



361A Old Finch Ave.
Toronto, ON M1B 5K7
www.torontozoo.com

Tel: 416-392-5900
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2020-08-05

**REQUEST FOR QUOTATION
HIGH VOLTAGE EQUIPMENT MAINTENANCE SERVICES & ARC
FLASH HAZARD ANALYSIS/SHORT CIRCUIT STUDY
RFQ 30 (2020-08)**

The Toronto Zoo invites you to submit a quotation to provide labour, tools, materials, equipment and services necessary for the execution and completion of the inspection, testing and fuse coordination study of the high voltage electrical distribution equipment noted within Appendix B & C. An arc flash hazard analysis and short-circuit study shall be completed at the time of inspection for all equipment noted in Appendix B & C. All work is to be completed in accordance with the specifications and drawings in the Request for Quotation (RFQ).

The work shall commence as soon as possible once the project is awarded and a Purchase Order has been issued.

The Quotation package includes Instructions, Terms & Conditions, Requirements, Drawings, and Forms. Quoted prices shall remain in effect for a period of ninety (90) days from the Quotation due date.

Site Meeting: A site meeting has not been scheduled for this RFQ. If you would like to review the site, please contact Kyle Rekker, krekker@torontozoo.ca

Due Date: Your quotation must be completed, and received by the Supervisor, Purchasing & Supply, Toronto Zoo, Administrative-Support Centre, 361A Old Finch Ave., Toronto, Ontario, M1B 5K7 by:

Wednesday, 2020-08-19, 1200 hours (noon, local time)

The Board of Management of the Toronto Zoo reserves the right to reject any or all quotes or to accept any quote, should it deem such an action to be in its interests.

If you have any queries regarding this request for quote, please contact Peter Vasilopoulos, Supervisor of Purchasing & Supply, (416) 392-5916. If you have any technical queries regarding this request for quote, please contact Kyle Rekker, krekker@torontozoo.ca

Yours truly,

Taryne Haight
Manager, Financial Services

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1.0 INSTRUCTIONS

- 1.1 Ensure that you have received all **twenty-two (22)** pages plus Equipment List (pages 16-21), Transformer List (pages 22-23), Section 26000 (pages 1-6), Section 26100 (pages 1-8), Section 26500 (pages 1-5) and **two (2)** drawings, High Voltage Distribution Single Line and Coordination Study for the RFQ package.
- 1.2 Complete ALL FORMS in section 4.0 and return by due date and time received on or before **Friday, 2020-08-19, 1200 hours (noon, local time)** or your Quotation will not be considered. Include signed copies of any addenda with your proposal package.
- 1.3 Quotations must not be submitted by facsimile, email or any other electronic format.
- 1.4 All Prices submitted shall be quoted in Canadian currency, Show itemized cost of HST if applicable.
- 1.5 Toronto Zoo reserves the right to award in whole or in part on the basis of the bids received, Lump Sum Price or Breakdown Price.
- 1.6 Use the attached submission label, when you submit your response in a sealed envelope or package and deliver to the Toronto Zoo.
- 1.7 Quotation prices shall remain in effect for a period of ninety (90) days from the Quotation due date.
- 1.8 Include product information, samples, and pictures, as necessary.
- 1.9 Provide references of at least three (3) clients for whom your company has performed similar work. References must include photos of three (3) different installations, client company name, contact name, address and e-mail address.
- 1.10 If applicable, suggested alternative products are acceptable, however all such products must be quoted separately and should not replace the Toronto Zoo requested product, work or service.
- 1.11 It is the responsibility of the Bidder to understand all aspects of the RFQ and to obtain clarification if necessary before submitting their quotation.
- 1.12 For any questions concerning the contract terms and conditions of this RFQ, please contact:

Peter Vasilopoulos, Supervisor,
Purchasing & Supply, Tel: 416-392-5916, Fax: 416-392-6711,
E-mail: pvasilopoulos@torontozoo.ca

Any questions regarding the work in this RFQ must be forwarded by the end of the day **Monday, 2020-XX-XX** to:
Kyle Rekker, Electrical & Plumbing Supervisor
Tel: 416-392-5989
Email: krekker@torontozoo.ca

2.0 TERMS AND CONDITIONS

- 2.1 Definitions:** Wherever used in the Request for Quotation the word “**Board**” means the Board of Management of the Toronto Zoo and the word “**Vendor**” or “**Contractor**” means the person or persons or Corporation to whom the purchase order is issued.
- 2.2 Vendor Assurance:** Unless otherwise stated, the goods, material, articles, equipment, work or services, specified or called for in or under this Quotation, shall be delivered or completely performed, as the case may be, by the Vendor as soon as possible and in any event within the period set out herein as the guaranteed period of delivery or completion.
- 2.3 Country of Origin:** Wherever possible, the goods, services, materials, articles or equipment, specified or called for in or under this Quotation, shall be of Canadian origin and manufacture.
- 2.4 Delivery:** The prices stated in this Quotation cover the services, material, articles or equipment referred to herein, being delivered F.O.B. destination, freight, express, duty and all other charges prepaid, unless otherwise indicated herein. A detailed delivery ticket or piece tally, showing the exact quantity of goods, material, articles or equipment shall accompany each delivery. A receiver’s receipt shall not bind the Board to accept the goods, material, articles or equipment covered thereby, or the particulars of the delivery ticket or piece tally therefore. The Vendor shall not be entitled to any interest upon any bill due to delay in its approval by the CEO of the Toronto Zoo or his designate.
- 2.5 Invoicing:** Unless otherwise indicated herein, the prices stated are payable in Canadian Funds at the head office of the Board. Any Harmonized Sales Tax (HST) applicable shall be shown as a separate item. The Vendor’s HST/Business registration number must be indicated on the invoice.

The Vendor shall clearly show any special charges such as packaging and freight, where applicable, as separate items on the invoice.

Payments to non-resident Vendors may be subject to withholding taxes under the Income Tax Act (Canada). Unless a non-resident Vendor provides the Board with a letter from Revenue Canada, Taxation waiving the withholding requirements, the Board will withhold the taxes it determines are required under the Income Tax Act (Canada).

- 2.6 Notice of Delivery:** The Vendor shall notify the Purchasing Agent of the Board at the address given for the mailing of invoices, in writing as soon as possible of the details of the shipment of the goods, materials, articles or equipment.
- 2.7 Right to Cancel:** The Board shall have the right to cancel at any time this Quotation or any contract or any part of any contract resulting from this Quotation in respect of the goods, material, articles, equipment, work or services set out in this Quotation or any such contract or part of such contract, not delivered or performed at the time of such cancellation, and the Board will not be responsible to make any payments in respect of any such goods, materials, articles, equipment, work or services and shall not incur any liability whatsoever in respect thereto.

In the event that the Vendor fails or neglects by any act or omission to comply with any of the conditions set out herein, this Quotation or any contract resulting from this Quotation may be unconditionally cancelled by the Board without notice to the Vendor.

- 2.8 Official Agreement:** No verbal arrangement or agreement, relating to the goods, material, articles, equipment, work or services, specified or called for under this Quotation, will be considered binding, and every notice advice or other communication pertaining thereto, must be in writing and signed by a duly authorized person.
- 2.9 Worker's Rights:** The Vendor shall comply with the conditions of the Board relating to Worker's Rights, a copy of which is available on application to the Manager, Fair Wage and Labour Trades Office, City of Toronto, 18th Floor, West Tower, City Hall, Toronto, Ontario, M5H 2N2 or by phone at 416-392-7300.
- 2.10 Insurance:** The Contractor shall, at his/her own expense obtain and, until the work is fully complete maintain, broad-scope insurance coverages, hereof, satisfactory to the Chief Executive Officer as to form and substance, with the indicated policy form of the Canadian Construction Documents Committee (CCDC), its equivalent or better subject to such modifications therein to cover unusual aspects of the work, working conditions or other circumstances as may be specified elsewhere in the Contract.
- 2.10.1 The Contractor shall effect, maintain and keep in force, at its sole cost and expense and satisfactory to the Chief Executive Officer as to form and substance the insurance described below:
- 2.10.2 All risks property insurance on property of every description and kind owned by the contractor or for which the Contractor is responsible while on the premises of the Board in an amount not less than full replacement value. The policy shall be endorsed to provide a waiver of subrogation against the Board for any loss or damage to insured property, however caused.
- 2.10.3 Commercial general liability insurance, including owners' and contractors' protective, products, completed operations, personal injury, employer's liability, contractual liability, occurrence basis property damage, liability arising from the sale of serving of alcoholic beverages and provisions for cross liability and severability of interests with a limit of not less than Two Million Dollars (\$2,000,000.00) per occurrence. The policy shall be endorsed to name the Board as an additional insured with respect to the operations of the Contractor under this agreement.
- 2.10.4 Standard automobile liability insurance for all owned vehicles with limits of not less than Two Million Dollars (\$2,000,000.00) per occurrence.
- 2.10.4.1 All policies of insurance required to be taken out by the Contractor shall be placed with insurers licensed to conduct business in the Province of Ontario and shall be subject to the approval of the Chief Executive Officer, acting reasonably.
- 2.10.4.2 The Contractor shall deliver to the Board evidence of the insurance required prior to the commencement of the agreement, in form and detail satisfactory to the Chief Executive Officer acting reasonably.
- 2.10.4.3 The provisions of this section 2.11 shall no way limit the requirements and obligations imposed on the Contractor elsewhere in the Contract, nor relieve the Contractor from compliance therewith and fulfillment thereof.

