DESIGN AND INSTALLATION OF OVERHEAD BRIDGE CRANE HOIST/TROLLEY ASSEMBLIES

SASEBO

NAVAL SHIP REPAIR FACILITY (NSRF)

YOKOSUKA, JAPAN

TECHNICAL SPECIFICATION

1 GENERAL REQUIREMENTS

1.1 BACKGROUND. The intent of this design build specification is to replace an existing 50/25 metric ton capacity electric hoist/trolley and controls on the overhead bridge crane # OH-9-1 located in building 480 of SRF-JRMC Detachment in Sasebo Japan. The existing double girder bridge frame structure provided by Ishikawajima Heavy Industries Co., Ltd. shall be utilized, but modification of existing footwalks and handrails must be performed to maintain safe access as necessary. The new crane will have a downgraded capacity of 45 ton on the main hoist.

1.2 CRANE SUMMARY.

110,231/55,115 lbs OET bridge crane (OH-9-1)

Span:	7050 mm
Runway Length:	66.03 m (approximately)
Capacity:	Main Hoist: currently-110,231 lbs; new capacity-99,207 lbs , Auxiliary Hoist: 55,115 lbs
Crane type:	Top running bridge, double girder OET with top running trolley/hoist
Crane and Hoist Classification:	CMAA 70, Class D or JIS C9620, Grade M6
Bridge High Speed:	2.5 – 25 m/min, Inverter control
Crane Drive:	Variable Frequency Drives (VFD) with VFD rated motors
Trolley Low-High Speed:	1.0 – 10 m/min
Trolley Drive:	V/F Control
Hoist Low-High Speed:	0.32 – **4.5** m/min (Main), Inverter control
Hoist Low-High Speed:	0.48 – **7.5** m/min (Auxiliary), Inverter control
Hoist Type:	V/F Control with Dynamic braking (Currently Open Loop)
Hoist lift required:	7.942 m (Main), 8.722m (Auxiliary)
Control:	Pendant control from independent track on bridge
Power Supply:	440-volt, 3-phase with grounding wire, 60-hertz

1.3 SCOPE. The Contractor shall furnish all labor, management, supervision, tools, materials, equipment, incidental engineering, and transportation necessary to design, fabricate, and install the new hoist/trolley and to test one (1) bridge crane. Remove the existing main/auxiliary hoist/trolley unit from the subject OET crane (OH-9-1) and install new package hoist/trolley and install new disconnect switch and runway conductors (Bridge Electrification) to provide sufficient capacity for simultaneous operation of all crane functions. The intent is to minimize the Contractor's overall on-site time and space requirements in order to minimize disruption to ongoing production activities. The crane shall be designed and built in compliance with all federal regulations, Crane Construction Standards, and Japan Industrial Standard (JIS) applicable to this equipment and it shall be installed, tested and fully operational upon completion of the project.

1.4 CONTRACTOR DELIVERY AND PICKUP. The new hoist/trolley shall be delivered, installed, and tested in Building 480 at NSRF/JRMC Detachment Sasebo, Japan. The Contractor shall be solely responsible for the delivery and pickup of all Contractor equipment, material, and supplies to and from NSRF-JRMC Detachment Sasebo work site. Ten (10) days prior to arrival at NSRF/JRMC Detachment Sasebo, the Contractor shall submit in writing to the Government Representative, the make, model, and capacity for any crane/equipment to be used on site during the accomplishment of this contract. **(Submittal)**

1.5 APPLICABLE STANDARDS. The crane and all work shall be in accordance with all applicable requirements ("shall" statements) and recommendations ("should" statements) of current revisions of OSHA, ASME B30.2, B30.10, HST-4, and CMAA 70 except as specifically modified herein. Furnished equipment shall comply in all respects with the following standards: National Electric Manufacturer's Association (NEMA) and the National Electric Code (NEC), or Japan Industrial Standards (JIS), JIS B 8801, JIS B 8821, JIS C 9620, Crane Construction Standards in Japan, Japanese Electrical Committee Standard (JEC) and Japan Electrical Manufacture's Standard (JEM).

1.6 MATERIALS. The following materials shall be used. Materials shall be free from all defects and imperfections that might affect the serviceability and appearance of the finished product. All material provided shall be "new and unused".

Components	Material
Wheels (Trolley)	Forged/wrought steel (stamped steel wheels are prohibited)
Hooks	Forged Carbon or Alloy Steel with a minimum elongation of 18% in 2 inches

1.6.1 General. Provide materials and equipment which are standard products of manufactures regularly engaged in the fabrication of complete and totally functional cranes including necessary ancillary equipment.

1.6.2 Prohibited Use of Asbestos Products. Provide materials and products, required for designing and manufacturing cranes, which do not contain asbestos.

1.6.3 Ductile Materials. All non-redundant components directly supporting the load shall be of ductile materials. These components include, but are not limited to all hoist drive gear reducer housings, motor frames and end bells, flanged adapters, and brake wheels and discs. For the purposes of this specification ductile is defined as having a minimum elongation of 5% in 2 inches. Furthermore, all shafts, keys, gears, torque carrying coupling components, and wire rope drum shall be steel.

1.6.4 Safety Warnings. Affix labels in a readable position to each lift block or control pendant in accordance with ASME B30.2. Submit safety warnings, diagrams and other framed instructions suitably framed and protected for display as indicated by the Contracting Officer as follows:

a. Design and locate the word "WARNING" or other legend to bring the label to the attention of the operator. Provide durable type warning labels and display the following information concerning safe-operating procedures: Cautionary language against lifting more than the rated load; operating the hoist when the hook is not centered under the hoist; operating hoist with twisted, kinked or damaged rope; operating damaged or malfunctioning hoist; operating a rope hoist with a rope that is not properly seated in its hoist drum groove; lifting people; lifting loads over people; and removing or obscuring the warning label.

1.7 ENGINEERING CHANGE PROPOSALS. The Contractor shall not incorporate any engineering changes in, nor deviate from this specification without prior written authorization from the Government Representative. All desired engineering changes and deviations from the

requirements of this Contract shall be formally submitted for approval of the Government Representative. **(Submittal)**

1.8 PROPRIETARY MARKINGS. All contract-required submittals (drawings, calculations, and technical info) shall be supplied without "proprietary" markings or statements. The Government shall have full rights to use, reproduce, "build from", modify, copy, and release all submitted information.

1.9 SUBMITTALS. Any Government comments on submittals shall be corrected and the submittal resubmitted by the Contractor within ten (10) working days of receipt of Government comments. The Government has ten (10) working days to return comments to the Contractor. If further comment rounds are required, both Contractor and Government shall continue to reply within ten (10) working days.

1.10 LEAD. Building 480 structure and the crane are painted with what is suspected to be lead base paint and any work that will disturb this paint shall be treated as “Lead Work” and the following applies. Some material containing lead (MCL) removal may not require implementation of the requirements of 29CFR 1926.62. Based on the experience of the Contractor and/or the use of a specific process or method for performing the work, the Contractor may be able to provide historic data (previous 12 months) to demonstrate that airborne exposures are controlled below the action level. Documentation of such methods or controls shall be presented to the Government Representative. In order to reduce the full implementation of 29CFR 1926.61, the Contractor shall provide documentation in an Assessment Data Report. **(Submittal)**

If implementation of 29CFR 1926.62 is required, then the contractor shall ensure the following:

a) Be aware of the potential hazard to his/her employees and Navy personnel.

b) Comply with local, state, and federal regulations to protect his/her employees, as well as Navy personnel.

c) Control lead dust outside the work boundary to less than 30 micrograms per cubic meter at all times, and shall do sufficient monitoring to confirm this level of control is maintained. In addition, the controlled work area(s) shall meet this criterion prior to release for unrestricted access. Contractors shall provide copies of their monitoring results to the cognizant industrial hygienist (SRF-JRMC, Code 140) via the Government Representative within 3 working days of collection. **(Submittal)**

d) Provide for frequent and regular inspections of the job site, materials, and equipment by a competent person.

e) Submit a written plan to include at least the following: **(Submittal)**

1. A description of each activity in which lead is emitted (e.g., equipment used, material involved, controls in place, crew size, employee job responsibilities, operating procedures, and maintenance practices).

2. A description of the specific means that will be employed to achieve compliance and, where engineering controls are required, engineering plans and studies used to determine methods selected for controlling lead.

3. A report of the technology considered in meeting the required standard.

4. Air monitoring data that documents the source of lead emissions.

5. Schedule for implementation of the lead program, including training certifications and medical qualifications.

6. A description of arrangements made among contractors on multi-contractor sites with respect to informing affected employees and Navy personnel of potential exposure to lead.

1.11 ACCESS FOR INSPECTIONS. The Contractor shall provide, upon request, access (via man lift, Aerial Work Platform, etc.) for Government personnel to observe and inspect all areas of the crane during installation and testing.

