DIVISION 14
CONVEYING SYSTEMS

2002/01/14

SECTION 14301
HOISTS AND TROLLEYS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Hoists and trolleys.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 05120 – Structural Steel.
   4. Section 09905 – Painting and Protective Coatings
   5. Section 11005 - Equipment: Basic Requirements.
   6. Section 14305 – Bridge Cranes

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Gear Manufacturer Association (AGMA).
   2. American National Standards Institute (ANSI):
      a. B30.11, Safety Code for Underhung Cranes and Monorail Systems.
      b. B30.16, Safety Code for Overhead Hoists.
      c. HST-4M, Performance Standard for Overhead Electric Wire Rope Hoists.
   3. ASTM International (ASTM):
      a. A36, Standard Specification for Carbon Structural Steel.
   4. National Fire Protection Association (NFPA):
      a. 70, National Electrical Code (NEC).

B. Comply with ANSI B30.11 and B30.16.

1.3 DEFINITIONS

A. Hook Height: The minimum acceptable distance in feet from bottom of hook in full raised position to the nearest floor surface.

B. Lift Height: The distance in feet from the bottom of the hook in full raised position to the surface of the lowest floor from which items may be hoisted.

C. Ultimate Load-Carrying Capacity: Live load, weights of all equipment and an allowance for impact.

D. Total Trolley Capacity: The ultimate load-carrying capacity of the trolley based on the ultimate strength of the material used (with a 5:1 safety factor) and the bearing life.

1.4 SUBMITTALS

A. Shop Drawings:
   1. See Section 11005.
   2. Reports of tests verifying strength of inserts and rail.
   3. Track layout including supports, splices, connections, switches, and end trucks.
   4. Load test results.

B. Operation and Maintenance Manuals:
   1. See Section 01340.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Hoists:
      a. Yale.
      b. Acco.
      c. Budgit
      d. Coffing
      e. Shaw-Box
      f. Or approved equal.
   2. Trolleys:
      a. Yale.
      b. Acco.
      c. Wright.
      d. Gaffey.
      e. Or approved equal.

B. Submit requests for substitution in accordance with Specification Section 01640.

2.2 MANUFACTURED UNITS

A. Trolley:
   1. Completely compatible with hoists, cranes, and monorails specified.
   2. Meet NEC standards according to classifications shown on Drawings.
   3. Capable of maneuvering curves without binding or scraping the track.
   4. Minimum B-10 bearing life of 5000 HRS based on 75 percent of the wheel load, excluding impact.
   5. Motor Driven: Tag No. HT-47
      a. Operate at 50/17 FPM
      b. Enclose internal gears in oil-tight housing.
      c. Design motors to operate with 460 V, 3 PH, 60 cycle power supply.
   6. Plain trolleys:
      a. Frame consisting of thick rolled steel sections extending beyond wheel flanges to protect wheels.
      b. Alloy steel hardened axles, ball-bearings and pressed steel wheels.
         1) Carburized and hardened ball tread wheels.
         2) Factory lubricated requiring no additional lubrication.

B. Hoists:
   1. Electric wire rope hoist: Tag No. HT-47
      a. Low headroom models.
      b. Hoist frames of welded heavy steel plate construction.
      c. Oil-tight gear casing for oil bath lubrication of gears.
      d. Construct rope drum and surrounding units to minimize abrading, crushing or jamming of the rope during usage.
      e. Drum diameter not less than 18 times the diameter of the rope used.
      f. Assure that two complete wraps of rope remain on the drum after lowering the load hook through its rated lift distance, unless a lower limit device is provided, in which case provide a minimum of one complete wrap.
      g. Double reeving for hoists with total lift height greater than hook height.
      h. Sheave and drum grooves shall be smooth and free from surface irregularities which could cause rope damage.
      i. Provide running sheaves with means for lubrication.
      j. Bearings:

1) Antifriction type.
2) Minimum B-10 life of 1250 HRS for Class H1, 2500 HRS for Class H2, and 5000 HRS for Class H3, based on full rated speed and mean effective load K of 0.65.

