

Project Sites: Rideau St. Lawrence Distribution 9 Substations in Prescott, ON; Morrisburg, ON; Iroquois, ON and Cardinal, ON

D-001 Rev. 1 Substation Condition Assessment

CONFIDENTIAL

March 18, 2020



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SECTION A: DISCLAIMERS AND REVISION LOG

Project Information

Project Name:	Substation Condition	Project Sites:	Cardinal MS1
	Assessment		Cardinal MS2
Project #:	30934		Iroquois MS
Report Title:	Substation Condition		Morrisburg MS1
	Assessment		Morrisburg MS2
Customer:	Rideau St. Lawrence		Prescott MS1
	Distribution		Prescott MS2
Document:	D-001		Prescott MS3
			Prescott MS4

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Revision Log

Revision	Date	Prepared by:	Reviewed by:	Approved by:	Description
00	2019-12-20	RSG	НН	RSG	Draft for Customer Review
01	2020-03-05	RSG	НН	RSG	Customer Comments



SECTION B: PREAMBLE

1. EXECUTIVE SUMMARY

Spark Power, as Tal Trees Power Services, was engaged by Rideau St. Lawrence Distribution to perform a data-driven condition assessment of their nine (9) municipal substation, located in four (4) operating areas, that would be used to plan future station projects or service activities. This information will be used to develop capital and, operations & maintenance budgets that can be incorporated in subsequent rate filing applications.

The findings of the assessment revealed a number of small modification and larger capital projects which would maintain system reliability and ensure long-term operations for Rideau St. Lawrence. The projects were provided with priority levels based on criticality and scoring of the component, available redundancy in the event of an emergency and benefit to the station's scoring after the change is made. A detailed list is provided in Section E.

Station	Total Station Score	Top Project	Priority	Score After Top Project
Cardinal MS1	2.6	New T1	Medium	3.7
Cardinal MS2	2.7	New T1	Medium	3.9
Iroquois MS	3.6	New T1	Low	4.2
Morrisburg MS1	3	New T1	High	3.8
Morrisburg MS2	2.7	New T1	Severe	3.6
Prescott MS1	3.8	N/A	N/A	N/A
Prescott MS2	3.3	N/A	N/A	N/A
Prescott MS3	2.8	40F1 & 40F2 Repair	Medium	3.5
Prescott MS4	3.0	New T1	Low	3.9

A summary of the most impactful upgrade for each station, priority level and change in station scoring after the project is completed is provided below.

2. INTRODUCTION

The data-driven condition assessment differs from the typical industry practice which relies on visual inspections and operational feedback during a site visit. The typical practice generally finds that equipment beyond manufacturer defined end-of-life should be planned for replacement. A data-driven assessment utilizes established industry maintenance practices to assess the condition of each component so that even components after manufacturer end-of-life can be considered for long-term reliability. For context, a liquid-filled transformer which rarely carries over 50% load can be expected to last well beyond its design lifespan, in many cases over 40 years.

3. METHODOLOGY

The preparation of this report consisted of the following steps:

1. Data Gathering

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- a. Available maintenance reports from 2017 & 2018 were received from Tal Trees
- b. Tal Trees performed maintenance services on five (5) substations in 2019 and provided reports to the engineering team.
- c. Site visits were performed at each substation to gather visual data on station infrastructure and accompanied by Rideau St. Lawrence personnel to establish an understanding of the station operating procedures.

2. Data Analysis

- a. Each substation was evaluated as follows:
 - i. Each major component was assessed based on the maintenance data.
 - 1. Assessments were broken up into several key categories based on NETA ATS equipment criteria.
 - 2. A cumulative score was established for each component based on a weighting of the component scores.
 - 3. A scoring matrix is provided below. Note that a zero (0) score is not shown but would be indicative of a failed component requiring replacement before reenergization.

			Equipment Scoring				
Equipment ID	Description	1	2	3	4	5	Weighting
Transformer	Mechanical Assessment	Visible evidence of oil pooling indicating significant leak and/or rust visible on tank, radiator or conservator.	Trace amounts of oil around the transformer. Some rusting of base or structural supports of the transformer.	Transformer accessory(ies) no longer functioning (i.e. liquid level, temperature gauge, etc.)	Transformer < 10 years old, no mechanical issues.	Appears brand new.	0.5
	TTR	Turns Ratio Rest results differ from tap changer. Investigate results.	Not applicable.	Not applicable.	Not applicable.	Turns Ratio Test Results match tap charger configuration.	0.5
	Winding Resistance	More than 1% deviation from average phase reading.	Not applicable.	Within 1% of average phase reading.	Not applicable.	Within 0.5% of average phase reading.	0.5
	Dielectric Absorption Test (DAT)	DAT indicates reduced dielectric capacity, supported by DGA	Indicates reduced dielectric capacity, DGA still within specification.	DAT is lower than previous past results but still acceptable.	DAT is within satisfactory specification.	All data within specification, near initial factory test data.	1
	Dissipation Factor	Greater than 1%.	Less than 1% corrected.	Less than 0.75% corrected.	Less than 0.5% corrected.	Less than 0.25% corrected.	0.5
	Dissolved Gas Analysis (DGA)	DGA results continue to trend in negative direction, or results indicate contamination.	DGA results exhibit levels indicative of overheating or reduced dielectric capacity, either trend data not	Results exhibit levels of overheating or reduced dielectric capacity in the past, but trend	Results within satisfactory specification.	All data well within specification, near initial factory test data.	5

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	Spare	No spare	available or change in data. Not applicable.	data is available and level. Spare	Not	Spare	
	opure	available.	not applicable.	transformer on- site.	applicable.	transformer off-site.	2
	Mechanical	Mechanical operation unreliable; Enclosure exhibiting significant rust	Slow or difficult operation; small amounts of rust	< 20 years old, no mechanical issues; trace or limited amounts of rust.	< 10 years old, no mechanical issues; no signs of enclosure degradation	Appears brand new.	2
Switching Equipment	Contact Resistance	High resistance, visible heat damage	Phase difference > 50%	Low resistance, phase difference > 25%	Low resistance, minor phase differences	Low resistance, all phases similar	2
	Fuse resistance	Phase difference > 50%	Phase difference > 25%	Low resistance, phase difference > 10%	Low resistance, minor phase differences	Low resistance, all phases similar	2
	Fuse spares	No longer available new	Spares > 1 week lead time, or refurbished units only	Spares > 1 day lead time	Spares available off- shelf	Spares on- site / in storage	1

- ii. The substation was then evaluated based on the findings of the site visit and discussion with Rideau St. Lawrence staff:
 - 1. An assessment was performed on individual categories based on industry best practices as identified in the scoring matrix provided below:

	Infrastructure Scores							
ltem	1	2	3	4	5			
Building	Significant structural or mechanical issues.	Structural or mechanical concerns are visually evident.	Some signs of deterioration, moisture infiltration, etc.	No signs of deterioration.	Installation condition consistent with brand new.			
Fencing	Significant problems with structural integrity of fencing.	Signs of deterioration of posts or open areas in wire mesh.	Some rusting of posts or minor damage to mesh.	No signs of deterioration.	Installation condition consistent with brand new.			
Ground Grid	Exposed grounding conductor, areas bare of granular; major safety concern	Areas lacking granular, weeds over 2' in length; visibly would not satisfy design resistance	Weeds growing through granular, granular mostly in tact, not recently tested to design resistance	Granular less than 6" deep, tested recently to design resistance	Granular at 6" depth, test ground rod visibly marked or accessible			
Structures	Significant rusting and structural defects in steel lattice or structure.	Some rusting or defects in structures. Clearances or heights no longer meet code.	Some rusting or defects in structures, no design flaws.	No signs of deterioration or design flaws.	Installation condition consistent with brand new.			
Foundations	Exposed rebar with visible signs of rust	Foundations exhibit signs of deterioration	Foundations exhibit some cracking due to	No signs of stress or wear, < 10 years old	No signs of wear or tear, less than 10 years old			

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	and deterioration.	around edges and in need of patching	age but otherwise in good condition		
Security	No security measures in place. Station readily accessible by unauthorized personnel.	Physical security in place, no yard lighting or extended security system	Both physical security measures and yard lighting in place. Visible from major roadways.	Some remote security in place, with physical measures and yard lighting.	Physical, and remote security features in place with yard lighting.
Conductors	Conductors installed or condition causing potential hazard.	Conductors or terminations appear to be deuterating due to age or installation practices.	Some signs of deterioration of conductor or terminations.	No signs of deterioration.	Installation condition consistent with brand new.
Safety	Code compliancy concerns require major renovation. (> \$100k)	Code compliancy concerns require restoration immediately (< \$50k)	Minor code compliancy concerns require immediate restoration (< \$10k).	Grandfathered code issues which can be readily corrected at next renovation.	No code compliancy concerns.

- 2. A cumulative score was established for the station based on the lowest score of the individual categories. The minimum score was selected as any infrastructure component was deemed equally important and substantial enough to necessitate the markings.
- iii. The cumulative substation score was established based on the weighting of component and substation infrastructure.
- b. Each substation was also scored based on its impact on system reliability. The system reliability score is used to prioritize recommended substation projects based on their impact to system availability.

	Reliability Score							
Description	1	2	3	4	5			
Redundancy	No redundancy or critical spares available.	Some redundancy is provided through manual switching but not at peak loading.	Redundancy provided through spare equipment which must be relocated.	Station is redundant at the station & feeder level via manual operation.	Station is redundant at the station & feeder level via automatic operation.			

3. Recommendations

- a. Based on the findings of the Data Analysis, project recommendations are made for each substation with an outlook over the next 1-5 years.
- b. Recommendations range from equipment replacement, spare capacity or infrastructure modifications. Projects are ranked based on impact, and recommended timeframe.
- 4. Summary and Conclusions
 - a. Overall recommendations are provided along with a prioritization amongst the substations based on community size and potential impact to system reliability.



b. Some recommendations for the design of future modifications are also provided which can improve system reliability.

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SECTION C: TERMS AND DEFINITIONS

Throughout this document, several technical terms, acronyms and initializations shall be used:

<u>Term</u> MS	<u>Definition</u> Municipal Substation	Description LDC-owned substation for transformation and distribution of rural system voltages (44 kV delta) to municipal voltages (generally 4160V or 13.8 kV four- wire systems)
DS	Disconnect Switch	An electrical isolation device
DG	Distributed Generation	Generation facility connected to distribution system
ТХ	Transformer	An electrical device which converts voltage levels
LBS	Load Break Switch	Isolation device that can operate during full load
LDC	Local Distribution Company	Utility that owns connecting distribution system
HONI	Hydro One Networks Inc.	Utility that owns distribution and transmission assets
OESC	Ontario Electrical Safety Code	Rules & requirements that govern electrical installations in Ontario
OGCC	Ontario Grid Control Center	Operations centre for Ontario Transmission Assets
TS	Transmission Station	Substation for transformation of transmission voltages (>= 69 KV) to distribution voltages (13.8 kV)
SEL	Schweitzer Engineering Laboratories	Manufacturer of utility-grade protection relays, communication processors and technologies.
SLD SCADA	Single Line Diagram Supervisory Communications and Data Acquisition	Schematic depicting facility electrical infrastructure System of relays, controllers and network devices used to monitor, control electrical system



SECTION D: CONDITION ASSESSMENT

1. CARDINAL MS1

Cardinal MS1 is a 44 kV to 4160V municipal substation located at 715 County Rd. 2 in the village of Cardinal, Ontario. It is one of two substations in the Cardinal area, with the other being Cardinal MS2. The transformer is a 3/4 MVA Oil Filled Transformer that dates to 1953. It has been maintained but never refurbished. The 4160V system runs from the transformer secondaries down a riser to a three-bay S&C Metal-Enclosed Switchgear lineup that includes a metering bay and two outgoing fused switch bays. The switchgear was installed new in 2013. One feeder is normally closed at the station while the other is normally open. There is redundancy within the 4160V distribution system in Cardinal.

The station infrastructure consists of a small steel lattice structure for the overhead incoming dead-end, a small single column secondary riser support structure and a shed. The station has a large surface area, sufficient for future expansion or side-by-side station replacement. It is surrounded by an eight-foot chain-link fence topped with barbed wire.