1.12 EQUIPMENT OPERATOR QUALIFICATIONS. All Contractor/Subcontractor personnel who will operate forklifts, manlifts, mobile cranes, and/or bridge cranes at SRF-JRMC, Yokosuka are required to provide a current operators license for that equipment or an alternative certification of operating qualifications. Submission of operating credentials shall be made to the Government Representative two days prior to operating the equipment on-site. Certification may be provided by any of the following three options: **(Submittal)**

a) Proof of a union operator's card covering the subject equipment.

b) Certificate from a qualified training facility.

c) Letter from the Contractor, on company letterhead, stating the operator's qualifications. This can be based on past experience, noting the estimated hours of operation of the specific equipment type.

1.13 CONTRACTOR PRODUCTION REPORT. The Contractor shall complete and submit regular Contractor Production Reports during the life of this contract. For the duration of design and fabrication activities conducted at the Contractor/Subcontractor facility, the reporting period shall be monthly. For the duration of erection, installation, and testing activities conducted at the SRF-JRMC Yokosuka work site, the reporting period shall be weekly. Reports shall be submitted to the Government Representative. **(Submittal)**

1.14 GOVERNMENT REVIEW. Government review and approval of submittals, certifications, and schedules does not relieve or reduce the Contractors obligation to comply with all contract requirements. Any errors or contract non-compliant issues found after government approval shall be corrected by the Contractor.

1.15 DISPOSAL. The Contractor is to carefully remove existing motors, brakes, control panels, and other electrical equipment from the existing crane as required by the scope of work. The Contractor shall dispose of all other equipment, including the removed crane components. Disposal of general waste generated as part of this contract, shall be the responsibility of the Contractor.

1.16 SUPPORTING INFORMATION. Refer to attached enclosure (1) for the general assembly drawing and electrical wiring diagram to modify the existing crane. It shall be the responsibility of the Contractor to obtain any needed design information concerning the existing crane such as dead load, wheel loads, etc.

1.17 REGULATORY REQUIREMENTS. All new functions and components shall comply with all Occupational Safety and Health Administration (OSHA) and other listed references in this specification. Anchorages shall be provided on the trolley. Anchorages to which personnel fall arrest equipment is attached shall be capable of supporting at least 5,000 pounds per person attached, or it must be designed, installed, and used as part of a complete personal fall

arrest system which maintains a design factor of at least 2.0 under the supervision of a qualified person as required by 29 CFR 1910.66.

Attach a permanent label at each anchorage point identifying it as a “Fall Protection Anchorage Point” listing its capacity (e.g. one person capacity).

Couplings with exposed bolts or nuts (non-safety type), if used, shall be provided with guards. The guards shall be removable type and allow for a visual inspection of the covered component when installed. The guards shall be securely fastened and shall be capable of supporting, without permanent deformation, the weight of a 200-pound person, unless the guard is located where it is impossible for a person to step on it.

2 DESIGN REQUIREMENTS

2.1 GENERAL DESIGN

2.1.1 Periodic Load Testing. The crane must be capable of periodic (twice yearly) 131.25% overload testing. Contractor shall certify that the crane components affected by the scope of work and their support systems are capable of being periodically load tested to 131.25% of its rated capacity without detrimental effects. **(Submittal)**

2.1.2 Emergency-Stop (E-stop). The crane components affected by the scope of work (structural, mechanical and electrical) shall be designed so that the E-stop button may be pushed during any operating mode (up to and including full speed and full load) without detrimental effects on the crane or loss of load control. **(Submittal)**

2.1.3 Environment. The new hoist/trolley and any replaced or added components shall be designed for use in an indoor environment with ambient temperatures of 5° to 40° Centigrade (23° to 100° Fahrenheit).

2.1.4 Electrical Supply. The new hoist/trolley and any replaced or added components shall be designed to operate on 440-volt, 3-phase with equipment grounding conductor, 60-hertz, alternating current (AC). The crane electrical installation shall comply with all applicable sections of the Crane Manufacturers Association of America (CMAA) 70, and MIL-C-82017C, and the National Electric Code or Crane Construction Standards, JIS, JEC and JEM.

2.1.5 Clearance Envelope and Hook Coverage. The existing crane with new hoist/trolley shall fit into the existing crane envelope without requiring modifications to the building. See Enclosure (1) for a general dimension sketch. The contractor shall make a site check to field verify all existing dimensions on these drawings and to determine the best way of designing, shipping and erecting the new hoist/trolley. The hook coverage (side to side) provided by the new hoist/trolley shall meet or exceed the existing coverage. The Contractor shall measure and record hook approaches of existing crane before it is removed. **(Submittal)**

2.2 STRUCTURAL REQUIREMENTS

2.2.1 Contractor needs to provide updated structural calculations in accordance with the structural calculation standards for cranes of CMAA 70, Construction Code for Cranes in Japan, and JIS B8821 to verify the capacity of existing endstops and bumpers and verifying existing crane will support additional trolley weight. **(Submittal)**

2.2.2 Maximum Wheel Loads. The bridge crane with new hoist/trolley shall be capable of operating on the existing rail system. The new main hoist will have its capacity downgraded

from 50 tons to 45 tons. The contractor shall ensure that the new crane wheel loading and impact to building and supporting structure does not exceed the existing crane's maximum wheel loading of 35,009 kilograms (77,180 Pounds) spaced 4,200 millimeters (165.35 inches) apart. The self-weight of all components of the existing unit is 24,900 (includes hoist/trolley) Kilograms. **Submittal)**

2.2.3 Trolley end stops. The contractor shall remove the existing (wheel contact type) trolley end stops and design, fabricate, and install new set of end stops.

End stops shall be compatible with trolley bumpers, and they shall be designed to withstand those forces of the fully loaded trolley at 100% rated speed (power off). The Contractor shall submit calculations verifying the design of the end stops. **(Submittal)**

2.2.4 Welding. All welding on the crane shall comply with AWS D14.1. All welding on the building structure, including runway stops, electrification hangers, etc., shall comply with AWS D1.1 or relevant JIS Z (Such as 3001, 3021, 3400, 3410, 3200, 3201, 3607, and G 3503 & 3523, and B 6801 & 6802,..etc).

2.2.5 Trolley Rails. The new hoist/trolley shall be installed onto the existing 70 mm^2 rails on 2.3 meter span.

2.2.6 Lugs. The new hoist/trolley frames shall have safety drop lugs to limit the drop of the hoist/trolley to 1 inch (25 mm) in case of wheel, axle, or bearing breakage.

2.2.7 Paint. The new hoist/trolley and any replaced or added components shall be painted using the Contractor's standard paint system. The color shall be brilliant yellow; the load block (excluding hook and nut) shall be brilliant yellow with black diagonal striping. All accessible fasteners shall be painted after final installation. All paint systems brought into the SRF-JRMC, Detachment Sasebo site shall be approved by the Government. Hook, hook nut, wire rope, sheave grooves, wire rope drum grooves wheel treads and other components/surfaces that are subjected to normal wear, shall remain unpainted. The primer coat and the finish coat of paint shall be smooth, even and free of runs, sags, orange peel, or other defects. Care shall be taken to preclude painting over non-painted surfaces. Any painted over grease fittings must be replaced; they may not be cleaned and reused. The painting system shall consist of anti-corrosive primers and 2 coats of acrylic epoxy gloss (cosmetic) topcoat. Primers and topcoats shall be the products of the same manufacturer. The use of paint containing any amounts of lead or mercury or chromates shall be prohibited. The primer and finish coats shall be identified in both the technical manual and drawings. Contractor shall submit color code or standard number. Contractor shall submit the painting system. **(Submittal)**

2.2.8 Clearance from obstruction. Minimum clearance of 3 inches overhead and 2 inches laterally shall be provided and maintained between crane and obstructions.

2.2.9 Major Components Attachments for Lifting and Handling. Major components (e.g trolley) shall be designed with structural or mechanical attachment points (lifting lugs, safety hoist rings, hoist rings or approved equivalent) when they are to be lifted or handled for installation. The contractor shall install the new hoist/trolley in accordance with an approved Crane Installation Plan. Onsite changes to the approved lifting plan shall be presented to the contracting officer's representative (or designee) for review prior to lift. **(Submittal)**

Lifting of any major components (e.g, trolley, large components without integral lift points) shall be considered critical, and lift plans shall comply with the requirements of paragraph 1.7.2.e of the NAVFAC P-307. When the installation plan requires lifting or handling of major components, rigging by choking or sweeping using synthetic products, wire rope or chain is not allowed unless specific approval is obtained. Rigging gear shall only be attached to major components using designed attachment points. Tilting of lifted or suspended components during installation when necessary shall only be accomplished using chain-falls, ratchet hoists or similar equipments and only in a controlled manner following approved written documentation. “Lifting” is not exclusive to cranes and can include use of any mechanized lifting device.

2.2.10 Walkways. The trolley shall be provided with handrails and kickplates meeting OSHA requirements. Modification of existing footwalks and handrails must be performed to maintain safe access as necessary between the trolley and the existing footwalk. The existing walkway shall be modified to increase stiffness in the walkway by reducing the deck plate panel size by half using structural members similar to existing for intermediate members. Anchorage tie-off points shall be added to the existing walkway to support a 5000 lb load.

