

ANNEX "A"

STATEMENT OF WORK

1. General

This statement of work outlines electrical, mechanical and structural maintenance services to be provided at the Wasauksing Swing Bridge in Parry Sound, ON. The bridge is the only vehicular access to Parry Island. As such, it is essential that the span operate reliably for marine requirements and return to the closed position to provide continued vehicular access to the island. The bridge electrical and mechanical systems shall be maintained in a safe, reliable condition with the bridge being continually available for operation and that any mechanical or electrical system failures or malfunctions receive immediate attention and elimination. Services for the bridge shall also include any required maintenance or minor repair work for the bridge structural components as the need for the arises.

Maintenance and repairs are to be provided to extend the life of the mechanical and electrical systems and to prevent any unnecessary failures and costly repairs. The program shall prioritize preventative maintenance to replace worn and aging components before they actually fail. Maintenance efforts shall be based on the *Bridge Inspection, Evaluation, and Maintenance Manual*, published by AASHTO, and other reference documents provided by the owner, including maintenance manuals. The Contractor shall continuously review the bridge electrical and mechanical systems and modify maintenance practices, including lubrication or other maintenance intervals, to minimize wear and ensure reliable service. The Contractor shall perform all work in accordance with all applicable local and national rules and regulations.

Maintenance activities shall include periodic verification of the functionality of the power and control systems, the integrity of the electrical system installation, oil changes, lubrication, and equipment adjustments. In addition, inspections shall be performed to record equipment deterioration and assess the need for replacement or repair of worn or end of life parts and equipment before they cause system failure or affect bridge operating reliability.

Bridge electrical and mechanical system maintenance shall also include 24/7 on-call failure and troubleshooting services during the navigation season. Following notification of a bridge electrical or mechanical system failure by the Departmental Representative, the Contractor shall respond and be at the bridge within four (4) hours of the notification.

Services shall also extend to include "as needed" structural maintenance for the swing bridge and the two timber approach spans adjoining it. This will include any maintenance or minor repair items for the structural steel and timber components of the crossing.

2. Summary of Maintenance Efforts

2.1 On-Call Services

Bridge electrical, mechanical and structural system maintenance shall include 24/7 on-call failure and troubleshooting services during the navigation season. Following notification of a bridge electrical and/or mechanical system failure by the Departmental Representative, the Contractor shall respond and be at the bridge

within four (4) hours of the notification.

2.2 General Housekeeping

- Maintain all work areas free of accumulated waste and rubbish. Remove and dispose of debris, used and obsolete material.
- Maintain work areas in safe condition during and after work completion.
- Remove excess lubricant, dust, dirt, and foreign matter from surfaces of all equipment to be maintained by this Contract.

2.3 Mechanical Maintenance Scope

The Contractor shall provide maintenance, routine cleaning, inspection, testing, and complete service for all mechanical machinery that comprise the bridge mechanical systems. The following is a list of major equipment or systems to be maintained under this Contract. This list is provided for guidance and may not be comprehensive. Any other mechanical equipment that affects or contributes to the safe and reliable operation of the bridge shall be considered as part of this Contract. Refer to Section 18. Mechanical Equipment and Systems Requiring Attention/Maintenance.

Documents listed in the Reference Documents section provide guidance on maintenance for many of these components.

2.3.1 Hydraulic Equipment

- Hydraulic Power Unit (HPU)
- Hydraulic Hoses, Valves, Manifolds
- Hydraulic Motors (Span Drive and End Wedge)
- Hydraulic Cylinder (Center Latch Actuator)

2.3.2 Span Drive Machinery

- Hydraulic Span Drive Motor
- Enclosed Gear Reducer
- Open Gearing and Rack Gear
- Plain Bearings
- Foot Pedal Actuated Brake

2.3.3 Span Support Machinery

- Rim Bearing Tracks (upper and lower tracks)
- Rim Bearing Wheels
- Center Post
- End Wedges
- End Wedge Machinery
 - a. Wedge Surfaces
 - b. Plain Bearings
 - c. Couplings
 - d. Open Gearing (Bevel and Spur Gears)
 - e. Enclosed Gear Reducer
 - f. Hydraulic End Wedge Motor

2.3.4 End Latches and Positioning Machinery

- Bumper Blocks
- End Latches
- End latch linkages and hydraulic cylinder actuator

2.3.5 Traffic Gate Machinery

- Traffic Gates

The Reference Documents section summarizes available maintenance reference materials including the available bridge maintenance manual and the AASHTO *Movable Bridge Inspection, Evaluation, and Maintenance Manual*. Baseline lubrication should be performed in accordance with the manual's lubrication schedule and charts. These documents should be followed as a guideline and the maintenance should be adjusted as necessary to minimize component wear and to ensure reliable operation. As an example, lubrication frequencies must be adjusted based on the lubrication performance during bridge operations over time.

If it is found that the bridge components are not listed or the components on the lubrication schedule are obsolete, the lubrication schedule shall be updated and submitted for review by the Departmental Representative.

For those items that are not addressed by the Reference Documents, the Contractor shall work with the Departmental Representative to develop a maintenance plan.

2.4 Mechanical Maintenance Procedures

The Contractor shall provide a written procedure documenting the work plan to maintain the mechanical systems as part of the site specific health and safety plan. The procedure shall be submitted for approval by the Departmental Representative prior to implementing the maintenance work plan. The plan shall address the maintenance of all items that can affect operation of the swing span.

