ITEM 599.0701 10 M EMERGENCY DRIVE – SB BRIDGE
ITEM 599.0702 10 M EMERGENCY DRIVE – NB BRIDGE

DESCRIPTION

This work shall consist of furnishing and installing all components required and rehabilitating the Emergency Drives of the Southbound and Northbound Bridges as shown in the Plans or as directed by the Engineer. This work shall also include the removal and disposal of all components replaced.

MATERIALS

A. Shop Drawings. Dimensions given on the Plans are nominal and intended for guidance. The Contractor shall make note of any variations from nominal dimensions on the shop drawings or provide written notice to the Engineer. Prepare working, erection, and shop drawings and submit to the State for approval. Where additional information is required or changes must be made the Contractor shall clearly identify such information on the shop drawings.

B. General Shop Drawing Requirements. All shop drawings shall be prepared as directed by the New York State Steel Construction Manual (SCM). Shop drawings shall detail and accurately dimension all parts. Shop drawings shall define limits of accuracy and tolerances required for machining, surface finishes and allowances for fits. Designate tolerances in the shop drawings in accordance with ANSI Y14.5 Dimensioning and Tolerancing. Unless specified in the Plans or herein, the shop drawings shall tolerance dimensions between machined parallel surfaces to 0.25mm (±0.010”) and tolerance flatness of machined surfaces to within 1.0mm (0.040”).

C. Manufacturer’s Literature. The Contractor shall submit catalog cuts and detailed Manufacturer’s literature for all components not detailed in the shop drawings. Clearly mark such items with the item number corresponding to the mark shown on the assembly drawing and the full and complete part number, extended to completely define the part including all optional or custom features. If the same cut sheet is used to define more than one item, submit multiple copies.

D. Material Certifications. The Contractor shall submit material certifications for all materials specified to require material testing within the Plans and specifications or within a referenced material specification (e.g. ASTM, ANSI, or others).

E. Procedures. In addition to required detailed shop drawings, the Contractor shall submit to the engineer for review various procedures described herein. The procedures shall be thorough and be supplemented by sketches, calculations, details, catalog cuts, photographs, etc. as required to demonstrate that the specified requirements can be met.

F. Notification of Shop Work. The Contractor shall provide advance notification to the State for all shop work and shop testing for which the specifications require, or indicate that it is the intent of the State, to provide a representative to observe or witness such activities. Provide a minimum of 30 days advance notice of such work.

G. Material Compatibility. The Contractor shall provide products which are compatible with other products of the mechanical work and with other work requiring interface with the mechanical work, including mechanical/electrical connections, control devices and supporting structure.

H. Nameplates. The Contractor shall provide each piece of mechanical equipment and apparatus with a permanent, corrosion-resisting metal nameplate on which is stamped the name of the Manufacturer, the catalog or model number, and the rating or capacity of the equipment or apparatus. Nameplates on all proprietary elements shall be readable, clean, and free of all paint before acceptance of the machinery.

I. Substitutions. Specification of a Manufacturer's part number, product, and/or name is for the purpose of defining quality, configuration, rating and arrangement of parts. Part numbers shown in the contract documents are not necessarily complete numbers nor are they intended to describe details of the component beyond those that are required. Be aware that Manufacturers may change product names and part numbers without advance notification. The Contractor shall select and provide manufactured products that meet the requirements and intent as shown in the contract documents. Provide complete, current part numbers for all proposed equipment and verify that the part as designated is appropriate for the intended function.

J. Brakes. The emergency brake shall function to stop the bascule leaf under emergency stops and to hold the leaf stationary against wind and unbalance loads while the leaf is operating under the emergency drive and both machinery brakes and motor brakes disengaged.

New emergency brakes shall be 230/460 VAC, three-phase, 60 Hz, spring applied electro-hydraulic released thruster type drum and shoe brake, AISE rated, mill duty brakes as manufactured by the following or approved equal:

Mondel Engineering	Johnson Industries, Ltd.	Hindon Corp.	Gemco / Ametek
2610 Dunwin Drive Mississauga, Ontario Canada L5L 1J5 905-828-1526	108 Skyway Avenue Toronto, Ontario Canada M9W 4Y9 416 213 9991	2055 Bee's Ferry Road Charleston, SC 29414 803-763-6616	1725 Western Drive West Chicago, IL 60185 630-231-5900

If no torque is shown in the Plans, the brake shall produce a torque equal to or up to 10 percent greater than the maximum torque of the existing brake. Thruster and drum sizes are to be rated for the torque requirements specified in the Plans and components shall meet the following:

1. Brake actuators shall be cast in aluminum alloy and fitted with double shaft seals, waterproof, and dustproof IP65/NEMA 4 utilizing a TENV, three-phase, squirrel cage motor. Actuator deign shall be independent of direction of drive motor rotation. The brake actuator shall be supplied with fluid suitable for ambient temperature range from -30°C to +60°C (-22°F to +140°F). The actuator shall be fitted with an integral time delay valve for adjusting the brake setting times. The valve setting shall be fully adjustable during brake operation.

