

ITEM 10599.2201M - REFURBISH SPAN MACHINERY AT LONG BEACH BRIDGES

DESCRIPTION. The work under this item includes the rehabilitation, removal, replacement, and adjusting of a portion of the bascule span operating machinery of a Scherzer rolling lift type bascule bridge. The requirements of Specification Subsection 104-08 apply to this work.

Bridge machinery work will include but not limited to the following:

1. Removal of the centralized lubrication system, piping, hose, and components.
2. Removal of each existing rack section, milling off the bottom, and reinstallation of the rack section with new turned bolts.
3. Provisions for new liners, piston rings, bushings, pins, valving, and piping for the rehabilitation of the air buffer.
4. New bronze bushings in existing split pillow block bearings B3.
5. New brass shim liners between cap and base of the split pillow block bearings B2 and B3 and new lubrication fittings on all bearings.
6. Provisions for new base bolts for Bearing B2.
7. Provisions for new supports for brakes.
8. Provisions for new live load shoe plates, shims, and stud bolts for the live load bearing area of the heel of each bascule girder.
9. Provisions for cleaning and painting of the existing main racks on the fixed machinery supports off of the moving leaf.
10. Provisions for cleaning and lubrication of the cross shaft coupling for the leaves.

MATERIALS. Unless otherwise shown or noted on the drawings or in this Section, all materials incorporated into the finished bridge machinery shall be new. The materials used in machinery and similar parts shall conform to the requirements of the referenced specifications. The Contractor shall furnish to the Engineer certified copies, in triplicate, of all analyses, hardness and chemical tests, and all other tests and inspections that are required to be made by the manufacturer by the Specifications designated. All test specimens required shall be provided by the Contractor.

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Submit test reports only on the following:

Cast Steel - ASTM A 27
Cast Bronze - ASTM B 22
Forged Steel - ASTM A 668
Rolled Steel - ASTM A 108

Dimensions indicated on the Contract drawings are nominal and intended for information. The Contractor shall obtain accurate dimensions of the existing bridge structure, machinery, and machinery supports as required for the work. Dimensions shown on the drawings are not guaranteed.

Dimensions shown on the Contract drawings for machinery parts were taken from original shop drawings prepared by a gear and machine manufacturer at the time the bridge was constructed. Copies of the shop drawings are available and may be obtained from the Division of Highways and General Engineering, County of Nassau, Department of Public Works, One West Street, Mineola, New York 11501. Dimensions shown on the original shop drawings are not guaranteed.

All dimensions, fits, and finishes provided in this Specification are given in English units to assure compatibility with existing machinery components which are to remain in service.

Quality Assurance

Codes and Standards. All installations shall conform to all Federal, State, and local codes, ordinances, and laws having jurisdiction over this project. In the event of a conflict between these Specifications and the above mentioned codes, the most stringent shall govern.

Reference Standards

American Gear Manufacturers Association (AGMA)

American National Standards Institute (ANSI):

B4.1: Preferred Limits and Fits for Cylindrical Parts

B46.1: Surface Texture

American Society for Testing and Materials (ASTM):

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A 27: Steel Castings, Carbon, for General Application, Spec. for.

A 36: Structural Steel, Spec. for.

A 108: Steel Bars, Carbon, Cold-Finished, Standard Quality, Spec. for.

A 123: Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strip, Spec. for.

A 307: Carbon Steel Externally Threaded Standard Fasteners, Spec. for.

A 325: High-Strength Bolts for Structural Steel Joints, Spec. for.

A 439: Austenitic Ductile Iron Castings, Spec. for.

A 569: Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip, Commercial Quality, Spec. for.

A 668: Steel Forgings, Carbon, and Alloy, for General Industrial Use, Spec. for.

B 22: Bronze Castings for Bridges and Turntables, Spec. for.

ANSI Y14.36: Surface Texture Symbols.

Source Quality Control

Shop Inspection. The Contractor shall arrange for the inspection of work at foundries, forge, and machine shops. It shall be the responsibility of the Contractor to provide free access to all premises where preparation, manufacture, assembly, and testing of raw materials, materials in process, and assembly are conducted. Such inspections are to facilitate work and avoid errors, but it is understood the Contractor is not relieved of the obligation of ensuring compliance with the drawings and specifications or the necessity of replacing defective materials and workmanship. Initial acceptance of materials and finished parts and assemblies shall not preclude subsequent rejection if found deficient. Replacement of such materials shall be the responsibility of the Contractor at his sole expense.