2.5 General Electrical Systems Description

The swing span has a hydraulic power unit that drives a hydraulic motor. The hydraulic motor drives a pinion that engages the geared rack mounted on the center pier. This causes the bridge to rotate through 90° in a counter clockwise direction to open for navigational traffic. The local utility grid provides the only source of electric power to the bridge. However, the bridge has provision for mobile emergency generator hookup through manual transfer switch and generator receptacle outlet. Power to the pivot pier is provided by a submarine cable from the island. Control systems also run through the same submarine cable from both shores to operate signals and warning gates.

The installed electrical elements include; electrical service to the bridge, power distribution panels, transfer switch, distribution transformer, motors, control panels, limit switches, traffic signals, traffic gates, navigation lights and associated circuit wirings and conduits.

2.6 Electrical Maintenance Scope

The scope shall include the maintenance shall including all electrical elements listed in the following section.

See the section 19. Electrical Equipment and Systems Requiring Attention/Maintenance for a description of major electrical equipment and systems to be maintained.

The Contractor shall provide routine cleaning, inspection, testing, complete maintenance and service of all the items identified in the section of equipment and systems requiring attention/maintenance. All repair and replacement of parts shall also be included in the Contractor's scope of work.

The Contractor shall review and monitor the electrical power supplied to the bridge and ensure that it is used effectively and efficiently and provision for back up mobile generator hookup are maintained electrically operational in accordance with the

current equipment O&M Manuals and all applicable codes and practices. In the case of concerns, issues or failures uncovered during the execution of its maintenance services, the Contractor shall immediately report the issue or failure to the Departmental Representative. Additionally, any bridge operating control issue shall be given the highest priority and resolved by the Contractor in the timeliest manner. If the Contractor is unable to quickly resolve the issue, it shall be reported to the Departmental Representative who will obtain additional troubleshooting assistance from the bridge control system vendor, span drive supplier or other related specialist.

If the Contractor and/or bridge personnel propose any new installation and/or modification work for the bridge electrical systems, a written quotation must be provided to the Departmental Representative and approval given by the Departmental Representative for such work to be performed by the Contractor prior to either procurements of materials and equipment or the work proceeding. Note that the scheduling of any and all bridge operating invasive work must be coordinated with and approved by the Departmental Representative.

2.6.1 Exclusions

Electrical maintenance work on or inside the Service Building are excluded.

A summary of exclusions follows:

- Building electrical service
- Building lights and receptacles
- Telephone
- Fire alarm system
- Heating, ventilation, and air conditioning system (HVAC)

2.7 Navigational Start Up

Provide 40 hours each of electrical, mechanical and hydraulic technical support to facilitate annual navigational season start up. This shall include ensuring that marine navigational aids, vehicular/pedestrian traffic control and the bridge mechanical systems are operational and functioning in accordance with that defined in the O&M Manual.

2.8 Structural Maintenance Scope

The scope of the structural work shall include addressing any arising emergency structural issues at the crossing. The structural work shall include the three structures comprising the crossing; the swing steel span and the two approach timber trestle spans. The work will aim at providing minor repairs for the bridge structural components as needed to ensure the continuous proper and safe operation of the bridge.

3. Additional Work

Any work/repairs outside of the contract shall be identified to the Departmental Representative and approval to proceed shall be received prior to carrying out the work. Invoices shall identify the work in detail, listing material and labor, the authorizing officer and date and the specific work order reference number.

A quote together with details of work to be done shall be provided at the time of requesting approval. The Departmental Representative retains the right to disapprove the quote and subcontract the work to a third party.

4. Work Completion

The Contractor shall complete the work as specified. Failure to do so may result in the Contractor being charged for additional shutdown costs, and cost of having the work completed by other forces, and any costs incurred by the Departmental Representative.

5. Reference Documents

Mechanical and electrical machinery shall be maintained in accordance with the provided documents and with best industry practice. General practice shall follow the inspection and maintenance requirements outlined in the information provided in the following reference documents.

5.1 Mechanical

The following is a list of documents made available by the Departmental Representative for use in maintaining the mechanical systems.

- Wasauksing Swing Bridge Operation and Maintenance Manual
 - Volume 1 – Operation Manual
 - Volume 2 – Mechanical Maintenance
 - Volume 3 – Electrical Maintenance
 - Volume 4 – Manufacturer's Literature
 - Volume 5 – Shop And As-Built Drawings; Manufacturer's Cut Sheets

Note that the listed documents are not comprehensive. Other equipment that affect or contribute to the safe and reliable operation of the bridge shall be considered as part of this Contract even if not described in the reference documents. If modifications of the documents are made, the Contractor shall revise and update the documents.

6. Minimum Standards

6.1 General

Where applicable, execute work to meet and/or exceed the requirements of the following codes and Specifications:

- Latest edition of the *Bridge Inspection, Evaluation, and Maintenance Manual* published by the American Association of State highway and Transportation Officials (AASHTO).
- CAN/CSA S6-14 Canadian Highway Bridge Design Code.
- National Building Code of Canada 2015, National Fire Code of Canada 2015, Ontario Building Code 2017 and any other code of provincial or local application.
- Fire Commissioner of Canada, No. FC 301, Standard for Construction Operations, and No. FC 302, Standard for Welding and Cutting, latest version.
- All applicable local and national safety regulations, including the Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario 2018.
- All applicable local and national environmental regulations, including the environmental Protection Act, O. Reg. 127/01 and O. Reg. 153/04.