Hourly load data was provided for Cardinal MS2. The load ranges from under 300 kW to approximately 1100 kW during the year. It appears that Cardinal MS1 was taken offline for a period, resulting in complete load shifting to Cardinal MS2, yielding a peak cumulative capacity of approximately 1800 kW. This data indicates that one transformer could effectively carry the Cardinal area load, providing a level of redundancy to the Cardinal distribution system. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed on August 24, 2017:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - o Capacitance Test
 - Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

The maintenance activities undertaken at the substation determined that most of the core components are in good working order, particularly the switching equipment. The cumulative scoring for the high voltage and secondary switching equipment scored an average of 4.2 out of 5, with low scores



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The power transformer on the other hand exhibits evidence of overheating and insulation degradation based on the oil analysis & dielectric testing. Due to the age of the transformer, it's possible that it may be nearing end-of-life rather than having experienced high loading or other usage-based degradation. As such, we have assessed the transformer a score of 1.55 out of 5.

c) Station Infrastructure Assessment

The station is in relatively good condition for the age of the construction. The fencing, structures, foundations and ground grid all appear in good condition. The station would score a 3 out of 5, due to the lack of remote security equipment, if not for the condition of the secondary conductors (flexible bus) directly off the transformer secondary bushings. Due to the visible fraying, these conductors should be replaced (at relatively low cost) and result in a station infrastructure a score of 2.

As some redundancy exists between Cardinal MS1 & Cardinal MS2, we established a redundancy score of 3 out 5.

d) Summary & Recommendations

Based on the substation assessment, we have developed a total score of 1 out of 5. The score is based on the findings that the transformer is potentially nearing end-of-life. Due the age of the unit and the status of the oil sample, we recommend that a spare or replacement transformer be considered in the near future.

The following minor recommendations are made to improve the reliability of the substation:

- Replace flexible bus at the transformer secondaries.
- Consider a motion-based camera system with SCADA reporting
- Until the transformer is replaced, we recommend performing oil analysis on an annual basis to develop trended DGA data

During the site visit, we identified the following procedural items which should be considered:

- The main switch is not load break rated. While kirk keying is not required for utility personnel, we do recommend providing signage or written procedures locally to ensure staff operate the low voltage disconnects prior to opening the main switch.
- While a simple configuration, we also recommend a single line diagram be placed within the station. A lamacoid on Bay 1 of the secondary switchgear would be an appropriate location.

2. CARDINAL MS2

Cardinal MS2 is a 44 kV to 4160V municipal substation located at 3039 John St in the village of Cardinal, Ontario. It is the second of two substations in the Cardinal area, with the other being Cardinal MS1. The transformer is a 3/4 MVA Oil Filled Transformer that dates to 1953. It was refurbished in 1996 by Reliance Transformers. The 4160V system runs from the transformer secondaries down a riser to a three-bay S&C Metal-Enclosed Switchgear lineup that includes a metering bay and two outgoing fused switch bays. The switchgear was installed new in 1996. The switchgear pad was constructed to allow for a third fused switch bay. There is redundancy within the 4160V distribution system in Cardinal.

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The station infrastructure consists of a concrete pole for the overhead incoming structure with underground cables connecting directly to the secondary bushings. The station has ample working space and located near industrial parking & residential properties.

Hourly load data was provided for Cardinal MS2. The load ranges from under 300 kW to approximately 1000 kW during the year. It appears that Cardinal MS1 was taken offline for a period, resulting in complete load shifting to Cardinal MS2, yielding a peak cumulative capacity of approximately 1800 kW. This data indicates that one transformer could effectively carry the Cardinal area load. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed on August 23, 2017:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - o Fuses & Fuseholder visual inspection & resistance testing
 - o All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - Capacitance Test
 - o Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

The equipment assessment results of Cardinal MS2 are very similar to Cardinal MS1. The switching equipment, except for the Phase A HV Fuses, are in great condition and appear to have several years of useful life remaining. We recommend investigating the Phase A HV Fuses at the next available maintenance activity to determine if the fuseholders require adjustment or repair to improve resistivity measurement. We scored the switching equipment an average of 3.6 out of 5 mainly due to lack of spare fuses.

The power transformer though does exhibit signs of deterioration in both the oil analysis and insulation resistance testing results, like the transformer for Cardinal MS1. We have assessed the transformer a score of 1.55 out of 5.

c) Station Infrastructure Assessment

The substation infrastructure appears in good condition, with no concerns visible or noted through operations. The station infrastructure scores a 3 out of 5 based on the lack of remote security features.



As some redundancy exists between Cardinal MS1 & Cardinal MS2, we established a redundancy score of 4 out 5.

d) Summary & Recommendations

Based on the assessment performed for Cardinal MS2, we have developed a total score of 2.7 out of 5. The score is primarily based on the findings that the transformer is exhibiting conditions associated with end-of-life. Due to the age of the unit and the status of the oil sample, we recommend that a spare transformer or replacement transformer be considered soon.

The following other recommendations are made to improve station reliability:

- Revisit Phase A HV Fuses & Fuseholder to determine cause of high resistance
- Consider a motion-based camera system with SCADA reporting
- Continue to monitor health of the transformer until replacement: perform oil analysis on an annual basis to develop trended DGA data

During the site visit, we identified the following procedural items which should be considered:

- The main switch is not load break rated. While kirk keying is not required for utility personnel, we do recommend providing signage or written procedures locally to ensure staff operate the low voltage disconnects prior to opening the main switch.
- While a simple configuration, we also recommend a single line diagram be placed within the station. A lamacoid on Bay 1 of the secondary switchgear would be an appropriate location.

3. IROQUOIS MS

Iroquois MS is a 44 kV to 8320V municipal substation located at 5799 Carman Rd in the village of Iroquois, Ontario. It is the only substation in this area, serving the small industrial and residential customers in the vicinity. The station is equipped with two transformer, two outgoing feeders. Transformer T1 is a 3 MVA Oil-Filled transformer built in 1953 by Brown Boveri. Transformer T1 is fed from an overhead lattice structure that is equipped with a manual air break switch, and vertical cut-out fuseholders. Transformer T1 has top-mounted HV and LV bushings, with the secondaries connecting to an open-air steel framed structure. An underground riser from the structure connects the transformer secondaries to an S&C Padmount Switchgear unit.

Transformer T2 is a 3 MVA Oil filled transformer built in 2015 by Northern Transformer. The 44 kV main overhead structure is a dead-end framed wood pole with a vertical, double break S&C Load Break switch & fuse holders. Bare conductors connect from the base of the switch to the primary bushings of the transformer. The secondary bushings on Transformer T2 are enclosed, live-front, side mounted terminations which are connected by underground cable to an S&C Padmount Switchgear unit.

With the two transformers connecting through the S&C Padmount Switchgear unit, Rideau St Lawrence can entirely switch the station load from one transformer to the other. Interlocking can be modified to allow the transformers to operate in parallel for added redundancy and flexibility. No remote-control capability exists either, meaning a failure would require a truck roll and manual operation of the switching equipment.

Underground cables are then run over to the overhead secondary structure where two outgoing feeders are setup. One feeder (11F1) is fused, while the other (11F2) uses single phase, oil filled reclosers. The recloser is not controlled or monitored by any external device.

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We have been provided with load data from the secondary side of Iroquois MS. Based on the data, it appears that the station is loaded between approximately 600 kW & 2300 kW; averaging 1280 kW. An additional 500 kVA of load is expected to be added in 2020.

a) Maintenance Data

The following maintenance activities were performed on October 18, 2097:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - o All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - o All components cleaned and fasteners verified
 - $\circ \quad \ \ \text{Recloser testing for 11F2}$
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - o Capacitance Test
 - Insulation Resistance Testing
 - Oil Sampling & Testing

DGA Analysis data from February 2017 was also made available for comparison.

b) Equipment Assessment

Based on assessment of the Maintenance reports, the high voltage switching equipment appears to be in good working order. The 44 kV Switch feeding T1-L is also equipped with a set of lightning arresters of which Phase C appears to require immediate replacement. While T1-L itself would score a 3 out of 5, it has been assessed a 1 out of 5 pending replacement. Transformer T2's switch T2-L is in good condition, scoring 4 out of 5, with point reduction due to not having spare fuses on site.

Power Transformer T1 appears to be deteriorating at it nears end of life. Maintenance data from the oil analysis yielded levels of Interfacial Tension and Neutralization Number outside of manufacturer and industry standard ranges. These results are indicative of oxidization and contamination of the insulating fluid. These results are bolstered by the findings of an oil leak & rust during the site visit. These results are very different from the 2017 DGA results which indicated that the transformer was in good working order. It is recommended that oil analysis continue more frequently (every year, at minimum), with removal from service dictated based on the trend & results of the analysis. At this time, the transformer is scored 2.3 out of 5. While the transformer should not be relied upon for an extended duration, it can remain in operation.



Power Transformer T2 is in great condition, which is predictable considering its age and loading conditions. Based on the site visit findings and the maintenance, it was assigned a score of 4.8 out of 5.

Secondary switching equipment is separated into two categories at this station, with manual switches for the bus tie & feeder 11F1, and a recloser for feeder 11F2. The S&C Padmount Switchgear is a PMH-13 unit that was installed in 2016. Maintenance documentation indicates that the unit is in near-brand new condition, resulting in a score of 5.

Feeder 11F1's overhead switch is an S&C Alduti-Rupter that appears to be in good condition from it's test results. Unfortunately, the Phase B lighting arrester associated with the outgoing feeder tests low, which results in a score of 2.

Feeder 11F2's recloser is a McGraw Edison Type L hydraulically controlled recloser. Although it is outside of its design life, its test results are reasonable in addition to the visual inspection which did not yield any indications of any concerns, resulting in a condition score of 4 out of 5.

c) Station Infrastructure Assessment

The substation's infrastructure exhibits some concerns which should be monitored. The concrete footings supporting the secondary overhead structure appear to be deteriorated with edges one of the footings approaching the base plate & the anchor bolts, although no rebar reinforcement or infringement of the anchor's required clearance indicates that the damage has not yet impacted structural integrity. It may be prudent to patch or seal the exterior of the concrete to prevent cracks or other structural damage from occurring.

Further, the metallic shed & storage space both exhibit oxidization on the exterior cladding although the structures are not critical to the operation of the station currently, and not concerning from a reliability perspective.

It was also noted that no remote monitoring or security measures at present at the substation. The cumulative station infrastructure score is 2 out of 5.

As there is no feeder redundancy available within town but there is a spare transformer for switching purposes, we have assessed the station a Redundancy Score of 4.

d) Summary & Recommendations

Based on the above assessments of the infrastructure and equipment at Iroquois MS, we have scored the station 3.3 out of 5.

The following recommendations are made to improve the reliability of the station:

- Replace lightning arrester on T1 and 11F1
- Consider a motion-based camera system with SCADA reporting
- Perform oil analysis on T1 annually; proactively remove transformer from service to avoid failure based on oil data trends
- Replace Transformer T1 to maintain redundancy.
- Perform preventative maintenance on concrete footings.



During the site visit, we identified the following procedural items which should be considered:

- The main switch T1-L is not load break rated. While kirk keying is not required for utility
 personnel, we do recommend providing signage or written procedures locally to ensure staff
 operate the low voltage disconnects prior to opening the main switch.
- While a simple configuration, we also recommend a single line diagram be placed within the station.

It should be noted that the load data indicates that Transformer T2 will experience loading generally in the area of 50% capacity, which can predict a longer than expected lifespan, however Transformer T1 will eventually need to be removed from service resulting in a high degree of risk for service in the Iroquois area.

4. MORRISBURG MS1

Morrisburg MS1 is a 44 kV to 4160V municipal substation located at 11 Fifth St. E. in the village of Morrisburg, Ontario. It is the first of two substations in Morrisburg, with the other being Morrisburg MS2. The transformer is a 5 MVA Oil Filled Transformer that dates to 1976. It has been maintained but never refurbished. Both incoming & outgoing structures are open-air, steel lattice with concrete footings. The 44 kV incoming structure is equipped with an air-break switch, cutout fuseholders and lightning arresters. The 4160V structure supports four (4) outgoing feeders, all equipped with load break switches & fuses. One of the feeders exits via underground cables while the remainder are overhead.

