

## ANNEX "A"

### STATEMENT OF WORK

The Contractor shall provide maintenance service to the Span Control and Lifting system, power distribution, related signalling systems and electrical systems of the Burlington Lift Bridge such that:

The lift span can be operated safely and continuously for the bridge and water traffic through the channel.

All the relevant and applicable rules and regulations from Authorities having jurisdiction over the Bridge area are met.

Electrical power supplied to the Bridge is used effectively and efficiently.

The Contractor will attend various site meetings as determined by the Bridgemaster which may effect the electrical power distribution and/or electrical systems of the bridge.

A written quote must be provided to the Bridgemaster for any new installations and/or modifications to the electrical systems.

The Contractor shall provide routine cleaning, inspection, test, complete maintenance and service of all the items identified in the section Equipment and systems requiring attention/maintenance. All repair and replacement of parts shall also be included. Any additional work not included in this Contract shall be approved by the Bridge Master or his representative in writing before the work is done.

In case an item is worn out or damaged beyond repair, the contractor shall source and replace the item. If an original part is not available, the Contractor should recommend a replacement. The cost of the procurement of the replacement part is not included in this contract but the labour required to replace the damaged item with the procured item shall be included. The Contractor should state in his bid, items for which installation cost should be part of the procurement cost. PWGSC retains the right to appoint the Contractor or other agent for the procurement. Accessories and consumable items required for installation should be provided by the Contractor.

The Contractor shall also 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.

Maintenance work of the following is excluded from this contract:

Building Services for the workshop building and Control building.

This includes:

Telephone

Fire alarm system

Gas supply and gas heating system

Power Supplied to the Bridge Tower Elevators

Pier lighting

Emergency Generators (Note: Servicing the mechanical diesel engines shall not be included. However, inspection and trouble shooting of the related electrical circuits shall be included.

## **Minimum Standards**

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

The Ontario Electrical Safety Code 2002, and all bulletins (Ontario).

CSA C22.1-02 Canadian Electrical Code 2002, Part I, except where specified otherwise.

Electrical Safety Authority and local applicable codes and regulations.

CAN/CSA S6-00 Canadian Highway Bridge Design Code.

National Building Code of Canada 1995, National Fire Code of Canada 1995, Ontario Building Code 1997 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 1990, Chapter 0.1 as amended, O. Reg. 213/91 as amended by O. Reg. 631/94, R.R.O. 1990, Reg. 834.

Environmental Protection Act, O. Reg. 127/01 and O. Reg. 153/04.  
In any case of conflict or discrepancy, the more stringent requirements shall apply.

## **Inspection by Electrical Safety Authority**

The Contractor shall arrange the inspection and obtain safety certificate from Electrical Safety Authority for major change and repair work on any system under this Contract.

## **Co-operation with Other Contractors**

The Contractor shall co-operate with other contractors hired by PWGSC to perform any work on the Bridge.

## **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.

## **Cleaning**

Maintain all work areas free of accumulated waste and rubbish.

Remove and dispose of debris, used and obsolete material.

Remove dust, dirt and foreign matter from surfaces of all equipment to be maintained by this Contract.

## **Cooperation and Protection**

Perform work with minimum disturbance to the operators and normal operation of the Lift bridge. The Bridge is in operation from Mid March to the end of December of every year.

Use existing facilities with the permission of the Bridge Master at no cost.

Use existing sanitary facilities designated by Bridge Master.

**Protect existing work from damage.**

Power shut down shall be kept to a minimum. Schedule shut downs well in advance with Bridge Master stating times and durations. Maintain all electrical services to all other branch circuits of the Bridge area. Premium time and cost, if required, 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 PWGSC representative.

**Meetings**

The Contractor or his representative shall attend monthly meetings at site when notified by the Bridge Master. Time spent at the meeting is counted towards the committed employee-hours

**Equipment and Tools**

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 Bridge Master with the year, make, model and capacity of Contractor's equipment, if Requested.

**Contractor**

Immediately after the award of the contract, the Contractor shall provide the Bridge Master with the name and address of any sub-contractors to be used.

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 department.

Contractor shall be competent on high voltage electrical work and testing. The contractor shall also be fully qualified and knowledgeable of PLC control, Synchro-Tie System utilized in a vertical lift bridge environment.