6.2 Electrical

Where applicable, execute work shall meet and/or exceed the requirements of the following codes and Specifications:

- Contractor shall comply with all Department Policies on Electrical Safety DP058.
- The Ontario Electrical Safety Code 26th Edition/ 2015 - Effective May 5, 2016, and all bulletins (Ontario).
- CSA C22.1-02 Canadian Electrical Code 2015, Part I, except where specified

otherwise.

- Electrical Safety Authority and local applicable codes and regulations.
- CAN/CSA S6-14 Canadian Highway Bridge Design Code.
- National Building Code of Canada 2015, National Fire Code of Canada 2015, Ontario Building Code 2017 and any other code of provincial or local application.
- Fire Commissioner of Canada, No. FC 301, Standard for Construction Operations, and No. FC 302, Standard for Welding and Cutting, latest version.
- Occupational Health and Safety Act and Regulations for Construction Projects, Revised Statutes of Ontario 2018.
- Environmental Protection Act, O. Reg. 127/01 and O. Reg. 153/04.
- Wasauksing Swing Bridge Operation and Maintenance Manual
- In any case of conflict or discrepancy, the more stringent requirements shall apply.

6.3 Mechanical

The bridge mechanical systems shall be maintained in accordance with the provided reference documents (including the maintenance manual), component manufacturers' instructions, and best industry practices. All provided information shall be used as a guideline and for tendering purposes. The maintenance tasks should be adjusted as necessary to minimize component wear and to ensure reliable operation. As an example, lubrication frequencies must be adjusted based on the lubrication performance during bridge operations over time.

If it is found that the bridge components are not listed or the components on the lubrication schedule are obsolete, the lubrication schedule shall be updated and submitted for review by the Departmental Representative.

6.4 Coordination and Schedule

- Within one month after the award of this Contract, the Contractor, in consultation with the Departmental Representative, shall submit a work schedule listing equipment and systems to be inspected, tested, serviced or repaired and the time the work is done. Notify the Departmental Representative of any changes to the maintenance schedule.
- The Departmental Representative reserves the right to modify the work schedule to meet the needs of the situation.
- Register site attendance in log book with the Departmental Representative and/or Security Officer on entering and leaving premises.
- The Contractor shall ensure that all the relevant and applicable rules and regulations from Authorities having jurisdiction over the bridge area including highway and the waterway are met and adhered to.

6.5 Maintenance Schedule

The bridge is normally available for opening 24/7 during the navigable channel operating season from mid-April thru mid-December each year.

The Contractor Shall:

- Provide 24/7 on-call service during the bridge operating navigable season. This on-call service shall require the Contractor to respond to requests for services within 4-hour of notification. The Contractor shall be responsible for troubleshooting, repairing or replacing any item that has failed. This shall include both items that have caused a bridge operating failure or items that have failed but have not caused a bridge outage.

- During the bridge shutdown season from mid-December thru mid-April, the Contractor shall perform annual maintenance of the bridge electrical and mechanical systems as described in this statement of work. Note that during this bridge outage season, the Contractor is not required to be on-call but to respond on an as needed basis to requests for assistance from the Departmental Representative.

6.6 Inspection by Electrical Safety Authority

During the execution of its maintenance services of the bridge the Electrical Contractor may be called upon to perform repairs or modify parts of the bridge electrical systems in order to maintain it in a safe and reliable condition.

When such repairs or modifications are major and undertaken by the Maintenance Electrical Contractor as part of his maintenance services, the Contractor shall arrange for the inspection and obtain safety certificates from Electrical Safety Authority having jurisdiction over the project for its work. Additionally, he shall perform his work to the complete satisfaction and approval of the Departmental Representative.

6.7 Cooperation with Other Contractors

The Contractor shall co-operate with other contractors hired by the Departmental Representative to perform any work on the bridge not directly related to the maintenance work specified herein.

6.8 Cooperation and Protection

Perform work with minimum disturbance to the operators and normal operation of the swing bridge. The bridge is in operation from mid-March to the end of December of every year. The Contractor shall coordinate with and obtain approval from the Departmental Representative for any required bridge or power outages necessary to perform his work.

The Maintenance Contractor will be granted use of existing bridge facilities with the permission and defined limitations of the Departmental Representative at no cost to the Maintenance Contractor.

6.9 Power Shut Downs

Power shut down shall be kept to a minimum. Schedule shut downs well in advance with Departmental Representative stating times and durations. Maintain all electrical services to all other branch circuits of the Bridge area. Premium time and cost, if required for any shutdown work, must be included in the contract price.

Provide temporary services, equipment and wiring as necessary to maintain continuity of crucial loads deemed so by the Departmental Representative.

6.10 Meetings

The Contractor or his representative shall attend monthly meetings at site when notified by the Departmental Representative. Time spent at the meeting is counted towards the committed employee-hours. For tendering purposes, it shall be assumed that a monthly meeting will take place for every month of the contract and each will have a duration of 2-hours.

