ELEVATING DEVICES

1. GENERAL

1.1 Summary

.1 This Section specifies the design, manufacture, delivery, installation and services required to provide complete and fully functioning:

.1 Elevator systems for the public, staff, and freight services.

.2 Dock lift systems outside of receiving bay doors including but not limited to the following: electrical power to power unit, hydraulic hoses linking power unit and lift, underground pathway in concrete or metal connecting dock lift to power unit in building, dock pit sized to accommodate flush bottom level, two (2) site bollards of concrete filled steel, storm drain in pit base and any other equipment, fittings or systems required for a fully functioning dock lift.

.3 Supply and install elevator systems and exterior loading dock lifts as noted in the Technical Requirements, with equipment and performance characteristics as generally described in this specification. Provide all necessary components to make the systems fully operational and functional.

.4 Provide all necessary components to make the dock lift and elevator systems fully operational and functional.

.5 Install dock lift outside of receiving bay door in loading areas. Exact location is indicated on the Final Design.

1.2 Standards

.1 Canadian Standards Association (CSA):

.1 CSA B44 13 - Safety Code for Elevators.

.2 Institute of Electrical and Electronics Engineers (IEEE):

.1 IEEE Standard 519-1992 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.

.3 American Society of Mechanical Engineers (ASME):

.1 ASME A17.1 - Safety Code for Elevators and Escalators.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Design submission documents submitted to The Office of the Fire Commissioner - Inspection and Technical Services Manitoba for permit.

.3 Description of special features such as Firefighters Emergency Operation, independent services, Emergency Power operation, two-way voice communication, and security operation.

2. PRODUCTS

2.1 Performance Criteria

.1 Elevators:

.1 The elevator and systems shall be designed to accommodate the requirements of the building in a manner which contributes to the overall efficiency and effectiveness of building operations.

.2 Elevator systems shall be designed to ensure there is sufficient capacity to accommodate the wide range of users and functions, and satisfies safety, reliability, responsiveness, accessibility and operational efficiency requirements.

.3 Elevators shall provide access for people and materials to building locations identified in the Technical Requirements.

.4 Equipment provided shall have a proven track record of at least five (5) years field operation in Canada in similar environments and similar configurations.

.5 Durable elevator cab finishes (including stainless steel fronts, impervious plastic laminate wall panels, and stainless steel hand and bumper rails) shall be provided.

.6 Emergency power operation of elevators shall be provided such that all elevators are fed with standby power.

.7 Elevators used for support services shall be configured with platforms to accommodate easy movement of material carts.

.8 Elevator shall be suitable for the environment they are installed in and shall be in accordance with Section 01450.

.2 Dock Lifts:

.1 The dock lift and systems shall be designed to accommodate the overall efficiency and operations requirements.

.2 The dock lift system shall be designed with sufficient capacity to accommodate the wide range of users and functions and satisfies safety, reliability, responsiveness, accessibility and operational efficiency requirements.

.3 Equipment provided shall have a proven track record of at least five (5) years operation in Canada in similar environments and of similar configuration.

.4 Dock lift shall be configured and positioned on site to accommodate easy movement of product sacks. Requirements for transportation of heavy equipment shall be considered and accommodated.

.3 Maintainability:

.1 Durable equipment finishes shall be provided.

.2 Arrange the equipment such that there are no times, dates, trips, or other circumstances that would shut down the equipment or change its operation.

.3 Elevator equipment provided under this Section must not contain proprietary features which limit the City's ability to engage a registered elevator maintenance contractor, other than the original manufacturer or installer, to provide routine maintenance services.

.4 Alarms:

.1 Integrate alarms into the PCS.

2.2 Elevators

.1 Barrier-Free Access:

.1 Arrange the controls and fixtures to meet barrier-free access requirements of the B44-13 Safety Code for Elevators.

.2 Fixtures:

.1 Provide a choice of fixtures from a third party supplier and use their standard products.

.2 Provide buttons with LED illumination and stainless steel targets.

.3 Operating Conditions:

.1 Provide equipment that is to operate normally when the machine room and hoistway temperature are between 0°C and 40°C.

.2 Provide equipment that is to operate normally when the power supply is within 10 percent of its rated voltage.

.3 As this is a corrosive environment, ensure all ferrous material including but not limited to steel and cast iron, except running surfaces of car and counterweight rails, are coated in accordance with Section 09900 and 09905.

.4 Elevators shall be designed for a 50 years of service life and shall be located for ease of repair and replacement.

.4 Maintainability:

.1 Select and arrange equipment for ease of maintenance to minimize any down periods. Provide an electrical interlock so as not to use the elevator in flood conditions.

.5 Equipment Summary:

.1 Provide the minimum performance and dimensional requirements for the passenger elevators.

.1 Machine room-less traction equipment.

.2 Minimum contract speed of 1.00 m/s.

.3 Capacity of 1590 kg, minimum. Size elevator to allow transfer and transport of a stretcher in the prone position.

.4 Single-speed side-opening or single-speed centre-opening entrances, depending on manufacturer's standard dimension and the stretcher requirement identified above, with a minimum width of 1067 mm and a height of 2134 mm.

.5 Floors served: All floors, including any below grade.

.6 Stops and openings: As set out in the Final Design.

.7 Passenger Elevator: Minimum clear inside cab dimensions of 2030 mm wide by 1680 mm deep. Minimum clear cab height to suspended ceiling of 2745 mm.

.8 Hoistway, pit, overhead dimensions as per manufacturer's specifications.

.9 Car Loading Classification: Class A.

.10 Operation: simplex or duplex, full selective-collective, as required.

.11 Control: variable-voltage, variable-frequency (VVVF) with regenerative drive.

.2 Provide the minimum performance and dimensional requirements for freight elevators. Final requirements to be adjusted as required by the Final Design:

.1 Machine room-less traction or overhead traction equipment.

.2 Minimum contract speed of 1.00 m/s.

.3 Minimum capacity of 2000 kg, or weight of heaviest forklift (minimum 3636 kg lifting capacity) or scissor lift, whichever is more stringent.

.4 Vertical bi-parting power operated entrances, by-pass design, as required, with a single or two section car gate, with a minimum width of 2400 mm and a height of 2440 mm.

.5 Floors served: All floors, including any below grade, as required by the Final Design.

.6 Stops and openings: As required by the Technical Requirements.

.1 Freight Elevator: Minimum clear inside cab dimensions of 2400 mm wide 2400 mm deep. Size to suit maximum equipment or vehicle as required by the Technical Requirements.

.2 Hoistway, pit, overhead dimensions as per manufacturer's standard specifications.

.3 Car Loading Classification: Class C1, C2 or C3, as required.

.4 Operation: Simplex, full selective-collective.

.5 Control: VVVF with regenerative drive.

.7 Elevator Control Room and Machinery Space Equipment – Machine-Room-Less Traction Elevators.

.1 Provide a gearless traction hoisting machine within the hoistway.

.2 Provide a spring applied electric brake, held open by an electro-magnet actuated by the controller. Design the brake to automatically apply in event of interruption of power supply from any cause.

.3 Provide an automatic reset governor located in the hoistway that can be maintained from the car top. When the governor has tripped, arrange that it shall be reset when the car is moved in the up direction.

.4 Provide sound and vibration isolation pads such that there is no direct contact between the machine and the building structure.

.5 Provide an emergency brake to stop the elevator if it overspeeds or if it moves more than 500 mm away from the floor with the doors open.

