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USACE / NAVFAC / AFCESA **UFGS-14636N (February 2003)**

Preparing Activity: NAVFAC **Superseding UFGS-14636N (September 1999)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 23 June 2005

Latest change indicated by CHG tags.
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DIVISION 14 - CONVEYING SYSTEMS

SECTION 14636N

CRANES, OVERHEAD ELECTRIC, TOP RUNNING (UNDER 20,000 POUNDS)

02/03

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SECTION 14636N

CRANES, OVERHEAD ELECTRIC, TOP RUNNING (UNDER 20,000 POUNDS)
02/03

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NOTE: This guide specification covers the requirements for overhead electric traveling (OET) cranes with top running bridges and trolleys, and with capacities less than 10 metric ton tons.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.
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NOTE: TThis guide specification shall not be used to procure cranes of 10 metric ton ton capacity or greater; cranes that operate in "hazardous locations" as defined in the National Electrical Code; nonstandard cranes; or cranes that handle hot (molten) metals or fissionable materials. Requirements for procurement of such cranes and all cranes of 10 metric ton ton capacity or greater shall be forwarded to Northern Division, Naval Facilities Engineering Command, Attn: 09A4, Crane Center, 10 Industrial Highway, Mail Stop #82, Lester, PA 19913-2090. (See NAVFAC Instruction 11450.1A).
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NOTE: TO DOWNLOAD UFGS GRAPHICS

Go to http://www.ccb.org/docs/ufgshome/graphtoc.pdf.

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NOTE: The following information shall be shown on the project drawings:

1. Sketch UFGS-14636-1, including data.

2. Maximum span of runway girder.

3. Runway rail size.

4. Runway girder size.

5. Channel cap size.

6. Size and location of crane stops.

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PART 1 GENERAL

1.1 REFERENCES

****

NOTE: Issue (date) of references included in project specifications need not be more current than provided by the latest guide specification. Use of SpecsIntact automated reference checking is recommended for projects based on older guide specifications.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASME INTERNATIONAL (ASME)

ASME B30.2	(2002) Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)

ASTM INTERNATIONAL (ASTM)

ASTM A 275/A 275M	(2003) Magnetic Particle Examination of Steel Forgings
ASTM A 307	(2004) Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A 325	(2004b) Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A 325M	(2004b) Structural Bolts, Steel, Heat Treated, 830 Mpa Minimum Tensile Strength (Metric)

ASTM A 563	(2004a) Carbon and Alloy Steel Nuts
ASTM A 563M	(2004) Carbon and Alloy Steel Nuts (Metric)
ASTM F 436	(2004) Hardened Steel Washers
ASTM F 436M	(2004) Hardened Steel Washers (Metric)
ASTM F 959	(2004) Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 70	(2004) EnviroTop Running and Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes, No. 70

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 3	(1993; R 2000) Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC
NEMA ICS 6	(1993; R 2001) Industrial Control and Systems: Enclosures
NEMA MG 1	(2003; R 2004) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2005) National Electrical Code

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-W-410	(Rev E) Wire Rope and Strand

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910	Occupational Safety and Health Standards
29 CFR 1910.147	Control of Hazardous Energy (Lock Out/Tag Out)
29 CFR 1910.179	Overhead and Gantry Cranes
29 CFR 1910.306	Specific Purpose Equipment and Installations

1.2 REQUIREMENTS

The requirements for the crane runway and rail supporting structures are specified in section 05120, "Structural Steel".

1.3 VERIFICATION OF DIMENSIONS

The Contractor is responsible for the coordination and proper relation of his work to the building structure and to the work of all trades. The

Contractor shall verify all dimensions of the building that relate to fabrication of the crane and shall notify the Contracting Officer of any discrepancy before the order for the crane is finalized.

1.4 SUBMITTALS

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NOTE: Submittals must be limited to those necessary for adequate quality control. The importance of an item in the project should be one of the primary factors in determining if a submittal for the item should be required.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy projects.

Submittal items not designated with a "G" are considered as being for information only for Army projects and for Contractor Quality Control approval for Navy projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Overhead electric crane; G

SD-03 Product Data

Hoist; G

Controls; G

Couplings; G

Pendant pushbutton station; G

Electrification; G

Motors; G

Brakes; G

SD-05 Design Data

Load and sizing calculations; G

SD-06 Test Reports

Hook and hook nut magnetic-particle tests; G

Wire rope breaking strength; G

Post-erection inspection; G

Operational tests; G

Hook test; G

No-load test; G

Load tests; G

SD-07 Certificates

Overload test certificate; G

SD-10 Operation and Maintenance Data

Overhead electric crane, Data Package 3; G

Submit in accordance with Section 01781 OPERATION AND MAINTENANCE DATA.