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Shop Drawings. Except as otherwise noted herein, shop drawings shall be in accordance with the applicable section of the New York State Steel Construction Manual which is current on the date of advertisement for bids.

Submit shop drawings, including complete details, schedules, and procedures, showing the sequence of erection. Material shall not be manufactured, fabricated, or delivered to the site until shop drawings have been approved by the Deputy Chief Engineer for Structures Design and Construction or his duly authorized representative.

It shall be the Contractor's responsibility to verify in the field dimensions given on the drawings. Dimensions given on the drawings are nominal and intended for guidance. The Contractor shall indicate on the shop drawing actual field dimensions taken.

Shop drawings shall show all parts completely detailed and dimensioned. State the grade and quantity of finishing, machining, tolerances, and allowances for each part for which a specific fit is required. Special machining and assembly instructions shall be shown on the shop drawings.

Shop drawings shall also indicate the method and sequence to be employed in assembly of bridge machinery. Shop drawings shall show all external dimensions and clearances necessary for installation of each item of machinery for the bridge.

Submit shop bills of materials covering all machinery parts, categorized according to the completed unit to be provided.

Identify each shop drawing with a suitable title to identify the parts detailed thereon.

Submit to the Engineer for approval an all-inclusive list of preliminary measurements and work the Contractor is to perform to ensure completion of the machinery work within the scheduled time periods allotted for channel navigation closures.

Castings. Provide piece mark number and heat number stamped or cast on each casting. Numbers shall appear in locations on the piece that is not subjected to significant stress during operation.

Castings shall be homogeneous and free of nonmetallic inclusions. Cracks, blow holes, or other defects in gear castings will be rejected.

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Bronze Bearing Castings. Metal for alloy C91100 shall be cast into ingots and allowed to cool. Castings shall be poured from remelted ingots.

Provide chemical analysis of each melt. No melt shall contain more than 0.08 percent sulphur. Perform and report physical tests in accordance with ASTM B22. Permanent set under 345 mPa compressive load shall be recorded.

Patterns for castings shall be made of thoroughly seasoned pattern lumber, well put together to withstand repeated use. They shall be finished to give a neat appearance to the castings and shall have designations as shown on the parts detailed on the shop drawings. The outer edge of all ribs, bosses, and the like shall be rounded off to a radius of one quarter of the thickness of the rib and all inside corners shall be filleted with wood fillets, well fastened and rounded out to a radius of one-half of the thickness of the thinnest rib forming the corner.

Blast clean castings of all loose sand and scale. Remove all fins, seams, gates, risers and other irregularities. Warped or distorted castings or castings that are out of tolerance to the extent as will interfere with proper fit with other machinery parts, will be rejected.

Show finished dimensions of castings on shop drawings. Deviations from dimensions shown on the drawings will not be permitted in excess of permitted tolerances.

Fasteners:

Turned Bolts. Turned bolts connecting machinery parts to each other or to supporting steel shall have turned shanks, cut threads, and semifinished, washer-faced, hexagonal heads and nuts. Finished shanks of bolts shall be 1/16-inch larger in diameter than the thread diameter. Dimensions of bolt heads and nuts shall comply with heavy series of ANSI B-18.2.1.

High-Strength Bolts. High-strength bolt dimensions shall conform to the current requirements for heavy hex structural bolts, ANSI B-18.2.1. Nut dimensions shall conform to current requirements for heavy hex nuts, ANSI B-18.2.2. Hardened washers shall be placed under the element (bolt head or nut) turned in tightening by the calibrated wrench method (i.e., by torque control).

Cap Screws. Cap screws shall have turned shanks, cut threads and finished washer-faced, hexagonal heads. Dimensions of cap screws shall comply with ANSI B-18.2.1.

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Bolt heads and nuts shall bear on seats square with the axis of the bolt. On castings, bearing areas shall be finished bosses, square-cut counter bores, or spot-faced seats.

Provide positive locks of an approved type on all nuts. Double nuts shall be furnished for all connections requiring occasional opening or adjustment. Double nuts shall be standard heavy hex nuts. Lock washers, when permitted, shall be heavy series complying with ANSI B18.2.1.