- 2.10.4.4 The parties agree that insurance policies may be subject to deductible amounts, which deductible amounts shall be borne by the Contractor.
- 2.10.4.5 The provisions of this article shall in no way limit the requirements and obligations imposed on the Contractor elsewhere in the Contract, nor relieve the Contractor from compliance therewith and fulfillment thereof.
- 2.11 Indemnity:** The Vendor shall at all times well and truly save, defend, keep harmless and fully indemnify the Board, the City of Toronto, Toronto Region and Conservation Authority and their servants, employees, officers or agents, hereinafter called the “Indemnities”, from and against all actions, suits, claims, demands, losses, costs, charges, damages, and expenses, brought or made against or incurred by the Indemnities, its or their servants, officers, employees, agents or invitees in any way relating, directly or indirectly, to goods, material, articles or equipment supplied or to be supplied, or to the supplying of goods or services, pursuant to this Quotation, or any other claim, action, suit, demand, loss, cost, charge, damage or expense relating to copyright, trademark or patent with regard directly or indirectly with any such goods, services, material, articles or equipment or the supply or performance thereof.
- 2.12 Liability for Acts of Vendor Employees, Contractors or Agents:** The Vendor acknowledges responsibility and accepts liability for the acts of any of its employees, contractors and agents while on Toronto Zoo property. The Toronto Zoo reserves the right to request background checks for any individual providing the services requested on behalf of the Vendor.
- 2.13 Guaranty of Quotation:** All goods, material, articles, equipment, work or services, specified or called for in or under this Quotation, shall be supplied or performed at the price or process and on the basis set forth or referred to in and in accordance with the Offer and this Quotation. The basis on which this Quotation is given shall include any specifications, plans, price schedules, samples, addenda or other details pertaining thereto, or provided in connection therewith.
- 2.14 Right of Notice:** Any notice that the Board may be required or desire to give to the Vendor shall for all purposes to be deemed to have been sufficiently and properly given and afforded by registered mail addressed to the Vendor at the address shown for the Vendor on this form and shall therefore be presumed to have been received by the Vendor on the third day following such registration.
- 2.15 Formal Contract:** The Vendor may be required and shall, if requested by the solicitor for the Board so to do, to execute and enter into a formal contract that is satisfactory to the solicitor for the Board, in order to document the contract resulting from this Quotation and to embody indemnity and related provisions that in the opinion of such solicitor are required to protect the Board.
- 2.16 Charity Status:** The Toronto Zoo is a registered charitable organization (registration #BN 119216398RR0001) and accordingly may be eligible for preferred pricing which should be reflected in the Quotation as submitted.
- 2.17 Performance Evaluation:** The Contractor’s performance will be evaluated by the Chief Executive Officer and/or Chief Executive Officer’s Representative during the Contract and at the end of the Contract. In the event that the Contractor’s performance is considered unsatisfactory by the Chief Executive Officer and/or Chief Executive Officer’s

Representative, the Contractor and/or its affiliates may become ineligible from bidding on future contracts issued by the Board.

3.0 PROJECT REQUIREMENTS

The Toronto Zoo invites you to submit a quotation to provide all labour, tools, materials, equipment and services necessary for the execution and completion, to the Toronto Zoo's satisfaction, of the inspection and testing of high voltage electrical distribution equipment to verify serviceability, identify repair required and to provide a detailed report on the condition of the equipment. The work includes all equipment below the 27.6 KV Toronto Hydro connection listed within Appendix B & Appendix C. Complete a detailed fuse co-ordination study. Provide a detailed itemized quote for recommended repairs. An Arc Flash Analysis & Short Circuit Study shall be completed at the time of inspection, for all equipment listed within Appendix B & C. After all necessary data is collected and analyzed; a complete and detailed technical report is to be issued. This report shall include a complete arc flash analysis & short circuit study with custom labels to be affixed to the appropriate switchgear/distribution panel fronts.

The work shall commence once the project has been awarded and a Purchase Order issued.

3.1 SCOPE OF WORK

1. Supply all labour, tools, materials, equipment and services necessary for the execution and completion, to the Toronto Zoo's satisfaction, of the inspection and testing of high voltage electrical distribution equipment to verify serviceability, identify repair required and to provide a detailed report on the condition of the equipment. The work includes all equipment below the 27.6 KV Toronto Hydro connection listed within Appendix B & Appendix C. Complete a detailed fuse co-ordination study. Provide a detailed itemized quote for recommended repairs.
2. An Arc Flash Analysis & Short Circuit Study shall be completed, at the time of inspection, for all equipment listed within Appendix B & C. After all necessary data is collected and analyzed; a complete and detailed technical report is to be issued. This report shall include a complete arc flash analysis & short circuit study with custom labels to be affixed to the appropriate switchgear/distribution panel fronts.
3. All work to be completed in accordance with applicable codes (e.g. Building Code, Electrical Code, Fire Code, etc.)
4. Any discrepancies must be brought to the attention of the Toronto Zoo.
5. Any work must be carefully coordinated with the Zoo to ensure the safety of visitors, staff and the animals. All work is to be scheduled with consideration to ongoing events and functions and may be subject to limitations as a result.
6. The contractor shall supply the Zoo with copies of relevant certificates and licences for all workers prior to commencement of work.
7. All measurements to be site verified.
8. Contractor is to check in and out at Security when entering or exiting Zoo property as per the schedule agreed upon between contractor and Zoo designate.

3.2 CONTRACTOR RESPONSIBILITIES

1. Regular meetings/communication with the Toronto Zoo Project Team to review project status and to discuss issues that may arise during the project.
2. Provide samples, mock ups, etc. as required to the Project Team.
3. Provide product information and SDS sheets to the Project Team prior to start of the work where applicable.
4. Protect adjacent areas not included in the project. Any damage caused will be the responsibility of the contractor to rectify at no additional cost to the Zoo.
5. Clean the work area and remove all debris from site on a daily basis and make good any damage caused as a result of the work.
6. Secure the work site and provide construction signs and barriers to prevent injury to Zoo personnel and the public who will require access to the surrounding space during the work. All temporary barriers shall be free standing/ self-supporting and interlocking to prevent unauthorized access.
7. Upon award of contract, Contractor is to finish all work, including clean up and demobilization by the completion date specified.
8. Submit all shop drawings for review and approval prior to start of fabrication. Review of shop drawings shall not mean that the Toronto Zoo approves detail design inherent in shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of his responsibility for errors or omissions in shop drawings or of his responsibility for meeting all requirements of the subcontract documents.
9. Submit close out documents as requested. Include warranties and “As built” drawings.

3.3 SAFETY SPECIFICATIONS

1. It is the responsibility of the Contractor to protect the site as required during construction.
2. Ensure that awareness of public safety is considered and protect visitors in the vicinity during the construction period.
3. All necessary personal protective equipment must be worn at all times and SDS sheets must be available on site as required.
4. The contractor is to abide by applicable Toronto Zoo Health & Safety Policies,
 - i. SAFE-002 Health & Safety Hazard Reporting
 - ii. SAFE-017 Contractors Safety
 - iii. SAFE-018 Vehicles on Site
 - iv. SAFE-007 Working in Confined Space
 - v. SAFE-025 Hot Work
 - vi. SAFE-013 Equipment Lockout/Tag-out

the Ontario Health and Safety Acts, the Ontario Building Code and all other applicable codes including the Fire Codes.

5. The contractor is to abide by the Toronto Zoo's Commitment to the City of Toronto's Corporate Smog Alert Response Plan
6. It is the responsibility of the Contractor to ensure that the work site is properly protected at all times. All work sites must be marked and hoarded adequately with construction signs posted to secure and isolate the work site from the public or other personnel that have access to the area.

3.4 OTHER INFORMATION

The successful bidder must demonstrate the ability to complete the work to standards acceptable to the Zoo and prove past performance in the completion of similar types of work for other clients by providing relevant examples of work and references. The successful bidder must also demonstrate and guarantee that they can produce the work in the allotted time.



4.0 SUBMISSION FORMS:

I/We, hereby, submit the Quotation and will comply with all terms, conditions, specifications and drawings (when provided) as set out within the Board’s Quotation.

I/We, hereby, have received, allowed for and included as part of our submission all issued Addendum numbered _____.

This form must be completed, properly signed and received on or before the date and time specified or your Quotation will not be considered. Quotation prices shall remain in effect for a period of ninety (90) days from the Quotation due date.

The Board of Management of the Toronto Zoo reserves the right to reject any or all Quotations or to accept any Quotation, should it deem such action to be in its interests.

