THE CRANE CORNER

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A WORD FROM TOPSIDE

Sam Bevins

One of our mission responsibilities per SECNAVINST 11260.2 requires that the Navy Crane Center "develop and maintain standard training programs for all personnel involved in the weight handling program." To achieve this, the Navy Crane Center, with the assistance of the naval shipyards, developed the 14 courses addressed in section 13 of NAVFAC P-307. In the last five years, this training has been delivered to thousands of personnel who are involved in the Navy's shore based weight handling program. This training has substantially helped Navy shore activity personnel improve the safety and effectiveness of their weight handling programs around the world.

Operational Risk Management
5-Step Process

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

To become more efficient in the delivery of this required training and provide a significant cost avoidance for activities, we have embarked on a project to convert our courses to web-based delivery. After more than a year of dedicated effort, we posted our first course on Navy Knowledge Online (NKO), www.nko.navy.mil. We reported this in our December 2004 Crane Corner.

Our training staff is hard at work on three additional courses we expect to post on NKO this fiscal year. We plan to have the General Crane Safety Refresher and the Category 2 Crane Safety Refresher courses available on-line by the end of May. The Crane Rigging course should be available by 1 October. Additional web-based courses will follow in the ensuing years.

Web-based training has a number of benefits. In addition to the tuition cost avoidance, web-based training saves travel costs and the associated time away from the job. In addition, students can take the training at their own pace. If the student closes NKO and returns, the student's progress is bookmarked. The student can take the course examination and print a completion certificate. The training is available both to Navy personnel and contractor personnel who work on Navy-owned cranes.

We are excited about this initiative, which will improve the delivery of required training and save precious Navy resources. Please ensure that everyone in the Navy weight handling community is informed of the availability of this web-based training.

Inside This Issue

HAVE YOU HEARD ABOUT?

Electrocution by coming in contact with high voltage distribution lines is the leading cause of death during crane operations. Following NAVFAC P-307, paragraph 10.11.1, and industry established safety procedures while working near high voltage lines will help mitigate the deaths and injuries resulting from this hazard. Crane operators in cabs are relatively immune to electrocution by the crane structure coming in contact with energized lines but may still be seriously injured by secondary hazards: fire, explosions, instability of crane, etc. Riggers working in close proximity to the load or crane structure suffer the greatest casualties since they are the most direct path to ground for the high currents resulting from contact with distribution lines.

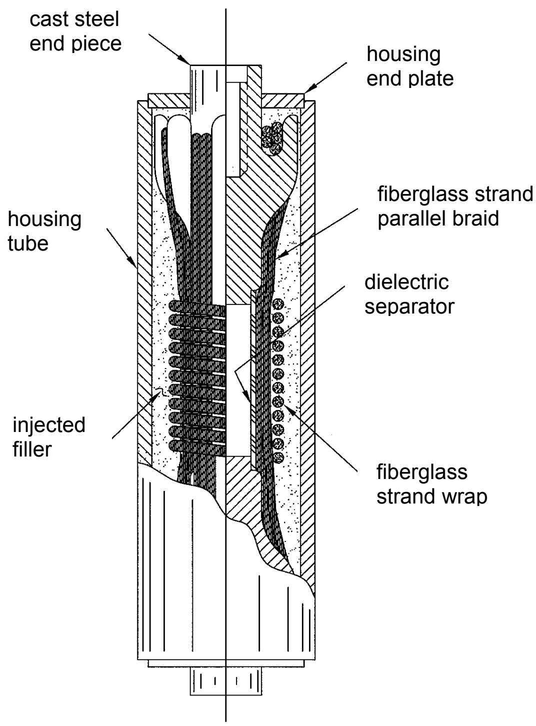

FIGURE 1

A relatively simple device known as an electrically insulating link (load insulator, radio frequency (RF) link) can dramatically increase the survivability of riggers working in close contact with the load. They are constructed with one basic principle, electrically isolate the load from the rest of the crane. These devices can also provide protection against RF energy coupling to the crane structure. This energy can cause burns and damage sensitive electronic loads if not properly isolated. These devices do not protect against lightning strikes, which pack more power than they are rated to handle. Figure 1 illustrates the construction of one such device. There are a variety of electrical and rated load configurations available.

The selection of an insulating link should be made with care since they come with many different ratings: maximum voltage, AC or DC, rated loads in tons, wire rope size, and electrical and mechanical safety factors. The rigging configuration is also important. Rigging can be: hook at bottom, stud at top; hook at bottom, bail at top; bail at both ends; or threaded studs at both ends.

