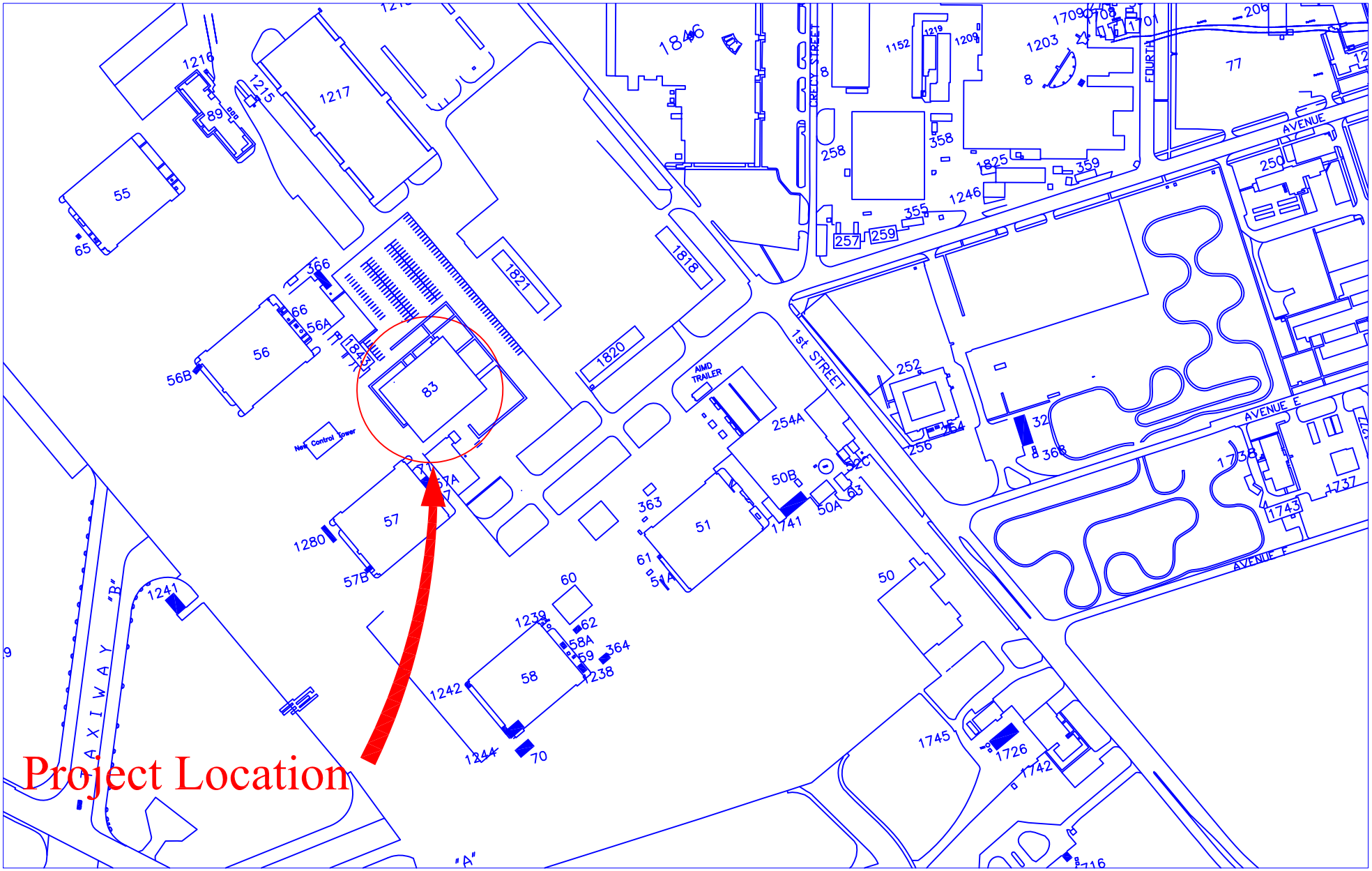
ATTACHMENT A
PROJECT LOCATION



ATTACHMENT B

NAVAL AIR STATION CORPUS CHRISTI TEXAS - WASTE SUMMARY SHEET

Name:

Number: BFKJHC

Activity*:

Project Title: INSTALL TWO 1.5 TON CRANES

Delivery Order:

Date of Project: Start: End:

POC/Phone:

Project Location: BUILDING 83

Types of Wastes	Landfill		Incinerated		**Recycled			***Composted		
	Tons	Cost	Tons	Cost	Tons	Cost	Revenue	Tons	Cost	Revenue
Metals										
Glass										
Paper & Paperboard Plastic										
Wood										
Asbestos										
Yard/Green Waste										
Other										
Ethylene Glycol Antifreeze										
Lead-Acid Batteries Used										
Motor Oil										
Construction& Demolition										
General Refuse										

*Recycling Facility used:_____

**Composting Facility used:_____

*** Asbestos Disposal Facility:_____

**** Waste (Hazardous/Non-Hazardous) Disposal Facility:_____

Revised - September 2015

Contact John Phillips @ 361-961-5356 or john.phillips7@navy.mil for details.

PMI EQUIPMENT INVENTORY

Attachment C

EQUIPMENT NO.	EQUIPMENT NAME	FACILITY SUFFIX	PROPERTY NO.

USER CODE	PRIORITY INSPECT	MAP GRID	ZONE	ROOM-WING

JOB NO.	PW CONTROL NO.	INVENTORY CODE	WARRANTY EXPIRATION DATE

MODEL	MODEL YEAR	MAKE

SERIAL NO.	USER FIELD ONE CAP:	USER FIELD TWO

REMARKS

COST:

	BTU	VOLT.	PHASE
OR	TON.	H.P.	AMP

NASCORPC 11014/25 (REV. 1-86)

ATTACHMENT D

Reset Form

INSPECTION/CERTIFICATION DOCUMENT FOR ELEVATED CRANE TRACKAGE

Building/Crane No:	Type:	Manufacturer:	Capacity:
83	Top Running Bridge	ShawBox	3,000 lbs

Detailed Visual Inspection	Operational (Mark appropriate box)			Current NDT	
Date:	Date:	"No Load"	"Load"	Date:	Type:
12/15/15	12/15/15	X		12/15/15	Sounding

Item No.	Items to be Inspected	Condition: Satisfactory	Restricted	Unsatisfactory	Corrected	Not Applicable
1	Rails					
2	Rail Joints	×				
3	Rail Bolts				✔	
4	J-Bolts, Clips, Tie Plates, Misc. Fasteners					
5	Gage					
6	Rail Alignment			×	✔	
7	Cross Section					
8	Rail Stops			×		
9	Clearances					
10	Signs and Appurtenances	×				
11	Support Structure					

Remarks (Item No.): Note any deficiencies and level (Marginal, Critical or Catastrophic) or "No defects noted." ☐ No Defects Noted

Item No.	Deficiency	Catastrophic	Remediation
1	E1, W1 Rail Ends are torch cut	Catastrophic	Not performed however requires cutting off 1" of rail at end. See additional comments
2	Splice bolts on all splice bars are orientated the same direction	No Defect	Alternated splice bar bolts and retightened
2	Max gap between rail at rail joint is .051" (at E5/E6). See additional comments for remaining splice measurements	No Defect	N/A
4	4th inside j-bolt forward of E2 is loose with cross-threaded nut	Critical	Removed 1st J-bolt from SE corner and replaced the loose J-bolt. Gap from 2nd jbolt to end stop is 29"
4	J-Bolts on both sides of joint splice are gapped between 48 1/8"- 48 3/4" apart on 95% of the splices	Critical	Not performed. See additional comments
4	All J bolts (except noted above) gap is 24 1/8"	No Defect	N/A

Additional remarks and structural comments listed on continuation sheet ☒

This crane trackage support structure has been inspected in accordance with NAVFACINST 11230.1F, Paragraph 4.1.4.2 after 4 year load test and is ☐ satisfactory ☐ Unsatisfactory (see Remarks)

Structural Inspector (signature)	Date:

This section of trackage covered by the inspection report above meets the applicable standards in NAVFACINST 11230.1F and is certified as follows:

Provide location/s if multiple certifications are checked

☒ FULL CERTIFICATION — Column 1 (Both E/W) to Column 7 (Both E/W)

☐ RESTRICTED CERTIFICATION

☒ NON-CERTIFICATION — Column 7 (Both E/W) to Column 10 (Both E/W)

Track Inspector (signature)	Date: 12/18/15
Certifying Official (signature)	Date:

Remarks: Continuation Sheet

Item No.	Deficiency	Catastrophic	Remediation
6	E2 Gap between rail and support girder measured at .150" tapering 42" to a final gap of .010"	Marginal	Applied Chockfast between rail and girder across all gap. Removed excess from rail base.
8	E1,W1 end stops with two different gage bolts. Each stop has one bolt that is grade 5 and the other is A325	Marginal	Not Performed Need to obtain proper bolt
1	Gear adrift (twine) found resting on rail and in the rail splice at E5/E6	Critical	Removed twine from rail
2	Splice bolts misaligned with splice plate and would not allow for full thread engagement	Marginal	Loosened bolts adjusted splice plate and retightened bolts. Remeasured gap and verified no vertical shift occurred
6	E6/E7 gap between rail and girder measured at .095" tapering 36" to final gap of .010"	Marginal	Not performed. requires monitoring annually
11	E6/E7 girder misalignment is 13/32"	Marginal	Not performed. requires monitoring annually
4	W5/W6 jbolt makes contact with conductor power feed	Critical	Turned Jbolt from inside of rail to outside/opposing Jbolt from outside to inside. Jbolt distance is 28" apart on ea side
3	W7/W8/E9 Splice bolts installed backwards	Marginal	Removed bolts and installed the correct way
6	W6 rail gap between girder is .080" tapering 52" to a final gap of .010"	Marginal	Not performed. requires monitoring annually
6	W8 rail gap between girder is .194" tapering 46" to a final gap of .010".	Marginal	Applied Chockfast between rail and girder across all gap. Removed excess from rail base.
6	E7-E8 rail gap between has .117" gap that tapers slightly however extends over 84" to E8 girder joint.	Marginal	Not Performed Requires remediation
6	E7-E8 Rail has a washer being used as a shim between rail and girder	Catastrophic	Non-Certification of 66' of northern section of rail (from Column 7-10 both E and W sides. see additional comments
11	W8 and E8 Broken welds on lateral support at this column	Critical	Not Performed. Rail is not certified due to washer on adjacent side. see additional comments
2	E9 splice plate measured no gap. W9 splice plate measured .015"	No Defect	N/A

Structural Remarks and additional comments

Item 1 continuation: Cutting 1" off will provide 1 3/4" gap from end of rail to end stop and will have a 5 " clearance from bridge wheel to end of rail. As the wheels are 4" from appearance of hardening and do not travel over the area then deficiency does not restrict the rail

Item 4 Continuation: Requires installing two j-bolts (one on each side of rail) 3 " north of rail splice. This will provide a 32-36 gap between j-bolts on both sides of rail splice.

Item 2 splice gap measurements: E3/E4 .022", E6/E7 no gap, W2/W3 .035", W5/W6 .009",W6/W7 .015", W7/W8,No gap

Item 6 Washer used as shim: This requires engineering evaluation to determine if settling is occurring. It appears this was done by the installer but no documentation as to why the girders were not shimmed properly instead of using a washer. Crane 83-1 has been stowed with the wheel approx 3' from washer placement and power disconnected at the bridge to ensure no operations will be conducted over that section of rail for safety. Additionally, E8 lateral support bracket has multiple broken welds.

Item 11 W8 and E8 broken weld: As these columns are directly across from each other is further indication that an engineering evaluation needs to be conducted. Review of the support structure did not identify any settling or cracks in the concrete around columns.

The Non certification is for the Northern 66' of rail from Column 7 (both sides) to column 10. The southern end of rail has full certification at this time

(h) An identical backup transmitter should be procured.

(i) Only one transmitter at a time shall be able to control the crane.

(j) Radio transmitters are required to include the following:

1. A key operated battery power switch.

2. An indication of battery power.

3. An indication of transmitting status.

(k) Battery assemblies should be of the rechargeable type.

(l) Not less than two sets of batteries should be provided for each transmitter.

(m) There shall be no significant loss in the system's efficiency and function at the end of eight hours of continuous battery use.

(n) Consideration should be given to the use of signal limiting devices to limit the distance an operator can be away from the crane and operate the radio controller.

2-5.17 **Operator Indicator Lights and Warning Devices.**

(a) A white light to indicate that power is available on the load side of the crane disconnect shall be viewable from the operator’s station.

(b) A blue light to indicate that the main contactor is energized shall be viewable from the operator’s station.

(c) A red motor over-temperature pilot light is required if a motor over-temperature device is specified.

(d) When a crane is equipped with a slow speed or micro-speed mode, a yellow or amber light to indicate slow speed or micro-speed mode should be provided and should be viewable from the operator’s station.

(e) When a selector switch is provided on the operator’s station to allow for operating multiple functions (e.g. two trolleys, two hoists, two bridges operated independently or in tandem) from the same set of controls, a green light viewable from the operator’s station shall be provided to indicate the function that is currently being controlled. If the controller allows for tandem operations, the green

light for both tandem functions shall be illuminated when in tandem mode.

(f) An audible or visual warning device shall be provided for all cranes; except for pendant controlled cranes where the ability of the operator to warn persons in the path of the load is not impaired. The warning device should be a horn or siren operated from a push button at the operator's station.

(g) On portal and floating cranes which are variably-rated at capacities less than their straight-line rating beyond a certain main hoist hook radius, a flashing yellow pilot light shall be provided in the cab to indicate that the hook is beyond the maximum radius for its straight-line rating.

(h) On cranes utilizing spud locks, boom pawls, or other such remote stowage devices that are operable from the operator's station; indicator lights shall be provided to indicate both engagement and disengagement of these devices.

(i) LED type lights should be used for all indicator lights.

(j) Indicator lights should be installed on the underside of indoor cranes (mounted on bridge, control panel, separate panel, etc.) where they are visible from the operating position. Indicator lights should only be installed on remote controllers and pendant controllers when glare or other circumstances make indicator lights mounted on the crane difficult to see. In lieu of indicator lights, LCD or similar type displays may be used on remote and pendant controllers.

2-5.18 **Transformers.**

(a) AC control circuits shall be fed from a single phase, air cooled, double wound transformer with a grounded metal screen between the primary and secondary windings of the transformer.

(b) Refer to section 2-5.19.5 for overcurrent protection requirements for transformers.

(c) Refer to section 2-5.22 for application requirements of isolation transformers.

2-5.19 **Protective and Disconnecting Devices**.

(a) Overcurrent protection is shall be provided, and is addressed in NEC Article 610 Part V. Both equipment and conductors shall be protected.

CERTIFICATION OF LOAD TEST AND CONDITION INSPECTION

Activity			Building/Location	
Crane No.	Type	OEM's Rated Capacity Main _____ lbs. _____ feet Aux _____ lbs. _____ feet Whip _____ lbs. _____ feet		Certified Capacity (If different from OEM's rated capacity, explain in "Remarks") Main _____ lbs. _____ feet Aux _____ lbs. _____ feet Whip _____ lbs. _____ feet

☐ Annual Certification ☐ Quadrennial Load Test

☐ Interim Recertification (Reason_____)

Appendix "E" Applicable Crane Test Procedure Paragraphs
(Include applicable subparagraphs.)

Category 1 or 4 Cranes *					
Boom Length	Test Load %	Minimum Radius		Load Moment or Maximum Radius	
Hoist		Pounds	Feet	Pounds	Feet
Main					
Aux					
Whip					
Other					

Hook Tram Measurements	Base Meas.	Before Test	After Test
Main Hook			
Aux Hook			
Whip Hook			
Other			

Category 2 Cranes					
Hoist	Test Load %	Pounds	Hook Tram Measurements		
			Base Meas.	Before Test	After Test
Main					
Aux					
Other					

Category 3 Cranes					
Hoist	Test Load %	Pounds	Hook Tram Measurements		
			Base Meas.	Before Test	After Test
Main					
Aux					
Other					

Certification

This is to certify that inspections and tests have been conducted in accordance with the procedures set forth in the current NAVFAC P-307. It is further certified that the crane identified above is satisfactory to lift its certified capacity.

Test Director (Signature)	Date
Inspector (Signature)	Date
Inspector (Signature)	Date
Certifying Official (Signature)	Date
Expiration Date	

Annual Certifications Since Hook NDT

Remarks

* For mobile cranes, list all test loads and configurations (e.g., over side/over rear, boom extended/retracted, lifts on tires, travelling, etc.).

