

14600 Cranes and Hoists

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PART 1 – GENERAL

1.01 DESCRIPTION

A. SCOPE

1. This section specifies bridge cranes and hoisting equipment.
2. Runway beams and rail are part of the building steel package and are not included in this section.
3. This specification is intended to ensure bidders offer a true Class “D” or Class “E” crane for heavy duty cycle application and ease of maintenance. As such, while potential bidders should attempt to meet as much of the specification as possible. Any exceptions by bidders to any section noted with “(*E)” shall result in a bid being disqualified without further review or recourse.

B. CRANE SUMMARY

Fill in the red blanks with your choices. Seek assistance from the CMAA manual for answers you are unsure of.

Crane #1 location

Span: ___ Ft., ___ Inches

Capacity: ___ Tons

Crane type: top running double girder

Classification: Crane shall be designed and constructed to CMAA Specification # 70, as applicable, for Class “___ [D or E]” service requirements and operation in a non-hazardous environment.

Crane speed: ___ FPM, variable frequency

Crane drive: Dual motor drive

Trolley speed: ___ FPM, variable frequency

Trolley drive: Motorized

Hoist speeds: ___ and ___ FPM, variable frequency closed loop

Hoist type: Electric wire rope

Hoist lift required: ___ Ft.

Control: Pendant from independent track and MLTX radio

Any other specifics that may apply to this crane

Repeat for additional cranes.

C. WORK INCLUDES THE FOLLOWING:

1. Detailed design of completed crane system, including bridge, end trucks, trolley, hoists, cabling, controls, and all appurtenances specified hereinafter.
2. Shop drawings.

3. Fabrication of a complete crane.
4. Inspection and shop testing.
5. Documentation and schedules.

1.02 REFERENCES

Equipment furnished under this section shall, except as otherwise noted, comply in all respects with the requirements of the following standards:

OSHA Occupational Safety and Health Administration
Part 1926.554 - Overhead Hoists
Part 1910.179 – Overhead and Gantry Cranes

*CMAA Crane Manufacturer’s Association of America
Specifications for Top Running Bridge & Gantry Type Multiple
Girder Electric Overhead Traveling Cranes - No. 70 (2004)
Specifications for Top Running and Under Running Single Girder
Electric Overhead Cranes Utilizing Under Running Trolley Hoist -
No. 74 (2004)

*ANSI / ASME
American National Standards Institute /
American Society of Mechanical Engineers
ANSI / ASME HST-4 - 1999 Performance Standard For Overhead
Electric Wire Rope Hoists
ANSI / ASME B30.16 – 2003 Overhead Hoists (Underhung)
ANSI / ASME B30.2 - 2001 Overhead and Gantry Cranes
(Top Running Bridge, Single Or Multiple Girder, Top Running
Trolley Hoist)
ANSI / ASME B30.11 – 2004 Monorails and Underhung Cranes
ANSI / ASME B30.17 – 2003 Overhead and Gantry Cranes (Top
Running Bridge, Single Girder, Underhung Hoist)

NEMA National Electric Manufacturer’s Association

NEC National Electric Code – 1999
Article 100, Article 240-1, Article 430-31, Article 430-51, Article
610-1, Article 610-31

*Compliance to this standard is limited to the extent such standard is incorporated into
and made mandatory by OSHA regulations.

1.03 SUBMITTALS

A. SHOP DRAWINGS AND EQUIPMENT DATA

1. Manufacturer’s catalog data for hoist.

2. Dimensional drawings and details for bridge crane system.
3. Wiring schematics. – ship with crane

B. OPERATIONS AND MAINTENANCE MANUALS (delivered in PDF via email at time of crane shipment)

1. Equipment function, normal operating characteristics, and limiting conditions.
2. Assembly, installation, alignment, and maintenance instructions.
3. Lubrication and maintenance instructions.
4. Guide to “troubleshooting”.
5. Parts list.
6. As-built drawing.
7. Test results.

1.04 APPLICABLE STANDARDS

- A. Contractor shall adhere to OSHA, state, and local safety guidelines, laws, rules, and regulations.
- B. Contractor shall conform to all applicable ANSI, CMAA, and HMI specifications and/or standards.
- C. Comply with CMAA specification 70, as applicable.
- D. Long lead items [hoist, end trucks, drives and controls] will be ordered by contractor upon receipt of purchase order and credit approval. Steel will not be ordered until shop drawings and submittals have been approved by the customer.
- E. All electric equipment shall be UL, CSA c/us or ETL labeled.