Load data for Morrisburg MS1 is provided via average load readings performed during the summer and winter months. No real-time or trended data is available as Hydro One data includes 44 kV customers in addition to the MS. The average load readings indicate loading of the station is approximately 2500 kW. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed on November 15, 2019:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - o All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - o Capacitance Test
 - o Insulation Resistance Testing
 - Oil Sampling & Testing



b) Equipment Assessment

The equipment at Morrisburg MS1 can be separated into two categories, the switching equipment and the transformer. The power transformer T1's test results indicate that it's dielectric breakdown has decreased below satisfactory levels since 2017. Due to this result, we score the transformer a 2.4 out of 5 and recommend continuing to perform oil sampling to monitor.

The switching equipment is in good condition based on the maintenance data. Certain elements appear to require monitoring or small component replacement, such an arc contact on 46F1 which should be replaced and a set of porcelain lightning arresters which are recommended for replacement to avoid porcelain fragments during a failure. Cumulatively the switching equipment would score 4 out of 5.

c) Station Infrastructure Assessment

The station infrastructure is also in fair condition. There are no visible code or structure concerns. The ground grid does exhibit some visible weeds which should be sprayed from time-to-time to avoid impact to the top layer of crushed stone. Otherwise, we would recommend remote station security of some type. The substation shed is also in poor condition, however it is not critical to the operation of the station. At this time, we would score the station infrastructure would score a 3 out 5.

As the station can only be temporarily fed from Morrisburg MS1, we have assessed the station a reliability score of 3 out of 5.

d) Summary & Recommendations

The Morrisburg MS1 station is in relatively good condition, with an assessed total station score of 3 out of 5. As with several other stations in this system, we have identified some concerns with the transformer which need to be monitored very closely; especially considering the lack of redundancy in the Morrisburg system.

The following recommendations are made to improve the reliability of the station:

- Replace lightning arresters on 46T1-L
- Consider a motion-based camera system with SCADA reporting
- Perform oil analysis on T1 annually;

During the site visit, we identified the following procedural items which should be considered:

- The main switch T1-L is not load break rated. While kirk keying is not required for utility
 personnel, we do recommend providing signage or written procedures locally to ensure staff
 operate the low voltage disconnects prior to opening the main switch.
- The station structure is not labelled for 46F4 nor is a single line provided onsite. We recommend preparing both as lamacoids and mounting during subsequent maintenance activities.

5. MORRISBURG MS2

Morrisburg MS2 is a 44 kV to 4160V municipal substation located on Village Rd in Morrisburg, Ontario. It is the second of two substations in Morrisburg. The transformer is a 5 MVA ONAN Oil Filled Transformer that was

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Load data for Morrisburg MS2 is provided via average load readings performed during the summer and winter months. No real-time or trended data is available as Hydro One data includes 44 kV customers in addition to the MS. The average load readings indicate loading of the station is approximately 1400 kW. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed on October 16, 2019:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - o All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - Capacitance Test
 - Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

The equipment at Morrisburg MS2 can be separated into two categories, the switching equipment and the transformer. The power transformer T1's test results indicate that it's experiencing elevated levels of Carbon Monoxide and Total Dissolved Combustible Gas, however the results are consistent with results produced during maintenance activities in 2017. The elevated level of these gases is indicative of overheating or secondary feeder faults, with the load data consistent with a transformer which may have been overloaded in the past, but which now carries relatively low load levels. We scored the transformer a 2.35 out of 5.

The switching equipment at Morrisburg MS2 requires some attention. The switch MS2F2-L has a broken arc compressor which is required for full load operation. This is a concern as the station does not have a load break switch on the 44 KV system, which means that the station relies on 4160V load break operation. Further, the metal-enclosed switchgear cells which house both MS2F1-L and MS2F2-L are exhibiting concerns of internal rusting. A more thorough analysis of the rust, as well as documenting it's progress should be undertaken at future maintenance activities.



Although some minor concerns exist, these are readily rectified, we have assessed the station switching equipment an average score of 3.9 out of 5. The scoring can be increased to 4.3 once MS2F2-L is repaired.

c) Station Infrastructure Assessment

The station's infrastructure is in good to great condition. The lattice structure was replaced or refurbished very recently, with ground grid, foundations and fencing all appearing to be in great condition as well. Based on a visual inspection and from maintenance notes, there does not appear to be any code concerns. As with all stations in the system, there is no security measures beyond the physical station fencing.

We have assessed the station infrastructure a score of 3 out of 5.

In discussion with Operations personnel, the station has no redundancy in coordination with MS1 due to feeder conductor limitations. As such, we score the station a reliability score of 3.

d) Summary & Recommendations

Morrisburg MS2's condition is very similar to MS1 with the exception that it's incoming structure and associated station infrastructure is in slightly better condition. The transformer T1 needs to be monitored closely and a plan should be put in place for its eventually replacement; especially considering the lack of redundancy in the Morrisburg system. A transformer replacement would lift the station from a score of 3.5 out of 5, to 4 out of 5.

In addition to the replacement of T1, we would recommend the following:

- Replace arc contacts on MS2F2-L;
- Consider a motion-based camera system with SCADA reporting;
- Perform oil analysis on T1 annually;

During the site visit, we identified the following procedural items which should be considered:

- The main switch is not load break rated. While kirk keying is not required for utility personnel, we do recommend providing signage or written procedures locally to ensure staff operate the low voltage disconnects prior to opening the main switch.
- While a simple configuration, we also recommend a single line diagram be placed within the station.

6. PRESCOTT MS1

Prescott MS1 is a 44 kV to 4160V substation consisting of open-air steel lattice substation structure on the primary, a 5000 kVA transformer and S&C Metal-Enclosed Switchgear installed inside of a brick & mortar substation building. The lattice structure supports an air break switch, fuse holders directly above the transformer, with IPS rigid bus running through the brick wall supported by insulators on either side & connecting to underground cable into the S&C Switchgear. The station is located at 675 Corrine St, Prescott, ON.

Load data for Prescott MS1 from three days in July & three days in January suggest that the station carries approximately 1900 kW of load. Operationally, the station has some redundancy within the town of Prescott as feeders can be manually switched between the four stations in the area. No significant load growth is expected.

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a) Maintenance Data

The following maintenance activities were performed at Prescott MS1 on November 13, 2017:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Power Transformer:
 - o Bushing & Connection Verification
 - Turn Ratio Test
 - o Primary & Secondary Winding Resistance
 - o Capacitance Test
 - Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

The equipment at Prescott MS1 can be separated into two categories, the switching equipment and the transformer. The power transformer T1's test results indicate that the transformer is in good condition resulting in a score of 3.6 out of 5, although it does have elevated PCB content which we recommend performing an oil replacement proactively.

Overall switching equipment is in good condition. The 4160V Switchgear was installed recently, in 2017 and is in near brand-new condition. The primary switch is older however can still be considered in good condition based on the maintenance results. We scored the switching equipment an average of 4.8 out of 5.

c) Station Infrastructure Assessment

The station infrastructure at Prescott MS1 is in relatively good condition, although the routing of uninsulated IPS is generally not performed any longer (usually cable, cable bus or open bus-duct now). The lattice structure & foundations outside do not exhibit any cause for concern.

While the building itself is utilitarian in nature, it encloses outdoor rated metal enclosed switchgear which does not require climate control

Considering the design, functionality and visual inspection results, we have assessed the station a score of 3 out of 5; which would be considered a 5 out of 5, if not for lack of remote security.

As mentioned previously, the station has redundancy in its feeder distribution system, albeit manually, and there receives a redundancy score of 4 out of 5.



d) Summary & Recommendations

Based on the substation assessment, we have developed a total score of 3.8 out of 5. The score is nearly the highest achievable score for the stations in the Rideau St. Lawrence distribution system due to the lack of remote security, and our scoring matrix. There are no recommendations for improving the reliability of this station.

During the site visit, we identified the following procedural items which should be considered:

- While a simple configuration, we also recommend a single line diagram be placed within the station. A lamacoid inside the switchgear building would be an appropriate location.
- Repair the metering devices on the 4160V system and consider a SCADA interface.

7. PRESCOTT MS2

Prescott MS2 is a 44 kV to 4160V substation consisting of a single open-air steel substation structure supporting both primary and secondary switching equipment, and a 5000 kVA ONAN transformer. The primary switch is an air break switch with separate fuseholders directly over the transformer. The secondary switch and fusing are two (2) outgoing feeders mounted vertically on the far side of the structure, away from the transformer. The station is located at 101 Churchill Rd. E, Prescott.

Load data for Prescott MS2 was provided for feeder 2 only from three days in July & three days in January which suggests the station carries 500-700 kW of load. Operationally, the station has some redundancy within the town of Prescott as feeders can be manually switched between the four stations in the area. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed at Prescott MS2 on July 28, 2017:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - o Capacitance Test
 - o Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

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Unfortunately test data is not available for the switching equipment on-site however anecdotal evidence, operational experience and the visual inspection estimates a score of 3.5 out of 5 for the switching equipment with no immediate concerns.

The transformer was recently replaced with a refurbished transformer in 2017. In accordance with the maintenance test results from the commissioning activities, the transformer is in good condition, scoring a 3.6 out of 5.

c) Station Infrastructure Assessment

The station's infrastructure is in good condition. The lattice structure and footings, and transformer pad all appear in good condition. The station also does exhibit some code-related grounding defects which should be rectified. The shed/building exhibits signs of rust but is not critical to the operation of the station at this time. As a result, the station has been graded a 3 out of 5.

As mentioned previously, the station has redundancy in its feeder distribution system, albeit manually, and there receives a redundancy score of 4 out of 5.

d) Summary & Recommendations

Based on the substation assessment, we have developed a total score of 3.3 out of 5. There are no recommendations for improving the reliability of this station.

During the site visit, we identified the following procedural items which should be considered:

• While a simple configuration, we also recommend a single line diagram be placed within the station. A lamacoid at the metering enclosure would be an appropriate location.

8. PRESCOTT MS3

Prescott MS3 is a 44 kV to 4160V substation consisting of open-air substation structures on the primary & secondary sides of a 5000 KVA ONAN transformer. The primary side is a steel lattice riser structure with a Dominion Air Break Switch, fuseholders to the top mounted bushings of the transformer. The secondary feeds a steel lattice structure supporting rigid IPS bus that is outfitted with four (4) switch & fuse outgoing feeders. The station is located at 101 Churchill Rd. E, Prescott and is located within the same fenced perimeter as Prescott MS2.

Load data for Prescott MS3 from three days in July & three days in January suggest that the station carries approximately 2960 kW of load. Operationally, the station has some redundancy within the town of Prescott as feeders can be manually switched between the four stations in the area. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed on October 23, 2019:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - o Fuses & Fuseholder visual inspection & resistance testing
 - o All components cleaned and fasteners verified
- Secondary Switchgear

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- Mechanical/Operational Verification
- Contact Visual Inspection & Resistance Testing
- Fuses & Fuseholder visual inspection & resistance testing
- All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - Capacitance Test
 - Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

The equipment at Prescott MS3 can be separated into two categories, the switching equipment and the transformer. The power transformer T1's test results indicate that the insulating oil is in good condition, however the TTR, Dissipation Testing both yielded abnormal results indicating degradation. From a mechanical perspective, the transformer's temperature gauge no longer functions, which is a concern. We scored the transformer a 3.1 out of 5.

Overall switching equipment is in good condition. Each of 40F1, 40F2 and 40F3 exhibit minor issues which should be repaired or investigated. We scored the switching equipment an average of 3.5 out of 5.

c) Station Infrastructure Assessment

Prescott MS3's station infrastructure does have areas requiring renovation or consideration. The primary pole & secondary lattice structure both appear in good condition, while concrete footings of the lattice structure present some cracking & degradation. The station also does exhibit some code-related grounding defects which should be rectified. Refer to the maintenance report for more information. As a result, the station has been graded a 2 out of 5.