Grooves in Linings. Necessary grooves for adequate distribution of the lubricant shall be provided. Grooves shall be machine cut and shall be smooth with rounded corners.

Shims. Shims required for leveling and alignment of machinery and equipment shall be stainless steel, neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims. Sufficient shims shall be furnished to provide for a total thickness of not less than two times the dimension given as nominal shims. Except as otherwise shown or noted, shims shall be provided to allow adjustments to 1/32-inch for machinery mounted on machinery supports and 0.003-inch for machinery parts. Shims shall be placed to provide full contact between machinery and machinery supports. Shims shall be shown in detail on the shop drawings.

Shop Welding. Shop welding of structural steel supports for brakes shall be in accordance with New York State Steel Construction Manual.

CONSTRUCTION DETAILS. The Contractor shall coordinate and schedule work to suit the Department of Transportation and Coast Guard requirements, as directed and approved by the Engineer. The Contractor shall coordinate machinery work with all other work and shall conduct operating tests of the machinery as outlined in these Specifications or as otherwise directed by the Engineer. The installation and adjustment of all machinery shall be done by millwrights experienced in this class of work.

Delivery, Storage and Handling. All machinery items and material shall be delivered to the site in accordance with the approved schedule of work.

Material shall be stored in accordance with the subsection 106-05 of the New York State Standard Specifications, current on the date of advertisement for bids.

All machinery including bearing liners, bolts, shims, and attachments shall be properly protected for shipment and storage.

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All machine finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion shall be protectively treated as noted in Section 740-01 of the Standard Specifications.

All shims shall be coated prior to shipment with a non-oxidizing coating and before erection, this coating shall be removed from the shims that are used.

Field Examination. Examine the areas and conditions under which machinery work is to be installed. Proceed with the rehabilitation work in the "as found" condition. Dimensions on the drawings are nominal and intended for guidance. Secure accurate field dimensions of the bascule span as may be required to accurately erect the machinery items. Variations from the drawings shall be noted and reported to the Engineer. Work shall not proceed at the various stages until unsatisfactory conditions have been corrected to the satisfaction of the Engineer.

Erection

Temporary Shoring, Supports, and Bracing. Provide temporary shoring, supports, and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made.

Temporary Work Platforms. Provide temporary planking and working platforms as necessary to effectively complete the work.

Anchor Bolts. Furnish anchor bolts and other connectors required for securing machinery to mounting frames and other in-place work.

It is the intention of these Special Provisions that no new holes will need to be drilled in the existing machinery supports. Some additions or modifications to existing supports for brakes will be required as shown. Holes in existing supports for shaft bearing base bolts are in place and are to be measured by the Contractor and used for fabricating the new machinery base bolts to be provided under this Contract. New turned base bolts shall be fabricated to the fit and finish specified elsewhere in these Specifications.

Gas Cutting. Gas cutting torches will not be permitted to be used for any purpose.

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Machinery Provisions

General. Before commencing the removal of any span drive machinery from the bascule spans, each of the existing shaft bearings shall be match marked to its machinery support beam. Bearing caps shall be match marked to the base of the bearing. Bearings shall be marked such that they will be re-erected in the same relative position and orientation as before they were removed. Match marks shall be made with a tool that will impress the marks into the metals.

Bearing caps shall be replaced on their bases using the same cap bolts. Cap bolts are to be reused. Base bolts, and shim liners between cap and base, shall be replaced with new brass ones. Old shim liners shall be used as templates for the new ones.

Shafts and Bearings. All new base bolts, laminated liners between bearing cap and base shall be fabricated prior to the time the existing bridge machinery is disassembled.

The fit of new bronze bushings in existing Bearings B3 housing shall be held in abeyance until the bearing bore for the new bushing outside diameter is determined. Fit of new split bushings and solid bushings in bearing bases shall be in accordance with Table 1, under Construction Details. Diameters for the class of fit of journals in bushings and bushings in bearings shall be shown on shop drawings. The Contractor shall be responsible for measurements to be made on existing bearings and new shafts to assure the class of fits specified. Bronze split bushings shall be secured against turning in the bearings as shown on the Plans. Grease grooves shall be provided in all bearings.

Immediately upon replacement of the bearings and shafts, and before operation of the machinery, all bearings shall be fully lubricated.