Contractor shall comply with all PWGSC Department Policies on Electrical Safety DP058.

The Contractor must be able to provide 24-hour-per-day emergency service and be on site within thirty minutes after an emergency call is placed.

**Subcontractors**

The Contractor may hire subcontractors, with the approval of the Bridge Master, for one-time maintenance work. All of this specification apply to the subcontractor' work and employees.

A quote from the subcontractor together with details of work to be done shall be provided at the time of requesting approval. The Bridge Master retains the right to disapprove the subcontracting and procure the same service through other channels.

**Contractor's Employees**

Employees' qualification:

The Electrical Engineer shall be provincial licensed and registered with Professional Engineers Ontario (PEO).

The Electrical Technologist/Technician shall hold a diploma or certificate specialized in Electrical Technology from a recognized educational institution.

The Electrician 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, dobel 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.

Notify the Bridge Master in advance of scheduled maintenance date.  
Register attendance in log book with the PWGSC representative and/or Security Officer on entering and leaving premises.

Shall be neatly and properly attired for the work to be performed. Safety footwear is mandatory at all times.

General labourers shall not perform any electrical work.

Shall abide by non-smoking restrictions. Smoking is allowed in designated areas only.

### **Materials**

Use new materials unless specified otherwise.

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

Purchase of any materials by the Contractor for any work under this Contract must be approved by the Bridge Master first. A quote with details of the material from the supplier shall be provided at the time of requesting approval. The Bridge Master retains the right to disapprove the purchase and procure the same material through other channels.

### **Replacement Parts**

The contractor shall use replacement parts by the manufacturer of the original part.

Rebuilt replacement parts by the same manufacturer may be used with prior written approval.

Replacement parts by another manufacturer may be used with prior written approval.

Leave repairable replaced parts on site or exchange for new part and show credit for exchange

on invoice.

### **Maintenance Manuals**

The Contractor shall obtain maintenance manuals of the systems and equipment to receive maintenance service. In case this is not possible because of obsolescence, the Contractor shall document the maintenance/service required.

Obtain maintenance manuals, not available on site, from manufacturers of systems and equipment when required by the Bridge Master.

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

### **Guarantees**

The Contractor shall guarantee any materials used and any work executed by him or his appointed sub-contractor, for a period of one (1) year from the date of completion of the work.

### **Existing Services**

Protect and maintain existing active services.

Use existing services at no cost.

Replace damaged existing work with material and finish to match original.

### **Annual Inspection Report and Monthly Work Report**

The Contractor shall produce an Annual Electrical Inspection Report for each fiscal year during the terms of this Contract. In case PWGSC 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 PWGSC, the Annual Electrical Inspection Report shall be due at the end of April of each year during the terms of this Contract.

The Annual Electrical Inspection Report shall include but not be limited to the following sections on all the electrical systems of the Bridge:

Major electrical work and modification completed during the year.

Items of concerns.

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.

### **Final Inspection**

Within two months towards the end of this Contract, a final inspection shall be performed.

Arrange inspection with PWGSC Representative.

Inspect work in presence of PWGSC Representative.

Correct deficiencies discovered during inspection.

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.

### **Documentation of Systems**

The Contractor shall keep one (1) copy of contract documents on site.

The Contractor shall keep all documentation for the operation and maintenance of the Bridge up-to-date. This should be properly bound, catalogued and filed and readily available for maintenance work. The documents should include but not limited to:

All electrical and mechanical drawings shall be updated with the latest revision. Both hard copies and digital copies should be properly filed at site. All new drawings should be done in CAD (computer aided drafting) and in .dwg format. Shop drawings and catalogue cut-sheets of new equipment shall also be included and filed.

All operation and maintenance manuals existing and new should be properly bound in binders and filed at site.

All programs for PLC(programmable logic controller) and digital controllers should be backed up and hard copies should be printed out. Both digital and hard copies shall be filed at site.

Test and inspection reports and log book should also be filed and maintained.

All the document mentioned above shall remain the property of PWGSC and not be removed from site through out the contract and at the end of the Contract.

### **Premises Security and Security Clearance**

Maintain premises security during work; close and lock gates, windows and doors on completion of work.

Only designated employees of the Contractors and approved subcontractors are allowed at site. The Bridge Master reserves the right to keep anybody out of the premises.