FIGURE 3-1

CRANE CONDITION INSPECTION RECORD

Note: Inspect components that are reasonably accessible without disassembly.

Crane No.:	Type:	Location:	Operator's Name:	Operator's License No.
Purpose of Inspection:	Legend: B = Before A = After D = During		Date Started:	Date Completed:

Item No.	Item Description	B	D	A	Insp/ Init.
1	Inspect structural components for damaged or deteriorated members, and for evidence of loose and missing fasteners and cracked welds.				
2	Inspect wire rope for wear, broken wires, corrosion, kinks, damaged strands, crushed or flattened sections, condition of sockets, dead end connections, and for proper lubrication.				
3	Inspect hooks for cracks, sharp edges, gouges, distortion, and freedom of rotation.				
4	Inspect hoist brakes and clutches, and rotate brakes on floating cranes for condition, wear, proper adjustment and proper operation. Spot check horizontal movement brakes and clutches for condition, wear, proper adjustment and proper operation.				
5	Inspect controls and control components for condition and proper operation.				
6	Inspect motors for condition and proper operation.				
7	Inspect limit switches for condition and proper operation. (Hook lower limit switch inspections/verifications may be performed at the maintenance inspection in lieu of the CCIR. Annotate in Remarks block if performed at the maintenance inspection.)				
8	If load test is performed at certification, inspect load indicators, load warning devices, and load shutdown devices for condition and working accuracy as specified in appendix C or D as applicable. (This may be performed at the maintenance inspection in lieu of the CCIR. Mark N/A if performed at the maintenance inspection.)				
9	Inspect mechanical equipment (shafts, couplings, gearing, bearings, etc.) for condition and proper operation.				
10	Inspect sheaves for condition and evidence of loose bearings and misalignment.				
11	Inspect wheels, axles, and trolley rails (as applicable) for uneven wear, cracks, and for condition and evidence of loose bearings and misalignment.				
12	Inspect load chains and sprockets for condition and proper operation.				
13	Verify capacity chart or hook load rating data is in view of operator and/or rigging personnel.				

Figure 3-3 (1 OF 2)

Item No.	Item Description	B	D	A	Insp/ Init.
14	Inspect operator's cab for cleanliness and operation of equipment.				
15	Inspect machinery house for cleanliness, proper safety guards, warning signs, and storage of tools and equipment.				
16	Verify proper operation of indicators, indicator lights, gauges, and warning devices.				
17	Verify current inspection of fire protection equipment.				
18	Verify that pressure vessel inspection certificates are posted and current. (See UFC 3-430-07 or appropriate document for test procedures.)				
19	Inspect outriggers, pads, boxes, wedges, cylinder mountings and level indicators for condition and proper operation.				
20	Inspect tires, crawler tracks, travel, steering, braking, and locking devices for condition and proper operation. (Applies to mobile cranes, boat hoists, rubber-tired gantry cranes, and certain category 4 cranes.)				
21	Verify accuracy of radius and/or boom angle indicator as specified in appendix C.				
22	Inspect pawls, ratchets, and rotate locks for proper engagement and operation of interlocks.				
23	Inspect tanks, lines, valves, drains, filters, and other components of air systems for leakage and proper operation.				
24	Inspect reservoirs, pumps, motors, valves, lines, cylinders, and other components of hydraulic systems for leakage and proper operation.				
25	Inspect engines and engine-generator sets for condition and proper operation.				
26	Inspect counterweights and ballast for condition and evidence of loose and missing fasteners.				
27	Verify barge compartment (voids) cover bolts are installed.				
28	Verify accuracy of list and trim indicators against design data or previous test data.				
29	Inspect rotate path assembly and center pin steadiment/support assembly for condition and proper operation.				
30	Inspect slewing ring bearings for condition and proper operation.				
31	Inspect travel trucks, equalizers, and gudgeons for condition and proper operation.				

Remarks:

Inspector Signature/Date:	Test Director Signature/Date:

Figure 3-3 (2 of 2)

APPENDIX D
ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES

Notes:

1. The following are the minimum inspection requirements. Due to the various makes and models of cranes in the Navy inventory with unique or special components, these specifications may require additional instructions. Components need not be disassembled for inspection, except: (a) where noted specifically to disassemble; (b) where activity experience warrants disassembly of specific components; or (c) where problems indicated by these inspections require disassembly for further inspection. Where disassembly and reassembly are required, or for other detailed inspection guidelines, shop repair orders or other work documents shall be utilized (except for inspection covers) to properly document the necessary steps required for disassembly, reassembly, and/or other inspection guidelines. Deleting or reducing the frequency of these inspections requires Navy Crane Center approval (see paragraph 2.6 for exceptions). Justification shall be provided with the activity's request. Additional or more frequent inspections based upon activity experience or OEM recommendations may be performed at the discretion of the activity. Additional inspection requirements and recommendations for specific OEM's are also contained in CSAs and EDMs located on the Navy Crane Center web-site (https://portal.navfac.navy.mil/ncc).

2. These specifications include both non-operational and operational inspection criteria. Where necessary to ensure the safety of inspection and maintenance personnel, the crane shall be de-energized in accordance with approved lockout procedures.

3. For inspections that involve fluids (lubricants, coolants, brake fluid, hydraulic fluid, etc.) or grease, inspect the fluid or grease for visual appearance, smell, and feel and inspect for indications of damaged or malfunctioning components.

4. Where an unsatisfactory condition is found, the item shall be identified on the "Unsatisfactory Items" sheet together with a statement of the condition observed. Corrective action in terms of adjustments, repairs, or replacements of items shall be detailed on a shop repair order or other appropriate document. (See NAVFAC P-300 for a sample shop repair order.)

5. Brake data measurements shall be recorded on the "Brake Data" sheet. Measurement attributes and criteria shall be based on brake and/or crane OEM and/or activity engineering organization recommendations. In addition to minimum and maximum settings, a preferred setting shall be specified where appropriate. Where measurements are inaccessible without disassembly, those measurements need only be taken when the brake is disassembled.

6. Where measurements are specified by the activity engineering organization, these measurements shall be recorded. Wire rope dimensional measurements and chain length measurements shall be recorded.

7. As an alternative to the above dimensional measurements, gages may be used if supplied by the OEM or as approved by the activity engineering organization. If gages are used, the gage part number or drawing number shall be recorded on the Maintenance Inspection Specification and Record.

8. Where an inspection item applies to multiple components (e.g., main hoist, auxiliary hoist), each component shall be identified in the "system inspected" column.

9. The inspection criteria address most of the features and components on typical cranes. If a crane is equipped with features or components not specifically covered by these requirements, those features and components shall be inspected (where inspection is practical, as determined by the activity engineering organization and approved by the certifying official) for proper condition and operation, e.g., emergency dynamic braking, motor overspeed and over temperature sensors, travel and rotate limit switches, and micro drives.

10. Where “NA” is used to note that an inspection criterion does not apply due to a reason other than the component or feature is not present on the crane, the reason for the “NA” shall be entered on the “Remarks” sheet. For example, if an “NA” is entered in item 13b, electric magnetic brake system (disc type brakes) due to the crane having a mechanical load brake and this not being the sixth annual inspection, these facts shall be noted on the “Remarks” sheet.

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__1___ OF _____

Crane	Type	Manufacturer	Capacity

Prior Inspection	Current Inspection	Legend: Check under condition
DATE	DATE	S = Satisfactory C = Corrected (If deferred, leave blank and identify on Unsatisfactory Items sheet) U = Unsatisfactory NA = Not Applicable

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
1	Structure (Bridge Girders, Trolley, Trucks, Equalizer Beams, Gantry, Boom, Jib, Pillar, Etc.)	Inspect structural components for damage, distortion, or deterioration, and for evidence of loose or missing fasteners and cracked welds. Inspect truck equalizer pins for proper lubrication. Ensure there is no interference between crane and building during operation. Ensure drain holes are clear for outdoor cranes.					
2	Rails and Tracks, including top running trolley rail and underhung trolley and runway beams (Not applicable to runway rails for top running bridge cranes and gantry cranes.)	Inspect rails, tracks, splices, switches, hanger rod assemblies, and end stops for damage, deterioration, visible misalignment, and for evidence of loose or missing fasteners and cracked welds. Inspect for abnormal wear or other evidence of bridge or trolley misalignment. For rail systems used by multiple cranes, this rail inspection may be independent of the crane inspection, but shall be performed annually and be current at the time of the cranes' certification.					
3	Handrails, Walkways, Ladders, and Personnel Safety Guards	Inspect for damage or deterioration, and for evidence of loose or missing fasteners and cracked welds.					
4	Bumpers	Inspect for damage or deterioration, and for evidence of loose or missing fasteners.					
5	Jib Boom Bearings	Inspect rotate bearings for proper lubrication. Rotate boom and inspect for evidence of bearing damage, overheating, and abnormal wear.					
6	Wheels and Axles	Inspect wheels for uneven wear, flat spots, chips, flange wear, or cracks, for evidence of loose or missing fasteners and bearing caps, and for proper lubrication. During operation, inspect for excessive movement between components, improper tracking, overheating, and other evidence of component wear or bearing damage. Listen for abnormal noise.					
7	Shafts and Couplings, including couplings integral to motor/speed reducer assemblies	Inspect for evidence of damage, misalignment, leaking seals, and loose keys, coupling bolts, and covers. During operation, inspect for vibration, overheating, and other evidence of misaligned, worn, or damaged components or bearings. Listen for abnormal noise. Inspect pillow blocks for damage, paying special attention to possible cracks in cast iron pillow blocks loaded in shear and tension, loose or missing fasteners, and cracks caused by overtensioned fasteners.					
	Shafts and Couplings (Hoist Drives)	Verify coupling alignments are within OEM tolerances at every eighth annual inspection (not applicable to NEMA c, d, and p-face motors, or similar configurations). Coupling alignment verification data shall be included in the crane's history file.					
8 a	Gearing (Hoist, Rotate, Travel) External Gears	Inspect for damaged or worn gears, for evidence of misalignment or loose keys, and for proper lubrication. During operation, listen for abnormal noise, and inspect for other evidence of possible damage. Inspect for evidence of bearing damage, overheating, and abnormal wear. Inspect pillow blocks for damage, paying special attention to possible cracks in cast iron pillow blocks loaded in shear and tension, loose or missing fasteners, and cracks caused by overtensioned fasteners.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET 2 OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
8 b	Gearing (Hoist, Rotate, Travel) Internal Gears, including clutches. (Not applicable to manual chain hoists).	Inspect gear case for proper lubricant level. Inspect for leaks and for evidence of loose or missing fasteners. Inspect breathers for restrictions. During operation, inspect for vibration, overheating, and other evidence of misaligned, worn, or damaged internal components or bearings. Listen for abnormal noise.					
	Hoist Gears (Not applicable to category 2 and 3 package hoist assemblies or manual chain hoists.)	Additionally, internal gearing for hoists shall be monitored by an oil or vibration analysis program. The oil or vibration analysis shall be performed at least once each certification period with results analyzed by a qualified source and documented and retained in the equipment history file for the life of the component.					
		As an alternative to oil or vibration analysis, internal gears shall be visually inspected for wear or damage and for evidence of misalignment. If all gears can not be visually inspected through inspection ports or by video probe or similar inspection devices, gear cases shall be disassembled for visual inspection. If this alternative is selected, perform at every tenth annual inspection.					
8 c	Gearing, Manual Chain Hoists	Inspect for evidence of worn, corroded, cracked, or distorted parts such as shafts, gears, bearings, pins, rollers, load sprockets, idler sprockets, or hand chain wheels. Manual chain hoists shall be disassembled at every sixth annual inspection for detailed inspection of above noted items.					
9 a	Mechanical Load Brakes - Powered Hoists	Inspect for proper lubricant level and for leaks. During operation, inspect for chattering, vibration, overheating, or other evidence of misaligned, worn, or damaged internal components. Listen for abnormal noise. For mechanical load brakes that can not be tested independently, disassemble at every tenth annual inspection and inspect for damage and deterioration. (See appendix E.)					
9 b	Mechanical Load Brakes – Manual Hoists	Inspect for evidence of worn, glazed, or oil contaminated friction discs; worn pawls, cams or ratchet; corroded, stretched, or broken pawl springs in brake mechanism. Manual hoist load brakes shall be disassembled at every sixth annual inspection for detailed inspection of above noted items.					
10	Mechanical Brakes	Inspect system for damage, for evidence of binding, loose, and worn components, and for proper lubrication. Disassemble as required to inspect brake linings for wear, debonding, and glazing, and drums for smoothness and for evidence of overheating. Inspect brakes for proper settings and for alignment of brake shoes. During operation, verify proper release, engagement, and stopping action in both directions of motion. Inspect for evidence of overheating. Note: For hoists without mechanical load brakes or self-locking worm gears, and where the brake stops the movement of the load, disassembly shall be done annually (quadrennially for cranes in the quadrennial program). For hoists with mechanical load brakes or self-locking worm gears, and for holding brakes and travel and rotate brakes, disassemble at every eighth annual inspection.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__3__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
11	Hydraulic Brake System	Inspect system for damage, for evidence of binding, loose, and worn components, and for proper lubrication. Disassemble as required to inspect brake linings for wear, debonding, and glazing, and drums for smoothness and for evidence of overheating. Inspect brakes for proper settings and for alignment of brake shoes. Inspect master cylinders for proper hydraulic brake fluid level. Inspect lines for damage, leakage, and evidence of loose connections. During operation, verify proper release, engagement, and stopping action in both directions of motion. Inspect for evidence of overheating. Note: For hoists without mechanical load brakes or self-locking worm gears, and where the brake stops the movement of the load, disassembly shall be done annually (quadrennially for cranes in the quadrennial program). For hoists with mechanical load brakes or self-locking worm gears, and for holding brakes and travel and rotate brakes, disassemble at every eighth annual inspection.					
12	Air Brake System	Inspect system for damage, for evidence of binding, loose, and worn components, and for proper lubrication. Disassemble as required to inspect brake linings and discs for wear, debonding, and glazing, and drums or rotors for smoothness and for evidence of overheating. Inspect brakes for proper settings and for alignment of shoes and calipers. Inspect air lines for damage and evidence of loose connections. During operation, verify proper release and engagement, and stopping action in both directions of motion. Inspect air lines and air application valves for proper operation and air leaks. Note: For hoists without mechanical load brakes or self-locking worm gears, and where the brake stops the movement of the load, disassembly shall be done annually (quadrennially for cranes in the quadrennial program). For hoists with mechanical load brakes or self-locking worm gears, and for holding brakes and travel and rotate brakes, disassemble at every eighth annual inspection.					
13 a	Electric Magnetic Brake System (Shoe and Band Type Brakes)	Inspect system for damage, for evidence of binding, loose, and worn components, and for proper lubrication. Disassemble as required to inspect linings for wear, debonding, and glazing, and brake drums for smoothness and for evidence of overheating. Inspect brakes for proper settings and alignment of brake shoes. Inspect wiring for damage or deterioration, and for evidence of loose connections. During operation, verify proper release, engagement, and stopping action in both directions of motion and timing of release and engagement. Inspect for evidence of overheating or other evidence of incomplete brake release. Note: For hoists without mechanical load brakes or self-locking worm gears, and where the brake stops the movement of the load, disassembly shall be done annually (quadrennially for cranes in the quadrennial program). For hoists with mechanical load brakes or self-locking worm gears, and for holding brakes and travel and rotate brakes, disassemble at every eighth annual inspection.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__4__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
13 b	Electric Magnetic Brake System (Disc Type Brakes)	Inspect brake housings for damage or evidence of loose hardware. Inspect brakes for proper settings. Inspect wiring for damage or deterioration, and for evidence of loose connections. Disassemble, as required, to inspect for damaged brake discs, splines, or other components, for glazing, debonding, alignment of components, and for proper brake lining thickness. During operation, verify proper release, engagement, alignment of components, and stopping action in both directions of motion and timing of release and engagement. Listen for abnormal noise, and inspect for vibration and overheating. Note: For hoists without mechanical load brakes or self-locking worm gears and where the brake stops the movement of the load, disassembly shall be done annually (quadrennially for cranes in the quadrennial program). For hoists with mechanical load brakes or self-locking worm gears, and for holding brakes and travel and rotate brakes, disassemble at every eighth annual inspection.					
13 c	Electric Magnetic Brake System (Caliper Brakes on Wire Rope Drums)	Inspect system for damage, for evidence of binding, loose and worn components, and for proper lubrication. Inspect brake linings for wear, glazing, debonding, and brake surfaces on drums for smoothness and for evidence of overheating. Inspect brakes for proper settings and alignment of calipers. Inspect wiring for damage or deterioration, and for evidence of loose connections. During operation, inspect for proper release and engagement and stopping action in both directions of motion and timing of release and engagement. For brakes with Belleville torque springs, record the number of cycles as shown on the brake cycle counter. Compare the total number of cycles applied to each brake actuator's Belleville springs to the allowable maximum number of cycles specified for that actuator and ensure that none of the springs have exceeded the maximum value. Record Belleville spring cycle limit and number of cycles in the equipment history file. (For brakes without cycle counters, the activity shall conservatively estimate the brake usage and ensure that the springs are replaced before their fatigue life is reached.) Note: For hoists without mechanical load brakes or self-locking worm gears and where the brake stops the movement of the load, disassembly shall be done annually (quadrennially for cranes in the quadrennial program). For hoists with mechanical load brakes or self-locking worm gears, and for holding brakes and travel and rotate brakes, disassemble at every eighth annual inspection.					
14	Sheaves	Inspect for abnormally worn or corrugated grooves, flat spots, abnormal play, and broken or cracked flanges. Inspect for evidence of loose or missing fasteners, keepers, and lubrication fittings. Gauge the wire rope grooves of all sheaves. Expose and examine sections of equalizer sheaves and saddles in contact with wire rope and where corrosion may develop because of poor drainage. During operation, verify free movement of all sheaves, and inspect for abnormal play, overheating, and other evidence of bearing or component wear or damage.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__5__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
15	Wire Rope Drum, Followers, and Machinery Foundations	Inspect drums for distortion, cracks, worn grooves, and for evidence of cracked welds and loose or missing fasteners. Inspect wire rope followers for proper adjustment and alignment. Inspect bearings for evidence of damage, overheating, or abnormal wear. Inspect machinery foundations for damage or deterioration, and for evidence of loose or missing fasteners and cracked welds. During operation, verify that at least two complete wraps of wire rope remain on grooved drums (at least three complete wraps on ungrooved drums) in all operating conditions. Listen for abnormal noise. Inspect for vibration, overheating, and other evidence of misaligned, worn or damaged components or bearings. Inspect pillow blocks for damage, paying special attention to possible cracks in cast iron pillow blocks loaded in shear and tension, loose or missing fasteners, and cracks caused by overtensioned fasteners.					
16	Wire Rope, Fastenings, and Terminal Hardware. See next page for wire rope rejection criteria.	Thoroughly inspect entire length of wire rope. The depth and detail of the inspection shall be that necessary to ensure that the entire rope is acceptable with special attention paid to areas of expected wear or damage, and to areas not normally visible to the operator during operation or pre-use check. During the inspection, pay the wire rope out as far as possible. For sections that can not be spooled off the drum, visual inspection of the wire rope on the drum is sufficient. Remove wire rope dressing from selected areas subjected to significant wear, exposure, and abuse. Dimensional (diameter) measurements shall be performed at several places over the length of the rope. Record minimum dimension measured in the “remarks” block. Expose and examine sections in contact with equalizer sheaves and saddles or where corrosion may develop because of poor drainage. Lubricate areas after inspection. Inspect sockets, swivels, trunnions, and connections for undue looseness, wear, cracks, corrosion, or other damage. Undue looseness in poured sockets is defined as looseness or evidence of slippage of wires in the securing material, evidence of deterioration of the securing material, looseness of wire rope strands or wires adjacent to the socket or any looseness resulting from cracks or other defects in the basket. Evidence of looseness between the securing material and the basket resulting solely from seating of the material in basket is acceptable. Drum end fittings need only be disconnected or disassembled when experience or visible indications deem it necessary. The Federal Specification for wire rope is RR-W-410.					
17	Load Chains and Sprockets	Inspect for damage or deterioration, and for evidence of loose or missing fasteners and cracked welds. Measure for increase in chain length. Record measurements or gage part/drawing number in the “remarks” block. Ensure chain is properly oriented with link welds facing away from load sprockets unless otherwise specified by the OEM. During operation, listen for abnormal noise. Inspect for overheating and other evidence of worn or damaged components and bearings.					
18	Hoist Blocks and Hooks (Including Hoist Mounting Hooks)	Inspect hoist blocks, cheek plates, swivels, trunnions, and lubrication fittings for damage or deterioration, cleanliness, freedom of movement, and for evidence of loose or missing fasteners. Inspect for loose, damaged, missing, or improperly sized retaining rings. Inspect hooks and mousing devices for damage. Inspect drip pans and gaskets for damage, proper clearance, and for evidence of loose or missing fasteners. Inspect for evidence of bearing damage, overheating, and abnormal wear. See appendix E for further inspection and test of hooks.					