k. Mechanical load brake.

l. Lower limit switch to stop hoist when hook reaches its lower limit.

m. Motor:
1) Motor brake.
a) Internal disc magnetic type.
b) Rated for 150 percent of motor torque.
c) Delivers rapidly with minimal hook drift.
2) TENV motors operable on 460 V, 3 PH, 60 cycle power.
3) Meet specified area classification.
4) Permanently lubricate and seal motor ball-bearings.
5) Provide an upper limit switch to stop the hoist motor and apply the holding brake when the hook reaches its upper limit.

n. Speed: 20/4 FPM

o. Controls:
1) Motor starters, electric conduit, control stations, magnetic reversing contactors and low-voltage transformer, necessary for a complete and totally functional conveying system.
2) Equipment rating: NEMA 4X.

p. Mark the hoist with the following information:
1) Name and address of manufacturer.
2) Manufacturer's unit identification number.
3) Rated load.
4) Voltage of AC or DC power supply and phase and frequency of AC power supply.
5) Rated amperage.

q. Hooks:
1) Forged steel.
2) Bottom hook free to swivel in the loaded condition without twisting the chain.
3) Gate or swing type latch hooks.

r. Automatic mechanical load brake which will prevent lowering of the load unless manual power is applied to the hand chain.

s. Sleeve or antifriction type bearings.

t. Enclose gearing in sealed construction and provide life-time lubrication.

u. Load limit clutch to automatically prevent hoist from lifting loads greater than rated capacity.

2. Mark each hoist with the following information:
a. Name and address of manufacturer.
b. Manufacturer's unit identification number.
c. Rated load.

C. Bridge Crane:
1. See Section 14305.

2.3 ACCESSORIES

A. Trolley stops design to engage the trolley frame rather than trolley wheels.

B. Electrification and Controls:
1. Provide electrical power to the motor-driven hoists and trolleys from the bridge crane.
2. Controls:
a. Pendant pushbutton control stations with reversing type contactors for electric hoists and/or trolleys.
b. Single station if hoist and trolley are both motor-driven.
c. Suspend control stations from trolleys.
d. Clearly mark function of each button.

e. Suspend station in a manner that will protect the electrical conductors against strain.
f. Control station shall be operable from 115 V power supply.
g. Ground control station to hoist.
h. Provide control cable lengths of 1 FT less than distance to nearest floor.

3. Switches:
   a. Manual switches.
   b. Completely compatible with hoists, trolleys, and monorails specified.
   c. Provide switch chain to within 6 FT of floor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide hook clearance required for access to all equipment, valves, and piping.

B. Support track as shown on Drawings.

C. Arrange supports for easy removal of track for repair or replacement.

D. Align track true and level.

E. Warning Signs:
   1. Affix to the hoist or the lower load block or the controls in a readable position a durable label or labels displaying the following information concerning safe operating procedures:
      a. The word WARNING or other legend designed to bring the label to the attention of an operator.
      b. Cautionary language against:
         1) Lifting more than rated load.
         2) Operating hoist when hook is not centered under hoist.
         3) Operating hoist with twisted, kinked or damaged rope or chain.
         4) Operating damaged or malfunctioning hoist.
         5) Operating hoist with a rope that is not properly seated in its groove (if applicable).
         6) Lifting people or lifting loads over people.
         7) Removing or obscuring warning label.

3.2 FIELD QUALITY CONTROL

A. Provide Manufacturer's Field Services as defined in Section 01650 to provide the following services:
   1. Assistance during installation to include observation, guidance, instruction of CONTRACTOR's assembly, erection, installation or application procedures.
   2. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.
   3. Revisiting the site as required to correct problems and until installation and operation are acceptable to OWNER.
   4. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
   5. Assistance during Demonstration Period functional and performance testing, and until product acceptance by the OWNER.
   6. Training of OWNER's personnel in the operation and maintenance of respective product as required herein.
      i. See Section 01650 for duration and scheduling of training sessions required.
      ii. Training may be specified as either during the Pre-Demonstration Period or Post Demonstration.
   7. Completion of Manufacturer's Certificate of Proper Installation as include in Section 01650 with applicable certificates for proper installation and initial, interim, and final test service.
   8. Complete Certificate of Successful Start-up as defined in Section 01650.