Cross Shaft Coupling. The Contractor shall disassemble, clean, inspect grid members for wear, repack with long term grease, install new seals, and reassemble cross shaft couplings.

Bearing Base Bolts. New base bolt dimensions shown on the Plans are nominal. The Contractor shall determine the body diameter for new turned bolts in existing holes in order to provide the class of fit shown in Table 1 of this section. The existing grip of base bolts shall also be determined by measurements made by the Contractor and sufficient thread length provided for double nuts. Both nuts shall be of full thickness, heavy hex series.

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Bearing Shims. The Contractor shall measure the exact compressed thickness of old shims. The same thickness of new shims provided under this Contract shall be placed during erection of machinery and the old shims removed and discarded. All refurbished bearings shall be replaced on the existing machinery supports at the same location and orientation as match marked prior to their removal.

Tail Lock Machinery. The Contractor shall disassemble, clean and polish, and lubricate and reassemble the tail lock shoe bearings.

Finished Surfaces. Machinery shall be finished, assembled and adjusted in an approved manner and to the best machine shop practice.

Limits of accuracy in machining and allowances for metal fits shall be shown on the shop drawings. Show working allowances separately for journals and for bearings such that the total differences between journals and the bearings are within prescribed limits.

Fits and finishes shall be as required in Table 1, following, unless otherwise shown or noted.

TABLE 1

Part	Fit	Finish
Machinery Base on Steel	---	250
Machinery Base on Masonry	---	500
Shaft Journals	RC6	8
Journal Bushing	RC6	16
Split Bushing in Base	LC1	125
Solid Bushing in Base (to 1/4-Inch Wall)	FN1	63
Solid Bushing in Base (Over 1/4-Inch Wall)	FN2	63
Hubs on Shafts (to 2-Inch Bore)	FN2	32
Hubs on Shafts (Over 2-Inch Bore)	FN2	63
Turned Bolts in Finished Holes	LC6	125
Sliding Bearings	RC6	32
Keys and Keyways	LC4	63
Machinery Parts in Fixed Contract	---	125
Teeth of Open Spur Gears:		

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Part	Fit	Finish
Under 1-Inch to 1 ³ / ₄ -Inch Circular Pitch	---	32
1-Inch to 1 ³ / ₄ -Inch Circular Pitch	---	63
Over 1 ³ / ₄ -Inch Circular Pitch	---	125

The above fits for cylindrical parts shall also apply to the dimensions of noncylindrical parts. Fits shall be in accordance with ANSI B4.1, Preferred Limits and Fits for Cylindrical Parts. Surface finishes shall be in accordance with ANSI B46.1, Surface Texture. Surface texture symbols shall be in accordance with ANSI Y14.36.

Finishes indicated on the drawings shall comply with ANSI B46.1. Symbols on shop drawings shall comply with ANSI B46.1. Roughness height values are specified in microinches as arithmetical average deviation from the mean line. Roughness specified is the maximum acceptable value. Any better degree of finish will be accepted.

Compliance with specified surface will be determined by sense of touch and by visual inspection of the work compared to standard roughness comparisons. Values of roughness width and height are not specified, but shall be consistent with the general type of finish specified by roughness height.

Flaws, such as scratches, ridges, holes, peaks, cracks, or checks making the part unsuitable for the intended use will be cause for rejection.

Finishes not indicated or specified shall be the type most suitable consistent with the class and fit required for end use.

Unfinished Surfaces

Lay out work to secure close match of adjoining unfinished surfaces. All discrepancies shall be chipped, ground smooth, or machined as appropriate to secure proper alignment. Unfinished surfaces shall be true to the lines and dimensions shown on shop drawings.

Depressions or holes not affecting strength or usefulness of the parts may be filled in a manner acceptable to the Engineer.

Machinery Installation

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Work shall not commence until the required items have been completed and approved for installation and preparations by others, where required, have been satisfactorily completed.

Work shall be carefully planned to meet the limited time period for complete bridge closure as indicated in the Contractor's Schedule of Rehabilitation. In order that the machinery repair and replacement work of the Contract be expeditiously completed without delays during the scheduled time period allotted for bridge closures, it is imperative that the Contractor complete as many advance field and shop measurements and preliminary shop fabrications as early in the Contract as possible. The Contractor shall make final shop measurements of existing parts to be reused and shall pursue the completion of repair and replacement components as necessary to meet the scheduled closures. All machinery work shall be closely coordinated with other work such as structural, architectural, and electrical work. The Contractor shall prepare an all-inclusive list of preliminary measurements and work that he proposes to perform to ensure completion of the machinery work within the scheduled time periods allotted in the sequence of construction. The preliminary and advance work shall be coordinated with the Engineer and the listing of preliminary measurements and work proposed shall be submitted to the Engineer for review.