CRANE SAFETY AWARENESS FOR THE SUMMER MONTHS

As we approach the summer months, weight handling managers and supervisors must place special focus on safe crane and rigging operations. In the last two years, 96 percent of crane accidents were attributed to human factors, and inattention was the most often cited principal human error. With the added distractions of warm weather (e.g., increased summer social activity and vacations) maintaining a sharp focus on the critical job at hand during weight handling operations will be challenging. During surveillance of weight handling operations, look for warning signs of complacency or taking shortcuts, and include operations where there is no load on the hook. 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. The principles of OPNAVINST 3500.39B, Operational Risk Management (ORM), 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.

All personnel involved in the weight handling program must 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.

The Navy Crane Center previously distributed seven crane accident prevention lessons learned videos to all naval shore activities 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 to crane teams and supervisors the impact that the human element can have on safe weight handling operations. Additional copies are available by emailing m_lstr_ncc_ccorn@navy.mil. We also produced and distributed to all activities with mobile cranes a mobile crane safety video to highlight the unique hazards of mobile crane operation. All crane team personnel associated with mobile crane operations will benefit from viewing this video and putting its safety lessons into practice. Copies of this video are available at http://dodimagery.afis.osd.mil/. Go to DAVIS\ DITIS. PIN is 806721.

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 naval 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.

TROLLEY TRACKING TROUBLES

Not long ago, an activity reported a crane accident where one side of a trolley came off a monorail beam in a 90-degree curve during load test. The cause was attributed to the trolley not matching the curve radius of the beam. Failing to ensure that trolleys are compatible with the beam type and size, ensuring that the minimum curve radius that the trolley will negotiate matches or exceeds the beam curve radius, or failing to ensure proper installation and adjustment of the trolley to the beam can lead to trolleys that do not track properly or may even result in the trolley becoming disengaged from the monorail beam. Fortunately, in this instance, the test weights were only about one inch off of the ground resulting in no injuries or damage to equipment.

Trolleys are designed to fit various types of beams. Trolleys for wide-flange beams (W shapes) normally have flat tread wheels. Trolleys for American Standard I-beams (S shapes) normally have tapered tread wheels or the wheels can be mounted to match the slope of the flange. Trolleys for patented track beams are designed for the smaller-width bottom flanges of the patented track. A trolley's ability to negotiate a curve is based upon the trolley size and beam size. The minimum radius curve that a trolley will negotiate is readily found in the manufacturer’s literature. Make sure that you have the right trolley for the right beam. The beam type and size and the minimum curve radius are required when ordering new trolleys.

Just as important as having the right trolley for the right beam is the proper installation and adjustment of the trolley to the beam. To keep the trolley tracking properly on the beam, it is important to have the specified spacing between the trolley wheel flange and the beam flange. When the trolley is centered under the beam, the spacing between each wheel flange and the beam flange should normally be around 1/16 of an inch – refer to the trolley manufacturer’s literature for the proper spacing. To achieve this spacing and keep the hoist centered under the beam, spacers and washers are utilized between the trolley side plates and hoist lug. The number of washers installed between the side plate and hoist lug should be the same on either side of the hoist lug. The distribution of the remaining washers on the outside of the side plates is important because the total number of washers used must be sufficient to properly tighten the nuts that secure the side plates. Ensure that any locking pins provided with the nuts are installed after tightening.

Remember, if you are experiencing trolley tracking troubles you should first stop any further use of the hoist. Then refer to the manufacturer’s literature for the proper installation of the trolley. Ensure that you have the right trolley for the right beam and that the trolley’s minimum radius curve is compatible with the curve radius in your beam. The trolley should be centered under the beam with the proper wheel spacing and the side plates securely fastened as specified in the manufacturer’s installation instructions. Never operate a hoist with a sloppy fitting or binding trolley.

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-136A: Samsung Portal Crane Travel Wheels. CSA-136 noted that several Samsung Heavy Industries (SHI) portal crane travel wheels had cracks and spalling of the wheel flanges and tread area. Activities were directed to clean and visually inspect all SHI portal crane travel wheels, document all existing wheel defects such as cracks, spalling, etc, and submit reports to Navy Crane Center. Cranes were allowed to remain in service pending Navy Crane Center and SHI review. This CSA provides additional periodic inspection guidance while final resolution is being determined by the Navy Crane Center and SHI.

Inspect one driver and one idler wheel on each side of the crane (four total) determined by the local engineering organization to be in the worst condition for the specific crane based on CSA-136 at each "A" PM while the crane is in service. This inspection shall be to the same detail as that required by CSA-136. A walk-around visual inspection (without cleaning) shall be made for all other wheels at each "A" PM. Report findings to the Navy Crane Center highlighting areas where defects have increased in size. During each "B" and "C" PM, all wheels shall be inspected to the same detail as that required by CSA-136. Report all findings to the Navy Crane Center highlighting areas where defects have increased in size. Cranes may remain in service pending Navy Crane Center review of findings. Additional guidance will be issued as necessary pending results of inspections and discussions between the Navy Crane Center and SHI.

