

**FUNDY OCEAN RESEARCH CENTER FOR ENERGY (FORCE)
HANTSPORT, NOVA SCOTIA**

**IN-STREAM TIDAL POWER GENERATING PLANT
INTERTIE SUBSTATION DEVELOPMENT**

**MANUFACTURE, TESTING AND DELIVERY OF
FOUR (4) 225kVA, 13.8/7.967kV-600V, OIL-FILLED
PADMOUNT GROUNDING TRANSFORMERS c/w
OIL-IMMERSED LOADBREAK SWITCHES**

FEBRUARY, 2011

**SPECIFICATION No.
023-478-2-11**

SPECIFICATION


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HANTSPORT, NOVA SCOTIA**

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INTERTIE SUBSTATION DEVELOPMENT**

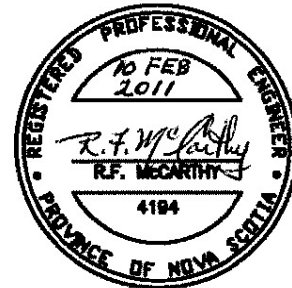
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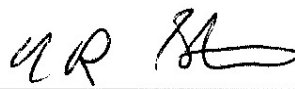
SIGNED AND SEALED:



**R. McCARTHY, P. ENG.
SENIOR ELECTRICAL ENGINEER**



SIGNED:



**N. STRUM, P. ENG.
QA/QC ENGINEER**

STRUM ENGINEERING ASSOCIATES LTD.

FEBRUARY, 2011

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SPECIFICATION

SECTION A

INFORMATION AND GENERAL REQUIREMENTS

SPECIFICATION

SECTION A

INFORMATION AND GENERAL REQUIREMENTS

1. GENERAL

- 1.1 This Technical Specification, prepared by Strum Engineering Associates Ltd. on behalf of Fundy Ocean Research Center for Energy (FORCE), consisting of the Information and General Requirements, the Technical Requirements, together with all Schedules, Drawings, and Addenda issued with and subsequent to the "Invitation to Tender", shall become a part of any Contract or Purchase Order to perform the work involved. In case of discrepancies between the work tendered to be performed and the work specified to be performed, the Technical Specification shall be final and binding unless there be mutual agreement to the contrary between FORCE and the Vendor.

2. DESCRIPTION OF PROJECT

- 2.1 The scope of work of this aspect of the intertie substation development project consists of the design, manufacture, factory testing, delivery to site and warranty of four (4), 225kVA, sealed tank, 13.8/7.967kV-600V, outdoor, oil-filled, three-phase, live front padmount grounding transformers complete with oil-immersed loadbreak switch and all specified auxiliary equipment.

3. DEFINITIONS

- 3.1 The **Owner's Engineer** shall mean:

Strum Engineering Associates Ltd.
80 Eileen Stubbs Avenue
Dartmouth, Nova Scotia, B3B 1Y6

Contact: Mr. Richard McCarthy, P. Eng.

Telephone: (902) 468-7325

Fax: (902) 468-1908

E-Mail: r.mccarthy@strumengineering.ca

- 3.2 The Vendor shall mean the Tenderer or Bidder as defined in the FORCE Terms and Conditions.

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3.3 The **Owner's** information and contact will be:

Fundy Ocean Research Center for Energy (FORCE)
C/O Strum Engineering Associates Ltd.
80 Eileen Stubbs Avenue
Dartmouth, Nova Scotia
B3B 1Y6

Contact: Mr. Frank Leblanc, P. Eng., FORCE Project Manager

Telephone: (902) 443 4690
Fax: (902) 468 1908
E-Mail: frank.leblanc@fundyforce.ca

4. ERRORS AND OMISSIONS

4.1 Should any details necessary for a clear and comprehensive understanding be omitted or any errors appear in the tendering documents, it shall be the duty of the Bidder to obtain clarification from the Owner's Engineer before submitting his tender. All additions or corrections to the Technical Specification will be issued in writing to all Bidders as addenda thereto. Bidders shall list in their tenders all the addenda that were received and considered when their tender was prepared.

5. MATERIAL AND WORKMANSHIP

- 5.1 All materials shall be new. Workmanship and material shall be of the best quality.
- 5.2 Equipment of the same type shall be interchangeable. Listed spare parts shall be identical and inter-changeable with parts in service that they are intended to replace.
- 5.3 There shall be no omission of items necessary or required to make a finished workmanlike first class installation, even though every item of labour and material may not be mentioned or shown in the Specification or on the Drawings.
- 5.4 Materials and standard parts which are supplied under the requirements of the Specification, and also those which are not specifically designated herein and which are necessary for the fulfilment of this Specification, shall be new, of high industrial quality, and in accordance with good industrial practice.

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6. GUARANTEE/WARRANTY

- 6.1 The Vendor shall warrant that all materials, equipment, and workmanship furnished in accordance with the purchase documents, comply in all respects with the Technical Specification, and shall guarantee in writing that the equipment will give successful and efficient service.
- 6.2 The Vendor shall, to the satisfaction of the Owner, rectify any defects which may appear in the equipment, or of which he shall receive notice from the Owner and for which he may have been responsible in the opinion of the Owner, for a period of twelve months after start-up or eighteen months after shipment, whichever occurs first.
- 6.3 Any equipment which fails to perform in accordance with the requirements of the Specification during this period may be rejected by the Owner. The Vendor shall proceed at once to make alterations or furnish new equipment, as may be necessary.
- 6.4 Costs of supplying any replacement equipment, or of modifications or alterations to equipment, in order to meet specified requirements shall be borne by the Vendor, including the costs, if any, of any work or materials provided by the Owner, and of any shipping charges incurred by the Owner.
- 6.5 Operation by the Owner of the equipment or any part thereof shall not constitute any waiver of the Owner's rights under this agreement.
- 6.6 The Vendor shall ensure that the Unit meets the requirements set out in the Specification and all relevant standards listed herein.
- 6.7 The Owner's purchase order terms and conditions shall prevail.

SPECIFICATION

7. VENDOR'S DRAWINGS

7.1 General

7.1.1 Drawings shall be clear and legible and have a title block including the name of the Project, and the number and title of the drawing.

7.1.2 All drawings shall be prepared on A1 size sheets, 594 mm by 841 mm. Use of other size sheets shall be approved by the Owner's Engineer.

7.2 System of Units

7.2.1 All dimensions shall be in the Imperial and Metric system.

7.3 Title Block

7.3.1 Drawing title blocks shall include the following information:

.1 Name of the Project as follows:

**IN-STREAM TIDAL POWER GENERATING PLANT
25kV Intertie Substation Development**

Fundy Ocean Research Center for Energy (FORCE)
Hantsport, Nova Scotia

Manufacture, Testing, Delivery and Warranty of Four (4)
225kVA, 13.8/7.967kV-600V, Oil-Filled, Three-phase, Live Front
Padmount Grounding Transformers c/w Oil-Immersed Loadbreak
Switch

Owner's Purchase Order No.