3.3 SCHEDULE

A. Hoist and trolley systems include but are not necessarily limited to the following:

TAG NUMBER	LOADING (TONS)	HOIST	TROLLEY	HOOK HEIGHT (FT)*	LIFTING HEIGHT (FT)*	Hoist HP	Trolley HP
HT-47	5	WR	EM	29	27	7.5	¼

* Distances listed are approximate as they will vary depending on hoist and trolley selection.

C = Chain
HG = Hand Geared
EM = Electric Motor
WR = Wire Rope
NA = Not Applicable

END OF SECTION

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1998/03/19

SECTION 14305
BRIDGE CRANES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Electric, top running bridge cranes.

B. Related Sections include but are not necessarily limited to:
   1. Division 0 - Bidding Requirements, Contract Forms, and Conditions of the Contract.
   2. Division 1 - General Requirements.
   3. Section 05120 – Structural Steel
   4. Section 11005 - Equipment: Basic Requirements.
   5. Section 14301 – Hoists and Trolleys.

1.2 QUALITY ASSURANCE

A. Referenced Standards:
   1. American Gear Manufacturers Association (AGMA).
   2. American Welding Society (AWS).
   3. Crane Manufacturers Association of America, Inc. (CMAA):
      a. 70, Standard Specifications for Electric Overhead Traveling Cranes.
      b. 74, Standard Specifications for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist.

B. Qualifications:
   1. Welding shall be done by certified welders and shall be in accordance with the AWS standards.

C. Coordinate installation to assure proper operation within the confines dictated by structural, equipment, mechanical and electrical installations.

D. Verify hook and lifting heights for each application to assure each system is completely operational over range intended.

1.3 SUBMITTALS

A. Shop Drawings:
   1. See Section 11005.
   2. Girder layout including supports, connections and appurtenances.
   3. Load test results.
   4. Scaled drawing showing hook coverage for each application. Drawing shall show all equipment and piping.

B. Operation and Maintenance Manuals:
   1. See Section 01340.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following manufacturers are acceptable:
   1. Bridge cranes:

a. Gaffey.
b. Konecranes.
c. Or approved equal.

B. Submit requests for substitution in accordance with Specification Section 01640.

2.2 MANUFACTURED UNITS

A. Performance and Configuration Requirements: Tag No. BRC-47:
1. Duty cycle rating: Class C.
2. Operating speed: 100 FT/min VFD.
3. Type: Top-running, single girder, dual-drive electric. Direct drive end trucks.
4. Rated capacity: 5 tons.
5. Span: 34-FT (See Drawings).
6. Drive horsepower: 2 drives each ¾ HP.
7. Power source: 460 Vac, 3 PH, 60 HZ.
8. Crane overhead clearance: 3 IN minimum to nearest obstruction.

B. Design load carrying parts, except structural members and gears, so that the calculated stress in the material, based on rated load, shall not exceed 20 percent of the published average ultimate strength of the material.

C. Comply with CMAA #70 and #74.

D. Trolley and hoist (Section 14301) compatible with the specified bridge crane.

E. Runway Rails:
1. Straight, parallel and level.
2. Sufficient strength and rigidity to prevent detrimental lateral or vertical deflection.

F. Girder:
1. Structural steel from standard structural shapes. Paint all structural steel and crane components in accordance with Section 09905, System #2.
2. Design girder to resist vertical, lateral and torsional forces and stresses as defined by CMAA #74.
3. The maximum vertical deflection of the girder produced by the dead load, weight of the trolley and hoist and the rated load shall not exceed 1/600 of the span.
4. Locate safety stops at each end of bridge girder to prevent overtravel of trolley hoist.