7. Parts, Equipment and Tools

7.1 General

The Contractor shall supply all the equipment and tools required for this Contract. All equipment and tools used must be safe, suitable for the purpose intended, and in good

condition.

Supply the Departmental Representative with the year, make, model and capacity of Contractor's equipment and calibration certification of all meters and recording instrumentation, if requested.

7.2 Materials

Use new materials unless specified otherwise.

The Departmental Representative will provide a stock of electrical fittings to facilitate electrical maintenance and minor repair. The Contractor shall inform the Departmental Representative of any materials required but not found in the stock.

Purchase of any special, unstocked electrical materials or equipment by the Contractor for any work under this Contract must be approved by the Departmental Representative prior to the procurement of such material and equipment. A quote with details of the material from the supplier shall be provided at the time of requesting approval. The Departmental Representative retains the right to disapprove the purchase and procure the same material through other channels.

7.3 Lubricants, Lubricating Equipment, and Tools

- Use new lubricants unless specified otherwise.
- The Departmental Representative will provide the lubricants that the Maintenance Contractor is to use on the equipment. The Contractor shall inform the Departmental Representative of any materials required but not found in stock. The Departmental Representative shall either approve the Contractor to procure the defined stock items or make other arrangements for their procurement if he deems they are necessary for the maintenance of the bridge. Re-stocking of maintenance materials is not considered part of this base contract.
- Purchase of any materials by the Contractor for any work under this Contract must be approved by the Departmental Representative first. A quote with details of the material from the supplier shall be provided at the time of requesting approval. The Departmental Representative retains the right to disapprove the purchase and procure the same material through other channels.
- The Contractor shall supply all Lubricating Equipment (such as grease guns, brushes, sprayers, caulk guns, etc. to apply lubricants) and Tools (such as allen keys, wrenches, etc.) to complete the required lubrication and maintenance of the machinery.
- Use of any lubricant that is not currently in use at the bridge shall be approved by the Departmental Representative prior to use.

7.4 Replacement Parts

In cases where items are found to have worn out or are damaged beyond repair, the Contractor shall source and replace the item. Where possible the contractor shall use replacement parts by the manufacturer of the original part. Replacement parts are considered Additional Work and cost to the contract.

If an original part is not available, replacement parts by another manufacturer may be used with written approval from the Departmental Representative, the Contractor should recommend a replacement. The cost of the procurement and installation of the replacement part is not included in this contract. The Departmental Representative retains the right to appoint the Contractor or a separate agent for the

procurement and installation of any identified replacement part.

7.5 Spare Parts

The Contractor shall provide a list of recommended spare parts to be stocked on site within one month after award of this Contract. The list shall include the name, part/catalogue number and supplier/manufacturer of each of the spare parts. As a basis for the preparation of this list the Contractor shall use the latest Maintenance Manuals for the bridge.

8. Personnel

8.1 Electrical Maintenance Contractor Qualifications and Experience

- General laborers shall not perform any electrical work.
- The Electrical Maintenance Contractor shall be qualified in all aspects of power distribution, control and drive systems associated with movable heavy structures.
- The Maintenance Electrical Contractor shall have been involved in the construction/installation or maintenance of the electrical power and control systems of at least three (3) movable highway bridges over similar navigable waterways carrying similar traffic to the Wasauksing Swing Bridge.
- The Electrical Maintenance Contractor shall provide the services of a Master Electrician registered in the Province of Ontario to manage the electrical maintenance for the bridge as herein specified and in accordance with Electricity Act, Part VIII, 1998 and Licensing of Electrical Contractors & Master Electricians, Regulation 570/05.
- The Master Electrician designated by the Maintenance Electrical Contractor shall be responsible for; planning and having direct supervision of electrical work carried out on behalf of the Maintenance Electrical Contractor, ensuring that the electrical work is carried out in accordance with applicable laws, including the Electrical Safety Code and the laws relating to health and safety and consumer protection, on behalf of the Maintenance Electrical Contractor and for other matters of a similar nature.
- The Master Electrician shall only be designated to the Maintenance Electrical Contractor contracted for the maintenance of the Wasauksing Swing Bridge, the designated Master Electrician must be actively employed by the designating Maintenance Electrical Contractor, and are not permitted to undertake electrical work unless they hold a valid certificate of qualification, as defined by the Trades Qualification & Apprenticeship Act, for the work being performed. To apply for a contractor's license the applicant must designate a Master Electrician and provide a signed declaration that they accept the designation and agree to carry out the responsibilities on behalf of the electrical contractor.
- In accordance with the Electricity Act Part VIII and its Regulations a license holder is responsible to conduct themselves with honesty and integrity and in accordance with the principle of protecting consumers and to ensure that all activities are carried out in accordance with all laws including the Consumer Protection Act.
- The Maintenance Electrical Contractor shall ensure that his Master Electrician is adequately supported to perform the scope of this request and meet the scheduled maintenance, troubleshooting and emergency callout services.
- Contractor shall be competent on high voltage electrical work and testing. The contractor shall also be fully qualified and knowledgeable of PLC control, communications systems and variable frequency drive systems utilized in a swing bridge environment.
- The Electrical Engineer assigned to the contract shall be provincial licensed and registered with Professional Engineers Ontario (PEO).