Wire Rope Rejection Criteria. Remove damaged portions (or replace entire length, if necessary) if any of the following are found:

1. Kinked, Birdcaged, Doglegged, or Crushed Sections. Kinked, birdcaged, doglegged, or crushed rope in straight runs where the core is missing or protrudes through or between strands, or where the rope does not fit properly in sheave or drum grooves. (This does not apply to runs around eyes, thimbles, shackles).

2. Flattened Sections. Flattened sections where the diameter across the flat is less than 5/6 of nominal diameter. (This does not apply to runs around eyes, thimbles, and shackles.)

3. Broken Wires. Six randomly distributed broken wires in one lay or three broken wires in one strand in one lay. One outer wire broken at the point of contact with the core of the rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure ("valley break"). For end connections, two broken wires within one lay length of the end connection.

4. Loss in Diameter. Reduction from nominal diameter of more than five percent.

5. High Strand. High strand where the height exceeds 10 percent of the nominal diameter.

6. Corrosion. Corrosion such that significant pitting occurs on the surfaces of outside wires. Minor surface roughness on outside wires is acceptable provided no significant pitting occurs and the rope is not corroded internally. Significant pitting is defined as pitting that can not be removed by abrasive removal of less than 1/3 of the original diameter of individual outside wires.

7. Heat Damage. Evidence of heat damage from any cause.

8. Wavy Rope. Wavy rope (where the longitudinal axis of the wire rope takes the shape of a helix instead of a line) when the diameter of the envelope of the wave is greater than 133 percent of the diameter of the nominal diameter of the wire rope. Use ISO 4309 as a guide.

9. Accumulation of Defects. An accumulation of defects that in the judgment of the inspector creates an unsafe condition.

10. Splices. Wire rope shall not contain splices.

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__6__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
19	Insulated Link	Inspect link surface for conductive contaminants such as graphite, grease, metallic particles, or rust streaks. Inspect for damage. See appendix E, for additional inspection and testing requirements for insulated links.					
20	Air Operating System	Inspect motors, valves, filters, water separators, cylinders, lines, regulators, and gauges for missing parts, damage, and evidence of loose or missing fasteners. Inspect for proper lubrication. Verify proper operation and inspect system for leaks.					
21	Runway and Trolley Electrification (Collector Bar, Festoon, and Cable Track Systems)	Inspect system and associated wiring for damage or deterioration, and for evidence of loose fasteners or connections (e.g. track joint assemblies, track hanger clamps, end clamps/stops, saddle assemblies, cable connectors, tow trolley, etc.). Inspect collector shoes, springs, and conductor bar surfaces for evidence of excessive wear and/or misalignment. Verify proper operation and that all moving parts operate freely without binding.					
21A	Crane Grounding	At eighth annual inspection, for all cranes where the bridge and trolley frames are grounded through the bridge and trolley wheels and their respective rails, perform a resistance check to determine the reliability of the crane's ground in a least four areas of the trolley and or runway. Resistances greater than five ohms require corrective action and/or activity engineering evaluation. Wheels and/or rails may require cleaning to reduce the resistance to less than five ohms. The resistance check shall be performed between both the load block and ground and between the pendant and ground. If there is no metallic pendant, the pendant to ground check will be omitted.					
22	Cable Reels	Inspect reel assembly and associated wiring for damage or deterioration, and for evidence of loose fasteners or connections. Inspect slip rings for damage, deterioration, indications of excessive wear, streaking or arcing/overheating, and proper contact. Verify proper operation.					
23	Electrical Hardware and General Lighting	Inspect conduits, raceways, junction boxes, light fixtures, and associated wiring for damage or deterioration, and for evidence of loose connections. Verify operation of lights. The activity engineering organization may reduce the frequency of opening enclosures based on their exposure to weather and past findings. The reduced frequency shall be no less frequent than every eighth annual inspection.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__7__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
24	Control Panels, Relays, Coils, Transfer and Disconnect Switches (including main disconnect switch), Conductors and Electronic (Solid State) Drive Control Systems	Inspect (without removing) contacts for proper alignment, pitting, and evidence of excess heating and arcing. Inspect transfer and disconnect switches, conductors, coils and contact leads, and shunts for insulation breakdown, missing hardware, and evidence of overheating. Inspect wiring for damage, deterioration, and evidence of loose connections. Inspect fuses for proper ratings and type, for evidence of loose connections and overheating. Inspect overload devices for evidence of loose connections and overheating. Inspect circuit breakers and switches for cleanliness and proper operation. Inspect panel boards and arc shields for cracks, evidence of loose or missing fasteners, cleanliness, and moisture. Manually operate relays, switches, contactors, and interlocks and verify that all moving parts operate freely without binding or excessive play. Inspect enclosures for cleanliness or damage, and for evidence of loose or missing fasteners, support components, and gaskets. During operation, verify proper operation of panel indicating lights and contactor sequence. Verify proper operation of environmental controls (e.g., strip heaters, cooling fans). Inspect the electronic (solid state) drive control systems wiring for damage or deterioration, and for evidence of loose connections. Visually inspect (without removing) components for evidence of damage or overheating. Verify that the drive is dry and free of dust, dirt, and debris. Ensure disconnect switches are not blocked and are accessible to personnel In accordance with National Electric Code NFPA 70.					
		At every eighth annual inspection, verify that the switch mechanism and/or handle on disconnects and safety switches cannot be moved to the energized or on position when locked in the de-energized or off position and that the handle properly indicates whether the switch is energized or de-energized.					
25	Controllers	Inspect cab and floor operated controllers for broken or loose springs, cracked or loose operating levers or push buttons, and pitted or burned contact points and segments. Inspect for broken segment dividers and insulators, proper contact pressure, excessive arcing, and worn or loose cams, pins, rollers, or chains, and for evidence of loose or missing fasteners. Inspect wiring for damage or deterioration, and for evidence of loose connections. Inspect pendant cable for proper securing hardware. Inspect for identifying label plates and direction indicators, and that crane and controller horizontal direction indicators match. Inspect such parts as bearings, star wheels, and pawls for proper lubrication. During operation, verify proper sequencing of speed points and operation of indicating lights, and deadman devices. Verify proper spring return and neutral latching.					
26	Resistors	Inspect resistors, insulators, and brackets for damage, distortion, or deterioration, and for evidence of loose or missing fasteners. Inspect wiring for damage or deterioration, and for evidence of loose connections. Inspect for evidence of overheating.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__8__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
27	Electric Motors (Hoist, Rotate, Travel)	Inspect motors and associated wiring for cleanliness, damage, or deterioration, and for evidence of loose connections. Inspect for proper lubrication. Inspect slip rings for damage and proper contact and commutators for evidence of destructive commutation. Inspect brushes for proper brush tension and length. Inspect insulation for deterioration and evidence of overheating. During operation, inspect for any abnormal vibration, overheating, or other evidence of misaligned, worn, or damaged internal components or bearings. Verify proper operation of environmental controls (e.g., strip heaters, cooling fans).					
28	Eddy Current Brakes	Inspect for cleanliness, damage, or deterioration, and for evidence of loose connections. Inspect for proper lubrication. Inspect wiring for damage or deterioration, and for evidence of loose connections. During operation, listen for any abnormal noise. Inspect for vibration, overheating, or other evidence of misaligned, worn, or damaged internal components or bearings.					
29	Limit and Bypass Switches	Remove covers and inspect electrical and mechanical components for damage or deterioration, and for evidence of loose connections. Inspect enclosures for evidence of moisture and arcing. Inspect wiring for damage or deterioration, and for evidence of loose connections. Inspect drive and actuating components for damage, deterioration, and proper lubrication, and for evidence of loose connections. During operation, verify proper functioning of primary and secondary limit switches, indicator lights, settings, and bypass switches.					
30	Operator's Cab	Inspect for leaks, broken glass, deterioration, and cleanliness. Inspect louvers, doors, windows, windshield wipers, heaters, air conditioners, operator's chair, and communication equipment for proper operation.					
31	Warning Devices, Operational Aides, General Safety Devices (Horns, Bells, Lights, etc.)	Inspect components and associated wiring for damage or deterioration, and for evidence of loose connections. The activity engineering organization may reduce the frequency of opening enclosures based on their exposure to weather and past findings. The reduced frequency shall be no less frequent than every eighth annual inspection. During operation, verify proper functioning of devices.					
32	Load Indicators, Load Warning Devices, Load Shutdown Devices	Inspect wiring for damage or deterioration, and for evidence of loose connections. During a load test year only, these devices shall be tested for proper operation at this inspection or the CCIR/load test (mark N/A if performed at the CCIR/load test). If not specified by the device OEM, the preferred accuracy requirement for all devices is plus 10 percent minus 0 percent of actual weight. If preferred accuracy requirement cannot be met, the minimum accuracy requirement is plus 10 percent minus 5 percent of the actual weight. Do not test beyond 131.25 percent of rated capacity. This inspection item does not apply to overload clutches; for overload clutches, see item 36.					

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET__9__ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA
33	Capacity Signs and Load Ratings	Inspect capacity signs and brackets for damage or deterioration, and for evidence of loose or missing fasteners. Verify that load ratings are correct, are noted in pounds, and are posted in view of operator and riggers. In those instances where two or more hoists may be arranged on a single beam, such as an interlocking monorail system, verify that the capacity of the supporting beam is clearly marked to preclude an overload condition.					
34	Fire Extinguishers	Ensure inspection is current.					
35	Crane Davits	Inspect davit structure for proper operation and any signs of damage. Check davit rope for cuts, abnormal wear, heat damage, or discoloration. Check tackle for free movement and operation. Check hook and tackle attachments for signs of damage and corrosion.					
36	Overload Clutches	For air hoists that are not equipped with limit switches, follow OEM procedure if available. If no OEM procedure is available, operationally inspect overload clutch by running the stop or block into the upper hoist frame at slowest possible speed. While continuing to hoist, listen for a clutching noise. If no clutching noise is heard, contact the hoist OEM for further evaluation. If a test weight is used, do not test beyond 131.25 percent of rated capacity. Due to the wide variation in overload clutch settings for various models and vintages of electric hoists, and the large amount of torque that can be produced by a motor in a locked rotor condition, testing of overload clutches for electric hoists shall not be performed.					
37	Lubrication and Servicing Records	Perform a review of lubrication and servicing records since the last Annual MISR to ensure the lubrication and servicing was performed as specified.					

REMARKS:

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD FOR CATEGORY 2 AND 3 CRANES SHEET_____ OF _____

Crane	Type	Manufacturer	Capacity

Item No	Items to be Inspected	Maintenance Inspection Specification	System Inspected	Condition			
				S	U	C	NA

REMARKS:

ANNUAL MAINTENANCE INSPECTION SPECIFICATION AND RECORD
FOR CATEGORY 2 AND 3 CRANES
UNSATISFACTORY ITEMS

SHEET_____ OF _____

Crane

NOTE: DESCRIBE ITEMS FOUND UNSATISFACTORY AND LIST SRO NUMBER ISSUED FOR CORRECTIVE ACTION. SIGN AND DATE TO VERIFY THAT THE DEFICIENCY HAS BEEN CORRECTED OR ACCEPTED AS IS. IDENTIFY DEFERRED ITEMS BY ANNOTATING A "D" IN THE SRO BLOCK. (SEE SECTION 2 FOR REQUIREMENTS FOR DEFERRAL OF WORK.)

Item No.	Deficiency	SRO No.	Verification of Correction (Signature and Date)

Mechanical Inspector (Signature):	Date:	Electrical Inspector (Signature):	Date:

MAINTENANCE INSPECTION SPECIFICATION AND RECORD
FOR CATEGORY 2 AND 3 CRANES
BRAKE DATA

SHEET_____ OF _____

CRANE:

NOTE TO INSPECTOR : Fill in applicable data as recommended by the brake and/or crane OEM. Record actual measurement inspected in "INSP" block. If adjustments are made, record adjusted setting in "ADJ" block. Otherwise indicate "NA". List repair document number and corrective action required under remarks.

