NAVFAC

THE CRANE CORNER

Navy Crane Center Technical Bulletin

http://portal.navfac.navy.mil/ncc ***51st Edition – September 2006***

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A WORD FROM TOPSIDE

Sam Bevins

Our fiscal year has just ended and I have some encouraging news to report. In the area of program compliance as reflected in our audits, a record 92 percent of the activities audited this year had compliant programs. This is a significant increase over the 83 percent compliant rate for the past two years. Navy shore activities have come a long way since FY98, when less than 20 percent of the activities audited were in overall compliance with the requirements of NAVFAC P-307. The condition of the Navy's cranes has also improved. Of the 400+ cranes inspected during our audits, 80 percent were found satisfactory. This is a new high and improves on the 76 percent satisfactory rate of the past three years. And in terms of how far activities have come, in FY98 barely half the cranes inspected were found satisfactory. This progress is a testament to the hard work of everyone at the Navy shore activities around the world…as they have proactively engaged to meet the required standards for their weight handling programs and equipment condition.

The final accident numbers are not yet in (allowing the 30 days for activities to submit reports) but at this point, we are seeing a 20+ percent reduction in the number of what we term "significant" accidents. These are injuries, overloads, dropped loads, and two-blocking accidents. Also, thus far, only three percent of all the accidents reported for FY06 met the OPNAV mishap reporting threshold, and these were all class C accidents. Our policy of requiring reports of all accidents that meet our stringent definition, no matter how minor, has enabled us to identify and share the lessons learned from the minor accidents so that the big ones can be avoided. Of course, our mutual goal is ZERO crane and rigging accidents!

On another positive note regarding accident reduction, the Navy shore activities responded well to our April 2006 "Crane Safety for the Summer Months" naval message. In this message, we noted the significant increase in accidents for June through August of 2005 compared to the same period in each of the previous three years and asked activities to intensify their focus on safe crane operations during these summer months of 2006.
The results for 2006 reflect the hard work of those involved in crane operations…achieving a record low accident count for these three months. The challenge now is to apply this same focus throughout the year to continue this improvement in safe operations.

Our acquisition personnel continued to deliver high quality cranes to meet the Navy's many and varied missions. We recently delivered a 151-ton portal crane to Norfolk Naval Shipyard and the shipyard had it certified and in productive service within a few days after we accepted it and turned it over to them.

As we begin a new fiscal year in a new location, within the largest concentration of Navy activities and weight handling equipment in the country with ready access to essentially every type and model of crane in the Navy inventory, we are the same Navy Crane Center "People Helping People Put Ships to Sea…Supporting Fleet Readiness"…committed with a strong sense of urgency to proactively assisting the global Navy shore activities achieve our mutual goal of safe and effective lifting and handling.

Inside This Issue

Operational Risk Management 5-Step Process

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

PITFALLS TO AVOID WHEN ASSESSING RUNWAY RAIL CAPACITY

Recently an activity requested approval to increase the capacity of one of three underhung bridge cranes that share the same runway. The activity engineer performed a rail capacity calculation using formulas published by the manufacturer. These equations are used to calculate the maximum equivalent center load (ECL) for rails with various crane end-truck configurations on a single span. The calculated ECL is then compared to the maximum ECL rating for a particular rail size and span. Using these equations, the engineer determined that a 27-inch spacer was needed to go between each crane to prevent exceeding the existing rail maximum ECL rating.

While reviewing the Crane Alteration Request, NAVCRANECEN discovered that the formulas were limited to two end-trucks with equal loading. The activity engineer had combined two 4-wheel end-truck cranes into one 8-wheel end-truck crane and made all three loads equal to satisfy the parameters. It initially appeared that the conservatism the engineer had used in his application would yield a satisfactory result. As part of the NAVCRANECEN technical review, a preliminary static analysis was performed using the actual conditions to verify the results…recognizing that a more comprehensive moving load analysis would be required to fully assess the conditions. The results of this preliminary static analysis concluded that 78-inch spacers were needed to satisfy the allowable stresses and maximum deflection as specified by MH27.1-2003, Specifications for Patented Track Underhung Cranes and Monorail Systems. This spacing would also satisfy the maximum hangar load (MHL) for the support hangars using this analysis.