- The Electrical Technologist/Technician assigned to the contract shall hold a diploma or certificate specialized in Electrical Technology from a recognized educational institution.
- The Electrician assigned to the contract shall be Provincial licensed journeyman qualified in the work of the Contract as per Regulation 1051/1990. Journeyman means a person who has successfully completed all the academic training and work experience required under the Apprenticeship and Tradesmen's Qualifications Act related to the Certified trade involved and has been issued a Certificate of Qualification by the governing body for the Province of Ontario.
- In the case of special testing, i.e.: injection testing of breakers, double testing of transformers, etc., a technician with a minimum of 5 years' experience shall be acceptable.
- In the case of thermo-scan (infrared scanning), the technician shall hold a Certificate of Training as received from a recognized course acceptable to the Department.

8.2 Mechanical Experience

The contractor shall be qualified in the maintenance and servicing of hydraulic systems and heavy machinery such as HPU's, hydraulic valves, hoses, and manifolds, open gearing, bearings, couplings, drum brakes, and enclosed gear reducers.

Hydraulic maintenance work (HPU, hoses, valves, manifolds, hydraulic cylinders, and hydraulic motors) shall be done under the supervision of a Certified Fluid Power Specialist. All hydraulic maintenance work shall be performed by a Certified Fluid Power Industrial Hydraulic Mechanic.

8.3 Subcontractor

Immediately after the award of the contract, the Contractor shall provide the Departmental Representative with the name and address of any sub-contractors intended to be used for routine maintenance as part of the Contract.

The Contractor may hire subcontractors, with the approval of the Departmental Representative, for one-time maintenance work. The requirement of this document in its entirety applies to the subcontractor's work and employees.

A quote from subcontractor's together with details of work to be done shall be provided at the time of requesting approval. The Departmental Representative retains the right to reject any subcontractor and procure the same service or services through other channels.

8.4 Contractor's Employees

- All Contractor's employees shall be neatly and properly attired for the work to be performed. Personal protective equipment, including safety footwear, is mandatory at all times.
- All Contractor employees shall abide by non-smoking restrictions. Smoking is only allowed in designated areas.

9. Documentation of Maintenance and System Updates

File and maintain the following documents on site at the bridge:

- The maintenance contract documents.
- Test and inspection reports.
- Maintenance logs.
- The contractor shall be responsible for documenting updates to the Systems associated with the maintenance work. The contractor shall update the Operation and

Maintenance Manuals to reflect the updated systems. These documents should be properly bound, catalogued and filed and made readily available for maintenance work. Documentation for updates may include:

- Up-to-date electrical on-line diagram.
- Control logic diagram including logic diagram programmed in the PLC.
- All electrical and mechanical drawings updated with the latest revision. Both hard copies and digital copies should be properly filed at site with the Departmental Representative. All new drawings shall be produced in CAD (computer aided drafting) and in .dwg format. Shop drawings and catalogue cut-sheets of new equipment shall also be included and filed in hard copy and electronic form.
- All programs for the PLC (programmable logic controller), drives, and digital/analogue controllers shall be backed up and hard copies shall be printed out. Both digital and hard copies shall be filed at site and provided to the Departmental Representative.

All the documents mentioned above shall remain the property of the Departmental Representative and not be removed from site throughout the Contract and at the end of the Contract.

10. Premises Security and Security Clearances

Only designated employees of the Contractor and approved subcontractors are allowed at site. The Departmental Representative reserves the right to reject access to the bridge premises to anyone associated with this contract.

11. Fees and Permits

The Contractor shall pay all fees required to obtain permits or certificates and shall make all arrangements with local utilities for isolation, grounding and re-energizing of electrical power, if such requirements are required to carry out the maintenance work.

12. Right to Use Other Forces

The Departmental Representative retains the right to appoint the Contractor or other agent for procurement of maintenance or for Additional Work. The Departmental Representative reserves the right to use their own, or any other forces of their choosing, to make any alterations on the bridge if they so desire.

13. Maintenance Manuals

As directed and scheduled by the Departmental Representative during the tendering process, the bidder shall participate in a site visit to the bridge. During the site visit, the Bidder will have the opportunity to interrogate all maintenance related documentation held at the bridge to assess its completeness and as a basis for their bid.

Following award of the contract the Contractor shall review the existing reference documents and, where maintenance information is missing, obtain maintenance manuals of the systems and equipment. Where manufacturer's maintenance information is unavailable, the Contractor shall document the maintenance/service required in the form of updated manuals to be submitted to the Departmental Representative for approval.

All maintenance manuals shall remain on site throughout the contract period and at the end of the contract. These manuals shall remain as Department property and be available to Department staff.

14. Guarantees

The Contractor shall guarantee any materials used and any work executed by him or his appointed sub-contractor, for a period of one year from the date of completion of the work.

15. Existing Services

Protect and maintain existing active services and facilities. Use existing services at no cost for maintenance of those items that are not covered under this contract.

16. Annual Inspection Report and Monthly Work Report

The Contractor shall produce an annual electrical and mechanical inspection report for each fiscal year during the terms of this Contract. The annual inspection will be scheduled to coincide with the navigation startup, at the beginning of each operational season. In case the Departmental Representative chooses to hire a third party to do an annual inspection, the Contractor shall co-operate with the third party to produce the electrical section of the Annual Inspection Report. In this case, no separate annual report is required. Unless otherwise arranged and approved by the Departmental Representative, the Annual Electrical Inspection Report shall be due at the end of April of each year during the terms of this Contract.