CSA-141: Debonding of Disc Brake Friction Material from Disc Plate on Columbus McKinnon Lodestar Model Series J Through Series RRT. An activity reported finding separation of the friction material from the brake disc plate on a Columbus McKinnon (CM) Lodestar model L 1-ton hoist. The disc brake is part number 35632 and is found on all Lodestar model series J through series RRT. The activity has three outdoor model L hoists and two of these had the friction material separation. During the installation of these cranes, sealing gaskets were not installed for the first year of operation, which allowed moisture to enter the hoist housing. Corrosion on the brake disc plate caused the adhesive to fail and the friction material to separate from the brake disc plate. The hoist manufacturer stated that they have recently changed the process by which the adhesive is applied to the friction material and disc plate so that future hoists and replacement brake discs will not be susceptible to this type of failure.

CM Lodestar models affected by this CSA are the following: J, JJ, L, LL, R, RR, RT, and RRT. This includes both single speed hoists and two speed hoists (which are designated with -2 after the model letter). The housing gaskets are part numbers 35840 (back frame cover gasket) and 35841 (motor housing cover gasket). These gaskets are installed on weatherproofed hoists. If a hoist was procured without specifying weatherproofing, then these gaskets may not be installed.

Activities with outdoor CM Lodestar model series J through series RRT shall inspect their cranes to ensure that they are properly equipped with sealing gaskets on both end covers. If these sealing gaskets are not installed, remove the crane from service and disassemble the electric brake to ensure no debonding has occurred. Install sealing gaskets on the two end covers, perform any necessary repairs, and load test and certify the hoist per NAVFAC P-307. Report any findings to the Navy Crane Center.

During the next annual inspection that includes a load test, naval activities with CM Lodestar model series J through series RRT hoists shall pay special attention to the brake disc plate and friction material during disassembly to ensure no corrosion products are present. Report any findings to the Navy Crane Center.

CSA-142: Cracks in Steering Foundation of 150-Ton Marine Travel Lifts. An activity reported finding cracks in the steering foundation structure on 150-ton marine travel lifts. These cracks are located in the horizontal beam just above the steering wheels. The activity has two identical marine travel lifts and the cracks were found on both. The OEM stated that the cracks were caused by fatigue at a stress concentration on the outside of the beam created by an internal stiffener. The 150-ton marine travel lifts are similar to the 200-ton and 300-ton models.

Naval activities shall inspect 150, 200, and 300-ton marine travel lifts' steering foundation (beam above the steering wheels) for cracks. If any cracks are found, remove the crane from service, notify the Navy Crane Center, contact the OEM for the repair procedure, and submit a Crane Alteration Request for approval.

CSA-143: Samsung Generator Space Heater Wiring and Drawing Deficiency. An activity reported that due to mislabeled terminal numbers on a drawing, the generator space heaters for the Samsung S1 and S2 cranes may be miswired. This miswiring can cause the generator space heater to be on when the engine is running and off when the engine is off. This is opposite of the intended operation.

Drawing number GE00-EEl-6D-003, sheet 2 of 3, incorrectly shows the normally open (NO) contact as being terminal number 1 of the engine run relay (ERR) and the normally closed (NC) contact as being terminal number 4. The correct configuration is the NO contact of the ERR is on terminal number 4 and the NC contact is on terminal number 1, which is the same convention used on all other similar relays throughout the diesel engine generator circuit.

- Before or during the next "A" maintenance inspection, inspect all Samsung S1 and S2 portal cranes for the proper circuit wiring. Improper circuit wiring can be determined by wire number 901 falling on terminal number 1 (NC contact) and wire number 902 falling on terminal number 4 (NO contact) of the ERR.
- If circuit wiring is unsatisfactory, correct the circuit wiring by relocating wire number 901 to terminal number 4 (NO contact) and by relocating wire number 902 to terminal number 1 (NC contact) of the ERR.
- Additionally, the Navy Crane Center will correct drawing number GE00-EEl-6D-003, sheet 2 of 3 to reflect the proper configuration of terminals NO (terminal number 4) and NC (terminal number 1) contacts on the ERR and distributed to all activities.