.2 Provide a 100 mm x 100 mm space to accommodate the Engineer's review stamp.

.3 Issue date and the drawing number.

.4 Space allotted for revisions including the number, description, and date.

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7.4 Review of Drawings

- 7.4.1 Drawings made by the Tenderer or his sub-contractors defining the work shall be provided at appropriate times within the program of work as defined in the Specification.
- 7.4.2 Five (5) prints or the electronic file (AutoCAD xxx.dwg file format) of each shop drawing shall be submitted to the Owner's Engineer, who will return, within 14 days after receipt, one copy of the reviewed drawings stamped as follows:

STRUM ENGINEERING ASSOCIATES LTD.

Date Received: _____ By: _____

This drawing has been reviewed for the sole purpose of determining conformance with the general requirements of the Contract Documents.

The Contractor shall remain responsible for all damages resulting from errors and/or omissions contained in this drawing and shall satisfy all obligations and liabilities connected therewith and with the Contract Documents.

Reviewed - Manufacturing May Proceed. ()

Reviewed - Submit Final Drawing. Manufacturing May Proceed. ()

Reviewed - Make Changes As Noted. Submit Final Drawing. ()
Manufacturing May Proceed.

Reviewed - Correct and Resubmit. ()

Review Not Required - Manufacturing May Proceed. ()

Date Review Completed: _____ By: _____

All drawings checked other than, "Reviewed - Manufacturing May Proceed", shall be corrected and recycled for review within 14 calendar days, and this procedure continued until final review is obtained.

SPECIFICATION

7.4/

- 7.4.3 Before proceeding with construction, submit for review to the Owner's Engineer, assembly drawings, foundation and base plate details, layout and drilling details, drawings covering construction, complete control schematic diagrams, and other pertinent data for the equipment under consideration. Do not start construction until instructed by the Owner's Engineer.
- 7.4.4 Do not revise those drawings or portions of drawings which have been approved during the review process unless these drawings or portions are affected by comments made or revisions requested.

7.5 Final Drawings

- 7.5.1 Final drawings shall incorporate any changes made during the construction and testing stages of the work, shall be exact drawings of the equipment as supplied, and shall be of such quality to enable electronic scanning without loss of detail.
- 7.5.2 Do not revise drawings given final approval by the Owner's Engineer except by his prior written consent.
- 7.5.3 Submit six (6) prints and the electronic (AutoCAD xxx.dwg file format) file of each final drawing to the Owner's Engineer.

8. OPERATION AND MAINTENANCE MANUALS

- 8.1 Prepare comprehensive instruction manuals describing in detail the construction and recommended procedures for assembling, dismantling, maintaining and operating all equipment and listing all replacement parts. These shall include copies of all pertinent bulletins and instructions prepared by the Vendors of component parts of the equipment, properly catalogued for easy reference.
- 8.2 Two (2) copies of the manuals shall be submitted in draft form to the Owner's Engineer for approval at least four weeks before the equipment is to be delivered. Five (5) copies of the approved manual shall be submitted at the time the equipment is shipped.

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9. WITNESSING OF TESTS AND TEST REPORTS

- 9.1 Advise the Owner's Engineer 14 days prior to the tests so that tests may be witnessed by the Engineer and Owner.
- 9.2 Submit six (6) copies of duly certified test reports, to be forwarded by courier prior to equipment shipment.

10. PACKAGING AND SHIPPING

- 10.1 All parts shall be thoroughly cleaned to remove oil, grease, dust, and other foreign material and all equipment openings shall be capped to prevent entry of foreign materials or damage.
- 10.2 Equipment shall be suitably prepared and packed so as to prevent damage occurring during storage, transportation, and unloading operations and to ensure that the equipment is in perfect working condition, has suffered no damage, and that all parts are intact on arrival at the destination.
- 10.3 Packaging and crating shall include suitable weather protection, moisture control, temporary bracing, blocking straps, skids, etc.

11. SIGNING AND SEALING OF VENDOR'S DRAWINGS

- 11.1 Execute design under the supervision of a licensed Engineer. The Engineer shall sign and seal:
 - 11.1.1 Shop fabrication drawings and specifications;
 - 11.1.2 Site erection drawings and specifications; and,
 - 11.1.3 Assembly, schematic and wiring diagrams.

12. CORRESPONDENCE

- 12.1 In view of the urgency attached to this project, the tender submission shall be by courier, and all other correspondence shall be by courier, facsimile or electronic mail (E-Mail).
- 12.2 The Vendor shall allow for this requirement in the prices quoted herein.

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13. SCHEDULE

- 13.1 All equipment associated with this Specification is required on site not later than 1 June 2011. Refer to Schedule No. 5, Page C-14, for the specific schedule requirements.

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SECTION B

TECHNICAL REQUIREMENTS

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SECTION B

TECHNICAL REQUIREMENTS

1. SCOPE OF WORK

- 1.1 1.1 Design, manufacture, test, deliver to FORCE, at the substation location in Black Rock, Nova Scotia, 10km west of the town of Parrsboro, Nova Scotia, and provide a written warranty for four (4), 225kVA, sealed tank, 13.8/7.967kV-600V, outdoor, oil-filled, three-phase, live front padmount grounding transformers complete with oil-immersed loadbreak switch and all specified auxiliary equipment., as specified herein.
- 1.2 In general, the grounding transformers shall be designed and manufactured as padmount transformers to CSA C2.1-06 and CSA C227.5, except as noted herein.
- 1.3 Offloading, erection, testing and commissioning of the 225kVA grounding transformers and associated components will be carried out by others and does not form part of this Contract.

2. SERVICE CONDITIONS

2.1 Application

- 2.1.1 Each grounding transformer will be installed outdoors on a concrete slab-on-grade pad. supplied and installed by others.

2.2 Supply System Data

2.2.1 13.8kV System Data

Nominal service voltage	kV rms	13.8
Rated (maximum) voltage	kV rms	15.0
Rated frequency	Hz	60
No. of phases & wiring		3/3
Neutral grounding	Solidly grounded at 5/6.67 MVA transformer neutral	
3 phase short circuit level (interrupting)	MVA	250

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2.3 Environmental Data

2.3.1 Design and manufacture the grounding transformers to be suitable for operation under the following conditions:

Elevation above sea level	m	75
Maximum ambient temperature	°C	40
Minimum ambient temperature	°C	-35
Maximum relative humidity	%	100

2.3.2 The intended location of the grounding transformers is classified as an outdoor environment with a heavy level of airborne contamination.