2. Brake torque springs shall be external torque springs, infinitely adjustable down to 40 percent of full rated torque, and shall be fully enclosed with calibrated torque and range of torque indicator. All brake arm pivot points shall be fitted with low maintenance bushings that do not require periodic lubrication. Mating pins shall be manufactured from corrosion resistant materials with self-locking washers that do not require cotter pins or hitch pins.

3. Brake adjustments shall be provided for self-adjustment for lining wear to sense the need for adjustment every time the brake sets and to make correction the next time the brake releases. Brake adjustments shall be resistant to externally caused vibration. Auto-equalization shall be provided such that when the brake releases, the running shoe clearance is automatically equalized and maintained. Brake adjustments shall be located to be immune to accumulated dust and be easily serviced.

4. Provide a latching hand release for manual release of the brake without power. The manual release shall be designed as a fixed component not requiring removable levers or wrenches and shall be accessible from outside the brake enclosure.

5. Electro-mechanical, lever-operated, brake mounted limit switches shall be provided for indication of brake released, brake set and brake manually released. Three independent limit switches with two N.O./N.C. contacts per switch rated for 120 VAC shall be utilized. Limit switches shall meet the requirements of the electrical work Specification.

6. Aluminum, NEMA 3R enclosures arranged to lift off for inspection shall be provided. Include provisions to access and operate manual hand release mechanism from outside the enclosure.

7. Brake shoes shall be self-centering and shall be easily replaced from either side of the brake frame without disassembling the top brake connecting rod or pull rod, and without disturbing the torque adjustments. Brake pads shall be copper ceramic.

8. All steel components shall be nitrided for corrosion protection and resistance to wear, scuffing and fatigue before surface painting. The process documentation shall be submitted to the Engineer.

9. Brake wheels shall be manufactured from ASTM A536 grade 65-45-12 ductile iron or equivalent strength and ductility, with diameters matching the requirements shown in the Plans. The bore and keyway shall be machined to the fit with the mating shaft and finish shown in the Plans or in accordance with the Manufacturer's recommendations if not indicated.

K. Weldments. Weldments shall be fabricated from ASTM A709M, Grade 345 structural steel. Weldments shall be provided as shown in the Plans and as detailed in the Shop Drawings.

Unless otherwise noted herein or in the Plans, all welding and weld inspection of machinery shall be performed in accordance with ANSI/AASHTO/AWS D1.5, and in accordance with all requirements of the SCM. Unless otherwise noted herein or in the Plans treat all welded machinery and weldments that support machinery or live load reactions as main members, all welds as subject to tension or stress reversal, and all welds as joining primary components.

Unless otherwise shown in the Plans, elements of weldments shall be connected by complete joint penetration welds. Do not use fillet welds where they would require machining to provide clearance for machinery, fasteners, or other attachments. Clip stiffeners to avoid overlapping stiffener welds with welds at the intersection of main plates.

Weldments shall be stress relieved after welding and prior to final machining. Unless otherwise shown in the Plans, machined surfaces of weldments shall be finished to the flatness required herein and parallel to each other and to the bottom of the base plate. The height of the weldment shall be per plan height ±3mm (1/8"). All exposed edges of weldments shall be ground to a chamfer or radius to eliminate sharp edges and burrs.

Finished mounting surfaces shall be prepared and painted, with a prime coat only, in accordance with the Standard Specifications, "Structural Steel Painting: Shop Applied."

L. Solid Bushings. Where required, provide solid bushings or shoes, as shown in the Plans of one piece bronze sleeve configuration. Bushings shall be provided with spiral cut lubrication grooves, unless shown otherwise in the Plans

M. High Strength Bolts. Unless otherwise specified, fasteners used for connecting machinery parts to each other and to supporting steelwork shall be turned bolts conforming to the minimum specified physical requirements of high strength, ASTM A325 or ASTM A449 cut thread, washer faced, hexagonal head bolts. Threads for turned bolts shall conform to the requirements of ASTM A325. Do not use ASTM A490 bolts. Nuts shall conform to ASTM A563 or A194, Grade DH or 2H, heavy hex series.

N. Washers. Hardened steel, plain washers shall conform to ASTM F436 and shall be used at the rotated end of high strength ASTM A325 or A449 bolts or studs and always under nuts. No more than one washer may be used at any end.