2.3 MECHANICAL REQUIREMENTS

2.3.1 Hoist/Trolley Mechanical Design. The mechanical design of the crane shall conform to CMAA #70, ASME B30.2, and other requirements specified herein. All drives which are not direct-connected with shafts in line shall be driven through gears. Retaining rings shall not be relied upon for axial retention of sheave pins or bearings on pins and axles; they shall be permitted only on standard commercial assemblies. Press fits shall not be relied upon for transmission of torque, except where permitted in travel drives. Cotter pins shall be permitted only for locking nuts against loosening and for retaining pins in standard commercial brake assemblies. The new hoist/trolley shall be designed to operate on the existing bridge rails.

2.3.2 Hoist Drum. The drum shall be a one-piece steel weldment, finish-machined after all welding and stress relieving has been completed, and drum design shall be in accordance with CMAA#70 section 4.6 or equivalent JIS standard as permitted. The drum shall include integral stub shafts or shaft hubs for through shafts as required. Drum shall not be mounted in a three bearing configuration. The drum shall be designed such that all hoisting rope is wound in a single layer and not less than two dead wraps of hoisting rope will remain on each end when the hook is in its extreme low position. Drum grooves shall be helical and machined right and left hand for double wire rope reeving. Minimum drum groove depth and pitch shall be in accordance with the recommendations in CMAA #70. The minimum pitch diameter of drums shall be in accordance with CMAA #70, Table 4.6.4-1.

2.3.3 Brakes. Each hoist shall be equipped with two independent and separate electro-mechanical brakes, each with a minimum torque rating of 130% of the rated motor torque. The brake torque settings shall be adjustable. Each brake shall also be able to independently hold the test load. Hoist brake shall be provided with a manual lever type, self-return to ON, release mechanism. Maintained OFF, release mechanisms are not permitted. All hoist brakes shall be designed to permit easy access for inspection and adjustment. The brakes shall be designated as primary and secondary brakes with the secondary brake being mounted closest to the wire rope drum in the drive train. The primary brake shall set after the controller has brought the load to a controlled stop when the master switch has been placed in the off position. The secondary brake shall be designed to set 1-3 seconds (adjustable time delay) after the time it takes the primary brake to normally apply. An uninterruptible power supply (UPS) shall not be used to

create the secondary brake time delay. In the event the controller system fails or an emergency stop condition is employed, the primary brake shall apply immediately; however, the time delay associated with the setting of the secondary brake shall still exist.

The trolley drive shall be provided with electro-mechanical brakes, that are spring applied, electrically released. Each brake shall have a minimum torque rating equal to 50% of the drive motor rated torque, and the torque setting shall be adjustable. Each brake shall be equipped with a manual self-return to ON brake release. The brakes shall be designed to permit easy access for adjustment and inspection for wear and/or setting of the friction discs.

Prior to the load test, the Contractor shall disassemble each brake to show the torque setting, air gap, plunger stroke, lining thickness, etc. for Government inspection and recording. **(Submittal)**

2.3.3.1 Friction Material. All brakes shall be supplied with asbestos free friction material. The Contractor shall provide a certification for each brake that states that its friction material is asbestos free. **(Submittal)**

2.3.3.2 Adjustment. All brakes shall be properly adjusted for their application. The Contractor shall provide a brake adjustment record for each brake on the crane. The record shall include the location of the brake, the brake manufacturer, model number, serial number, the manufacturer's required settings and dimensions with tolerances, the actual setting and dimensions. **(Submittal)**

2.3.4 Wire Rope. The drum line pull shall not be more than 20% of the nominal breaking strength of the wire rope to obtain a minimum wire rope design factor of 5 to 1. The hoisting rope shall be 6 x 36 class construction, extra improved plow steel or extra-extra improved plow steel, regular lay, uncoated, with an independent wire rope core or OEM's recommended equivalent type. Wire rope shall be in accordance with all requirements of ASTM A1023/A or equivalent JIS standard. Hoisting rope dead end connections to equalizer bar (if used) shall be by means of poured socket connections or swaged fittings installed in a manner that develops the full breaking strength of the hoisting rope. The sockets shall be forged steel. Swaged connections used on the wire rope shall have a minimum of three destructive test samples demonstrating that the published efficiency for the swaged connection used is achieved (i.e., the swaged socket develops 100 percent efficiency) on all samples. Wire rope pulling out of the swage socket is an unacceptable test result. Wedge sockets shall be prohibited on wire rope. The rope shall be lightly coated with the Contractor's recommended lubricant. Wire rope ends at the drum shall be anchored by means of swaged fittings or by clamping. Clamped hoisting rope ends shall be neatly and securely seized with wire. The hoist shall be double reeved. The Contractor shall provide documentation of the actual wire rope breaking strength of a sample taken from the wire rope reel, and the test report (pass or fail) for swaged socket (if used). **(Submittal)**

2.3.5 Hook, Hook Nut and Hook Block. The hook shall be single barb forged steel conforming to ASTM A668 or ASTM A521 or equivalent JIS standard with a longitudinal elongation of not less than 18% in 2 inches. The hook nut shall be secured to the hook by a commercial standard removable and reusable means (tack-welding is prohibited). The hook shall be provided with a safety latch. The hook and hook nut shall not be painted or plated. Load blocks shall be entirely of steel construction. The designs shall preclude the wire rope from being cut, pinched, crushed, or chafed in case of two-blocking or unloading of the wire rope, in accordance with 29 CFR Part 1910.179. The load blocks shall be centered between the girders. The hook shall rotate freely with up to 131.25% rated load. The hoist capacity in pounds shall be clearly

marked on both sides of the load blocks. The hook blocks shall be constructed so that the hooks and hook nuts can be removed without disassembly of the blocks. Prior to the load test, the Contractor shall remove the hook and nut and provide them to the Government for a non destructive test (NDT). The Government will NDT the entire load hook and nut. The NDT acceptance criterion is no linear indications greater than 1/16 of an inch, anywhere. The Contractor shall replace any hook and/or nut that do not meet this criterion as documented by the Government NDT report. The Contractor shall reinstall the hook and nut after satisfactory NDT testing by the Government.

2.3.6 Bumpers. Bumpers of the elastomeric, hydraulic or spring type shall be provided on the new trolley. The bumpers shall be designed such that the maximum deceleration rate for the trolley shall not exceed 4.88 meters/s^2 (16 feet/s^2) at 50% of the full load rated speed, power off (full load rated speed shall be used unless adequate information is supplied by owner to determine the actual attainable maximum speed). Additionally, the bumpers shall be capable of absorbing the total energy at 100% trolley full load rated speed (power off).

Trolley bumpers shall fully mate with the new end stops and mounted to provide proper clearance when bumpers are fully compressed. The design of bumpers shall include a mean of retaining the bumper in case of broken or loosened mounting connection.

Calculations shall verify trolley bumpers design. **(Submittal)**

2.3.7 Couplings. Couplings, excluding gear limit switch couplings, shall be steel. Chain type couplings shall not be permitted. Couplings between closely spaced bearings shall be of the full flexible type. Half-flexible type couplings shall be used for floating shafts and for shafts of lengths more than 16 shaft diameters between the coupling and the farthest bearing. Half-flexible couplings may be used on brake wheels. Rigid couplings may be used where the distance between the coupling and the farthest bearing is greater than 32 shaft diameters. Brake wheel couplings (if used) shall have the brake wheel mounted on the driven hub. For a built-up hoist assembly, barrel type couplings shall be used in connection between the hoist reducer output shaft and drum flange. There shall be adequate clearance between couplings and adjacent components to allow removal of the cover for inspection, adjustment and alignment. Flexible couplings shall not be relied upon to compensate for inaccurate alignment. Ends of coupled shafts shall be aligned within the recommended installation criteria of the coupling manufacturer. The Contractor shall submit a certification that each coupled pair of shafts was aligned using the coupling manufacturer's recommended procedures and shall provide a record of the actual measured misalignment for each coupling installation. **(Submittal)**

2.3.8 Gearing. All gearing shall be of the enclosed (gear reducer) type, except final drive. Shafts with three or more bearing supports shall not be permitted. Gear reducers shall be standard commercial products. Enclosed reducers shall have a convenient means of lubricant level indication and draining (i.e. ball valve equipped drains). Hoist gearing shall be spur, helical, or herringbone type only. Open type drum gear-pinion sets (if applicable) shall consist of spur gears only. Trolley drive gearing may be spur, helical, herringbone or spiral bevel. Shaft mounted gear reducers may be used for trolley drive. The torque arms shall be other than threaded rod type and shall be designed and installed so that no eccentric loads are imposed on them. Enclosed gearing shall conform to ANSI/AGMA 6013, 6034, or 6035, or equivalent Japanese industrial standards as permitted. The drum gear (if applicable) shall be removable from the drum. Enclose open gears with safety guard removable covers over openings for inspection and access for grease lubrication.