3. STANDARDS

3.1 Unless otherwise specified herein, design, manufacture, and test the transformers in accordance with the latest issue of the following standards:

CSA C22.1-09	Canadian Electrical Code; Part 1, Safety Standard for Electrical Installations
CSA C22.2-94	Special Purpose Enclosures
CSA C2.1-06	Single-Phase and Three-Phase Liquid-Filled Distribution Transformers
CSA C227.5-08	Three Phase, Live Front, Pad-Mounted Distribution Transformers
CSA C22.2 No. 193 (R2009)	High-Voltage Full-Load Interrupter Switches
CSA C50-08	Insulating Oil, Electrical for Transformers and Switches
CSA C71-1	Insulation Coordination - Part 1: Definitions, Principles and Rules
CSA C71-2	Insulation Coordination - Part 2: Application Guide
CSA C108.3.1-M84	Limits and Measurement Methods of Electromagnetic Noise From AC Power Systems 0.15 - 30 MHz

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CSA C802.1-00	Minimum Efficiency Values for Liquid-Filled Distribution Transformers
CSA C802.3-01	Maximum Losses for Power Transformers
CSA G164-M92	Hot Dip Galvanizing of Irregularly Shaped Articles
CSA W59	Welded Steel Construction (Metal-Arc Welding)
CSA Z229	Quality Assurance Program
ANSI C37	All related standards to switchgear assemblies, disconnect switches, insulators, and bus supports.
IEEE No.1-2000	Recommended Practice - General Principles for Temperature Limits in the Rating of Electric Equipment and for the Evaluation of Electrical Insulation.
ANSI C29.1-1988	Electrical Power Insulators - Test Methods
ANSI C57.12.00	IEEE Standard General Requirements for Liquid-Immersed Distribution Power and Regulating Transformers
ANSI C57.12.27	Conformance Requirements for Liquid-Filled Distribution Transformers
ANSI C57.12.80	IEEE Standard Terminology for Power and Distribution Transformers
ANSI C57.12.90	IEEE Standard Test Code for Distribution, Power, and Regulating Transformers and IEEE Guide for Short Circuit Testing of Distribution and Power Transformers
ANSI C57.91	IEEE Guide for Loading Mineral Oil-Immersed Transformers
ANSI C57.98	IEEE Guide for Transformer Impulse Tests
ANSI C57.100	IEEE Standard Test Procedure for Thermal Evaluation of Liquid-Immersed Distribution Transformers and Power Transformers

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ANSI C63.2	American National Standard for Electromagnetic Noise and Field Strength Instrumentation 10Hz to 40 GHz - Specifications
NEMA TP1-1996	Guide for Determining Energy Efficiency for Distribution Transformers
NEMA TR1-1993	Transformers, Regulators, and Reactors (Including Noise Level Requirements)
NEMA 107-1987	Methods of Measurement of Radio Influence Voltage (RIV) of High Voltage Apparatus
EEMAC G8-3.3	Metal-Enclosed Interrupter Switchgear Assemblies
EEMAC Y1-2	Performance Specification for Finishing Systems for Outdoor Electrical Equipment

3.2 Apply all reference publications and amendments listed within the above standards.

3.3 Other alternative standards may be used if approved by the Owner's Engineer.

4. DESIGN BASIS

4.1 Base the detailed design on this Specification. Produce detailed drawings and submit for approval prior to the start of manufacture.

5. EQUIPMENT, APPARATUS AND MATERIAL SUPPLIED BY OTHERS

5.1 All power cables, control cables, protection cables and auxiliary supply cables external to each transformer shall be supplied and installed by others.

SPECIFICATION

6. PRODUCT DELIVERY, STORAGE AND HANDLING

- 6.1 The grounding transformers shall be shipped from the factory per INCOTERMS 2000 designation DDP (Delivered Duty Paid).
- 6.2 Each transformer shall be shipped liquid-filled under pressure of dry nitrogen or an approved dry inert gas as approved by the Owner's Engineer. Each transformer shall be provided with a pressure gauge suitably protected from damage during transit. The pressure and temperature shall be recorded at the time the transformers leave the factory. The recorded information shall be given to the Owner's Engineer so that it can be compared with the pressure and temperature readings obtained after the transformers have been received at site to ascertain if any leakage has occurred. Ensure that each transformer arrives at site in an uncontaminated condition.
- 6.3 Crate all assembly parts and components removed for shipment to prevent damage. Radiators shall be shipped with their shutoff valves closed and locked packed in such a way that it is not possible for any weight to be placed directly on the fins, tubes or panels. All parts and components are to be free from rust.
- 6.4 A spare set of radiator flange gaskets shall be provided for each transformer.
- 6.5 The Vendor is responsible for ensuring that the dry nitrogen blanket is maintained after each transformer has been offloaded. All hoses, valves and fittings required to install the nitrogen blanket shall be supplied by the Vendor. The nitrogen shall have less than 0.03 percent by weight of moisture.
- 6.6 The transformer oil shall preferably be shipped in the transformer tank but may be shipped by alternative methods and the transformers filled on site by the Vendor, if approved by the Owner's Engineer. The oil shall arrive at site at the same time as the transformers. Ensure that the oil arrives at site in a clean, uncontaminated condition.
- 6.7 Sufficient transformer oil shall be supplied for filling each transformer tank to the proper level. The transformer oil shall comply with CSA C50-97. The transformer oil shall be PCB free and shall include acid inhibitors.
- 6.8 The transformer oil shall be Voltesso 35, or approved equivalent.

SPECIFICATION

7. CONSTRUCTION OF THE ASSEMBLY

7.1 Padmount Grounding Transformer c/w Oil-Immersed Loadbreak Switch

Each assembly shall consist of a sealed tank padmount grounding transformer, complete with a close coupled, primary, group operated, three pole, oil-immersed, loadbreak switch and primary cable termination compartment suitable for bolt-on cable terminations of primary conductors. The loadbreak switch operating handle shall be located in an electrically isolated compartment, separated from the medium voltage and low voltage bushing compartments by steel barriers. The barriers shall be provided to permit opening the loadbreak switch without opening the doors to, or exposing, the primary and secondary bushings and cable termination compartments of the transformer. Primary cables will be bottom entry and the unit will be designed to enclose the primary cable conduits within the unit's enclosure.