1.05 WARRANTIES

- A. Provide one-year warranty for moving parts and controls.
- B. Provide a ten-year warranty for bridge girders and structural steel.

PART 2 - PRODUCTS

2.01 ACCEPTABLE PRODUCTS

- A. Bridge crane package systems shall be provided by one of the following:

Advantage Crane Service
Ace World Companies
Uesco Cranes
Zelus Material Handling

- B. Hoist shall be Ace World Companies A-Series, T-Series, or Advantage-Series electric wire rope type.

2.02 MATERIALS

<u>Components</u>	<u>Material</u>
Bridge beams	Steel, ASTM A36 or A992
End trucks	Steel, ASTM A36 (or equal)
Trolley	Steel, ASTM A36 (or equal)
Wheels	Cast iron or steel
Hooks	Forged steel

2.03 EQUIPMENT

- A. **HOIST AND TROLLEY**

1. Top-running double girder cranes shall utilize the Ace World Companies A-Series double girder trolley electric wire rope hoists as manufactured by Ace World Companies of Fort Worth Texas.
2. All hoisting components, including hoisting motor, gearbox, and drum, shall be foot mounted to deck of trolley. Face/flange mounted motors and gearboxes are not acceptable.
3. Hoist and trolley motors shall be per 1.01B above, as applicable.
4. Hoist motors shall be connected to the hoist gearbox by a driveshaft with a coupling, flexible gear type.

5. (*E) Hoist motor shall never be placed inside the wire rope drum.
6. (*E) Wire rope drum shall never be driven by two hoisting motors.
7. (*E) Hoisting motor(s) shall be two winding squirrel cage type for variable frequency control.
8. (*E) Hoisting motor(s) shall be built on a NEMA frame, 60 minute motor rating, F insulation, and TEFC (totally enclosed fan cooled) for Class “D”, TENV for Class “E”. Hoisting motors shall not exceed 2500 revolutions per minute and shall be NEMA motors.
9. (*E) Hoist shall be furnished with closed-loop adjustable frequency inverter drive with an encoder mounted on the motor shaft.
10. Hoisting motor shall be by Leeson.
11. (*E) Hoisting gearbox shall be horizontally split in order to easily inspect and replace gears and bearings. An inspection port shall be placed on top of the gearbox covering at least 60% of the top surface.
12. (*E) The hoisting gearbox shall be made of fabricated steel and foot-mounted to the trolley deck with bolts.
13. (*E) Drum bearing shall not require re-alignment after removal.
14. The hoist gears shall be helical through-hardened with encapsulated bearings.
Bearings shall have 10,000 hours L-10 bearing life for Class “D”.
Bearings shall have 20,000 hours L-10 bearing life for Class “E”.
15. Trolley shall be furnished with an adjustable frequency inverter drive.
16. (*E) Trolley bearings shall be modified MCB type for reliability and ease of access and removal. Trolley wheels shall be 400BHN. Full MCB bearings for trolley and bridge wheels shall be quoted as a line item option for Class “E” cranes.
17. (*E) Trolley motors shall be inverter duty motors with minimum class “F” insulation and motor enclosures shall be TENV [totally enclosed non-ventilated]. Trolley motors shall not exceed 2500 revolutions per minute and shall be NEMA motors.
18. Motor and gearbox shall by Nord for easy sourcing of replacement parts.
19. Upper and lower limit switches shall be provided. Limit switch shall provide upper and lower limit of hoist travel, hoist slow down prior to reaching upper limit and phase sequence supervision at upper limit. An additional weighted block operated limit shall be included.

20. (*E) Hoist motor brake shall be DC disc type with adequate torque to stop and hold over **125%** of the hoist rated load. Acceptable manufacturers shall include Pintsch-Bubbenzer and Midwest Brakes.
21. (*E) The wire rope drum shall have a minimum groove depth of 3/8 diameter of the wire rope. For class “E” cranes, a groove depth of half-diameter shall be quoted as a line item option.
22. The rope drum shall be equipped with a hinged bar to help keep the rope aligned in the grooves of the drum. The bar shall actuate a switch that stops the up-motion when the rope is improperly aligned on the drum.
23. (*E) Wire rope shall be constructed from galvanized steel having a minimum safety factor of 5. Wire rope shall not be of metric type; 6x37 or 7x35 shall be preferred.
24. (*E) Wire rope sheaves/pulleys mounted on the trolley shall be configured so that said sheaves/pulleys can be inspected and removed from the top and not from underneath for ease of access and maintenance.

