

# SUBMITTAL REGISTER

CONTRACT NO.

TITLE AND LOCATION

DD2

CONTRACTOR

ACTIVITY NO	TRANSMITTAL NO	SPEC SECT	DESCRIPTION ITEM SUBMITTED	PARAGRAPH	GOVT CLASSIFICATION	CONTRACTOR: SCHEDULE DATES			CONTRACTOR ACTION		APPROVING AUTHORITY				MAILED TO CONTR/ DATE RCD FRM APPR AUTH	REMARKS	
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BRIDGE CRANES, OVERHEAD HAND GEARED, UNDER RUNNING  
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PART 1 GENERAL

1.1 REFERENCES

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

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

AGMA 2011	(2014B) Cylindrical Wormgearing Tolerance and Inspection Methods
AGMA ISO 10064-6	(2010A) Code of Inspection Practice - Part 6: Bevel Gear Measurement Methods
AGMA ISO 17485	(2008A; Supplement 2008) Bevel Gears - ISO System of Accuracy (Including Supplement - Tolerance Tables 2008)
ANSI/AGMA 2001	(2004D; R 2010) Fundamental Rating Factors and Calculation Methods for Involute Spur and Helical Gear Teeth
ANSI/AGMA 2015-1	(2001A; R 2014) Accuracy Classification System - Tangential Measurements for Cylindrical Gears
ANSI/AGMA 6013	(2006A; R 2011) Standard for Industrial Enclosed Gear Drives

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 325	(2011) Steel Construction Manual
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AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M	(2010; Errata 2011) Structural Welding Code - Steel
AWS D14.1/D14.1M	(2005) Specification for Welding Industrial and Mill Cranes and Other Material Handling Equipment

ASME INTERNATIONAL (ASME)

ASME B1.1	(2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)
ASME B18.2.2	(2010) Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series)

ASME B30.11	(2010) Monorails and Underhung Cranes - Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings
ASME B30.16	(2012) Overhead Hoists (Underhung)
ASME B30.17	(2006; R 2012) Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoists)
ASME HST-4	(1999; R 2010) Performance Standard for Overhead Electric Wire Rope Hoists

ASTM INTERNATIONAL (ASTM)

ASTM A194/A194M	(2014a) Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High-Pressure or High-Temperature Service, or Both
ASTM A307	(2014) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
ASTM A325	(2014) Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
ASTM A563	(2007a; R2014) Standard Specification for Carbon and Alloy Steel Nuts
ASTM F436	(2011) Hardened Steel Washers

CRANE MANUFACTURERS ASSOCIATION OF AMERICA (CMAA)

CMAA 74	(2010) Specifications for Top Running and Under Running Single Girder Electric Overhead Cranes Utilizing Under Running Trolley Hoist, No. 74
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MATERIAL HANDLING INDUSTRY OF AMERICA (MHI)

MHI MH27.1	(2009) Specifications for Underhung Cranes and Monorail Systems
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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2014; AMD 1 2013; Errata 1 2013; AMD 2 2013; Errata 2 2013; AMD 3 2014; Errata 3-4 2014; AMD 4-6 2014) National Electrical Code
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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)

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|-----------------|--|
| 29 CFR 1910.179 | Overhead and Gantry Cranes                   |
| 29 CFR 1910.306 | Specific Purpose Equipment and Installations |