By signing and submitting this FORM, you are agreeing to the release of your quotation information, as deemed necessary by the Board, in order to conduct business associated with this quotation or project.

COMPANY INFORMATION	
Company Name:	
Name of authorized Signing Officer	Title:
Signature of authorized Signing Officer:	Date:
Contact Name:	Title:
Address:	
Telephone #:	Fax #:
Email:	Web Site:
HST #:	

4.1 QUOTATION PRICING - LUMP SUM PRICE EACH SCOPE ACCORDINGLY

DESCRIPTION – HIGH VOLTAGE EQUIPMENT MAINTENANCE SERVICES & ARC FLASH HAZARD ANALYSIS/SHORT CIRCUIT STUDY	Price complete, excluding HST
Provide all labour, tools, materials, equipment and services necessary for the execution and completion, to the Toronto Zoo’s satisfaction, of the inspection and testing of high voltage electrical distribution equipment to verify serviceability, identify repair required and to provide a detailed report on the condition of the equipment. The work includes all equipment below the 27.6 KV Toronto Hydro connection listed within Appendix B & C in compliance with legislated requirements and those noted within Section 26100. Complete a detailed fuse co-ordination study. Provide a detailed itemized quote for recommended repairs.	\$
An Arc Flash Hazard Analysis and Short-Circuit Study shall be completed, at the time of inspection, for all equipment listed within Appendix B & C in compliance with legislated requirements and those noted within Section 26500. After all necessary data is collected and analyzed; a complete and detailed technical report is to be issued. This report shall include a complete arc flash hazard analysis with custom labels to be affixed to the appropriate switchgear/distribution panel fronts.	\$
HST	\$
Total	\$

COMMITMENT TO DELIVER	YES / NO
Please confirm that you are able to complete the work described herein by Friday, 2020-XX-XX .	

DISCOUNT	Discount and/or Other	Days
Discount allowed for prompt payment and period within which invoice must be paid to qualify.	%	
Charity Status: The Toronto Zoo is a registered charitable organization (registration #BN 119216398RR0001) and accordingly may be eligible for preferred pricing which should be reflected in the Quotation as submitted.		

Name of Firm:	
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SUBMISSION LABEL

This address label should be printed and affixed to the front of your sealed tender, quotation and proposal envelope/package submission. Toronto Zoo will not be held responsible for envelopes and packages that are not properly labelled or submitted to an address other than the one listed on this label.

Vendor Name _____

RFQ 30 (2020-08) – HIGH VOLTAGE EQUIPMENT MAINTENANCE SERVICES AND ARC FLASH HAZARD ANALYSIS

Due Date: Wednesday, 2020-08-19, 1200 hours (noon, local time)

TO BE RETURNED TO

**TORONTO ZOO
C/O SUPERVISOR, PURCHASING & SUPPLY
ADMINISTRATIVE SUPPORT CENTRE
361A OLD FINCH AVE.
TORONTO, ONTARIO
M1B 5K7**

NOTICE OF NO BID

INSTRUCTIONS:

It is important to the Toronto Zoo to receive a reply from all invited bidders. If you are unable, or do not wish to submit a bid, please complete the following portions of this form. State your reason for not bidding by checking the applicable box(es) or by explaining briefly in the space provided. It is not necessary to return any other Request for Proposal/Quotation/Tender documents or forms. Please just return this completed form by fax or by mail prior to the official closing date.
Purchasing and Supply Fax Number: (416) 392-6711.

A Proposal/Quotation/Tender is not submitted for the following reason(s):	
<input type="checkbox"/> Project/quantity too large.	<input type="checkbox"/> Project/quantity too small.
<input type="checkbox"/> We do not offer services or commodities to these requirements	<input type="checkbox"/> Cannot meet delivery or completion requirement
<input type="checkbox"/> We do not offer this service or commodity.	<input type="checkbox"/> Agreements with other company do not permit us to sell directly.
<input type="checkbox"/> Cannot handle due to present commitments.	<input type="checkbox"/> Licensing restrictions
<input type="checkbox"/> Unable to bid competitively.	<input type="checkbox"/> We do not wish to bid on this service or commodity in the future.
<input type="checkbox"/> Insufficient information to prepare quote/proposal/tender	<input type="checkbox"/> Specifications are not sufficiently defined
<input type="checkbox"/> We are unable to meet bonding or insurance requirements.	

<u>Other reasons or additional comments (please explain):</u>

Company Name:	
Address	
Contact Person:	
Signature of Company Representative:	
Date:	
Phone Number:	
Email address	
Fax Number:	

APPENDIX A – LIST OF SUB-CONTRACTOR

The Bidder proposes to sublet the following portions of the Work to the persons firms or corporations indicated. The Bidder (Contractor) is responsible for all pricing with all subcontractors.

The Bidder submits that in proposing the under mentioned subcontractors, the Bidder has consulted each and have ascertained to our completed satisfaction that those names are fully acquainted with the extent and nature of the work and that they will execute their work with the requirements of the contract documents.

Work or services to be provided	Name and address of sub-contractor or person	Telephone

Name of Bidder:	
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Appendix B

Main Incoming 27.6 KV Switchgear

Cell Number	Description	Note/Location
1	Incoming 27.6kV	
2	Meter Cabinet	

Main Vista Switch

Way	Description	Note/Location
1	From Transfer Switch	
2	To North Service building (cell #4)	
3	To Polar Bear Switch	
4	Spare	
5	Spare	

Administration Building

Cell Number	Description	Note/Location
1	Service building to Americas Pavilion loop feeder	
2A	Eurasia Paddock feeder	Feeds T26 & Submersible 27, 28 & 23
2B	Americas Paddock feeder	Feeds Submersible 29, 1 & 2
3	North Service building transformer	Feeds T1
4	From main outdoor switchgear	
	K-Bar Unit	For Outdoor Holding
	<u>Low Voltage Switchboards</u>	
	• SWBD-AAA	High Voltage Room
	• SWBD-BBB	Penthouse
	• DP-NAA	High Voltage Room
	• DP-NBB	Shipping/Receiving
	• DP-NCC	Bell Telephone Room
	• DP-NDD	Commissary
	• DP-NEA	Generator Room
	• MCC-1A	Boiler Room
	• MCC-1AE	Boiler Room
	• RP-PHRA	Penthouse
	• DP-SAA	South Service 1 st Floor Electrical room
	• DP-SBB	South Service 1 st Floor Electrical room

	<ul style="list-style-type: none"> • DP-SEA 	South Service 1 st Floor Electrical room
	<ul style="list-style-type: none"> • PP-WHC-AAA 	South Service 1 st Floor Electrical room
	<ul style="list-style-type: none"> • PP-WHC-BBB 	South Service 3 rd Floor Electrical room
	<ul style="list-style-type: none"> • PP-WHC-AA 	South Service 1 st Floor Electrical room
	<ul style="list-style-type: none"> • PP-WHC-EAA 	South Service 1 st Floor Electrical room
<u>Dry Core Transformers</u>		
T1	North Service building transformer	Main electrical room
T3	Transit garage	Material Storage room
T5	Transformer room	Shipping/Receiving
T6	Main Electrical room	Main electrical room
T7	Generator transfer switch	General maintenance area
T8	Penthouse	3 rd Floor
T9	Bell telephone room	Basement
T10	South Service	Electrical room
	South Service	Electrical room (outside)
	Elevator Room	Basement
	Transit/Bendix Garage	Compressor room

Americas Pavilion

Cell Number	Description	Note/Location
1	Americas Pavilion to North Service building loop feeder	
2	Loop feeder Americas Pavilion to Way #1 at Watusi vista switch	
3	Paddock feeder	Feeds T32
4	Building transformer	Feeds T5
<u>Low Voltage Switchboards</u>		
	<ul style="list-style-type: none"> • SWBD 	High Voltage room
	<ul style="list-style-type: none"> • DP-NA 	High Voltage room
	<ul style="list-style-type: none"> • DP-NB 	Mechanical room
	<ul style="list-style-type: none"> • DP-NE 	High Voltage room
	<ul style="list-style-type: none"> • DP-7AA (from T32) 	Polar Bear Mechanical room (underwater)

Watusi Vista Switch

Way	Description	Note/Location
1	From Americas Pavilion (cell #2)	
2	To Africa Pavilion (cell #3)	
3	Paddock feeder	Feeds Submersible 34, 12, 35, Weston Station & K-Bar

4	Spare	
	<u>Low Voltage Switchboards</u>	
	<ul style="list-style-type: none"> DP-MA (from Sub. 12) 	Madagascar Snack Bar

Weston Station

		Description
		Weston Station Switch
		Pad mount transformer
	<u>Low Voltage Switchboards</u>	
	<ul style="list-style-type: none"> SWBD 	Weston Station