NAVCRANECEN then contacted the rail manufacturer to discuss this disparity. The manufacturer offered to perform a moving load analysis. Initial results did not meet the maximum deflection criteria previously established by static analysis. The final dynamic analysis determined that a spacing of 12 feet was required to satisfy all criteria. This is almost twice the spacing that was determined by static analysis.

This study indicates that rigorous static and dynamic analysis is required in cases involving more than two end trucks or end trucks with unequal loadings to ensure that safety factors and code requirements are met. Engineers must apply formulas within the given parameters for which they were derived. In this case, the activity engineer used conservatism in his application and still calculated an insufficient spacing. The results obtained with software programs should also be checked by other techniques for verification ■

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.

EQUIPMENT DEFICIENCY MEMORANDUM

EDM 087, Cracked Load Chain Dead-end Connection on a Columbus-Mckinnon (CM) Lever Ratchet Hoist

The purpose of this EDM is to inform activities of potential load chain dead-end connections that could crack due to improper installation of the load chain dead-end pin. An activity reported that the hoist frame connection for the load chain dead-end pin was cracked. The affected hoist was a CM 6-ton lever ratchet hoist with an aluminum hoist frame. CM lever ratchets with steel frames do not exhibit evidence of cracking at the chain dead-end connection. The dead-end pin is not normally loaded unless the full length of the load chain is paid out.

The dead-end pin for the 6-ton ratchet hoist is a groove pin (P/N 40853) with a 3/8 inch nominal diameter and an expanded (groove) diameter of 0.380 inches. The activity procedure is to drive the dead-end pin into the hoist frame connection until the end of the pin is recessed in the hoist frame. The OEM stated that the dead-end pin should be installed by driving the pin into the hoist frame until the end of the groove pin is slightly above flush with the hoist frame. This installation instruction is not specifically addressed in the OEM operation, maintenance, and parts manual.

NAVCRANECEN recommends that activities with aluminum frame CM lever ratchet hoists ensure their dead-end pin installation procedures are in accordance with the OEM recommendations noted above. If existing local instructions include driving the pin flush with or recessed in the hoist frame, then the hoist frames should be inspected for damage.

Third Quarter FY06 Accident Report

The Navy Crane Center disseminates Shore Activity Weight Handling Equipment (WHE) accident lessons learned to prevent repeat accidents and improve overall 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 reports of all contractor accidents, including contractor caused accidents with Navy owned cranes.

For the third quarter of FY06, 59 Navy weight handling equipment WHE accidents (47 crane accidents and 12 rigging gear accidents) and 4 contractor crane accidents were reported. Significant Navy WHE accidents this quarter include 6 dropped loads, 5 injuries, 3 overloads, and 2 two-blocking's.

INJURY

Accident: The tip of a diver's finger was pinched off and another finger broken when his hand was caught between two wire rope slings. Divers were installing a temporary platform on a ship using a floating crane. Due to concerns with chafing, two wire rope slings were substituted for synthetic slings, which were required by the procedure. Approval for this substitution was not obtained. This was the first time wire rope slings had been used for this lift. Chafing material was placed between the wire rope slings and the hull. As the rigging gear was tensioned, the chafing material shifted. The lift was stopped and the material adjusted. During re-tensioning, a diver's hand was caught between the two wire rope slings. The activity's investigation revealed inadequate communication for control of the lift, lack of understanding of the tendency of wire rope slings to twist when a load is applied and unapproved sling substitution.
Lessons Learned: Changes in procedures must be approved by the appropriate organizations. The changes must be understood and communicated to personnel involved. Where the load is submerged, a positive form of communications shall be used. Additionally, personnel must not position themselves or parts of their bodies in potential pinch points.

Accident: A machinist suffered two broken bones in his leg when a 2500 lb metal side rail fell over onto him. A rigger and assist machinist were in the process of flipping a 2500 lb arresting engine side rail, using a pendent controlled bridge crane. The side rail was lifted and set down on its edge unsupported. Then tension was removed from the rigging. While repositioning the rigging gear to facilitate flipping, the unsupported side rail fell over onto the machinist.
Lessons Learned: Prior to disconnecting rigging gear or allowing personnel to access areas around the load, the rigger must ensure loads are stable. Assist personnel must be briefed and understand these precautions.