BRAKE	TYPE	SPRING LENGTH/ TORQUE SETTING				AIR GAP/ PLUNGER STROKE				LINING THICKNESS	
		MIN	MAX	ACTUAL		MIN	MAX	ACTUAL		MIN	ACT
				INSP	ADJ			INSP	ADJ		

MAINTENANCE INSPECTION SPECIFICATION AND RECORD
FOR CATEGORY 2 AND 3 CRANES
BRAKE DATA

SHEET_____ OF _____

REMARKS:

APPENDIX E - CRANE TEST PROCEDURES

1 General Instructions.

1.1 Weight handling equipment shall be tested according to the appropriate paragraphs of these procedures depending on the type of equipment. The sequence of testing shall be at the option of the test director except that the no-load test shall be performed first. Except as noted, the nominal test load shall be 125 percent of rated capacity (105 percent for mobile cranes, locomotive cranes, aircraft crash cranes, mobile boat hoists, rubber-tired gantry cranes, and category 4 cranes). Because of the various makes and models of cranes in the Navy inventory, it is not possible to include specific tests for each individual crane or component. However, activities shall ensure that all components and features that affect load bearing, load control, or operational safety are properly tested (where testing is practical, as determined by the activity engineering organization and approved by the certifying official) and documented on the certification form. Load testing with loads above the limits specified herein is not authorized.

1.2 All test results shall be entered on the Certification of Load Test and Condition Inspection (figure 3-1) for applicable items according to crane type. Appropriate entries shall be recorded in each space. If a space does not pertain to the particular crane being tested, the entry shall be recorded as Not Applicable (NA).

1.3 The inspector shall assist the test director by checking during the load test for improper operation or poor condition of safety devices, electrical components, mechanical equipment, and structural assemblies. Observed defects critical to continued testing shall be reported immediately to the test director who shall suspend testing until the deficiency is corrected. Where a test paragraph directs the test director to observe for lowering of the load, measurements, markings, or some other direct indication to ensure that the test load has not lowered are required

1.4 Inspection and Testing of Hook Assemblies.

Note: These criteria apply to both the load hook and the hoist mounting hook, if the activity treats hook-mounted hoists as category 2 or 3 cranes. The hook nondestructive test (NDT) noted in paragraph 1.4.4 is not required for manual hoists.

1.4.1 Annual Visual Inspection. Inspect for evidence of wear in swivels and pins, and for proper operation and condition of safety latches. Inspect for corrosion, deformation, and wear. Inspect for such other conditions as nicks, cracks, or gouges. All cracks shall be removed. Other conditions shall be removed or, for questionable conditions, referred to the activity engineering organization for resolution. Removal of defects shall be by grinding only. Correction of defects by use of heat or welding is not permitted. The hook shall be removed from service if there is any bending or twisting of the hook exceeding 10 degrees (or as recommended by the OEM) from the plane of the unbent hook. No attempt shall be made to straighten bent or twisted hooks. Grinding shall follow the contour of the piece, blending with a maximum 1:3 (i.e., maximum rise to run) taper. Removal of cracks shall be verified by nondestructive test as described in paragraph 1.4.4. Removal of defects as specified will not require load test and recertification. Where normal wear or

removal of defects results in a reduction of 10 percent or more of the OEM's nominal dimension (or as recommended by the OEM if more restrictive), the hook shall be discarded. Hooks and nuts shall not be painted or plated, but a clear corrosion preventative coating may be applied.

1.4.2 Hook Throat Spread. Hooks shall be measured for hook throat spread before and after load test. A throat dimension base measurement shall be established by installing two tram points and measuring the distance between these tram points. This base dimension shall be retained in the equipment history file for the life of the hook. The distance between tram points shall be measured before and after load test. Hooks showing an increase in the throat opening by more than five percent from the base measurement shall be discarded.

1.4.3 Hook Disassembly and Visual Inspection. In conjunction with the hook NDT (and as noted below in paragraph 1.4.3.1), the hook, retaining nut or eye pin (and swivel eye bar as applicable), and bearings shall be disassembled from the block and thoroughly inspected. The hook and retaining nut shall be visually inspected for thread wear and all components shall be inspected for corrosion damage. Block bearing plates shall be visually inspected for cracks, wear, or other damage. Bearings shall be inspected for evidence of unusual wear and free rotation. All components shall be lubricated as required during assembly.

1.4.3.1 Special Disassembly Requirements for Forged Carbon Steel Hooks and Hooks on Manual Hoists. For forged carbon steel hooks and for hooks on manual hoists, the following additional disassembly and inspection requirements apply:

a. The activity engineering or inspection organization shall determine whether operating conditions warrant disassembly and inspection of forged carbon steel hooks, nuts, and bearings at a more frequent periodicity than the hook NDT periodicity.

b. For forged carbon steel hooks subject to corrosive environments or outdoor exposures, disassemble for visual inspection the hook, nut, and bearing, as a minimum, every ninth "B" PM for category 1 and 4 cranes, and every second quadrennial load test for category 2 and 3 cranes between NDT's. Disassemble hooks on manual hoists subject to corrosive environments or outdoor exposures, as a minimum, at every second quadrennial load test. The activity engineering organization may authorize the performance of this special disassembly and inspection on a less frequent periodicity based on past experience and inspection findings.

1.4.4 Hook NDT. The entire hook and eye pin or swivel eye bar as applicable, shall be NDT'd for defects according to the following periodicity based on the type of hook noted below. NDT of hook nuts is not required. The type of hook shall be documented in the equipment history file. The NDT is valid for the number of certification periods noted below:

Forged Carbon Steel: 24 certification periods.

Forged Alloy Steel: 8 certification periods.

Cast Carbon Steel or Cast Alloy Steel: 6 certification periods.

Bronze or Stainless Steel: 6 certification periods.

Notes:
1. If the material type and/or manufacturing method cannot be determined: for hook capacities greater than 30 tons, the hook shall be treated as a cast hook; for hook capacities of 30 tons or less, the hook shall be treated as a forged alloy steel hook after it is determined to not be a stainless steel or bronze hook.

2. If the OEM capacity of a forged alloy hook installed on the crane is greater than the certified capacity of the crane, or if the number of lifts performed is documented to be less than 3000 per year, (e.g., a 50,000-pound OEM rated hook, installed on a 20,000-pound certified capacity crane, or a hook with a documented number of lifts at 1000 per year) then it may be possible to perform the required hook NDT on a less frequent periodicity than the above requirements. Requests for less frequent hook NDT periodicities shall be completely detailed and addressed to Navy Crane Center on an RCDR.

1.4.4.1 Hook NDT Methods. NDT shall be magnetic particle method in accordance with NAVSEA Technical Publication T9074-AS-GIB-010/271. ASTM A275 may be used with the following restrictions: DC yokes (including switchable AC/DC yokes used in the DC mode) and permanent magnet yokes shall not be used, automatic powder blowers or any other form of forced air other than from a hand-held bulb shall not be used for the application or removal of dry magnetic particles; arc strikes shall be removed; and equipment ammeters shall have an accuracy of +/- 5 percent of full scale (equipment ammeter accuracy other than that stated is acceptable provided the MT procedure states that a magnetic field indicator is used to establish and verify adequate field strength for all aspects of the inspection). For hooks of non-magnetic material, NDT shall be liquid penetrant (PT) method in accordance with ASTM E 1417 or T9074-AS-GIB-010/271. For PT testing of hooks containing stainless steels, titanium, or nickel-based alloys, total halogens, and sulphur used in the NDT process shall be controlled as specified in T9074-AS-GIB-010/271. If NDT cannot be performed on surfaces inside small holes (e.g. hook/nut captivation roll pin holes), those surfaces shall be visually inspected to the maximum extent practical. Acceptance criterion shall be no linear indications greater than 1/16 inch. Acceptance criteria for external hook threads may be based on the acceptance criteria in SAE standard J123. NDT shall be performed prior to load tests.

The activity engineering organization may evaluate for acceptance linear indications in non-load-bearing areas of the hook such as the hook tip. Additionally, the activity engineering organization may evaluate all linear indications for relevance in accordance with the applicable NAVSEA technical publication noted above.

1.4.5 NDT Quality Assurance Requirements. Navy activities with established NDT quality assurance programs that meet NAVSEA, NAVAIR, Fleet (or equivalent) quality program

requirements should be used as sources for NDT to the maximum extent practical. If a commercial NDT vendor is used for NDT, the following requirements apply:

a. The vendor shall provide a letter certifying that the vendor meets the requirements of ASTM E 543. The certification shall be current, within one year of the date the NDT was performed.

b. The vendor shall develop, and submit for review, procedures, including technique sheets specific to the types, shapes, and sizes of the parts being examined (e.g., shank hook, eye hook, duplex hook, eye pin, swivel eye bar). For the magnetic particle method, the procedures shall adequately describe the orientation of the hook,swivel eye bar, or eye pin with the magnetizing equipment. A Level III examiner who is independent of the vendor and is certified in the applicable NDT method shall review these procedures. Activities that do not staff NDT personnel may utilize another Navy activity or other Government organization, such as the Defense Contract Management Agency or Supervisor of Shipbuilding, for this review on a cost reimbursable basis.

c. Vendor certifications and approved procedures shall be retained on file for the life of the NDT period.

1.4.6 Hook Identification. Each hook and eye pin or swivel eye bar as applicable, shall be uniquely identified with some type of permanent marking in order to provide positive traceability to the NDT report. The marking on the hook and eye pin or swivel eye bar shall be visible with the hook installed on the crane or hoist. Where possible, the marking on the other components shall be visible with the hook installed on the crane or hoist. Markings shall be located where the strength of the hook will not be reduced.

1.5 Inspection and Testing of Insulated Links.

1.5.1 General Inspection. Ensure link surface is clean and that no conductive material exists on the outer surface of the link such as graphite grease, metallic particles, or rust streaks. Check for obvious mechanical damage. Minor nicks, cuts, tears or abrasions are acceptable on the outer cover.

1.5.2 Link Identification. Each link shall be uniquely identified with some type of permanent marking to provide positive traceability to its base tram measurement and NDT report.

1.5.3 Dimensional Inspection. Establish tram points across the dielectric structure of the link and measure base tram reading before initial installation of the link. Measure the distance between the tram points before and after the load test. Compare the measurement to the base tram measurement. Reject link if measurement exceeds the base tram measurement by more than one percent.

1.5.4 Link Disassembly, and Nondestructive Test (NDT). Disassemble the link, connecting stud(s), hook, and nut in conjunction with hook disassembly. Perform a visual inspection of the metal link ends for thread damage, wear, and corrosion. Apply

a temporary sealing tape over the threaded holes to prevent moisture entry into the link during the disassembled period. Perform a magnetic particle inspection of the stud in accordance with ASTM A 275 or NAVSEA Technical Publication T9074-AS-GIB-010/271. Acceptance criterion shall be no linear indications greater than 1/16 inch. The NDT quality assurance requirements noted above for hooks apply.

1.5.5 Electrical Test. After reassembly of the link on the crane, and at every annual certification, apply a minimum of 10,000 volts across the insulated link and measure leakage current. Leakage shall not exceed 70 microamps per 1,000 volts.

1.6 Prerequisites to Load Testing.

1.6.1 Test Area. A safe test area shall be selected and all traffic and unauthorized personnel and equipment shall be cleared from test area. This test area shall be roped off or otherwise secured to prevent entry of unauthorized personnel and equipment.

1.6.2 Rigging. Rigging gear shall conform to the requirements of section 14.

1.6.3 Crane Tracks and Rails. Portal crane tracks (and runway rails for top running bridge cranes, gantry cranes, and wall cranes) to be used during crane load tests shall be certified, along with associated supports and foundations, per NAVFACINST 11230.1. If the crane load test is also the load test for track/rail certification, the track/rail shall be given a control inspection prior to load testing and shall have no catastrophic defects as defined by NAVFACINST 11230.1.

1.6.4 Pre-Test Briefing. The load test director shall conduct a pre-test briefing to ensure all load test team personnel understand the required procedures of the test.

1.7 Precautions During Load Testing. Prescribed tests are overload tests and extreme caution shall be observed at all times. Personnel shall remain clear of suspended loads and areas where they could be struck in the event of boom failure. The test load shall be raised only to a height sufficient to perform the test.

1.7.1 Test Speeds. During tests, normal operating speeds shall be employed. Rated speeds in accordance with specifications need not be attained. Emphasis shall be placed on the ability to safely control loads through all motions at normal speeds.

1.8 Duplex (Sister) Hook with Hole for Shackle Pin. For crane hooks with a hole used for lifting, both the hook barbs and the lifting hole shall be load tested. As a minimum, a ten-minute static test shall be completed. For similar crane attachments (in lieu of hooks) with holes for attachment, a ten-minute static test shall be completed for each hole. The requirements of paragraph 1.4 2 (Hook Throat Spread) do not apply to the lifting hole.

2. Portal and Floating Cranes.

2.1 No-Load Test.

2.1.1 Hoist Operating and Limit Switch Test. Accomplish for all hooks as follows:

Note: Position boom as required.

a. Controller Range. Raise the respective load hook through the controller range, stopping below upper limit switch (where applicable).

b. Upper Limit Switch. Raise load hook slowly into the upper limit switch to establish that limit switch is operating properly.

c. Upper Limit Switch Bypass. Raise hook slowly through the upper limit switch by using limit switch bypass (where applicable).

d. Backup Limit Switch. Raise hook slowly into backup limit switch (where applicable).

e. Lowering Control Range. Lower load hook below the upper limit switch through the lowering control range.

f. Lower Limit Switch. Lower load hook slowly into lower limit switch to establish that limit switch is operating properly.

2.1.1.1 Emergency Brakes on Wire Rope Drums (Shaft Failure Detection System). Simulate a system fault by interrupting (e.g., by use of a test switch) the motor encoder signal while lowering the hoist at the minimum speed necessary to simulate a system fault. Verify that the brake applies within the designed delay and that the hoist control is disabled in each direction. Restore the encoder signal path after the test. Repeat this test using the drum encoder. If the system uses components other than encoders (e.g., resolvers) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables).

2.1.2 Boom. Boom operating and limit switch test shall be accomplished as follows:

a. Raise Boom. Raise boom through controller range, stopping below upper limit switch.

b. Upper Limit Switch. Raise boom slowly into the upper limit switch.

c. Limit Switch Bypass. Lower boom below limit switch and raise boom slowly through limit switch by using limit switch bypass (where applicable).

d. Backup Limit Switch. Raise boom slowly into backup limit switch (where applicable).

e. Controller Range. Lower boom through controller range, stopping above boom lower limit switch (where applicable).

f. Lower Limit Switch. Lower the boom slowly into the boom lower limit switch (where applicable).

g. Limit Switch Bypass. Raise boom above the lower limit switch and lower boom through limit switch by using limit switch bypass (where applicable).

2.1.2.1 Emergency Brake on Wire Rope Drum (Shaft Failure Detection System). Simulate a system fault by interrupting (e.g., by use of a test switch) the motor encoder signal while lowering the hoist at the minimum speed necessary to simulate a system fault. Verify that the brake applies within the designed delay and that the hoist control is disabled in each direction. Restore the encoder signal path after the test. Repeat this test using the drum encoder. If the system uses components other than encoders (e.g., resolvers) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables).

2.1.3 Luffing Drum Pawl. Check luffing drum pawl for proper engagement in ratchet gear and with limit switch. Check the luffing drum pawl limit switch (if installed) for proper operation. With luffing drum pawl disengaged, check that boom hoist motor shuts off, brake engages, and indicator lights operate correctly (where applicable) by manually activating the limit switch. An alternate method is to engage the luffing drum pawl with the luffing hoist drive de-energized and then ensure that the drive cannot be energized in the downward direction.

CAUTION: Do not engage the luffing drum pawl into a downward rotating ratchet gear.

2.1.4 Rotation Lock (Wind Lock, Spud Lock). Engage rotation lock and inspect to ensure full engagement. Check that rotation lock limit switches (clockwise and counterclockwise) prevent engaging rotation drive (where applicable). Operate rotation lock bypass (clockwise and counterclockwise) to ensure proper operation (where applicable).

CAUTION: Use only enough power to check operation of bypass.

Note: Applicable switches may be operated manually to check for correct operation in lieu of engaging rotation lock.

CAUTION: Ensure rotation lock is disengaged prior to continuing test.

2.1.5 Rotation. Rotate clockwise and counterclockwise with boom at minimum radius.

2.1.6 Travel. Conduct travel test in accordance with paragraph 2.2.3.l, except without load.

2.1.7 Deadman Controls. Test all deadman controls (where installed). Start each motion. Release deadman control. Motion shall stop.