7.2 Assembly Moving Facilities

- 7.2.1 Supply hook-type lifting lugs with rounded edges, drilled, for a shackle of sufficient size to lift the completely assembled unit.
- 7.2.2 Jacking steps shall be attached to the assembly at each corner at a height not less than 12 inches or more than 20 inches.
- 7.2.3 Pulling eyes, minimum 2 inches diameter, shall be provided on the assembly base, two per side, to permit pulling the assembly in any direction and shall be braced to withstand the pull up to 15° from the horizontal.
- 7.2.4 The assembly base shall be reinforced to permit moving the assembled and filled transformer on rollers in any direction.
- 7.2.5 The location of the centre of gravity shall allow the transformer to be safely tilted to 15° either with or without oil and shall not result in dangerous overturning moments from the usual transporting, rolling, skidding, and jacking operation.
- 7.2.6 The location of the "shipping" and "dressed" centre of gravity shall be painted on the assembly. The centre of gravity in both shipping and installed configurations shall be clearly shown on both the outline and shipping drawings for both longitudinal and transverse axes.

SPECIFICATION

7.2/

7.2.7 Information on the permissible vertical angle of slinging and any other handling restrictions shall be shown on the shipping drawing.

7.3 Assembly Painting and Finishing

7.3.1 The assembly enclosures shall be cleaned of rust, loose mill scale and other foreign matters by near-white metal blast cleaning. Castings shall be properly smoothed and sharp edges shall be filed. Oil, paraffin, and grease shall be removed by use of solvent.

7.3.2 After cleaning, the exposed exterior surfaces and interior surfaces of the termination sections shall all receive 4 coats of paint at the factory as follows:

- .1 A primary coat of zinc-rich epoxy paint strictly applied in accordance with the instruction of the paint Vendor.
- .2 Two coats of non-glossy, oil resistant paint compatible with primary coat. The second coat shall be applied on completion of factory tests.
- .3 One final coat of glossy, oil resistant, zinc-silicate (self-curing) paint, non-fading ASA 61 Gray (or other color TBA).

7.3.3 The interior of the transformer tank, transformer termination enclosure and control cabinet shall be painted with an oil resistant paint of white or other approved light colour.

7.3.4 Damage to paint incurred during transport shall be repaired by thoroughly cleaning the damaged portion and applying the full number of coats that had been applied before the damage was caused.

7.3.5 Two litres of touch-up paint per unit shall be supplied for repair of damages incurred during installation.

7.3.6 Screws and bolts shall be rust-proof and shall not be subjected to deterioration by time and humidity. Unpainted steel shall be properly protected either by galvanizing, metalizing, or by thermal cadmium plating.

SPECIFICATION

8. GROUNDING TRANSFORMER INFORMATION

8.1 Ratings and Data

8.1.1 225kVA, 13.8/7.9672kV- 600V Padmount Grounding Transformers

Quantity		4
Type	3-phase, oil-filled, sealed tank, padmounted	
Rated frequency	Hz	60
Rated voltages of windings:		
- primary	kV rms	13.8 (nominal tap)
- secondary	V rms	600
Connection of windings:		
- primary		Grounded Wye
- secondary		Delta
Type of cooling		ONAN
Average temperature rise of any winding above 30°C ambient temperature, measured by resistance	°C	65
Power rating at primary (13.8kV) nominal tap position at rated output voltage and 0.9 power factor lagging		
- ONAN 65°C Rise	kVA	225
Off load taps on primary voltage (13.8kV) winding (referenced to voltage on the secondary voltage winding)		5 full capacity, nominal 2 at 2.5% above nominal and 2 at 2.5% below nominal
Winding material	Copper (aluminum not acceptable)	
Primary Neutral grounding		solidly grounded

SPECIFICATION

8.1.1/

Positive Sequence Impedance - 225kVA (65°C) ONAN (Base)	%	4.0 (Minimum)
Vector Group		Yd1
Sound level standard		Per NEMA and ANSI Standards
Rated Lightning-Impulse Withstand Voltage:		
- Primary (13.8kV) winding	kV crest	95
- Secondary (600V) winding	kV crest	30
- Primary phase bushings	kV crest	95
- Primary neutral bushing	kV crest	95
Rated Short Duration Power Frequency Withstand Voltage:		
- Induced voltage for Grounded Primary winding	kV rms	2.0 x 13.8 for 7200 cycles
- Induced voltage for Secondary winding	V rms	2.0 x 600 for 7200 cycles
Rated short duration power frequency withstand voltage (Dry, 1 minute, 60Hz):		
- Primary winding bushings	kV rms	36
Minimum bushing creepage (kV based on phase to phase voltage)	mm/kV	25.0

8.1.2 Short Circuit Rating

- .1 Transformer core and coils assembly shall be designed to withstand, without injury or permanent deformation, the mechanical and thermal stresses caused by a short circuit on the external terminals of any winding or windings with rated voltage maintained across the terminals of all other windings for a minimum duration of two seconds.

SPECIFICATION

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8.2 Transformer Construction

8.2.1 Transformer Tank

- .1 The sealed tank design shall be of welded, sheet-steel construction, free from distortion, and constructed according to the transformer outline drawings submitted by the Vendor for review by the Owner's Engineer before construction.
- .2 The tank cover shall be welded to the transformer tank using flanges to facilitate removal.
- .3 Design the transformer tank and radiators to withstand, without deformation, full vacuum and positive and negative pressure according to Clause 7.2 of CSA-C2-M91.
- .4 Gasketed joints shall be designed to maintain an even and effective pressure to ensure oil tightness without overstressing the gasket. The material and thickness of all gaskets supplied shall be clearly shown in an appropriate table in the instruction manual provided in accordance with the requirements of Section A-8 of this Specification.
- .5 The bottom plate of the transformer tank shall be at least 1/8" thicker than that required by design strength requirements to allow for possible rusting.
- .6 Surge (lightning) arresters will be supplied and installed by others.
- .7 All box-type stiffeners on the tank wall shall be provided with self-draining holes.
- .8 The transformer terminal box enclosure, shall have overlapping hinged double doors, complete with a padlockable handle or tamper-proof, five point bolt system.
- .9 A weatherproof corrosion resistant NEMA 4X control box shall be provided, of sufficient size to house terminal blocks, auxiliary relays etc. as required for the transformer protection devices (sudden pressure, level instruments and current transformer).

SPECIFICATION

8.2/

8.2.2 Transformer Radiators

- .1 Each radiator assembly shall be individually welded and shall receive a quality control pressurized check for leaks prior to, and following tanking of, the core and coils.
- .2 The radiators shall be treated and painted on the inside and galvanized on the outside, according to CSA G164-M92.
- .3 Bracing of radiator fins, tubes or panels shall not be by direct welding of the bracing to the fins, tubes or panels.
- .4 Minimum separation between radiators shall be 6 inches. Radiators shall not be positioned over handholes, inspection covers or test point covers.

