THE CRANE CORNER

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A WORD FROM TOPSIDE

Sam Bevins

Fiscal Year 2005 was another busy and productive year for the Navy Crane Center as we executed our primary mission of promoting safe weight handling operations at the global Navy shore activities.

World events, war on terror, natural disasters, etc., have intensified an already heavy Navy weight handling workload. Despite the increased activity associated with these events, Navy shore activities managed to improve on the excellent safety record achieved in the past few years. The total number of shore activity crane accidents was the lowest since we started keeping records in FY98. In terms of severity, accidents meeting OPNAV reporting thresholds dropped dramatically from nine in FY04 to two this year. Our emphasis on reporting the small accidents, whether or not injury or damage occurs, helps us identify and share lessons learned to prevent more serious accidents. Although the FY05 safety record is commendable, we continue to encourage our Navy shore activities to drive toward our ultimate goal of ZERO weight handling equipment (WHE) accidents.

The positive performance in activity compliance with NAVFAC P-307 requirements continued in FY05 with 83 percent of the shore activities audited found to be substantially compliant. This metric is a positive indicator of activity recognition - from the Commanding Officer to the essential deckplate personnel who maintain and operate our cranes - of the importance of safe equipment and safe operations. It also reflects the commitment of Regional Commanders and Enterprise Commands to provide the resources necessary for a successful weight handling program.

Navy shore activities maintained their high standard of equipment condition in FY05 with 76 percent of audit cranes found fully satisfactory. This metric is a key indicator of equipment readiness at Navy shore activities to meet Fleet weight handling requirements.

In the acquisition arena, we accepted and certified four state-of-the-art 60-ton portal cranes, delivered another 60-ton portal crane, awarded the order for a 151-ton portal crane, and provided technical consultation services for the purchase of 80-ton and 150-ton portal cranes in Japan. We acquired or provided technical consultation for procurement of 20 new and 3 reconstituted bridge cranes of various capacities. We acquired a 40-ton rubber tire gantry crane and a 75-ton mobile boat hoist, and provided technical consultation for the procurement of five 150-metric ton mobile boat hoists.

Training is a major contributor to the improvements that are being achieved by the Navy shore activities. We completed the conversion of our mandatory Category 2 Crane Safety Refresher and General Safety Refresher courses from classroom instruction to web-based instruction. The conversion to web-based training delivery will save significant tuition and travel costs and time away from the job. We continue to focus on mobile crane safety since mobile cranes are typically involved in the more serious accidents during lifting and handling. In FY04, we distributed a training film on mobile crane operations safety. That year, mobile cranes were involved in 39 percent of Navy crane accidents. In FY05, mobile cranes were involved in only 33 percent of Navy crane accidents.

With effective criteria management, training support, assistance in weight handling program management, engineering, inspection, and safety, and with the acquisition of new and reconstitution of existing equipment, the Navy Crane Center stands ready to assist the Navy shore activities in their support of the Navy's ever increasing missions in today's challenging global environment.

A safe and reliable Navy weight handling program is essential for Fleet readiness.

Inside This Issue

INTEGRATING PACKAGE HOISTS WITH BRIDGES OF DIFFERENT MANUFACTURERS

Recently an activity reported an equipment deficiency due to a wiring error made when integrating a package hoist (trolley and hoist functions) with a bridge (bridge function and main line contactor) of a different manufacturer. The problem was discovered during loss of power testing. The activity found that while the trolley or hoist pushbutton was being depressed it was not possible to power off the crane with the power off pushbutton. Further investigations found that the manufacturer's drawings for the crane were correct, but during initial installation by a third party, the packaged hoist and bridge were not wired together correctly. That miswiring caused power to back feed from the package hoist circuit and maintain power to the mainline contactor until the hoist or trolley pushbutton was released and the stop button was depressed.

This is one example of a problem that can be experienced when package hoists and bridges are integrated incorrectly. Other possible problems that can be encountered due to miswiring or improper design of package hoists and bridges from different manufacturers are unintentional bypassing of safety devices, incorrect circuit voltages (also found in the reported problem), and increased nuisance trips.