2.2 Load Test. The following is considered to be the most time and cost effective sequence of performing the required tests. Activities may vary the sequence as required.

2.2.1 Load Test for Variable Rated Cranes. All cranes shall be tested in accordance with paragraphs 2.2.2 through 2.2.5. In addition, variable rated cranes shall be tested in accordance with paragraph 2.3 with the appropriate test load at the maximum radius of the crane.

2.2.2 Stability Test. (For balanced deck design cranes only). During static and dynamic configurations with test load (paragraphs 2.2.3.a, b, d, and i) observe for clearance between the rollers and the upper and lower roller rails. If no clearance is observed, stability is satisfactory. If clearance is observed, perform the following:

a. The center pin nut clearance with the steadiment shall be set per crane OEM's specification.

b. In the static mode, position the boom parallel and perpendicular to the track (for floating cranes, position the boom parallel and perpendicular to the athwartships centerline of barge) and examine roller path for clearance.

c. If the loading conditions do not result in contact of the steadiment with the center pin nut, then the activity engineering organization shall evaluate for wear or structural defects. If the mechanical roller and structural assembly condition is determined to be unsatisfactory, then the crane shall be removed from service and corrective action initiated. Should the structural and mechanical roller assembly condition be determined satisfactory, then a record of the roller clearance data for various quadrants shall be recorded and incorporated in the equipment history file as a "crane roller clearance data standard of acceptance" and shall be utilized during future periodic testing. It is not necessary to repeat these roller clearance data readings on an annual basis unless there is a noticeable change with the clearance data or a major change did occur for this crane (e.g., alteration affecting crane stability).

d. If either loading condition noted in paragraph b results in contact of steadiment with the center pin nut, indicating a possible lack of crane stability, the crane shall be removed from service and a request for an engineering evaluation shall be forwarded to the Navy Crane Center.

2.2.3 Main and Boom Hoists, Rotate, and Travel. For the main hoist, rotate, and travel tests, the test load shall be the maximum test load for the crane. For the boom hoist tests, the test load and radius shall be such as to produce the maximum drum line pull. This may require a different test load than for the main hoist test.

a. Hoist and Boom Static Test. Raise test load to clear ground and hold for 10 minutes with boom at the maximum radius for the load lifted. Rotate load and hook

360 degrees clockwise and counter-clockwise to check bearing operation. Do not allow a hoist pawl (dog) to carry the load. Observe lowering of the test load, which may indicate malfunction of boom or hoisting components or holding brakes. If either hoist has primary and secondary holding brakes (i.e., where each brake is designed to individually hold the load), then the following tests shall be performed, for each applicable hoist, in lieu of the single 10 minute holding test noted above:

(1) Raise the test load and observe for proper timing sequence in the application of the primary and secondary brake when the controller is returned to neutral. Visually observe both hoist holding brakes to ensure correct operation. Raise the test load approximately one foot and hold open one of the brakes. Hold the load for 10 minutes and observe for lowering of the load, which may indicate malfunction of hoisting components or brake. Rotate load and hook 360 degrees clockwise and counter-clockwise to check bearing operation. Do not allow a hoist pawl (dog) to carry the load.

(2) Reset the brake held open and open the first brake tested. Again hold the load for 10 minutes observing for malfunctions. Reset the brake and verify the proper timing sequence of the setting of the brakes.

(3) If the brakes are designed to individually hold only the rated capacity (and not 125 percent), then the tests in subparagraphs (1) and (2) may be performed with a test load of 100 (+5/-0) percent of rated capacity and the certification shall be so noted. However, the brakes, acting together, shall demonstrate the ability to hold a 125 percent test load for a 10 minute period.

b. Hoist Dynamic Test. Raise and lower the test load and visually observe smooth control through the range. Stop the load during hoisting and lowering to verify the crane stops and holds the load. Check for proper operation of dynamic braking.

CAUTION: Dynamic braking will not stop motion.

c. Wire Rope Test for New Rope. The maximum working length of new wire rope shall be tested before being put in service. This shall be accomplished during either the static or dynamic test. (For cranes servicing drydocks, this will require lifting the test load into or out of the deepest drydock available.)

d. Boom Hoist Operating Test. Starting from maximum radius and with the load attached, raise the boom to minimum radius. Lower the boom to maximum radius. Visually observe for smooth motion through boom controller range. Stop the hoist during hoisting and lowering to verify the crane stops and holds the load. Check for proper operation of dynamic braking.

e. Hoist Foot Brake Test (Hydraulic or Mechanical). Lower test load, using first control point, then apply the foot brake. This shall stop the lowering motion of the test load.

CAUTION: Not applicable to load-sensitive reactor type hoist controls.

f. Boom Foot Brake Test (Hydraulic or Mechanical). Start with boom near maximum radius and with the test load approximately two feet from the ground surface. Lower test load using the first control point of the boom hoist. Apply the foot brake. This shall stop the lowering motion of the boom and test load.

CAUTION: Not applicable to load-sensitive reactor type hoist controls.

g. Hoist Loss of Power (Panic Test). This test is designed to test the reaction of a hoisting unit in the event of power failure during a lift. Hoist the test load approximately 10 feet above the ground. Lower test load at slow speed and, with the controller in the slow lowering position, disconnect the main power source by pushing the main power stop button or buttons, then return the controller to the neutral position. The test load shall stop lowering when the controller is placed in the neutral position.

CAUTION: This test is not to be performed on cranes that do not have powered down hoists. Additionally, the activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

h. Boom Loss of Power (Panic Test). This test is designed to test the reaction of the boom hoist in the event of power failure during a lift. Hoist the load approximately 10 feet above the ground with the boom near maximum radius. Lower the boom at slow speed, disconnect the main power source by pushing the main power stop button, then return the controller to the neutral position. The boom shall stop lowering when the controller is placed in the neutral position.

CAUTION: This test is not to be performed on cranes that do not have powered down hoists. Additionally, the activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

i. Rotation. Start with boom at maximum radius, rotate left and right 360 degrees with the boom hoist pawl (dog) engaged. However, if test area will not permit, two complete revolutions of the swing pinion are considered adequate. Test loads for floating cranes can be rotated over the water.

CAUTION: Exercise care when rotating loads over water. Ensure during the initial load test the floating crane has adequate draft readings per design data. When

testing a floating crane, monitor the radius to ensure the allowable radius is not exceeded due to listing of the barge.

j. Rotate Stopping Test. At maximum radius, rotate left and right at slow speed and apply the foot brake. The foot brake shall demonstrate ability to stop the rotating motion in a smooth, positive manner. For cranes without a foot applied rotate brake, rotate left and right, then return the controller to the neutral position. The rotate brakes or rotate drive, as applicable, shall stop the rotating motion of the crane in a smooth, positive manner. For floating cranes, where space permits, the parking brake shall demonstrate its ability to prevent rotation when applied with the boom at 45 degrees from the centerline of the barge. Hold for 10 minutes with brake applied.

k. Travel Test (Boom over side). This test shall be conducted with the boom at maximum allowable radius positioned 90 degrees with the crane rails and boom dog engaged. With the test load raised to clear the ground and with the boom dog engaged, travel in one direction a minimum of 50 feet. Repeat with boom on opposite side where conditions permit.

CAUTION: Operate crane at very slow travel speed. Ensure track and supporting foundation are sound and free of any obstruction over test travel area. (Not applicable to floating cranes).

l. Travel Test (Boom over front). With the test load raised to clear the ground and with the boom centered between the crane rails and boom dog engaged, travel in one direction a minimum of 50 feet. The crane shall accelerate and decelerate smoothly. All motions shall be smooth and positive. (Not applicable to floating cranes). Repeat with the boom rotated over the opposite end.

2.2.3.1 Emergency Brake on Wire Rope Drum (Shaft Failure Detection System).

a. Static Test. Test the ability of the hoist caliper disc brake to hold the test load after testing the other holding brake(s). Raise the test load approximately one foot off the ground. Do not engage the boom hoist pawl (if applicable). Depress the emergency stop pushbutton to disconnect the main power source and set the brakes. Manually release all brakes except the caliper disc brake. Hold the load for 10 minutes with the caliper disc brake. Observe for lowering of the load, which may indicate a malfunction of the hoisting components or the brake. Reset the other holding brake(s) to the applied condition. Energize the main power source. Verify that the load is held by the holding brake(s). Operate the hoist in each direction and verify proper operation of all controls and brakes.

b. Dynamic Test. Perform with a test load of 100 (+5/-0) percent of rated capacity. Raise the load to a sufficient height to perform the following test. Lower the load at the minimum speed necessary to simulate a shaft failure. Disable all hoist brakes except the wire rope drum brake and simulate a system fault by interrupting (e.g., test switch) the motor or drum encoder. The brake shall stop the load. If the system uses

components other than encoders (e.g., resolvers) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables). Reset all brakes and/or programming. (CAUTION: Station appropriately trained personnel at each disabled hoist brake in case of failure of the drum brake to stop the load. These personnel shall be in constant contact with the load test director and prepared to safely engage the hoist brakes when directed.)

CAUTION: The activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

2.2.4 Auxiliary Hoist. Maximum test load for the hoist.

a. Static Test. Raise test load to clear ground and hold for 10 minutes without hoist pawl (dog) engaged at the maximum radius for that load. Rotate load and hook 360 degrees clockwise and counter-clockwise to check bearing operation. Observe for lowering of the load, which may occur, that may indicate malfunction of hoisting components or holding brakes. If the hoist has primary and secondary holding brakes, then the tests noted in subparagraphs 2.2.3.a (1), (2), and or (3), shall be performed in lieu of the 10 minute holding test noted above.

b. Dynamic Test. Raise and lower test load and visually observe smooth control through the range. Stop the load during hoisting and lowering to verify the crane stops and holds the load. Check for proper operation of dynamic braking.

c. Wire Rope Test for New Rope. The maximum working length of new wire rope shall be tested before being put in service. This shall be accomplished during either the static or dynamic test. (For cranes servicing drydocks, this will require lifting the test load into or out of the deepest drydock available.)

d. Foot Brake Test (Hydraulic or Mechanical). Lower test load using first control point, then apply the foot brake. This shall stop the lowering motion of the test load.

CAUTION: Not applicable to load-sensitive reactor type hoist controls.

e. Loss of Power (Panic Test). This test is designed to test the reaction of the hoisting unit in the event of power failure during a lift. Hoist the test load approximately 10 feet above the ground. Lower test load at slow speed and with the controller in the slow lowering position, disconnect the main power source by pushing the main power stop button or buttons, then return the controller to the neutral position. The test load shall stop lowering when the controller is placed in the neutral position.

CAUTION: This test shall not be performed on cranes that do not have powered down hoists. Additionally, the activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

2.2.4.1 Emergency Brake on Wire Rope Drum (Shaft Failure Detection System).

a. Static Test. Test the ability of the hoist caliper disc brake to hold the test load after testing the other holding brake(s). Raise the test load approximately one foot off the ground. Do not engage the boom hoist pawl (if applicable). Depress the emergency stop pushbutton to disconnect the main power source and set the brakes. Manually release all brakes except the caliper disc brake. Hold the load for 10 minutes with the caliper disc brake. Observe for lowering of the load, which may indicate a malfunction of the hoisting components or the brake. Reset the other holding brake(s) to the applied condition. Energize the main power source. Verify that the load is held by the holding brake(s). Operate the hoist in each direction and verify proper operation of all controls and brakes.

b. Dynamic Test. Perform with a test load of 100 (+5/-0) percent of rated capacity. Raise the load to a sufficient height to perform the following test. Lower the load at the minimum speed necessary to simulate a shaft failure. Disable all hoist brakes except the wire rope drum brake and simulate a system fault by interrupting (e.g., test switch) the motor or drum encoder. The brake shall stop the load. If the system uses components other than encoders (e.g., resolvers) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables). Reset all brakes and/or programming. (CAUTION: Station appropriately trained personnel at each disabled hoist brake in case of failure of the drum brake to stop the load. These personnel shall be in constant contact with the load test director and prepared to safely engage the hoist brakes when directed.)

CAUTION: The activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

2.2.5 Whip Hoist. Maximum test load for the hoist.

a. Static Test. Raise test load to clear ground and hold for 10 minutes without hoist pawl (dog) engaged at the maximum radius for that load. Rotate load and hook 360 degrees clockwise and counter-clockwise to check operation of bearing. Observe for lowering of the load, which may indicate malfunction of hoisting components or holding brakes. If the hoist has primary and secondary holding

brakes, then the tests noted in subparagraphs 2.2.3.a (1), (2), and/or (3) shall be performed in lieu of the 10 minute holding test noted above.

b. Dynamic Test. Raise and lower test load and visually observe smooth control through the range. Stop the load during hoisting and lowering to verify the crane stops and holds the load. Check for proper operation of dynamic braking.

c. Wire Rope Test for New Rope. The maximum working length of new wire rope shall be tested before being put in service. This shall be accomplished during either the static or dynamic test. (For cranes servicing drydocks, this will require lifting the test load into or out of the deepest drydock available.)

d. Foot Brake Test (Hydraulic or Mechanical). Lower test load using first control point, then apply the foot brake. This shall stop the lowering motion of the test load.

CAUTION: Not applicable to load-sensitive reactor type hoist controls.

e. Loss of Power (Panic Test). This test is designed to test the reaction of a hoisting unit in the event of power failure during a lift. Hoist the test load approximately 10 feet above the ground. Lower test load at slow speed and, with the controller in the slow lowering position, disconnect the main power source by pushing the main power stop button, then return the controller to the neutral position. The test load shall stop lowering when the controller is placed in the neutral position.

CAUTION: This test shall not be performed on cranes that do not have powered down load hoists. Additionally, the activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

2.2.5.1 Emergency Brake on Wire Rope Drum (Shaft Failure Detection System).

a. Static Test. Test the ability of the hoist caliper disc brake to hold the test load after testing the other holding brake(s). Raise the test load approximately one foot off the ground. Do not engage the boom hoist pawl (if applicable). Depress the emergency stop pushbutton to disconnect the main power source and set the brakes. Manually release all brakes except the caliper disc brake. Hold the load for 10 minutes with the caliper disc brake. Observe for lowering of the load, which may indicate a malfunction of the hoisting components or the brake. Reset the other holding brake(s) to the applied condition. Energize the main power source. Verify that the load is held by the holding brake(s). Operate the hoist in each direction and verify proper operation of all controls and brakes.

b. Dynamic Test. Perform with a test load of 100 (+5/-0) percent of rated capacity. Raise the load to a sufficient height to perform the following test. Lower the load at the minimum speed necessary to simulate a shaft failure. Disable all hoist brakes except the wire rope drum brake and simulate a system fault by interrupting (e.g., test switch) the motor or drum encoder. The brake shall stop the load. If the system uses components other than encoders (e.g., resolvers) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables). Reset all brakes and/or programming. (CAUTION: Station appropriately trained personnel at each disabled hoist brake in case of failure of the drum brake to stop the load. These personnel shall be in constant contact with the load test director and prepared to safely engage the hoist brakes when directed.)

CAUTION: The activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

2.3 Variable Rated Load Test. In addition to the tests prescribed in paragraph 2.2, variable rated cranes shall be tested with the appropriate test load at the maximum radius of the crane on the main hoist as follows:

2.3.1 Stability Test. (For balanced deck design cranes only). During testing in accordance with paragraphs 2.3.2, 2.3.3, and 2.3.6, observe for clearance between the rollers and the upper and lower roller rails. If no clearance is observed, stability is satisfactory. If clearance is observed perform the tests and take the necessary actions noted in paragraphs 2.2.2.a through d.

2.3.2 Static Test. Raise test load to clear ground and hold for 10 minutes with boom at maximum radius. Do not allow a hoist pawl (dog) to carry the load. Observe for lowering of the load, which may indicate malfunction of hoisting components or brakes.

2.3.3 Boom Hoist Operating Test. Starting from maximum radius and with the load attached, raise the boom to the maximum radius for the next higher load. Lower the boom. Observe for smooth hoisting and lowering motions through the controller range. Stop the hoist during hoisting and lowering to verify the crane stops and holds the load.

2.3.4 Boom Foot Brake Test (Hydraulic or Mechanical). Start with boom near maximum radius, and with the test load approximately two feet from the ground surface, lower test load, using first control point of the boom hoist. Apply the foot brake. This shall stop the lowering motion of the boom and test load.

CAUTION: Not applicable to load-sensitive reactor type hoist controls.