Sheaves shall have 10,000 L-10 bearing life and 20:1 ratio to rope diameter for Class “D” cranes.

Sheaves shall have 40,000 L-10 bearing life and 24:1 ratio to rope diameter for class “E” cranes. Class “E” cranes shall also have individual grease ports for each upper sheave.

25. (*E) Hoist reeving shall be dual-reeved for true vertical lift. No horizontal hook drift is acceptable when operating the hoisting motion.
26. The actual hoist control enclosure rating shall be at least equivalent to IP55 / NEMA 4 type.
27. Hooks shall be made of forged alloy steel and shall be fitted with a spring-loaded safety latch.
28. Hook block shall be made of plate steel. Stamped or pressed steel shall not be used.
29. (*E) Lower block sheaves/pulleys shall be 400BHN for durability. Lower sheaves shall be 20:1 ratio to wire rope diameter for Class “D” cranes and 24:1 ratio to wire rope diameter for Class “E” cranes.
30. (*E) AGMA quality class 12 machine cut, hardened and precision ground hoist gearing. The gears inside the hoist gearboxes shall be lubricated by oil and not semi-fluid grease.
31. (*E) AGMA quality class 12, hardened and precision ground trolley drive gearing, lubricated.

32. Trolleys shall have energy absorbing bumpers.
33. All hoist and trolley wiring shall be in rigid or flexible conduit.

B. BRIDGE GIRDER

1. Bridge girder shall be per 1.01B above, as applicable.
2. Bridge girders shall be constructed from welded box girders or Structural beams, Steel, ASTM A36 or A992, as required.
3. (*E) Bridge girders shall be fitted with ASCE rail for trolley to run upon.

C. END TRUCKS AND BRIDGE DRIVE

1. End trucks shall be designed in accordance with CMAA specifications as applicable (reference appendix B).
2. End trucks shall be bolted to bridge girder.
3. Bridge drive shall be dual-motor (A-4 arrangement per CMAA).
4. Bridge drive shall be designed to stop the bridge within CMAA specifications.
5. End trucks shall be equipped with rail sweeps and energy-absorbing rubber bumpers.
6. Travel limit switches to be provided as necessary for safe operation.
7. Bridge shall be furnished with an adjustable frequency inverter drive for smooth acceleration and deceleration.
8. (*E) Bridge motors shall be inverter duty motors with minimum class "F" insulation and motor enclosures shall be TENV [totally enclosed non-ventilated]. Bridge motors shall not exceed 2500 revolutions per minute and shall be NEMA motors.
9. Acceptable manufacturer shall be Nord for easy sourcing of replacement parts and durability.
10. (*E) AGMA quality class 12, hardened and precision ground bridge drive gearing.
11. (*E) End trucks shall have dual-flanged wheels designed to run upon ASCE rail fitted to runways by either J-bolts or specifically designed clips from manufacturer such as Gantrex.

D. POWER SUPPLY

1. Power supply for the hoist shall be _____ volt, 3 ph., 60 Hz. All power required for the operation of the hoist, trolley, and end trucks shall be developed from this source.
2. Runway electrification shall be 4-bar safety type rigid conductors as manufactured by Insul-8, Duct-O-Wire Company or Wampfler. Wall mounted disconnect switch and power to runway conductors provided by Electrical Contractor.
3. Unless otherwise noted, scope of supply shall assume that runway power supply feeds current to runway electrification system at center of runway, and specifically is not end-fed.
4. Scope of supply shall assume runway electrification is adequate for new and existing cranes in sum unless otherwise noted by buyer.
5. Scope of supply shall assume that runway electrification is supplied and installed not by crane provider. If scope of specifically notes that crane provider is to supply and install runway electrification, contractors other than crane provider shall supply mainline disconnect with fused breaker appropriately sized with conduit up to runway elevation and minimum ten feet of loose cable at end conduit for wiring to runway electrification. Solid core wire shall not be used.
6. Cross bridge electrification shall be flat cable style festoon system with terminal box, multi-conductor cord, plug connectors (when available) and accessories. Cables are to be hardwired when plug connectors are not available.