.6 Provide a solid-state drive complete with isolation transformers, filters (to meet IEEE Standard 519-1992 for Special Applications), and isolation pads located in controller room.

.7 Provide a digital velocity encoder on the motor, to transmit motor speed and position to the controller.

.8 Provide a microprocessor-based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, static drive units, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels, located in controller room.

.9 Provide an electrically-released brake system, to permit momentary nudging of elevator within the hoistway under test or emergency conditions.

.10 Locate controller room remotely at roof level, immediately above, or in rear proximity to elevator core.

.8 Elevator Machine Room Equipment – Overhead Traction Elevators:

.1 Provide a geared or gearless traction hoisting machine located within the machine room.

.2 Provide a spring applied electric brake, held open by an electro-magnet actuated by the controller. Design the brake to automatically apply in event of interruption of power supply from any cause.

.3 Provide a governor in the machine room.

.4 Provide sound and vibration isolation pads such that there is no direct contact between the machine and the building structure.

.5 Provide an emergency brake to stop the elevator if it over speeds or if it moves more than 500 mm away from the floor with the doors open.

.6 Provide a solid-state drive complete with isolation transformers, filters (to meet IEEE Standard 519-1992 for Special Applications), and isolation pads located in controller room.

.7 Provide a digital velocity encoder on the motor, to transmit motor speed and position to the controller.

.8 Provide a microprocessor-based controller consisting of relays, contactors, switches, capacitors, resistors, fuses, circuit breakers, overload relays, power supplies, circuit boards, static drive units, wiring terminal strips, and related components all enclosed in a cabinet with hinged door panels, located in the machine room.

.9 Provide an electrically-released brake system, to permit momentary nudging of elevator within the hoistway under test or emergency conditions.

.10 Locate machine room directly above the hoistway.

.9 Hoistway Equipment:

.1 Provide entrances consisting of doors, frames, sills, sight guards, door hangers, tracks, interlocks, door closers, gibs, and all other equipment required for a complete installation. Provide entrance doors and frames on passenger elevator finished in brushed stainless steel. Provide a painted finish for freight elevators, hoistway entrances doors and frames.

.2 Provide standard ‘T’ section steel guide rails for the car (and counterweight). Install guide rails using brackets fastened to the building structure. Clamp the guide rails to the bracket with clips arranged to prevent any horizontal movement of the rail. Join the rail sections using steel backing plates.

.3 Provide hoist ropes or belts of sufficient size and number to lift the load and ensure proper wearing qualities. Provide either steel ropes consisting of at least six strands wound around a hemp core centre or polyurethane-coated belts with high-tensile-grade zinc-plated steel cords. Ensure that all the ropes for a particular elevator are from the same manufacturing run.

.4 Provide a counterweight to counterbalance the elevator for smooth and economical operation with cast iron or steel plate weights contained in a structural steel frame. Provide a counterweight equal to the weight of the elevator car at least 45 and 50 percent of the rated capacity.

.5 For the car (and counterweight) of the passenger elevators, provide spring mounted roller guides at the top and the bottom of the car (and counterweight) frame. For the freight elevators, use heavy-duty swivel slipper guides.

.6 Provide fascia from each hall sill to the entrance header below. Include express zones. Extend the fascia into the pit and the overhead.

.7 Provide a car frame constructed of steel channels and a platform constructed of steel channels with a wood or metal sub-floor. Isolate the frame and platform from one another so that there is no metal to metal contact in order to prevent the transmission of noise and vibration.

.8 Mount the elevator cab shell on the platform in alignment with the hoistway entrances. Isolate the cab from the car frame and platform.

.10 Cab Equipment:

.1 Provide durable elevator cab finishes (including stainless steel fronts, hand and bumper rails, and indirect lighting) to suit the building. Cab finishes shall be selected from the manufacturer's standard range of options and conform with City Standards.

.2 Provide car doors, gates, jambs, headers, hangers, tracks, door closers, gibs, electrical contacts, and all other equipment required for a complete installation.

.3 Provide each passenger elevator with swing return car stations, quantity to suit design. For each freight elevator, provide one applied car station on the side wall adjacent to the car gate. Incorporate floor push buttons, door open and close buttons, an alarm button, and other fixtures required for normal operation in car stations.

.4 Provide for each floor button a call registered light and momentary audible tone. Provide a firefighters' emergency operation cabinet. Provide, below the car call and door control buttons, a locked service cabinet containing devices other than those used for normal operation.

.5 Engrave the car station with the elevator capacity, identification number, government installation number, and other markings required by code.

.6 For each elevator with front and rear doors provide two (2) car stations. Otherwise, provide one (1) car station per elevator.

.7 Provide a digital (dot-matrix or segmented) car position indicator above each car station with a minimum 50 mm high display.

.8 Do not install any certificates or licences in the cab.

.9 Provide a voice synthesizer for each elevator with automatic verbal announcement of each floor at which the elevator stops. Provide a system that handles a variety of other messages and indications as may be required by City at a later date.

.10 Provide an infra-red multiple beam door protective device that protect the full width and up to 1830 mm from the floor of the door opening. Mount the device 25 mm behind from the leading edge of the door.

.11 Provide battery-operated emergency cab lighting.

.12 Provide a two-speed exhaust fan mounted in the cab top.

.13 Provide one (1) set of cab protective pads that cover all walls and the cab front return panels of the passenger elevators, along with pad hooks. Provide pad hooks in each passenger elevator.

.14 Provide a heavy-duty closed-loop door operator to open and close the car and hoistway doors simultaneously.

.15 Provide a hands-free two-way voice communications system with a lobby rescue station and remote handset. Provide communication from each car enclosure to designated security station.

.11 Hall Equipment:

.1 Where required, provide hoistway access switches in the entrance frame or in the hall door sight guard.

.2 Provide hoistway door unlocking devices (by lunar key) on the hall doors at all floors.

.3 Provide one (1) riser hall station for each elevator. Provide in each hall station illuminating up and down push buttons (at terminal floors, provide only one button) located with their centreline 1070 mm plus or minus 25 mm above the floor.

.4 Provide a digital (dot-matrix or segmented) hall position indicator located above the main floor entrance with a minimum 50 mm high display.

.5 Provide hall lanterns with electronic tones at each entrance.

.6 Provide a remote fire recall switch for each group of elevators.

.7 Provide a lobby panel for the elevators that include car position indicator, in service pilot lights, parking switches, standby power switches and indicators, firefighter’s emergency operation key-switch and indicators, voice communication and other elements required by the specification.

.12 Electric Wiring:

.1 Provide copper wiring to connect the equipment.

.2 Run the wire in metal conduit, duct or electrical metallic tubing.

.3 Provide travelling cable between car stations and the controller in the machine room.

.4 Provide at least six (6) sets of spare shielded wires and a spare coaxial conductor in the travelling cable. This is in addition to the wiring identified elsewhere in this Section.

.5 Provide at least 20 percent spare wires in each travelling cable.

.6 Provide on one (1) controller a separate junction box for non-elevator devices such as telephones, cameras, and security systems.

.13 Operational Features:

.1 Provide electronic card access to all elevators. Card access system to be integrated for the Facility card reader system.

.2 Provide for installation of security cameras in all elevators. Provide the required wiring in the travelling cable run between the car top and the controller as well as power to the car top for the camera.

.3 Provide equipment and labour for installation of a card reader security system. Provide the required wiring between the card reader and the elevator security box in the machine room along elevator controller connections and circuits for the security system (including floor tracking).

.4 Provide independent service.