In the event that the Departmental Representative decides that a third party performs the bridge mechanical and electrical annual inspection, the Contractor shall provide the necessary support for the third party to perform their inspection work.

The annual electrical inspection report shall include but not be limited to the following sections on all the electrical systems of the bridge: visual inspection of the bridge electrical systems including all equipment, sub-systems, electrical installation, raceways, cabling including droop cables and cable reels as well as the tower to tower aerial cable installation. The report shall include:

- Major electrical work and modification completed during the year.
- Items of concerns and items identified by the Departmental Representative for special attention.
- Recommendations
- Reports of Tests and Inspection done by the Contractor and third party.
- Photographs and drawings.

A monthly Work Report summarizing the work done and the employee hours spent at site should also be submitted.

Time spent for this inspection and writing of the report shall be charged as Maintenance hours.

It shall be included as Item 1 Committed hours or billed as non-emergency service if the committed number of hours in that month has been exceeded.

17. Final Inspection

The Contractor shall provide a final inspection of the mechanical and electrical systems within two months of the end of the Maintenance Contract. The final inspection shall be coordinated for inspection in the presence of Departmental Representative. Time spent for this inspection shall be charged as maintenance hours. It shall be included as committed hours or billed as non-emergency service, if the committed number of hours in that month has been exceeded.

All deficiencies known to the Departmental Representative and not rectified during the execution of the contract, and those deficiencies uncovered during the final inspection, shall be corrected prior to the Maintenance Contract closeout.

18. Mechanical Equipment and Systems Requiring Attention/Maintenance

The following is a list of major mechanical equipment to be maintained under this Contract. This list is provided for guidance and may not be comprehensive, review of Volume 2 of the O&M Manual will be necessary for review of entire scope.

Apart from the exceptions noted by the Departmental Representative and Contract Documents, the maintenance shall include all mechanical equipment in the Bridge area, or mechanical equipment that affects or contributes to the safe operation of the Bridge, bridge auxiliaries, or facilities shall be considered as part of this Contract.

Suggested minimum maintenance/service intervals are provided in the following table in accordance with this key:

- W - Weekly
- BW - Bi-Weekly
- M - Monthly
- Q - Quarterly
- SA - Semi Annually
- A - Annually

Caution: The recommended intervals are provided for guidance only. Actual intervals may depend on the environment, duty cycle, etc. Adjust the intervals as necessary to provide preventative maintenance to ensure reliability.

Item	Description	Location	Maintenance/Service	Remarks	Interval
1	Lubrication (See Volume 2 of O&M Manual, Figure 4.0)				
1a	Center Post	Center Pier	Spray Lubricant	Performed by Contractor	BW
1b	Plain Bearings (28)	Lubrication lines on walkway and 4 corners of the span	Lubricate; one shot of grease	Performed by Contractor	W
1c	Open Gears – Span Drive and End Wedge	Center Pier	Lubricate all open gearing including rack and pinion sets	Performed by Contractor	BW
1d	Rim Bearing Wheel Shafts (48)	Center Pier	Lubricate the Rim Bearing Wheel Shafts	Performed by Contractor	W
1e	End Wedge Reducer (4)	4 corners of the span	Check fluid level and replenish oil as needed. Replace fluid annually.	Performed by Contractor	Q, A

1f	Span Drive Reducer Fluid	Center Pier	Check fluid level and replenish oil as needed. Replace fluid annually.	Performed by Contractor	Q, A
1g	Hydraulic Power Unit	Near Operator's Station	Check fluid level and replenish hydraulic oil as needed. Replace fluid annually.	Performed by Contractor	Q, A
1h	Brake	Operator's Station	Check/replenish the brake fluid level	Performed by Contractor	A
2	Brakes				
2a	Brakes	Operator's Station	Check for satisfactory operation; Ensure that the brakes are clean and free of debris; check the brake shoes are free of contamination by lubricants; Check the tubing for signs of leakage.	Performed by Contractor	SA
2b	Brakes	Operator's Station	All items from 2a; Check brake shoe lining for thickness; Inspect integrity of brake linkages.	Performed by Contractor	A
3	Span Drive and Wedge Drive Reducers				
3a	Reducers	Center Pier	Check oil level; Look for leaks in housing; Clean/remove accumulated debris; Monitor the reducer during operation to detect the presence of noise or vibrations	Performed by Contractor	SA
3b	Reducers	Center Pier	All items from 3a; Replace fluid yearly; check extent of ongoing corrosion of reducer and mounting brackets.	Performed by Contractor	A
4	Bearings				
4a	Span Drive-(5) End Wedge Shaft Bearings-(24)	View As-Built Drawings	Check machinery supports for corrosion or cracks as well as all foundation and mounting bolts; check mounting bolts and tighten as required; Lubrication fitting should be checked to ensure that they are receiving grease; Monitor bearings for vibration, noise or the generation of heat during operation.	Performed by Contractor	SA