CSA-144A: Check for Proper Assembly of Johnson Industries Caliper Disc Brake Actuators. CSA-144 required activities to verify proper assembly of Johnson Industries caliper disc brake actuators. This revision supersedes and cancels CSA-144. An activity reported finding two out of four end cover cap screws broken on a Johnson Industries model BAH1018 caliper disc brake actuator utilized on a Johnson Industries 3018 caliper disc brake. The screws are not load bearing or load controlling components and are used to store the actuator caging ring and secure the end cover plate to the actuator housing. Failure of these screws did not affect the safe operation of the actuator. It was concluded that the actuator piston, used to release the brake was not fully threaded and seated on the spring guide (approximately 2 turns short of 20 turns or 0.159 inches short of full thread engagement). When hydraulic pressure was applied to the actuator to release the brake, the piston contacted the caging ring and, over time, two of the four end cover capscrews broke.

Johnson Industries drawing DSAS-01.5, titled "DS" series brake actuator instructions, provides a pocket depth dimension "A" to verify that the piston is fully threaded and seated on the spring guide for all model "DS" caliper disc brake actuators. The pocket depth dimension "A" varies between the model numbers.

At the next "B" maintenance inspection, activities equipped with Johnson Industries series "DS" caliper disc brakes (Westmont, Craft, AmClyde, and Samsung portal cranes) shall check all actuators for proper "A" dimension pocket depth indicating the piston is properly threaded/seated on the spring guide. Actuators that are found with pocket depth dimensions greater than allowable may remain in-service provided the brake air gap and actuator spindle have not been adjusted since the last load test and certification. This ensures that the actuator force (and brake torque) has not been reduced since the previous load test. These dimensions shall be recorded and available for comparisons during future inspections.

Actuators that require servicing to fully thread/seat the piston to the spring guide shall have Loctite 242 applied to the first 10 threads of the spring guide (Johnson Industries standard practice: counting from threaded end of spring guide, apply sparingly, approximately two drops will suffice). As a minimum, all actuators shall be serviced to fully thread/seat the piston and to apply Loctite 242 no later than the next "C" maintenance inspection. Due to variation in Johnson Industries pocket depth dimension tolerances and machining practices on the spindle retainer recess, some actuators may have pocket depth dimensions out of specification even though the piston is fully threaded/seated on the spring guide. These actuators may be used provided the spring guide to piston-threaded connection is confirmed as fully seated and the actual pocket depth is recorded and traceable to that actuator assembly and assembled components for comparison upon future inspections. To date, fully threaded/seated actuators have been found with pocket depth dimensions 0.004 and 0.007 inches greater than allowable. Report all findings and dimensions to the Navy Crane Center.

CSA-145A: <u>Inspection and Replacement of Johnson Industries Caliper Disc Brake Actuator Disc Springs</u>. CSA-145 required activities to inspect and replace Johnson Industries caliper disc brake springs. This revision supersedes and cancels CSA-145. Johnson industries model "DS" caliper disc brake actuators use disc springs, also known as Belleville springs/washers, to provide brake clamping force. Johnson Industries has stated that these disc springs used in the "DS" series brakes are highly stressed components and usually have a finite fatigue life. The estimated cycle life of the disc springs varies depending on the model brake, air gap, and brake application design. The caliper disc brakes on the Craft 60-ton, AmClyde 171.5-ton, and Samsung 60-ton and 151-ton portal cranes are emergency brakes and see limited cycles. Therefore, periodic spring replacement is not expected to be warranted. The caliper disc brakes on the Westmont 60-ton portal cranes are frequently cycled as they act as both emergency brakes and the secondary hoist holding brakes. Therefore, periodic replacement is warranted.

Johnson Industries has calculated the fatigue life range of the specific Belleville springs based on minimum and maximum air gap as follows:

- DS 3040 brakes used on Westmont 60-ton main and boom hoists and Craft 60-ton main hoists, 50,000 to 75,000 cycles.
- DS 3018 brakes used on Westmont 60-ton whip hoists, 900,000 to 1,100,000 cycles.
- DS 1050D brakes used on AmClyde 171.5-ton main hoist, 750,000 to 1,000,000 cycles.
- DS 1050D brakes used on AmClyde 171.5-ton boom hoist, 1,000,000 to infinite number of cycles.
- DS 3025D brakes used on AmClyde 171.5-ton auxiliary hoists, infinite number of cycles.
- DS 2050 brakes used on Samsung 60-ton and 151-ton main and boom hoists, 75,000 to 150,000 cycles.
- DS 1050 brakes used on Samsung 60-ton and 151-ton whip/auxiliary hoists, 75,000 to 150,000 cycles.