8.2.3 Valves and Pipes

- .1 All valves supplied shall be tabulated as to type, size, and Vendor on appropriate drawings and in the instruction books. Information leaflets shall be included for each type of valve.
- .2 An oil drain valve shall be located on the transformer tank wall as close as possible to the tank bottom to permit draining of oil and oil filtering operation.
- .3 A ½" globe valve and non-corrodible plug shall be provided for oil sampling from the transformer tank bottom and located near the oil drain valve for mechanical protection.
- .4 All valves shall be installed to provide clear, unobstructed access to valve handles.

SPECIFICATION

8.2/

8.2.4 Transformer Core

- .1 The core shall be manufactured of high-grade, grain-oriented, non-aging, silicon steel laminations having smooth insulated surfaces with edges free from burrs. The core and associated insulation shall be designed so that no detrimental changes in physical or electrical properties will occur during the life of the windings.
- .2 Core clamps shall be insulated from the core and electrically connected to the transformer tank. Core bolts, where used, shall be suitably insulated, minimum Class B, and shall be capable of withstanding the maximum voltage and temperature conditions that occur in the core during the design life of the windings.
- .3 The core and windings shall be braced to prevent displacement or distortion during transportation. Temporary blocking, if required, shall be marked in red to facilitate identification for removal, and noted in the installation instructions.
- .4 The transformer core ground connection shall be brought through the side of the transformer tank in either the primary or secondary terminal enclosure via a 5kV bushing and shall be connected to ground through a resistor having a minimum rating of 250 ohms, 25 Watts continuous. The core ground conductor connection shall be removable for testing purposes.
- .5 The core ground lead and connections shall be of sufficient cross sectional area to withstand fault current of 20 kA RMS for one second without fusing.

8.2.5 Transformer Windings

- .1 The winding connections and voltages shall be as indicated in Section 8.1 (Page B-8).
- .2 The winding material shall be copper.
- .3 Angular displacement and polarity shall be in accordance with CSA C2.1-06.
- .4 The primary wye winding neutral shall be brought through the transformer tank via a 5kV rated bushing (H0).

SPECIFICATION

8.2.5/

- .5 Polarity markings and schematic information of all windings shall be indicated on the nameplate.

8.2.6 Transformer Bushings

- .1 The transformer shall be provided with sidewall bushings for the three phases (H1, H2, H3) and the neutral (H0) of the primary winding for connection to the utility source and the line side of the oil-immersed loadbreak switch. Side wall bushings shall be provided for the three phases (X1, X2, X3) of the secondary winding in the secondary cable terminal compartment (refer to Section 7.1).
- .2 The primary bushings shall be wet-process porcelain type, or equivalent. Copper bushing leads shall be used to connect the transformer primary winding to the load side of the oil-immersed loadbreak switch.
- .3 The secondary bushings shall be for test purposes only, i.e. shall not be connected to an external load. A 1000V insulated 'boot' shall be supplied to cover the bushing terminal pad.
- .4 Bushings shall be gray, unless otherwise specified.
- .5 Each primary bushing shall have a stud-to-4 hole NEMA pad adaptor to accept the installation of one (1), 2 AWG copper, 15kVinsulated conductor, using a two-hole, long-barrel, copper crimp type compression connector.
- .6 One (1), two-hole, long-barrel, copper crimp type compression connector shall be supplied for each medium voltage phase and neutral bushing (H1, H2, H3 and H0).
- .7 All current carrying terminal connections shall be silver plated, copper alloy. Aluminum and Cu/Al are not acceptable.
- .8 Bushing terminal pads shall be drilled in accordance with ANSI C37-32 and shall be complete with terminal connectors and stainless steel hardware. The ampacity of the bushing terminal pads and connectors shall not be less than required for the maximum ONAN rating of the transformer.

SPECIFICATION

8.2/

8.2.7 Miscellaneous

- .1 All nuts and bolts ½" in diameter and smaller shall be stainless steel or silicon bronze. Plated fastenings are not acceptable.
- .2 Wiring on the exterior of the transformer shall be protected by rigid aluminum conduit.
- .3 Provide a ground pad inside the cable terminal box enclosure for the purpose of grounding the primary cable shields.

8.3 Off-load Tap Changing

- 8.3.1 The off load tapchanger shall be located on the primary winding with taps in accordance with CSA-C2-M91.
- 8.3.2 The tap changer shall be capable of carrying full capacity on all tap positions.
- 8.3.3 Control of the tap changer shall be externally accessible within the low voltage terminal compartment, with the mechanism penetrating the transformer tank above the oil high level mark. The tapchanger handle shall be equipped with padlocking hardware suitable to lock the handle in any position.
- 8.3.4 A sign reading “**CAUTION – Off Load Tapchanger. Do Not Operate with Transformer Energized.**” shall be attached beside the operating handle.

8.4. Accessories

8.4.1 General

- .1 All accessories shall be supplied in accordance with CSA-C2-M91, but subject to the modifications stated in this Specification.

8.4.2 Nameplate

The transformer nameplate shall be fabricated from stainless steel and permanently engraved in accordance with CSA-C2-M91, with the following additional data included:

- .1 The rating information shall be for 65°C temperature rise.

SPECIFICATION

8.4.2/

- .2 The nameplate shall state that the entire insulating oil system is capable of withstanding full vacuum.
- .3 Insulation rating of the primary neutral shall be stated if graded insulation is supplied.
- .4 A phasor diagram of all windings shall be shown.
- .5 Measured values of positive and zero sequence impedances shall be shown based on ONAN (65°C Rise), rating. Positive and zero sequence impedances between windings shall be shown.
- .6 On drainage, filling, and sampling plug nameplates, indicate their purpose.

8.4.3 Control Box

- .1 Provide a NEMA 4X enclosure with suitably rated terminal blocks for connection of transformer instruments, and current transformer, and for termination of field cables.
- .2 The control box shall be accessible within the low voltage terminal compartment of the transformer.
- .3 Provide shorting-type terminal blocks for the current transformer connections. Provide access to all CT taps at the terminal blocks.

8.4.4 Pressure Relief Device

- .1 An automatic pressure relief device (valve), Qualitrol or approved equal, mounted above oil level (high level), shall be provided. The opening pressure of the pressure relief valve shall be less than the withstand pressure of the tank structure. The pressure relief valve shall have a minimum flow rate of 7 l/s at a gauge pressure of 100kPa. A means for manual pressure and vacuum relief shall also be provided. DPDT auxiliary contacts functioned by the operation of the pressure relief device shall be wired to the control box.