O. Shims. Shims required for leveling and alignment shall be stainless steel, full depth shims, trimmed to the dimensions of the assembled unit. Unless detailed otherwise to include keepers, shims shall be drilled with complete holes for all bolts that pass through. The nominal shim pack thickness shall be 12mm (½") unless otherwise specified. Shim material shall be ASTM A666, type 304 or 316 stainless steel. Thin brass precision thickness shims may be used for final adjustment. Sufficient thicknesses shall be provided to permit 0.125mm (0.005") variations of the nominal shim thickness plus one full allowance shim. All shims shall be corrosion-resistant. The Contractor shall provide the State with one full set of additional shims for each type of component.

P. Shafting and Pins. Rolled material may be used for shafting and pins up to 100mm (4") diameter. Forged material shall be used for larger diameter shafts and those having integral flanges or pinions. Homogeneity of forgings is required; shafts shall be reduced to size from a single bloom or ingot at no less than red heat. The blooms or ingots shall have a cross sectional area at least three times that required after finishing. The finished product shall be free of injurious flaws such as seams, pipes or cracks. Forged shafts over 200mm (8") in diameter shall have a hole bored lengthwise through the center. The diameter of the hole shall be about 1/5 the diameter of the shaft.

The Contractor shall test shafting materials for mechanical properties and furnish certificates to the State. Finished shafts shall be free of camber and run without vibration, noise or chatter at all speeds up to and including 120 percent of design speed.

The Contractor shall test all cold-finished shafting for its mechanical properties, and furnish a test certificate to the engineer.

Dowel pins shall be American National Standard unhardened ground dowel pins with 440MPa (64ksi) minimum ultimate shear strength.

Q. Seals. Seal replacements for all items, such as speed reducers and couplings, shall be replaced by items provided by or recommended by the original Manufacturer of the equipment.

R. Lubricants. Proprietary units shall use lubricants approved by the Manufacturer; other units shall be supplied with the lubricants specified herein or by the State. Immediately after erection and before operation, the Contractor shall lubricate all rotating and sliding parts and fill all gear housings with the lubricants specified on lubrication charts. Lubricants provided shall be formulated for use in extreme temperature applications with lower and upper operating temperature extremes of -28 and +93 C (-20 F / +200 F) respectively.

S. Breather. Speed Reducer breathers shall be desiccant type breathers manufactured for use on machinery items such as speed reducers and other equipment.

CONSTRUCTION DETAILS

A. General. Construction shall be in accordance with the requirements defined herein and in the Plans and the provisions of the AASHTO Movable Specifications and the SCM. Where a conflict exists between documents, the requirements of the Plans and specifications shall govern over those of the AASHTO Movable Specifications.

Unless specified in the Plans or herein, dimensions between machined surfaces shall have a parallel, perpendicular or circular tolerance of 0.25mm (0.010") and machined surfaces shall have a flatness tolerance of 1.0mm (0.040").

All machinery shall be set, aligned and verified by experienced millwrights. Millwrights shall have a minimum 10 years of experience in setting and aligning heavy machinery and shall have completed installation of machinery for a minimum of two bascule bridges. The qualifications of the proposed millwrights shall be submitted to the Engineer for review.

B. Basis of Acceptance. All fabrication of Structural Steel shall follow all of the requirements of the SCM. In addition, all shop drawings submitted shall follow all guidelines given in the SCM. No installation or rehabilitation work may take place until the shop drawings and procedures are approved by the Engineer.

C. Machinery Alignment. All machinery shall be installed and aligned in accordance with the Manufacturer's instructions and the Specifications. Manufacturer recommended coupling installation alignment tolerances shall apply. Where the Manufacturer does not publish recommended tolerances, the maximum parallel offset of the coupling hubs may not exceed 2.5 mm per meter (0.0025 inches / inch) of diameter of the outer grid or gear tooth and angular offset may not exceed 1/16 degrees.

D. Turned Bolts. Where holes in pre-manufactured components are to be bolted through with turned bolts, the turned bolts shall be detailed to meet the required fit with the hole as manufactured or to be reamed. Certified prints, from the component Manufacturer, shall be submitted with shop drawings of the adjoining weldments.

E. Cleaning. Cleaning of the Clutch and other machinery components shall utilize solvents where applicable. The Contractor shall consult the original Manufacturer of the component for procedures required for cleaning. The procedure shall contain a list of cleaning materials that can safely be used to clean the item. Submit this procedure and list for approval prior to beginning work. Cleaning shall immediately be followed by lubrication where required.

F. Bolting. Unless otherwise specified or shown in the Plans, bolt holes in machinery parts for connection to supporting steelwork shall be drilled in the shop a minimum of 1.6mm (1/16") diameter smaller than the finished bolt diameter or drilled from solid at assembly. Drill and ream at final assembly.