As mentioned previously, the station has redundancy in its feeder distribution system, albeit manually, and there receives a redundancy score of 4 out of 5.

d) Summary & Recommendations

Based on the substation assessment, we have developed a total score of 2.8 out of 5. The score is based on the findings that the switching equipment requires some repairs and that some grounding modifications are required to bring the station up to current code requirements.

The primary issue with the station is it's switching equipment, with repairs required particularly on 40F1 & 40F2, as well as procuring spare fuses for the HV switch and fixing the grounding issues. We recommend pursuing those repairs, which would improve the station condition from 2.8 to 3.5.

The following minor recommendations are made to improve the reliability of the substation:

• Consider a motion-based camera system with SCADA reporting



- We recommend performing all transformer testing on an annual basis to develop trended data and monitor for future failure
- Add a second ground connection from the gang operated switch handle to the ground mat & ground grid per OESC requirements.

During the site visit, we identified the following procedural items which should be considered:

While a simple configuration, we also recommend a single line diagram be placed within the station. A lamacoid at the metering enclosure would be an appropriate location.

9. PRESCOTT MS4

Prescott MS4 is a 44 kV to 4160V substation consisting of open-air substation structures on the primary & secondary sides of a 5000 KVA ONAN transformer. The primary side is a wood pole riser structure through an S&C Air Break Switch, fuseholders to the top mounted bushings of the transformer. The secondary feeds a steel lattice structure supporting rigid IPS bus that is outfitted with two (2) Cooper Kyle Type W reclosers and space for a future third. The station is located at 800 Boundary Rd, Prescott, ON.

Load data for Prescott MS4 from three days in July & three days in January suggest that the station experiences between 1350 to 1700 kW of load. Operationally, the station has some redundancy within the town of Prescott as feeders can be manually switched between the four stations in the area. No significant load growth is expected.

a) Maintenance Data

The following maintenance activities were performed on May 24, 2018:

- High Voltage Switch Testing:
 - Mechanical/Operational Verification
 - Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Secondary Switchgear
 - Mechanical/Operational Verification
 - o Contact Visual Inspection & Resistance Testing
 - Fuses & Fuseholder visual inspection & resistance testing
 - All components cleaned and fasteners verified
- Power Transformer:
 - Bushing & Connection Verification
 - o Turn Ratio Test
 - Primary & Secondary Winding Resistance
 - o Capacitance Test
 - o Insulation Resistance Testing
 - Oil Sampling & Testing

b) Equipment Assessment

The equipment at Prescott MS4 can be separated into two categories, the switching equipment and the transformer. The power transformer T1's test results indicate that the dielectric strength of it's oil is being reduced, while it's dissipation factor is low. Given the condition of its exterior tank & radiator



which is exhibiting rust due to a degrading paint cover, the transformer is considered in poor condition, requiring replacement or refurbishment. We scored the transformer a 2.2 out of 5.

Overall switching equipment is in good condition. The insulation test results for the recloser on 30F1 appears low, we suggest this be investigated on future maintenance activities; potentially sooner than every three (3) years to monitor for possible failure. We scored the switching equipment an average of 3.8 out of 5.

c) Station Infrastructure Assessment

The station's infrastructure is in good to great condition. The primary pole & secondary lattice structure both appear in good condition, while concrete footings & pads do not appear to exhibit any degradation. As with the other stations in the system, security is provided only by a station fence, resulting in an infrastructure score of 3 out of 5.

As mentioned previously, the station has redundancy in its feeder distribution system, albeit manually, and there receives a redundancy score of 4 out of 5.

d) Summary & Recommendations

Based on the substation assessment, we have developed a total score of 3 out of 5. The score is based on the findings that the transformer is a cause for concern, although provided with some redundancy through nearby stations. Due the age of the unit and the status of the oil sample, we recommend that a spare, replacement or refurbishment be considered.

The substation is otherwise in good condition and could be re-assessed at 4.3 out of 5 following rectification of transformer concerns.

The following minor recommendations are made to improve the reliability of the substation:

- Monitor 30F1 insulation resistance results
- Consider a motion-based camera system with SCADA reporting
- Until the transformer is replaced, we recommend performing all testing on an annual basis to develop trended data

During the site visit, we identified the following procedural items which should be considered:

• While a simple configuration, we also recommend a single line diagram be placed within the station. A lamacoid at the metering enclosure would be an appropriate location.

SECTION E: CONCLUSIONS

a) Substation Scoring Summary & Priorities

While each station was scored individually and summarized below with the top project and a priority rating given the concern presented by the data, local loading (i.e. if any redundancy within the area) and level of concern presented by the top project. For context, a station with a score under 3 likely requires capital planning soon, while a station above 3 is in good condition and may need only small modifications or preventative maintenance activities.

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Station	Total Station Score	Top Project	Priority	Comments
Cardinal MS1	2.6	New T1	Medium	MS2 could bear load
Cardinal MS2	3.1	New T1	Medium	MS1 could bear load
Iroquois MS	3.3	New T1	Low	T2 on-site & good condition
Morrisburg MS1	3.1	New T1	High	MS2 may be able to bear load, but feeder conductor may be impacted.
Morrisburg MS2	2.7	New T1	Severe	MS1 may be able to bear load, but feeder conductor may be impacted.
Prescott MS1	3.8	N/A	N/A	No project recommendations.
Prescott MS2	3.3	N/A	N/A	No project recommendations
Prescott MS3	2.8	40F1 & 40F2 Repair	Medium	Some redundancy within Prescott area
Prescott MS4	3.0	New T1	Low	Some redundancy within Prescott area

The following chart illustrates the presented severity levels:

Severity Level	Comment
Very low	No bearing on reliability.
Low	Would impact reliability but
	requires N-1 failure which is
	low risk.
Medium	Would impact reliability but
	requires N-1 failure but more
	likely to occur.
High	Would impact reliability. Could
	be dealt with for short-term
	duration.
Severe	Failure impacts reliability.

For context, a score under 3 likely requires capital planning over the next 1-5 years, while a score above 3 implies that longer term planning can be considered.

From the above, a significant quantity of transformers is nearing end-of-life, as ascertained by the maintenance results. In order to better accommodate the replacement of these transformers in the capital budget (or maintenance budget depending on the payment terms), we recommend a staggered approach to the replacements. Since the substations (except for Iroquois MS) are 44 kV to 4160V stations, a single spare transformer can be used to replace any station transformer. Whether procured through capital expenditure or leased, a transformer can be held initially as a spare, acting as an emergency replacement for all stations. Subsequent purchases can then either be installed directly onsite or used to re-stock the spare if it has already been depleted.

The following table has been developed to map potential projects and their impact to the station scoring based on our established ranking.

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Station	Beginning Station Score	Recommended Projects	Priority	Change in Station Score	Comments
	2.6	Replace T1	Medium	+1.1	MS2 could bear load.
Cardinal MS1		Replace Flex Bus	Low	+0.3	Recommend replacement at next maintenance
	3.1	Replace T1	Medium	+1.2	MS1 could bear load
Cardinal MS2		Add Spare Fusing	Medium	+0.3	Recommend best practice
	3.3	Replace T1	Low	+0.6	T2 is primary unit.
Iroquois MS		Replace Lightning Arresters	Low	+0.1	Recommend replacement at next maintenance.
		Concrete Footing Preventative Maintenance	Medium	+0.3	Perform initial assessment in near future.
	3.1	Replace T1	Severe	+0.9	High due to redundancy concerns
Morrisburg MS1		Replace Porcelain Lightning Arresters	Low	+0.1	Recommend replacement at next maintenance.
		Replace LV Fuse	Low	+0.1	Recommend replacement at next maintenance.
	2.7	Replace T1	Severe	+0.9	High due to redundancy concerns
Morrisburg MS2		Replace Porcelain Lightning Arresters	Low	+0.1	Recommend replacement at next maintenance.
		Replace Arc Contact + Spare HV Fuses	Low	+0.4	Recommend replacement at next maintenance.
Prescott MS1	3.8	N/A	N/A	N/A	N/A
Prescott MS2	3.3	N/A	N/A	N/A	N/A

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	2.8	Replace T1	Low	+0.7	Relatively good condition, not immediate concern.
Prescott MS3		40F1 & 40F2 Repair + Spare HV Fuses	Low	+0.4	Recommend replacement at next maintenance.
		Grounding Repairs	Medium	+0.4	Recommended as soon as possible.
		Footing Patches	Low	+0.4	Perform initial assessment in near future.
Prescott MS4	3.0	Replace T1	High	+0.9	Some redundancy on feeder.

b) Additional Topics

Through the development of this condition assessment, it was apparent that the stations are well maintained and operated to this point in their lifecycle. Based on the analysis, there are minimal projects which need to be undertaken in order to extend the lifetime of the stations another 10 years or more, apart from the implementation of a universal program for transformer replacement.

We do want to note that some devices did pass the condition assessment with fair maintenance results, however some actions are recommended to preserve the reliability and operation of the stations:

- HV Disconnect Switches
 - As with the Power Transformers, the HV Disconnects are approaching end-of-life and may be difficult to find spare parts for. Stations such as Iroquois (T1-L), Cardinal MS1, Cardinal MS2, Morrisburg MS1, Morrisburg MS2 are all equipped with HV Disconnects which were procured from manufacturer's which no longer exist and for which spare part capacities will deplete overtime. A program from replacement with new S&C devices may be prudent, however is not predicated on the analysis of any maintenance data. A stocked spare 44 kV disconnect is recommended as well.
- Oil Analysis
 - If a staggered spare transformer & replacement program is selected, it will be necessary to increase the frequency of oil sampling. We recommend that any transformer identified as necessitating a replacement project be sampled at a minimum of once per year. The data should be built into a tracking sheet to establish a deterioration trend.

c) Design Recommendations

While this report was focused on the assessment of the substations and recommendations associated with maintaining the station reliability & infrastructure, the following topics could be considered in order to improve the capabilities and reliability of the station:



- For substations such as Cardinal MS1 and Cardinal MS2 where fuses are used for circuit protection, it is recommended that future component replacements include the use of reclosers for feeder protection. Reclosers can be pole mounted or built into metal-enclosed switchgear, and provide substantial capabilities:
 - An obvious advantage of reclosers is that they can be configured, with protective relaying, to automatically reclose during fault scenarios in the event only momentary fault conditions (i.e. tree contact) occurs. In discussion with Rideau St. Lawrence personnel, currently field staff will perform an inspection prior to replacing the fuses and re-closing the switch but uncertainty exists when the inspection yields no root cause.
 - Reclosers can be further configured with remote operating apparatus (an HMI, or simple pushbuttons) to allow operators distance from the electrical device during operation.
- SCADA & Metering has been a topic of discussion amongst most utilities as part of the smart metering & grid modernization efforts that have been pursued over the past 10-15 years. In discussion with operators, there is currently no operators center overseeing the status or control of the distribution system. Considering the configuration of the system and the devices available (mostly fused disconnects), there is not significant impetus to developing a system at this time, however steps can also be taken to allow for this if design steps such as a transition to reclosers is considered:
 - Installation of metering devices on all feeders
 - o Development of SCADA screens for each station (view device status, load flows, etc.)
 - Development of alarm emailing & text messaging for operations staff
 - Remote control of feeder devices (reclosers if available) to avoid truck rolls during inclement weather by re-engaging reclosers.

It should also be noted that Rideau St. Lawrence is considered to have very low cyber security risk in its infrastructure as the stations require physical access to perform switching or affect system performance.

- As part of the telecommunications infrastructure of a SCADA (or eventual SCADA system), some security infrastructure should be added. A relatively simple, single camera setup with on-site storage would be suitable for the nine (9) stations. With a SCADA system, an alarm and/or photo can be delivered during motion sensor activation, but otherwise just locally stored for future review or remote viewing on demand.
- We recommend reviewing the ground grid design for 44 kV utility stations on a 10-year basis due to the age of some of the stations, and the typically rising fault currents experienced in the Ontario transmission & distribution systems. The fault levels have been rising due to increasing renewables penetration, as well as increasing propensity for parallel system operation.