4b	Span Drive-(5) End Wedge Shaft Bearings-(24)	View As-Built Drawings	All items from 4a; Measure and document the bearing clearance.	Performed by Contractor	A
5	Open Gearing				
5a	Span Drive Gearsets-(3) End Wedge Drive Gearsets-(6)	Machinery Room	Inspect gearsets for adequate lubricant	Performed by Contractor	SA
5b	Span Drive Gearsets-(3) End Wedge Drive Gearsets-(6)	Machinery Room	All items from 5a; Check for wear of gear teeth; Check rack condition for connection of rack to pivot pier; Check for gear teeth contact.	Performed by Contractor	A
6	Shafts				
6a	Shafts	Machinery Room	Remove debris from shafts; Inspect all keyway shoulders and other stress risers for cracks; inspect shafts for signs of deformation.	Performed by Contractor	SA
6b	Shafts	Machinery Room	All items from 6a	Performed by Contractor	A
7	End Wedge Machinery				
7a	End Wedge Machinery	4 Corners of Span	Check wedges and wedge bases are adequately lubricated; Clean away debris and all excess lubricant; Inspect the integrity of the wedges and bases; Inspect the anchorage of the bases to the concrete in the nose piers; Check straightness of shafts and connecting rods.	Performed by Contractor	SA
7b	End Wedge Machinery	4 Corners of Span	All items from 7a; Inspect Acme screws for travel and wear; Inspect wedge, wedge guide, wedge base and any shims for movement under live load.	Performed by Contractor	A

8	End Latch Machinery				
8a	End Latch Machinery	4 Corners of Span	Check clevis on rod end of hydraulic cylinder; Check drive linkage and turnbuckles; Check latch push rods for wear; Inspect latch guide/receiver for lubrication	Performed by Contractor	SA
8b	End Wedge Machinery	4 Corners of Span	All items from 8a; Ensure latch receivers are adequately affixed to the nose piers.	Performed by Contractor	A
9	Rim Bearing Assembly				
9a	Rim Bearing Assembly	Machinery Room	Check for lubrication at the center post; check for lubrication at each wheel; check linkage connecting wheels	Performed by Contractor	SA
9b	Rim Bearing Assembly	Machinery Room	All items from 9a; Monitor rim bearing assemblies during operation. Note any gaps between the rim bearing wheels and track	Performed by Contractor	A
10	Hydraulic Power Unit/Hoses				
10a	HPU/Hoses	Machinery Room	Inspect all hoses for deterioration such as wear and abrasions; Inspect HPU for signs of leakage; Check hydraulic fluid level	Performed by Contractor	SA
10b	HPU/Hoses	Machinery Room	All items from 10a; Replace hydraulic fluid and HPU oil filter; Check pressures during operation	Performed by Contractor	A

19. Electrical Equipment and Systems Requiring Attention/Maintenance

The following is a list of major electrical equipment or systems to be maintained under this Contract. This list is provided for guidance and may not be comprehensive.

Apart from the exclusions noted in Section 2.6 Electrical Maintenance Scope, the maintenance shall include all electrical equipment in the Bridge area that supplies or transmits electrical power, or that affects or contributes to the safe operation of the Bridge, bridge auxiliaries, or facilities shall be considered as part of this Contract.

Suggested minimum maintenance/service intervals are provided in the following table in accordance with this key:

- W - Weekly
- M – Monthly
- SA – Semi Annually
- A - Annually

Caution: The recommended intervals are provided for guidance only. Actual intervals may depend on the environment, duty cycle, etc. Adjust the intervals as necessary to provide preventative maintenance to ensure reliability.

Item	Description	Location	Maintenance/Service	Remarks	Interval
1	Electric Utility Service				
1a	Electrical Service Disconnect Switch	Utility Meter Pole	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Check proper installation of fuse, termination, wiring insulation, and connections; Clean Unit; Ensure proper enclosure weather seal against water ingress. Replace failed fuse as required.	Performed by Contractor	SA

1b	Transfer switch	Utility Meter Pole	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Check proper transfer function, conductor terminations, and connections; Clean Unit; Ensure proper enclosure weather seal against water ingress.	Performed by Contractor	SA
1c	Emergency Generator Hookup Outlet	Utility Meter Pole	Inspect anchorage, alignment, grounding, and required area clearances; Check proper conductor terminations, and connections; Clean Unit; Ensure proper enclosure weather seal against water ingress.	Performed by Contractor	SA
1d	Electrical Feeder Cable	On Bridge Structure	Inspect exposed sections of cables for physical damage and evidence of overheating, Secure any loose cable attachment, Inspect all feeder connections. Perform an insulation-resistance test on each conductor with respect to ground and adjacent conductors. The applied potential shall be 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable. The test duration shall be one minute.	Performed by Contractor	A

1 e	Submarine Cable	On Bridge Structure	Inspect exposed sections of cables for physical damage and evidence of overheating, Secure any loose cable attachment, Inspect all feeder connections. Perform an insulation-resistance test on each conductor with respect to ground and adjacent conductors. The applied potential shall be 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable. The test duration shall be one minute.	Performed by Contractor	A
1 f	Festooned Cable	On Bridge Structure	Inspect exposed sections of cables for physical damage and evidence of overheating, Secure any loose cable attachment, Inspect all feeder connections. Perform an insulation-resistance test on each conductor with respect to ground and adjacent conductors. The applied potential shall be 500 volts dc for 300-volt rated cable and 1000 volts dc for 600-volt rated cable. The test duration shall be one minute.	Performed by Contractor	A