Unless otherwise specified or shown in the Plans, bolt holes in steelwork for turned bolts shall be drilled from solid at assembly or erection after proper alignment. Do not pre-drill holes full size prior to final assembly. Note that several of the bolts may be installed in the place of existing structural rivets. Where this is the case, the mating steel shall be provided without holes, transfer punched and drilled to meet the required hole arrangement. Final reaming of the holes shall be performed in both the existing steel and the new steel simultaneously. Use of temporary bolts or clamps for the purpose of holding the pieces for reaming shall be required.

All contact surfaces of structural steel to which machinery is to be bolted shall be cleaned in accordance with the specifications for structural steel, to be bolted together, before bolting.

Bolt holes through unfinished, rough cast surfaces shall be spot faced for the bolt head and nut.

Except as noted herein or in the Plans, ASTM A325M and ASTM A449 bolts used for connecting steel machinery parts together or to structural steel, and whose nominal threaded diameter is less than or equal to 38mm (1-1/2”), shall be bolted in accordance with the bolted connection requirements of AASHTO and the standard specifications.

G. Welding and Weldments. Do not perform field welding on weldments or other connections unless specifically required in the contract documents.

H. Seals. Install split seals and one-piece seals in accordance with the Manufacturers’ instructions. Shaft and seal slot finish shall be in accordance with seal Manufacturer recommendations, and shall be not rougher than 1.6 µm (63 µ”). Seals shall effectively stop all leaking of lubricant through the area protected. Any leakage past seals will be cause for rejection.

I. Testing. All testing must be performed in daylight hours without the presence of significant wind, rain, lightning or other adverse weather. Sufficient contractor personnel must be stationed to perform a single dedicated task. Two-way communication must be established between all locations and personnel. Testing must be witnessed by the engineer.

The emergency drives shall be used to operate each leaf a minimum of two times. Each leaf shall be raised to the fully open position and the brakes set. The leaf shall remain in the full open position a minimum of one minute prior to lowering the leaf without movement. During operation the brakes shall not drag, the couplings shall not disengage and the motor shall not trip in order to be acceptable. The operation of the leaves shall be smooth, without significant oscillation, and controlled at all times.

J. Lubrication of Machinery. Grease fittings shall be connected with tubing or fittings so that grease is introduced directly into the grease grooves for distribution. Tubing shall be extended from the bearings to convenient lubrication stations. Vibration absorbent braided stainless steel hose, 200mm (8”) minimum length, shall be installed between the pipe and the component lubricated. Tubing supports shall be provided at increments not to exceed 915mm (3 feet) between supports. Lubrication stations shall be mounted for easy access to maintenance.

Immediately after erection and before operation, all rotating and sliding parts shall be lubricated and all gear housings shall be filled with the approved lubricants specified on lubrication charts.

K. Startup Requirements. Implement startup procedures that protect the equipment from damage and ensure safe working conditions during bridge operations throughout construction. The spanlock assemblies shall not be left in the engaged position unless appropriate interlocking, preventing the operation of the bascule leaf, is in place, tested and working.

L. Protection of Equipment. During construction, all equipment shall be protected from damage as a result of construction operations and contamination from dust and debris. Should any equipment become contaminated, immediately clean the equipment, relubricate, and protect from further contamination. The bridge shall not be operated and no enclosed equipment opened during any period in which construction operations can contaminate the equipment.

M. Painting. Ferrous metal surfaces of the Emergency Drive machinery and associated hardware and supports shall be painted. Ferrous surfaces of new machinery shall be painted in accordance with the Standard Specifications, "Structural Steel Painting Shop Applied." Field installed bolts and structural steel surfaces exposed during the installation of machinery shall be painted in accordance with the Standard Specifications, "Structural Steel Painting: Overcoating and Localized." Do not paint machined surfaces in sliding contact or those specified to be lubricated. Costs for all painting shall be incidental to the painting of structural steel.

N. Demolition. Where removal or replacement is called for in the Plans or the Specifications, these components shall be removed in their entirety. Removal and disposal of such equipment shall include all shims, fasteners or other miscellaneous items that are also replaced through the work of this Contract. All removed components shall be disposed of properly, by the Contractor, in accordance with all local, State and Federal regulations. All associated fees shall be borne by the Contractor and shall be incidental to this payment item.

METHOD OF MEASUREMENT

This work will be measured for payment on a lump sum basis for each bridge.

BASIS OF PAYMENT

The lump sum price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work. Associated electrical work, including motor starters, conduit, wiring, and limit switches required for operation of the Emergency Drives are to be provided under separate pay items. A progress payment of 50% of the quantity will be paid based upon all weldments being provided and installed and all brake work being completed on this item.