1.5 QUALITY ASSURANCE

1.5.1 Certificates: Overload Test Certificate

Submit a statement that the crane can be periodically load tested to 125 percent (plus 5 minus 0) of rated load.

1.5.2 Drawings: Overhead Electric Crane

Show the general arrangement of all components, clearances and principal dimensions, assemblies of hoist, trolley and bridge drives, and electrical schematic drawings. Include weights of components and maximum bridge wheel loads and spacings.

1.5.3 Design Data: Load and Sizing Calculations

Submit calculations verifying the sizing of the bridge girder, end trucks and travel drives. [Include seismic analysis of bridge girder and end trucks.]

PART 2 PRODUCTS

2.1 GENERAL

****
NOTE: For LANTNAVFACENGCOM use Class C only.
****

****
NOTE: Specify Class A Crane where precise handling of valuable machinery and equipment at slow speeds with long idle periods is required. Full capacity loads may be handled for initial installation of machinery and for infrequent maintenance.

Specify Class B Crane where service requirements are light and speeds are slow. Loads may vary from no load to full capacity, averaging 50 percent of full capacity, with two to five lifts per hour. Not over 50 percent of the lifts will be at full capacity.

Specify Class C Crane where service requirements are moderate. Loads may vary from no load to full capacity, averaging 50 percent to full capacity, with 5 to 10 lifts per hour. Not over 50 percent of the loads will be at full capacity.
****

****
NOTE: A footwalk is recommended unless: the crane can be safely serviced by another means; or where lack of clearance would prohibit one.
****

Provide overhead electric traveling (OET) crane[s] conforming to CMAA 70, Class C, for [indoor] [outdoor] service, ASME B30.2, and as specified herein. [Provide a footwalk on the drive girder side.] The crane shall be pendant controlled and operate in the spaces and within the loading conditions indicated. The crane shall operate on [_____]-volts AC, 60 Hz, [single] [three] phase power source. Maximum crane wheel loads (without impact) due to dead and live loads, with the trolley in any position, shall not cause a more severe loading condition in the runway support structure than that produced by the design wheel loads and spacings indicated.

2.1.1 Capacity

The crane shall have a minimum rated capacity of [_____] metric tons tons ([_____] kg pounds). Mark the rated capacity in both kilogram and pound units printed in different colors on both sides of the crane on the bridge girders.

2.1.2 Speeds

****
NOTE: For LANTNAVFACENGCOM add bracketed sentence.
****

****

NOTE: Slow full-load operating speeds invariably provide improved load control and increased productivity. The full-load speeds enclosed in brackets are recommended for most applications. However, should other speeds be required, the following guidelines are provided:

1. Hoist:

STANDARDIZED HOIST LIFT RANGES,
RATED LIFTING SPEED RANGES

Rated load capacity (metric tons)	Hoist lift range (m)	Hoist lift speed range (mm/s) Low	High
3	3 to 28	50 to	250
5	3 to 18	50 to	200
7 1/2-10	3 to 17	40 to	150

STANDARDIZED HOIST LIFT RANGES,
RATED LIFTING SPEED RANGES

Rated load capacity (tons)	Hoist lift range (ft)	Hoist lift speed range (ft/min) Low	High
3	10 to 84	10 to	50
5	10 to 56	10 to	45
7 1/2-10	10 to 49	8 to	30

2. Trolley: Trolley travel speed should approximate the speed required to traverse the bridge span in 45 seconds. (12 m40 ft span-trolley speed 250 to 300 m/s 50 to 60 ft/min).

3. Bridge: Bridge travel speed should not exceed the maximum speed that the floor walking, crane pendant control operator can comfortably negotiate in a work area, approximately 750 mm/s 150 ft/min.

****

OET crane shall have the following full load speeds (plus or minus 10 percent):

a. Hoist - high speed of [75 mm/s15 feet per minute (ft/min)] [_____]

b. Trolley - high speed of [300 mm/s] [60 ft/min] [_____]

c. Bridge - high speed of [500 mm/s] [100 ft/min] [_____]

[For two speed motions, provide the low speeds at 1/3 of the specified high speeds.]