.5 Provide firefighters' emergency operation (Phase I and Phase II) for all elevators.

.6 Provide standby power operation of the elevators such that all elevators are fed with standby power and capable of operating at least one at a time. Arrange that at least one elevator in the Facility can operate at the same time on standby power.

.14 Operating Performance:

.1 Levelling – Arrange such that the car stops within 3 mm of the floor level.

.2 Operating time – Adjust the equipment so that the operating time of passenger elevator is 11.0 seconds or less (based on 1067 mm wide two-speed side-opening doors and speed of 1.0 m/s and travel of 5.0 m). Measure the operating time from the time that the doors begin to close until they are three-quarters open at the next floor.

.3 Ride quality – Arrange such that the lateral acceleration (front to rear and side to side) measured during express runs is less than 150 mm/s/s peak-to-peak.

.4 Adjust the door equipment so that the noise level is less than 60 dBA during a full door open and door close operation. Measure the noise levels using a sound level meter set to the "A" scale for a fast response.

.5 Arrange the machine room equipment so that the noise level with the elevator running is less than 78 dBA. Measure the noise levels using a sound level meter set to the "A" scale for a fast response.

2.3 Dock Lifts

.1 Provide equipment that operates normally when the exterior temperature is between minus -40°C and plus 40°C.

.2 Provide equipment that operates normally when the power supply is within 10 percent of its rated voltage.

.3 Provide standby power operation.

.4 Provide the minimum performance and sizing to meet Performance Criteria.

.5 Equipment Summary:

.1 Pentalift HED 68, or approved equivalent.

.2 Minimum 1829 mm x 2438 mm deck size.

.3 Remote power unit located in receiving room.

.4 Maximum 30 second lift time.

.5 Minimum capacity of 2,000 kg or greater as required by the Final Design.

.6 Bevel toe guards.

.7 Removable guard rail with midlevel rail and kick plate.

.8 Plated access chain.

.9 Deck-mounted push button – removable.

.10 Up-travel limit switch.

.11 Hydraulic-powered bridge.

.12 Toe sensor.

.13 Wall-mounted push button.

.14 Two-second warning bell.

.15 Manual lowering valve.

.16 Swing-out night stop.

.17 Hoistway, pit, as per manufacturer’s specifications.

.6 Hoistway and Pit Equipment:

.1 Provide structure and material consisting of reinforced concrete, guards, and all other equipment required for a complete installation.

.2 Provide pit surface sloped to drain which is connected to site storm drainage system.

.7 Electric Wiring:

.1 Provide copper wiring to connect the equipment.

.2 Run the wire in metal conduit, duct or electrical metallic tubing.

.3 Provide travelling cable between dock lift and the power unit in the receiving room and the Power Unit and local electrical panel.

.8 Operational Features:

.1 Provide NEMA 4X control stations.

.2 Equip motor with a NEMA 12 pre-wired control enclosure.

.3 Incorporate a velocity fuse to prevent deck free-fall in the event a hydraulic hose is accidentally severed.

.4 Provide standby power operation of the dock lift such that dock lift is fed with standby power and capable of operating in power outages.

.9 Operating Performance:

.1 Levelling – Arrange that the lift stops within 3 mm of the floor level.

.2 Operating time – Adjust the equipment so that the operating time is thirty (30) seconds or less.

.10 Arrange the power unit equipment so that the noise level with the dock lift in operation is less than 75 dBA.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer’s recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

.3 Test the system or sub-system to demonstrate performance of the equipment and controls. Perform the following activities during testing as a minimum:

.1 Full-Load Run Test: Elevators shall be tested for a period of one (1) hour continuous run with full contract load in the car. The test run shall consist of the elevator stopping at all

floors, in both directions of travel, for not less than five (5) or more than ten (10) seconds per floor.

.2 Speed Test: The actual speed of the elevator shall be determined in both directions of travel with full contract load and no load in the elevator. Speed to be determined by certified tachometer. The actual measured speed of the elevator with all loads in either direction shall be within five (5) percent of specified rated speed. Full speed runs shall be quiet and free from vibration and sway.

.3 Temperature Rise Test: The temperature rise of the motor shall be determined during the full load test run. Temperatures shall be measured by the use of thermometers. Under these conditions, the temperature rise of the equipment shall not exceed 50°C above ambient temperature. Test shall start when all machine room equipment is within 5°C of the ambient temperature. Other tests for heat runs on motors shall be performed as prescribed by the IEEE.

.4 Car Leveling Test: Elevator car leveling devices shall be tested for accuracy of leveling at all floors with no load in car and with contract load in car in both directions of travel. Accuracy of floor level shall be within plus or minus 3 mm of level with any landing floor for which the stop has been initiated regardless of load in car or direction of travel. The car leveling device shall automatically correct overtravel and undertravel and to maintain the car floor within plus or minus 3 mm of level with the landing floor regardless of change in load.

.5 Insulation Resistance Test: The elevator's complete wiring system shall be free from short circuits and ground faults and the insulation resistance of the system shall be determined by use of megohm meter.

.6 Safety Devices Tests: Safety devices shall be tested as required by ASME A17.1 Section 8.10.

.7 Overload Devices: Test all overload current protection devices in the system at final inspection.

.8 Limit Stops:

.1 The position of the car when stopped by each of the normal limit stops with no load and with contract load in the car shall be accurately measured.

.2 Final position of the elevator relative to the terminal landings shall be determined when the elevator has been stopped by the final limits. The lower limit stop shall be made with contract load in the elevator. Elevator shall be operated at inspection speed for both tests. Normal limit stopping devices to be inoperative for the tests.

.9 Working Pressure: Verify working pressure of the hydraulic systems by pressure gauge placed in the system line. Take readings with no load and full load on dock loading platform.

.10 Test automatic shut-off valve for proper operation.

.11 Setting of Car Door Contacts: Measure the position of the car door at which the elevator may be started. The distance from full closure is not to exceed that required by ASME A17.1. Test with the hoistway doors closed or the hoistway door contact inoperative.

.12 Setting of Interlocks: Measure the position of the hoistway door at which the elevator may stop. Distance shall not to exceed ASME A17.1 requirements.

.13 Operating and Signal System: Operate the elevator or lifting device by the operating devices provided and the operation signals and automatic floor leveling shall function in accordance with requirements specified. Starting, stopping and leveling shall be smooth and comfortable without appreciable steps of acceleration or deceleration.

.14 Performance of the control system to be witnessed and verified by the Professional of Record.

.15 Malfunction of any tested system or parts of equipment during the testing shall be corrected, repaired, or replaced and the test repeated.

END OF SECTION

MONORAIL HOISTS

1. GENERAL

1.1 Summary

.1 This Section includes the supply and installation of monorail hoists including the following:

.1 Supply, installation, and testing of the complete conveying system including rail beams in accordance with Z256 “Safety Code for Material Hoists.”

.2 All necessary appurtenances and incidentals required for operating the trolley and hoists in accordance with Design Builder’s Design and in accordance with national and local governing codes of the safety standards for cranes, as published by ASME.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 American Institute of Steel Construction (AISC):

.1 Manual of Steel Construction, Part 5, Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.

.3 American Society of Mechanical Engineers (ASME):

.1 AMSE B30.11 - Monorails and Underhung Cranes.

.2 AMSE B30.16 - Overhead Underhung and Stationary Hoists.

.4 American Society for Testing and Materials (ASTM):

.1 ASTM A36/A36M - Carbon Structural Steel.