Accident: During a lift of a 110 lb actuator from the pier to a ship, the actuator slipped from the rigging and fell to the dry dock floor. The crane team was tasked to lift and place a 110 lb actuator through a ship's logistics escape trunk for installation shipboard. A synthetic round sling was used to choke around the body of the actuator. Additional rigging to prevent the actuator from slipping from the sling was not used. The actuator was lifted slightly, checked for proper attachment and transported to the ship. During transport, the actuator began to swing excessively. To regain control, a rigger grabbed the synthetic sling causing the actuator to slip from the sling. The actuator fell, struck the side of the ship and dropped to the dry dock floor.
Lessons Learned: All loads must be properly rigged prior to lifting. Special precautions must be taken when using a single point choker hitch to rig unusual shapes, delicate objects, or critical components.

Accident: During offload of an aerial platform, vehicle (man lift), the man lift tipped over and a portion of the basket and boom went into the water. A portal crane was used to lift a man lift off a barge. The crane operator had been qualified for only 4 months and had not lifted this type of man lift previously. Small craft warnings had been posted and local instructions required suspension of crane operations during these conditions; however, the small craft warnings were not communicated to the crane team. The rigger estimated the weight of the man lift to be 35,264 lbs. This estimate was based on previous load moment indicator (LMI) read out weights of similar man lifts. However, the rigging gear used for the lift was only rated to lift 34,000 lbs. The rigging gear was attached to pad eyes on the man lift. The two rear pad eyes were marked "tie down only" and were not approved for lifting. The man lift was lifted, stability checked, then hoisted. Ten feet above the barge the man lift rotated, and tipped unexpectedly, causing the basket and a portion of the boom to go into the water. Management was notified and a recovery plan was developed, approved and briefed. At the completion of the recovery action, the activity determined that rigging gear used during recovery was not certified.
Lessons Learned: Activities must ensure that proper procedures are in place for lifts involving man lifts or similar equipment. This includes procedures for contractors and contractor equipment being lifted by a crane. These procedures must include the weight, approved lift points and any special instructions for lifting. Riggers must correctly size rigging gear for each lift. Activities should consult the OEM if questions or concerns arise. Additionally, management must ensure that recovery actions are thoroughly reviewed and properly supervised.

Accident: During operations to lift a damaged tug boat using a mobile boat hoist, synthetic web slings failed causing the bow of the tug to drop. An activity was tasked to lift a damaged 97 ton tug boat. The port side had been punctured and the tug was taking on water. The removal was considered urgent. The rigger identified that the tug's lifting attachments would not align with the mobile boat hoist hooks and decided to sweep the hull using six synthetic web slings. This type of craft had not been lifted by this activity before. The tug was lifted, transported to a storage area and positioned over support blocks. Just prior to lowering, two slings located at the bow failed. Investigation revealed that the bottom of the tug's hull was comprised of sharp edges. These sharp edges were under the water line and not visible to the rigger. No chafing material was used to protect the synthetic web slings from damage. The remaining four slings also showed indications of similar damage.
Lessons Learned: Rigger's must ensure that adequate chafing material is used to protect slings from damage. Submerged loads should be examined prior to lifting. During the initial lift, observe that the slings are properly positioned and protected. If unsatisfactory conditions are observed stop, place the load in a safe condition and correct the deficiency. Activities must ensure adequate oversight of urgent work.

Accident: A retaining slat on a food module being lowered into a ship became dislodged and dropped to the deck. An activity was lifting food modules in and out of the food chute in the forward logistics escape trunk of a ship. During lowering of one of these food modules, a retaining slat on one of the shelves dislodged, fell and nearly hit a rigger. Investigation revealed that, due to the routine nature of the job, the supervisor did not properly brief the crane team or ensure a pre-lift check list for this job before it was completed. Additionally, personnel did not tape or wrap the ends of the retaining slat as they had been previously briefed. (The taping or wrapping of the food module retaining slats was a lesson learned from previous problems).

Lessons Learned: Supervisors should ensure that personnel are properly briefed and follow approved lifting and handling processes. Complacency/ overconfidence can affect the performance of personnel, especially where routine or repetitive work is involved.