APPENDIX A: CONDITION ASSESSMENT SUMMARIES

S	ubstation	IROQUOIS DS
A	ddress	5799 Carman Rd., Iroquois, ON

	Transformers								
	Transformer Data								
Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.	
T1	BROWN BOVERI	44 kV	Delta	8320/4160 V	Wye Ground	3000	66	N/A	
T2	NORTHERN TRANSFORMER	44 kV	Delta	8320/4160 V	Wye Ground	3000	4	N/A	

		Condition Assessment							
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall	
T1	2	4	4	3	4	4	1	2.3	
T2	5	5	5	5	5	4	5	4.8	

		Switching Equipment										
				Switching Equi	pment Data					Fuse Eq	uipment Data	
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
T1-L	EASTERN POWER DEVICES	44 kV	46 kV	1957 (assumed)	N/A	600A	N/A	No	S&C PF	SMD	100E	4
T2-L	S&C ALDUTI RUPTER	44 kV	46 kV		N/A	600A		Yes	S&C PF	POWER FUSE	100E	0
11-F1	S&C ALDUTI RUPTER	7.2 kV	8.3 kV		N/A	600A		Yes	S&C	SM-5	200A	2
PADMOUNT	S&C	13.8 kV	15 kV	3	N/A	600A		Yes	S&C		200A	3

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Condition Assessment									
Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall					
4	4	2	2	3.1					
5	5	5	2	4.6					
4	4	4	4	4.0					
5	4	5	5	4.7					
	Mech. Op. 4 5 4 5 5	Mech. Op. Contact Res. 4 4 5 5 4 4 5 4 5 4							

Comments:

-T1-L Lightning Arrester Phase C needs replacement..

-11-F1 Phase B Lightning Arrester needs replacement

	Recloser(s)								
	Switching Equipment Data								
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)		
11F2	MCGRAW EDISON	4800 V	8320 V	N/A	N/A	100A	5 KA		

	Condition Assessment						
Device #	Ops. Counter	Mech. Op.	Contact Res. (Closed)	Contact Res. (Open)	Overall		
11F2	N/A	4	4	4	4		

	Station Infrastructure Score						
	Condition Comments						
Building	3						
Fencing	4						
Ground Grid	4						
Structures	3						
Foundations	2						
Security	3						
Safety	3						
Conductors	4						
		T1 is on potential but not loaded.					
Redundancy	4	Switching can't be performed under load.					
		No feeder redundancy.					
Total Score	3.3						

Substation	CARDINAL DS1
Address	715 County Rd. #2. Cardinal. ON

		Transformers						
		Transformer Data						
Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.
T1	Brown Boveri	44 kV	Delta	4160/8320 V	Wye Ground	3000	66	N/A

		Condition Assessment						
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall
T1	4	4	4	2	1	1	1	1.55

Comments:

-Transformer oil exhibits high Carbon Dioxide content (3307 ppm), lower than required Dielectric Breakdown and lower than expected Interfacial Tension which requires close monitoring. May be exhibition of overloading/overheating or simply degradation over time.

-Recommend transformer replacement or spare stock in the future.

		Switching Equipment						ent				
				Switchi	ng Equipment Data				Fuse E	quipment Data		
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
23TIL-X	Delta Star	46 kV	48 kV	Unknown	N/A	600A	N/A	No	Dominion Cutout Tower Mount 2834-C2	Tower Mont	65E	6
23F1	S&C	4.2 kV	4.8 kV	6	N/A	600A	180	Yes	S&C SM 86641R2	SM	400E	6
23F2	S&C	4.2 kV	4.8 kV	6	N/A	600A	180	Yes	S&C SM 86641R2	SM	400E	6

		Condition Assessment						
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall			
23TIL-X	4	5	4	2	4.0			
23F1	5	4	3	4	4.0			
23F2	5	5	4	4	4.6			

Comments:

-23F1 Contact Resistance of Fuseholder passes although differs from 23F2. Likely related to loading. No immediate concerns but recommend trending in future maintenance reports.

-Recommend Interlocks for switch or clear demarcation of operating procedures for operating primary switch. A

lamacoid could be created and installed on-site. Air break switch should not be operated under load.

-23T1-L is aging hardware but exhibits no discernable issues. Recommend keeping 48 kV fuses in stock on site or in shop.

Station Infrastructure Score						
Condition	Comment					
5	No building.					
5	N/A					
4	Recommend backfilling around S&C Switc					
5	N/A					
5	N/A					
3	No cameras.					
3						
2	Transformer Flexible Secondaries visibly fr					
4	N/A					
2.6						
	Condition 5 5 4 5 5 3 2 4					

Recommendations

'- Transformer requires monitoring or prioritization.

- Substation otherwise in good condition, with exception of transformer, score would be 4.

- No test data on substation bus or conductors. Recommend replacing transformer secondary connections at next maintenance shutdown due to visible fraying. Assessing secondaries based on IR scanning or other techniques would not be worth the cost of replacement.

Substation	CARDINAL DS2
Address	3039 John St., Cardinal, ON

		Transformers						
		Transformer Data						
Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.
Т2	Moloney Electric Co.	44 kV	Delta	4160/2400 V	Wye Ground	3000	67	N/A

		Condition Assessment						
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall
T2	4	4	4	2	1	1	1	1.55

		Switching Equipment										
				Switching Equipme	nt Data				Fuse Eq	uipment Dat	a	
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
CSST2-L	Kearny	46 kV	48.3 kV	N/A	N/A	N/A		Yes	S&C SMD-2C 186925R1-T4	SMD-2C	65E	0
33F4	S&C	4.2 kV	4.8 kV	23	N/A	600A		Yes	S&C SM5S 86641R2	SM5S	300E	0
33F5	S&C	4.2 kV	4.8 kV	23	N/A	600A		Yes	S&C SM5S 86641R2	SM5S	300E	0

		Condition Assessment					
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall		
CSST2-L	4	4	3	2	3.4		
33F4	4	4	4	2	3.7		
33F5	4	4	4	2	3.7		

Comments:

-Elevated fuse resistance readings for Phase C, posible fuse holder refurbishment or fuse replacement required in near future. -Recommend Interlocks for switch or clear demarcation of operating procedures for opening. Air break switch should not be operated under load.

-Recommend switch replacement ?

	Condition	
Building	5	No building.
Fencing	5	
Ground Grid	3	
Structures	4	
Foundations	5	
Security	3	
Safety	5	
Conductors	4	
Redundancy	4	
Total score	3.1	

Substation:	MORRISBURG MS1
Address	11 Fifth Street East, Morrisburg, ON

		Transformers							
		Transformer Data							
Device #	Manufacturer	Ianufacturer Primary Voltage Primary Config. Secondary Voltage Secondary Config. Size (kVA) Age Refurb.						Refurb.	
MS1 - 11 FIFTH ST	HK PORTER COMPANY CANANA LTD	44 kV	Delta	4160/2400 V	Wye Ground	5000	43	N/A	

	Condition Assessment							
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall
MS1 - 11 FIFTH ST	4	4	4	4	4	1	2	2.4

		Switching Equipment										
		Switching Equipment Data										
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
46T1-L	EASTERN POWER DEVICES	46 kV	48.3 kV	N/A	N/A	600 A	N/A	No	S&C SMD 5249872	SMD	150 A	3
46F1	S&C	7.2 kV	8.3 kV	N/A	N/A	600 A	N/A	Yes	S&C POWER FUSE SM5 86151R2	SM5	400 A	4
46F2	S&C	7.2 kV	8.3 kV	N/A	N/A	600 A	N/A	Yes	S&C POWER FUSE SM5 87511	SM5	400 A	4
46F3	S&C	7.2 kV	8.3 kV	N/A	N/A	600 A	N/A	Yes	S&C POWER FUSE SM5 86151	SM5	400 A	4
46F4	S&C	14.4 kV	17 kV	N/A	N/A	600 A	N/A	Yes	S&C POWER FUSE SM5 86152R2	SM5	400 A	4

		Cond			
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall
46T1-L	4	4	4	5	4.1
46F1	4	4	4	5	4.1
46F2	4	4	4	5	4.1
46F3	4	4	2	5	3.6
46F4	4	4	4	5	4.1

Comments:

-46F1 arc contact is damaged, should be replaced.

-46F3 Phase A fuse hairline crack

-46T1-L is equipped with porcelain arresters; polymer are recommended as porcelain explode during failures.

	Condition	Comments
Building	3	
Fencing	4	
Ground Grid	4	
Structures	3	
Foundations	3	
Conductor	4	
Security	3	
Safety	5	
Redundancy	3.5	Can be fed from MS1
		Can feed MS1 but only temp
		Concern : feeder conductor and total load
Total Station	3.1	

Substation:	MORRISBURG MS2
Address	Village Rd, Morrisburg, ON

				Transformer	S			
	Transformer Data							
Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.
MS2 - VILLAGE RD	Transelectrix	44 kV	Delta	4160/2400 V	Wye Ground	5000	31	N/A
				Condition Assess	ment			
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall
MS2 - VILLAGE RD	4	4	4	3	5	1	2	2.35

						Switching Ed	quipment					
		Switching Equipment Data								Fuse E	quipment Data	
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
W20T1-L	KEARNEY NATIONAL CANADA	46 kV	47.5 kV	31	N/A	600 A		No	DOMINION CUTOUT	BPD46100	125 A	0
∕IS2F1-L	S&C	14.4 kV	17 kV	30	N/A	600A	40 kA	Yes	S&C SM-5S 86642R2	SM-5S	400 A	3
MS2F2-L	S&C	14.4 kV	17 kV	30	N/A	600A	40 kA	Yes	S&C SM-5S 86642R2	SM-5S	400 A	3

Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall
W20T1-L	2	5	5	1	3.6
MS2F1-L	4	5	4	5	4.4
MS2F2-L	1	5	4	5	3.6
Comments:					
-Replace					

	Condition	Comments
Building	N/A	No building.
Fencing	4	None.
Ground Grid	3	Some weeds.
Structures	4	No comment.
Foundations	4	
Conductor	2	
Security	3	No cameras. Previous copper theft.
Safety	5	
Redundancy	3.5	Can be fed from MS1 temporarily
Total Station	2.7	
Substation:	PRESCOTT MS1	
-------------	----------------------------------	
Address	103 Churchill East, Prescott, ON	

		Transformers						
		Transformer Data						
Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.
B20IT1-X	Ferranti Packard	44 kV	Delta	4800 V	Wye	5000	54	N/A

	Condition Assessme	ondition Assessment						
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall
B20IT1-X	4	4	4	4	3	2	4	3.55

		Switching Equipment										
		Switching Equipment Data							Fuse Equipment Data			
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
Tower Switch	Dominion Cutout	44 kV	48.3 kV	N/A	N/A	600A	40 kA	Yes	S&C SMD-50	SMD-50	100E	2
Tower Switch	S&C	4.2 kV	4.8 kV	N/A	N/A	600 A	25 kA	Yes	N/A	N/A	N/A	N/A
46F2	S&C	4.2 kV	4.8 kV	N/A	N/A	600 A	25 kA	Yes	S&C SMD-40	SMU-40	250E	9
46F3	S&C	4.2 kV	4.8 kV	N/A	N/A	600 A	25 kA	Yes	S&C SMD-40	SMU-40	250E	9
46F4	S&C	4.2 kV	4.8 kV	N/A	N/A	600 A	25 kA	Yes	S&C SMD-40	SMU-40	250E	9

	Condition Assessment							
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall			
Tower Switch	4	4	4	5	4.1			
Tower Switch	5	5	5	5	5.0			
46F2	5	5	5	5	5.0			
46F3	5	5	5	5	5.0			
46F4	5	5	5	5	5			
Comments:		-	-					

	Condition
Building	5
Fencing	5
Ground Grid	5
Structures	5
Foundations	5
Conductor	5
Security	5
Safety	5
Redundancy	4
Total score	3.8

Substation:	PRESCOTT MS2
Address	103 Churchill East, Prescott, ON

		Transformers						
		Transformer Data						
Device #	Manufacturer	Manufacturer Primary Voltage Primary Config. Secondary Voltage Secondary Config. Size (kVA) Age Refurb.				Refurb.		
T1	Reliance Power	44 kV	Delta	4800 V	Wye	5000	29	N/A

		Condition Assessment						
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall
T1	4	4	4	4	4	2	4	3.6

		Switching Equipment							
		Switching Equipment Data							
Device #	Manufacturer	anufacturer Nom. Voltage Max. Voltage Age Refurb. Rating (A) Rating (MVA,sym) Load Break (Y/N) Fu							Fuseholder

		Condition Assessment						
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall			
					0.0			
Comments:								

	Condition
Building	5
Fencing	4
Ground Grid	4
Structures	4
Foundations	4
Conductor	4
Security	3
Safety	4
Redundancy	4
Total score	3.3

	Fuse Equipment Data								
•	Fuse Type	Fuse Size	Spare Qty						

Substation:	PESCOTT MS3
Address	103 Churchill East, Prescott, ON

			Transformers									
		Transformer Data										
0	Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.			
٦	Г1	ARCHER	44 kV	Delta	4160/2400V	Wye Ground	5000	56				

		Condition Assessment										
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall				
T1	3	1	4	4	1	1	4	3.05				
-Transformer Te	-Transformer Temperature gauge not working											
-Transformer na	meplate missing											
-Turns Ratio read	-Turns Ratio reading lower than expected.											
-Dissipation Test	-Dissipation Test yields higher than expected results.											