It is not uncommon for bridge cranes to be composed of a packaged hoist from one manufacturer and a bridge system from a separate manufacturer with installation by a third party. When package hoists and bridges from separate manufacturers are integrated, it is important to ensure that there are no design or wiring errors that would compromise either system.

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-151A: Failure of a Welded Alloy Steel Load Chain Link. CSA-151 directed activities to immediately inspect 1/2-ton and 1-ton Budgit chainfalls and 1-ton, 1-1/2 ton, and 2-ton Tugit lever hoists for load chain with both chain embossing marks "HDY" and "*" (star). Load chains found with these markings were to be removed from service until further notice. An activity reporting failure of one link in a load chain with these markings. The preliminary investigation showed that the failed link lacked adequate fusion in the weld.

The chain manufacturer investigated the failed load chain link and concluded that the weld had proper fusion based on the fracture surface showing evidence of ductile tearing. The chain manufacturer also noted evidence of necking (decrease in diameter) of the failed link and oversized pitch length (over the print specification) on adjacent links that would indicate the application of a load in excess of the factory proof load at some point during its use. Finally, physical testing of the portions of returned chain revealed that the chain did meet the specifications. Specifically, breaking strength tests exceeded the minimum ultimate breaking strength values for the chain. The manufacturer does not consider this chain link failure to be a result of improper material or manufacture.

Based on the findings provided by the chain manufacturer, CSA-151 actions are canceled.

UPDATE TO CSA-154: Yale Engineering Series EW and Series CE Limit Switch Failure. An activity recently submitted a crane alteration that prevents the Yale series EW limit switch from failing if the cover plate is not securely tightened. This crane alteration can be obtained from the Navy Crane Center.

EQUIPMENT DEFICIENCY MEMORANDA

EDM-086: Derailment of Gear Driven Trolley from Monorail Beam. An unloaded manually gear driven trolley derailed from a monorail beam and fell to the deck. The trolley is a Chester 1,000-pound trolley running on a wide flange W6 X 15 beam. The trolley was mounted per OEM instructions that require a 1/16-inch clearance between the trolley wheel flange and the beam edge. While the unloaded trolley was traveling along the monorail, the load created by the gear drive assembly tilted the trolley assembly and caused the other side of the trolley to lift off the beam flange. The trolley then slid to the gear driven side causing the wheels on that side to come off the edge of the flange. The trolley side plates and spacing washers are held together by cotter pins, which may have contributed to this accident by allowing more clearance between the wheel tread and beam flange.

The trolley OEM stated that this type of accident had not been reported, but recommended the installation of an under beam roller for this application. Other trolley OEMs, such as Yale and Budgit, require similar anti-tilt devices for their manual gear driven trolleys.

Activities should determine if such a device is warranted for their specific trolley OEM, installation, and application. If in doubt, contact the trolley OEM for further guidance.

FOURTH 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 and 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 fourth quarter of FY05, 56 Navy weight handling equipment (WHE) accidents (48 crane accidents and 8 rigging gear accidents) and 3 contractor crane accidents were reported. Significant Navy accidents this quarter included 3 dropped loads, 5 overloads, and 3 two-blockings.

DROPPED LOADS

Accident: A mobile crane was dropped while being lifted to a carrier flight deck. The manufacturer recommended lifting the unit by the outriggers. Rubber chafing protection was wrapped around the outrigger beams and held in place until tension was applied to the slings. The crane was then lifted approximately 12 inches and stopped to check the balance of the load. At this time, the right front round sling parted when it came into contact with the sharp edge of the outrigger beam. The rubber chafing material had manufactured slots every eight inches and a tear from previous usage. This allowed the sharp edge to protrude through the rubber when it was compressed under load. When the first sling parted, it caused the load to shift, which jarred the other three slings from the protective chafing gear, placing them in contact with sharp edges resulting in their parting and the load dropping. Additionally, due to the weight of the load, configuration, and lift points, this evolution met the criteria of a complex lift per NAVFAC P-307, but was not treated as such.
Lessons Learned: CSA-153, proper use of synthetic slings, provides lessons learned.