2.3.9 Anti-drip Protections. The new hoist/trolley shall be designed to preclude leakage of lubrications onto lifted loads, floor, or external grounds. Fit all equipments which can not be made leak-proof with suitable drip pans or shall have the foundations seal welded to create a dam. Drip pans shall be installed under all drive machinery. Drip pans shall be manufactured of steel and designed to permit easy removal of collected lubricant.

2.3.10 Design Factors. The hoist drive, except the wire rope, shall be designed to withstand the setting of the hoist brake under a full speed lowering condition with either no-load or rated load on the hook whichever load condition represents the worst case scenario. The trolley and hoist shall be designed to meet the requirements of ASME B30.2, ASME HST-4 and CMAA #70 or equivalent JCA design as permitted.

2.3.11 Alignment. All base-mounted motors, gear reducers, brakes, and pillow blocks shall be locked in proper alignment, both longitudinally and laterally, after adjustment, shimming, and fastening, with appropriately sized dowel pins or shear bars.

2.3.12 Threaded Fasteners. All base-mounted and flange-mounted components and all mechanical connections subjected to calculable loads shall be fastened with SAE J429, Grade 5 or Grade 8 fasteners, ASTM F436 washers, and SAE J995 Grade 5 or Grade 8 nuts or equivalent Japanese industrial standards. Mounting fasteners from flange-mounted components, including keeper bars, may be installed into tapped holes provided that adequate thread engagement is provided to develop the full tensile strength of the fastener. All nuts shall have a minimum of one thread pitch of the bolt protruding above the nut top surface. Fastener connections shall be sized neglecting any benefit to be derived from shear bars or dowel pins.

2.3.13 Sheaves. Sheaves shall be steel. The grooves shall be machined or ground to contour and rim toughened to not less than 320 BHN. The minimum pitch diameters of running sheaves shall be in accordance with Table 4.5.2-1 of CMAA #70. Sheave groove depth shall be not less than 1.15 times the hoisting rope diameter.

2.3.14 Trolley Drives. The trolley drives shall be A-4 type as specified in CMAA #70.

2.3.15 Shafts, Axles, and Pins. All shafts, axles, and pins shall be steel. The trolley axles shall be of the rotating type.

2.3.16 Trolley Wheels. The trolley travel wheels shall be double flanged and rolled-to-shape or roll-forged to provide properties in congruence with ASTM A504 or equivalent Japanese industrial standards. Wheels shall not be made from plate steel. Trolley wheels shall have straight treads. Wheels shall be rim toughened to not less than 320 BHN. Wheel sizing shall be in accordance with CMAA #70 recommendations.

2.3.17 Keys and Keyseats. Key / keyseat assemblies shall be of the parallel type and machined. The manner of key installation shall preclude any possibility of a key shifting out of its intended position.

2.3.18 Bearings. All bearings shall be of the antifriction type except where specifically permitted or required otherwise. Permanently lubricated sealed bearings shall be used wherever practical. All antifriction bearings shall be supplied with inner races except that bearings without inner races are permitted as part of packaged hoist units. If a pedestal bearing is used to support the drum, the housing shall be steel.

2.3.19 Shims. All based mounted components shall have a minimum of 0.100 inches of shims under each foot. The number of shims of any thickness shall be limited to four (4) under any mounting bolt. Shoe brake bases shall be shimmed to align the brake shoes with the brake wheel. Shims shall be pre-cut, slotted, stainless steel, with the thickness stamped on an insert tab. The shape of the shims shall resemble a U and the slot widths shall approximate the mounting bolt diameters. The shim tabs shall be visible after installation.

2.3.20 Fits. All gears, pinions, couplings, brake drums, wire rope drums, wheels, other similar components shall be interference fitted to their respective shaft or axle. Interference fits shall conform to the force fit requirements prescribed in ANSI B4.1 and shall be medium drive fits unless length of engagement, material, or loading indicates otherwise. Alternatively, in bridge and trolley drives, keyless hub-to-shaft connections shall be permitted where minimum potential interface fits capable of transmitting maximum torque (not less than 200% rated motor torque) is provided. The individual component manufacturers shall endorse these interference fits. Bearings, bushings, and seals shall be fitted in accordance with the manufacturer's recommendations. Where multiple interference fitted components are installed on a single shaft from the same end, there shall be clearance between each component's bore and the portion of the shaft from the installation end up to its mounting location. Fits of components within standard commercial assemblies, such as gear reducers and electric motors, shall comply with the applicable industry standards or with the manufacturer's standard practice if industry standard criteria are not available.

2.4 ELECTRICAL REQUIREMENTS

2.4.1 The hoist/trolley shall be designed to operate on 440-volt, 3-phase plus equipment grounding conductor 60-hertz, AC, and capable of operating ancillary loads as well as the hoist, bridge, and trolley functions simultaneously with 100% rated load and 100% speed. Existing function motors are: hoist (2) 33 KW (44.25 HP), (2) trolley 2.2 KW (2.95 HP), (2) bridge 3.7 KW (4.96 HP). All control circuits shall be fed from a single phase, air cooled, double wound transformer. Enclosures for control panels and auxiliary devices shall be UL or CSA listed metallic NEMA type 12 as defined by NEMA Standards Publication Number 250. The enclosures shall be designed with appropriate heating and/or cooling accessories to maintain a climate within the panel that provides an appropriate internal temperature environment for proper operation of the drives. There shall not be any condensation inside the control panels. All electrical components shall be industrial grade and located so they are easily accessible for inspection and maintenance.

2.4.2 The contractor shall remove the existing 100 A runway electrification system and provide a new rigid runway electrification system for the crane with sufficient capacity for the existing bridge and new drives, including all necessary hardware to the crane from a wall or column mounted disconnect switch that will be installed in section 2.4.3 of this specification. The runway electrification system shall consist of three power conductors and an equipment grounding conductor that shall connect to a reliable building ground. The new electrification system shall be enclosed safety bar type. The ground runway conductor shall be colored green. Runway conductors shall be a minimum of 125 amps and sized for simultaneous motions of the bridge, trolley, and main hoist drive. The crane shall be grounded through the runway electrification system. As necessary, modify the existing electrical collector shoes to match the new runway conductors. Collectors shall be heavy duty sliding shoe type and shall be compatible with the electrification system. The collector shoes shall be specifically designed to match the conductor contact surface. Collector arms shall be insulated, spring loaded and shall permit sufficient lateral and vertical movement to allow for imperfect track and for misalignment relative to the

crane. Two collector shoes (tandem design) shall be provided for each conductor; each collector shoe shall be rated for its branch circuit current or higher so as to provide redundancy. Contractor shall submit a calculation showing amperage required for simultaneous motions of the bridge, trolley, and main hoist drive and the resulting conductor size chosen. **(Submittal)**

2.4.3 The contractor shall provide a disconnecting switch between the runway contact conductors and the power supply meeting all requirements of NEC 610.31 including:

Readily accessible and operable from the ground or floor level.
Capable of being locked in the open position.
Open all ungrounded conductors simultaneously.

2.4.4 The contractor is to provide a main line disconnect switch on the OET bridge prior to the main power supply box to allow electrical isolation of the crane for service. The mainline disconnect shall be a lever arm type switch (rotary type switches are not acceptable) located in a separate enclosure, such that when the disconnect is secured; there are no energized conductors in any control panels. The disconnect switch shall meet all NEC requirements.

All interconnecting wiring shall be copper stranded construction. All electrical components shall be UL rated or equivalent local standards. Motor branch circuit conductors shall be sized as to have an ampacity not less than 150% of the motor full load current rating and to be no smaller than 12 AWG. Conductor selections shall be selected and de-rated based on maximum ambient temperature. In determining the ampacity of continuous loads such as utility, heating, lighting, and air conditioning shall be multiplied by 2.25 in order to permit application of NEC 610-14 (a) for crane supply conductors.

Raceways shall be ferrous rigid metal conduit. Liquidtight flexible metal conduit may be used for run less than 1 meter when flexible connections are needed for motors and lighting. Excluding conduit directly connected to dynamic breaking resistors, raceways shall maintain a 12-inch clearance between the raceway and surfaces with temperatures exceeding 104°F. A separate grounding wire, sized in accordance with Section 250-122 of NEC, shall be routed with all ungrounded conductors. All wiring shall be numbered or tagged at all connection points. Power conductors which are shielded shall be labeled as to the conductor size. All unused conduit openings shall be plugged. All conductors shall terminate on terminal blocks; there shall be no splices, except for the following exceptions:

a. Encoder conductors shall have a continuous run from the encoder to the drive. If signal transmission between a drive and encoder is longer than 50 meters, then fiber optic cable shall be used.

b. Motor connections may be lugged and connected with nuts, bolts, flat washers and lock washers in lieu of terminal block in the motor connection box. No wire-nuts shall be permitted.