The contractor shall submit his name, address and date of birth and the name, address and date of birth of all employees who will be required to work in the above mentioned facility, occupied premises, to the PWGSC representative immediately following notification of contract award.

### **Additional Work**

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

PWGSC reserves the right to have any or all additional work performed by others. A quote together with details of work to be done shall be provided at the time of requesting approval. The Bridge Master retains the right to disapprove the quote and subcontract the work to third party.

### **Work Schedule**

Within one month after the award of this Contract, the Contractor in consultation with the Bridge

Master shall submit a work schedule, listing equipment and systems to be inspected, tested, serviced or repaired and the time the work is done.

The Bridge Master reserves the right to modify the work schedule to meet the need of the situation.

### **Right to Use Other Forces**

The Crown 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.

### **Equipment and Systems Requiring Attention/Maintenance**

The following is a list of major equipment or systems to be maintained under this Contract. This list may not be exhaustive, any other equipment in the Bridge area supplying, transmitting electrical power for or affecting or contributing to the safe operation of the Bridge shall be considered as part of this Contract.

Minimum maintenance/service interval:

M - Monthly

A - Annually

SA - Semi Annually

### **Maintenance Device/Location/Location Interval**

#### **Power System**

1000kva ONAN Padmount Transformer South West Lawn	A
Insulating oil, and dissolved gas analysis	
Winding Insulation and turns ratio test	
13.8 kV Fused Disconnect Switch South West Lawn	A
Resistance test on switch contacts and fuses	
Transformers ANN 75kva 2nd Floor, Control House	A
Winding Insulation test	
Transformers ANN 45kva 1st Floor, Control House	A
Winding Insulation test	
600kW Emergency Generator 1st floor, Control House	SA
Verify operation on load bank and during lift	
Maintain breaker	
37kW Generator (Bldg Service) 1st floor, Control House	SA
Verify operation on building load	
Maintain Breaker	
Transfer Switch Small Diesel 1st floor, Control House	A
Verify all connections and function test	
Transfer Switch North Tower MCC North Tower	A
Verify all connections and function test	
Ventilation System for E Generator 1st floor, Control House	M
Verify system settings and operation	
Load bank for Emergency Generator South Compound	M
Inspect and test disconnect switch and load bank components, verify operation	
Space Heater Outdoor metalclad enclosure	A
Verify proper operation	
Switchboard #1 1st floor, Control House	A
Inspect and test all connections	
Maintain all air breakers	
Inspect and test switchboard components	

Switchboard #2 2nd floor, Control House	A
Inspect and test all connections	
Maintain all air breakers	
Inspect and test switchboard components	
UPS 5kva 2nd floor PLC room	A
Inspect and load test	
Verify proper operation	

**Control System**

Control Cubicle #1 2nd floor, Control House	M
Inspect and test all breakers and contactors	
Verify all connections	
Control Cubicle #2 2nd floor, Control House	M
Inspect and test all contactors	
Verify all connections	
Control Cubicle #3 2nd floor, Control House	M
Inspect and test all contactors	
Verify all connections	
Control Cubicle #4 2nd floor, Control House	M
Inspect and test all contactors	
Verify all connections	
Inspect and test magnetic amplifiers, rectifiers and resistors	
Control Cubicle #5 2nd floor, Control House	M
Inspect and test all contactors	
Verify all connections	

**Indicators**

Traffic Control System 3rd Floor, Control House	M
Test and verify all components and operation	
Navigation Control Panel 3rd Floor, Control House	M
Test and verify all components and operation	
Computer Operator Terminal 3rd Floor, Control House	M
Test and verify all components and operation	
Computer Alarm Terminal 3rd Floor, Control House	M
Test and verify all components and operation	
Include simulated alarms	
Skew and Height Indicators 3rd Floor, Control House	M
Test and verify all components and operation	
Voltage, Current and Indicator Lights	M
Confirm operation and accuracy of all panel meters	

**Lifting System (Operational Devices)**

Safety Interlocks Throughout	M
Confirm and test operation	
Limit Switches Throughout	M

Confirm and test operation  
Polarization tests and mechanical checks Y

### **Drive System**

Main Motors (4 - 150HP each) North and South Towers M  
Inspect and test winding insulation  
Inspect rotor brushes  
Test heater setting and operation

Motor Transfer Switches 2nd floor, Control House M  
Inspect and test, check all connections