.2 ASTM A123/A123M - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A153/A153M - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.4 ASTM B221 - Aluminum-Alloy Extruded Bar, Rod, Wire, Shape, and Tube.

.5 ASTM F3125/F3125M - High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.5 Canadian Standards Association (CSA):

.1 CSA B167 - Overhead Cranes, Gantry Cranes, Monorails, Hoists, and Jib Cranes.

.2 CSA G40.20/G40.21 - General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel.

.3 CSA S16 - Design of Steel Structures.

.4 CSA W47.1 - Certification of Companies for Fusion Welding of Steel.

.5 CSA W48 - Filler Metals and Allied Materials for Metal Arc Welding.

.6 CSA W55.3 - Certification of Companies for Resistance Welding of Steel and Aluminum.

.7 CSA W59 - Welded Steel Construction (Metal Arc Welding).

.8 CSA W178.1 - Certification of Welding Inspection Organizations.

.9 CSA W178.2 - Certification of Welding Inspectors.

.10 CSA W186 - Welding of Reinforcing Bars in Reinforced Concrete Construction.

.11 CSA Z256 - Safety Code for Material Hoists Welding Requirement.

.6 Master Painter Institute (MPI):

.1 MPI-INT 5.1 - Structural Steel and Metal Fabrications.

.2 MPI-EXT 5.1 - “Structural Steel and Metal Fabrications”.

.7 Steel Structures Painting Council (SSPC):

.1 SSPC SP2 - Hand Tool Cleaning.

.2 SSPC SP3 - Power Tool Cleaning.

.3 SSPC SP5 - White Metal Blast Cleaning.

.4 SSPC SP6 - Commercial Blast Cleaning.

.5 SSPC SP7 - Brush-Off Blast Cleaning.

.6 SSPC SP10 - Near-White Blast Cleaning.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

2. PRODUCTS

2.1 Performance Criteria

.1 Provide equipment to safely, and without strain on device, hoist and move the desired equipment.

.2 Equipment to be designed to meet requirements of Section 01450 for hazardous areas.

.3 Design equipment for a minimum fifty (50) percent working overload capability based on rated capacity.

.4 Monorails shall be single girder, top or under running as required in the Schedule 18 Technical Requirements. Monorail hoist to be chain hoist. Hoist and trolley to be electrically operated.

.5 Provide monorail hoist with following requirements:

.1 Capacity, span, runway length, and maximum lift rating: as required by the Technical Requirements and Final Design.

.2 Hoisting Speeds: 2-speed, 2.4 m/min and 9.7 m/min.

2.2 Monorail Girder

.1 The girder shall be an I-beam complete with rail capping as required by the monorail hoist supplier.

.2 Locations of end stops to be positioned to prevent damage to equipment and building components.

.3 Rubber bumpers shall be provided to mate with the runway end stops.

2.3 Load Chain

.1 Load chain to be through and case hardened steel.

.2 Load chain shall be proof tested to twice the working load limit.

2.4 Trolley

.1 The trolley shall be a four-wheel unit or combinations of two wheel units with load bars or frames from which carrier and hoist are suspended and moved along the tracks. They shall be of a design to suit the type of track furnished and may have flat tread or flanged wheels.

.2 Load bars or special frames shall be cradled in the trolley yokes on swivel pins with thrust bearings for the maximum load. The load bars and special frames hung from the trolley yokes shall be of all steel or forged steel construction. Other design and construction features of wheels, bearings, and their lubrication shall comply with the current Standard Specifications for steel railway bridges, CSA serial designation S1.

.3 All bearings to be lifetime lubricated.

.4 Rubber bumpers shall be provided to mate with the girder end stops.

2.5 Hoists

.1 The hoists shall be of the highest standard designed for equipment of this type with hoisting capacities as required by the Technical Requirements.

.2 Hoist shall meet ASME B30.16.

.3 Hoist to have metric rating.

.4 Hoist to have true vertical lift.

.5 Provide 4-pocket, heat treated lift wheel.

.6 All bearings to be lifetime lubricated.

.7 Include hoisting drum if required to meet Performance Criteria.

.8 The hoist and trolley shall be integrally constructed and shall be a low-head type of capacity in accordance with the Technical Requirements.

.9 Each hoist and rope shall be load tested to 125 percent capacity and test certificates provided to the Design Builder.

2.6 Hook Block

.1 The hook block shall of the swivel type carrying a heavy forged steel hook. The hook shall swivel on ball bearings of ample capacity, and include a latch.

2.7 Rails

.1 Supply and install all required rails as shown on Design Builder's Drawings. All top running crane rails shall be ASCE 27.2 kg rail Standard or as required by the Design Builder's Design.

2.8 Painting

.1 The monorail hoist assembly shall receive one shop coat of high visibility yellow anti-corrosive paint. Refer to Section 09910.

.2 All exposed surfaces of monorail and hoist shall be painted in factory. All damaged paint shall be touched up after installation.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

.3 Hoist commissioning shall be undertaken on site following installation of the monorail and hoist system to CSA B 167. Specifically include:

.1 Operation of all monorail and hoist functions at 0 percent of the load to verify direction, operation, limits, and brakes.

.2 Load testing at 100 percent rated capacity to verify monorail deflection, hoist, and trolley speeds, and brakes.

.3 Operation of the trolley travel with 100 percent load to guarantee performance. Travel to include full travel area.

.4 Load testing at 125 percent of rated capacity to verify that the hoist motor has the power to lift load and that hoist brake will hold the load without slipping.

END OF SECTION

PORTABLE DAVIT CRANE

1. GENERAL

1.1 Summary

.1 This Section specifies the portable davit crane for removal of equipment.

1.2 Standards

.1 Hoist Manufacturers Institute (HMI).

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Structural calculations for the complete crane assembly with reactions at each connection point, including detailed loadings to the mast support connect system, listing vertical, impact, longitudinal and lateral forces conforming to the design loadings specified in Division 1, signed and sealed by a Professional Engineer registered in the Province of Manitoba.

.3 Certified factory test results.

1.4 Quality Assurance

.1 Qualifications: Minimum five (5) years' experience in the production of portable davit cranes.

2. PRODUCTS

2.1 Manufacturers and Products

.1 Acceptable Manufacturers:

.1 Thern.

.2 Dayton.

.3 Or approved equal.

2.2 Performance and Design Criteria

.1 Area exposure per Section 01450.

.2 The design requirements for the following parameters shall conform to the Final Design:

.1 Minimum capacity.

.2 Minimum vertical lift below floor level.

.3 Minimum boom length.

.4 Maximum boom length.

.1 Boom length is distance from centreline of equipment to davit mast.

.3 Provide lightweight materials and coatings for corrosion resistance in accordance with section 01450.

.4 Size equipment as per Manufacturer's recommendations for lifting equipment.

.5 Provide the appropriately sized davit crane per working area, or building, for each equipment weight grouping.

.6 Provide portable davit configured to lift and remove equipment without strain.

.7 Davit may need to be in pieces so that it can be carried or transported without exceeding operator lifting limits of 25 kg. Pieces heavier than 25 kg require a lifting plan.

2.3 Materials

.1 Crane mast, boom, base: aluminum or other light weight material.

.2 Hand Winch: Zinc plated.

.3 Use electric winch for ratings over 200 kg. Hand Winch for lower than 200 kg

.4 Wire rope: Type 304 stainless steel.

.5 Hook: Galvanized steel.

2.4 Configuration, Components and Features

.1 General:

.1 Provide number of crane assemblies as required by the Final Design.