For Westmont 60-ton portal cranes, current shipyard estimates of the maximum number of brake cycles are as follows:

- PHNSY&IMF main hoist cycles 40,000; boom hoist 20,000; whip hoist 120,000.
- PNSY main hoist cycles 37,000; boom hoist 28,000; whip hoist 75,000.
- PSNS&IMF main hoist cycles 36,000; boom hoist 9,000; whip hoist 145,000.

For Westmont 60-ton portal cranes, replace the Belleville springs on the main hoist caliper disc brake actuators at the next "B" maintenance inspection. Replace the Belleville springs on the boom hoist at the next "C" maintenance inspection. Replace the Belleville springs on the whip hoist at the second "C" maintenance inspection.

For Westmont 60-ton portal cranes, after initial spring replacement per above, activities shall design and install cycle counters for disk brake actuations (following Crane Alteration Request policies provided by NAVFAC P-307) and replace Belleville springs for all hoists before the minimum cycles have been reached.

For Westmont 60-ton portal cranes, activities that can verify less cycles than specified above, or longer fatigue life than the minimum due to specified air gaps may request waiver by sending a Request for Clarification, Deviation, or Revision (RCDR) to the Navy Crane Center per NAVFAC P-307.

For all Johnson Industries model "DS" caliper disc brakes installed on cranes other than Westmont 60-ton portal cranes, activities shall ensure that the Belleville springs are replaced before the minimum cycles are reached.

These requirements shall be addressed and documented in the equipment history file for each crane affected. NAVFAC P-307 maintenance inspection criteria will be updated to reflect the contents of this CSA.

EQUIPMENT DEFICIENCY MEMORANDA

EDM-073: Collector Wheel Support Bracket Failure Due to Improper Splicing of Bridge Conductor Wires. An activity reported the failure of a collector wheel support bracket as it contacted a span support clip. The collector wheel had become disengaged from the conductor wire as the wheel traveled over a splice in the conductor wire span. The disengaged wheel then contacted the support clip and, as the crane continued to travel, the collector wheel support bracket fractured and fell to the deck. The conductor wire had been repaired previously and two different types of conductor wire had been spliced together, the original round type wire and a newer figure eight-type wire.

Activities are reminded of the importance of required inspections on the collector assembly including the conductor span wires per the NAVFAC P-307, appendix D, item 22. For new installations, conductors shall be continuous in accordance with UFC 3-320-07N (formerly MIL-HDBK-1038). Repairs to existing conductor wires should ensure the same type of conductor wire is used throughout the span. Splices should be installed, inspected, and maintained such that the collector wheel runs over the splice correctly.

EDM-074: Electrical Control Failures. An activity reported an accident involving electrical control failure where a hoist contactor failed to de-energize. The operator was pressing the up button and when the button was released, the hoist block continued to rise. A contactor was undersized for the hoist motor, which caused the contacts to weld closed. Maintenance personnel installed the incorrect contactor.

When routine maintenance requires the replacement of electrical controls, personnel should verify the replacement parts are the same size and rating as the existing equipment or as specified in engineering drawings. Any change in OEM controls shall be approved by the Navy Crane Center per NAVFAC P-307, section 4.

EDM-075: Corrosion Build-Up on Hubbell Explosion Proof Pendant Pushbuttons. An activity reported that the pushbuttons could stick to the point where they will not release or release very slowly. This problem occurs when the stainless steel shaft on the pushbutton has increased resistance to the aluminum hole on the pushbutton face due to corrosion of dissimilar metals. After further investigation, it was determined this condition was exacerbated because bronze bushings were not installed.

The manufacturer stated that bronze bushings are not standard in explosion proof style XPBC pushbutton stations. The bronze bushing inserts are recommended for environments where the controller is subject to various chemicals and salty air to prevent corrosion build-up.

Facilities with Hubbell XPBC pendant controllers should inspect the pendant for corrosion between the stainless steel shaft on the pushbutton and aluminum hole on the pendant face. Activities are reminded of inspection requirements in NAVFAC P-307, section 9, Operator's Daily Checklist and appendix D, annual inspections. Paragraph 9.1.2.1.4.d requires operators to check controls through a range sufficient to ensure that they operate freely. Appendix D for controllers requires maintenance to verify proper spring return. If corrosion exists, activities should install bronze bushings to prevent future corrosion.

EDM-076: Cracked Housing on a Lift-Tech 1-Ton Tugit Lever Hoist. An activity recently reported finding a Lift-Tech 1-ton Tugit lever hoist with a cracked frame assembly. Smeared material and a crack in the hoist frame were found in the area where the load chain enters the load sprocket. The lever hoist was being used with specially designed weight handling equipment in an orientation other than vertical. An investigation concluded that the chain became cross-linked when entering the load sprocket, causing the chain to jam into and ultimately break the hoist frame.