2.4.5 Bridge-to-trolley electrification shall be festooned type utilizing flat cables suspended from carriers riding on an I-beam or C-track. The conductors shall be selected so as to be of the longest length without splices. Conductors shall be fabricated from copper. A minimum of 20% of the festoon control circuit conductors for each electrification system shall be spares at the time of crane acceptance. The trolley is required to be grounded through this conductor system. Festooned cable loops shall not extend below the high hook position. Lighting shall be added, mounted on the bridge walkway, aimed downward, on the floor. There shall be a minimum of (2)

500 W lights provided, illumination shall be approximately the same illumination as existing building fixtures, and shall be energized with crane power. Lighting fixtures shall be complete with lamps, shall be of rugged design and construction, and shall be of corrosion resistant materials. An on/off switch for crane lighting shall be located on the pendant controller.

2.4.6 Grounding and Bonding. Component grounding and bonding shall be IAW NEC 610.61.

2.4.7 Each hoist shall be equipped with upper and lower limit switches as well as a redundant block operated secondary upper limit switch to prevent contact between the hook and crane components ("two blocking"). When the primary upper limit is reached, the operator shall still be able to lower the block out of the upper limit switch. Lowering of the block shall automatically reset the primary limit switch. A lower limit switch shall be adjustable to set the extreme lower limits of hook travel. When the lower limit is reached, the operator shall still be able to raise the block. Raising of the block shall automatically reset the lower limit switch. The anti-two blocking limit shall be a gravity-set block-actuated switch. The block actuated switch shall remove all power from the affected hoist drive motor and brake independent of the hoist drive controller, utilizing a hoist line contactor, and set the brake when the secondary upper limit is reached. A spring-returned three position keyed bypass switch to bypass the hoist limits shall be provided on the outside of the control panel for each hoist. The far right position shall allow resetting of the secondary upper limit switch prior to resuming operation. During resetting of the secondary limit, the hoist shall operate in the lowering direction only. The far left position shall allow bypassing of the primary upper limit switch to allow the secondary limit switch to be tested on a periodic basis. The center position of the bypass switch shall be the NORMAL position with neither upper limit being bypassed. Hoist drives shall include slow down function that limits hoist speed to 25% when approaching upper and lower limit switches.

The primary upper limit switches shall be set at the maximum practical hook height but not lower than the existing hoists' lifts. The secondary upper limit switches shall be set not lower than the hook block height of the primary upper limit switch plus the maximum run-out distance and not higher than the maximum run-out distance below the lowest contact point of the hoist or trolley structure (two-block condition). (The runout distance is defined as the hook block maximum drift after switch activation, in the hoisting direction at rated speed with no load on the hook.)

2.4.8 All controllers shall be properly selected, installed, and adjusted. Controllers for all motors shall be inverter type with smooth drive mechanism operating characteristics in hoisting and trolleying for the bridge crane. Static reversing, adjustable frequency controllers shall be provided for the trolley electric drive. Static reversing, adjustable frequency, speed regulated, closed loop flux vector controller with encoder feedback shall be provided for each hoist. Dynamic braking shall be provided for each electric drive. Hoist and trolley brakes shall set after the associated controller decelerates the drive motor to a controlled stop. Hoist and trolley controllers shall be sized to provide sufficient starting torque to initiate motion of that crane drive mechanism from standstill with 0 to 131.25% of rated load on the hook and not produce any rollback. The hoist controller shall enable the drive motor to develop full torque continuously at zero speed. All new motors must run smoothly, without torque pulsations at the lowest speed and be energized at a frequency not exceeding 60 HZ, but not less than 50 Hz, at the high speed.

Varistors for transient protection shall be provided internal to the controller.

Minimum harmonics protection shall consist of a reactor connected in series with each controller's line (input) terminals. All reactors shall be rated for continuous duty operation based upon motor nameplate amperes and shall be designed for 60 HZ operation.

For a drive motor branch circuit that exceeds 33 meters in length, a reactor shall also be connected

in series with the controller load (output) terminals to provide standing wave protection.

2.4.9 The drive mechanism motors shall conform to NEMA MG 1. The hoist motors shall be AC vector duty, totally enclosed non ventilated (TENV) or totally enclosed fan cooled (TEFC), squirrel cage induction type with encoder. The trolley drive motors shall be AC inverter duty, totally enclosed non-ventilated (TENV) or totally enclosed fan cooled (TEFC), squirrel cage induction type. All motors shall have a 60 minute duty rating minimum. Motor insulation shall be a minimum of Class F, with a Class B temperature rise.

Motors shall be equipped with thermal trip type over-temperature protection. The temperature sensors shall be of the automatic resetting type and installed integral to the motor windings. Activation of any integral motor over-temperature device shall energize a red indicating FAULT light mounted on the crane and shall de-energize the individual function as follows:

Hoist: Hoisting direction only

Trolley: Travel motion in either direction.

The red indicating fault light shall remain energized until the over-temperature device resets.

2.4.10 Each drive mechanism's electro-mechanical brake(s) shall release upon movement of the electric drive's push button from the OFF position and verification of motor torque and shall set after the electric drive's controller is returned to the OFF position and motors have regeneratively slowed to a controlled stop. Hoist secondary brakes shall be controlled separate from the primary brakes and connected to a different output (within the drive or independent of the drive) from the primary brakes as specified in Appendix A.

2.4.11 Overload Protection. Each hoist shall be provided with a load-limit system consisting of a load-cell, load-sensing electronics, overload indicator lights, overload alarm bell and alarm cut-out switch. Each load cell shall be mounted to receive the load from equalizing sheave pin or upper block sheave pin. A load-limit system shall be capable of detecting and stopping hoist up operation during overload conditions at any speed shall be provided on each hoist motor circuit. Each load limit system shall have a keyed override, accessible during hoist testing, which can be deactivated during overload testing. The keyed override shall be located on the control panel. The contractor shall provide documentation from the overload limiting device manufacturer stating the tested tolerance for a range of settings from 80% to 125% of the rated hoist capacity. A final adjustment of overload protection shall be set at 95% of rated load. Provide an overload alarm light located on the crane to indicate a load greater than the preset maximum. Overload alarm shall be indicated with a red light and clearly labeled "OVERLOAD". Also provide a bell to indicate when an overload condition exists. Make provisions to turn off the bell from pendant station.

2.4.12 There shall be one main line contactor. Energization of the main line contactor shall be controlled by a POWER-OFF/POWER-ON pushbutton on the pushbutton station.

2.4.13 Proper over current protection for the control circuit, including control circuit transformer, shall be provided in accordance with the National Electric Code or relevant JIS. Motor branch circuits shall be individually protected by circuit breakers capable of being locked in the open position without use of a portable lockout device.

2.4.14 Pendant controls. Pendant controls shall have a means for securing crane power during normal work stoppage. “Power off” pushbutton must be wired to remove all power from the motors and brakes. Pendant control pushbuttons shall have two stages for each function operation, shall be spring returned to OFF position and shall be marked legibly (in KANJI) to indicate the motion it controls. The first stage shall be low speed. The second stage shall allow rated function speed to be achieved. Pendant controllers shall be supported from overhead by a small stainless steel wire rope or strain lead. Pendant weight shall not be supported by the pendant cable. The strain lead must be at least 3 mm diameter. A horn or bell, energized by a pushbutton on the pendant controller shall be provided.

2.4.14.1 Provide heavy-duty, dust-and-oil-tight type operating pushbuttons, and the following pendant control pushbuttons is for overhead bridge crane.

(1) Main Hoist (Ue/Shita)
(2) Aux. Hoist (Ue/Shita)
(3) Trolley (Kita/Minami)
(4) Bridge (Higashi/Nishi)
(5) Power (Iri/Kiri)
(6) Warning bell or horn switch
(7) Lights (Iri/Kiri)

2.4.14.2 A black "POWER ON" push-button with a guard to prevent accidental actuation, a red mushroom head POWER OFF pushbutton and a key to allow locking the pendant in the OFF position shall be provided.

2.4.15 Provide the junction box at transition from horizontal to vertical for pendant cable, and ensure that festooning cables do not interfere with the hoist or building interferences after installation. The pendant shall move independent of the trolley and be capable of allowing operation from any point along the "span".

2.4.16 There shall be two 120 VAC duplex outlets complete with metal weather-proof enclosure and self-closing weatherproof receptacle cover provided on the crane. The outlets shall be located at the end of the bridge runway near the bridge motors. The circuit(s) supplying receptacles shall incorporate ground-fault circuit-interrupter protection for personnel and shall be protected by a circuit breaker with a minimum rating of 15 amps.

2.4. 17 Identification. Electrical wires shall be marked at all connection points. All interconnecting wires shall be of stranded construction. All electrical connections shall be torqued. Torque the connections as specified by the manufacturer of the electrical component, or if the manufacturers torque specification is not available, to the torques specified in JIS C2805 Table 2. All connections in motor and control circuits shall be on terminal boards, or made with crimped lugs that are bolted/screwed together and insulated.