The Contractor shall provide personnel and supervising engineers familiar with and experienced in the design and installation of movable bridge machinery. The Contractor shall provide all equipment as may be required for proper installation.

Machinery shall be carefully placed according to match and installation marks and accurately adjusted and aligned using steel shims as required, and all items shall be carefully bolted, clamped or held down as may be necessary. All surfaces in contact with bolt heads and nuts shall be clean and free of grease and paint.

After installation has been completed, the Contractor shall completely and carefully ascertain that all items and equipment are correctly adjusted and aligned, all gears are clean and free of obstructions, and all bolts are properly tightened. All rotating and sliding parts shall be lubricated with the specified lubricants.

Alignment and Adjustment

Installation and adjustment of machinery shall be by millwrights with demonstrated skill in this type work.

Installation and assembly of the machinery shall be in accordance with part number and match marks. All parts shall be adjusted for precise alignment by means of shims and pulled tightly

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against supporting members by use of new base bolts, temporary bolts, or other approved means.

Mounting surfaces shall be clean of dirt, paint, and other foreign materials.

Connecting bolts and nuts shall be securely tightened to torque value appropriate for the bolt and nut sizes.

Live Load Shoe Plates. Provide new live load shoe plates, shims and stud bolts for adjusting the live load bearing of the tail end of the bascule girder. The Contractor shall make field measurements to determine the existing bolt diameters, bolt length and bolt spacing before ordering and fabricating the plates and shims. Studs shall have double nuts with hardened washers under the nuts. Plate thicknesses and shims are of different thickness on each leaf. Before removing any of the existing shoe plates, the Contractor shall measure and record the existing thickness of each plate and the total thicknesses of shims between each plate and the bascule girder top flange. This shall be done at each of the eight shoe plates. New plates shall be shimmed so that the roadway joint is even across the rear floor break and all rear corners of the span are in bearing simultaneously under the anchorages. Under such conditions, the vertical clearance between the driven tail lock and the seated bascule girder shall be 1/16" to 1/8".

Field Welding. No field welding to the existing bridge machinery supports shall be permitted.

Painting. Painting of new bridge machinery surfaces shall be in accordance with the Special Note, "Preparation and Painting of Steel Surfaces." The Contractor shall indicate painting requirements on the shop drawings.

Machine finished surfaces shall be protectively treated as noted in the Standard Specifications Section 740-01.

Blast cleaning of machinery surfaces after assembly or finishing shall not be permitted.

All new bridge machinery and existing bearing housings shall be cleaned in accordance with the requirements of SSPC-SP6, No. 6 Commercial Blast Cleaning, Standards BS a2, CS a2 or DS a2, as applicable (except machine finished surfaces) and shall be painted as specified in the Special Note, "Preparation and Painting of Steel Surfaces."

Lubrication. Except as otherwise shown or noted, all rebushed bearings and surfaces requiring lubrication, other than open gear teeth, shall be fitted for a pressure system of

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lubrication, using standard buttonhead fittings. All new grease fittings shall be the same type, requiring only a single type adaptor on the grease application units.

During installation, the Contractor shall lubricate all rotating and sliding parts of the machinery, open gearing, nose locks, tail lock machinery and bearing housings with lubricants indicated on the approved charts.

Testing: The Engineer may inspect and approve each phase of the completed machinery installation prior to operation of the bridge. The Engineer shall also observe the testing and trial runs of the entire machinery installation.

Operation testing of the machinery shall be under the normal mode of bridge control. During test runs, all parts shall be observed to detect incorrect adjustment, misalignment, overheating or other malfunctions. All defects shall be corrected at no additional cost to the State before final acceptance.

Operating Tests. Prior to commencing operating tests, the installation of the span operating machinery and the final span balancing shall have been satisfactorily completed and accepted by the Engineer. Before final acceptance, the bridge bascule span will be test operated by Nassau County personnel to demonstrate that all new and repaired span operating equipment is in proper adjustment and working order and that the system complies in all respects with the drawings and Specifications. The Contractor shall prepare and submit to the Engineer for approval testing procedures that must be approved before any testing may commence. Six copies of all test data shall be submitted to the Engineer for record.

