

**HOIST, MONORAIL AND JIB CRANE SYSTEMS**

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**1. GENERAL**

**1.1 References**

- .1 The following is a list of standards which may be referenced in this Section:
  - .1 ANSI:
    - .1 B30.10, Hooks.
    - .2 B30.11, Monorails and Underhung Cranes.
    - .3 HST 1M, Performance Standard for Electric Chain Hoists
    - .4 HST 2M, Performance Standard for Hand Chain Manually Operated Chain Hoists.
    - .5 HST 4M, Performance Standard for Overhead Electric Wire Rope Hoists.
    - .6 MH27.1, Underhung Cranes and Monorail Systems.
  - .2 CSA:
    - .1 CSA C22.1, Canadian Electrical Code, Part I (20th Edition).
    - .2 CSA C22.2 No. 33-M1984 (R2004), Construction and Test of Electric Cranes and Hoists.
  - .3 NEMA:
    - .1 MG 1, Motors and Generators.
    - .2 250, Enclosures for Electrical Equipment (1,000 V maximum).
  - .4 EEMAC:
    - .1 M1-7, Motors and Generators.
  - .5 NFPA: 2005 National Electrical Code (NFPA 70):
    - .1 Article 610, Cranes and Hoists.
  - .6 Province of Manitoba Occupational Safety and Health Regulations.

**1.2 Design Requirements**

- .1 Monorail System: Specifications for Underhung Cranes and Monorail Systems, ANSI MH27.1 and ANSI B30.11.

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- .2 Hoist: ANSI B30.11, Hoist Manufacturers' Institute.
- .3 Trolley: ANSI MH27.1.
- .4 Wire Rope Hoist Service Class: ANSI HST 4M.
- .5 Chain Hoist Service Class: ANSI HST 1M.
- .6 Hook: ANSI 30.10.
- .7 Stress and Safety Factors: ANSI MH27.1 and ANSI B30.11. Properly select materials of construction for stresses to which subjected.
- .8 Safety of Operation, Accessibility, Interchangeability, and Durability of Parts: ANSI B30.11 and OSHA requirements.

**1.3 Submittals**

- .1 Shop Drawings:
  - .1 Make, model, weight, and horsepower of each equipment assembly.
  - .2 Complete catalog information, descriptive literature, materials of construction, and specifications on hoist, wheels, gears and bearing, trolley drive system, hoist motor and assemblies, hook, brakes, starting system, variable speed drive system, conductors (bus bar, festoon, cable reel), controls, remote control system, and accessories.
  - .3 Power and control wiring diagrams, including terminals and numbers.
  - .4 Motor nameplate data in accordance with EEMAC M1-7, and include any motor modifications.
  - .5 Factory finish system.
  - .6 General arrangement of jib crane and hoist, engineering description and complete list of materials
  - .7 Details of trolleys.
  - .8 Details of hoists, cable and hooks
  - .9 Details of retrieval system complete with description and design requirements.
  - .10 Details of jib crane anchorage and connections system complete with engineering calculations, sealed and signed by a licensed Professional Engineer registered in the Province of Manitoba

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.2 Information Submittals:

- .1 Factory Functional Test Report.
- .2 Manufacturer's certification of compliance that the factory finish system is identical to the requirements specified herein.
- .3 Special shipping, storage and protection, and handling instructions.
- .4 Manufacturer's printed installation instructions.
- .5 Field load tests results
- .6 Suggested spare parts list to maintain the equipment in service for a period of 1 year and 5 years. Include a list of special tools required for checking, testing, parts replacement, and maintenance with current price information.
- .7 List of special tools, materials, and supplies furnished with equipment for use prior to and during startup and for future maintenance.
- .8 O&M Manual.

**1.4 Environmental Requirements**

- .1 Temperature: Maximum 40°C; minimum 5°C.
- .2 Humidity: Maximum 100%.