.2 Provide crane that can be disassembled into portable components for storage and transport.

.3 Provide crane assembly with lift capacity to bear the full weight of the equipment including the mounting plates, with a safety factor of at least 3.0.

.4 Comply with requirements of the HMI for the equipment furnished under this Section.

.2 Mast: Rotate 360 degrees on a pin-and-sleeve bearing in the base while loaded.

.3 Boom:

.1 Provide handle to the boom for ease of rotation.

.2 Adjustable angle between 5 degrees and 45 degrees from horizontal at all times, including when under full load, with ratchet-style screw-jack.

.3 Adjustable to four different positions, with at least two positions providing the minimum capacity specified in this Section.

.4 Winch: Provide spur-gear hand winch with brake for load control.

.5 Davit Socket Base:

.1 Where possible, davit base to be socket flush-mounted.

.2 Design anchor bolts in accordance with Manufacturer's recommendations and requirements specified in Section 05501.

.6 Wire Rope:

.1 Provide wire rope to meet the lift capacity and the vertical left below floor level specified in this Section.

.2 Provide wire-rope keeper at each mounting base for attachment of wire rope when not in use.

.3 Use clevises, safety hooks, or similar attachment fittings with mechanical closures at connection to the boom.

.4 Provide latch-type hook and swaged ball fitting.

2.5 Finishes

.1 Clearly indicate hoist capacity on the crane using letters 25 mm high or larger.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

.3 Ensure davit is properly aligned over equipment so there is no binding, rubbing or scraping of equipment.

.4 Comply with the installation, inspection, testing and commissioning requirements of Section 11000 and the additional requirements specified in this Section.

3.2 Checkout and Testing

.1 Factory Acceptance Tests:

.1 Factory test according to Manufacturer's standard test procedures.

.2 Provide certified test results.

.2 Field Testing:

.1 Test by operating the davit crane through a complete lifting and lowering cycle at each location while loaded with the maximum load rating specified in this Section.

END OF SECTION

BRIDGE CRANES

1. GENERAL

1.1 Summary

.1 This Section specifies supply and installation and testing of bridge cranes. Work includes, but is not limited to, designing, manufacturing, shipping, installing, commissioning, and testing for top running or under running single or multiple girder electric overhead crane(s) with electric wire rope hoist(s).

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 Cranes:

.1 American National Standards Institute (ANSI):

.1 ANSI/ASME HST-4 - Performance Standard for Overhead Electric Wire Rope Hoists.

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

.3 ANSI/ASME B30.11 - Monorails and Underhung Cranes.

.4 ANSI/ASME B30.16 - Overhead Underhung and Stationary Hoists.

.5 ANSI/ASME B30.17 - Cranes and Monorails (With Underhung Trolley or Bridge): Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Sling.

.6 ANSI B92.1 - Involute Splines and Inspection.

.7 ANSI/MMA MH27.1 - Specifications for Underhung Cranes and Monorail Systems.

.2 Crane Manufacturer's Association of America (CMAA):

.1 CMAA Specification No. 70 - Specification for Top Running Bridge & Gantry Type Multiple Girder Electric Overhead Travelling Cranes.

.2 CMAA Specification No. 74 - Top Running & Under Running Single Girder Electric Traveling Cranes Utilizing Under Running Trolley Hoists.

.3 American Bearing Manufacturers Association (ABMA).

.4 American Gear Manufacturers Association (AGMA).

.5 National Electrical Manufacturer Association (NEMA).

.3 Structural Steel:

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.

.2 ASTM A36/A36M - Standard Specification for Carbon Structural Steel.

.3 ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless.

.4 ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.5 ASTM A143/A143M - Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedures for Detecting Embrittlement.

.6 ASTM A153/A153M - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.

.7 ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength.

.8 ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.9 ASTM A384/A384M - Standard Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.

.10 ASTM A385/A385M - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip).

.11 ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

.12 ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.

.13 ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.

.14 ASTM A588/A588M - Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance.

.15 ASTM A780/A780M - Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.

.16 ASTM A992/A992M - Standard Specification for Steel for Structural Shapes.

.17 ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.

.18 ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

.2 American Welding Society (AWS):

.1 D1.1, Structural Welding - Steel.

.3 Canadian Standards Association (CSA):

.1 CSA G40.20/G40.21 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA S16 - Design of Steel Structures.

.3 CSA S136 - North American Specification for the Design of Cold-Formed Steel Structural Members.

.4 CSA W47.1 - Certification of Companies for Fusion Welding of Steel Structures.

.5 CSA W48 - Filler Metals and Allied Materials for Metal Arc Welding.

.6 CSA W55.3 - Certification of Companies for Resistance Welding of Steel and Aluminum.

.7 CSA W59 - Welded Steel Construction (Metal Arc Welding).

.4 Canadian Institute of Steel Construction (CISC).

.5 Canadian Sheet Steel Building Institute (CSSBI).

.6 Canadian General Standards Board (CGSB).

.7 The Society for Protective Coatings (SSPC).

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Crane data.

.3 Travel and hoisting speeds.

.4 Dimensions and weights.

.5 Runway.

.6 Conductors.

.7 Controls.

.8 Power supply and all motor sizes.

.9 Collision avoidance system.

.10 Spreader beams.

1.4 Quality Assurance

.1 Test reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by Manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

2. PRODUCTS

2.1 Performance Criteria

.1 Provide equipment to safely, and without strain on device, hoist and move the desired equipment.

.2 Equipment to be designed to meet requirements of Section 01450 for hazardous areas.

.3 Design equipment for a minimum fifty (50) percent working overload capability based on rated capacity.

2.2 General

.1 Classification, performance criteria, and operation characteristics of each crane: as required by the Schedule 18 Technical Requirements and as included, but not limited to, items described below.

.2 Crane:

.1 Crane group: CMAA duty classification.

.2 Crane use: indoor or outdoor.

.3 Height of Lift.

.4 Span.

.5 Crane load capacity: working load limits.

.6 Dynamic coefficient for live load.

.7 Dynamic coefficient for dead load.

.8 Sideways pull factor.

.9 Crane acceleration.

.10 Max crane weight (with hoists).

.11 Main girder type.

.12 Hoist lift speed: variable frequency drive (VFD) - Stepless.

.13 Hoist upper and lower hoist limits: UP and DOWN, adjustable.

.14 Trolley travel speed: VFD - Stepless.

.15 Bridge travel speed: VFD – Stepless.

.16 Crane main / control voltage.

.17 Crane movement warning device: pendant operated warning horn.

.18 Painting system: SSPC, Safety Yellow.

.19 Protected from nearby equipment such as overhead infrared heaters.

.20 Anti-sway control system.

.21 Safety features:

.1 Load limiting device to prevent overload condition.

.2 Bridge travel limit switches.

.3 Upper and lower limits.

.4 Thermal overload protection for motors.

.5 Warning horn: button activated.

.6 Collision avoidance system as applicable.

.7 Fall protection system.

.3 Bridges:

.1 Bridge traveling group: CMAA duty classification.

.2 Bridge traveling speed: stepless.

.3 Bridge girders wheel base.

.4 Max bridge weight (without Hoists).

.5 Bridge lock-out key switch in pendant station.

.6 Bridge control synchronized with other bridges as applicable.

.4 Hoists:

.1 Hoist load capacity.

.2 Hoisting height.

.3 Hoisting type.

.4 Hoist group: ASME duty classification.

.5 Hoisting speed: stepless.

.6 Hoist control: synchronized with other hoists as applicable.

.7 Hoist Lift Speed: VFD - Stepless.