E. CONTROLS

The following controls shall be used as applicable:

1. Six-way operation, plug-in pushbutton pendant suspended from independent festoon track. An MLTX radio by Magnetek shall be quoted as an option. A cab shall not be quoted as an option unless specifically requested.
2. Pendant shall include Start (momentary) button and Emergency Stop (push to maintain, turn to release) that controls a mainline contactor in the bridge control panel.
3. Pushbutton and radio shall be clearly marked with hoist, trolley and bridge travel directions.

4. Hoist shall be variable frequency inverter control with encoder and closed feedback loop.
5. Trolley and bridge controls shall be variable frequency inverter control (standard), as required per section 1.01.B.
6. Electrical control enclosures shall be IP55 or NEMA 4 type. Pushbutton enclosure shall have a rating of IP65, NEMA 4X, 4 or 5.

F. LABELING

1. Hoist and bridge beam shall be labeled with load rating.
2. A corrosion-resistant nameplate shall be fixed to the bridge with the following information:
 - a. Name of manufacturer
 - b. Mfg.'s model number and serial number
 - c. Capacity
 - d. Date of manufacture (month and year)

G. PAINTING

1. Hoist and trolley shall be factory painted (2-part epoxy) per manufacturer's standards.
2. Bridge shall be shop cleaned, primed, and painted per manufacturer's standards.
3. The following items shall not be painted:
 - a. Rail surfaces in contact with wheels
 - b. Wheel running surfaces
 - c. Hoist wire rope
 - d. Conductor bar, festoon cables and supports

PART 3 – EXECUTION (if applicable to crane manufacturer)

3.01 INSTALLATION AND INSPECTION

- A. Inspect structure and crane rail erection for conformance with reviewed shop drawings and contract documents prior to installation of equipment. Bring nonconforming work to the attention of the customer prior to proceeding with crane installation. Non-conforming runway structure or installation must be corrected prior to crane installation and load testing of crane system. Costs of delays or additional work due to nonconforming runway structure will be

reimbursed by the Owner. Runway beams and/or rails not supplied or installed by crane provider must be within span, straightness, and elevation tolerance specified by CMAA (see chart below). Crane provider shall not be required to warrantee or otherwise guarantee proper functioning of equipment installed on a runway that does not meet CMAA specification. Runway end stops shall not be included in this specification or scope of supply.

REQUIRED RUNWAY TOLERANCES

ITEM	FIGURE	OVERALL TOLERANCE	MAXIMUM RATE OF CHANGE
CRANE SPAN (L) NOMINAL SPAN L		L ≤ 50' A = 3/16" L > 50' ≤ 100' A = 1/4" L > 100' A = 3/8"	1/4" IN 20'
STRAIGHTNESS (B)		B = 3/8"	1/4" IN 20'
ELEVATION (C)		C = 3/8"	1/4" IN 20'
TOP RUNNING TRANSVERSE RAIL TO RAIL ELEVATION (D)		L ≤ 50' D = +/- 3/16" L > 50' ≤ 100' D = +/- 1/4" L > 100' D = +/- 3/8"	1/4" IN 20'
TRANSVERSE GIRDER TO GIRDER ELEVATION UNDER RUNNING (D)			

- B. Scope of supply shall note explicitly whether installation is required.
- C. If crane provider is required to install crane as part of scope of supply, installation prices shall be quoted for one mobilization on straight time with no interference from other trades during said installation.
- D. (*E) End user or general contractor shall engage a third party surveyor that is not in the business of manufacturing overhead cranes or hoists to ensure straightness and levelness of runway for entire length before installation of crane(s). This shall not be included in scope of crane supply.

3.02 TESTING

- A. Should on-site load testing be required, the crane equipment shall be operated through a complete lift and lowering cycle and through a complete travel of the bridge and trolley to determine that the equipment shall perform smoothly and safely and that pendant cable length is sufficient to permit operation from desired floor levels. All tests shall be carried out with the bridge crane equipment loaded at 125 percent of capacity. The bridge crane purchaser shall provide the test weight loads and rigging unless otherwise noted. Any defects shall be corrected by the bridge crane provider without any expense to the Owner.

3.03 USE BY CONTRACTOR

- A. If crane is used by the Contractor, it shall be repaired, repainted, and otherwise refurbished to like new condition prior to its acceptance. The crane provider shall then perform a detailed inspection at owner's cost prior to warranty taking effect. The Contractor assumes all responsibility for operation and maintenance until the crane has been accepted by Owner.

3.04 CLEANUP

- A. Upon completion of work, area shall be cleaned and restored to original condition, acceptable to the Owner.

END OF SECTION