The condition of slack load chain requires special attention when the hoist is used in orientations other than vertical and where the slack load chain is not freely suspended. Users should operate the hoist carefully checking to ensure that the load chain is not kinked or twisted as it enters the load sprocket. Routine inspections should include observation of the area of the hoist frame where the load chain enters the load sprocket. Signs of smeared or deformed material on the hoist frame near the load sprocket are good indicators that the load chain may have been cross-linked and may have caused additional damage. Some disassembly of the hoist may be required for closer examination. Always refer to the operation, service, and parts manual supplied with the hoist.

NAVFAC P-307, section 14, requires annual inspection and load test of lever-operated hoists per OEM and ASME B30.21 instructions. More frequent inspections may be required based on the amount and type of use of the hoist. Questionable conditions should be referred to the activity engineering organization or the OEM for resolution. Activities should ensure that adequate inspection attributes are included in pre-use and periodic visual inspections.

FIRST QUARTER FY05 ACCIDENT REPORT

The Navy Crane Center 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 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. In addition, contracting officers are required to forward to the Navy Crane Center and the host activity reports of all contractor accidents including contractor caused accidents with Navy-owned cranes.

For the first quarter of FY05, 50 Navy weight handling equipment (WHE) accidents (40 crane accidents and 10 rigging accidents) and 4 contractor crane accidents were reported. Significant Navy accidents this quarter included seven dropped loads, two overloads, and three two-blockings.

DROPPED LOADS

Accident: While being loaded aboard a ship, a life raft container was dropped into the water. The containers were rigged using two nylon slings in a choker hitch, one on each side of the container. During the pre-lift brief, ship's force personnel assigned to assist were cautioned to pull evenly on both nylon slings when pulling the containers into the holding rack. Ship's force personnel pulled one sling by hand and pulled the other sling using a boat hook. The sling pulled with the boat hook came off, causing the container to drop.
Lessons Learned: This is the third accident in the past 12 months where a life raft container was dropped due to improper rigging and handling. As explained in Crane Corner accident reports, a strap should have been attached horizontally between the two nylon slings to prevent one or both of the slings from sliding off the load. In addition, tag lines should have been used to control and maneuver the load.

Accident: A cover for an outboard transducer array assembly (OTAA) was dropped when one of the eye bolts used for attaching the rigging gear snapped off. The rigging was attached to eye bolts at three points on the cover assembly. The eye bolts, which are required to be loaded in the plane of the eye, were loaded outside the plane and at 90 degrees from their shanks. Swivel hoist rings were specified but were not used. There were no engineered rigging procedure in place. (The OTAA technical representative developed the rigging procedure on-site.) Also, prior to the lift, the lead rigger noticed one of the eye bolts was slightly bent but continued the lift.
Lessons Learned: Management must ensure that rigging procedures for unique lifts are approved by the cognizant engineering organization. Riggers must ensure that only the proper equipment in serviceable condition is used when rigging a load. Whenever there is a change in conditions, the evolution must stop until alternative procedures are approved.

Accident: While being lifted from a balancing machine, a high-pressure turbine (HPT) and high-pressure compressor (HPC) simulator assembly fell back onto the machine when the load became unbalanced. The HPT/HPC assembly utilizes a special below-the-hook lifting device that is adjustable to fit several varieties of HPT/HPC. Incremental adjustments of the lifting device to fit each type of HPT/HPC are difficult. Final adjustment must be done while the load is suspended. In the past, a similar accident was attributable to the difficulty of adjusting the lifting device, causing management to address the design of the lifting device.
Lessons Learned: Management must continue to coordinate with the cognizant engineering activity for possible redesign of the lifting device to enhance safe handling of the different HPT/HPCs. Additionally, place continued emphasis on the safe use of this device during the pre-lift briefs.

Accident: A steel plate was dropped while being lowered onto a cutting table. Prior to installing plate clamps for the lift, the crane rigger inspected the plate clamps for obvious damage, but failed to notice a spring was not holding the cam jaw parallel to the adjusting screw and the cam pin was bent. These items are specific inspection points per the OEM but were not addressed in the activity pre-use inspection. During installation of the clamps, the crane rigger failed to follow OEM instructions, which required a 1/4-inch gap between the plate clamp body and the plate. He did not ensure that the plate was free of any paint, rust, coatings, etc. The plate lifted was wet and had a coat of paint as a preservative. In addition to the crane rigger, the rigger-in-charge also failed to follow the OEM requirements.
Lessons Learned: Management must ensure that personnel perform properly and use the correct rigging gear for the lift. Additionally, management must ensure that OEM requirements are incorporated into locally developed procedures.