2.4.18 Hour Meter

Provide a non-resettable hour meter, connected across the main line contactor, readable from the exterior of the main control panel, to indicate the elapsed number of hours the crane is energized.

2.4.19 Indicator Lights
All indicator lights shall be located on the crane and be visible from the ground these include:

(1) A white pilot light to indicate that power is available on the load side of the crane disconnect.

(2) A blue pilot light to indicate crane is energized.
(3) A red fault light as specified indicated in paragraph 2.4.9.
(4) A red OVERLOAD light as specified in paragraph 2.4.11.

2.5 MISCELLANEOUS REQUIREMENTS

2.5.1 Capacity Signs. Two capacity plates shall be provided, one for each side of the crane. Each plate shall be lettered to indicate the rated capacity of the bridge and the rated hoisting capacity of the hoist in pounds. The capacity plates shall be of sheet metal with black epoxy paint lettering on a white epoxy paint background. All lettering shall be of sufficient size to be easily read from the floor. Capacity plates shall be securely attached to the crane.

2.5.2 Bridge/Trolley Direction Labeling. The bridge and trolley travel directions shall be labeled as N/S/E/W (marked legibly in KANJI). These directions shall be labeled on the end trucks and bridge girder, or the hoist bottom so they are visible from the floor. The pendant pushbuttons shall have corresponding directional labels.

3 TEST, INSPECTION AND ACCEPTANCE

3.1 General Testing Requirements**.** Each prescribed test and inspection shall be fully documented in a report describing data recorded, conditions observed, acceptability, dates, and personnel involved. All testing shall be performed in the presence of Government representatives. The Contractor shall advise the Government of the anticipated test dates not less than seven working days prior to the beginning of the test.

3.1.1 Existing Conditions. Prior to installation, the existing crane and building shall be inspected by the crane contractor and a representative appointed by the Contracting Officer to document the condition of all existing construction and record any existing damage, and verify operating clearances. Upon completion of the work, the crane contractor and the appointed representative shall again inspect the building to determine the extent of any damage that may have occurred as a result of work performed under this contract. Any damage to either the building and/or its contents as a result of the crane installation and/or testing shall be the responsibility of the crane contractor under this contract.

3.2 Shop Testing. The Contractor at his own facility prior to shipment shall test each operating part or major component of the assembled new hoists/trolley at a minimum of "No Load". Items tested and/or inspected shall include brakes (operation and adjustment), interlocks, lights, motor controls, speeds, limit switches, wiring, and paint.

3.3 Field Testing. After the new hoists/trolley is installed, the Contractor shall perform inspection, and then perform no load, endurance and load tests in accordance with Appendix B.

3.3.1 Prior to lifting weights for the first time, the Contractor shall allow the Government to perform a safety inspection of the crane. The Contractor shall assist the Government by operating the crane as needed.

3.3.2 Government shall provide certified test weights and rigging gear for crane testing. The contractor shall provide all personnel and equipment necessary to conduct the tests, including but not limited to crane operators, riggers, personnel to supervise the test and record results, and calibrated test equipment. A government representative shall be on site during testing to verify data recorded and verify testing performed. The test weight marked shall be the actual weight taken from the scale or other measurement device. Solid weights shall be measured

using calibrated equipment traceable to the National Institute of Standards and Technology, with a minimum accuracy of ±2%. Test areas must be roped off or otherwise secured to prevent entry of unauthorized personnel and equipment.

3.4 Final Government Inspection**.** After satisfactory Contractor field-testing, the Government shall have 15 working days to operate and inspect the crane for contract compliance. The Government shall provide the Contractor with a punch list of deficient items for correction. The Contractor shall correct all noncompliant items, at Contractor expense, prior to acceptance.

3.5 Acceptance. The Government acceptance location of the crane will be in Building 480 at the SRF-JRMC Detachment Sasebo, Japan, after satisfactory results from the tests and inspections and after receipt of all certifications and technical documentation.

4 TECHNICAL DOCUMENTATION

4.1 General Requirements. The Contractor shall submit to the Government Representative all items of technical documentation listed hereinafter. The Contractor shall ensure that all submittals are entirely legible, translated in English and Japanese, and fully comply with the contract requirements. The content and time of submission shall be as specified below. Submit three (3) copies of all submittals unless otherwise noted. The Government shall have 2 weeks minimum to review all submittals prior to the contractor starting work.

4.2 Design Submittals – SUBMIT PRIOR TO FABRICATION

4.2.1 CALCULATIONS. The following industry standard sizing calculations shall be provided for review. All variables shall be listed and defined at the beginning of each calculation section; variables shall be in accordance with required references. Calculations shall include all relevant loads, stresses, allowable and resulting factors of safety based on the existing loading data.

a) CMAA 70 load cases 1 and 2 or JIS B 8821 calculation standards for steels structures of cranes. In addition to load cases 1 and 2 of CMAA No. 70, the following additional load combination shall also be considered:

Test Loads - The modified crane will be periodically tested up to 131.25% of the modified capacity. Combined stresses for the following load combinations shall be calculated to ensure structural adequacy during testing:

Case 3: Test Loads (Stress Level 3)

$DL\ (DLF_B) + TL\ (DLF_T) + LL\ (1 + HLF) + IFD + SK$

Notes: (1) LL = 1.3125 x rated capacity.

(2) Test and extraordinary loads shall not be considered in the fatigue analysis.

(3) Formula abbreviations correspond to principal loads as defined in CMAA #70 Section 3.3.

(4) The subscripts “T” and “B” refer to trolley and bridge, respectively.

b) Wire rope calculations indicating FS > 5 between rated load line pull and nominal wire rope strength

c) CMAA 70 motor and brake sizing calculations or JIS C9620

d) Trolley endstops

e) Dead weight delineating hoist/trolley, end trucks, and total crane weight

f) Bridge maximum wheel loads (without impact)

g) Runway electrification system and disconnect sizing

h) Overcurrent protection

i) Trolley frame analysis including hoist support beam deflection as applicable.

j) Design/selection compliance to components applicable to section 2.3.10.

4.2.2 DRAWINGS.

4.2.2.1 General Arrangement Drawings. These drawings shall demonstrate compliance with the contract specification. The complete crane rail system shall be shown in plan view. In addition, the crane shall be shown in side and end elevation views. All major features of the crane shall be shown, including:

a) clearances from operating envelope

b) dead weights of each new or replaced crane component and location of centers of gravity for each

c) speeds (trolley and hoist)

d) capacity

e) electrical power supply requirements.

f) bridge and trolley wheel loads (without impact).

g) hoist/trolley make and model

h) trolley electrification detail

i) pendant detail

j) hook coverage map

4.2.2.2 Bridge (Runway) Electrification Layout. Provide a layout of the replacement runway conductor/collector system. The layout shall show the position of support brackets including fastening details, all components of the electrification system, and appropriate dimensions.

4.2.2.3 Electrical Drawings. These drawings shall include complete schematic diagrams for the crane. Complete assembly (wiring) diagrams including a comprehensive component material list showing all electrical components used on the crane. These drawings shall show the layout of electrical equipment on the crane, including control panel enclosures, motors, brakes, limit switches, conduits, and conductor systems.

4.2.3 CATALOG CUTS. Catalog cuts shall be marked-up or supplemented with additional sheets to clearly identify the model or size and selected options, features, or modifications to demonstrate compliance with specification requirements. Catalog cuts, which show any modifications beyond the standard options and all supplemental pages, shall bear original signatures and dates of the equipment manufacturer's authorized representative. Each catalog cut and each supplemental sheet shall clearly identify the drive to which it applies. The contractor shall submit catalog cuts for the following items.

a) hoist/trolley (including details on any gear reducers, brakes, couplings, limit switches, motors, hook blocks, hooks, wire rope, bumpers, etc.)

b) hoist drive's motor control equipment

c) trolley drive's motor control equipment

d) runway electrification

e) electrical cable festoon system (trolley)

f) pendant control, pendant cable

g) motors

h) variable frequency drives

4.2.4 INSTALLATION PLAN. The Contractor shall submit a plan detailing the logistics involved in unloading at the laydown area and erection of the new hoist/trolley. The plan shall include the type of equipment necessary for the unloading at the laydown area, storage and protection of the new hoist/trolley at the laydown area, transportation to the erection site, coordination of work effort, equipment, and materials required for testing and explanation of new hoist/trolley erection and testing.

4.3 Project Documentation Submittals – SUBMIT PRIOR TO FIELD TESTING (unless specified elsewhere in this document)

4.3.1 CERTIFICATIONS. All certifications shall be dated and shall bear the original signature (above the printed name) of the authorized representative of the Contractor or the manufacturer of the items or equipment being certified. Each certification shall clearly identify the drive, component, or location (as applicable) to which it applies.