**1.5 Spare Parts**

- .1 Furnish for each remote control crane:
  - .1 One transmitter.
  - .2 One battery.

**2. PRODUCTS**

**2.1 General**

- .1 All equipment in this is to be supplied by one Manufacturer.
- .2 Hoist and trolley Manufacturer to coordinate equipment requirements with steel structures, drive motor, hoisting cable or chain, hook, rails, stops, and electrical equipment controls.
- .3 Where adjustable speed drives or remote control systems are required, crane Manufacturer to furnish a coordinated operating system.

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**2.2 Supplements**

- .1 Datasheets and any other specific requirements are attached to this Section as Supplements.

**2.3 Trolley**

- .1 Frame: Welded steel, cast steel, or ductile iron construction, or a combination thereof. Construct to control deflection of trolley assembly while transmitting the carrying load to running surface.
- .2 Where required in the Supplements at the end of this Section, provide trolley drive shaft, driven by an electric motor through a gear reduction unit.
- .3 Where required in the Supplements at the end of this Section, provide chain sprocket mounted on shaft. Furnish chain to within 1.5 m of operating floor level. Drive shaft shall drive the trolley wheels through a gear and pinion or spur gear arrangement.
- .4 Furnish roller assembly stabilizers on single-girder trolley units to prevent tipping during load pickup.
- .5 Wheels: Rolled or forged steel, accurately machined and ground to receive inner bearing races. Furnish alloy steel axles. Rotating axles with wheels mounted press fit and keys, or with keys alone. Minimum tread hardness 210 Brinell.
- .6 Drive Gears: Helical, spur or herringbone type, rolled or cast steel, with machine cut teeth.
- .7 Bearings: Combination radial and thrust type, double row, angular contact ball bearings or single-row tapered roller bearings. Bearings prelubricated and sealed, or fitted for pressure lubrication. Locate pressure lubrication fittings for accessibility during maintenance.
- .8 Brakes: Suitable for service class and rated torque capacities as specified in ANSI B30.11.

**2.4 Hoist**

- .1 For jib cranes, design anchorage and connections system for mounting full cantilever wall bracket type to building structure by a Professional Engineer licensed and registered in the Province of Manitoba.
- .2 Hoisting machinery shall consist of rope drum driven through gear reductions, load blocks, hook, hoisting rope, sheaves, and hoist braking. Drum size and length sufficient for minimum two turns of cable remaining on drum when hook is at lowest position.
- .3 Rope drum and surrounding members constructed to minimize abrasion, crushing or jamming of hoist rope. Load blocks enclosed type. Hoisting rope extra flexible, improved plow steel wire rope, made especially for hoist service.
- .4 Hook: Construct with sufficient ductility to open noticeably before hook failure, equipped with safety latch, free to rotate 360 degrees with rated load and positively held in place with locknuts, collars or other devices.

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- .5 Brakes: Mechanical and electric load brake and controls, designed in accordance with ANSI 4M, and adjustable to compensate for wear.
- .6 Hoisting Machinery: Load chain wheel driven through gear reductions, an electric motor or a hand chain wheel, load blocks, sheaves, chain, hook, and hoist braking.
- .7 Chain: Non-jamming close-link coil type. Hand chain wheel deep pocket for reception of chain. Hand wheel shall have a guard that prevents chain slipping or jumping. Chain hoists shall have chain storage adequate for storing the full lift length of chain and shall be designed and located to avoid interference while hoisting.
- .8 Hook: Construct with sufficient ductility to open noticeably before hook failure, equipped with safety latch, free to rotate 360 degrees with rated load, and positively held in place with locknuts, collars or other devices.
- .9 Brakes: In accordance with ANSI HST 1M and 2M, adjustable to compensate for wear, spring set, electric release load brake system, which releases load when drive motor is energized and holds load when the drive motor is de-energized.