Africa Pavilion

Cell Number	Description	Note/Location
1	Africa Pavilion to Indo-Malaya Vista Switch loop feeder WAY # 1	
2	Paddock Feeder	Feeds T-39, 11, 11A & Submersible 8, 10 & 31
3	Africa Pavilion to Americas Pavilion loop feeder (cell #2)	Through the Watusi Vista switch Way 2
4	Building Transformer	Feeds T6
	<u>Low Voltage Switchboards</u>	
	<ul style="list-style-type: none"> SWBD 	High Voltage room
	<ul style="list-style-type: none"> DP-AE 	High Voltage room
	<ul style="list-style-type: none"> DP-AA 	High Voltage room
	<ul style="list-style-type: none"> DP-BB 	High Voltage room
	<ul style="list-style-type: none"> DP-CC 	High Voltage room
	<ul style="list-style-type: none"> MCC-A1 	Mechanical room (basement)
	<ul style="list-style-type: none"> DP-11AA (from T11A) 	Hyena House
	<ul style="list-style-type: none"> DP-10AA (from Sub. 10) 	Penguin Mechanical room (underwater)

Indo-Malaya Vista Switch

Way	Description	Notes/Location
1	Indo-Malaya vista switch to Africa Pavilion loop feeder (cell #1)	
2	Indo-Malaya vista switch to Membership Vista switch (way #1)	
3	Sumatran Tiger pad mount transformer	
4	Indo-Malaya pad mount transformer	Feeds T2 (Indo-Malaya Pavilion)
5	Hippo House pad mount (#13) & Giraffe House pad mount (#13A)	
6	African Savannah restaurant pad mount	

<u>Low Voltage Switchboards</u>		
	DP-SR (from Savannah TX)	Simba Lodge
	DP-13AA (from T13)	Hippo House

Indo-Malaya Pavilion

	Description	Notes/Location
<u>Low Voltage Switchboards</u>		
	• SWBD	Electrical room (basement)
	• DP-MA	Electrical room (basement)
	• DP-MB	Electrical room (basement)
	• DP-ME	Electrical room (basement)

Membership Building & Vista Switch

Way	Description	Notes/Location
1	Membership Building to Indo-Malaya Vista Switch loop feeder (way #2)	
2	Membership Building to Australasia pavilion loop feeder (cell #2)	Through K-bar at Education
3	Building Transformer	Feeds T7
4	Building Transformer	Feeds T8
5	Paddock Feeder	Feeds Submersibles 30 & 18
6	Spare	
<u>Low Voltage Switchboards</u>		
	• DP-T7	High Voltage room
	• DP-T8	High Voltage room
	• DP-AAA	Mechanical room (basement)
	• DP-AEA	Mechanical room (basement)
	• DP-MW (from Sub. 30)	Malayan Woods
<u>Dry Core Transformers</u>		
	Parking lot lighting	High Voltage room
	Membership Boiler room	Mechanical room (basement)
	Peacock Café	Electrical closet
	Exit Gate	Parking lot shed (exit)
	Entrance Gate	Parking lot island (entrance)
	Waterfall Pump Room	Mechanical room (front bridge)

Education Building

	Description	Notes/Location
	Education Switch	
	Pad mount transformer	Feeds Education
	K-Bar unit	
	<u>Low Voltage Switchboards</u>	
	• DP-	Electrical room (basement)
	• PP-AA	Mechanical room
	• PP-BB	Mechanical room

Australasia Pavilion

Cell Number	Description	Notes/Location
1	Australasia pavilion to Australasia Vista (way #2)	
2	Australasia to membership building Vista loop feeder (way #2)	Through K-bar at Education
3	Building Transformer	T1
4B	Paddock Feeder	Feeds T33 & Submersible 20 & 24
	<u>Low Voltage Switchboards</u>	
	• SWBD	High Voltage room
	• DP-UA	High Voltage room
	• DP-DEA (from Sub. 20)	Eurasia Snack Bar

Australasia Vista Switch

Way	Description	Notes/Location
1	From Polar Bear Switch	
2	To Australasia Pavilion Cell #1	
3	Feeder to Splash Island & Bard Barn pad mounts	
4	Spare	

Polar Bear Switch

	Description	Notes/Location
	Polar Bear Switch	
	Pad Mount Transformer	Feeds Polar Bear House, Beaver Tails, Tim Hortons Express & Retail Store

Main Barn

	Description	Notes/Location
--	-------------	----------------

	<u>Low Voltage Switchboards</u>	
	• DP-AAA	Electrical Room
	<u>Dry Core Transformers</u>	
	Main Barn	T1
	Main Barn	T2

Emergency Generator Site

	Description	Notes/Location
	Generator Switchboard	Generator Area
	Generator Transformer	Generator Area
	Transfer Switch	Generator Area

Appendix C

Submersible Transformers			
Vault Number	Location	# of Transformers	Fed From
1	Tundra Reindeer	1	Cell 2B North Service through k-bar at Tundra Reindeer
2	Mayan Temple	1	Reindeer Transformer Vault 1
10	Penguin Mechanical Room	3	T-39 Rhino/Hoofstock
12	Madagascar Washroom	2	Vault 34 Africa Pump Station through k-bar
18	Indian Rhino	1	T-Splice from Malayan Woods Vault 30
20	Eurasia Snack Bar	1	Cell 4B Australasia
23	Eurasia Reindeer	1	Vault 28 Oryx
24	Pink Palace	1	Vault 20 Eurasia Snack Bar
27	Dhole	1	Cell 2A north Service
28	Oryx	1	Vault 27 Dhole House
29	Outdoor Holding	1	Cell 2B North Service through k-bar at Tundra Reindeer
30	Malayan Woods	3	Cell 3 Membership
31	Africa Restaurant and Penguin Holding	3	Cell 2 Africa Pavilion
34	Africa Pumping Station	3	Watusi Vista Switch Way 3
35	Racoon House	3	Vault 34 Africa Pump Station through k-bar
Total		26	

Pad-Mount Transformers				
Vault Number	Location	1 Or 3 Ph.	KVA	Fed From
26	Wisent	1	100	T Splice off line from Cell 2 North Service
32	Americas Restaurant	3	225	Americas Pavilion Cell 3
	Weston Station	3	225	Watusi Vista Switch
	Bird & Rhino Hoofstock	3	225	Africa Pavilion Cell 2
13A	Giraffe House	3	225	Indo-Malaya Vista Switch Way 6 through Hippo (13)
13	Hippo House	3	225	Indo-Malaya Vista Switch Way 6
	Savannah Restaurant	3	500	Indo-Malaya Vista Switch Way 5
	Sumatran Tiger	1	75	Indo-Malaya Vista Switch Way 3
	Education	3	300	Education Switch
	Tundra Air	3	75	Polar Bear Switch



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	Splash Island	3	300	Australasia Vista Switch Way 3
	Bird Barn	3	225	Splash Island Transformer
7	Polar Bear	3	225	Polar Bear Switch
T2	Indo-Malaya Pavilion	3	500	Indo-Malaya Vista Switch Way 4
11	Lion House	1	167	Vault 31 Africa Restaurant
11A	Hyena House	1	100	Vault 11 Lions
8	Cheetah & Baboon	3	150	Vault 10 Penguin Mechanical Room
33	Snow Leopard & Pumping Station	1	167	Vault 24 Pink Palace
		Total: 18		

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SECTION 26000 – GENERAL ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1. References

1.1.1. This section applies to and is a part of all Sections of Division 26.

1.2. Work Included

1.2.1. Section of these Electrical Specifications are not intended to delegate functions nor to delegate work and supply to any specific trade and the work shall include all labour, materials, equipment and tools required for a complete and working installation as described, but not necessarily limited to items in the following Sections:

Section 26100 Electrical Maintenance Testing

Section 26500 Arc Flash Hazard Analysis & Short Circuit Study

1.3. Drawings and Specifications

1.3.1. If obvious ambiguities or omissions are noticed when tendering, refer same to the Owner for a ruling and obtain the ruling in writing in the form of an Addendum. Claims for extras, ambiguities or omission of items brought to the attention of the Owner after the award of a contract which, due to the nature of the ambiguity or omission, should have been brought to the attention of the Owner during the tendering period, will not be allowed.

1.3.2. The drawings show locations for apparatus and materials. Do not scale drawings. The locations shown are approximate, and may be altered, to meet requirements of the material and/or apparatus, other equipment systems being installed, and of the building.

1.4. Permits, Certificates and Fees

1.4.1. Refer to the General Conditions.

1.4.2. Obtain from the Municipality and/or Utilities, all required permits to complete the work of Division 26. When work is complete, supply and turn over to the Owner all required inspection certificates from governing authorities to certify that the work as installed conforms to the rules and regulations of the governing authorities.

1.4.3. Unless otherwise noted, pay all fees and charges levied by the Municipality, Utilities and any other governing authority for permits, inspections and certificates, and work performed by the Municipality or Utilities in connection with the work of Division 26.

1.4.4. Comply with the requirements of the latest edition of the applicable CSA Standards, the requirements of the Authorities, Federal, Provincial and Municipal Codes, the applicable standards of the Underwriter's Association and all other authorities having jurisdiction.

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In case of conflict, the codes take precedence over the Contract Documents. In no instance reduce the standard established by the drawings and specifications by applying any of the codes referred to herein.