Tail Lock Tests. After all repair and rehabilitation work on the tail locks have been completed and the tail lock limit switch has been adjusted, the Contractor shall conduct the following tests. For each test, only one tail lock shall be tested at a time. The Contractor will be shown the location where hand cranks are stored at the bridge site for manually operating the tail locks. With electrical power disconnected from the tail locks, the Contractor shall release the lock motor-reducer brake and shall hand crank the tail locks through three complete drive-draw cycles of operation. During these operations, the Contractor shall demonstrate the operation of the lock machinery to the Engineer. When the Engineer is satisfied that there is no binding of parts, the locks may be operated with electrical power. All operation of lock machinery using electric power will be by Nassau County personnel.

The Contractor shall remove the hand crank and restore electrical power to the lock motor reducer. At this time, and before operation of the tail lock through a full cycle using electrical

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power by Nassau County personnel the Contractor shall demonstrate to the Engineer that the rotation of the motor is in the proper direction such that the lock lever arms are operating on the bottom half of the circle of rotation generated by the lock lever clevis pin. Any attempt to operate on the top half of the circle will damage the lock machinery. The Nassau County personnel will then operate the lock with electrical power through 10 cycles of operation. All final adjustments to length between connecting rod end pin centers or limit switch adjustments shall be made at this time by the Contractor. The travel of the lock strap shall be set in its fully withdrawn position to assure that it is clear of the bascule span when the leaf is in motion. This procedure shall be repeated for the other tail locks.

Span Drive Operational Tests. After the span operating racks, bearings, liners, bolts, and brakes have been installed and aligned, the leaves will be operated by Nassau County personnel in the presence of the Contractor and the Engineer. Each bascule leaf will be operated alternately with one another through a minimum of ten cycles each. During these runs, the entire equipment shall be inspected to determine whether all features are in proper working order and adjustment. Also, during each cycle the electrical power consumption as measured by a recently calibrated recording wattmeter, provided and connected by the Contractor, shall measure the power consumed and the results submitted to the Engineer for approval. Should the wattmeter readings indicate excessive power losses as determined by the Engineer or should any portion of the assembly being tested tend to heat up, the racks shall be re-aligned until such losses are not excessive. The operating cycles to be tested under power shall be with the normal mode of bridge control in the operator's house. During these tests, the bascule span shall be in a state of final balance acceptable to the Engineer in accordance with these Specifications.

Disposal of Existing Items and Parts. All items of machinery and its fasteners that are indicated to be removed and replaced with new material and parts shall become the property of the Contractor. Such items shall be properly disposed of by the Contractor at a location off the site of the project limits.

Contractor Supervised Bascule Span Operation. The Contractor shall provide a minimum of one person to supervise the operation of the bridge for a period of 14 calendar days (10 hours a day) after the entire installation is completed including final balancing and operating tests. The person shall be able to supervise its operation, and to make any adjustments or corrections that may be required in the mechanical or electrical equipment of the bridge. The person shall instruct not more than three Nassau County employees at any one time in the operation of the bridge during the 14 calendar day period.

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METHOD OF MEASUREMENT. Payment for this work will be made on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for this work shall include the cost of all apparatus, tools, devices, materials, and labor to manufacture, ship, install, erect, align, adjust, lubricate, test, and paint, all in an approved manner, to complete machinery for the bascule span as provided herein. All apparatus, tools, devices, materials, and labor, not specifically stated or included, that may be necessary for the work shall be furnished by the Contractor at no additional cost to New York State Department of Transportation.

The lump sum price bid shall also include the costs of supervising Nassau County employees for the 14 calendar day period; for any adjustments or corrections required to the mechanical or electrical equipment; and for cleaning and painting new bridge machinery.

Progress payments will be made in accordance with the following:

The Contractor shall submit a schedule of work outlining all work phases, with a percentage figure assigned to each phase. The percentages assigned to each phase are subject to the approval of the Engineer. The Engineer will use this schedule to set progress payments. The Engineer may request a revised work schedule at any time. Failure by the Contractor to supply a revised work schedule upon request will cause the progress payment process to be immediately terminated.