2.3.5 Automatic Boom Brake (Where applicable, i.e., Washington Crane Company). This brake is to prevent a "free fall" boom in case of failure of clutch, boom hoist control, and

foot brake. With the test load approximately four inches above the ground, set the brake firmly. Release the mechanical boom dog. Release the boom clutch by operating the boom hoist control. Slowly release the foot brake to the free position. Hold the test load with automatic brake for five minutes then lower test load by applying the boom hoist clutch and lowering with the controller operation.

2.3.6 Rotation. Start with boom at maximum radius, rotate left and right 360 degrees with the boom hoist pawl (dog) engaged. However, if test area will not permit, two complete revolutions of the swing pinion are considered adequate. Test loads for floating cranes can be rotated over the water.

CAUTION: Exercise care when rotating loads over water. Ensure during the initial load test the floating crane has adequate draft readings per design data. When testing a floating crane, monitor the radius to ensure the allowable radius is not exceeded due to listing of the barge.

3 Tower Cranes and Derricks.

3.1 General. Tower cranes and stiff leg derricks shall be tested in accordance with instructions for portal cranes under paragraph 2 (except for rotation testing which is described below).

3.2 Tower Crane and Derrick Rotation. Rotation testing shall be conducted in accordance with the rotation test for portal cranes through normal design operating arc.

4 Hammerhead Cranes.

4.1 Hammerhead Crane Hoists. Hoists shall be tested in combination(s) such that all structural, mechanical, and electrical components are tested in all possible configurations. Hoists shall be tested in accordance with applicable instructions for portal cranes.

4.2 Hammerhead Rotation. Rotation shall be tested in accordance with instructions for portal cranes.

4.3 Hammerhead Trolley Motion.

4.3.1 No-Load. Travel the allowable length of the trolley runway through the control range. Operate trolley into the limit switches at slow speed. Bring trolley back and by using the limit switch bypass, move trolley into the outboard rail stops. Repeat above procedure for inboard limit switches and rail stops.

4.3.2 Load Test. Raise test load to clear ground and move trolley to the maximum allowable radius. Hold test load for 10 minutes. Do not move trolley beyond the trolley limit switch. After the ten-minute holding test, travel the allowable length of the trolley runway.

4.4 Travel. Travel motion shall be tested in accordance with the instructions specified for portal cranes where applicable.

5 Mobile Cranes, Locomotive Cranes, Aircraft Crash Cranes, and Category 4 Cranes. These cranes are complex machines and the following requirements are not designed to test each and every component to its maximum stress state. Instead, the test is configured to safely and efficiently test the greatest number of critical components to the specified load level. Commercial truck mounted telescoping boom cranes shall be tested in accordance with paragraph 5.4. Lattice boom cranes shall be tested in accordance with paragraph 5.5. Articulating boom cranes shall be tested in accordance with paragraph 5.8. Test procedures for other category 4 cranes shall follow OEM procedures and recommendations. Where no procedures are provided by the OEM, procedures shall be developed by the activity engineering organization using the procedures of this subsection as a guide.

5.1 Test Load. The nominal test load shall be 105 percent of rated capacity. The rated capacity shall be the capacity shown on the posted load chart or as limited by other factors such as hook block capacity or wire rope line pull if the crane is not fully reeved. The test load includes the weight of (or deduction values for) the hook, block, slings, and ancillary lifting devices (and for some cranes hoist wire rope not accounted for in load charts), and the combined weight deduction values shall be subtracted from the nominal test load in order to determine the amount of test weights to be used. Follow OEM load chart instructions for weight deduction values. Check accuracy of load indicators where installed. If controlled assembly procedures, as described in section 3, are to be used in lieu of load test and recertification for change-out of ancillary equipment, the applicable ancillary equipment shall be tested during the annual certification testing.

5.2 Mobile Cranes Temporarily Mounted on Barges. The certifying official shall prescribe appropriate test conditions and precautions. Follow all requirements of section 3. During the load moment test, the rotate brake shall be tested to demonstrate its ability to prevent rotation when applied with the boom at 45 degrees from the centerline of the barge. Hold this position for 10 minutes with the brake set.

5.3 Pre-test Preparation. Select a test area that is level and free of ground obstructions. Extend outriggers or stabilizers as specified by the OEM, when so equipped. For cranes with variable outrigger/stabilizer or crawler positions, only the fully extended position requires testing, tests are not required for intermediate outrigger/stabilizer or crawler settings. For most truck and cruiser cranes, crane carrier shall be raised sufficiently to completely unload tires. Level crane as required by OEM's load chart. Ensure machine, including hydraulic system, is brought up to operating temperature before performing tests.

5.3.1 Cautions for Mobile Crane Tests.

a. Test personnel shall remain fully alert to wind, other weather, and visibility conditions that may jeopardize the safe performance of the tests.

b. Lift the test load only high enough to perform the required tests.

c. When lifting test loads, always lift the load well within the maximum radius and slowly boom down to the pre-measured radius stopping at least once to test the effectiveness of the boom brake or holding valve.

d. A crane outrigger may become light (start to rise up within the outrigger pad) and the outrigger pad may clear the ground during load testing (with the boom positioned over the opposite corner) depending on the make and model. Generally, this is normal and not an indication of tipping. However, if two outriggers exhibit this condition simultaneously the activity shall verify with the crane OEM that the crane exhibiting this condition is safe for use

e. Ensure all "on rubber" lifting requirements established by the OEM and activity are followed when lifting loads "on-rubber" (free-rated capacity). Attach taglines to the load to control oscillation. Extend outriggers and maintain minimal clearance (3 to 4 inches) above ground. Test personnel shall stand clear of tires during "on-rubber" load tests.

5.4 Telescoping Boom Cranes.

5.4.1 No-Load Tests.

5.4.1.1 Hoist(s).

a. Raise and lower each hook through the maximum possible working distance of hook travel. After lowering the hook, ensure the wire rope is packed tightly on the drum prior to proceeding with the load tests to prevent wire rope displacement and crushing.

b. Raise each hoist block into the limit switch (where installed) at slow speed. Ensure the anti-two block alarm operates or the hoist is disabled in accordance with the OEM's operating instructions. If the crane is equipped with control lockouts (also known as function limiters or kickouts), carefully ensure all additional functions that could also two block the hoist are disabled (e.g., telescope out, boom down) in accordance with the OEM's operating instructions.

c. Raise each hoist block beyond the limit switch by using the bypass switch (where installed).

5.4.1.2 Boom.

a. Raise and lower the boom through the full working range.

b. Extend and retract telescoping boom sections the full distance of travel. For latching boom cranes, ensure all boom extend modes operate properly and ensure all boom latching/pinning positions engage properly for each section.

5.4.1.3 Other Functions. Other functions including swing shall be operated through a minimum of one full cycle/revolution of major components; e.g. one full revolution of track crawlers, 360 degrees of upper rotation.

a. Test the work area limit switch (area definition device), if applicable.

5.4.2 Load Test. The load test consists of a maximum certified capacity test and a load moment test. In some cases, these tests may be combined. Additionally, a maximum line pull test is required for cranes that use multiple reeving configurations, and other appropriate tests are required for cranes that use ancillary equipment with Ancillary Equipment Procedures (AEPs) during the certification period. The sequence may be varied by the activity, however the following test sequence is recommended. For cranes with multiple reeving configurations, the maximum line pull test (paragraph 5.4.2.4.a) should be performed first.

5.4.2.1 Maximum Certified Capacity Test.

a. The test load shall be 105 percent of the maximum certified capacity of the crane. Determine the maximum permissible radius for the maximum certified capacity. Perform the test at the maximum boom length for this capacity and radius.

b. Raise the test load using the hoist.

c. Lower the test load and test the ability of the brake to control, stop, and hold the test load (10 minute hold).

d. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. With the test load raised, rotate the hook 360 degrees clockwise and counter-clockwise to check bearing operation If the size of the test load precludes a full 360 degree rotation of the hook, perform the hook rotation test during the load moment test.

Note: Due to the number of layers of wire rope on the drum, some cranes may not be able to lift the test load per the OEM's load chart.. If the crane cannot lift the test load, check the OEM's hoist line pull for the particular model hoist and layer of rope. If hoist line pull (available torque) is the limiting factor, reduce the test load based on the hoist line pull limitation and perform the required test. Certify the crane based on the reduced test load (i.e., certified capacity is test load divided by 1.05). If the crane cannot lift the reduced test load, verify that the system hydraulic pressure and relief valves are set within OEM specifications. If the settings are within specification, contact the OEM.

e. Operate the boom from maximum radius to minimum radius. Repeat the test, operating the boom from minimum radius to maximum radius for the load applied.

5.4.2.2 Load Moment Test.

a. Test Configuration:

- Boom length - shortest length where all sections are partially extended, but not less than 50 percent total powered boom length (or latching section boom length).
- Maximum radius - the radius that creates the maximum load moment that will safely clear the outriggers/stabilizers/carrier through the complete swing range.
- The test load shall be 105 percent of OEM load chart capacity at this boom length and radius.

Note: For the purposes of this test, load moment is the product of capacity multiplied by radius. Cranes equipped with multiple boom modes must have multiple load charts checked to ensure the maximum load moment is selected.

b. Telescopic Component Slippage. Raise the test load using the hoist. Operate the boom from maximum radius (as defined above) to minimum radius for the load applied. Hold the load for 5 minutes without use of controls by the operator. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. Lower the boom from minimum radius to maximum radius (as defined above) before proceeding to the next test.

c. Outrigger/Stabilizer Component Slippage. Swing the test load at slow speed through the complete swing range as allowed by the OEM, and apply the brake periodically during rotation. The brake shall demonstrate its ability to stop the rotating motion in a smooth, positive manner. Hold the load with the boom positioned over (or near as allowed by OEM) each outrigger/stabilizer for 5 minutes (holding over the center front outrigger/stabilizer is not required). Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. Swing the crane in the opposite direction through the complete swing range as allowed by the OEM.

Notes for telescopic and outrigger/stabilizer component slippage tests:

1. The significance of any lowering shall be evaluated by the activity engineering organization depending on operating requirements and safety.

2. For cranes equipped with outrigger locking devices but where activity operating procedures permit operation without the use of the locking devices, this test shall be performed with the locking devices disengaged.

3. If a latching boom crane's telescoping cylinder has the capability to telescope, retract or hold the boom while unpinned under load, it shall be tested by repeating the telescopic component slippage test at 105 percent of the maximum telescoping/retracting/unpinned holding capacity with the boom unpinned. However

if the only function of the telescoping capacity is to extend or retract boom sections, ancillary equipment, or rigging hardware, and no loads are telescoped, then the telescoping cylinder does not require a telescopic component slippage test.

5.4.2.3 Auxiliary and Whip Hoist. The test load shall be 105 percent of the maximum certified capacity for the hoist to be tested. Tests shall be performed with the boom fully extended or until 2 wraps of wire rope remain on a grooved hoist drum or 3 wraps of wire rope remain on a smooth hoist drum.

a. Raise the test load using the hoist.

b. Lower the test load and test the ability of the brake to control, stop, and hold the test load (10 minute hold).

c. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. With the test load raised, rotate the hook 360 degrees clockwise and counter-clockwise to check bearing operation.

5.4.2.4 Maximum Line Pull Test and Ancillary Equipment Tests. For cranes that will use multiple reeving configurations or ancillary equipment (swing-away jibs, power pinned fly sections, manual extensions, jibs at variable offsets, multiple load blocks, etc.) during the certification period, using procedures per section 3, the following load tests are required:

a. Maximum Line Pull Test.

Note: Testing of all possible reeving configurations is not required. In some cases, this test may be combined with the maximum certified capacity test or load moment test.

1. The reeving configuration to be tested shall be such that the test load produces 105 percent of the maximum allowable wire rope line pull. If the crane cannot lift the test load due to the number of layers of wire rope on the drum, see the Note of paragraph 5.4.2.1.

2. Raise the test load using the hoist.

3. Lower the test load and test the ability of the brake to control, stop, and hold the test load (10 minute hold).

b. Ancillary Equipment Tests.

1. The test load shall be 105 percent of the maximum certified capacity of the equipment, or 105 percent of the maximum allowable wire rope line pull if the equipment is not fully reeved. For jibs with variable offset angles, test at the greatest offset used. For telescoping extensions, test at the fully extended length. Each point of a bifold

swingaway shall be tested. Record each test configuration and test load on the certification supplement form, figure 3-2.

Note:

For cranes with multiple counterweight configurations, testing of all possible counterweight combinations is not required. However, all counterweights that will be used during the certification period shall be tested in some combination during the annual load test.

5.4.2.4.1 Ancillary Equipment Used Without Procedures. As noted in section 3, paragraphs 3.5.3.1.1 and 3.5.3.1.2, ancillary equipment procedures are not required and the existing certification is not voided when removing and reinstalling outrigger pads, counterweights, outrigger extension pins, and boom angle and extension pins, provided all of the components are load tested at the annual certification. The OEM's instructions shall be followed when installing or removing these items.

5.4.2.5 "On-Rubber" (Free-Rated) Load Test. Allowable "on-rubber" rated capacity for over the side lifting for cranes equipped with outriggers shall not exceed 60 percent of the OEM's load chart values per paragraph 11.3. For those cranes, testing over the side "on-rubber" is not required. (For rubber tired cranes without outriggers, contact the Navy Crane Center). See section 11 for allowable "on-rubber" (free rated) capacities and other stability information for used and altered cranes. Check the stability and operation of crane, carrier, wheels, tires, brakes, etc., under load by performing the following tests, when lifting without outriggers and/or traveling with the load are permitted at the activity for the type of crane being tested.

Notes: Some cranes have different ratings for stationary lifts and for traveling with a load. Each allowable configuration shall be tested.

a. Maximum Certified On-Rubber Capacity.

1. Hoist 105 percent of the maximum certified on-rubber capacity at the minimum possible radius over the rear (or over the front as required by the OEM). Slowly boom down to the maximum radius for the maximum certified capacity. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or wheels/tires/axle components.

2. Rotate through the on-rubber working arc as allowed by the OEM. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or wheels/tires/axle components.

3. Travel a minimum of 50 feet with the test load over the rear (or front as required by the OEM) with the boom parallel to the longitudinal axis of the crane carrier. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or wheels/tires/axle components.

5.5 Lattice Boom Cranes.

5.5.1 No-Load Tests.

5.5.1.1 Hoist(s).

a. Raise and lower each hook through the maximum possible working distance of hook travel. After lowering the hook, ensure the wire rope is packed tightly on the drum prior to proceeding with the load tests to prevent wire rope displacement and crushing.

b. Raise each hoist block into the limit switch (where installed) at slow speed. Ensure the anti-two block alarm operates or the hoist is disabled in accordance with the OEM's operating instructions. If the crane is equipped with control lockouts (also known as function limiters or kickouts), carefully ensure all additional functions that could also two block the hoist are disabled (e.g., boom down) in accordance with the OEM's operating instructions.

c. Raise each hoist block beyond the limit switch by using the bypass switch (where installed).

5.5.1.2 Boom.

a. Raise and lower the boom through the full working range.

b. Raise the boom into the upper limit switch (where installed). Raise the boom past the boom upper limit switch using the bypass switch (where installed).

c. Raise the boom into the backup upper limit switch (where installed).

d. Test the lower limit switch (where installed) by the same procedure prescribed for testing the upper limit switch.

5.5.1.3 Other Functions. Other functions including swing shall be operated through a minimum of one full cycle/revolution of major components; e.g. one full revolution of track crawlers, 360 degrees of upper rotation.

a. Test the work area limit switch (area definition device), if applicable

5.5.2 Load Test. The load test consists of a maximum certified capacity test and a load moment test. In some cases, these tests may be combined. Additionally, a maximum line pull test is required for cranes that use multiple reeving configurations, and other appropriate tests are required for cranes that use ancillary equipment with ancillary equipment procedures during the certification period. The sequence may be varied by the activity, however the following test sequence is recommended. For cranes with multiple reeving configurations, the maximum line pull test (paragraph 5.5.2.4.a) should be performed first.

5.5.2.1 Maximum Certified Capacity Test.

a. The test load shall be 105 percent of the maximum certified capacity of the crane. Determine the maximum permissible radius for the maximum certified capacity. Perform the test at this radius.

b. Raise the test load using the hoist.

c. Lower the test load in power down mode (if the hoist does not have power down mode, use the foot brake to control, stop, and hold the load by latching the foot brake pedal) and test the ability of the brake to control, stop, and hold the test load 10 minutes without boom, or load hoist pawls engaged in the teeth (do not disable pawl system).

d. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. With the test load raised, rotate the hook 360 degrees clockwise and counter-clockwise to check bearing operation. If the size of the test load precludes a full 360 degree rotation of the hook, perform the hook rotation test during the load moment test.