- 1.4.5. Before starting any work, submit the required number of copies of drawings and specifications to the authorities for their approval and comments. Comply with any changes requested as part of the Contract, but notify the Owner immediately of such changes for proper processing of these requirements. Prepare and furnish any additional drawings, details or information as may be required.

1.5. Shop Drawings

N/A

1.6. Operating and Maintenance Instruction Manuals

N/A

1.7. Record Drawings

N/A

1.8. Definitions

- 1.8.1. The following are definitions of words found in Sections of this Specification governed by this Section and on associated drawings

1.8.1.1. "Provide" shall mean supply, install and connect complete.

1.8.1.2. "Install" shall mean install and connect complete.

1.8.1.3. "Supply" shall mean supply only.

1.8.1.4. "Subcontractor" shall mean the firm having a sub contract with the contractor to perform, supervise and coordinate all work of this Division.

- 1.8.2. Notwithstanding any definition elsewhere in the contract documents, where the terms "Authorities", or "Authorities having jurisdiction" are used in this Division, they shall mean any and all laws and/or by-laws of any federal, provincial or local authorized agencies having jurisdiction over the sum total or parts of the work including, but not restricted to the Municipal Planning and Building Department, Municipal Fire Department, Plumbing Regulations, Gas Utilization Code, The Construction Safety Act, Municipal Public Works Department, Federal and/or Provincial Fire Marshall, the Gasoline Handling Act, the Canadian Electrical Code.

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1.8.3. Notwithstanding any definition elsewhere in the contract documents, wherever the term "Work" is used in this Division it shall mean all equipment, permits, materials and labour to provide a complete mechanical installation as required and detailed in Drawings and Specifications.

1.9. Specified, Acceptable and Alternate Equipment and Materials

N/A

1.10. Material and Equipment

N/A

1.11. Temporary Services

1.11.1. The use of permanent facilities for temporary construction service will not affect, in any way, the commencement date of the warranty period.

1.12. Superintendence

1.12.1. Maintain at the job site, at all times, qualified personnel and supporting staff, with proven experience in erecting, supervising, testing and adjusting projects of comparable nature and complexity.

1.12.2. The supervising personnel and their qualifications are subject to the approval of the Owner.

1.13. Expediting

1.13.1. Continuously check and expedite delivery of equipment and materials. If necessary, inspect at the source of manufacture. Continuously check and expedite the flow of necessary information to and from all parties involved.

1.13.2. Immediately inform the Owner in case information is required from him.

1.14. Trial Usage

N/A

1.15. System Acceptance

1.15.1. Submit original copies of letters from the manufacturers of all systems indicating that their technical representatives have inspected and tested the respective systems and are satisfied with the method of installation, connection and operation. Where existing systems are extended, such letters shall cover both new and existing equipment and connections. Where Site Acceptance Tests are conducted, include these with the rest of the documentation.

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1.15.2. These letters shall state the names of persons present at testing, the methods used, and a list of functions performed with location and room numbers where applicable.

1.16. Instruction to Owners

N/A

1.17. Cleaning

1.17.1. Before energizing any systems, inspect and clean the inside of panel boards, and cabinets to ensure that they are completely free from dust and debris.

1.17.2. Clean all polished, painted and plated work bright.

1.17.3. Remove all debris, surplus material and all tools.

1.17.4. Carry out additional cleaning operating of systems as specified in other sections of this Section.

1.18. Examination of Site and Documents

1.18.1. Prior to submitting a tender carefully examine conditions at the site which may or will affect the work. Refer to and examine all contract documents.

1.19. Existing Underground Services

1.19.1. Before commencement of excavation for the work, determine in consultation with other trades, the Owner, the Municipalities and Utilities the presence, if there are any existing underground services at the site. Locate such services and mark out same. Ensure that all trades concerned are aware of their presence.

1.19.2. Be responsible for any damage done to existing underground services caused by neglect to determine and mark out the location of such services prior to excavation work commencing.

1.19.3. Be responsible for the costs involved due to delays to the contract and for new service connections not being made when required for non compliance with the above.

1.1. Flashing

N/A

1.20. Workmanship

**HIGH VOLTAGE EQUIPMENT MAINTENANCE & ARC FLASH HAZARD
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SECTION 26000 – GENERAL ELECTRICAL REQUIREMENTS

N/A

1.21. Mounting Heights

N/A

1.22. Patents

- 1.22.1. Pay all royalties and licence fees, and defend all suits or claims for infringement of any patent rights, and save the Owner harmless of loss or annoyance on account of suit, or claims of any kind for violation or infringement of any letter, patent or patent rights, by this subcontractor or anyone directly or indirectly employed by him or by reason of the use by him or them of any part, machine, manufacture or composition of matter on the work, in violation or infringement or such letters, patent or rights.

1.23. Rights Reserved

- 1.23.1. Rights are reserved to furnish any additional detail drawings, which in the judgement of the Owner may be necessary to clarify the work, and such drawings shall form a part of this contract.

1.24. Work in Existing Buildings

- 1.24.1. Where existing services such as electrical power, fire alarm system, television system etc., are required to be disrupted and/or shut-down, co-ordinate the shut-downs with the Owner and carry out the work at a time and in a manner acceptable to them. Carefully schedule all disruption and/or shut-downs and ensure that the duration of same is kept to the absolute minimum. Submit for approval a written, concise schedule of each disruption at least 72 hours in advance of performing work and obtain Owner's written consent prior to implementing.
- 1.24.2. Should any temporary connections be required to maintain services during work in the existing building, supply and install all necessary material and equipment and provide all labour at no extra cost. Should any existing system be damaged, make full repairs without extra cost, and to the satisfaction of the Owner.
- 1.24.3. Refer to Owners directives for phasing and staging of work and adhere to that programme. Comply with instruction regarding working hours necessary to maintain the building in operation.

1.2. Owner Right to Relocate Electrical Items

N/A

1.3. Electrical Tender Form

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- 1.3.1. Submit with the tender the Electrical Tender Form.
- 1.3.2. At the time of tender closing, indicate only the total cost of work for this Division, and any separate prices where indicated.
- 1.3.3. After tender close, and within 48 hours of being advised, submit the form showing requested information as indicated in Instructions to Bidders.
- 1.3.4. There will be no substitution of manufacturers or sub-trades after Tender close except as approved by the Owner.

END OF SECTION

HIGH VOLTAGE EQUIPMENT MAINTENANCE

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING

PART 1 – GENERAL

1.1. General Requirements

1.1.1. Conform to General Electrical Requirements, Section 26100 as applicable.

1.2. References

ASTM D877/D877M-19 - Test Method for Dielectric Breakdown Voltage of Insulating Liquids using Disk Electrodes.

ASTM D924-15 - Test Method for Dissipation Factor and Relative Permittivity of Electrical Insulating Liquids.

ASTM D1500-12 - Test Method for ASTM Colour of Petroleum Products (ASTM Colour Scale).

ASTM D1524-15 - Test Method for Visual Examination of Used Electrical Insulating Oils of Petroleum Origin in the Field.

IEEE C57-15 - Distribution, Power, and Regulating Transformers.

IEEE Std. 48-20 - Test Procedures and Requirement for Alternating-Current Cable Terminations Used on Shielded Cables Having Laminated Insulation Rated 2.5kV through 765kV or Extruded Insulation Rated 2.5kV through 500kV.

IEEE Std. 400-12 - Field Testing and Evaluation of the Insulation of Shielded Power Cable Systems Rated 5kV and Above.

NFPA 70B-19 - Recommended Practice for Electrical Equipment.

CSA Z462-18 - Workplace Electrical Safety.

1.3. Description of Work

1.3.1. Supply all labour, materials, plant equipment and services necessary for the execution and completion, to the Toronto Zoo's satisfaction, of the inspection and testing of high voltage electrical distribution equipment to verify serviceability, identify repairs required and to provide a detailed report on the condition of the equipment. The work includes all equipment below the 27.6 KV Toronto Hydro connection listed in appendix B and appendix C. Complete a detailed fuse co-ordination study. Provide a detailed itemized quote for recommended repairs.

1.4. Project Conditions

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING

1.4.1. Sequencing, Scheduling

1.4.1.1 Power Outage: Co-ordinate with the Toronto Zoo designate and with the local supply authority if necessary, for a power outage. Be responsible for arranging with the local supply authority for the interruption and reconnecting of the electrical power supply and all costs for same shall be included in this Bid.

1.4.1.2 All scheduling must co-ordinate, and accommodate, with any/all pre-arranged events taking place on Toronto Zoo property. This may result in limitations on working days.

1.4.1.3 Outage Time:

a) State the estimated time required to complete the work as specified and also state the time required for work requiring the sub-station to be de-energized.

b) Shutdowns will be scheduled after normal operating hours and will be limited to maximum eight (8) hours dependent on season and temperatures.

1.4.1.4 Co-operation

a) Co-operate with the Toronto Zoo designate to keep the shut-down times to a minimum and a mutually agreed upon time for shut-down shall be determined with one weeks notice.

b) When all work requiring the de-energizing of the equipment is completed, the Toronto Zoo designate may inspect the work before the equipment is re-energized.

c) A list of required shutdowns and time required to complete location specific work shall be provided to the Toronto Zoo. A mutually agreed upon schedule for the shutdowns will be completed in coordination with the Zoo designate and provided to the Zoo.