4.3.2 TECHNICAL MANUAL. The contractor shall provide a technical manual for the crane containing at a minimum the following items. The technical manual shall be supplied in paper and electronic format. The technical manual will not be limited to the hoist/trolley alone, but shall include all the equipment furnished under this contract.

a) assembly, installation, alignment, and programming instructions

b) preventative maintenance, including periodicity

c) equipment function, normal operating instructions and characteristics, and special precautions/limiting conditions for starting and stopping, operation, and safety

d) guide to troubleshooting

e) lubrication instructions including location of lubrication points, type of lubricant to be used, and the frequency of lubrication

f) catalog cuts for all components (see Design Submittal requirements)

g) parts lists including enough detail to support ordering replacement parts from general industry and a recommended spare parts list

h) as-built drawings in 11" x 17" format.

i) Control System Parameter Record. After the crane has passed the final field test, the contractor shall complete a control system parameter record for the crane and provide the crane parameter file downloaded from the crane at time of acceptance. The record shall include the contract number, contractor’s name and address, date, all control system

parameters and their final settings. Each control system parameter shall be designated as either used or unused.

4.3.3 INSPECTION, ENDURANCE TESTING AND NO LOAD/LOAD TEST REPORTS

4.3.3.1 Inspection Reports. The contractor shall submit a maintenance inspection report to document the inspections required by Appendix B. A preliminary copy shall be submitted for review prior to the inspection and a completed copy shall be submitted with the inspection results.

4.3.3.2 No load/Load Test Procedures/Report. The contractor shall develop and submit a proposed no load/load test procedure including all contractual and OSHA required testing that will demonstrate operation, capacity, safety etc. of the crane. As a minimum, the test procedure shall conform to the requirements of Appendix B. The test procedure shall be submitted and approved prior to beginning any testing. Upon successful completion of all testing, the contractor shall submit a completed record of test results and data.

4.4 As-Built Submittals – SUBMIT AFTER COMPLETION OF FINAL PUNCHLIST

4.4.1 AS-BUILT DRAWINGS. The purpose of the "as-built" drawing classification is to identify the last approved version, which the crane design/construction has undergone at the time of its acceptance by the Government. Each drawing shall list the latest revision - in alphabetical order- followed by the "as-built" entry in the revision block.

4.4.2 DRAWINGS ON CD-ROM. The Contractor shall provide all final "as built" contract drawings on CD-ROM disk(s). The format of the drawing files shall be in AutoCAD. Files shall have "DWG" extensions in version 2002 or newer or DXF format.

5 ADMINISTRATIVE REQUIREMENTS

5.1 Christmas Shutdown. In addition to the above listed holidays, SRF-JRMC Yokosuka is normally closed for all except emergency services during the week between Christmas and New Year's Day. Any onsite work during this time must be specifically requested by the Contractor and approved by the Government Representative as stated above.

5.2 Legal/Regulatory Compliance. The Contractor is responsible for obtaining all appointments, licenses, and permits required for the prosecution of the work. The Government Representative may request evidence of such permits and licenses at any time during contract performance.

5.3 Safety Plan. The Contractor shall be required to submit a formal Safety Plan within fifteen (15) working days following contract award. The Safety Plan must comply with all of the applicable standards contained in 29 CFR, Parts 1910, 1915, and 1926. The Safety Plan must be designed to assure that the cranes, personnel, equipment, building, Government property and adjacent waters will be safeguarded against injury or damage throughout the crane removal and installation process. The plan will address worker fall protection. **(Submittal)**

5.4 Energy Conservation. The Contractor shall comply with the base energy conservation program. Use of high energy consuming tools or equipment requires prior approval by the Government Representative.

5.5 Design Review Meeting. The contractor shall, prior to commencing fabrication, meet in a Design Review meeting with the Government Representative and other Government personnel to discuss the design and any comment resolutions. Prior to the design review meeting, the contractor shall have submitted required drawings and calculations a minimum of one month earlier for Government review. The contractor shall notify the Government 30 days prior to scheduling of the Design Review Meeting.

CSA-121A

AVTRON ADDVANTAGE-32 ホイストドライブのマイクロプロセッサーの故障

参照: A/MSG/NAVCRANECEN LESTER PA/061700Z/JUN03

1. 本安全広報の目的は、マイクロプロセッサーで制御されるクレーンの安全装置に関する詳しい情報と指示を提供することである。マイクロプロセッサーで制御されるクレーンには、周波数可変装置、フラックスベクトル装置、インバータ装置、デジタル DC 装置、シリコン制御型整流装置(SCR'S) や絶縁型バイポーラトランジスタ(IGBT'S) の点弧を制御するマイクロプロセッサーを使用する装置等が含まれる。

2. 背景：参照Ａは、AVTRON ADDVANTAGE-32 ホイスト制御ホイストドライブにおいて、つり荷の制御不良があったことを海軍のあるゆる部隊に警告し、NCC の同意の下に部隊の技術部門がドライブ/コントロールの適切な予防対策が決定するまで上記のホイストドライブが備わるクレーンの使用を中止するよう指示していた。これまでに、各部隊は NCC の同意の下、その他の製造メーカーのマイクロプロセッサー制御ホイストドライブについてもマイクロプロセッサー制御盤が故障した場合に、つり荷の制御不良を防止する適切な予防対策の実施を決定するよう指示を受けていた。

3. 定義：

   Ａ．閉ループシステムとは、回転計発電機（タコジェネレーター）エンコーダレゾルバー等によってモータの軸回転速度が駆動制御部に帰還するシステムである。

   Ｂ．開ループシステムとは、回転計発電機（タコジェネレーター）エンコーダレゾルバー等によってモータの軸回転速度が駆動制御部に帰還しないシステムである。

   Ｃ．トルクプルービングとは、ブレーキが開放される前に、つり荷を宙づりのまま保持するために必要な十分なモーター制動トルクを確保するドライブである。

4. 指示：マイクロプロセッサーで制御されるクレーンと NAVFAC P-307 第 14 節に記されるクレーンとホイストすべてについて、各部隊は NCC の同意の下、マイコン駆動制御部の一内部部品が不良になった場合に、つり荷の制御不良を防止する適切な予防対策を決定するよう指示を受けた。部隊の決定事項および NCC の同意内容を文書化し、該当クレーンの機器経歴ファイルに機器が廃却されるまで保存しておくこと。

5. ドライブ/コントロールの適切な最低予防対策を以下に記す：

   Ａ．モータとブレーキからの電源をすべて遮断するための「非常停止」または「電源切り」ボタンが備わっていること。

   Ｂ．ホイストドライブモーターとブレーキからの電源をすべて遮断するための最終上限リミットスウイッチ回路がマイクロプロセッサードライブから独立して備わっていること。

   Ｃ．開ループシステムは、動力伝達装置のメカニカルロードブレーキを利用しなければならない。

   Ｄ．閉ループシステムは、モーター制動トルクを供給できなければならない。

6. 閉ループシステムは、以下の機能のうちの一つを備えている事：

   Ａ．ホイストブレーキを１台備えるクレーンの場合、ブレーキを開放するために、それぞれのブレーキ接触器を励磁する２つの独立した出力回路が必要である（接触子がブレーキコイルと直列になっているもの）。もしくは、そのドライブから独立した追加のブレーキ接触器で、その接触子がドライブが制御するブレーキ接触器と直列になったもの。

B．ホイストブレーキが２台備わるクレーンの場合、２次ブレーキは、１次ブレーキとは別の出力（ドライブ内または独立したドライブ）に接続されていること。

C．１次ブレーキ以外にメカニカルロードブレーキを備える事。

7. 以下の追加安全装置を検討しなければならない。

A．そのドライブから独立した複数の運転ができる１次ブレーキ。（例えば、マスタースイッチ/ペンダントステーションまたは「デッドマン」スイッチを通じて励磁される独立したブレーキ接触器に基ずいたブレーキ操作（それらのブレーキ接触子はドライブで制御されるブレーキ接触器と直列に配線されていなければならない。）

B．１次ブレーキとは別の駆動出力に接続されている２次ブレーキ。

C．２次ブレーキで、その運転がドライブから独立したもの。（例えば、マスタースイッチ/ペンダントステーションまたは「デッドマン」スイッチを通じて励磁される独立したブレーキ接触子によってブレーキが作動する）

D．ドライブプロセッサーを監視する独立した監視装置で、ブレーキを掛けたり、ドライブを停止することができるもの。

E．ドライブから独立した制御システム（プログラム可能な論理制御器またはコンピューターなど）で、このドライブの入力と出力を監視し、ブレーキを掛けたり、ドライブを停止することができるもの。

8. 本 CSA が参照Ａにて要求される対策完了日に代わり優先される。前述のパラグラフ４が要求する審査が本 CSA 発行日から 120 日以内に完了していること。クレーンに前述のパラグラフ５および６に記述する適切な安全装置を持たないものは、次回の年次 PM（またはタイプＢ）までに変更されていなければならない。前述のパラグラフ５および６の要件に関する例外や免除事項がクレーン改造申請書に記載されてあること。