2.1.3 Hoist

CMAA 70 and as specified herein.

2.1.4 Crane Safety

Comply with the mandatory and advisory safety requirements of ASME B30.2, 29 CFR 1910.147, 29 CFR 1910.179, 29 CFR 1910.306, and all applicable provisions of 29 CFR 1910.

2.2 STRUCTURAL REQUIREMENTS

****
NOTE: Specify welded box girders for bridge spans of 15 m 50 feet or more.
****

[Provide welded box girders for the bridge.] Make girder to end truck connections with unaltered ASTM A 325M ASTM A 325 high strength bolts, ASTM A 563M ASTM A 563 nuts, and ASTM F 959 or ASTM F 436M ASTM F 436 washers. Galvanized or coated bolts shall not be used. Make structural bolted connections not referenced above with ASTM A 325M ASTM A 325 or ASTM A 307 bolts.

[2.2.1 Seismic Forces (SF)

****
NOTE: Seismic forces should be considered in the design of all cranes in Seismic Zones 3 and 4. Enter the appropriate factor in the formula for SF as determined below:

Seismic Zone	**Factor**
3	**0.45**
4	**0.60**

****

Consider seismic forces in the design of the crane. Apply seismic forces laterally, parallel to the bridge girders and parallel to the runway girders as two separate load cases. Apply seismic forces concurrently with the dead load (DL) and trolley load (TL). Locate the concentrated load in the same positions as when calculating vertical shears and bending moments. Consider twisting moments due to eccentric horizontal forces. Allowable combined stresses shall be 133 percent of Stress Level One in CMAA 70. Calculate combined stresses due to seismic forces for the following load combination:

Seismic Loading = DL + TL + SF

where SF = [_____] DL (distributed) + [_____] TL (concentrated)]

2.3 MECHANICAL REQUIREMENTS

Shafts, gears, keys, and couplings, shall be steel. Cast iron and aluminum used to support components of the hoist power transmission train shall be ductile. All bearings, except those subject only to small rocker motion, shall be anti friction type.

2.3.1 Load Block and Hook

****
NOTE: For LANTNAVFACENGCOM, add bracketed paragraph.
****

Construct the load block of steel. Provide forged steel, safety type hook, with hook nut keyed to hook shank by means of a setscrew installed in a plane parallel to the longitudinal axis of the hook shank, or other similar easily removable securing device. Provide hook with spring loaded steel safety latch for closing the hook throat opening. The hook shall be unpainted. [Each hook and hook nut shall be capable of complete disassembly which enables access to all surfaces of hook, including shank and hook nut for inspection purposes. Provision shall be made for the hook nut, or other hook-to-block fastener, to be keyed to hook shank by means of a set screw or similar, easily removable, securing device.]

2.3.1.1 Hook and Hook Nut Magnetic-Particle Tests

****
NOTE: For LANTNAVFACENGCOM, substitute bracketed paragraph.
****

Magnetic-particle inspect the hook and nut over the entire area in accordance with ASTM A 275/A 275M. Acceptance standard shall be no defects. A defect is defined as a linear indication that is greater than 3 mm 1/8 inch long with its length equal to or greater than three times its width.

[Each hook, including shank and hook nut, shall be inspected over the entire surface areas by magnetic particle inspection. I hook nut is not used, any device that functions the same as the hook nut shall be inspected by magnetic particle inspection.

a. Procedure: Magnetic particle inspection shall be conducted in accordance with ASTM A 275/A 275M. This inspection shall be conducted at the factory of the hook manufacturer or hoist manufacturer. Alternately, a recognized independent testing lab may conduct the inspections if equipped and competent to perform such a service, and if approved by the Contracting Officer.

b. Acceptance Criteria: Defects found on the hook or hook nut shall result in rejection of defective items for use on furnished hoist. For this inspection, a defect is defined as a linear or non-linear indication for which the largest dimension is greater than 3 mm 1/8 inch. Weld repairs for defects on hook or hook nut will not be permitted.

c. Test Report: A test report of the magnetic particle inspection of each hook and hook nut provided shall be submitted to and approved by the Contracting Officer prior to final acceptance of hoist installation. Test reports shall be certified by the testing organization.

d. Weld Repair: Weld repairs for defects on hooks or hook nuts will not be acceptable.]

