditions are anticipated. The LID must be carefully monitored and stopping points shall be established to ensure the safe working load of the crane or rigging gear will not be exceeded. It is critical to have the LID reader properly positioned to monitor the LID. To optimize the risk mitigation, a chainfall or small hoist inserted below the crane hook can provide increased control of load movement and can more quickly alert the crane team to a binding situation. This method of handling constrained loads is strongly advised. In addition, effective communications among all members of the crane team is essential.

The consequences of inadequate preparation, lack of situational awareness and an effective means of positive control when lifting constrained loads can be catastrophic. In addition to potential damage to the crane and associated rigging, damage may also be incurred to critical ship equipment. Most importantly, the potential for injury is significantly increased.

Process adherence and the application of operational risk management will help prevent crane accidents. Assess the job, understand the potential risks, and then identify and implement mitigations before proceeding. A failure to do so may jeopardize your safety or that of others. Commanding Officers of Navy shore activities are strongly encouraged to communicate these precautions throughout their area of responsibility and intensify their efforts to raise the level of safety awareness in their weight handling operations while continuing to strive for the goal of zero weight handling accidents.

WEB BASED TRAINING

The Navy Crane Center has an ongoing cost avoidance initiative to expedite training which reduces costs and increases convenience for the Navy Shore activities. As such, two additional NAVFAC P-307 training courses, Category 2 and Cab-operated Category 3 Crane Safety and Category 4 Crane Safety, are now available on the internet via eLearning at Navy Knowledge Online.

Other web based training courses include: General Crane Safety, General Crane Safety Refresher, Category 2 Crane Safety Refresher, Category 3 Crane Safety, Crane Rigger, and Rigging Gear Inspection. Click on the registration tutorial at https://www.nko.navy.mil and learn how to access these courses. Additional training information can be viewed by clicking the Navy Crane Center training link at https://portal.navfac.navy.mil/ncc.

Load Test Director, Contractor Crane Awareness, and Certifying Official are currently undergoing conversion to web based training and will be available online soon. Crane Mechanic, Mobile Crane Mechanic, Mechanical Crane Inspector, Crane Electrician, and Electrical Crane Inspector are also slated for conversion and are targeted for completion in 2009.

REMINDER

The Navy Crane Center will be hosting a 3-day Navy Weight Handling Conference 5 - 7 May 2009 at the Norfolk Waterside Marriott in Norfolk, VA. A registration form is now available on the Navy Crane Center's website, https://portal.navfac.navy.mil/ncc. Please submit the registration form as early as possible but no later than 3 April 2009

SHARE YOUR SUCCESS

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

Weight Handling Program Films

Accident Prevention, seven crane accident prevention lessons learned videos are available to assist activities in raising the level of safety awareness among their personnel involved in weight handling operations. The target audience for these videos is crane operations and rigging personnel and their supervisors. These videos provide a very useful mechanism for emphasizing the impact that the human element can have on safe weight handling operations. Send requests to ***nfsh_ncc_crane_corner@navy.mil*** for these videos.

Weight Handling Program for Commanding Officers provides an executive summary of the salient program requirements and critical command responsibilities associated with shore activity weight handling programs. The video covers NAVFAC P-307 requirements and activity responsibilities. The video is available at http://dodimagery.afis.osd.mil/ (DAVIS/DITIS) (PIN 806467) in VHS, CD-ROM, and DVD.

Load Testing Mobile Cranes at Naval Shore Activities provides load test personnel guidance on properly testing mobile cranes per NAVFAC P-307. The video is available at http://dodimagery.afis.osd.mil/ (DAVIS/DITIS) (PIN 806634) in VHS, CD-ROM, and DVD.

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) in VHS, CD-ROM, and DVD.

HAVE YOU HEARD ABOUT INDEXING FUNCTION?

Many variable frequency drives equipped with motor encoder feedback (i.e. closed-loop) have a software feature, which is known as indexing. Some drive manufacturers call this feature "Position Indexing," "Position Control," or even "Super Creep." Indexing is a feature that allows the motor being controlled to rotate a pre-determined distance at a pre-determined speed (frequency). The rotation duration is usually configured in terms of encoder pulses. For example, a motor equipped with an encoder with 1024 pulses per revolution would turn ½ shaft revolution if the duration were configured to 512 pulses. The indexing enable can be input into the drive in the form of a selector switch. The indexing feature can also be configured to repeat the shaft rotation after a period of wait time if the indexing enable and directional controller are still engaged.

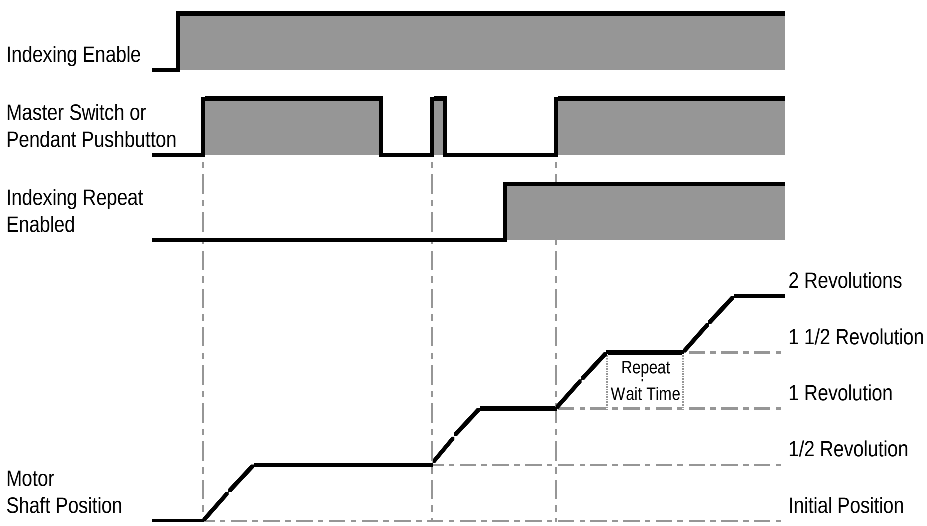


Figure 1: Example Timing Diagram of Indexing Function
(Indexing Duration = ½ Motor Revolution)

This feature can be useful on cranes when very precise or slow motions are necessary. When used in a hoisting configuration, indexing can be used in conjunction with a load indicating device (LID) to slowly increase wire rope pull to ensure load movement is within the predetermined weight limits. A naval shipyard has had good success with indexing for installing and removing large shafts from lathes.

As a note of caution on some drives, when indexing is enabled on the hoist function, the brake remains released and the load is held stationary by the motor. Always remember to disable indexing (by turning selector switch back to 'Normal') before removing power to the crane. This will return brake operation to normal, allowing a standard shut down sequence (i.e. brake sets before power is removed). Otherwise, if the power to the crane is removed without disabling the indexing function, there is the potential for some slight movement of the load in the lower direction as the brake sets.