## 1.2 DEFINITIONS

- a. Crane Bridge: That part of an overhead crane system consisting of girder(s), end trucks, end ties, walkway, and drive mechanism which carries the trolley(s) and travels along the runway rails parallel to the runway.
- b. Crane Runway: The track system along which the crane operates horizontally, including track hangar rods, track connection devices, and runway structural supports.
- c. Dead Loads: The loads on a structure which remain in a fixed position relative to the structure.
- d. Girder: The principal horizontal beam of the crane bridge. It is supported by the crane end trucks. Normally the crane trolley mounted hoist is suspended from the girder below the crane.
- e. Live Load: A load which moves relative to the structure under consideration.
- f. Patented Track: A generic term referring to track built in accordance with MHI MH27.1 utilizing a composite track section incorporating a proprietary bottom flange shape. For this crane system, it is provided for the crane bridge girder. Runway shall be standard rail section as listed in CMAA 74.
- g. Rated Load: For the purpose of this specification the rated load is defined as the maximum working load suspended under the load hook.
- h. Standard Commercial Cataloged Product: A product which is currently being sold, or previously has been sold, in substantial quantities to the general public, industry or Government in the course of normal business operations. Models, samples, prototypes or experimental units do not meet this definition. The term "cataloged" as specified in this section is defined as "appearing on the manufacturer's published product data sheets. These data sheets must have been published or copyrighted prior to the issue date of this solicitation and have a document identification number or bulletin number.
- i. Trolley Mounted Hoist: A combined unit consisting of a wheeled trolley that provides horizontal motion along the bridge girder, and a hoist suspended from the trolley, that provides lifting and lowering of a freely suspended load.
- j. Underrunning (Underhung) Crane: A hand geared overhead traveling crane that is supported by crane end trucks suspended below the crane runway. The load is supported by hanging from the lower flange of a beam.

## 1.3 REQUIREMENTS

The requirements for the crane runway and rail supporting structures are

specified in Section 05 12 00, STRUCTURAL STEEL, and must conform to AISC 325.

#### 1.4 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. Verify all dimensions of the building that relate to fabrication of the crane and notify the Contracting Officer of any discrepancy before finalizing the crane order.

#### 1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

##### SD-02 Shop Drawings

Underrunning Overhead Hand Geared Crane system; G

##### SD-03 Product Data

Underrunning Overhead Hand Geared Crane system; G

Submit data for all system components, including the following:

bridge end trucks; G

couplings; G

##### SD-05 Design Data

Load and sizing calculations; G

Crane bridge girder; G

##### SD-06 Test Reports

Load Test; G

No-load Test; G

Post-erection inspection report; G

Operational test report; G

##### SD-07 Certificates

Overload Test Certificate; G

Certificate of Compliance with Listed Standards; G

##### SD-10 Operation and Maintenance Data

Underrunning Overhead Hand Geared Crane system, including runway system, Data Package 4; G

Submit data package in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA including weekly, monthly, semi-annual, and annual required maintenance items.

## 1.6 QUALITY ASSURANCE

### 1.6.1 Manufacturer Qualification

Underrunning Overhead Hand Geared Crane system, including sub-system components manufactured by vendors, must be designed and manufactured by a company with a minimum of 10 years of specialized experience in designing and manufacturing the type of overhead crane required to meet requirements of the Contract Documents and conforming to ASME B30.17.

### 1.6.2 Pre-Delivery Inspections

Contractor is responsible for performance of quality control inspections, testing and documentation of steel castings, hook assembly and trolley as follows.

#### 1.6.2.1 Inspection of Steel Castings

Visually inspect load-carrying steel castings. All load bearing components, couplings, shafts, and gears, in the hoist drive train must be rolled or forged steel, except brake drums which may be ductile iron. Methods of repairing the discontinuities is subject to review by the Contracting Officer.

### 1.6.3 Certificates

Submit a statement that the crane is capable of being load tested semi-annually to 131.25 percent of rated capacity without any detrimental effects.

Also provide the following certificates:

Overload Test Certificate  
Certificate of Compliance with Listed Standards

### 1.6.4 Drawings: Underrunning Overhead Hand Geared Crane System

Submit shop drawings showing the general arrangement of all components in plan, elevation, and end views; hook approaches on all four sides, clearances and principal dimensions, and assemblies of hoist. Include weights of components and maximum bridge wheel loads and spacing.