.8 Hoist upper and lower hoist limits: UP and DOWN, adjustable.

.5 Trolleys:

.1 Trolley type: for applicable girder configuration.

.2 Trolley traversing group: CMAA duty classification.

.3 Trolley traversing speed: stepless.

.4 Trolley control: synchronized with other trolleys as applicable.

.6 Electrical:

.1 Crane main / control voltage.

.2 Main fuse size at bridge panel.

.3 Under voltage and over current protections.

.4 Festoon system cable control.

.7 Control.

.8 Pendant type and cable length.

.9 Radio control, frequency Hz as required by the City.

.10 Control method: pendant on separate track and radio control.

.11 Control methods: for hoist, trolley, and bridge in respective panel.

.12 Anti-collision device.

.13 Methodology for two (2) cranes as applicable: control options on pendant/remote control crane selector either one (1) of the following:

.1 Crane A active.

.2 Crane B active.

.3 Crane A+B active.

2.3 Rigging Accessories

.1 Spreader beams:

.1 Manufacturer to include for necessary field measurements and design to manufacture spreader beams based on components to be lifted.

.2 Spreader beam to be capable of supporting load in all configurations in perfectly balanced lifts.

2.4 Bridges

.1 Girder:

.1 Standard wide-flange structural shapes or box sections fabricated from steel plate selected for maximum live load capacity with minimum dead weight.

.2 Designed to resist all vertical, horizontal, and torsional forces.

.2 End trucks:

.1 Structural steel providing a rigid structure.

.2 Design to allow easy wheel removal and exchange.

.3 Fitted with rail sweeps and shock absorbing bumpers capable of decelerating and stopping crane within limits stated by CMMA and Workplace Safety and Health Act (WSHA).

.3 Wheels:

.1 Rolled or forged steel or cast of iron or steel designed to carry wheel loads without undue wear.

.2 Hardened to 300 BNH for long operating life.

.3 Driven by a fully splined shaft for uniform rotational force distribution.

.4 Supported on fixed axles by anti-friction lifetime lubricated bearings as required by crane classification.

.4 Drives:

.1 Individual drive units mounted on each end truck or a centre drive unit. Each drive to consist of motor, brake, and gearbox.

.2 All motors to be totally enclosed, fan cooled, two speed, and squirrel cage. Motors shall have Class "F" insulation and shall be thermally protected by heat sensors embedded in windings. Two speed drives to be at a high to low speed ratio of 4:1 with automatic acceleration control. Acceleration and deceleration rate to be as constant as possible and shall not be measurably affected by variation of live load or by location of live load on bridge span.

.3 Motor brakes shall be disk type with asbestos-free lining material, and a stepless brake torque adjustment.

.4 All gears shall be heat treated and shall run on anti-friction bearings in a fully enclosed gearbox with constant oil bath lubrication.

2.5 Trolleys

.1 Frame: welded structural steel.

.2 Wheels:

.1 Rolled or forged steel or cast of iron or steel designed to carry wheel loads without undue wear.

.2 Hardened to 300 BNH for long operating life.

.3 Supported on fixed axles by anti-friction lifetime lubricated bearings with a minimum B-10 life as required by crane classification.

.3 Drives:

.1 Powered by a totally enclosed, fan cooled, two speed, squirrel cage motor complete with brake of sufficient torque capacity.

.2 Motor: Class "F" insulation and thermally protected by heat sensors embedded in windings. Two speed drives shall be at a high to low speed ratio of 3:1 with automatic acceleration control. Acceleration and deceleration to be limited to minimize load swing.

.3 Motor brake: disk type with asbestos-free lining material, and a stepless brake torque adjustment.

2.6 Hoists

.1 Hoists:

.1 Single drum wire rope type, powered by an electric motor through a gear train integral with hoist. Hoist to be complete and shall include an electrically operated motor brake, mechanical load brake, load block, hook, and wire rope reeving.

.2 Suspension frame and/or drum hanger: precision machined welded structural steel and to form a ductile shock resistant unit giving protection and shrouding to wire rope drum.

.2 Drums:

.1 Welded combination of structural steel and pipe and with machined grooves with a depth not less than 0.5 times rope diameter, a pitch not less than 1.14 times rope diameter. Minimum ratio of drum pitch diameter to wire rope diameter of not less than 20 for single reeving.

.2 Proportioned so that no overwrap occurs when hook is in its highest position. No less than two (2) complete wraps of rope to remain in grooves when hook is at lowest position of rated lift.

.3 Full depth flanges to be provided to prevent wire rope from jamming.

.3 Wire rope:

.1 Regular lay, extra flexible pre-formed plow steel, 6 x 37 construction, internally lubricated.

.2 Hoist capacity rating divided by number of parts of rope shall not exceed 20 percent of nominal breaking strength of rope.

.3 Wire rope ends to be fitted with swaged fittings. Attachment of wire rope to hoist frame to be accessible and to permit easy replacement of rope. Rope end attaching to drum to automatically disengage from drum when lowest hook position of rated lift has been exceeded so that reverse wrapping of rope on drum is prevented.

.4 Load blocks and sheaves:

.1 Load blocks: enclosed type protecting load sheave or sheaves. Load block frame: welded combination of cast and structural steels.

.2 Load blocks to support load hook on heavy duty anti-friction thrust bearing permitting hook to swivel freely through 360-degree rotation with capacity load. Provision to be made to replace hooks easily.

.3 Sheaves: made of forged or alloy steel; cast iron not permitted; machined grooves and a minimum ratio of sheave pitch diameter to wire rope diameter of not less than 20 for running sheave and 10 for equalizing type.

.4 Running sheaves to be supported on anti-friction roller bearings. Provision to be made to lubricate bearings of running sheaves through sheave axle.

.5 Hooks:

.1 Drop forged, heat treated alloy steel.

.2 Sufficient ductility to open noticeably before hook failure when subjected to abuse or overload.

.3 Be retained by positively secured nuts that prevent hooks from working loose.

.4 Spring type latch to close throat opening.

.6 Gearing and bearings:

.1 Hoist gearing to consist of triple reduction train spur gears; alloy steel gear teeth designed with a twenty (20) pressure angle and carburized for high endurance and long wear.

.2 Gearing to be designed and manufactured in accordance with AGMA standards. All gear train components to be free of burrs.

.3 High speed gearing to be splash lubricated and operate in a bath of AGMA rated gear oil, enclosed in an oil-tight housing. Oil-tight housing to be provided with a pressure relief valve and all openings to be provided with oil seals.

.4 Supporting and/or torque transmitting shafts to be made of steel and to be supported on anti-friction bearings.

.5 Spline connections to be used where appropriate for convenience in assembly and service. Spline connections, where used, shall have splines machine cut to ANSI B92.1.

.6 Bearings to be ball or roller anti-friction bearings and to be standardized production items of bearing manufacturers in accordance with ABMA.

.7 Bearings shall be designed for a minimum B-10 life.

.8 Gear housing to be attached directly to drum hanger with one end of drum shaft on an anti-friction ball bearing.

.9 Gear housing to be configured to efficiently dissipate heat generated by gear train.

.10 Gear housing cover to be machined from cast iron and attached to gear housing to form an oil-tight assembly.

.7 Brakes:

.1 Hoist to be equipped with two (2) independent brakes, a mechanical load brake and an electric motor brake. Both brakes to be independent and capable of preventing a load from free-falling.

.2 Simple regenerative braking is not to be used as a substitute for a mechanical load brake.