9. 運転士は、制御されていない動きなどを察知したらいつでも「緊急停止」または「電源遮断」スイッチを投入すること。次に、クレーンの技術的な評価および/またはクレーン検査の通知を直ちに受けること。さらに NAVFAC P-307 の 10.13 項のつり荷の最初の巻き上げに指示されている通り、玉掛け員はつり荷が完全に宙づりになった時点で運転士に巻き上げ停止の合図を送り、つり荷が適切に安定しブレーキが適切に作動することを確認する。

10. 本 CSA は、REVMONT、CRAFT、SAMSUNG 60-ton ポータルクレーン、NAVSHIPYARD NORFOLK 165-ton スチフレッグデリック、SAMSUNG 151-ton ポータルクレーンまたは NAVSHIPYD PUGET SOUND の管理された工場内にある橋型クレーンには適用されない。NCC および各部隊の技術担当部門は、上記のクレーンをこれまでに審査した。これらのクレーンは、本 CSA のパラグラフ５および６を満たし、パラグラフ７および 11 に記述する追加安全装置類が最低一つ備わっている。

11. すべての新しいクレーンと NAVFAC P-307 第 14 節のホイストとクレーンはすべて、本 CSA の要件満たさなければならない。

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FM NAVCRANECEN LESTER PA//09//
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BT
UNCLAS //11262//
MSGID/GENADMIN/NAVCRANECEN LESTER PA//

SUBJ/CRANE SAFETY ADVISORY (CSA) 121, MICROPROCESSOR FAILURE ON /AVTRON ADDVANTAGE-32 HOIST DRIVES// REF/A/MSG/NAVCRANECEN LESTER PA/161602ZSEP2002// AMPN/REF A IS CRANE SAFETY ADVISORY 110, UNCONTROLLED LOWERING OF WHIP HOIST.// POC/ANGELO HORIATES/GS/NAVY CRANE CENTER/LOC:LESTER PA
/TEL:610-595-0505/TEL:DSN: 443-0505/TEL:FAX: 610-595-0748
/EMAIL:HORIATESAG@NCC.NAVFAC.NAVY.MIL//

RMKS/1. The purpose of this CSA is to alert navy activities of a catastrophic failure on an AVTRON addvantage-32 hoist drive. A private shipyard reported that a KONE crane utilizing the subject drive for its auxiliary hoist failed causing a load to free fall approximately 18 inches to the ground. The operator lifted the load and intended to stop to verify the load was balanced. When the page 02 RULSBMR0284 UNCLAS //11262// hoist controller was returned to neutral, the load lowered to the ground. The cause of the drive failure has been identified as a failed chip on a microprocessor circuit board. This failure allowed the aux hoist brake to remain open even though the controller was in the neutral position.

2. Activities are directed to determine if any of their cranes utilize AVTRON addvantage-32 drives. If these drives are utilized in hoists, activities are directed to remove these cranes from service until the local engineering organization has determined, with concurrence by Navy Crane Center, that appropriate drive/control safeguards are in place to prevent loss of load control if the microprocessor board fails.

3. For all other manufacturers' microprocessor controlled hoist drives, activities are directed to determined within 120 days, with concurrence by navy crane center, that appropriate drive/control safeguards are in place to prevent loss of load control if a microprocessor board fails. This CSA does not apply to REVmont, craft, or Samsung 60 ton portal cranes, the Samsung 151 ton portal crane, Navshipyd Norfolk 165 ton stiff leg derrick, or to Navshipyd Puget sound bridge cranes in the controlled industrial facility. PAGE 03 RULSBMR0284 UNCLAS //11262//
These cranes have appropriate safeguards.

4. As noted in ref a, whenever the operator senses a loss of control, he/she should engage the "emergency stop" or "power off" switch. Crane engineering and/or crane inspection should be immediately notified. In addition, as specified in NAVFAC P-307 paragraph 10.13, upon initial hoisting of the load, the rigger shall signal the operator to stop hoisting when the load becomes completely suspended (i.e., lifted just enough to clear the ground) to ensure the load is properly balanced and the brake is functioning properly.//
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SUBJ/CRANE SAFETY ADVISORY (CSA) 121A, MICROPROCESSOR FAILURE ON/AVTRON ADDVANTAGE 32 HOIST DRIVES//
REF/A/MSG/NAVCRANECEN LESTER PA/061700Z/JUN03//AMPN/-//
POC/ANGELO HORIATES/GS/NAVCRANECEN/LOC:LESTER PA/
TEL:610-595-0505 EXT 125/TEL:DSN: 443-0505/TEL:FAX: 610-595-0748
EMAIL:horiatesag@ncc.navfac.navy.mil//

RMKS/1. The purpose of this CSA is to provide additional information and direction regarding required safety features on microprocessor controlled cranes. Microprocessor controlled cranes include adjustable frequency drives, flux-vector drives, inverter drives, digital dc drives, and any other drives utilizing a microprocessor that controls the firing of silicon controlled rectifiers (SCR's) or insulated gate bipolar transistors (IGBT's).

2. BACKGROUND: REF A alerted navy activities of a loss of load control failure on an AVTRON addvantage-32 hoist drive and directed activities to remove cranes equipped with these hoist drives from service until the local engineering organization, with concurrence by navy crane center (NCC), could determine that appropriate drive/control safeguards are in place. Additionally, for all other manufacturers' microprocessor controlled hoist drives, activities were directed to determine, with concurrence by NCC, that appropriate drive/control safeguards were in place to prevent loss of load control should a microprocessor board fail.

3. DEFINITIONS:
A. Closed-loop system is a drive system where there is motor shaft speed feedback to the drive controller by a tachometer-generator, encoder, or resolver.

B. Open-loop system is a drive system where there is no motor shaft speed feedback to the drive controller.

C. Torque proving is a drive feature that ensures adequate motor torque is available to suspend the load before brakes are released.

4. DIRECTION: for all microprocessor controlled hoist drives, including NAVFAC P-307 Section 14 hoists and cranes, activities are directed to determine, with concurrence by NCC, that appropriate drive/control safeguards are in place to prevent loss of load control should an internal component in a microprocessor drive fail. This determination and NCC concurrence shall be documented and permanently placed in the crane's equipment history file. Previous determinations shall be reaccomplished as a result of updated requirements.

5. Appropriate minimum drive/control safeguards are identified below:

A. "emergency stop" or "power off" pushbuttons must be wired to remove all power from the motors and brakes.

B. Final upper limit switch circuitry must be wired to remove all power from the hoist drive motor and brake(s) independent of the microprocessor drive.

C. Open-loop systems must utilize a mechanical load brake in the drivetrain.

D. Closed-loop systems must provide torque proving.

6. For closed-loop systems, one of the following features is also required:

A. For cranes with one hoist brake, two independent drive outputs energizing separate brake contactors, whose contacts are in series with the brake coil, are required to release the brake; or an additional separate brake contactor independent of the drive whose contact is in series with the drive controlled brake contactor.

B. For cranes with two hoist brakes, the secondary brake shall be connected to a different output (within the drive or independent of the drive) from the primary brake.

C. A mechanical load brake in addition to the primary brake.

7. The following additional safety features should be considered:

A. A primary brake that has redundant operation independent of the drive (e.g., a brake operation based upon a separate brake contactor energized through the master switch/pendant station or “Deadman” contacts whose contact is in series with the drive controlled brake contactor).

B. A secondary brake connected to a different drive output from the primary brake.

C. A secondary brake whose operation is independent of the drive (e.g., a brake operation based upon a separate brake contactor energized through the master switch/pendant station or “Deadman” contacts).

D. An independent watchdog system monitoring the drive processor that has the capability to apply the brakes and shut down the drive.

E. A supervisory control system (such as a programmable logic controller or computer), independent of the drive, that monitors the inputs and outputs of the drive and has the capability to apply the brakes and shut down the drive.

8. The action completion dates required by ref a are superseded by this CSA. The review required by paragraph 4 shall be completed within 120 days of the issue date of this CSA. Cranes that are not equipped with adequate safety features as described in paragraphs 5 and 6, must be reconfigured by the next annual (or type “B”) pm after the review. Exceptions or waivers to the requirements of paragraphs 5 and 6 shall be addressed on crane alteration requests.

9. As noted previously, whenever the operator senses a loss of control, he/she should engage the “emergency stop” or “power off” switch. Crane engineering and/or crane inspection should be immediately notified. In addition, as specified in NAVFAC P-307, Paragraph 10.13, upon initial hoisting of the load, the rigger shall signal the operator to stop hoisting when the load becomes completely suspended (i.e., lifted just enough to clear the ground) to ensure the load is properly balanced and the brake(s) is functioning properly.

10. This CSA does not apply to Westmont, Craft, or Samsung 60-ton portal cranes, Navshipyd Norfolk 165-ton stiff leg derrick and Samsung 151-ton portal crane, or Navshipyd Puget sound bridge cranes in the controlled industrial facility. NCC and the local activity engineering

organizations have evaluated these cranes. These cranes meet paragraphs 5 and 6 of this CSA and are equipped with at least one of the additional safety features described in paragraph 7.

11. All new cranes including NAVFAC P-307 Section 14 hoists and cranes shall meet the requirements of this CSA