Note: Due to the number of layers of wire rope on the drum, some cranes may not be able to lift the test load per the OEM's load chart. If the crane cannot lift the test load, check the OEM's hoist line pull for the particular model hoist and layer of rope. If hoist line pull (available torque) is the limiting factor, reduce the test load based on the hoist line pull limitation and perform the required test. Certify the crane based on the reduced test load (i.e., certified capacity is test load divided by 1.05). If the crane cannot lift the reduced test load, verify that the system hydraulic pressure and relief valves, or clutch settings and tolerances, are set within OEM specifications. If the settings are within specification, contact the OEM.

e. Operate the boom from maximum radius to minimum radius for the load applied. Repeat the test, operating the boom from minimum radius to maximum radius for the load applied.

f. Free-Fall Operation Mode Test. If the OEM and activity permits operation of the crane in free-fall mode, test the ability of the brake to stop the load with the friction clutch disengaged. This test shall be performed in strict accordance with OEM and activity instructions and shall not exceed maximum recommended OEM allowances for loads.

5.5.2.2 Load Moment Test.

a. Test Configuration:

- Maximum radius - the radius that creates the maximum load moment that will safely clear the outriggers/stabilizers/carrier/crawler through the complete swing range

- The test load shall be 105 percent of OEM load chart capacity at this radius.

Note: For the purposes of this test, load moment is the product of capacity multiplied by radius.

b. Outrigger/Stabilizer Component Slippage. Raise the test load using the hoist. Swing the test load at slow speed through the complete swing range (at maximum radius as defined above) as allowed by the OEM and apply the brake periodically during rotation. The brake shall demonstrate its ability to stop the rotating motion in a smooth, positive manner. Hold the load over (or near as allowed by OEM) each outrigger/stabilizer for 5 minutes (holding over the center front outrigger/stabilizer is not required). Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes or outriggers. Swing the crane in the opposite direction through the complete swing range as allowed by the OEM.

Notes for outrigger/stabilizer component slippage tests:

1. The significance of any lowering shall be evaluated by the activity engineering organization depending on operating requirements and safety.

2. For cranes equipped with outrigger locking devices but where activity operating procedures permit operation without the use of the locking devices, this test shall be performed with the locking devices disengaged.

c. Crawler Crane Rotation. Raise the test load using the hoist. Swing the test load at slow speed through the complete swing range (at maximum radius as defined above) as allowed by the OEM and apply the brake periodically during rotation. The brake shall demonstrate its ability to stop the rotating motion in a smooth, positive manner. Hold the load with the boom positioned over (or near as allowed by OEM) the corner of each crawler tread for 5 minutes (holding over the center front outrigger/stabilizer, if equipped, is not required). Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, outriggers, or crawler treads. Swing the crane in the opposite direction through the complete swing range as allowed by the OEM.

d. Boom Operation. Operate the boom from maximum radius to minimum radius for the load applied. Repeat the test, operating the boom from minimum radius to maximum radius for the load applied.

5.5.2.3 Auxiliary and Whip Hoist. The test load shall be 105 percent of the maximum certified capacity for the hoist to be tested.

a Raise the test load using the hoist.

b Lower the test load and test the ability of the brake to control, stop, and hold the test load (10 minute hold).

c. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or outriggers. With the test load raised, rotate the hook 360 degrees clockwise and counter-clockwise to check bearing operation.

5.5.2.4 Maximum Line Pull Test and Ancillary Equipment Tests. For cranes that will use multiple reeving configurations or ancillary equipment (fixed jibs, luffing jibs, jib inserts, multiple load blocks, etc.) using procedures per section 3, the following load tests are required:

a Maximum Line Pull Test.

Note. Testing of all possible reeving configurations is not required. In some cases, this test may be combined with the maximum certified capacity test or load moment test.

1. The reeving configuration to be tested shall be such that the test load produces 105 percent of the maximum allowable wire rope line pull. If the crane cannot lift the test load due to the number of layers of wire rope on the drum, see the Note of paragraph 5.5.2.1.

2. Raise the test load using the hoist.

3. Lower the test load and test the ability of the brake to control, stop, and hold the test load (10 minute hold).

b. Ancillary Equipment Tests.

1. The test load shall be 105 percent of the maximum certified capacity of the equipment, or 105 percent of the maximum allowable wire rope line pull if the equipment is not fully reeved. For jibs with variable offset angles and lengths, test at the greatest offset and length used. Record each test configuration and test load on the certification supplement form, figure 3-2.

Notes:

1. For cranes with multiple boom sections, testing of all possible boom insert combinations is not required. However, all sections that will be used during the certification period shall be tested. Repeat the maximum certified capacity test of paragraph 5.5.2.1 at the maximum boom length anticipated for use during the certification period using 105 percent of the maximum capacity for that boom length.

2. For cranes with multiple counterweight configurations, testing of all possible counterweight combinations is not required. However, all counterweights that will be used during the certification period shall be tested in some combination during the annual load test.

5.5.2.4.1 Ancillary Equipment Used Without Procedures. As noted in section 3, paragraphs 3.5.3.1.1 and 3.5.3.1.2, ancillary equipment procedures are not required and the existing certification is not voided when removing and reinstalling outrigger pads, counterweights, outrigger extension pins, and boom angle and extension pins, provided all of the components are load tested at the annual certification. The OEM's instructions shall be followed when installing or removing these items.

5.5.2.5 "On-Rubber" (Free-Rated) Load Test. Allowable "on-rubber" rated capacity for over the side lifting for cranes equipped with outriggers shall not exceed 60 percent of the OEM's load chart values per paragraph 11.3. For those cranes, testing over the side is not required. See section 11 for allowable "on-rubber" (free rated) capacities and other stability information for used and altered cranes. Check the stability and operation of crane, carrier, wheels, tires, brakes, etc., under load by performing the following tests, when lifting without outriggers and/or traveling with the load are permitted at the activity for the type of crane being tested.

Note: Some cranes have different ratings for stationary lifts and for traveling with a load. Each allowable configuration shall be tested.

a. Maximum Certified On-Rubber Capacity.

1. Hoist 105 percent of the maximum certified on-rubber capacity at the minimum possible radius over the rear (or over the front as required by the OEM). Slowly boom down to the maximum radius for the maximum certified capacity. Engage the boom and load hoist pawls, where applicable. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or wheels/tires/axle components.

2. Rotate through the on-rubber working arc as allowed by the OEM. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or wheels/tires/axle components.

3. Travel a minimum of 50 feet with the test load over the rear (or front as required by the OEM) with the boom parallel to the longitudinal axis of the crane carrier. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or wheels/tires/axle components.

5.5.2.6 Crawler Travel Test. Check the stability and operation of carrier, brakes, crawlers, etc., under load by performing the following tests, when traveling with the load is permitted for a crawler crane.

Notes: Some cranes have different ratings for stationary lifts and for traveling with a load.

a. Maximum Certified Travel Capacity.

1. Hoist 105 percent of the maximum certified travel capacity at the minimum possible radius over the rear (or over the front as required by the OEM). Slowly boom down to the maximum radius for the maximum certified travel capacity. Engage the boom and load hoist pawls, where applicable. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or crawler components.

2. Travel a minimum of 50 feet with test load over the rear (or front as required by the OEM) with the boom parallel to the longitudinal axis of the crane carrier. Observe for any lowering that may occur, which may indicate a malfunction of boom or hoisting components, brakes, or crawler components.

5.6 Test After Change or Repair of Tires. For cranes with "on rubber" lift capability, in lieu of a load test the following test may be performed after change or repair of tires. The crane shall be traveled (with no load on hook) a minimum of 100 feet, forward and reverse, with the counterweight positioned over the corner of the crane with the affected tire (if allowed by the OEM) and with the boom at minimum radius or as required by the OEM. This test may also be used for repairs on load bearing axle/suspension components on mobile cranes equipped with counterweights provided the OEM allows the counterweight to be positioned over the area of the crane with the affected repair.

5.7 Wire Rope Test for New Rope. The maximum working length of new wire rope shall be tested before being put in service on any hoist. For the main hoist, this shall be accomplished by performing the maximum certified capacity test of paragraphs 5.4.2.1 or 5.5.2.1 as appropriate and the load moment test of paragraphs 5.4.2.2 or 5.5.2.2 as appropriate, unless the line pull during the load moment test is equal to or greater than the line pull during the maximum certified capacity test in which case the maximum certified capacity test is not required. For the auxiliary and whip hoists, this test shall be accomplished by performing the test of paragraph 5.4.2.3 or 5.5.2.3 as appropriate.

5.8 Articulating Boom Crane. Follow the requirements of paragraphs 5.1, 5.3, and 5.3.1, and perform a no-load test in accordance with paragraph 5.4.1 as applicable. Definitions and nomenclature are extracted from ASME B30.22, Articulating Boom Cranes.

5.8.1 Maximum Test Load for the Outer Hook or Padeye.

CAUTION: Lift the test load only high enough to perform the required tests. Use of long slings or chain falls to maintain a safe load height is recommended.

a. Static Test. Raise the test load to clear the ground with boom sections at either the minimum allowable articulating angle (typically inner boom and secondary boom in a straight line for a 0 degrees articulation angle) or at the maximum allowable articulating angle (knuckled in) for the size of the load, and at the minimum possible radius for the load and hold for ten minutes. Rotate load and hook 360 degrees clockwise and counter-clockwise to check bearing operation, if applicable. Observe for any lowering that may occur, which may indicate a

malfunction of boom or hoisting components, brakes, or outriggers/stabilizers. Tests 5.8.1.a through c shall be performed with any manual or hydraulic telescoping boom sections fully retracted.

Note: The length of the test slings and safety of the lift will govern the actual minimum test radius. Use extreme caution when lifting load for cranes that have no winch (wire rope hoist) to maintain load within radius. See note under 5.4.2.1 for winch, if applicable.

b. Dynamic Test. Raise and lower the test load at normal operating speeds using the winch if so equipped. Test the ability of the winch brake and controls to control and stop the load. If the crane is not equipped with a winch skip this step.

c. Boom Operation. Using the inner and secondary boom lift cylinders, operate the boom from minimum radius to maximum radius for the load applied. Repeat the test in the opposite direction.

d. Hydraulic Component Slippage For Cranes Equipped With Hydraulic Extension (Telescoping) Cylinders. Lift the test load inside the maximum radius and allow time for fluid and component temperatures to stabilize. Hold the load for ten minutes without use of controls by the operator. There shall be no significant lowering of the load, boom, or outrigger/stabilizer beams due to components or systems malfunction or failure during the test.

Notes for hydraulic component slippage test:

1. Test at the maximum hydraulically extended boom length, minimum allowable articulating angle, and minimum radius corresponding to that boom length and articulating angle (long slings or portable manual hoists may be required to keep the load as close to the ground as possible).

2. In addition, for cranes with load chart configurations that allow lifts with the secondary boom (and/or other boom sections) articulated below horizontal (knuckled in), perform the test with all extension (telescoping) cylinders fully retracted, at the maximum articulating angle (knuckled in), and at the minimum radius for that configuration if not previously performed in paragraph 5.8.1.a.

3. For cranes without lockable outriggers/stabilizers, or for cranes with lockable outriggers/stabilizers where the activity allows operation without the use of the locking devices, one of the above tests shall be performed on the opposite side of the crane (and over the front for cranes with front outriggers).

4. For cranes equipped with the same hydraulic holding valve for both directions on the hydraulic extension (telescoping) cylinder(s), the test in paragraph 5.8.1.d note 2 is not required.

5. For cranes without hydraulic telescoping cylinders, the test in paragraph 5.8.1.a may serve as the hydraulic component slippage test for one side and the stability test in paragraph 5.8.2.c will serve as the hydraulic component slippage test for the opposite side.

6. The significance of any lowering shall be evaluated by the activity engineering organization depending on operating requirements and safety.

5.8.2 Stability Test. The test load shall be established based on the maximum hydraulically extended boom length (for cranes equipped with hydraulic extension cylinders), minimum articulation angles, and maximum allowable radius as determined by the posted load chart (typically "straight out"). See exception below.

a. Boom Operation. Raise and lower the boom using the inner boom lift cylinder through a safe working range based on the length of the slings for the length of boom extended and radius as determined below. Visually observe for smooth operation.

b. Rotation. At slow speed, rotate left and right the maximum degrees allowed by the OEM at the radius as determined below with boom and load hoist pawls (dogs) engaged where applicable. The crane shall demonstrate its ability to stop the rotating motion in a smooth, positive manner.

c. Hydraulic Component Slippage For Cranes Equipped Without Hydraulic Extension (Telescoping) Cylinders. Lift the test load inside the maximum radius and allow time for fluid and component temperatures to stabilize. Hold the load for ten minutes without use of controls by the operator. There shall be no significant lowering of the load, boom, or outrigger/stabilizer beams due to components or systems malfunction or failure during the test.

Notes for hydraulic component slippage test:

1. For cranes without lockable outriggers/stabilizers, or for cranes with lockable outriggers/stabilizers where the activity allows operation without the use of the locking devices, one of the above tests shall be performed on the opposite side of the crane (and over the front for cranes with front outriggers).

2. The significance of any lowering shall be evaluated by the activity engineering organization depending on operating requirements and safety.

Notes for stability test:

1. These tests shall be performed over the side of the crane. Stability testing can be extremely hazardous, particularly with long booms. To minimize the hazard, perform the test in the following configurations:

2. If no ratings are governed by stability, perform the above tests with the boom at the maximum hydraulically extended boom length (for cranes equipped with hydraulic extension cylinders), minimum articulation angles, and maximum allowable radius as determined by the posted load chart (typically "straight out"). If some load chart ratings are governed by stability, perform the test with the boom positioned at the first boom length

governed by stability, minimum articulation angle, and maximum allowable radius and load for that boom length.

3. When lifting test loads, always lift the load well within the maximum radius and slowly boom down to the pre-measured radius (as determined above) stopping at least once to test the effectiveness of the boom hydraulic system to control the load. Lift the test load only high enough to perform the required tests.

4. A crane outrigger/stabilizer may become light (start to rise up within the outrigger/stabilizer pad) and the outrigger/stabilizer pad may clear the ground during this procedure (with the boom positioned over the opposite corner) depending on the make and model. Generally, this is normal and not an indication of tipping. However, the activity shall verify with the crane OEM that a crane exhibiting this condition is safe for use.

5.8.3 Maximum Test Load for the Inner Hook or Padeye. If crane is equipped with an inner hook or padeye, that is utilized by the activity, perform the test required by paragraph 5.8.1.a and c, on the inner hook or padeye.

5.8.4 Ancillary Equipment. When authorized, ancillary equipment (manual extensions, etc.) shall be load tested. Test load shall be based on the maximum rated load for the equipment, or as limited by wire rope line pull if the equipment is not fully reeved. Record each test configuration and test load on the certification supplement form, figure 3-2.

5.8.4.1 Ancillary Equipment Used Without Procedures. As described by section 3, paragraphs 3.5.3.1.1 and 3.5.3.1.2, procedures are not required and the existing certification is not voided when removing and reinstalling outrigger pads, counterweights, outrigger extension pins, boom angle and extension pins, etc., provided all of the components are load tested and certified at the annual certification.

5.9 Weight Handling Equipment Used for Other than Lift Crane Service. Locomotive, crawler, truck, and cruiser cranes that are used for clamshell, dragline, magnet, pile driving, or other non-lift crane work shall be tested at the maximum safe working load permitted for the size wire rope being used. This test shall be performed in all working motions except travel. Buckets, magnets, etc., may be removed for testing wire rope. No test is required after reassembly. Retesting is not required when end attachment is changed from original connection (i.e., changed from clamshell use to dragline and so on) during the certification period.

6 Bridge/Overhead Traveling, Wall, Gantry, Cantilever Gantry and Semi-gantry.

6.1 No-Load Test.

6.1.1 Hoist.

a. Raise each load hook slowly into the hoist limit switch.

b. Check for proper operation of the backup limit switch (where applicable).

c. Lower and raise each hook through controller range.

d. Check for proper operation of lower limit switch (where applicable).

6.1.1.1 Emergency Brake on Wire Rope Drum (Shaft Failure Detection System). Simulate a system fault by disconnecting the motor encoder signal while lowering at slow speed. Verify that the brake applies within the designed delay and that the hoist control is disabled in each direction. Reconnect the encoder after the test. Repeat this test with the drum encoder. If the system uses components other than encoders (e.g., resolvers, mechanical overspeeds) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables).