Accident: A dry ice container was dropped when it slipped out of the rigging gear. While off-loading dry ice containers, the rigger utilized two synthetic slings in a basket configuration to lift four containers at a time. The synthetic slings were threaded under the containers then attached by shackles to a four-leg wire rope sling assembly. During one of the evolutions, the synthetic slings were crossed under the containers, which when compressed during the lift caused one of the containers to squeeze out of the rigging gear.
Lessons Learned: Improper rigging procedures were utilized by attempting to lift four items at one time, which when lifted were only held in the rigging gear by compressing against each other. Proper rigging practices must be followed.

Accident: A foundation piece was dropped while being lowered into a missile tube. Five foundation pieces were attached to a strongback by threaded rods, a bottom support plate, and nuts. Although this was a first-time evolution for this crane team, supervision provided only verbal instruction on attaching the foundation pieces to the strongback and failed to provide written direction. The supervisor then left the work site. When the assembly was lifted, it was momentarily stopped to check load stability and crane brakes, but no one checked the attached foundations, rods, plates, and nut thread engagement. While lowering the load into the missile tube, one of the plates and foundation pieces dropped from the strongback. The investigation revealed that two of the nuts were improperly installed.
Lessons Learned: Management must ensure proper procedures are in place and that written direction and site supervision are provided for first time evolutions of unusual lifts. During pre-lift checks of rigging arrangements and rigging gear, riggers should also check to see that load attachments are adequately secured.

OVERLOADS

Accident: A mobile crane's test load exceeded the NAVFAC P-307 allowable load during testing. During the annual load test of a 75-ton hydraulic crane, the crane test team selected the wrong weight for the hydraulic slippage test. This resulted in a test load that exceeded the maximum test capacity by 11 percent.
Lessons Learned: Load tests are planned overloads to the crane. Therefore, it is extremely important that test load weights not exceed the maximum tolerance allowed by NAVFAC P-307. Test load weights should be as close to the nominal test load (110 or 125 percent, depending on the type of crane) as is practical, and be confirmed by the rigger and load test director.

Accident: A mobile crane was overloaded while lifting a diesel engine and skid. The weight of the load was estimated at 7,430 pounds. The plan called for the lift to be at a 30-foot radius. However, after setting up the crane, the team realized that the lift would actually be made at a 42-foot radius. The crane operations supervisor checked the crane's load moment indicator (LMI) and briefed the crane team that the capacity of the crane at 42-foot radius was 9,300 pounds. The crane team verified the radius with a tape measure and rigged the load in accordance with the plan. As the load was lifted and was partially suspended, the LMI, which was equipped with an overload indicator and shutdown capability, stopped the hoisting of the load. When the diesel engine and skid were subsequently weighed, the weight was verified as 9,600 pounds.
Lessons Learned: When the actual lift deviated from the plan, the lift should have been stopped and reevaluated. The manufacturer's load charts and not the LMI should have been used to verify the crane capacity at the verified radius. Additionally, there should have been an engineering evaluation to calculate the weight of the load, or a load indicating device should have been incorporated in the rigging and an appropriate stop point established to prevent overloading the weakest link in the load path.

Accident: A category 2 crane was overloaded while loading test weights onto a truck. After the load test of a 20,000-pound capacity monorail, the operator was directed to load the test weights onto a truck for movement. Instead of moving weights individually, the operator lifted the entire 125 percent test weight package, overloading the crane by 5,000 pounds.
Lessons Learned: When a crane is no longer in a weight test mode, exceeding the crane's capacity is not allowed.

Accident: A material transfer platform was overloaded while lifting pallets of lead ballast. A number of pallets of both small and large lead ballast bricks were to be removed from a dry dock. The rigger estimated each pallet to weigh between 2,700 and 3,000 pounds based on past experience of lifting similarly configured pallets. Three pallets were placed on the material transfer platform, which had a safe working load (SWL) of 10,000 pounds. The three pallets had the larger bricks and more than one of the pallets had extra levels of bricks on them, which was unnoticed by the rigger. When the load was raised approximately two inches off the ground, the load was stopped to check the hoist brakes. At this time, the rigger asked the operator what the weight reading was on the LMI. The operator stated that the reading was fluctuating between 15,000 and 15,500 pounds. The rigger had the load lowered to the ground because he thought the weight on the platform was too close to its SWL. At that time, the rigger took the middle pallet off the platform and was about to replace it with a lighter pallet, when a supervisor observing the lift ordered the evolution stopped. After weighing the pallets, their total weight was found to be 10,500 pounds, which exceeded the SWL of the platform.
Lessons Learned: The estimated combined weight of the pallets was 90 percent of the capacity of the material platform. Since the weights were only estimated from past experience and not all of the lead bricks were visible, the pallets should have been individually weighed prior to loading them on the platform. In addition, whenever a possible overload occurs, as in this case, the crane team must stop the operation and call for supervisory assistance.