2.3.2 Hoisting Ropes

****
NOTE: For LANTNAVFACENGCOM, add bracketed paragraph section.
****

FS RR-W-410. Hoisting ropes shall be 6 by 37 class construction, improved or extra improved plow steel, with an independent wire rope core. Maximum hoisting rope fleet angles shall be 4 degrees for drums and 4.75 degrees for sheaves. Hoisting rope end connections, other than drum connections, shall be speltered sockets with forged steel terminals. Provide proof of wire rope breaking strength. [Provide wire rope minimum safety factor of 5 to 1 based on the ratio of actual minimum wire rope breaking load to the calculated load on rope when hoist is assumed loaded to rated capacity. Certification from rope manufacturer verifying provided wire rope breaking strength, shall be submitted to Contracting Officer and approved prior to final acceptance of hoist. No paint or coatings will be allowed on the wire rope. Minimum length of the wire rope shall enable the load hook to operate through its full hook lift range and still have a minimum of two full wraps of wire rope around the rope drum.]

2.3.3 Sheaves

****
NOTE: Select 16 rope diameters for a class A or B crane, and 18 rope diameters for a class C crane.
****

Provide steel sheaves. Minimum pitch diameters shall be [16] [18] times the rope diameter for running sheaves, and 12 times the rope diameter for equalizer sheaves.

2.3.4 Drum

****
NOTE: For LANTNAVFACENGCOM, add the bracketed sentence.
****

****
NOTE: Select 16 rope diameters for a class A or B crane, and 18 rope diameters for a class C crane.
****

The drum shall be of steel construction. Design drum so that not less than two dead wraps of hoisting rope will remain on each anchorage when the hook is in its extreme low position. Drum grooving shall be right and left hand. Minimum drum groove depth, shall be 0.375 times the rope diameter. Minimum drum groove pitch shall be either 1.14 times the rope diameter, or the rope diameter plus 3 mm 1/8 inch, whichever is smaller. Minimum drum pitch diameter shall be [16] [18] times the rope diameter. [The surface of the drum which comes in contact with wire rope shall not be painted, coated, or galvanized.]

2.3.5 Wheels

Trolley and bridge travel wheels shall be double flanged and of rolled-to-shape wrought or forged steel. Wheels shall be rim toughened to

not less than 320 BHN. Wheel sizing and flange-to-rail head clearances shall be in accordance with CMAA 70 recommendations. Bridge travel wheels shall have tapered treads.

2.3.6 Bridge and Trolley Brakes

****
NOTE: Select "100 percent" for outdoor crane, "50 percent" for indoor crane.
****

Provided crane with electro-mechanical bridge and trolley brakes conforming to CMAA 70. Provide brakes with a minimum torque rating of [100] [50] percent of the drive motor rated torque.

2.3.7 Bumpers

****
NOTE: Select "spring" bumpers for bridges on cranes over 5 metric tons tons capacity or with a bridge speed of over 250 mm/s 50 fpm; and for trolleys on cranes over 10 metric tons tons capacity.
****

Provide bumpers on the bridge and trolley. Provide [spring] [elastomeric or spring] type bumpers on the bridge. Provide [spring] [elastomeric or spring] type bumpers on the trolley.

2.4 ELECTRICAL REQUIREMENTS

2.4.1 Motors

****
NOTE: Select two speed motors for bridge and trolley drives if magnetic controls are specified in paragraph entitled "Controls"; select single speed motors if electronic controls are specified in paragraph entitled "Controls."
****

NEMA MG 1. Provide [two] [single] speed AC squirrel cage induction type motors for the bridge and trolley drives. Provide two speed, AC squirrel cage induction type motor for the hoist. Motor insulation shall be Class F. Provide totally enclosed non-ventilated (TENV) motor enclosures.

2.4.2 Controls

****
NOTE: Select one of the following options. The first option provides magnetic controls for the bridge, trolley, and hoist. The second option provides electronic controls for the bridge and trolley and magnetic controls for the hoist.

When the two-speed bridge and trolley motor is specified, the slow speed will be 1/3 to 1/4 of rated travel speed. Reduced voltage starting, acceleration, and deceleration, serve to reduce the acceleration rate that is normal for squirrel-cage

motors. Squirrel-cage motors with two-speed magnetic controls provide satisfactory results with slow bridge and trolley speeds, and should be specified when short travel distances are involved and where fine positioning is not required. For faster bridge and trolley speeds or finer positioning requirements, specify electronic controls.