PART 2 – PRODUCTS

2.1 Materials and Equipment

2.1.1 Supply all materials, tools and equipment required to perform maintenance of sub-station equipment.

2.1.2 Two hard copies and one electronic copy of all project data and final reports shall be provided within 30 days of project completion.

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING**PART 3 – EXECUTION****3.1 Inspection and Testing****3.1.1 Switchgear and Switchboard Assemblies****3.1.1.1 Visual and Mechanical Inspection**

- a) Inspect for physical, electrical, and mechanical condition.
- b) Compare equipment nameplate information with latest one-line diagram when available.
- c) Check for proper anchorage, required area clearances, physical damage, and proper alignment.
- d) Inspect all bus connections for high resistance using one of the following methods;
 - Use low resistance ohmmeter.
 - Check tightness of bolted connections by calibrated torque-wrench method in accordance with manufacturer's published data.
 - Perform thermographic survey in accordance with Article 3.2, Thermographic Survey.
- e) Test all electrical and mechanical interlock systems for proper operation and sequencing;
 - Closure attempt shall be made on locked-open devices. Opening attempt shall be made on locked-closed devices.
- f) Clean and inspect all porcelain bushings, stand-off insulators, and lightning arrestors.
- g) Inspect accessible insulations, for evidence of physical damage or contaminated surfaces.
- h) Verify proper barrier and shutter installation and operation.
- i) Lubrication;
 - Verify appropriate contact lubricant on moving current carrying parts.
 - Verify appropriate lubrication on moving and sliding surfaces.
 - Apply no-oxide grease to switch and fuse contact surfaces.
- j) Exercise all active components.
- k) Inspect all mechanical indicating devices for proper operation.
- l) Verify proper operation of switchgear/switchboard heaters.
- m) Ensure filters and/or vents are clear.
- n) Complete all racking, in and out, of switchgear equipment ensuring proper alignment, operation and connection

3.1.1.2 Electrical Test

- a) Perform ground-resistance tests.
- b) Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground in accordance with manufacturer's instructions.

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- c) Perform resistance measurements on all bus joints with a low-resistance ohmmeter.
- d) Perform insulation-resistance tests at 1000V dc on all control wiring. Do not perform the test on wiring connected to solid state components.
- e) Perform control wiring performance test. Use the elementary diagrams of the switchgear to identify each remote control and protective device. Conduct tests to verify satisfactory performance of each control feature.
- f) Perform over-potential tests on each bus section, phase-to-phase and phase-to-ground. Test voltages shall be in accordance with manufacturer's instructions.
- g) Perform the following tests on control power transformers:
 - Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
 - Verify that primary and secondary fuse ratings or circuit breakers match drawings.
 - Perform insulation-resistance test. Measurements shall be made from winding-to-winding and windings-to-ground.

3.1.1.3 Test Values

- a) Bolt-torque levels shall be in accordance with the manufacturers' specifications.
- b) Compare bus connection resistances to values of similar connections.

3.1.2 Transformers

3.1.2.1 27.6 kV oil filled transformers. **Do not** take samples of the askarel filled transformers.

- a) Sample of oil to be drawn from all transformers and taken to laboratory for the following tests:
 - Neutralization
 - Colour
 - Interfacial Tension
 - Dielectric Strength
- b) Inspect for oil leaks, excessive resting, etc.
- c) Clean and inspect all bushings.
- d) Check condition of thermometer, oil levels, gauges, gas detector relay, pressure relief device, paint, gaskets, throats, etc.
- e) Tighten or torque all connections.
- f) Inspect and test overall grounding system.
- g) Test insulation resistance;
 - High to low voltage
 - High voltage to ground
 - Low voltage to ground

HIGH VOLTAGE EQUIPMENT MAINTENANCE

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING

- h) Test insulations resistance of all associated high voltage and low voltage cables.
- i) Thoroughly clean submersible vaults.
- j) Inspect condition of vault, grate, grounds, and drains, etc.
- k) Top up oil levels and replace gaskets if required.

3.1.2.2 Dry Core Transformers

- a) Inspect and clean transformer core and coils using air blower (Less than 25 psi). Use of steel brushes is prohibited. Use of liquid cleaners is prohibited.
- b) Clean and inspect all bushings.
- c) Tighten or torque all connections.
- d) Clean or replace forced air filters if required.
- e) Check for loose core blocking.
- f) Vacuum entire enclosure.
- g) Inspect and test overall grounding system.
- h) Test insulation resistance;
 - High to low voltage
 - High voltage to ground
 - Low voltage to ground
- i) Test insulations resistance of all associated high voltage and low voltage cables.

3.1.3 Primary Lightning Arrestors**3.1.3.1 Lightning Arrestors**

- a. Inspect grounding conductor and bus connections.
- b. Clean arrestor exterior, porcelain and nameplate. Check for cracks, chips, copper splash and cement deterioration.
- c. Inspect grounding cables and connections – inside and outside the enclosure.
- d. Ensure no grounding conductors create a hazardous condition.

3.1.4 Low Voltage Switchboards

3.1.4.1 Refers to low voltage switchboard/distribution panels listed within Appendix B.

3.1.4.2 Clean and vacuum inside of enclosures.

3.1.4.3 Check mechanical operation of breaker and contact equipment.

3.1.4.4 Withdraw breaker and thoroughly clean.

3.1.4.5 Check condition of main and arcing contacts and chutes.

HIGH VOLTAGE EQUIPMENT MAINTENANCE

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING

- 3.1.4.6 Measure contact resistance across each pole of breaker.
- 3.1.4.7 Lubricate all moving parts where necessary.
- 3.1.4.8 With breaker closed measure insulation resistance pole to pole to ground.
- 3.1.4.9 Exercise electro-mechanical trip devices.
- 3.1.4.10 Inspect bus bar and associated cable for:
 - a) signs of overheating
 - b) tightness
 - c) corrosion

3.2 Thermographic Survey

- 3.2.1 Thermographic Survey to include all high and low voltage distribution listed within Appendix B. & C.
- 3.2.2 Visual and Mechanical Inspection.
 - 3.2.2.1 Inspect for physical, electrical, and mechanical condition.
 - 3.2.2.2 Remove all necessary covers prior to thermographic inspection.
- 3.2.3 Equipment to be inspected shall include all current-carrying devices.
- 3.2.4 Provide report including the following:
 - 3.2.4.1 Discrepancies.
 - 3.2.4.2 Temperature difference between the area of concern and the reference area.
 - 3.2.4.3 Cause of temperature difference.
 - 3.2.4.4 Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.
 - 3.2.4.5 Identify load conditions at time of inspection.
- 3.2.5 Test Parameters
 - 3.2.5.1 Equipment shall detect emitted radiation and convert detected radiation to visual signal.

HIGH VOLTAGE EQUIPMENT MAINTENANCE

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING

3.2.5.2 Thermographic surveys should be performed during periods of maximum possible loading but not less than forty percent (40%) or rated load of the electrical equipment being inspected.

3.2.6 Forward a complete report to the Toronto Zoo designate. The report will include a deficiency list, list of recommended repairs and the inspection sheets for equipment inspected. The inspection sheets shall include location of equipment, identification of equipment, nameplate data, test results, observations and comments. Included in the report shall be an Authority To Bind signature statement, to be signed by the Toronto Zoo designate. The last paragraph of the report shall include the following:

“We advise that in our opinion the electrical power apparatus as covered in the report, having been inspected, tested and repaired at the sub-station (description) _____ appears to be in good condition except _____ (itemize). We recommend that _____

Signed by an officer of the Company”

3.2.6 The report shall indicate as-found and as-left conditions along with check list of all procedures performed.

3.2.6.1 This report shall be submitted to the Toronto Zoo within thirty (30) working days after completion of the work.

3.3 Ultrasonic Detection for Partial Discharge Analysis

3.3.1 Ultrasonic detection analysis to be completed simultaneously with Thermographic Survey. Access all submersible vault chambers, pad-mount enclosures and additionally, overhead pole-mounted devices. Perform the following energized predictive inspection from grade level only.

3.3.2 Visual and Mechanical Inspection.

3.3.2.1 Inspect for physical, electrical, and mechanical condition.

3.3.2.2 Remove all necessary covers prior to inspection.

3.3.3 Equipment to be inspected shall include all current-carrying devices.

3.3.4 Provide report including the following:

3.3.4.1 Discrepancies & probable cause of discrepancies

3.3.4.2 Areas inspected. Identify inaccessible and/or unobservable areas and/or equipment.

HIGH VOLTAGE EQUIPMENT MAINTENANCE

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SECTION 26100 – ELECTRICAL MAINTENANCE TESTING

3.3.4.3 Identify load conditions at time of inspection.

3.3.5 Test Parameters

3.3.5.1 Corona detector should be capable of detecting high frequency partial discharge emissions and converting them to audible and visual signals for relative amplitude comparison.