Accident: A spreader bar was overloaded by approximately 3,300 pounds while attempting to lift an enclosure off a ship. The enclosure weighed 133,500 pounds (not including the rigging weight) and the team was briefed that during the lift, when the crane's LMI reached 147,000 pounds, the lift would be stopped to confirm there was no binding. After checking for binding, they would then hoist in increments of 1,000 pounds with a stopping point of 155,000 pounds. When the LMI reading had reached 147,000 pounds, only three corners of the enclosure had lifted off the ship. The team agreed to continue the lift as previously briefed. When the LMI reading had reached 152,000 pounds, all four corners appeared to have lifted off the ship. However, further attempts to raise the load, up to a LMI reading of 155,000 pounds, were not successful and the lift was stopped. At this time, the enclosure had been raised high enough for a supervisor to notice that a fastener might still be installed to the ship's deck. The lead shop removed only seven of the eight fasteners. It was

assumed that the eighth bolt was not installed since it was not installed in the same configuration as others. Additionally, the lead shop work leader did not report to his supervisor that only seven bolts had been removed, although the procedure identified the enclosure to be secured with eight bolts.
Lessons Learned: Management must ensure that personnel perform as trained and do not deviate from the established procedure without supervisory and/or engineering approval. When establishing stop points to avoid overloads, the plan must consider the capacity of each component in the lifting configuration to ensure the weakest link is not overloaded.

TWO-BLOCKINGS

Accident: A mobile crane whip hoist was two-blocked when the operator unknowingly pressed down on the boom extension pedal on the floor of the operator's cab, causing the boom to extend and raise the hook block into the sheave. The operator, a student in training, had just been signaled to stow the boom in its cradle, which required by-passing the hoist limit switch.
Lessons Learned: Instructors must ensure operator trainees remain alert and focused at all times during operation and are properly reacting to signals. Special attention must be given whenever mobile crane safety devices are by-passed for traveling or reconfiguring the crane.

Accident: A category 3 crane was two-blocked when operated while tagged out of service by an unknown operator. The crane had been tagged out of service for faulty limit switches. However, it was still energized.
Lessons Learned: Cranes that are unsafe to operate must be made inoperable to unauthorized personnel (e.g., locked pendant station, deenergized power source).

Accident: A category 3 crane was two-blocked when the limit switch did not activate. During a pre-use operational check of the crane, the maintenance/ inspection team checked and activated the primary and secondary limit switches manually by raising the limit switch weight by hand. Then they raised the hook block slowly into the limit switch weight, but neither the primary nor the secondary switch activated, causing a two-blocking. The mechanical linkage that activates the limit switches bound up due to lack of lubrication, failing to turn the cams through the switches.
Lessons Learned: Management must ensure that annual inspections are performed on all limit and bypass switches to ensure proper lubrication and activity instructions for lubrication are developed as required by NAVFAC P-307.

SIGNIFICANT RIGGING GEAR ACCIDENT

Accident: A rigger injured a finger when it was caught between a pump and a staging pipe. While lowering a 500-pound pump onto its foundation, the pump encountered interference with the staging pipe. Clearance checks revealed that the pump needed to be shifted approximately 1 1/2-inches to clear the staging pipe. While attempting to manually move the pump, the rigger's finger was pinched between the pump and the staging pipe.
Lessons Learned: Riggers must remain alert at all times and avoid placing body parts in pinch zones.