**2.5 Jib Crane Boom**

- .1 Fabricate boom track and mast of AISI C1045 carbon steel with a minimum Brinell hardness of 197
- .2 Design load carrying flange to stress values stated in the Monorail Manufacturers' Association Specifications for Under-hung Cranes and Monorail Systems.

**2.6 Jib Crane Wall Bracket Fittings**

- .1 Design anchorage and connections system for connecting wall bracket to building structure including fittings ,plates, braces and connecting hardware. All fittings shall have roller bearings
- .2 Fabricated steel fittings for the indicated loads
- .3 Fittings shall be high grade ductile iron casting.

**2.7 Safety Stops and Bumpers**

- .1 Fit open ends of track with safety stops or bumpers to prevent trolleys from running off the ends or hitting walls and equipment
- .2 Provide bumpers on the ends of trolleys to prevent damage to wheel flanges.

**2.8 Jib Crane Bolts and Nuts**

- .1 Bolts: ASTM A307 Gr.A; except bolts used for structural connections ASTM A325
- .2 Nuts: ASTM A563

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**2.9 Jib Crane Grease Fittings**

- .1 Pipe lubrication points on the trolley and hoists to a convenient location and terminate in button-head fittings to facilitate servicing.

**2.10 Electrical**

- .1 Supply and Install electrical equipment including motors, motor starters, pendant control, control systems, wire, and conduit.
- .2 Electrical: In accordance with CSA C22.1 Section 40, CEC and NFPA 70, NEC Article 610.
- .3 Supply motors compatible with adjustable frequency, variable speed, drive system, 40 to 1 speed range, suitable for hoist, trolley, and bridge drive applications. Controls with 120 VAC, microprocessor based, pulsed width modulation design, withstand 45°C temperatures, housed in NEMA 250, Type 4 enclosure, and supplied with 200% overcurrent protection.
- .4 Monorail conductor voltage drops from monorail track supply taps shall permit the hoist and trolley motors to operate within voltage tolerances of plus or minus 10%, when building supply voltage is at plus or minus 5% of design voltage.
- .5 Supply and install Enclosed Bus Bar Conductors: Stainless steel clad hard copper enclosed in insulation. Collector sliding noncopper bearing, carbon shoe type, with adjustable spring tension arms for contact between bus bar and controls. Collector mechanism components aluminum, stainless steel, plastic, or other noncorrosive materials.
- .6 Supply and install Festooned Flat Cable Conductors: Flexible cable, carried by heavy-duty roller, permanently lubricated roller bearings, with monorail support system that will dispense and retrieve flexible cable without twisting or tangling, and 20% spare conductor in each cable assembly.
- .7 Supply and install Cable Reel Conductors: Flexible cable, housed on a circular wheel, counter-torque spring to dispense and retrieve cable, with sag not more than 0.9 m below connection point on hoist or trolley at maximum travel.
- .8 Grounding: External in accordance with CSA C22.1 Section 10.

**2.11 Controls**

- .1 Hoist and Trolley: Pendant control having momentary contact pushbuttons with a device which will disconnect motors from line on failure of power. Device shall not permit any motor to be restarted until controller handle is brought to the OFF position, or a reset switch or button is operated. Furnish with undervoltage protection as a function of each motor controller, or by magnetic main line contactor.