3.3.5.2 A higher sensitivity probe or parabolic antennae should be used when inspecting U/G cable elbow terminations in particular.

3.3.5.3 Establish a baseline level reading and record levels, locations and precise equipment component where potentially problematic levels are encountered

3.3.6 Forward a complete report to the Toronto Zoo designate. The report will include a deficiency list, list of recommended repairs and the inspection sheets for equipment inspected. The inspection sheets shall include location of equipment, identification of equipment, nameplate data, test results, observations and comments. Included in the report shall be an Authority To Bind signature statement, to be signed by the Toronto Zoo designate. The last paragraph of the report shall include the following:

“We advise that in our opinion the electrical power apparatus as covered in the report, having been inspected, tested and repaired at the sub-station (description) _____ appears to be in good condition except _____ (itemize). We recommend that _____

Signed by an officer of the Company”

3.3.7 The report shall indicate as-found and as-left conditions along with check list of all procedures performed.

3.3.7.1 This report shall be submitted to the Toronto Zoo, and be deemed property of the Toronto Zoo, within thirty (30) working days after completion of the work.

END OF SECTION

AR FLASH HAZARD ANALYSIS & SHORT CIRCUIT STUDY

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SECTION 26500 – ARC FLASH HAZARD ANALYSIS & SHORT CIRCUIT STUDY

PART 1 – GENERAL

1.1. General Requirements

1.1.1. Conform to General Electrical Requirements, Section 26000 as applicable.

1.2. References

- IEEE 141-93 - Electric Power Distribution for Industrial Plants.
- IEEE 242-01 - Protection and Coordination of Industrial and Commercial Power Systems.
- IEEE 399-97 - Industrial and Commercial Power Systems Analysis.
- IEEE 241-90 - Electric Power Systems in Commercial Buildings.
- IEEE 1015-06 - Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
- IEEE 1584-18 - Performing Arc-Flash Hazard Calculations.
- IEEE C57-15 - Distribution, Power, and Regulating Transformers.
- IEEE C37.13-15 - Low-Voltage AC Power Circuit Breakers Used in Enclosures.
- IEEE C37.010-16 - AC High-Voltage Circuit Breakers >1000V Vac Rated on a Symmetrical Current Basis.
- IEEE C37.41-16 - Design Tests for High-Voltage >1000V Fuses and Accessories.
- NFPA 70E - Electrical Safety in the Workplace.
- CSA Z462-18 - Workplace Electrical Safety

1.3. Description of Work

- 1.3.1. The Contractor shall furnish an Arc Flash Hazard Analysis and Short-Circuit Study as per the requirements set forth in NFPA 70E – Standard for Electrical Safety in the Workplace. The Arc Flash Hazard Analysis & Short Circuit Study shall be performed in accordance with the IEEE 1584 equations presented in NFPA 70E-18 Annex D. The scope of the study shall include all switchgear, switchboard, motor control centre, distribution panel and transformer equipment listed within Appendix B & C.
- 1.3.2. The Contractor shall provide all required equipment, tools, materials and staff to complete an Arc Flash Hazard Analysis and Short-Circuit Study.

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1.4. Project Conditions

1.4.1. Sequencing, Scheduling

1.4.1.1 Power Outage: Coordinate with the Toronto Zoo designate and with the local supply authority if necessary, for a power outage. Be responsible for arranging with the local supply authority for the interruption and reconnecting of the electrical power supply and all costs for the same shall be included in this Bid.

1.4.1.2 All scheduling must co-ordinate, and accommodate, with any/all pre-arranged events taking place on Toronto Zoo property. This may result in limitations on working days.

1.4.1.3 Outage Time:

a) State the estimated time required to complete the work as specified and also state the time required for work requiring the equipment to be de-energized.

b) Shutdowns will be scheduled after normal Zoo closing hours and will be limited to maximum eight (8) hours dependent on season and temperatures.

1.4.1.4 Co-operation

a) Cooperate with the Toronto Zoo designate to keep the shut-down times to a minimum and a mutually agreed upon time for shut-down shall be determined with one weeks notice.

b) When all work requiring the de-energizing of the equipment is completed, the Toronto Zoo designate may inspect the work before the equipment is re-energized.

c) A list of required shutdowns and time required to complete location specific work during the shutdown shall be provided to the Toronto Zoo. A mutually agreed upon schedule for the shutdowns will be completed in coordination with the Zoo designate and provided to the Zoo.

PART 2 – PRODUCTS

2.1. Materials and Equipment

2.1.1. Existing Single-Line, attached to this RFQ, shows details of the 27.6kV supply ring only. In addition to all 27.6kV noted equipment, include 45 Low-Voltage switchboards & 21 Dry-Core transformers as listed in Appendix B.

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- 2.1.2. Supply all materials, tools and equipment required to perform arc-flash hazard analysis & short circuit study of equipment listed within Appendix B & C.
- 2.1.3. The studies shall be performed using the latest revision of SKM and CYME software (or equivalent)
- 2.1.4. Provide an updated Single Line Diagram in AutoCAD & PDF including the listed Low Voltage Switchboards. Original AutoCAD to be provided by the client.
- 2.1.5. Two hard copies and one electronic copy of all project data and final reports shall be provided within 30 days of project completion.

2.2. Arc Flash Labels

- 2.2.1. Provide 4in. X 6in. thermal transfer type labels of high adhesion vinyl for each work location analyzed. Labels shall be formatted in accordance with CSA Z462.
- 2.2.2. All labels shall be based on recommended overcurrent device settings and will be provided once the results of the analysis have been accepted by the owner.
- 2.2.3. The label shall include the following information, at a minimum:
 - 2.2.3.1. Equipment designation
 - 2.2.3.2. Nominal Voltage
 - 2.2.3.3. Arc flash boundary
 - 2.2.3.4. Hazard risk category
 - 2.2.3.5. Incident energy
 - 2.2.3.6. Working distance
 - 2.2.3.7. Engineering report number, revision number and issue date
 - 2.2.3.8. Shock boundaries
- 2.2.4. Labels shall be machine printed, with no field markings. A sample arc flash label shall be submitted for written approval prior to printing.
- 2.2.5. One arc flash label shall be provided for each piece of equipment listed within Appendix B & C.
- 2.2.6. Arc flash labels shall be field installed by a qualified person. Installation of arc flash labels shall be included in the bid.

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PART 3 – EXECUTION

3.1. Analysis and Study

- 3.1.1. Arc Flash Hazard and short circuit study shall be carried out by an electrical power system engineering and field testing group and shall be sealed by a Professional Engineer.
- 3.1.2. Arc Flash study to be done in accordance with CSA Z462.
- 3.1.3. Existing conditions shall be verified and/or documented. All information shall be obtained under this contract.
- 3.1.4. Collect pertinent data at each equipment location. All data collection shall be performed by a qualified person to ensure accurate equipment modeling.
 - 3.1.4.1. Transformer ratings, including voltage, power percent impedance, winding ratio, and X/R ratio.
 - 3.1.4.2. Protective device ratings including current, time-current characteristics, settings, and time-delays.
 - 3.1.4.3. Switchgear data, including conductor phase spacing, type of grounding, and appropriate working distances.
 - 3.1.4.4. Data collection shall include from the utility down through each switchgear, switchboard, motor control centre, distribution panel and transformer listed within Appendix B & C. Subsequent loads fed from low voltage switchboards and distribution panels, not listed, are not included in this bid.
 - 3.1.4.5. Obtain, from the utility, the minimum, normal and maximum operating service voltage levels, three-phase short circuit MVA and X/R ratio, as well as line to ground short circuit MVA and X/R ratio at the point of connection, including the local or internal disconnect switch, fuse or circuit breaker.
- 3.1.5. Prepare an appropriate system model and single line-diagrams.
- 3.1.6. Prepare a short-circuit study to determine the single/three phase bolted fault current at each location.
- 3.1.7. Prepare arc-flash calculations in accordance with NFPA 70E and IEEE1584 using SKM and CYME software (or equivalent).
 - 3.1.7.1. Calculate arc current in accordance with applicable guidelines

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- 3.1.7.2. Determine protective device total-clearing times based upon the time-current characteristics.
- 3.1.7.3. Calculate arc-flash incident energy level based on the protective device total clearing times and the working distance.
- 3.1.8. Determine appropriate personal protective equipment in accordance with risk levels defined in NFPA 70E.
- 3.1.9. Calculate the arc-flash protection boundary distance.
- 3.1.10. After all necessary data is collected and analyzed; a complete and detailed technical report is to be issued. This report shall include a complete arc-flash hazard analysis, single line diagrams and custom labels to be affixed to the appropriate switchgear/distribution equipment fronts.
- 3.1.11. Adjust relay and protective device settings accordingly prior to installing arc flash labels. Adjustments to existing settings shall be field performed and included in the bid.
- 3.1.12. Forward a complete report to the Toronto Zoo designate. The report will include a deficiency list, list of recommended repairs and the inspection sheets for equipment inspected. The inspection sheets shall include location of equipment, identification of equipment, nameplate data, test results, observations and comments. Included in the report shall be an Authority To Bind signature statement, to be signed by Toronto Zoo designate. The last paragraph of the report shall include the following:

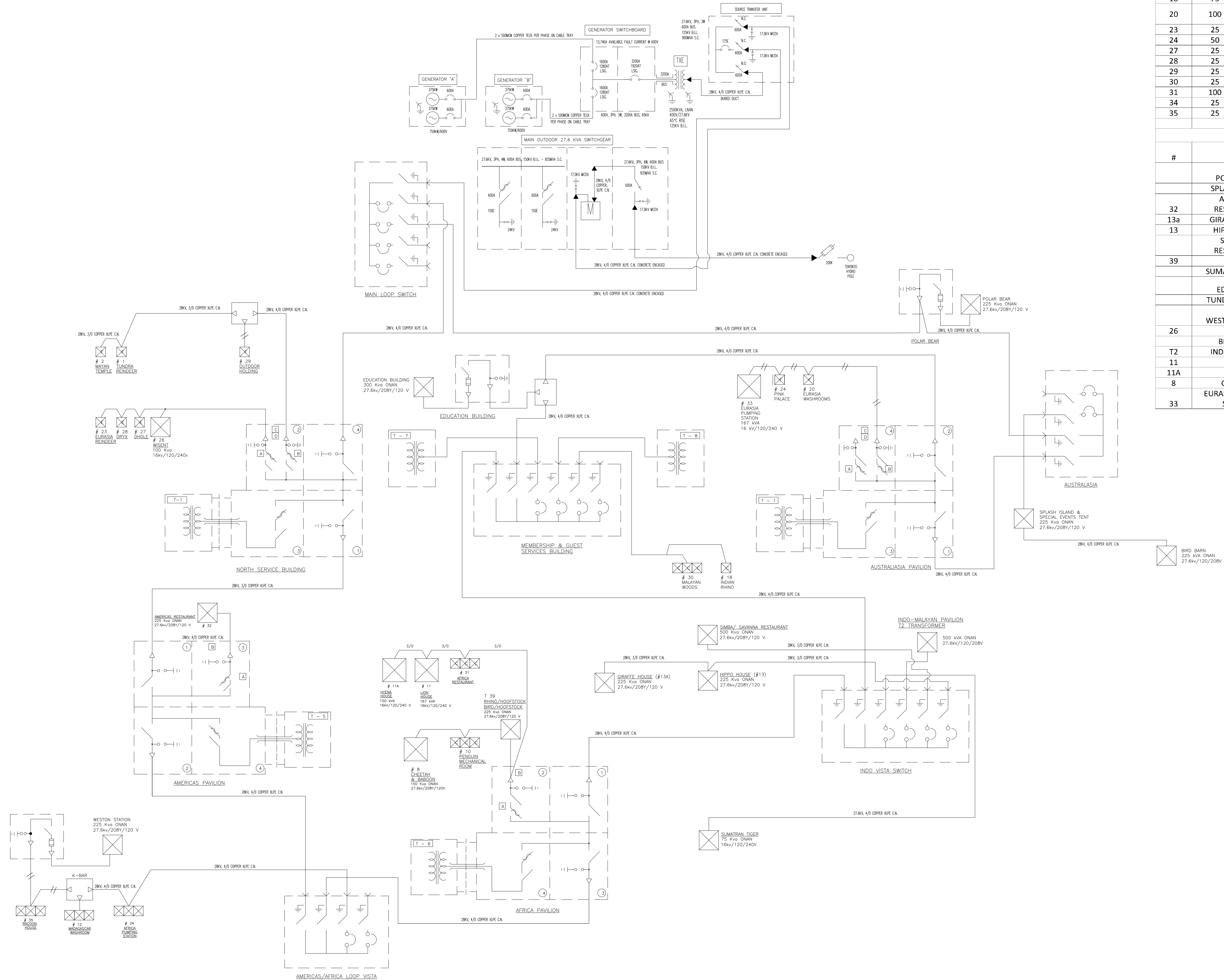
“We advise that in our opinion the electrical power apparatus as covered in the report, having been inspected, tested and repaired at the sub-station (description) _____ appears to be in good condition except _____ (itemize). We recommend that _____

Signed by an officer of the Company.”
- 3.1.13. The report shall indicate as-found and as-left conditions along with a checklist of all procedures performed.
 - 3.1.13.1. This report shall be submitted to the Toronto Zoo, and be deemed property of the Toronto Zoo, within thirty (30) working days after completion of the work.

END OF SECTION

TORONTO ZOO

SINGLE LINE DIAGRAM
HIGH VOLTAGE ELECTRICAL DISTRIBUTION
REVISED 2018-09-18



SUBMERSIBLES					
VAULT	SIZE	PHASES		FED FROM	AFFECTED BUILDINGS
		1	3		
1	25	X		OPS COMPLEX PADDOCK WEST	TUNDRA REINDEER
2	100	X		OPS COMPLEX PADDOCK WEST	MAYAN TEMPLE
10	25		X	AFRICA PADDOCK FEEDER	PENGUIN MECHANICAL ROOM
12	50		X	AMERICAS/AFRICA LOOP VISTA	MADAGASCAR WASHROOMS
18	75	X		MEMBERSHIP VISTA WAY 5	INDIAN RHINO
20	100	X		AUSTRALASIA	EURASIA KEEPER ROOM, WASHROOM, RETAIL STORE, VIEWING BUILDING & MANDARIN EXPRESS
23	25	X		OPS COMPLEX PADDOCK EAST	EURASIAN REINDEER
24	50	X		AUSTRALASIA	PINK PALACE CAMEL HOUSE
27	25	X		OPS COMPLEX PADDOCK EAST	DHOLE
28	25	X		OPS COMPLEX PADDOCK EAST	ORYX
29	25	X		OPS COMPLEX PADDOCK WEST	OUTDOOR HOLDING
30	25		X	MEMBERSHIP VISTA WAY 5	MALAYAN WOODS
31	100		X	AFRICA PADDOCK FEEDER	AFRICA RESTAURANT
34	25		X	AMERICAS/AFRICA LOOP VISTA	AFRICA PUMPING STATION, WATUSI
35	25		X	AMERICAS/AFRICA LOOP VISTA	KATA (RACCOUR HOUSE)

PAD MOUNT TRANSFORMERS					
#	NAME	SIZE (kva)		FED FROM	AFFECTED BUILDINGS
		PHASES			
	POLAR BEAR	225, 3Ø		OPS - AUSTRALASIA LOOP FEEDER	POLAR BEAR HOLDING, RETAIL STORE, BEAVERTAILS, TUNDRA AIR RIDE
	SPLASH ISLAND	225, 3Ø		AUSTRALASIA VISTA WAY 3	SPLASH ISLAND, KIDS ZOO, SPECIAL EVENTS TENT
32	RESTAURANT	225, 3Ø		AMERICAS PAVILION	AMERICAS RESTAURANT, POLAR BEAR MECHANICAL ROOM, POLAR PATIO
13a	GIRAFFE HOUSE	225, 3Ø		INDO VISTA WAY 6	GIRAFFE HOUSE
13	HIPPO HOUSE	225, 3Ø		INDO VISTA WAY 6	HIPPO HOUSE, GAUR 2
	SAVANNA RESTAURANT	500, 3Ø		INDO VISTA WAY 5	SAVANNA RESTAURANT, RHINO POOL MECH. ROOM, BUSH CAMP, SAVANNA PICNIC SITE, OLD BABOON AREA PANEL
39	T39	225, 3Ø		AFRICA PADDOCK FEEDER	RHINO / HOOFSTOCK, BIRD / HOOFSTOCK
	SUMATRAN TIGER	75, 1Ø		INDO VISTA WAY 3	SUMATRAN TIGER
	EDUCATION	300, 3Ø		AUSTRALASIA - MEMBERSHIP LOOP FEEDER	EDUCATION BUILDING
	TUNDRA AIR RIDE	75, 3Ø		POLAR BEAR	STEP UP TRANSFORMER AT TUNDRA AIR RIDE
	WESTON STATION	225, 3Ø		GIRAFFE VISTA WAY 3	PUMPING STATION, GRIZZLY BEAR, DUCK HOUSE, WESTON STATION WASHROOMS
26	WISENT	100, 1Ø		OPS COMPLEX	BARBARY APES, WISENT
	BIRD BARN	225, 3Ø		SPLASH ISLAND	RED PANDA, BIRD BARN, AMUR TIGER
T2	INDO PAVILION	500, 3Ø		INDO VISTA 4	INDO PAVILION
11	LIONS	167, 1Ø		AFRICA PADDOCK FEEDER	LIONS, WILDBEEST
11A	HYENA	100, 1Ø		AFRICA PADDOCK FEEDER	HYENA, SAVANNA RETAIL, PORCUPINE
8	CHEETAH	150, 3Ø		AFRICA PADDOCK FEEDER	CHEETAH
33	EURASIA PUMPING STATION	167, 1Ø		AUSTRALASIA	EURASIA PUMP STATION, SNOW LEOPARD