SPECIFICATION

8.4/

8.4.5 Transformer Indication

- .1 An oil level gauge shall be mounted on the front of the tank in the low voltage compartment. DPDT auxiliary contacts functioned by a drop of the tank oil level shall be wired to the control box.
- .2 A pressure-vacuum gauge, Qualitrol or approved equal, complete with shutoff valve, shall be mounted on the front of the tank in the low voltage compartment.
- .3 A 'top' oil temperature indicator, complete with indicating hand and drag hand for maximum indication, shall be mounted on the front of the tank in the low voltage compartment. Two form 'c' contacts wired to terminal blocks in the control cabinet, with settings 90°C for alarm and 105°C for trip (settings to be confirmed by transformer Vendor).
- .4 Alternatively, the transformer gauges may be housed in a separate tank mounted weatherproof enclosure.

8.4.6 Current Transformer

- .1 A standard 50-5A, single ratio, encapsulated, toroidal bushing type current transformer shall be installed externally on the primary neutral (H0) bushing. The minimum current transformer relay accuracy shall be C10 @ 50-5A. The current transformer shall be installed on a tank wall bracket. The current transformer shall be designed in accordance with CSA Standard C60044-1-07.
- .2 The ratio and polarity of the current transformer shall be shown on the nameplate.
- .3 The current transformer shall be oriented with the primary polarity mark away from the transformer H0 bushing, i.e. towards ground.
- .4 The dielectric strength of the current transformer secondary wiring shall be sufficient to withstand the current transformer open circuit voltage for one minute. Current transformer secondary wiring to the control cabinet terminal blocks shall be considered an integral part of the current transformer for all test requirements. All wires shall be identified at each end with heat-shrinkable wire markers.

SPECIFICATION

8.4.6/

- .5 The continuous thermal current rating shall be 200% of rated current, based on temperature rise in accordance with CSA C60044-1-07.
- .6 The current transformer shall be adequately braced to prevent damage and movement during shipping. Instructions for removal of all temporary shipping braces shall be supplied.
- .7 The current transformer shall be removable without removing the H0 bushing
- .8 The following information shall be supplied for the current transformer:
 - .1 Specification number for replacement
 - .2 Ratio and accuracy
 - .3 Resistance of the full secondary winding
 - .4 Excitation curves
 - .5 Magnetization curves

8.4.7 Connectors

- .1 Two transformer tank grounding connection pads, drilled for NEMA two-hole connectors, shall be supplied on diagonally opposite sides of the transformer tank. A copper, two-hole, long barrel, Burndy, crimp-type copper connector suitable for 4/0 AWG copper and installation hardware shall be supplied for each connection pad.

8.4.8 Gaskets

- .1 Gaskets shall be of either nitrile rubber or neoprene rubber, or an approved equivalent. Gaskets stops shall be provided to prevent over-compression of the gasket material. A sufficient quantity of gasket cement shall be supplied for initial installation. One spare gasket of each type necessary for field assembly shall be provided.

SPECIFICATION

9. 13.8kV OIL-IMMERSED LOADBREAK SWITCH

9.1 Supply a two-position, three-pole, oil-immersed group operated, primary loadbreak switch that is integral to the overall transformer assembly.

9.1.1 Ratings and Data

Type	two-position, oil-immersed, 3-polegroup operated
Mechanism	stored energy trip free
Rated voltage	kV rms 15.5
Maximum voltage	kV rms 15.5
Rated current for continuous service at 60Hz and 40°C ambient	A rms 550
Rated 3 phase momentary fault withstand at 15.5kV (1 second)	kA rms sym 12
Rated frequency	Hz 60
Rated impulse withstand voltage	kV crest 95
Rated power frequency withstand voltage (1 min.)	kV rms 36

9.1.2 The oil-immersed loadbreak switch shall be a Cooper Power Systems Model LS2R515H3N2A, or approved equal.

9.1.3 A reinforced glass window shall be provided in the transformer tank wall to allow for visual confirmation that the loadbreak switch is “open” or “closed”.

9.1.4 Provide dimensioned drawings with the Tender to indicate the layout arrangement of the loadbreak switch within the transformer tank, with respect to the location of the core and coils.

SPECIFICATION

9.1/

9.1.5 Provide suitable interlocking devices to restrict access to LV compartment unless the load-break switch is open, and to comply with applicable standards.

9.2 Nameplates

9.3.1 Provide one nameplate made of stainless steel and fixed to the exterior wall of the transformer tank, near the loadbreak switch operating mechanism, with non-rusting screws, showing the following details:

- Vendor's name and address
- Vendor's model and serial number
- Manufacturing date
- Basic impulse insulation level
- Basic equipment data according to the standards of the equipment
- List of design standards and certifications in compliance

10. FACTORY TESTS

10.1 Unless otherwise specified, carry out transformer testing in accordance with ANSI C57.12.90, and loadbreak switch testing in accordance with EEMAC G8-3.3, latest edition.

10.2 In addition, the following factory tests shall be performed on three of the transformers selected at random:

10.2.1 No-load loss test to be performed at 90%, 100%, and 110% rated volts.

10.2.2 The excitation current test shall be extended to include the saturation curve up to 115% rated volts and the curve shall be extrapolated to 130% of rated voltage.

10.2.3 After completion of all other tests and prior to shipment, the unit shall be energized at 110% voltage 60 Hz for one hour at no load. The results shall be within 5% of previous no load loss test results.

10.3 Advise the Owner's Engineer fifteen (15) working days prior to the tests so that he may attend.

10.4 All test facilities shall be available at the place the equipment is being manufactured.

10.5 Upon completion of tests, four copies of Vendor certified test results shall be supplied to the Owner. The test results shall show all tests conducted in accordance with this Specification.

SPECIFICATION

11. SHIPPING TESTS

11.1 The following test procedure shall be performed on the assemblies as a test for shipping damage:

11.1.1 At the factory prior to shipment:

- a) After loading the assemblies onto the common carrier, the Vendor shall measure the core insulation of each transformer with a 1000V (minimum) bridge megger. The value of core insulation and the applied test voltage (ac or dc) shall be included in the certified transformer test report under "Core Insulation Resistance Test After Loading onto Carrier at Factory".
- b) The dew point of the shipping gas inside each transformer per shall be checked to ensure it is below -40°C. The results shall be recorded on the test reports.

11.1.2 At the destination:

- a) Prior to off-loading the assemblies from the Carrier, the Owner's Engineer, in the presence of the Vendor, shall measure the transformer core insulation and the dew point of the gas. These readings shall be compared to the values obtained at the factory.

12. TOOLS

12.1 Supply a list and prices of a complete set of all special tools that may be required for the normal and proper maintenance of the equipment supplied.

SPECIFICATION

13. CONSTRUCTION DOCUMENTS

13.1 Vendor's Drawings

13.1.1 Transformer drawings shall show basic details and dimensions, location of centre of gravity, gasket location, thickness and material as well as other details as necessary.