.3 Electric motor brake to have a minimum CMAA Class-E service rating direct acting disk type using a short stroke magnet, operated by rectified DC supplied by brake control. Torque rating of brake to be not less than 150 percent of full load torque rating of hoist motor and shall quickly set and stop motor when power is interrupted.

.4 Mechanical load brake to be a multiple disk brake in an oil bath and can hold a full capacity load independent of DC motor brake and requires no adjustment for wear and controls and load while being lowered.

.8 Motors:

.1 Hoist motor to have a NEMA 210 frame (minimum) that results in a long life and maintenance free motor. High starting torque motor to be designed to NEMA "D" motor operation, without reducing hoist performance.

.2 All motors shall be two speed, totally enclosed, non-ventilated TENV 4-pole, NEMA 210 frame (minimum) motor with Class F insulation and a rating of thirty (30) minutes continuous operation, with full load. Hoist to be designed to operate at a temperature rise of 75°C over 40°C ambient. Two speed drives to be at a high to low speed ratio of 6:1.

.3 Motor coupling to be retained on motor shaft and shall connect to splined end of motor extension shaft.

.4 Use of universal joints or flexible coupling which require internal inspection at drum shaft and motor connection shall not be substituted for a steel spline connection.

.9 Dual limit switch:

.1 All hoists shall be equipped with a hairpin limit operated gravity type upper limit switch. Limit switch to be arranged to interrupt control circuit to stop hoist motor and set motor brake, and apply motor brake when hook reaches its upper limit. Incorporate backup limit switch, such as NEMA 4/12, to prevent load block from jamming into hoist drum, in event of a geared limit switch malfunction.

.2 Each hoist to be equipped with an upper and lower geared limit switch in addition to standard weight limit switch. Geared limit switches to have two (2) or four (4) independently adjustable circuits. Lower limit of geared limit switch to be arranged to interrupt control circuit to stop hoist motor and apply motor brake when hook reaches its lower limit and shall stop hoist with not less than two (2) complete wraps of rope remaining on drum.

.3 Use of a slip clutch between motor and hoist drum as an upper and lower travel limit device is not permitted.

.4 Limit switch to be equipped with a digital drum revolution counter for use in evaluating service conditions and maintenance intervals.

2.7 Controls

.1 Hoist and trolley motor control to be completely enclosed and to consist of following major components:

.1 AC 4-pole magnetic reversing contactor, mechanical and electrical interlock. Minimum NEMA Size 1 contactors specifically rated for CMAA Duty classification to be used for

all motors. Control coils to be wound for 115 V unless otherwise required by Design Builder's Design.

.2 A control circuit transformer with fused secondary to be supplied to reduce power supply voltage to 115 V in control circuit. Transformer for 575 V power supplies to be re-connectable.

.3 Brake control components including bridge rectifier, diode assembly, transient suppressors, and brake transformer.

.2 Control components to be mounted on sheet metal panels. Panels to be coated with white enamel so all components and wiring are clearly visible for servicing.

.3 Control enclosures to be made of sheet steel with door to NEMA 4 standards. External wiring to enter enclosure behind panel. Control wiring to be colour-coded based on function and tagged at each end.

.4 Control panel includes mainline fusing to protect crane from short circuits. A manual disconnect switch and a mainline contactor to allow remote electrical on-off switching of main power supply. Motors to be fuse protected to provide overcurrent and short circuit protection in all three phases.

2.8 Push Button Station

.1 Floor control of crane to be by means of a double insulated, NEMA 4 rated, pushbutton station with a key lock switch. Buttons to be sealed and rated NEMA 3R, 4, and 12, and to have double break silver contacts and to spring return to "Off" position. Each pair of buttons in station to be electrically interlocked. Pendant pushbutton station to be supported by a strain chain to protect electrical conductors against strain. Conductor for grounding pendant pushbutton station to be provided in control cable; strain chain is not to be used as a ground conductor.

.2 Pushbutton station to be suspended from a trolley travelling inside a smoothly operating track along full length of girder to allow operator to move independently of lifted load.

.3 Design in accordance with Section 01450 for hazardous locations.

2.9 Runway Electrification

.1 Runway conductor and collector system to be sized and installed to all applicable codes and standards listed in Article 1.2.

.2 Runway conductors to be copper, using conductors for three phases with one (1) extra conductor used for grounding equipment and to be supplied with crane for each crane runway. Conductors to have sufficient ampacity to carry required current to crane when operated at rated load and speed.

.3 Mainline collectors to be mounted on bridge to transmit current from runway conductors.

2.10 Runway Rails and Runway End Stops

.1 Supply and install as required by the Technical Requirements.

2.11 Painting

.1 Structural parts to be cleaned of rust and mill scale. Complete crane to be given appropriate number of coats of anti-corrosion primer and finish paint to protect surface from environmental damage. Type of paint and colour of final coat shall be Painting System: SSPC-SP3 Safety Yellow.

2.12 Collision Avoidance System

.1 Low frequency electromagnetic system to prevent collisions from automatically and repetitively occurring between two (2) or more cranes with each other and with both ends of runway.

.2 A combination of transceivers, transmitters, and receivers mounted on cranes and at ends of runway to interface with each for distance/position detection and control.

.3 Wireless system to have its power supplied from 115 V control circuit on crane.

.4 All components shall be housed in standard NEMA-1 enclosures to resist service environment.

.5 Wire directly into cranes electrical controls, the three-step slow down and complete stop before collision control sequence to be: Alarm, Slow, and Stop. Each of the three step distance setpoints to be independently adjustable in field to provide ranges required.

.6 A timed by-pass on activation of "stop" setpoint to allow operation close into end of runway or another crane.

.7 Receiving and transmitting functions to be monitored continuously by a built-in self-monitoring/alarm system to alert personnel of malfunction.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer’s recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

.3 Crane Manufacturer to check alignment of crane runway and crane rail. If runways are found not to be level and not within tolerances required by CMAA, then advise Design Builder to have necessary adjustments made by runway installers before crane installation.

.4 Install crane rail on crane runway beams and structural steel supports supplied and installed to normal structural steel tolerances. Where runways cross building expansion joints, provide same number of expansion joints in each run of rail as there are expansion joints in building.

Expansion joints to be located in close vicinity to building expansion joints and to be scarfed and spliced, to reviewed details, to maintain horizontal and vertical alignment of rails. Expansion joints and splices in pairs or rails are not to be located exactly opposite each other.

.5 Prior to shipment, crane shall be fully assembled at Manufacturer's shop for shop testing and parts to be match marked for reassembly on site.

.6 After crane has been commissioned, following tests to be conducted (City attendance optional):

.1 Running Test.

.2 Load Test.

.3 Deflection Test.

.4 Brake Test.

.5 Collision Avoidance Test.

.7 All tests shall be performed in accordance with referenced design, performance, and safety standards.

END OF SECTION

GANTRY CRANE

1. GENERAL

1.1 Summary

.1 This Section specifies design, fabrication, supply, installation and testing of a portable gantry crane including electric wire rope hoist, manual geared trolley, tank cover lifting frame, and all appurtenances required for a complete installation.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 Canadian Standards Association (CSA):

.1 CSA Z256 – Safety Code for Material Hoist.

.2 CMAA – Crane Manufacturers Association of America Specification No. 74.

.3 CSA B167.M – General Purpose Electric Overhead Travelling Cranes.

.4 CSA C22.2 No. 33 – Construction ad Test of Electric Cranes and Hoists.