					Switch	ning Equipme	ent					
				Switching Equipme	ent Data				Fuse E	Equipment D	Data	
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
E201T1-L	DOMINION	46 kV	48.3 kV		N/A	600A	N/A	NO	S&C SMD-1A 118925R1	SMD-1A	100 A	6
40F1	S&C ALDUTI RUPTER	7.5 kV	7.5 kV		N/A	400 A		Yes	S&C SMP-W 86151	SM-5	400 A	6
40F2	S&C ALDUTI RUPTER	7.5 kV	7.5 kV		N/A	400 A		Yes	S&C SMP-W 86151	SM-5	400 A	6
40F3	S&C ALDUTI RUPTER	7.2 kV	8.2 kV	58	N/A	600 A		Yes	S&C SMP-W 86151	SM-5	400 A	6
40F4	S&C ALDUTI RUPTER	7.5 kV	7.5 kV		N/A	400 A		Yes	S&C SM-5 86151R2	SM-5	400 A	6

	Condition Assessment									
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall					
E201T1-L	4	4	4	1	3.6					
40F1	1	4	4	5	3.3					
40F2	1	3	3	5	2.7					
40F3	4	4	2	5	3.6					
40F4	4	4	4	5	4.1					

Comments:

-40F3 exhibits fuse resistance differences greater than expectations, recommend monitoring fuses & fuseholders during futrue maintenance.

-40F2 exhibits contact & fuse resistance differences greater than expectations, recommend monitoring fuses & fuseholders during future maintenance.

-No spare primary fuses on-site; located at Industrial Rd. shop.

-40F1 & 40F2 both have arc contacts in poor condition. This should be rectified due to lack of load break switch on primary.

	Condition
Infrastructure	
Building	N/A
Fencing	4
Ground Grid	4
Structures	4
Foundations	2
Conductor	4
Security	3
Safety	3
Redundancy	4
Total score	2.8

Substation:	PRESCOTT MS4
Address	800 Boundary Rd., Prescott, ON

	Transformers									
	Transformer Data									
Device #	Manufacturer	Primary Voltage	Primary Config.	Secondary Voltage	Secondary Config.	Size (kVA)	Age	Refurb.		
T1	Reliance Power Equipment	44 kV	Delta	4160/2400 V	Wye Ground	5000	28	N/A		

	Condition Assessment									
Device #	Mechanical	TTR	Winding Resistance	DAT	Cap.	Spare	DGA	Overall		
T1	2	4	4	4	2	1	2	2.2		
-										

Comments:

-Transformer T1 extgerior paint in poor condition; exhibiting rust.

-Dielectric breakdown is low per DGA analysis

-Dissipation is higher than normal; although could be result of age.

		Switching Equipment										
	Switching Equipment Data								Fuse Equipment Data			
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)	Load Break (Y/N)	Fuseholder	Fuse Type	Fuse Size	Spare Qty
H201T-L	S&C	44 kV	46 kV	33	N/A	600A	40 KA	Yes	Dominion	N/A	N/A	X2 65A X2 125A

	Condition Assessme	Condition Assessment									
Device #	Mech. Op.	Contact Res.	Fuse Res.	Spares	Overall						
H201T-L	4	5	4	4	4.3						
Comments:											
- None											

Recloser(s)										
	Switching Equipment Data									
Device #	Manufacturer	Nom. Voltage	Max. Voltage	Age	Refurb.	Rating (A)	Rating (MVA,sym)			
30F1	Cooper Power Systems	14.4 kV	15.5 kV	28	N/A	400	12 kA			
30F2	Cooper Power Systems	14.4 kV	15.5 kV	28	N/A	400	12 kA			

ance Spares	
ance spares	Overall
3.0	3.3
3.0	3.9
	3.0

	Condition
Building	N/A
Fencing	5
Ground Grid	5
Structures	5
Foundations	5
Conductor	5
Security	3
Safety	5
Redundancy	4
Total score	3.0



APPENDIX B: MAINTENANCE RECORDS

CONFIDENTIAL



September 27th, 2017

Rideau St. Lawrence 985 Industrial Rd. Prescott, ON. K0E 1T0

Attention: John Biccum

Re: Maintenance Inspection Report - Our Ref: 15769 Site: Cardinal D.S. #1 – 715 County Rd. #2, Cardinal, ON.

To whom it may concern,

Please find the attached report for the maintenance work and inspections completed August 24th, 2017.

Tal Trees cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

Load Break Switch & Secondary Switch gear:



102 Parks Drive, Belleville ON K8N 4Z5OFFICE. 613-968-9648TALTREES.CA



- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, As well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.

Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with anti-oxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer test was completed on the transformer.

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



Findings/Repairs:

• Power transformer currently only has one connection to ground, it requires a second connection on opposite corner to comply with OESC.



- There are braided bus connections between the secondary bus on transformer and cables on dip pole. These braided connections are fraying and deteriorated and should be replaced. (Connections are approx.. 4" in length)
- All transformer test results were satisfactory with the exception of the capacitance dissipation factor and dielectric absorption test (insulation resistance). These test results might be an indication that the transformer has low oil levels. This is further supported by the oil results and should be followed up with Tal Trees for further recommendations.

Recommendations:

- Please install another ground connection to transformer enclosure on opposite side of existing ground connection.
- Replace braided bus connection on secondary bus.
- Check transformer oil levels.
- Continue with regular yearly maintenance.



All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all of the recommended repairs listed in this report.

If you have any questions/concerns please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence.

Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville ON. K8N 4Z5



102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA





HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	Incoming 4	4KV	Device ID	2	23TIL-X
	Rideau St. Lawrence					t 24th, 2017		
	985 Industrial Rd., Prescott				15769			
	DS#1 Cardinal		System Ne	eutral Present				
	715 County Rd #2							
Nameplate Data								
Switch Mounting		Pole	Tow	er X		Other		
Switch Type	Load Break A	Air Break X				Other		
Manufacturer	DELTA STAR			BIL Rating	N/A			kV
Date Of Manufacture	N/A			Feeder ID	23T1L-	Х		
Serial #	N/A			Feeds To	T1			
Catalog #	115452H		Interr	upting Rating	N/A			Α
Nom. / Max. Voltage	46.0 48.3	kV	Continue	ous Ampacity	600			Α
Comments	TYPE # PMB236							
Lightning Arrestors	_							
Lightning Arrestors	Yes X	No						
Class	Distribution Inter	mediate X	Statio	on				
Composition	Ceramic	Polymer X						
Manufacturer	OHIO BRASS		Max. /	MCOV Rating		48.0 /	39.0	kV
Catalog #	303039							
Comments								
Protective Device Data								
Primary Fuse Holder Dat	а		Primary Fu	se Link Data	a			
Manufacturer	DOMINION CUTOUT			Manufacturer	S&C			
Туре	TOWER MOUNT			Туре	SMD14	4		
Nom. / Max. Voltage	46.0 / 48.3	kV		Link Size	65E			Α
Holder Max. Fuse Link	200A			TCC #	153-1			
Holder Catalog #	2834-C2		L	ink Catalog #	445065	SR1		
Primary Fuse Link Spare	s / Location							
Spare Primary Fuses	Yes	No X		# of Spares				
Spare Location								
Comments								
Interlock								
Key Interlock	Yes	No X						
Interlock Type		hanical	Utility Lo	ck				
Devices Interlocked		Breaker	Trans. Er		Ot	her		
Manufacturer		Dieakei	TTATIS. LI	Key Interloc				
Comments				itey interioe	κ π			
Load Side Conductor	 Data							
Conductor Type		Bus Bar		luctor Size / D		SOLID		
Conductor Material	Aluminum	Copper X		uctors per Pha				/ Phase
Tape Shield	Aluminum	Copper		Bond Size / D	-	SOLID		
Concentric Neutral		Copper		Bond Coduct				
Insulation Voltage				utral Conduct				
Insulation Type	DARE CU		Ne	eutral Size / D	in. <u>N/A</u>	•		
Comments								
Recorded By:	C. SULLIVAN, R. MELVIN							



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

PO W	EK SERV	POWER COMPA	NY			System ID	Inco	ming 44	ĸv	Device	ID	23TIL	-X
Visual Inspec	tion / Mechar	nical Tests	;										
•	ate Condition	Satisfactor		N	ot Satisfa	actory	N/A		Com	iments			
•	ator Condition	Satisfactor	y X		ot Satisfa		N/A		Com	ments			
Ground	Connections	Satisfactor	y X	N	ot Satisfa	actory	N/A		Com	iments			
Lightn	ing Arrestors	Satisfactor	у Х	N	ot Satisfa	actory	N/A		Com	iments			
Arc	Suppressors	Satisfactor	У	N	ot Satisfa	actory	N/A	Х	Com	iments			
Key Interlo	ock Operation	Satisfactor	у	N	ot Satisfa	actory	N/A	X	Com	iments			
Ground Strap	s & Materials	Satisfactor	у Х	N	ot Satisfa	actory	N/A		Com	iments			
Switch Conditi	on / Operation												
Switch Oper	ration As Left	Satisfactor	у Х	N	ot Satisfa	actory	N/A		Com	iments			
Contact Surfa	ace Condition	Satisfactor	у Х	N	ot Satisfa	actory	N/A		Corr	iments			
Simultan	eous Closure	Satisfactor	у Х	N	ot Satisfa	actory	N/A		Com	ments			
Electrical Tes	sts												
Earth Resistan	ce (3-Point Te	st)				Arc Suppre	ssor	Contac	t Res	istance			
Earth Resistar	nce in Ohms.					Arc Suppre	essor	Contact F	Resist	ance in Oh	ims.		
						Phase A			N/A			Ω	
Earth Resistar	Earth Resistance <u>Ω</u>					Phase B			N/A			Ω	
						Phase C			N/A			Ω	
Switch Insulati	ion Resistance	ļ				Switch / Fu	se Co	ontact R	esis	tance			
Resistance in Me	eg-Ohms after 1	minute.				Resistance	in mio	ro-Ohms	after	1 minute.			
Test Voltage	1 kV 2	kV	5 kV	1	0 kV	Test Currer	nt	10 A					
						_							
	Phase A	Phase	В	Pha	se C	-		Phase A	λ	Phase	В	Phas	e C
Phase to GND	Ν/Α ΜΩ	N/A	MΩ	N/A	MΩ	Contact	ts	1256	μΩ	1284	μΩ	1241	μΩ
						Fus		1065	μΩ	1071	μΩ	1122	μΩ
						Overa	all	N/A	μΩ	N/A	μΩ	N/A	μΩ
Load Side Con	ductor Insulati	ion Resista	nce										
Resistance	in Meg-Ohms @	10000	V DO	after	1 minut	e l	Phase	A to Gro	und	3	30000)	MΩ
						I	Phase	B to Gro	und	2	79000		MΩ
							Phase	C to Gro	und	2	49000		MΩ
			e										
Lightning Arres	stor Insulation	Resistanc	-										-
	stor Insulation in Meg-Ohms @	Resistanc		after	1 minut	e l	Phase	A to Gro	und	1	21000)	MΩ
				c after	1 minut			A to Gro B to Gro	H		21000 26000		MΩ MΩ