****

[Provide two-speed magnetic controls for the bridge drive, trolley drive, and hoist motors. Ensure that an energized drive motor initially rotates only in the direction selected by the operator by depressing the corresponding pushbutton; i.e., is not overhauled. Feed control circuits from a single phase, air cooled, double wound transformer with a grounded metal screen between the primary and secondary windings of the transformer.

a. Bridge and Trolley Control

Provide bridge drive and trolley drive motor control systems with resistive or reactive reduced voltage starting, acceleration, and deceleration utilizing, for each, separate banks of voltage reducing resistors or reactors and timing relays. On deceleration, insert the resistors or reactors into the motor's high speed leads prior to de-energization of the high speed contactor. Ensure smooth acceleration and deceleration. Provide bridge drive and trolley drive motor control systems with a drift point between OFF and the first speed control point in each direction.

b. Plugging Protection

Provide plugging protection for the bridge and trolley drives. Provide time delay relays, which will prevent the plugging of bridge and trolley drive motors, in the control circuit; arrange the controls to set the associated drive's brake if attempts are made to plug.]

[Provide two-speed magnetic controls for the hoist motor; provide four-speed adjustable frequency controls for the bridge and trolley drive motors. Ensure that an energized drive motor initially rotates only in the direction selected by the operator by depressing the corresponding pushbutton; i.e., is not overhauled.

a. Bridge and Trolley Control

Provide static reversing, dynamic braking, adjustable frequency (achieved by sinusoidal pulse width modulation), constant torque controllers for the bridge and trolley drive motors. Size each of the controllers so as to provide sufficient starting torque to initiate motion of that crane drive from standstill with rated load under the hook. The acceleration time and the deceleration time shall be independently adjustable from 2 to 20 seconds; initially, set acceleration at 5 seconds and deceleration at 2 seconds. In each direction, provide a drift point between OFF and the first running speed point; provide four running speed points, namely 10, 33, 67, and 100 percent of rated speed. The motor shall run smoothly, without torque pulsations at the lowest speed, and shall be energized at a frequency not exceeding 60 Hz at the highest speed. Include with the controller a full wave rectifier

and a three-phase inverter. Select diodes and power transistors so that their current ratings are not less than 200 percent of full load motor current. Provide motor overload protection utilizing a thermal sensitive device embedded in its windings.

Energize each crane drive's electro-mechanical brake by a dedicated contactor controlled directly by the pushbuttons on the pendent pushbutton station; i.e., when both of the pushbuttons for a drive are in the OFF position the brake shall be set and when either of them is in any drift or speed point position the brake shall be released. Provide dynamic braking. Connect resistors to the controller's DC bus whenever motor regeneration causes the DC voltage to rise to a predetermined unacceptable level. Provide resistors continuously rated at a minimum of 125 percent of the full load motor current.

b. Hoist Control

Feed control circuit from a single phase, air cooled, double wound transformer with a grounded metal screen between the primary and secondary windings of the transformer.]

2.4.3 Protection

Not less than that required by NEMA ICS 3, CMAA 70, NFPA 70, 29 CFR 1910.147, 29 CFR 1910.179, 29 CFR 1910.306 and all applicable provisions of 29 CFR 1910. Provide enclosed type circuit breaker for crane disconnect. The main line contactor shall be the floor operated disconnect. Provide for lockout/tagout of all hazardous energy sources.

2.4.4 Resistors

****
NOTE: Include "125 percent of" only if electronic controls have been selected previously.
****

Provide resistors rated for continuous duty operation based upon [125 percent of] the motor nameplate amperes and fabricated of corrosion resistant metal; the use of "wire wound" type resistors is prohibited for segments of 8 ohms or less. Mount resistors in substantial, ventilated enclosures constructed entirely of non-combustible materials. Provide resistors with terminals fitted in the coolest position in the enclosure.

2.4.5 Reactors

Provide reactors rated for continuous duty operation based upon the motor nameplate amperes. Select reactors for 60 Hz operation and having taps for field adjustment of inductance so as to permit achievement of the optimum acceleration characteristics for the drive. Secure the cores and the coils of the reactors to prevent any permanent change in the relative position of the parts. Ground the core to the case or make electrically accessible, except for toroidal coils and nonmetallic cores such as ferrites.