.5 CSA G40.21 – Structural Quality Steel.

.6 CSA HA Series M – Standards for Aluminium Alloys.

.7 CSA S157-M – Strength Design in Aluminium.

.8 CSA S16 – Design of Steel Structures.

.9 CSA W47.1 – Welding.

.3 Canadian Welding Bureau (CWB):

.1 CWB W59 – Welding.

.4 HMI.

.5 National Building Code of Canada (NBCC).

.6 Crane Manufacturers Association of America (CMAA).

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

.2 Shop Drawing showing layout drawings, specifications, catalogue cuts and descriptive literature, including make, model, dimensions, clearance envelope, equipment weights, member sizes, connection details, and electrical schematics for electrical hoist.

.3 Cross-sectional details with complete list of materials used for construction.

.4 Bearing ratings at design conditions.

.5 Weld inspection reports.

.2 A copy of this Section with Addenda updates, and all referenced Sections and Addenda updates, with each paragraph check-marked to show Specification compliance or marked to show deviations.

.3 Certification that the gantry crane is suitable for the design conditions with the design sealed, signed and dated by a Professional Engineer registered in the Province of Manitoba.

.4 Confirmation that Manufacturer has a least five (5) portable gantry crane installations of similar size and type in satisfactory service for a period of not less than five (5) years.

2. PRODUCTS

2.1 Performance Criteria

.1 Provide equipment to safely, and without strain on device, hoist and move the desired equipment.

.2 Equipment to be designed to meet requirements of Section 01450 for hazardous areas.

.3 Design equipment for a minimum 50 percent working overload capability based on rated capacity.

2.2 Manufacturers and Products

.1 Acceptable Manufacturers:

.1 Gantry crane: Norelco Cranes; Konecranes.

.2 Electric hoist: Yale; Vulcan.

.3 Casters/wheels: Algood; Bestway.

.4 Or approved equivalent.

2.3 Design Criteria

.1 Function:

.1 The portable gantry crane shall be used for removing, transporting and replacing equipment.

.2 Provide the appropriately sized gantry crane per working area, or building, for each equipment weight grouping.

.2 Capacities and Performance:

.1 The portable gantry crane design criteria for the following parameters shall conform to the Final Design, including a minimum 50 percent working overload capability:

.1 Gantry crane rated capacity.

.2 Hoist hook travel, minimum.

.3 Electric hoist rated capacity.

.4 Crane dimensions as shown in the Final Design.

.2 Design gantry crane to NBCC and CMAA and CSA crane standards.

.3 Design and fabricate structural components to CSA S157 and Section 05500.

.4 Design gantry crane to be easily moved by two (2) operators, when transporting equipment.

.5 Gantry crane shall easily travel across various surfaces as set out in the Final Design.

2.4 Materials

.1 Crane beam: Aluminium alloy.

.2 Framing members: Aluminium alloy.

.3 Crane wheels: Rubber, polyurethane or composite construction.

.4 Hoist: Aluminium Alloy housing.

.5 Chain: Steel.

.6 Lower block load hook: Steel.

.7 Side plates: Steel.

.8 Nuts, bolts, washers: Type 316/316L stainless steel.

.9 Plates: Type 316/316L stainless steel.

.10 Locking pins: Type 316/316L stainless steel.

.11 Lifting frame: Type 316/316L stainless steel.

2.5 Configuration, Components and Features

.1 Provide crane beam of the self-levelling and self-aligning type.

.2 Crane wheels: minimum 250 mm diameter flat-free pneumatic tire with tapered roller bearings, non-scuff wheel brakes, lockable and swivel able, with four-position swivel locks at 90-degree intervals, complete with spring-loaded pin assembly, to facilitate travel in a straight line. Maximum wheel width includes entire truck-axle assembly.

.3 Provide crane with four towing and guiding handles, located at a convenient elevation at opposite corners of the gantry.

.4 Provide crane with two (2) double pedal -type floor locks, mounted at opposite ends of the crane beam with rubber pads for non-slip floor contact, enclosed spring, electroplated for corrosion protection.

.5 Design the gantry crane with sufficient flexibility to bear evenly on all four wheels in areas where uneven surface slopes exist.

.6 Provide crane with an electric wire rope hoist; heavy duty 115 V motor designed for outdoor service, 30 minute rated with a 75°C rise over a 90°C ambient temperature with Class H insulation and motor winding thermostats; disk-type motor brake; roller-clutch type load brake; load limiting device; pushbutton control station arranged for easy operation from the solids contact tank walkways; adjustable upper and lower limit switches; forged and hardened gears in a drip-proof oil bath.

.7 Provide full-swiveling lower block with load hook and spring-type safety latch.

.8 Provide crane with geared trolley with side plates, convex-machined treads that maintain roundness throughout long use, pre-lubricated sealed bearings, strong yokes, safety lugs and adjustable width with trolley chain arranged for easy operation from the solids contact tank walkways.

2.6 Finishes

.1 Procedures: Section 09900.

.2 Prime Coat: Shop applied, coating material per Section 09905.

.3 Finish Coat: Field applied, coating material per Section 09905.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer’s recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

3.2 Functional Testing

.1 Perform the following tests:

.1 After completion of installation, completely test the portable gantry crane and hoist to ensure compliance with the performance requirements as specified.

.2 As a minimum, operate the equipment through a complete lifting and lowering cycle at each location to determine that the equipment performs smoothly and safely without failure.

END OF SECTION

JIB CRANE

1. GENERAL

1.1 Description

.1 This Section specifies the supply and delivery of a jib crane with hydraulic lift for lifting equipment.

1.2 Standards

.1 All codes and standards to be latest edition unless noted otherwise.

.2 Crane Manufacturers Association of America (CMAA).

.3 HMI.

.4 Canadian Standards Association (CSA):

.1 CAN/CSA-Z256, Safety Code for Material Hoist.

1.3 Submittals

.1 Provide submittals in accordance with Section 01300 and the following:

.1 Manufacturer's descriptive literature for materials.

2. PRODUCTS

2.1 Manufacturer and Products

.1 Acceptable Manufacturers:

.1 Thern.

.2 Dayton.

.3 Or approved equivalent.

2.2 Performance Criteria

.1 Design each crane for a minimum fifty (50) percent working overload capability based on rated capacity.

.2 Jib crane load rating and boom reach shall conform to the Final Design.

.3 Provide equipment to safely, and without strain on device, hoist and move the desired equipment.

.4 Equipment to be designed to meet requirements of Section 01450 for hazardous areas.

2.3 Equipment Components

.1 All materials used for the equipment and accessories are to be designed by Manufacturer and have the necessary strength, stability, and stiffness for the intended service.

.2 Equip mast and boom with a hydraulic pump system which raises and lowers the boom to allow objects to be either lifted or lowered.

.3 The design criteria for the following parameters shall conform to the Final Design:

.1 Overall base width.

.2 Overall base length.

.3 Boom reach.

3. EXECUTION

3.1 General

.1 Install in accordance with Manufacturer's recommendations and as required by the Final Design.

.2 Undertake commissioning phases as specified in the Schedule 18 Technical Requirements.

3.2 Testing

.1 Factory Tests:

.1 Perform factory tests according to Manufacturer's standard test procedures.

.2 Provide certified test results.

.2 After completion of installation, completely test crane at 150 percent of rated load to ensure compliance with the performance requirements as specified.

.3 As a minimum, test by operating the equipment through a complete lift and lowering cycle to determine that the equipment performs smoothly and safely without failure.

END OF SECTION