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 6839

Tested By: C. SULLIVAN, R. MELVIN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	System ID	INCOMING	G 4160 Device ID 23F1			
Customer	Rideau St. Lawrence		Date	Auaus	st 24th, 2017	
	985 Industrial Rd., Prescott			15769		
	DS#1 Cardinal	System Ne				
Site Address	715 County Rd #2	2				
Nameplate Data						
Switch Mounting	Metal Enclosed X Pole	Tow	ver		Other	
Switch Type	Load Break X Air Break				Other	
Manufacturer	S&C		BIL Rating	60		kV
Date Of Manufacture	10/2013		Feeder ID	23F1		
Serial #	N/A		Feeds To	LS204	l	
Catalog #	CTD-594553	Interr	upting Rating	40000		Α
Nom. / Max. Voltage	4.2 / 4.8 kV	Continue	ous Ampacity	600		Α
Comments						
Lightning Arrestors						
Lightning Arrestors	Yes No X					
Class	Distribution Intermediate	Statio	on			
Composition	Ceramic Polymer	otati				
Manufacturer		Max./	MCOV Rating		1	kV
Catalog #						
Comments						
Protective Device Data						
Primary Fuse Holder Dat	a	Primary Fu	se Link Data	a		
Manufacturer			Manufacturer			
Туре	SM		Туре	55		
Nom. / Max. Voltage	7.2 / 8.3 kV		Link Size	400E		Α
Holder Max. Fuse Link	400E		TCC #	119-4		
Holder Catalog #	86641R2	L	ink Catalog #	26160	0R4	
Primary Fuse Link Spare	s / Location					
Spare Primary Fuses			# of Spares	6		
Spare Location	SHED BEHIND SWITCHGEAR		·	-		
Comments						
Interlock						
Kasa kata da ak						
Key Interlock	Yes No X	1 14:124 - 1 -	ok 🗌			
Interlock Type	Electrical Mechanical	Utility Lo		0	ther	
Devices Interlocked Manufacturer	H.V. Switch Breaker	Trans. Er				
Comments			Key Interloc	к <i>#</i>		
Load Side Conductor I						
Conductor Type	Cable X Bus Bar		luctor Size / D			
Conductor Material	Aluminum Copper		uctors per Pha			/ Phase
Tape Shield	Aluminum Copper		Bond Size / D			
Concentric Neutral	Aluminum Copper		Bond Coduct			
Insulation Voltage			utral Conduct			
Insulation Type	Ν/Α	Ne	eutral Size / D	im. <u>N//</u>	4	
Comments						
	NOT LEGIBLE.					

Recorded By: D. MACLEAN, R. MELVIN



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

- POW	ER SERVI	POWER COMPANY		System	ID IN	COMING	6 4160	Device I	D	23F′	1
Visual Inspec	tion / Mechan	ical Tests									
-	ate Condition	Satisfactory X	Not Sa	isfactory	N/	A	Com	nments			
Insula	tor Condition	Satisfactory X	Not Sa	isfactory	N/.	A	Con	nments			
Ground	Connections	Satisfactory X	Not Sa	isfactory	N/.	A	Con	nments			
Lightn	ing Arrestors	Satisfactory	Not Sa	isfactory	N/.	AX	Con	nments			
Arc	Suppressors	Satisfactory X	Not Sa	isfactory	N/.		Con	nments			
Key Interlo	ock Operation	Satisfactory	Not Sa	isfactory	N/.	ΑΧ	Con	nments			
Ground Strap	s & Materials	Satisfactory X	Not Sa	isfactory	N/.	A	Con	nments			
Switch Conditi	on / Operation				-						
Switch Ope	ration As Left	Satisfactory X	Not Sa	isfactory	N/.	A	Con	nments			
Contact Surfa	ace Condition	Satisfactory X	Not Sa	isfactory	N/.	Α	Con	nments			
Simultan	eous Closure	Satisfactory X	Not Sa	isfactory	N/.	A	Con	nments			
Electrical Tes	sts										
Earth Resistan	ce (3-Point Tes	st)		Arc Su	opress	or Cont	act Res	sistance			
Earth Resistar	nce in Ohms.			Arc S	uppress	or Contac	ct Resist	ance in Ohn	ns.		
					eΑ		N/A		9	2	
Earth Resistar	Earth Resistance			Phase	ЭB		N/A		9	2	
				Phase	ЭC		N/A		9	2	
Switch Insulati	on Resistance			Switch	/ Fuse	Contac	t Resis	tance			
Resistance in Mo	eg-Ohms after 1	minute.		Resist	ance in r	nicro-Oh	ms after	1 minute.			
Test Voltage	1 kV 2	kV 5 kV	10 kV	Test C	Test Current 10 A						
		1			Г						
	Phase A	Phase B	Phase C			Phas		Phase E		Phas	
Phase to GND	Ν/Α ΜΩ	Ν/Α ΜΩ	N/A N	Ω Co	ntacts	540	μΩ		μΩ	612	μΩ
					Fuse	547.8	μΩ		μΩ	766	μΩ
Load Side Con	ductor Insulati	ion Resistance			Overall	584	μΩ	655	μΩ	677	μΩ
	in Meg-Ohms @		DC after 1 mi	nute	Pha	se A to C	Ground	,	N/A		MΩ
Resistance	in weg-onins @	V		lute		se B to C	-		V/A		MΩ
						se C to C			V/A		MΩ
Lightning Arre	stor Insulation	Resistance					o ound				
			DC after 1 mi	nute	Pha	se A to C	Ground	1	N/A		MΩ
. teolocarioo	Resistance in Meg-Ohms @ V DC after 1 min					se B to C			N/A		MΩ
					Pha	se C to C	Ground	1	N/A		MΩ
Comments / C	Observations										

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 6839

Tested By: D. MACLEAN, R. MELVIN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	INCOMING	4160	Device ID	23F2
Customer	Rideau St. Lawrence			Date	Augus	st 24th, 2017	
Customer Address	985 Industrial Rd., Prescott				15769		
	DS#1 Cardinal		System Ne	eutral Present			
Site Address	715 County Rd #2		,				
Nameplate Data							
Switch Mounting	Metal Enclosed X	Pole	Tow	/er		Other	
Switch Type	Load Break X Air B	Break				011	
Manufacturer				BIL Rating	60		kV
Date Of Manufacture				Feeder ID	-		
Serial #				Feeds To	-		
	CTD-594553		Interr	upting Rating			А
Nom. / Max. Voltage		kV		ous Ampacity	-		A
			Contanta	ouo / inpuony			
Lightning Arrestors							
Lightning Arrestors	Yes	No X					
Class	Distribution		Statio	on			
Composition		lymer	Otativ				
Manufacturer			May /	MCOV Rating		Ι	kV
Catalog #				MOOV Rating		,	R V
Comments							
Protective Device Data	2						
			Drimor Cu	oo Link Dot	-		
Primary Fuse Holder Dat		1		se Link Data			
Manufacturer				Manufacturer	-		
Type		1.1/		Type	-		
Nom. / Max. Voltage		kV		Link Size	-		Α
Holder Max. Fuse Link				# TCC	-		
Holder Catalog # Primary Fuse Link Spare	· · · · · · · · · · · · · · · · · · ·		L	ink Catalog #	20100	0114	
Spare Primary Fuses		No		# of Sporoo	c		
. ,				# 01 Spares	0		
	SHED BEHIND SWITCHGEAR						
Comments							
Interlock							
Key Interlock	Yes	No X					
Interlock Type	Electrical Mecha	nical	Utility Lo	ck			
Devices Interlocked	H.V. Switch Br	eaker	Trans. Er	ncl.	0	ther	
Manufacturer				Key Interloc	k #		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X Bu	s Bar	Cond	luctor Size / D	im 22(MILS	
Conductor Material		opper X		uctors per Pha			/ Phase
Tape Shield		opper		Bond Size / D)	, 1 11000
Concentric Neutral		opper X		Bond Coduct		-	
Insulation Voltage		Shho!		utral Conduct		<u>\</u>	
Insulation Type				eutral Size / D			
Comments			INC			`	
Comments							
Recorded By:	D. MACLEAN, R. MELVIN						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

— POW	ER SERV	ICES POWER COMPANY		System ID		G 4160	Device I		23F2
Visual Inspec	tion / Mechar	nical Tests							
-	ate Condition	Satisfactory X	Not Satisfa	actory N	/A	Com	nments		
Insula	tor Condition	Satisfactory X	Not Satisf	actory N	/A	Com	nments		
Ground	Connections	Satisfactory X	Not Satisf	actory N	/A	Com	nments		
Lightn	ing Arrestors	Satisfactory	Not Satisf	actory N	/A X				
Arc	Suppressors	Satisfactory X	Not Satisfa	actory N	/A	Com	nments		
Key Interlo	ck Operation	Satisfactory	Not Satisf	actory N	/A X	Con	nments		
Ground Strap	s & Materials	Satisfactory X	Not Satisf	actory N	/A	Com	nments		
Switch Conditi	on / Operation								
Switch Ope	ration As Left	Satisfactory X	Not Satisf	actory N	/A	Corr	nments		
Contact Surfa	ace Condition	Satisfactory X	Not Satisf	actory N	/A	Con	nments		
Simultan	eous Closure	Satisfactory X	Not Satisfa	actory N	/A	Com	nments		
Electrical Tes	ts								
Earth Resistan	ce (3-Point Tes	st)		Arc Suppress	sor Cor	ntact Res	sistance		
Earth Resistar	nce in Ohms.			Arc Suppress	sor Cont	act Resist	ance in Ohm	S.	
				Phase A		N/A		Ω	
Earth Resistar	Earth Resistance			Phase B		N/A		Ω	
				Phase C		N/A	1	Ω	
Switch Insulati	on Resistance			Switch / Fuse	Conta	ct Resis	tance		
Resistance in Me	eg-Ohms after 1	minute.		Resistance in	micro-C	hms after	1 minute.		
Test Voltage	1 kV 2	kV 5 kV	10 kV	Test Current	1	0 A			
				_					
Dhase to CND	Phase A N/A MΩ	Phase B N/A MΩ	Phase C N/A MΩ	Contonto		ase A	Phase B		Phase C
Phase to GND		Ν/Α ΜΩ	Ν/Α ΜΩ	Contacts Fuse	482 613	Ωμ Ωμ			506 μΩ 581 μΩ
				Overall	668	μ <u>22</u> μΩ			597 μΩ
Line Side Cond	luctor Insulatio	on Resistance		Overall	000	μι	031 1		μ12
	in Meg-Ohms @		C after 1 minut	e Ph	ase A to	Ground	>50	0000	MΩ
						Ground		0000	MΩ
						Ground		0000	MΩ
Lightning Arre	stor Insulation	Resistance				I			
	in Meg-Ohms @		C after 1 minut	e Ph	ase A to	Ground	N	/ A	MΩ
	Ĵ l				Ground		/ A	MΩ	
				Ph	ase C to	Ground	N	/ A	MΩ
Comments / C	Observations								

Test Instrument(s)

Manufacturer / Model ______ Serial # Megger Ductor 7776 6839

Tested By: D. MACLEAN, R. MELVIN



TRANSFORMER DATA SHEET (Pg. 1 of 4)