Accident: During a scheduled weight test of a category 3 bridge crane, the weights were dropped when the hook separated from the hoist block. Investigation revealed that after a non-destructive test of the hook was performed, reassembly of the hook was done incorrectly. A thrust ring that fits around two washer halves used to retain the hook shank in the hoist block was omitted. When the load was lifted, the washer halves spread pulling the hook through the hoist block, resulting in the load dropping to the ground.
Lessons Learned: Management must ensure that maintenance and inspection personnel perform properly and applicable technical manuals are available for the proper disassembly/assembly of components.

Accident: An air conditioning sea water pump was dropped when it slipped through the nylon lashing. While moving a pump from a stand to a pallet, the operator used two pieces of single-ply nylon lashing choked around the pump at a point below its center of gravity. Additionally, the operator failed to check the work package for the weight of the pump, which was 1,114 pounds. The combined lashings utilized had a working load limit of 1,000 pounds. Although the lashing was overloaded, the positioning of the lashing around the pump caused it to shift as it was lifted off the stand, slipping through the lashing and dropping to the floor.
Lessons Learned: Personnel must ensure that they know the weight of the load and use proper rigging practices for lifting odd-shaped loads.

Accident: A mechanical loading arm was dropped when the sling being used to lift it parted. The load weighed 19,000 pounds and the four-leg sling's rated capacity was 12,500 pounds. Because the sling was proof tested to 25,000 pounds, personnel thought that was its capacity. The personnel performing the lift were not familiar with proper rigging practices of NAVFAC P-307.
Lessons Learned: Management must ensure that only qualified personnel select the proper rigging gear and rig the loads.

OVERLOADS

Accident: A category 3 crane's test load exceeded the NAVFAC P-307 allowable load during testing. During the annual load test of a 1,000-pound capacity jib crane, the load test director and inspector, who were assisting, lifted a weight of 2,500 pounds. Neither realized the capacity of the crane was 1,000 pounds until after the load was lifted, causing an overload of approximately 1,200 pounds.
Lessons Learned: Management must ensure that personnel perform properly and that cranes are tested per the requirements of NAVFAC P-307.

Accident: A mobile crane auxiliary hoist, a buoyancy tank bumper plate/chain channel assembly, and associated rigging gear were overloaded while fitting the assembly to the hull of a submarine. When necessary to attach buoyancy tanks to submarine hulls to aid in moving them in and out of dry dock, the assembly is installed to protect the hull. The installation requires two cranes, one port side and one starboard. Therefore, it is considered a complex lift. After the assembly was fitted around the hull, the day shift could not complete the job and turned it over to the second shift. The second shift received a pre-lift brief, but the lift was not briefed as a complex lift. Additionally, the mobile crane operator, who was also assigned as the acting supervisor, was late to the site and was not briefed. As a result of not being briefed, the crane operator did not know the weight of the load or that the "weakest link" of the assembly was the rigging gear. After detaching the port side crane, the mobile crane was used to hoist the starboard side of the assembly to remove the slack. The crane rigger asked the operator for the load moment indicator (LMI) reading, which was 3,300 pounds. The crane rigger then instructed the operator to hoist up until the LMI changed readings. The operator knew that the auxiliary hoist capacity was 12,920 pounds, minus deductions. Although the LMI reading changed, he did not stop hoisting because he did not believe the reading was near its limit. When the crane rigger saw the assembly come up against the hull, he signaled the operator to stop hoisting. At that same time, the LMI alarm sounded indicating an overload. The reading was at 14,000 pounds. The assembly installation instructions did not identify the installation as a complex lift; the second shift did not brief the two-crane lift as a complex lift. The second shift operator did not receive a pre-lift brief. Someone other than the mobile crane operator should have been the acting supervisor; the operator did not stop hoisting when the LMI changed as instructed. The day shift mobile crane operator did not remain at the controls of the crane with a suspended load awaiting his relief.
Lessons Learned: Management must ensure that all members of the crane team perform properly and are briefed when there is a change of crane teams during a lift. Additionally, management must ensure that there are sufficient members assigned to the crane team to accomplish the operation safely. Crane operators must stay at the crane controls when a load is suspended. Operators must not deviate from the hoist plan without first discussing the change with the crane team.

TWO-BLOCKINGS

Accident: A mobile crane whip hoist was two-blocked when the operator inadvertently rested his foot on the boom extension pedal on the floor of the operator's cab, causing the boom to extend raising the hook block into the sheave. The hoist limit switch had been by-passed for traveling the crane.
Lessons Learned: Crane operators must remain alert and focused at all times during all types of operations. Special attention must be given whenever mobile crane safety devices are by-passed for traveling or reconfiguring the crane.