2	Power Distribution Equipment on Bridge Structure				
2a	Power Panel	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Operate the circuit breakers to insure smooth operation; Check and secure circuit conductor terminations, Verify proper ground and neutral connections; Clean Unit; Ensure proper enclosure weather seal against water ingress. Replace failed circuit breaker(s) as required.	Performed by Contractor	A
2b	Small Distribution Transformer Dry-type (<10 KVA)	On Bridge Structure	Inspect physical and mechanical condition; Inspect anchorage, alignment, and grounding; Clean the unit.	Performed by Contractor	A
2c	Motor Starter	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Operate the circuit breakers and contactors to insure smooth operation; Verify proper size and function of the overload relay; Check and secure circuit conductor terminations, Verify proper ground and neutral connections; Clean Unit; Ensure proper enclosure weather seal against water ingress.	Performed by Contractor	SA

2d	Safety Disconnect Switches	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Clean Unit; Ensure proper enclosure weather seal against water ingress.	Performed by Contractor	A
3	Control System				
3a	Control Relay Panel	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Test and verify all components and operation; Verify proper operation of relays, control switches, indication lights; Replace faulty or failed relays, control switches, and indication lights; Check and secure circuit conductor terminations, Clean Unit; Ensure proper enclosure weather seal against water ingress. Replace failed fuse, relay, indication lamp, control switch as required.	Performed by Contractor	SA

3b	HPU PLC Cabinet	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and required area clearances; Exercise all active Components; Test and verify all components and operation; Verify proper function and operation of power supply, communication, and I/O modules; Verify field proper connections and function of PLC and field devices; check proper function of the PLC control logic; Check and secure circuit conductor terminations, Clean Unit; Ensure proper enclosure weather seal against water ingress.	Performed by Contractor	SA
3c	Limit Switches (LS): Span Drive Machinery (4); End Wedges (1); End Latches (1)	Machinery LS are located on Center pivot pier. End Wedge LS are located on the Southwest Corner of the span and the End Latch LS are located at the West latch	Inspect physical, electrical, and mechanical condition; Inspect anchorage and proper alignment with the target(s); Verify proper operation, feedback control and indication; Clean limit switch and associated target. Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress. Replace failed limit switch as required.	Performed by Contractor	M
3d	Control Valve Cabinet	On Bridge Structure	Inspect physical, electrical, and mechanical condition; Verify proper operation of the control valves, feedback control and indication; Clean unit.	Performed by Contractor	M

4	Hydraulic Power Unit (HPU) Pump Motor				
4a	HPU Pump Motor	HPU Unit on Bridge Structure	Inspect physical and mechanical condition; Inspect anchorage, alignment, and grounding. Verify the absence of unusual mechanical or electrical noise or signs of overheating; Perform Insulation Resistance test and General Cleaning	Performed by Contractor	SA
5	Traffic Control Equipment				
5a	Traffic Gates and gongs (2)	Bridge Roadway Level	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, grounding, and gate arm clearances; Exercise all active components; Test and verify all components and operation; Verify proper function and operation of operator motor, gate arm lights, gong, limit switches, and control interlocks; Check and secure circuit conductor terminations, Clean Unit; Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress.	Performed by Contractor	M
5b	Traffic Lights (4)	Bridge Roadway Level	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, and grounding; Verify proper function and operation of signal lights and control interlocks; Check and secure circuit conductor terminations, Clean Unit; Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress.	Performed by Contractor	M

5c	Navigation Lights (8)	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, and grounding; Verify proper function and operation of light fixtures and control interlocks; Check and secure circuit conductor terminations, Clean Unit; Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress. Replace failed lamps as required.	Performed by Contractor	M
5d	Warning Horn	On Bridge Structure	Inspect physical, electrical, and mechanical condition including evidence of moisture or corona; Inspect anchorage, alignment, and grounding; Verify proper function and operation; Check and secure circuit conductor terminations, Clean Unit; Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress.	Performed by Contractor	M
5e	Span and Roadway Lighting	Bridge Roadway	Test and confirm proper operation. Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress. Replace lamps, photo cell, and/or ballast as required.	Performed by Contractor	M
6	Weather Monitoring System				
6a	Weather Station	Service Building	Inspect and monitor system for proper function	Performed by Contractor	M
6b	Information Sign Display	On Bridge Structure	Inspect and monitor system for proper function	Performed by Contractor	M

7	General Wiring and Conduit Raceway System				
7a	General conduits and electrical boxes	On Bridge Structure	Ensure electrical enclosure and/or junction boxes are properly weather sealed against water ingress. Repair broken and/or detached conduits. Provide missing electrical box cover, attachment hardware, and replace and/or provide gasket and sealant as required.	Performed by Contractor	A
7b	General conduits and electrical boxes	On Bridge Structure	Repair power and control faulted circuit as required.	Performed by Contractor	

20. Technical Support

- Review design and demolition details
- Provide staging support for electrical demolition/removals/installations
- Review construction concepts and staging
- Review interface points for temporary traffic controls and stage new traffic controls (lights, gates, barriers and signals)
- Participate on site meetings on behalf of the Departmental Representative
- Review shop drawings/working plans
- Attend off site testing for new electrical control systems
- Provide onsite commissioning support
- Coordinate with consultants on site as needed
- Review as built drawings and O&M manual