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- .2 Pushbuttons: Fully magnetic, plain reversing type, housed in NEMA 250, Type 12 enclosure, with contactors of sufficient size and quantity for starting, accelerating, reversing, and stopping duty for specified hoist service class.
- .3 Trolley Drives: Soft start controls, 575/230 VAC series device, installed between drive motor and motor starter with torque and acceleration rate adjustable, suitable for trolley drive service, and work in conjunction with crane control and pendant or remote system, as specified in the Supplements.
- .4 Pendant Pushbutton Control Stations: Heavy-duty, oiltight, suspended from trolley, or as specified in datasheet, with control transformers to supply 120 VAC power to pushbutton control station. Pushbutton enclosure supported with chain or wire rope. Control wire cable attached to support chain or wire rope at not more than 1.8 m intervals. Furnish control station buttons for control of hoist and trolley ON/OFF main line contactor power switch which removes all power from control station.
- .5 Remote Control System: Frequency modulated (FM), radio controlled system, belt mounted operator and capable of operating all crane functions.
- .6 Control motions indicate direction of resultant crane motion. Furnish spring-loaded switch motions, with return to OFF position when switch is released and designed to prevent runaway crane situations.
- .7 Crane motions shall stop automatically when crane can no longer receive remote signals and designed to stop when control signal for any motion becomes ineffective.
- .8 Remote Control Crane Motions: Hook raise and lower, trolley movement, and crane power up and power down. Furnish an EMERGENCY OFF pushbutton station which will disconnect main line power via a remote switch, and manual reset function to activate all motions after an EMERGENCY OFF event.

**2.12 Accessories**

- .1 Equipment Identification Plate: 1.6 mm stainless steel with 6 mm die-stamped equipment tag number securely mounted in a readily visible location.
- .2 Lifting Lugs: Equipment weighing over 45 kg.

**2.13 Factory Finishing**

- .1 Prepare and prime and finish coat in accordance with Section 09901 – Painting and Finishing – Process Mechanical.

**2.14 Source Quality Control**

- .1 Factory Inspections: Inspect control panels and equipment for required construction, electrical connection, and intended function.

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- .2 Factory Tests and Adjustments: all equipment furnished.
- .3 Factory test report shall include Test Data Sheets.

**3. EXECUTION**

**3.1 Installation**

- .1 Power feeds and local disconnect to equipment are by Division 16.
- .2 Install in accordance with Manufacturer's printed instructions.
- .3 Provide lubrication and lubrication fittings.

**3.2 Field Quality Control**

- .1 Functional Tests: Conduct on each hoist, monorail and jib crane system.
  - .1 Alignment: Test complete assemblies for proper alignment and connection, and quiet operation.
- .2 Performance Test:
  - .1 Conduct on each hoist, monorail and jib crane system.
  - .2 Conduct electrical tests in accordance with CSA C22.2 No. 33.
  - .3 Load tests in compliance with OSHA, ANSI B30.11, and ANSI MH27.1

**3.3 Manufacturer's Services**

- .1 Verify satisfactory delivery of the equipment by completing Form 100, illustrated in Section 01650 – Equipment Installation.
- .2 Instruct Contractor in the methods and precautions to be followed in the installation of the equipment. Certify the Contractor's understanding by completing Form 101, illustrated in Section 01650 – Equipment Installation.
- .3 Arrange for a technically qualified Manufacturer's Representative to attend the installation work, certify correct installation, train operating and maintenance staff and undertake the testing of the system for sufficient periods, to ensure the equipment is installed, operated, and maintained in accordance with the Manufacturer's recommended procedures.
- .4 The minimum periods of Site attendance for all hoists are identified in the following table along with the form to be completed on each of these trips.
- .5 The total number of trips will depend on the Contractor's schedule. The cost of additional trips, to be determined by the Contract Administrator, shall be borne by the Contractor.



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Arrange for a technically qualified Manufacturer's Representative to attend the installation work, certify correct installation, train operating and maintenance staff and undertake the testing of the system for sufficient periods, to ensure the equipment is installed, operated, and maintained in accordance with the Manufacturer's recommended procedures.

<b>Item</b>	<b>Description</b>	<b>Total number of business days</b>	<b>Form</b>
1	Equipment Delivery	3	100
2	Installation Assistance	2	101
3	Witnessing of Equipment Installation	5	102
4	Assistance in Equipment Performance Testing	5	103
5	Operator and Maintenance Training	4	T1

**3.4 Installation Witnessing**

- .1 The Contractor shall ensure that equipment is installed plumb, square and true within tolerances specified by the Manufacturer's Representative and as indicated in the Contract Documents.
- .2 The Manufacturer's Representative shall ensure the equipment is installed as required to provide satisfactory service.
- .3 The Manufacturer's Representative and the Contractor are to cooperate to fulfill the requirements for a successful installation as documented by Form 102, illustrated in Section 01650 – Equipment Installation.