Accident: A mobile crane auxiliary hoist was two-blocked while the operator's daily check was being performed. While checking the anti-two-blocking device, the operator failed to react to stop operation to prevent the hoist from two-blocking. The operator stated that the device failed to activate. However, when inspected, no discrepancies were found.
Lessons Learned: Operators must remain focused at all times and shall approach limit switches only at a slow speed.

Accident: A mobile crane main hoist was two-blocked when the operator accidentally engaged the main hoist control while raising the boom. The crane was in maintenance and the limit switches were in the by-pass mode.
Lessons Learned: Crane operators must remain alert and focused at all times during all types of operations. Special attention must be given whenever mobile crane safety devices are by-passed for traveling or reconfiguring the crane.

SIGNIFICANT RIGGING GEAR ACCIDENTS

Accident: A 1,000-pound working load limit (WLL) dynamometer was damaged beyond repair when it was mistakenly used in a rigging configuration for a load that weighed 7,350 pounds. A 10,000-pound WLL dynamometer was supposed to be used. Additionally, the workers turned it in to the test and calibration lab not recognizing this to be a rigging gear accident.
Lessons Learned: Management must ensure that riggers perform properly and select the correct sized equipment for the task. Following an accident or suspected accident, NAVFAC P-307 requires activities to stop work and promptly initiate an investigation. Management must ensure that all applicable personnel are trained on these requirements.

Accident: Two one-ton chain hoists were overloaded during a lift of approximately 6,400 pounds. Although procedures identified the rigging configuration and gear requirements, the riggers failed to recognize that they installed the wrong capacity chain hoists.
Lessons Learned: Management must ensure that riggers perform properly, select the correct equipment for the task, and verify the requirements prior to the lifting evolution.

SIGNIFICANT CONTRACTOR CRANE ACCIDENTS

Accident: While static load testing ship padeyes, a sling was overloaded. The sling was put through the padeyes in a basket hitch configuration and attached to the hook. The test procedures required a static pull on the padeyes of 68,000 pounds for 10 minutes. However, at one point in the test, it was realized that the crane's load moment indicator was reading approximately 100,000 pounds. The sling was rated for 84,000 pounds capacity in the basket hitch configuration.
Lessons Learned: Ensure that procedures are briefed, understood, and followed by all crane team members. When performing static pulls for testing padeyes, operators must be especially alert to dynamometer readings. Slight increases in lifting pressure can quickly overload a crane or rigging gear.

Accident: A rigger injured one of his fingers when it became caught between twisted wire ropes. While lifting a pump from a dry dock well opening, the crane's hoist block started to spin causing the crane's wire ropes to twist. The rigger attempted to control the twisting by grabbing the wires and got his finger caught.
Lessons Learned: Personnel must remain alert at all times and not put themselves in a position where they may be injured from a sudden movement of the load. Additionally, the lifting evolution must be stopped when deficiencies are noted.

Accident: A 55-foot aid-to navigation boat was dropped when a nylon sling parted causing damage to the boat and trailer. When the nylon slings were placed under the boat, there were no divers available to ensure the slings were set correctly and there was no interference, sharp edges, etc. The bow sling had a twist in it. The stern sling was starting to cut from sharp edges on the boat. When the boat was lifted out of the water and held over the trailer, the contractor realized the trailer was too small. Moments before the boat dropped, a discussion was held about removing the propellers and rudders and personnel were under portions of the boat. This

accident could have resulted in serious personal injury or death. After the accident, the contractor did not notify the contracting officer, failed to preserve the scene, used different slings to lift the boat off the trailer onto blocks, and removed the trailer from the area. The investigation also revealed that the contractor was not knowledgeable of the applicable portions of NAVFAC P-307 for contractor cranes operated on Navy facilities.
Lessons Learned: Ensure that qualified personnel are available to perform the work. Divers should have been available to place the rigging and chafing gear onto the underside of the boat. Personnel must be aware of the dangers of placing portions of their bodies under a load. Management and contracting officers must ensure that all applicable portions of NAVFAC P-307 are included in the contract, understood, and followed.
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 hazardous operations, which should be used in the planning and preparation of all WHE lifts.

E-mail submission (m_lstr_ncc_safe@navy.mil) of reports of accidents, unplanned occurrences, and near misses is encouraged. 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 malfunction or failure.

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We are always in need of articles from the field. Please share your sea stories with our editor, (610) 595-0905, fax (610) 595-0748, or e-mail m_lstr_ncc_ccorn@navy.mil.

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Weight Handling Program Films

Accident Prevention, seven crane accident prevention lessons learned videos 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 m_lstr_ncc_ccorn@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.