Control Cable Transfer Switches North and South Towers M  
Inspect and test all connections  
Confirm operation

Span Lock Motor and Control Limit Sw South Compound M  
Confirm connections  
Inspect and test winding insulation  
Inspect and test motor brake

Span Lock Motor and Control Limit Sw North Compound M  
Confirm connections  
Inspect and test winding insulation  
Inspect and test motor brake

Span Brakes North and South Towers M  
Inspect and test winding insulation  
Inspect and test all limit switches and components

Reactors/magamps North and South Towers M  
Verify all connections

Contactors North and South Towers M  
Verify all connections and test and confirm operation

Motor Control Centres North and South Towers A  
Verify all connections and test and confirm operation

Reactor Cubicle North 2nd floor, Control House M  
Test and confirm all connections

Reactor Cubicle South 2nd floor, Control House M  
Test and confirm all connections

Resistor Cubicle North 2nd floor, Control House A  
Test and confirm all connections  
Confirm resistance steps

Resistor Cubicle South 2nd floor, Control House A  
Test and confirm all connections  
Confirm resistance steps

Polarization tests and mechanical checks Y

### **Alarm and Signaling**

Traffic Lights North and South Roadway M  
Test and confirm proper operation

Span and Roadway Lighting M  
Test and confirm proper operation

Navigation Lights on span and ends of piers M  
Test and confirm proper operation

Traffic and Barrier Gate Roadway M  
Test and confirm proper operation  
Verify connections, contactors and limits

Air horn, Siren, Loudspeakers Bridge Span M  
Test and confirm proper operation

**Cabling, Wiring and Fittings**

Cable Reels South & North Compound	M
Test and confirm proper operation	
Inspect brushes and collector rings	
Inspect Cable and connections	
Test and confirm spring tension	
Grounding and Bonding Throughout	A
Inspect all conductors and connections	
Inspect all lightning components	

**Miscellaneous**

Compressor and Dryer	SA
Confirm all connections	
Associated limit switches and control	

**Auxiliary Drive System**

Component Test	SA
Inspect and verify aux drive control	
Function test reduced voltage drive	
Winding Insulation test on transformer	
Inspect and test all associated disconnect switches	
Check Break Clearance	SA
Confirm	
Aux. Drive Test (8 hours/test) Off Hours	SA
Monitor electrical systems during testing/operation	
Provide motor characteristic loading data for duration of operation	
System Test inc. Pendant, Starter, Transfer Switch, MCC Breaker	SA
Motor Insulation	A
Winding insulation test	
Generator Disconnects	A
Inspect and test all associated disconnect switches	
Emergency Lighting	A
Test and confirm operation	
Associated Wiring Insulation	A
Test all conductors for insulation resistance	

**Thermographic Scan**

(All accessible current carrying components) Including but not limited to:

Pole at Beach Blvd	A
Pole at Bridge Gate	
Pole at Transformer	
Main Transformer Secondary Connections	
Motor Control Center (North Tower)	
Main Motor Switches 9 North and South Towers)	
Main Motors 9 North and South Motors	
Lighting Panel ( Non lift, North and South Tower)	
Asco Transfer Switch ( South Tower)	
Motor Control Center ( South Tower)	
Control House:	
Switchboard #1 both sides	
Switchboard #2	

Drive Panel  
Cubicle #1 – 15  
Reactor Panels

Diesel Lifts  
Switchboard #1 ( right hand side)  
Diesel Beaker  
Diesel Load Bank Switchboard #1  
800 A outdoor switch  
Outdoor Load bank

Non Lift Scans  
75kVA Transformer  
45kVA transformer  
60A Disconnect  
Lighting panels (2<sup>nd</sup> floor, A, AA, EA, EA2 Junction Box, B. UPS, Sub light panel 3<sup>rd</sup> floor)  
Asco Transfer Switch Hydro  
Asco Transfer Switch Generator  
Small Diesel Breaker  
Small Diesel Control Panel

Navigation Start Up  
Provide 40 hours of electrical/technical support to facilitate annual navigation start up.

**Other Equipment**

Radar	Y
Anemometer	Y
HVAC	SA
Card Access system	Y
Cameras	Y
Electrical/gas powered heating systems	Y

**Technical Support**

Review design and demolition details	Y
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 PWGSC	
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 manuals	