6.1.2 Trolley. Operate the trolley through the controller range in both directions. Operate the full distance of the bridge rails and slowly contact the trolley rail stops with the bumpers. Verify proper brake operations.

6.1.3 Bridge. Operate the bridge through the controller range in both directions. Operate the full distance of the runway and slowly contact the runway rail stops with the crane bridge bumpers. Verify proper brake operation.

6.2 Load Test. Test each load hook separately.

6.2.1 Hoist.

a. Static Test. Raise test load approximately one foot and hold for 10 minutes. Rotate load and hook 360 degrees clockwise and counter-clockwise to check bearing operation. Observe for lowering of the load, which may indicate malfunction of hoisting components or brakes. For hoists with primary and secondary holding brakes, perform the tests in paragraph 6.2.1.b in lieu of this test.

b. Primary and Secondary Holding Brakes. For hoists with primary and secondary holding brakes (i.e., where each brake is designed to individually hold the load) raise the test load and observe the proper timing sequence in the application of the primary and secondary brake when the controller is returned to neutral. Visually observe both hoist holding brakes to ensure correct operation.

(1) Raise the test load approximately one foot and inactivate the secondary holding brake while testing the primary holding brake. Hold for 10 minutes. Rotate load and hook to check bearing operation. Observe for lowering of the load, which may indicate malfunction of hoisting components or brakes.

(2) Re-engage secondary holding brake and release the primary holding brake. Hold for 10 minutes. Observe for lowering of the load, which may indicate malfunction of hoisting components or brakes. Re-engage the

primary holding brake. Recheck proper operation of time delay and ensure smooth positive stopping.

(3) If the brakes are designed to individually hold only the rated capacity (and not 125 percent), then the tests in subparagraphs (1) and (2) may be performed with a test load of 100 (+5/-0) percent of rated capacity, and the certification shall be so noted. However, the brakes, acting together, shall demonstrate the ability to hold a 125 percent test load for a 10-minute period.

c. Dynamic Test, Including Dynamic Load Brake. Raise and lower test load and visually observe smooth control and acceleration between points. Stop the load during hoisting and lowering to verify the brake stops and holds the load.

Note: Dynamic load brakes include eddy current brakes, DC regenerative braking, regenerative braking from squirrel cage motors, etc. Dynamic braking will not stop motion.

d. Mechanical Load Brake. Raise test load no more than five feet. With the hoist controller in the neutral position, release the holding brake (see notes). The load brake shall hold the test load. Raise test load the minimum amount to perform the following test. Again, with the holding brake in the released position, start the test load down slowly and return the controller to the neutral position as the test load lowers. The load brake shall stop the test load. If the load brake does not stop the test load, but prevents the test load from accelerating, activities shall contact the OEM or activity engineering organization to ensure that the load brake is operating as designed. This characteristic and OEM or activity engineering organization correspondence shall be documented in the equipment history file.

Note 1: Methods of releasing the holding brake will vary from crane to crane depending upon the design of the brake and hoist. The two general methods of releasing the brake are mechanical and electrical. There are rare examples of holding brakes that may be defeated pneumatically or hydraulically. The following are various examples of releasing a brake that may apply to a particular crane:

a. Using a pry-bar between the pressure plate and housing of a disc brake to release the disc brake.

b. Mechanically forcing a brake solenoid plunger into the released position.

c. Installing a clamp to clamp a disc brake open.

d. Inserting a block into a brake linkage to prevent the brake from applying.

e. Using the brake release levers/handles if the brake is so equipped.

f. Adjusting the brake setting such that no torque is produced by the brake. This method will require a static and dynamic retest of the brake when it is adjusted back to the correct setting after the load brake test.

g. Installing a switched jumper that electrically releases and sets the brake. The switch shall set the brake in the event of a mechanical load brake failure. Temporarily installing the switched jumper is not a crane alteration. Permanent installation of a switched jumper is a crane alteration requiring Navy Crane Center approval.

The activity shall describe in writing how the holding brake will be defeated to test the mechanical load brake (or why the brake cannot be defeated). This description may be in the form of a detailed or standard procedure, or may be annotated on the remarks portion of the crane condition inspection record.

CAUTION**:** Depending on the design of the brake, some of the mechanical methods will require work to be performed in the vicinity of energized electrical circuits. Mechanics and electricians who perform work in energized areas shall be trained by the activity and all work shall meet applicable OSHA requirements. Methods “c,” “e,” and “g” do not necessarily require work in energized areas.

Note 2: For hoists where the holding brake cannot be mechanically or electrically released (such as brakes that are integral to the motor’s rotor which energizes the armature when released or only release by centrifugal force), observe for smooth lowering motion and unusual noise or overheating during lowering.

e. Loss of Power (Panic Test). This test is designed to test the reaction of a hoisting unit in the event of power failure during a lift. Hoist the test load to a convenient distance above the surface. Lower test load at slow speed and with the controller in the slow lowering position, disconnect the main power source and return the controller to the neutral position. The test load shall stop lowering when the controller is placed in the neutral position.

CAUTION: The activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

6.2.1.1 Emergency Brake on Wire Rope Drum (Shaft Failure Detection System).

a. Static Test. Test the ability of the hoist caliper disc brake to hold the test load after testing the other holding brake(s). Raise the test load approximately one foot off the ground. Depress the emergency stop pushbutton to disconnect the main power source and set the brakes. Manually release all brakes except the caliper disc brake. Hold the load for 10 minutes with the caliper disc brake. Observe for lowering of the load, which may indicate a malfunction of the hoisting components or the brake.

Reset the other holding brake(s) to the applied condition. Energize the main power source. Verify that the load is held by the holding brake(s). Operate the hoist in each direction and verify proper operation of all controls and brakes.

b. Dynamic Test. Perform with a test load of 100 (+5/-0) percent of rated capacity. Raise the load to a sufficient height to perform the following test. Lower the load at the minimum speed necessary to simulate a shaft failure. Disable all hoist brakes except the wire rope drum brake and simulate a system fault by interrupting (e.g., test switch) the motor or drum encoder. If the system uses components other than encoders (e.g., resolvers, mechanical overspeeds) to provide detection, the activity engineering organization shall develop the method for simulating the fault (e.g., forcing variables). The brake shall stop the load. Reset all brakes. (CAUTION: Station appropriately trained personnel at each disabled hoist brake in case of failure of the drum brake to stop the load. These personnel shall be in constant contact with the load test director and prepared to safely engage the hoist brakes when directed.)

6.2.2 Trolley Motion. Operate the trolley with the test load (if space is available) the full distance of the bridge rails using extreme caution. Verify proper brake operation.

6.2.3 Bridge Motion. With the trolley at one end of the bridge, operate the bridge, with test load, the full distance of the runway (if space is available) using extreme caution. With the trolley at the opposite end of the bridge, operate the bridge in the opposite direction using extreme caution. Observe for any binding of the bridge trucks, and verify proper brake operation.

Note: If the crane is equipped with multiple trolleys (or multiple hoists) which are used to achieve the rated load of the crane (e.g., two 10,000 pound trolleys which together allow for a 20,000 pound maximum capacity) then the tests in 6.2.2 and 6.2.3 shall be performed with the multiple trolleys (or hoists) loaded simultaneously.

6.3 Stopping Under Loss of Power (For Cranes without Bridge or Trolley Automatic Brakes). A safety hazard exists in controlling the motion of the bridge and trolley, and therefore the motion of the load, for certain cranes in the event of a power failure. The seriousness of the hazard varies with the speed of bridge or trolley; the size and weight of the load; the surrounding environment; and the operating characteristics of the individual cranes. The major factor in reducing this hazard is the skill and response of the operator because it is not considered either feasible or practical to modify all the existing cranes that are not provided with automatic braking in all travel modes. These requirements do not apply if the bridge crane is exclusively cab operated and has an operator applied brake (e.g., hydraulic foot brake, mechanical foot brake, etc.), or if the crane utilizes self-locking worm gear drives for the bridge or trolley. Accordingly, the following actions shall be taken:

6.3.1 The operating characteristics of the crane under a loss of power shall be determined by operational field testing (with the test load) and recorded. This shall be a one time test unless repairs, or alterations are made that will change the operating characteristics of the crane under the loss of power.

6.3.2 The certifying official shall make a determination that the operating characteristics are within acceptable limits of safety for operations under loss of power.

6.3.3 Instructions, as appropriate, shall be posted in the crane cab and/or on the pendant controller to warn the operator of the characteristics of the crane and the necessary precautions in the event of loss of power.

6.4. Gantry Frame Extension Pins. As described by section 3, paragraph 3.5.3.1.3, procedures are not required and the existing certification is not voided when removing and reinstalling pins used to raise and lower gantry cranes, provided the pins are load tested and certified with the crane at the highest elevation for which use is anticipated.

7 Jib, Pillar, Pillar Jib, Monorail, Davit, and Fixed Overhead Hoist.

7.1 No-Load Test. Test each operation separately.

7.1.1 Hoist.

a. Raise each load hook slowly into the hoist limit switch.

b. Check for proper operation of the backup limit switch (where applicable).

c. Lower and raise each hook through the controller range.

d. Check for proper operation of lower limit switch (where applicable).

7.1.2 Trolley. Operate the trolley through the controller range in both directions. Operate the full length of the monorail or jib and slowly contact the stops. Verify proper brake operations. Operate all rail switches and verify proper operation.

7.1.3 Swing. (Jib, Pillar, and Pillar Jib) Swing through working range (where space is available) at maximum radius.

7.2 Load Test.

7.2.1 Hoist.

a. Static Test. Raise load approximately one foot and hold for 10 minutes. Rotate load and hook 360 degrees clockwise and counter-clockwise to check bearing operation. Observe for lowering of the load, which may indicate malfunction of hoisting component or brake.

b. Dynamic Test, Including Dynamic Load Brake. Raise and lower test load and visually observe smooth control and acceleration between points. Stop the load during hoisting and lowering to verify the brake stops and holds the load.

Note: Dynamic load brakes include eddy current brakes, DC regenerative braking, regenerative braking from squirrel cage motors, etc. Dynamic braking will not stop motion.

c. Mechanical Load Brake. Raise test load no more than five feet. With the hoist controller in the neutral position, release the holding brake (see notes). The load brake shall hold the test load. Raise test load the minimum amount to perform the following test. Again, with the holding brake in the released position, start the test load down slowly and return the controller to the neutral position as the test load lowers. The load brake shall stop the test load. If the load brake does not stop the test load, but prevents the test load from accelerating, activities shall contact the OEM or activity engineering organization to ensure that the load brake is operating as designed. This characteristic and OEM or activity engineering organization correspondence shall be documented in the equipment history file.

Note 1: Methods of releasing the holding brake will vary from crane to crane depending upon the design of the brake and hoist. The two general methods of releasing the brake are mechanical and electrical. There are rare examples of holding brakes that may be defeated pneumatically or hydraulically. The following are various examples of releasing a brake that may apply to a particular crane:

a. Using a pry-bar between the pressure plate and housing of a disc brake to release the disc brake.

b. Mechanically forcing a brake solenoid plunger into the released position.

c. Installing a clamp to clamp a disc brake open.

d. Inserting a block into a brake linkage to prevent the brake from applying

e. Using the brake release levers/handles if the brake is so equipped.

f. Adjusting the brake setting such that no torque is produced by the brake. This method will require a static and dynamic retest of the brake when it is adjusted back to the correct setting after the load brake test.

g. Installing a switched jumper that electrically releases and sets the brake. The switch shall set the brake in the event of a mechanical load brake failure. Temporarily installing the switched jumper is not a crane alteration. Permanent installation of a switched jumper is a crane alteration requiring Navy Crane Center approval.

The activity shall describe in writing how the holding brake will be defeated to test the mechanical load brake (or why the brake cannot be defeated). This description may be in the form of a detailed or standard procedure, or may be annotated on the Remarks portion of the crane condition inspection record.

CAUTION**:** Depending on the design of the brake, some of the mechanical methods will require work to be performed in the vicinity of energized electrical circuits. Mechanics and electricians who perform work in energized areas shall be trained by the activity and all work shall meet applicable OSHA requirements. Methods "c," "e," and "g" do not necessarily require work in energized areas.

Note 2: For hoist where the holding brake cannot be mechanically or electrically released (such as brakes that are integral to the motor's rotor which energizes the armature when released or only release by centrifugal force), observe for smooth lowering motion and unusual noise or overheating during lowering.

d. Loss of Power (Panic Test). Hoist the test load to a convenient distance above the surface and, while slowly lowering test load, cut main power to hoist and return the controller to the neutral position. Load shall stop. The significance of the stopping distance for air hoists shall be evaluated and published by the certifying official depending on operating requirements and safety.

CAUTION: The activity engineering organization shall review the system circuitry for cranes with electronic controls to assure that this test can be performed safely without damaging the control system. For cranes where the controls may be damaged, the activity engineering organization shall document their justification and fully describe the alternate tests performed. Alternate test procedures require Navy Crane Center approval.

7.2.2 Trolley. Operate the trolley, with test load, through the full distance of the monorail or jib (where the space is available). Observe for any malfunctioning of the trolley assembly and alignment of monorail or jib. Verify proper brake operation.

7.2.3 Swing (Where Applicable). Swing the test load (where space is available) through the working range at maximum radius, stopping the load at several points. There shall be no excessive drift of jib or trolley at any of these points. If a horizontal force of 15 pounds or less will restrain the load, then the drift is acceptable.

7.4 Boom Angle and Extension Pins. As described by section 3, paragraph 3.5.3.1.2, procedures are not required and the existing certification is not voided when removing and reinstalling boom angle and extension pins on category 3 pedestal mounted commercial boom assemblies, provided the pins are load tested and certified with the crane.

8 Mobile Boat Hoists Including Self Propelled and Towed Types, and Rubber-Tired Gantry Cranes.

8.1 Test Load. The nominal test load shall be 105 percent of the OEM capacity unless the OEM does not allow testing over 100 percent of the OEM capacity. Depending upon the design of the mobile boat hoist, the test load may include the weight of (or deduction values for) the spreader and sling assemblies below the lower block. Follow OEM or activity engineering instructions for weight deduction values.

8.2 No-Load Test.

8.2.1 Hoist.

a. Raise and lower each block through the maximum working range of hook travel.

CAUTION: After lowering blocks, ensure wire rope is packed tightly, and there is a minimum of two wraps on grooved drums (three wraps on smooth drums) prior to proceeding with load tests.

b. Run each hoist block into the upper limit switch (where installed) at slow speed.

8.2.2 Travel Test. Travel a minimum of 50 feet (if applicable) steering left and right testing for proper steering operation. Verify steering alignment is in accordance with OEM instructions. Test travel alarms and emergency stop switches (where installed). For towed type mobile boat hoists, tow the boatlift a minimum of 50 feet.

8.3 Load Test.

8.3.1 Hoist.

CAUTION: On certain types of mobile boat hoists that use deck fittings for lifting test loads, ensure that the rotation alignments of the deck fittings are aligned in the plane of the sling. Lift the test load only high enough to perform the required tests.

a. Static Test. Raise the test load approximately one foot and hold for 10 minutes. Observe for any lowering that may occur, which may indicate a malfunction of the hoisting components, or hoist brakes.

Notes for paragraph 8.3.1.a:

1. On certain types of mobile boat hoists, the hoist drums use one continuous length of wire rope between two hoists. The wire rope shall be equalized (equal amounts of wire rope on each drum) before a lift is made. Follow OEM procedures for equalizing hoist drums.

2. For certain types of mobile boat hoists the engine shall be at full speed when lifting the test load. Follow the OEM instructions if available.

3. For mobile boat hoists with individual hoists connected to each corner of the test load, ensure that the test load is raised evenly.

4. For mobile boat hoists that have individual load hooks on a single load beam (spreader), the load beam shall be marked with its maximum capacity. If the rated capacity of the load beam is based on the capacity of all hooks, the hooks shall be tested together at the test load percentage shown in paragraph 8.1.

b. Hoist Dynamic Test. Raise and lower the test load at normal operating speeds and visually observe smooth control.

c. Hoist Brake. Test the ability of the hoist brake to control and stop the load while slowly raising and lowering the test load.

8.3.2 Travel Test. For self-propelled mobile boat hoists, travel the mobile boat hoist at slow speed a minimum of 50 feet forward and reverse. At slow speed apply the travel foot brake. While traveling, steer right and left. For towed type mobile boat hoists, tow the mobile boat hoist a minimum of 50 feet.

CAUTION: Attach taglines to the load to control oscillation. Test personnel shall stand clear of tires during load test.