SIGNIFICANT CONTRACTOR CRANE ACCIDENT

Accident: A mobile crane and chain hoist were overloaded when the chain hoist was caught on a structural member during hoisting. Equipment weighing approximately 11,000 pounds was to be removed from the auxiliary machinery room of a ship. The rigging assembly included four chain hoists attached to slings on the crane hook. The operator was working under the direction of the riggers located in the cofferdam. While hoisting up, the operator assumed the load had been attached because the LMI was beginning to register a load. However, the load was not attached. One of the chain hoist's hooks had caught on a structural member of the cofferdam and was applying a strain. When the chain hoist hook broke, the crane boom shock loaded upward causing the wire rope to wrap around the boom.
Lessons Learned: All crane team members must ensure that they are alert and focused at all times throughout the entire lifting evolution.

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, recommended corrective and preventive actions, probable cause and contributing factors, and an assessment of damage. For equipment malfunction or failure, include a specific description of the component and the resulting effect or problem caused by malfunction or failure.

CRANE SAFETY FOR THE NEW YEAR, 2006

Historically, January has been a bad month for Navy weight handling equipment accidents. Typically, the crane operation tempo picks up after an extended holiday break. The combination of an increased lifting and handling tempo following extended leave very likely contributes to the high number of accidents in January. Preemptive measures taken in response to Navy Crane Center guidance resulted in significant reductions in January accident numbers for the last two years. We can do better.

With the coming of the New Year, all weight handling managers must intensify emphasis on crane operation safety as crane teams return from their leave and pick up the pace of lifting and handling operations. In FY05, 90 percent of the accidents were attributable to human error and almost 40 percent of the accidents occurred with no load on the hook. With a heightened safety awareness (even when operating unloaded cranes), an ingrained philosophy of operational risk management, and a commitment to safety by all, we will improve on the trend of the past two Januarys. Share this message with all personnel involved in weight handling operations and encourage them to continue driving for our ultimate goal of zero accidents.

P-307 QUESTIONS & INTERPRETATIONS

The questions and interpretations listed below are based on crane program issues that arose and Requests for Clarification, Deviation, or Revision, NAVFAC P-307, figure 1-1.

Question: NAVFAC P-307, Appendix E, Paragraph 5.5.6, Test After Repair/Replacement of Wheel Studs Versus Tires. Grove mobile cranes, model RT635C, are tested per appendix E, paragraph 5.5.6, when a tire repair/change is performed. The same test for wheel stud repair is more practical, but not clearly defined/allowed.

A mobile hydraulic crane required repairs to the rear wheel studs. The Grove mobile cranes, model RT635C, are tested on-rubber over the front as established by the OEM's Pick and Carry Capacities Load Chart. There is no on-rubber pick and carry load chart for over the rear operation. An on-rubber pick and carry lift over the front unloads the rear tires. Loading of the rear tire with the repaired studs would be better accomplished if performed with the counterweight over the tire. However, NAVFAC P-307 presently allows this test method for changed or repaired tires only. Any load bearing rear axle component would be better load tested in the same manner as set forth in paragraph 5.5.6 when loading over the front is the only allowable configuration.

Request clarification of this test requirement to allow for testing of wheel studs and other load bearing rear axle components in the same manner as described in NAVFAC P-307, appendix E, paragraph 5.5.6.

Answer: The test requirements in NAVFAC P-307, appendix E, paragraph 5.5.6, Test After Change or Repair of Tires, are appropriate for testing load bearing axle and suspension components on mobile cranes equipped with counterweights.

SHARE YOUR SUCCESS

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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25-TON PORTAL CRANE

An activity has decided not to maintain certification on their 25-ton portal crane with a rail gage of 30 feet. The crane was designed by Lindholm Engineering and manufactured by Star Iron in 1963.

In 2002, most of the crane components were restored. Some of the major modifications were installing electronic static stepless controls for the electric hoist drives, installing electro-mechanical disc brakes for the hoists, reconditioning the main engine generator set including retrofitting with new controls, painting the entire crane, and installing a new jib extension. Navy Crane Center administered the crane modification contract. The following information was taken from the crane's load chart:

Hoist	Capacity	Hook Radius
Main Hoist	56,000-lb	77-ft
	39,390-lb	90-ft
Whip Hoist	16,800-lb	120-ft
	15,680-lb	139-ft

Any Navy activity interested in obtaining this crane may contact m_lstr_ncc_ccorn@navy.mil for further information.

Weight Handling Program Films

Accident Prevention, seven crane accident prevention lessons learned videos are available to assist Navy 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.