Shop drawing quality must be equivalent to the contract drawings accompanying this solicitation. Drawings must be reviewed, signed and sealed by a licensed professional engineer.

Provide integral schedule of crane components on each drawing. Provide maximum wheel loads (without impact) and spacing imparted to the runway track beams. Indicate the crane speeds along the runway; all speeds indicated are speeds with hoist loaded with rated crane capacity load.

### 1.6.5 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. Calculations must be must be reviewed, signed and sealed by a licensed professional engineer.

#### 1.6.6 Welding Qualifications and Procedure

Welding must be in accordance with qualified procedures using AWS D14.1/D14.1M as modified. Written welding procedures must specify the Contractor's standard dimensional tolerances for deviation from camber and sweep and not exceed those specified in AWS D14.1/D14.1M and CMAA 74. Welders and welding operators must be qualified in accordance with AWS D1.1/D1.1M or AWS D14.1/D14.1M. Allowable stress values must comply with CMAA 74.

#### 1.7 CRANE SAFETY

Comply with the mandatory and advisory safety requirements of ASME B30.11, ASME B30.16, ASME HST-4, NFPA 70, 29 CFR 1910, 29 CFR 1910.147, 29 CFR 1910.179, and 29 CFR 1910.306.

### PART 2 PRODUCTS

#### 2.1 UNDERRUNNING CRANE SYSTEM

Provide under running bridge overhead hand geared crane, with under running trolley mounted hoist , conforming to CMAA 74, Class C (Moderate Service) for indoor and outdoor service.

All components of the crane system must comply with MHI MH27.1, Class C (Moderate Service), and CMAA 74, Class C, except as modified and supplemented in this specification section. The crane span must be as indicated.

Reference in publications to the "authority having jurisdiction" means the "Contracting Officer."

The crane must operate in an indoor and outdoor environment having an ambient temperature range of 0 to 100 degrees F.

Maximum crane wheel loads (without impact) due to dead and live loads, with the trolley in any position, causing a more severe loading condition in the runway support structure than that produced by the design wheel loads and spacing indicated on the design drawings is not permitted.

##### 2.1.1 Capacity

Provide a crane with a minimum rated net payload capacity of 3 tons. Mark the rated capacity in both ton and pound units printed in different colors on each side of the crane bridge girders. Capacity marks must be clearly legible to the operator at ground level. Individual hoist units must have their rated capacity clearly marked on their bottom block, and additionally labeled on the hoist body. Rated capacity must include all accessories below the hook, such as load bars, magnets, grabs, etc. as part of the load to be handled.

## 2.1.2 Crane Bridge

### 2.1.2.1 Crane Bridge Girder

The summation of all normal stresses on a girder section under analysis can not exceed the allowable stress for tension or compression as stated in CMAA 74.

### 2.1.2.2 Bridge End Trucks

Provide end trucks conforming to CMAA 74.

Configure bridge trucks with a feature that limits load movement to one inch in the event of wheel or shaft failure.

End trucks have the ability to accomodate the width of the bottom flange of the supporting beam.

### 2.1.2.3 Bumpers

Provide trolley and bridge bumpers conforming to CMAA 74 guidelines.

## 2.2 STRUCTURAL

### 2.2.1 Welding

Use AWS D14.1/D14.1M for welding design and procedures, including pre-weld and postweld heat treatments. However, the minimum classification of electrodes must be the E70 series.

### 2.2.2 Structural Bolted Connections

Structural bolted connections must be in accordance with CMAA 74, Section 3.8.

## 2.3 MECHANICAL

### 2.3.1 Threaded Fasteners

Fasten base-mounted and flange-mounted components and all mechanical connections subjected to calculable loads with ASTM A325 plain uncoated bolts (ASTM A307) with appropriate ASTM A194/A194M or ASTM A563 plain nuts; and ASTM F436 plain, through hardened, flat, circular washers. Match bolt and nut threads. Oversize tapping is not permitted. Bolt and nut threads must conform to ASME B18.2.2 and ASME B1.1. Bolts and screws may be installed into tapped holes only in heat treated steel with a minimum hardness of 195 BHN.