**3.5 Equipment Performance Testing**

- .1 The Manufacturer's Representative shall ensure that each hoist, including all component parts, operates as intended.
- .2 The Manufacturer's Representative shall demonstrate satisfaction of requirements specified herein.
- .3 The Manufacturer's Representative and the Contractor are to cooperate to fulfill the requirements for successful testing of the equipment as documented by Form 103, illustrated in Section 01650 – Equipment Installation.

**3.6 Training**

- .1 The Manufacturer's Representative shall provide the services of factory trained instructors for the purpose of training the City's personnel in the proper operation and maintenance of

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the equipment as documented by Form T1. Conform to the requirements of Section 01650 – Equipment Installation.

**3.7 Supplements**

- .1 The supplements listed below, following “End of Section,” are a part of this Specification.
- .2 Data sheets:
  - .1 Hypochlorite Building Area Hoists: CRN-J001
  - .2 Hypochlorite Building Jib Crane: CRN-J002

**END OF SECTION**

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**SUPPLEMENT 1 – HYPOCHLORITE BUILDING – PROCESS SUMP PUMPS**

PARAMETER	VALUE
Tag No. (s)	<b>CRN-J001</b>
Type	Wire rope
Number of rope falls	2
Capacity rating (tonne)	2
Manual or Powered	Powered
Clearance* (mm)	435
Monorail length (m)	14.550
Beam dimensions	W360x51
Monorail beam underside (Geodetic) (m)	244.750
Minimum travel range of hook (Geodetic) (m)	
Lower	237.750
Upper	244.315
Minimum travel length of cable (m)	6.565
Minimum hook approach (mm)	N/A
Hoist control	Two speed
Hoist speed, min (m/min)	1
Hoist speed, max (m/min)	6
Trolley control	Variable speed
Trolley speed, min (m/min)	0
Trolley speed, max (m/min)	20
Remote control (Yes or N/A)	N/A
Hoist power (kW)	9
Trolley power (kW)	0.45
Voltage (V/phase/frequency Hz)	575 / 3 / 60
Design standard	Konecranes Canada Inc. Model CXT 4021 – Low headroom
Acceptable Manufacturers	Konecranes Canada Inc., Kaverit Steel and Crane, P&H Handling Material, Mannesman Demag

**Note:** \* The clearance is defined as the distance from hook saddle to top of flange on the underside of the monorail beam.

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**SUPPLEMENT 2 – HYPOCHLORITE BUILDING – MECHANICAL MEZZANINE JIB CRANE**

PARAMETER	VALUE
Tag No. (s)	<b>CRN-J002</b>
Type	Wall Mounted full cantilever type jib crane with 180° manual swing and four locking positions
Capacity rating (kg)	250
Hoist Operation (Manual or Powered)	Manual
Trolley Operation (Manual or Powered)	Powered
Outreach (m)	3.0
Maximum Rotation Angle	180° Manual swing
Maximum Boom Depth (mm):	300
Hoist Lifting Height (m):	6.0
Top of Jib Crane Elevation (m):	241.85
High Hook:	240.91
Under side of Boom	241.55
Hoist control	Two speed
Hoist speed, min (m/min)	1
Hoist speed, max (m/min)	4
Trolley control	Manual
Hoist power (Amps)	1.4
Voltage (V/phase/frequency Hz)	575 / 3 / 60
Design standard	Konecranes Canada Inc. Jib Crane Model XMUW Hoist Type: XN01 254b1
Acceptable Manufacturers	Konecranes Canada Inc., Kaverit Steel and Crane, P&H Handling Material, Mannesman Demag