G. End Trucks:
1. Carry crane bridge on end trucks sized to carry the rated load when it is lifted at one end of the crane bridge.
2. End truck wheelbase minimum of 1/8 of the crane span.
3. Construct from structural channels welded and bolted into a rigid box section.
4. Assure proper alignment of axles.
5. Design so that drop of truck is limited to 1 IN in case of axle or wheel failure.
6. Equip motorized top-running cranes with rail sweeps which extend below the top of the rail and project in front of the crane wheels.

H. Crane Wheels:
1. Top-running double flanged wheels of forged steel, cast-iron, cast carbon or alloy steel.
2. Support each wheel on roller bearings mounted on stationary axles suitable to take radial and thrust loads.
3. Factory lubricate and seal bearings.
4. Wheels may be heat treated.

I. Crane Drives:
1. Provide each end truck with a helical gear motor reducer.
2. Motors integral with fully-enclosed oil splash lubricated gear reducers.
3. Support gear reduction shaft by precision ball or roller bearings.
4. Design motors and drives to supply the crane speed specified.

5. Permanently lubricate and seal motor ball-bearings.

J. Bearings: 5000 HRS B-10.

K. Gearing:
1. All gearing except the final reduction at the wheels shall run in oil or be splash lubricated.
2. Comply with AGMA specifications for load ratings.
3. Gears not enclosed in gear boxes.
   a. Safety guards.
   b. Provisions for lubrication and inspection.

L. Bridge Brake:
1. Capable of stopping bridge within a distance in feet equal to 10 percent of full load speed (in fpm) when traveling at full speed with full load.

M. Bumpers and Stops:
1. Capable of stopping the crane at a rate of deceleration not to exceed 3 FT per second when traveling in either direction at 20 percent of rated speed.
2. Sufficient energy absorbing capacity to stop the crane when traveling at full speed with full load.
3. Stops designed to resist full load speed.
4. Locate stops at limit of bridge travel.
5. Runway stops shall not engage wheel treads.

2.3 ACCESSORIES

A. Electrification and Controls:
1. Provide electrical power to the equipment using the following method:
   a. Copper or galvanized steel conductor with enclosed insulation, 3 power conductor, 1 ground conductor.
2. Controls:
   a. Pendant pushbutton control stations with reversing type contactors for electric hoists and/or trolleys as well as the crane.
   b. Single control station if hoist and trolley are both motor-driven.
   c. Suspend control stations from trolleys.
   d. Clearly mark function of each button.
   e. Suspend station in a manner that will protect the electrical conductors against strain.
   f. Control station shall be operable from 115 V power supply.
   g. Ground control station to hoist.
   h. Provide control cable lengths of 1 FT less than distance to nearest floor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify sufficient hook coverage for each application to assure each system is capable of lifting all equipment, valves, and piping intended.

B. Install runway rails with center-to-center distance and elevation within +1/8 IN.

C. Warning Signs:
1. Maximum 10 FT intervals along rails with electrical conductors.
2. At stairs or ladders located 6 FT or less from the rail(s).
3. Warning sign legend and colors:
   a. DANGER (red).
   b. HIGH VOLTAGE (black).
   c. 480 Vac (black).
   d. KEEP OFF (red).

3.2 FIELD QUALITY CONTROL

A. Test each crane using 110 percent rated load.

B. Provide Manufacturer's Field Services as defined in Section 01650 to provide the following services:

1. Assistance during installation to include observation, guidance, instruction of CONTRACTOR's assembly, erection, installation or application procedures.
2. Inspection, checking, and adjustment as required for equipment to function as warranted by manufacturer and necessary to provide written approval of installation.
3. Revisiting the site as required to correct problems and until installation and operation are acceptable to OWNER.
4. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
5. Assistance during Demonstration Period functional and performance testing, and until product acceptance by the OWNER.
6. Training of OWNER's personnel in the operation and maintenance of respective product as required herein.
    i. See Section 01650 for duration and scheduling of training sessions required.
    ii. Training may be specified as either during the Pre-Demonstration Period or Post Demonstration.
7. Completion of Manufacturer's Certificate of Proper Installation as include in Section 01650 with applicable certificates for proper installation and initial, interim, and final test service.
8. Complete Certificate of Successful Start-up as defined in Section 01650.

END OF SECTION