2.4.6 Limit Switches

Provide upper and lower limit switches which de-energize the hoist motor. Lift limiting and overload limiting devices which use a clutch to stop motion shall not be furnished with the hoist.

2.4.7 Pendant Pushbutton Station

Suspend the pendant pushbutton station from an independent festooned messenger track system, operating the length of the bridge. Locate the pendant pushbutton station [1200 mm] [4 feet] [_____] above the finished floor. Clearly mark all controls for identification of functions.

2.4.8 Bridge and Runway Electrification

Provide festooned type or enclosed safety bar type bridge electrification. Provide enclosed safety bar type runway electrification.

2.5 ENCLOSURES

Provide enclosures for control panels, controls, and brakes in accordance with NEMA ICS 6, Classification Type [1 indoor, general purpose] [2 indoor, drip-proof] [3 outdoor, dust-tight, rain-tight, sleet-resistant] [_____].

2.6 PAINTING

****
NOTE: For LANTNAVFACENGCOM, add final bracketed sentence.
****

****
NOTE: Select blast cleaning, zinc-rich primer, and alkyd finish coat for outdoor cranes. For corrosive atmospheres, specify appropriate protective requirements.
****

Provide a primer and finish coat. Provide brilliant yellow finish coat. All paint coats shall be smooth and even, free of runs, sags, orange peel, or other defects. Paint the lower load block yellow with black diagonal stripes. [Blast clean the crane prior to painting. Primer shall be zinc-rich type and shall not contain chromates. The finish coat shall be a high-gloss alkyd copolymer enamel formulated for marine environments.] [Paint, coatings, or galvanizing on the following items or areas will not be acceptable: hoist wire ropes, hook nuts, or areas on sheaves or rope drums in contact with the wire ropes.]

2.7 IDENTIFICATION PLATES

Furnish and install identification plates. Provide noncorrosive metal identification plates with clearly legible permanent lettering giving the manufacturer's name, model number, capacity in both kilogram and pound units printed in different colors, and other essential information or identification.

2.8 RUNWAY SYSTEM AND CRANE RAIL

Provide structural steel and crane rail as specified in Section 05120 STRUCTURAL STEEL.

PART 3 EXECUTION

3.1 ERECTION AND INSTALLATION

Erect and install the crane, complete in accordance with the approved submittals and in condition to perform the operational and acceptance tests.

3.2 ERECTION SERVICES

The crane manufacturer shall provide supervisory erection services.

3.3 FIELD QUALITY CONTROL

3.3.1 Post-Erection Inspection

After erection, the Contractor and the Contracting Officer shall jointly inspect the crane bridge and hoist systems and components to determine compliance with specifications and approved submittals. The Contractor shall notify the Contracting Officer [_____] days before the inspection. Provide a report of the inspection indicating the crane is considered ready for operational tests.

3.3.2 Operational Tests

****
NOTE: For LANTNAVFACENGCOM, delete sentence beginning, "Perform the 125 percent", and add the bracketed sentence.
****

****
NOTE: Determine if Government furnished test loads are available at the site. If not they must be provided by the Contractor.
****

After erection and inspection, test the hoist, bridge, and trolley as specified herein. Perform the 125 percent rated load test with the bridge and trolley located to obtain maximum loads on the bridge and runway girders. Test the systems in service to determine that each component of the system operates as specified, is properly installed and adjusted, and is free from defects in material, manufacture, installation, and workmanship. Rectify all deficiencies disclosed by testing and retest the system or component to prove the crane is operational. [The Contractor shall furnish test loads, operating personnel, instruments, and other apparatus necessary to conduct field tests on each crane.]

3.3.3 Test Data

Record test data on appropriate test record forms suitable for retention for the life of the crane. Record operating and startup current measurements for electrical equipment (motors and coils) using appropriate instrumentation (i.e., clamp-on ammeters). Compare recorded values with design specifications or manufacturer's recommended values; abnormal differences (i.e., greater than 10 percent from manufacturer's or design values) shall be justified or appropriate adjustments performed. In addition, high temperatures or abnormal operation of any equipment or machinery shall be noted, investigated, and corrected. Record hoist, trolley, and bridge speeds during each test cycle.

3.3.4 Hook Test

Measure hook for hook throat spread before and after load test. Establish a throat dimension base measurement by installing two tram points and measuring the distance between these tram points (plus or minus 0.4 mm 1/64 inch). Record this base dimension. Measure the distance between tram points before and after load test. An increase in the throat opening by more than five percent from the base measurement shall be cause for rejection.