TWO-BLOCKINGS

Accident: A bridge crane undergoing maintenance was two blocked. Maintenance personnel had removed a bridge crane from service awaiting replacement parts for the crane's upper limit switch. After installation of the parts, additional electrical problems were identified. Prior to completing these repairs, the crane was energized and two blocked. The activity's investigation revealed multiple violations of the lock out/tag out procedure, non-compliance with standard operating processes and inadequate communications and control of maintenance work.

Lesson Learned: Personnel must follow approved lock out/tag out procedures. Crane maintenance work may involve more that one trade, multiple crane functions and in some cases contractor personnel. Adequate lock out/tag out controls must be in place and followed to avoid mishaps.

OVERLOADS

Accident: During the annual load test of a mobile crane, the wire rope rated capacity was exceeded. An activity conducted a load test on a mobile crane and subsequently certified the crane for service. During the activity's annual audit, a review of the crane's load test revealed that an error was made in determining the test load. The test director, in calculating the maximum test load for a single part wire rope, calculated a test load based on a 4 to 1 safety factor, versus the 5 to 1 required for rotation resistant wire rope. This calculation error resulted in overload of the wire rope by 2000 lbs. The Activity's crane certification process did not identify this error.

Lessons Learned: Test directors should ensure that test procedures are properly developed and reviewed prior to use. Load test calculations should be checked and approved by a competent individual to verify the accuracy of the calculation and ensure criteria used for the test are correct.

Accident: A bridge crane, rigging gear, and hydraulic roll press were damaged while loading a plate into the roll press. The crane operator attached a plate clamp to one end of a five-ton plate and lifted it into the roll press where the press operator began feeding the plate into the rollers. The crane operator traveled the crane to keep the hoist block centered while maintaining tension on the rigging to hold the plate square to the rollers. The operators stopped the operation to evaluate the progress. After ensuring the operation was proceeding satisfactorily, the press operator began feeding the plate into the press. At this point, the crane operator should have lowered the hoist block to release the tension in the rigging. The feeding of the plate into the press exerted pressure on the plate forcing it downward causing the chain sling to further tighten and break. After the chain separated, the plate recoiled downward damaging the roll press platform. Other damage included an overloaded crane, high stranded wire rope, a distorted shackle and an overloaded plate clamp. The operator did not lower the hoist block sufficiently to provide enough slack in the rigging, nor did he tell the press operator that the slack in the rigging was being eliminated and to stop operations.

Lessons Learned: Management must ensure personnel performing coordinated operations are familiar with all aspects of the operation with special emphasis on proper communications. Personnel must recognize and stop work when unusual circumstances develop.

Accident: An operator rotated a loaded mobile crane into a configuration that was not rated to carry a load, resulting in an overload of the crane. While lifting an antenna from a roof, the load was rotated over the front of the cab, without the front outrigger stabilizer in place or the rigger in charge's direction. The lift was poorly planned and briefed with no discussion regarding movements, responsibilities or contingencies. When the crane operator unexpectedly rotated the load over the cab, the crane team was unprepared and unsure how to react to the change in direction. Additionally, non-standard hand signals were used by the rigger in charge, causing confusion between the crane team members.

L**essons Learned:** Management shall ensure lifts are adequately planned and thoroughly briefed prior to execution and that crane team members are familiar with and utilize standardized hand signals. During lifting operations, crane operators shall only make movements when given direction to do so by the designated rigger. Additionally, any crane team member shall stop the job anytime unsafe conditions are found.

SIGNIFICANT RIGGING GEAR ACCIDENTS

Accident: During removal of an electronic control gear box from its foundation, a rigger's finger was injured (pinched) and a critical ship component was damaged. Riggers were installing electronic control gear boxes on four engines on an aircraft carrier. Seven of eight gear boxes had been successfully installed. During fit up on the last gear box, the rigger, using a chain fall, lifted and lowered the gear box. During lowering, the rigger held the gear box to one side; in this process, the rigger's finger was pinched. The rigger released the gear box causing the unprotected shaft of the gear box to contact the foundation and become damaged. The activity's investigation revealed that no special handling requirements were provided for these critical components. Each of the previous, seven gear boxes were installed without protecting the gear box output shafts.
Lessons Learned: Personnel involved in rigging should not place themselves or parts of their bodies in pinch points. Additionally, activities should ensure that sensitive equipment is identified and special handling instructions are provided. NAVFAC P-307 requires activities to prepare procedures including rigging sketches for critical non-crane rigging operations.