13.1.2 A separate shipping drawing shall be supplied for the assemblies giving the following information:

- a) Shipping heights, width, length, and base dimensions
- b) Centres of gravity in shipping condition
- c) Location of jack steps, rolling areas, and blocking areas
- d) Slings requirements and restrictions, if any, for crane off-loading of the transformer
- e) Position of gas bottles, regulators, and gauges if shipped in gas
- f) Position of core ground test link
- g) Details of gas shipping conditions and pressure checks to be made
- h) Complete Bill of Materials

13.1.3 Wiring diagrams, schematic diagrams, layout drawings, bills of material and product data sheets shall be provided.

13.2 Operation and Maintenance Manuals

13.2.1 Instruction manuals shall describe in detail the construction and recommended procedures for assembling, dismantling, maintaining, and operating all equipment and listing all replacement parts. These shall include copies of all pertinent bulletins and instructions prepared by the Vendors, of component parts of the equipment, properly catalogued for easy reference.

SPECIFICATION

14. EFFICIENCY EVALUATION

- 14.1 The Vendor shall guarantee the following transformer losses:
 - a) No-Load loss in kilowatts at rated voltage and rated frequency.
- 14.2 Measurement of load losses is not required. No load will be connected to the secondary (600V) delta winding.
- 14.3 Transformer no-load losses determined under tests shall be corrected to 85°C.
- 14.4 For comparison of tenders, the transformer no-load losses will be evaluated on the basis of the capitalized cost figures calculated over a 20 year life expectancy of the transformer, as stated below, and are to be given on the base ONAN rating:
 - .1 No-Load Losses: \$2,190 per kW
- 14.5 If the losses as tested exceed the losses as guaranteed by more than the tolerances specific in CSA Standard CSA-C2-M91, the following shall apply:
 - .1 The capitalized cost of the no-load losses as guaranteed will be subtracted from the excess of capitalized cost of the losses as tested and the excess of the capitalized cost will be assessed to the Vendor as a cost adjustment using the figures per Section 14.4.

SPECIFICATION

SECTION C

SCHEDULES

SPECIFICATION

SECTION C

SCHEDULES

1. INSTRUCTIONS

- 1.1 Complete and submit with the tender and schedules contained in this section.
- 1.2 Incomplete schedules may render the tender inadmissible.

SPECIFICATION

SCHEDULE No. 1

TECHNICAL INFORMATION

1. 225kVA, GROUNDING TRANSFORMERS c/w OIL-IMMERSED LOADBREAK SWITCHES

1.1 225kVA, 13.8/7.967kV-600V Grounding Transformers:

Quantity		_____
Vendor		_____
Type		_____
Rated capacity at low voltage terminals at 65°C rise:	MVA ONAN	_____
Rated primary voltage	kV rms	_____
Rated secondary voltage	V rms	_____
Guaranteed positive sequence impedances, Z_1 on rated MVA base, at 85°C and mid tap	H-L %	_____
Guaranteed zero sequence impedances, Z_0 on rated MVA base, at 85°C and mid tap	H-L %	_____
Guaranteed no-load losses at rated frequency and rated voltage on mid tap, 85°C	kW	_____

SPECIFICATION

SCHEDULE No. 1 (Cont'd)

1.1 225kVA, 13.8/7.967kV-600V Grounding Transformers (Cont'd):

Exciting Current:

- | | | |
|-------------------------|-------|-------|
| - at 100% rated voltage | A rms | _____ |
| - at 110% rated voltage | A rms | _____ |

Efficiency at rated frequency
and the following currents
on mid tap, 85°C:

- | | | |
|--------------------------------|---|-------|
| - at 125% ONAN load, 65°C rise | % | _____ |
| - at 100% ONAN load, 65°C rise | % | _____ |
| - at 75% ONAN load, 65°C rise | % | _____ |
| - at 50% ONAN load, 65°C rise | % | _____ |

Regulation:

- | | | |
|------------------------|---|-------|
| - at 80% power factor | % | _____ |
| - at 90% power factor | % | _____ |
| - at 100% power factor | % | _____ |

Winding material _____

Vector group _____

Rated lightning-impulse withstand voltage:

- | | | |
|---------------------|----------|-------|
| - Primary winding | kV crest | _____ |
| - Secondary winding | kV crest | _____ |
| - Primary bushings | kV crest | _____ |

SPECIFICATION

SCHEDULE No. 1 (Cont'd)

1.1 225kVA, 13.8/7.967kV-600V Grounding Transformers (Cont'd):

Rated short duration power
frequency withstand voltage:

- | | | |
|--|--------|-------|
| - Induced voltage for grounded primary winding | kV rms | _____ |
| - Induced voltage for grounded secondary winding | kV rms | _____ |

Rated power frequency
withstand voltage (dry, 1 min., 60 Hz):

- | | | |
|--------------------|--------|-------|
| - Primary bushings | kV rms | _____ |
|--------------------|--------|-------|

Rated current:

- | | | |
|----------------------|-------|-------|
| - Primary bushings | A rms | _____ |
| - Secondary bushings | A rms | _____ |

Bushing Leakage Distance:

- | | | |
|--------------------|----|-------|
| - Primary bushings | mm | _____ |
|--------------------|----|-------|

Minimum corona inception voltage for 13.8kV winding	kV rms	_____
---	--------	-------

Minimum corona inception voltage for 600V winding	kV rms	_____
---	--------	-------

Maximum sound level measured in accordance with IEC 551	dB	_____
---	----	-------

SPECIFICATION

SCHEDULE No. 1 (Cont'd)

1.1 225kVA, 13.8/7.967kV-600V Grounding Transformers (Cont'd):

Maximum RIV at 1 MHz measured at 5% above rated voltage in accordance with NEMA 107 μV _____

Short circuit current withstand ratings:

- Primary winding A rms sym. _____

- Secondary winding A rms sym. _____

Maximum duration of rated short circuit withstand current:

- Primary winding sec _____

- Secondary winding sec _____

Type of steel core lamination _____

Flux density of core at 13.8kV Tesla _____

Flux density of core at 600V Tesla _____

Thickness of transformer plates:

- tank mm _____

- radiator plates mm _____

- control cabinet mm _____

Vacuum that tank and radiators can withstand kPa _____

Positive pressure that tank and radiators can withstand kPa _____

SPECIFICATION

SCHEDULE No. 1 (Cont'd)

1.2 Terminal Arrangements and Conductor Connectors:

Connectors for Primary (H1, H2, H3) Terminal Conductors:

- Vendor _____
- Designation or Catalogue No. _____
- Type _____

Connector for H0 Terminal Conductor:

- Vendor _____
- Designation or Catalogue No. _____
- Type _____

1.3 Accessories:

Off-Load Tap Changer:

- Vendor _____
- Type _____
- Number of Steps _____
- % Primary voltage variation % _____
- Capacity of taps A _____

Transformer Tank Liquid Temperature Indicator:

- Vendor _____
- Type _____
- Contact Rating _____

SPECIFICATION

SCHEDULE No. 1 (Cont'd)

1.3 Accessories (Cont'd):

Transformer Tank Liquid Level Gauge:

- Vendor _____
- Type _____
- Scale _____
- Contact Rating _____

Transformer Tank Pressure-Vacuum Gauge:

- Vendor _____
- Type _____
- Scale _____

Transformer Tank Pressure Relief Device:

- Vendor _____
- Type _____
- Setting for pressure relief _____
- Contact Rating _____

SPECIFICATION

SCHEDULE No. 1 (Cont'd)

Transformer HO Grounding Current Transformer:

- Vendor _____
- Type _____
- Ratio _____
- Accuracy Class _____

1.4 Insulating Oil:

- Vendor _____
- Type _____

1.5 Cooling System:

- Number of radiators _____

1.6 Transformer Weights, Dimensions, and Miscellaneous:

- | | | |
|--|----|-------|
| Overall height | m | _____ |
| Overall width | m | _____ |
| Overall length | m | _____ |
| Weight of core and coils | kg | _____ |
| Weight of tank and fittings | kg | _____ |
| Weight of oil | kg | _____ |
| Total weight of transformer assembly | kg | _____ |
| Method of oil shipment | | _____ |
| Maximum shipping weight
(heaviest item) | kg | _____ |

SPECIFICATION

SCHEDULE No. 2

DOCUMENTS TO BE SUBMITTED WITH TENDER

Drawing or Document Ref. No.

Completed Schedules	_____
Outline dimensions and layout of equipment and enclosures	_____
Bills of Material	_____
Catalogues	_____
Instruction Pamphlets	_____
Painting Procedure Specification	_____
Certified "Type Test" Reports (including list of Type Tests to be performed)	_____
List of Recommended Spare Parts (Include prices for each item):	
- readily available	_____
- long delivery	_____
List of required Special Tools	_____
Bar chart progress schedule showing manufacture, delivery, issue of drawings, and all phase of the work	_____
Transportation method and route (including details of trailer and wheel loading)	_____

SPECIFICATION

SCHEDULE No. 3

TENDERED VARIATIONS FROM THE SPECIFICATION

The Tenderer shall detail hereunder, any variations from the terms and conditions of this Specification:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Signature: _____

Date: _____

SPECIFICATION

SCHEDULE No. 4

ERECTION SUPERVISOR

State the daily rate for the provision of a qualified person to supervise the erection and commissioning of the equipment being supplied.

The daily rate shall cover all costs such as salary, subsistence, local traveling within 30 kilometres of the jobsite, communications and the supply of any special tools he/she requires to properly perform the work.

Daily Rate for Erection Supervisor: \$ _____

Also provide details of any terms and conditions applicable to each supervisor:

SPECIFICATION

SCHEDULE No. 5

COMMENCEMENT AND COMPLETION DATES

	<u>Required Dates</u>	<u>Tendered Dates</u>
1. Issue of Purchase Order	1 March 2011	
2. Submit Bills of Material and Planning Schedule for review.	1 April 2011	
3. Submit assembly drawings, foundation and base plate details, layout and drilling details, single line diagrams, wiring diagrams, control schematics and drawings for review.	1 April 2011	
4. Submit performance curves and other supporting documentation.	1 May 2011	
5. Submit final copies of shop drawings	1 May 2011	
6. Submit draft copies of Operation and Maintenance Manuals.	1 May 2011	
7. Delivery of grounding transformers, DDP F.O.R.C.E. Intertie Substation location Black Rock, Nova Scotia, 10km west of Parrsboro, Nova Scotia	1 June 2011	

SPECIFICATION

SCHEDULE No. 6

SPARE PARTS LIST

<u>Recommended Spare Parts</u>	<u>Quantity</u>	<u>Price (Cdn \$)</u>
1. Complete Set of Gaskets, together with Gasket Cement	1	
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Total Price Carried to Schedule 8: \$ _____

SPECIFICATION

SCHEDULE No. 7

ACCESSORIES AND SPECIAL TOOLS LIST

<u>Recommended Accessories and Special Tools</u>	<u>Quantity</u>	<u>Price (Cdn \$)</u>
1.		
2.		
3.		
4.		
5.		

Total Price Carried to Schedule 8: \$ _____

SPECIFICATION

SCHEDULE No. 8

PRICE LIST

<u>Item</u>	<u>Description</u>	<u>Qty</u>	<u>Price (Cdn \$)</u>
1.	Design, manufacture, test, deliver, off-load, and provide a written guarantee for four (4), 225 kVA, Sealed Tank, 13.8/7.967kV-600V, Padmount Grounding Transformers c/w Oil-Immersed Loadbreak Switches	lot	\$ _____
2.	Accessories and Special Tools (from Schedule No. 7)	lot	\$ _____
	Total Equipment Supply (Items 1 & 2)		\$ _____
	Transportation DDP to FORCE Intertie Substation site. Black Rock, Nova Scotia, 10km west of Parrsboro, Nova Scotia	lot	\$ _____
	Canadian Customs Duty	lot	\$ _____
	Harmonized Sales Tax (HST)	15%	\$ _____
	Total Supply & Deliver FORCE Intertie Substation site. Black Rock, Nova Scotia, 10km west of Parrsboro, Nova Scotia		\$ _____
4.	Tenders shall provide a separate price for the following optional item:		
	Spare Parts List (from Schedule No. 6)	lot	\$ _____

SPECIFICATION

SCHEDULE No. 9

FORM OF TENDER

**Item: Four (4), 225kVA, 13.8/7.967kV-600V, Sealed-Tank, Oil-Filled
Padmount Grounding Transformers c/w Oil-Immersed Loadbreak Switches**

Vendor Ref. No.: _____

1. Total Supply, Delivery & Assembly (From Schedule No. 8): \$ _____
2. Terms of Payment: _____
3. Customs Clearance by: _____
4. Point of Shipment: _____
5. Promised Shipping Date: _____
6. INCOTERMS 2000 Definition: _____
7. Recommended Methods of Shipment: _____
8. Estimated No. of Packages: _____
 - Shipping Weight Each Package: _____
 - Shipping Dimensions Each Package: _____
9. Conditions of Guarantee: _____
10. Other: _____

Prepared by: _____

Date: _____