3.3.5 No-Load Test

Raise and lower the hook through the full range of normal travel at rated speed for three complete cycles. Raise and lower the hook, testing other speeds of the crane. Verify proper operation of hoist limit switches. Operate the bridge and trolley in each direction the full distance between end stops. Operate through the entire speed range and verify proper brake operation.

3.3.6 Load Tests

3.3.6.1 Hoist

****

NOTE: For LANTNAVFACENGCOM, delete test loads of 50.

****

Perform the following tests, as specified, with test loads of 50, 100, and 125 percent (plus 5 minus 0) of rated load. If the hoist is equipped with an overload limit device, disconnect it to allow the hoist to lift the test load. Proof test the overload limit device after it is reconnected.

a. Static Load Test (125 percent only): Check entire structure, holding brake and hoisting components as follows: Raise the test load approximately 300 mm one foot. Hold the load for 10 minutes. Rotate the load and hook to check bearing operation. Observe lowering that may occur which indicates a weakness in the structure or malfunction of hoisting components or brakes.

****

NOTE: For LANTNAVFACENGCOM, change "10 cycles" to "5 cycles."

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b. Raise and lower and test load through the full lift range. Lower the load to the floor, wait 5 minutes, then raise and lower the load through two more cycles. As a minimum, operate in each speed for each test load. In addition, the dynamic test of test load sequence number 2 (100 percent of rated load) shall be repeated for 10 cycles at rated speed, in order to demonstrate proper operation and repeatability of all functions without component overheating or malfunction. Completely stop the machinery at least once in each direction during each cycle to ensure proper brake operation. The hoist shall not be stopped for more than 15 seconds prior to commencing the next cycle.

c. Hoist Load Brake (125 percent only): Raise test load approximately 1500 mm 5 feet. With the hoist controller in the neutral

position, release (by hand) the holding brake. The load brake should hold the test load. Again with the holding brake in the released position start the test load down (first point) and return the controller to the "off" position as the test load lowers. The load brake should prevent the test load from accelerating.

d. Hoist Loss of Power Test (125 percent only): Raise the test load to approximately 2400 mm 8 feet. While slowly lowering the test load (first point), disconnect the crane's power source. Verify that the test load does not lower and that the brake is set.

3.3.6.2 Trolley

Operate the trolley the full distance of the bridge rails in each direction with a test load of 125 percent of rated load on the hook (one cycle). Check proper functioning of all drive speed control points. Verify proper brake action.

3.3.6.3 Bridge

With a test load of 125 percent of rated load on the hook, operate the bridge for the full length of the runway in one direction with the trolley at the extreme end of the bridge, and in the opposite direction with the trolley at the opposite extreme end of the bridge (one cycle). Check proper functioning of all drive speed control points. Check for any binding of the bridge end trucks and verify proper brake action. Record deficiencies. Secure from testing if deficiencies are found.

3.3.6.4 Rated Travel Tests

Repeat travel tests for trolley and bridge with a test load of 100 percent of rated load. Repeat the test for 5 cycles at rated speed to demonstrate proper operation and repeatability of all functions without the overheating or malfunction of any components. Completely stop the machinery at least once in each direction during each cycle to ensure proper brake action. The machinery shall not be stopped for more than 15 seconds prior to commencing the next cycle.

3.3.6.5 Trolley Loss of Power Test

With a test load of 100 percent of rated load, raise the test load approximately midway between the trolley and any permanent obstruction on the operating floor. Starting at a safe distance from walls or other obstructions, attain a slow speed (first point) of trolley travel. While maintaining a safe distance from obstructions, disconnect the main power source at the wall mounted safety switch (disconnect) to simulate a power failure. Verify that the trolley stops and that the brake sets properly. Measure the distance required for the trolley to stop.

3.3.6.6 Bridge Loss of Power Test

With a test load of 100 percent of rated load, raise the test load approximately midway between the trolley and any permanent obstruction on the operating floor. Starting at a safe distance from walls or other obstructions, attain a slow speed (first point) of bridge travel. While maintaining a safe distance from obstructions, disconnect the main power source at the wall mounted safety switch (disconnect) to simulate a power failure. Verify that the bridge stops and that the brake sets properly.

Measure the distance required for the bridge to stop.

-- End of Section --