Accident: During a rigging operation to rotate a coupling shaft collar, synthetic lashing used to handle the collar was cut allowing the collar to drop. Riggers were installing the lower shaft coupling split collar onto a shaft inside a ship's shaft alley. The plan was to rig the collar into position over the top of the shaft and then roll the bottom portion of the collar under the shaft. Synthetic lashing was installed through open holes on each end of the collar. Chafing material was positioned to protect the synthetic lashing from damage. As the collar was rotated, the lashing rendered off the chafing material, allowing sharp edges of the collar to cut through the lashing causing the load to drop.
Lessons Learned: Chafing material must protect synthetic slings and lashing from sharp edges and abrasive conditions. Chafing material must be secured in place to prevent movement during rigging operations. If there is any doubt, wire rope lashing, which is more durable, should be used.

Accident: A rigger was injured when a shielding block slipped from the rigging and struck him on the leg. Riggers were removing shielding blocks from a compartment within the ship. The shielding blocks weighed from 40 to 148 pounds. The blocks had to be rigged through various levels of the compartment and then through a hull cut. Personnel were pre-positioned at different levels to assist in the removal. The shielding blocks were choked with a synthetic web sling, then attached to a nylon rope that was placed over a hook of a disabled air hoist. The shielding blocks were hand lowered to another rigger who received them and pulled them through the hull to a vestibule floor. Numerous shielding blocks were successfully handled in this manner. During handling of one of the blocks, the block hung up allowing the synthetic sling to become slack. The rigger was not aware of this condition and tried to lift the shielding block away from the obstruction. During this process, the synthetic sling slipped from around the shielding block and dropped, injuring a rigger.

The activity's investigation revealed that personnel were not properly positioned to observe and handle the shielding blocks, the method used to rig the shielding blocks was inadequate, and the rigger placed himself in an area within the envelope where he could be injured.
Lessons Learned: Refer to lessons learned of the first dropped load accident noted above.

SIGNIFICANT CONTRACTOR ACCIDENT

Accident: A contractor was lifting a mobile crane when two synthetic round slings parted and the crane fell. The crane was being lifted from the floor of a dry dock to be placed on the pier. The rigging configuration consisted of a four-leg chain sling with each sling leg attached to one of four synthetic round slings. Each round sling was used in a basket configuration and wrapped around the crane's outrigger beams. Chafing material was used to protect the slings. During the lift, the chafing material and synthetic slings were cut through by sharp edges on the outrigger beams allowing one end of the crane to drop.

Lessons Learned: Synthetic material is not approved for use with loads with sharp edges. NAVFAC P-307 contains requirements for sling inspection and use. Crane Safety Advisory (CSA) 153, Proper Use of Synthetic Slings, outlines special precautions for the proper use of synthetic slings.

Third quarter accident trends indicate an increase of occurrence of personnel placing themselves in pinch points or in areas around a load where the potential of injury is increased. Additionally, the improper use and damage to synthetic slings continues to be a concern. Crane Safety Advisory (CSA) 153, Proper Use of Synthetic Slings, addresses requirements for the use of synthetic slings. Weight handling program managers and safety officials are encouraged to review the above lessons learned with personnel performing lifting and handling functions and consider the potential risk of accidents occurring at your activity. OPNAVINST 3500.39B, Operational Risk Management, prescribes methods for assessing hazardous operations, which should be used in the planning and preparations of all WHE lifts.

E-mail submission of reports of accidents, unplanned occurrences and near misses is encouraged. The e-mail address is m_nfsh_ncc_safety@navy.mil. The reports must include a complete and concise situation description, corrective and preventive actions, probable cause and contributing factors, and an assessment of damage. For equipment malfunction or failure include specific description of the component and the resulting effect or problem caused by the malfunction or failure.

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 m_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.

SHARE YOUR SUCCESS

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