All bridge girder to end truck connection fasteners and any other fasteners critical to the structural integrity of the crane shall be designed, installed and tightened in accordance with AISC Specification for Structural Joints Using ASTM A325 or A490 Bolts. These joints shall be "slip-critical" connections and the corresponding representative sample testing shall be conducted.

### 2.3.2 Antifriction Bearings

Provide antifriction type bearings, except where bushings are specifically permitted or required. Provide grease lubricated bearings with means for

relubrication through easily accessible lubrication fittings or provide permanently lubricated and sealed bearings.

### 2.3.3 Bushings

Provide manufacturer's standard bronze alloy bushings and thrust washers. Provide means for relubrication of grease lubricated bushings through easily accessible lubrication fittings or provide oil impregnated type bushings.

### 2.3.4 Gears

Gears must conform to the applicable requirements of ANSI/AGMA 2015-1, ANSI/AGMA 2001, AGMA ISO 10064-6, AGMA ISO 17485, AGMA 2011, and ANSI/AGMA 6013.

## 2.4 CRANE PAINTING

Paint exposed portions of the crane and girders in accordance with CMAA 74. Desired color is brilliant yellow.

Coat faying surfaces of bolted connections per AISC 325, but do not apply finish paint.

Paint the load block brilliant yellow with black diagonal striping, one inch wide diagonal black stripes located on 2 inch centers.

Factory paint mechanical equipment in accordance with the manufacturer's best standard practice (for the specified environment).

## 2.5 IDENTIFICATION PLATES

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

### 2.5.1 Markings on Crane

Markings include: bridge motion direction arrows on both sides of the bridge. Markings must be visible from bridge deck loading points.

## PART 3 EXECUTION

### 3.1 POST-ERECTION INSPECTION

After erection, the Contractor, the activity crane certifying official, and the Contracting Officer must jointly inspect the crane bridge and hoist systems and components to verify compliance with specifications and approved shop drawings and manufacturer's data. Notify the Contracting Officer 15 days before the inspection.

Document the results of this inspection and submit the post-erection inspection report to the Contracting Officer for approval.

### 3.2 OPERATIONAL TEST

After erection and inspection, test the hoist, bridge, and trolley as specified herein. All tests must be witnessed by a technical

representative of the Contracting Officer and the activity crane certifying official.

Perform the 125 percent rated load test with the bridge and trolley located to obtain maximum loads on the runway and bridge 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 meets the specified requirements.

Provide all personnel and equipment required to meet the specified test requirements. This includes test loads, and rigging gear, crane operating personnel, instruments, and all other necessary apparatus.

### 3.2.1 Operational Test Report

Record crane test data on appropriate test record forms suitable for retention for the life of the crane. Include in the test records:

- a. Test date
- b. Crane identification number
- c. Weather conditions (temperature, humidity, barometric pressure, dew point, prevailing wind direction and velocity, and crane orientation)
- d. Identification of each test performed
- e. Results of each test performed
- f. Data collected during testing
- g. Remarks

### 3.2.2 No-Load Test

Check entire clearance envelope to ensure there are no obstructions. Operate the bridge and trolley in each direction the full distance between end stops; bring bumpers into contact with bumper stops at each end of travel.

### 3.2.3 Trolley

Operate the trolley the full distance of the bridge rails in each direction with a test load of 125 percent of rated load.

### 3.2.4 Bridge Load Test

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/hoist 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. Contractor to provide load test

### 3.2.5 Rated Travel Test

Repeat travel tests for trolley/hoist and bridge with a test load of 100 percent of rated load. Repeat the test for 2 cycles to demonstrate proper operation and repeatability of all functions without the malfunction of any components.

-- End of Section --