	POWER SE	ERVICES	r		System ID				Device II	D	Т	1	
	Customer Address Site	Rideau St. Lawrend 985 Industrial Rd., DS#1 Cardinal 715 County Rd #2						August 15769	24th, 201	7			
-	Diate Data Transformer Class Transformer Cooling			mount ONAF	Station LNAN	X	DR	Y	Other_ Other_				
Bushir	ng Configuration	Dead Front	Тор	- Тор 🛛 🗙	Top - Side	Si	ide - Sic	le	Other				
	Date of Manufacture	¢ C197 3000		KVA V	T C	ore & Wi anks & I Coolant \ Coolant ' Total '	Fittings /olume Weight	6450 N/A		kg kg L kg kg		lb Ib Gal Ib Ib	X X X X
F	Primary Ampacity Secondary Voltage Secondary Ampacity IV Winding Materia V Winding Materia	e 4160/8320 / 208 N/A		A V A	Perc	mperatur HV BIL LV BIL ent Impe mper Re	Rating Rating edance	N/A	5.50 %	°C kV kV ONAN YES	X	°F ONAF NO	-
C	SA Specification(s) Comments				Tran	sformer	Colour	GRAY					
N Fa G Liq	Inspection ameplate Conditior n / Pump Operatior Ground Connections uid Levels In Tanks Interlock Operatior p. Gauge Operatior	n Satisfactory s Satisfactory s Satisfactory X n Satisfactory	No No No No	t Satisfacto t Satisfacto t Satisfacto t Satisfacto t Satisfacto t Satisfacto t Satisfacto	ory N	N/A X N/A X N/A N/A N/A X N/A X		Comment Comment Comment Comment Comment	s s s	Y 1 GRO			
C	oolant Temperature Comments		°C	X °F	N	lax. Coc	olant Te	mperatur	e <u>20</u>	_°C	X	°F	
Oil Cons	s ervator Oil Conservato Silica Gel Breathe Silica Gel Colou Comments	er Yes Ir GoodE	No X No X Bad	Replac	В	ervator \ reather \ N/A [/olume			_ L _ L		Gal Gal	
-	onger Data		As	As	Vector Dia	gram:			15.Dyr	11			
De	signation	Tap Voltages (V)	Found	Left			Λ^{H}	2	X2				
1 / A 2 / B	105.00% 102.50%	44000 42900	x	X			/ `	×	\rightarrow	X3			
3 / C 4 / D 5 / E	100.00% 97.50% 95.00%	41800 40700 39600			Prima	ary Vecto		НЗ	X1 Second	ary Vec	tor	X	
	Comments	: 											
	Recorded By	. D. MACLEAN, C. IV	ANY										



TRANSFORMER DATA SHEET (Pg. 2 of 4)

FOWER 3E	SPARKPOWER COMPANY	S	System ID	Device ID	T1
Neutral Grounding Re	sistor (NGR)				
Manufacturer NGR Voltage NGR Resistance	Yes	<u>ν</u> Ω	Maximum Current		Α
Transformer Lightning	Arrestors				
Lightning Arrestors Class Composition Manufacturer	Distribution Ceramic	No X Intermediate Polymer	Station Max. / MCOV Rating	1	kV
Catalog # Comments				1	
Interlock					
Key Interlock Interlock Type Devices Interlockec Manufacturer	Elec.	No X Mech. Breaker	Utility Lock Trans. Encl Key Interlock #	Other	
Comments					
Fans					
Fans # of Fans	Yes	NoX	Fan Voltage		
Transformer Load Side	e Conductor Data				
Conductor Type Conductor Material Tape Shield Concentric Neutral	Aluminum	Bus Bar Copper X Copper Copper Copper	Conductor Size / Dim. Conductors per Phase Bond Size / Dim. # of Bond Conductors	1 2/O	/ Phase
Insulation Voltage Insulation Type			# of Neutral Conductors Neutral Size / Dim.		
Comments:					



TRANSFORMER TEST SHEET (Pg. 3 of 4)

	OVVE	A SPARKP	CES OWER COMPANY			System ID			Dev	ice ID		T1
Electric	al Tests											
Turn Rat	tio Test	Test Vol	tage: Automa	tic	X Oth	er V						
Tap P	osition /	Tap Voltage	Calculated		H 1 To	H 2	H 2 To	ь н	3	Н3	То	H 1
Desig	nation	v	Ratio		X 1 To	X 0	X 2 To	x x	0	X 3	То	X 0
1/A	105.00%	44000										
2 / B	102.50%	42900	17.862		17.8	374	17	.881			17.80	62
3 / C	100.00%	41800										
4 / D	97.50%	40700										
5/E	95.00%	39600										
					Excitation Currrent	Percent Deviation	Excitation Currrent	Perce Devia		Excita Currre		Percent Deviation
		Tap Posi	tion As Found	2	0.450 mA	0.007 %	0.420 m/	0.1	10 %	0.340	0 mA	0.000 %
		Tap Posi	ition As Left		mA	%	m/	\	%		mA	%
Primary	Winding I	Resistance				Secondary	v Winding R	esistan	ice			
Res	istance in c	hms at 0.5	A after 1	mir	nute	Resist	ance in milli-c	hms at	5	Α	after	1 minute
H0 - H1 H0 - H2 H0 - H3		N/A Ω N/A Ω N/A Ω	H1 - H2 H2 - H3 H3 - H1	3.4	470 Ω 470 Ω 460 Ω	X0 - X1 X0 - X2 X0 - X3	16.900 I	mΩ mΩ mΩ	X1 - X X2 - X X3 - X	(3	32.2	00 mΩ 00 mΩ 00 mΩ
	Stabiliz	ation Time >	1	Mi	nute	St	abilization Tin	ne > _	1		_Minu	ıte
Capacita	ance Test											

Cap

	Low - Ground		Low - Guard		UST (High - Low)		High - Guard		High - Ground	
Capacitance in pico-farads	7167	рF	1870	рF	5294	рF	5085	рF	10377	рF
Uncorrected D.F. (%)	2.040	%	2.360	%	1.900	%	2.020	%	1.960	%
Corrected to 20 °C (%)	2.040	%	2.360	%	1.900	%	2.020	%	1.960	%

Temp. Correction Factor 1

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @	V DC after 1 minute	Phase A to Ground	N/A	MΩ
		Phase B to Ground	N/A	MΩ
		Phase C to Ground	N/A	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	V DC a	fter 1 minute			
Phase A to Ground	N/A	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground	N/A	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground	N/A	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

SECONDARY CONDUCTOR INSULATION RESISTANCE RESULTS ARE ON H.V. SWITCH TEST PAGE. DISSIPATION FACTOR RESULTS ARE HIGHER THAN NORMAL LIMITS.

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	0311	51091	5563	7776
Tested By:	D. MACLEAN, C. IVAN				



TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID

Device ID

T1

Dielectric Absorption Test (Insulation Resistance)

	High to Lo	w & Gnd	Low to Hig	gh & Gnd	High & Low to Gnd		
Time	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected	
15 sec	116.2 MΩ	116 MΩ	59 MΩ	59 MΩ	49 MΩ	49 MΩ	
30 sec	126.9 MΩ	127 MΩ	65 MΩ	65 MΩ	54 MΩ	54 MΩ	
45 sec	130.2 MΩ	130 MΩ	69 MΩ	69 MΩ	55 MΩ	55 MΩ	
1 min	133.4 MΩ	133 MΩ	72 MΩ	72 MΩ	56 MΩ	56 MΩ	
2 min	138.2 MΩ	138 MΩ	76 MΩ	76 MΩ	57 MΩ	57 MΩ	
3 min	140 MΩ	140 MΩ	78 MΩ	78 MΩ	58 MΩ	58 MΩ	
4 min	141.1 MΩ	141 MΩ	80 MΩ	80 MΩ	58 MΩ	58 MΩ	
5 min	141.8 MΩ	142 MΩ	82 MΩ	82 MΩ	59 MΩ	59 MΩ	
Test Voltage	10000	v	1000	v	1000	V	
Multiplier	1		1		1	1	
Polarization Index	1.0	0	1.(00	1.0	00	
TCC 1.00		Insulat	ion Resistance Rea	dings Corrected to	20 °C		

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohms after 1 minute.					Resistance in meg-ohms after 1 minute.	
	High to Low & Ground	133	ΜΩ @	10000	v	Core Ground Accessible
	Low to High & Ground	72	ΜΩ @	1000	v	Test Voltage
	High & Low to Ground	56	ΜΩ @	1000	v	Core Ground Resistance

Core Ground Accessible
 Test Voltage
 Core Ground Resistance



Yes

						<u>\bsorption T</u> me	<u>cor</u>		
	100000 -								
s)									
Ĕ									
aol									
leg									
Ś									
nce	10000 -								
sta									
esi	-								
L L L	-								
tio									
Insulation Resistance (Megaohms)									
lns	1000								
	1000	15 sec	30 sec	45 sec	1 min	2 min	3 min	4 min	5 min
High to I	Low & Gnd	116	127	130	133	138	140	141	142
	ligh & Gnd	59	65	69	72	76	78	80	82
High & L	ow to Gnd	49	54	55	56	57	58	58	59

-	Test Instrument(s)	Manufacturer / Model	Megger	
		Serial #	7776	
Comments:	TRANSFORMER IN	SULATION RESIST	ANCE RESULTS	SARE VERY LOW.
	THIS MAY BE DUE	TO WEATHER CON	DITIONS (DAIN	

THIS MAY BE DUE TO WEATHER CONDITIONS (RAIN/HUMIDITY) WHEN TESTED.

Tested By: D. MACLEAN, C. IVANY

September 27th, 2017



Rideau St. Lawrence 985 Industrial Rd. Prescott, ON. K0E 1T0

Attention: John Biccum

Re: Oil Analysis Report - Our Ref: 15769 Site: Cardinal D.S. #1 – 715 County Rd. #2, Cardinal, ON.

To whom it may concern,

Please find attached the oil analysis results of samples taken recently at your facility.

Transformer – Asea Brown Boveri, Serial no. C197 (T1)

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. With the exception of Carbon Dioxide (CO2), all of the other dissolved gases remained stable and within IEEE recommended limits. Carbon Dioxide (3307 ppm) exceeds the IEEE recommended Condition 2 limit (2501-4000 ppm). Elevated levels of these gases indicate that the windings paper insulation is being stressed due overheating. Possible causes can be attributed to loading issues or problems with oil circulation. Please contact us to perform a FURAN analysis with remaining sample. We recommend resampling in 6 months for DGA to monitor these gases.

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the insulating fluid to be in satisfactory condition, remaining clear with zero amounts of sediment detected, and having a slight amount of water content (24 ppm). All of the parameters with the exception of Interfacial Tension and Dielectric Breakdown were found within manufacturer recommended limits. Interfacial *Tension (22 dynes/cm)* remains below current recommended manufacturer guideline minimum limit (25 dynes/cm). Interfacial Tension (IFT) measures the tension at the interface between two liquids which do not mix (oil and water) and is expressed in dynes/cm. This test is used to detect the presence of oil decay products (sludge), polar contaminants from solid insulating materials and oxidation products in the oil. Please contact Tal Trees if you wish to perform an inhibitor analysis on remaining sample. The Dielectric Breakdown (32KV) is lower than recommend limit (40KV). *Dielectric Breakdown* of an insulating oil is a measure of the oils ability to withstand electrical stress without failure. Contaminants such as particles, contaminants and water can reduce the dielectric strength of an insulating liquid. All of the other measured parameters remained within IEEE recommended limits for acceptable in-service operation. We recommend resampling at your earliest convenience to verify Dielectric Breakdown.



Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence in the future.

Yours Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville ON. K8N 4Z5





		IPLE ANALYSIS R I SERVICE - OIL		Y
Cust PO : RSL-CA	RDINAL MS1		Lab No : File No : Cust No :	T 2017-1767 13888 TLT02
TALTREES POWER SER	VICES			
102 PARKS DRIVE			Date Received :	AUG 31 2017
			Analysis Date :	SEP 12 2017
BELLEVILLE	ON		Analyzed By :	TM
K8N 4Z5			Reviewed By :	SwP
	SF	MPLE IDENTIFIC	ATION	
Description : T1				
Rating : HV_Rating : Manuf. / Date: ASEA B Serial No : C197	44 k	RI 1953 Sampl	e : 8500 e Port : BOTTOM - ed By : CI e Date : AUG 24 2	
TEST	ASTM NO.	RECOMMENDE	D LIMITS	TEST VALUES
Dielectric Breakdown	D1816 D877		KV (Min) 1816 - KV (Min) 877 -	32
Neutralization Number	D974	0.2 Max (0. Milligrams		0.06
Interfacial Tension	D971	25 Dyne (Minimu	s/cm m)	22
Cranifia Creatity	D1298	(60/60°F		0.888
Specific Gravity API Gravity	D1290	(80/80 1	,	27.8
Colour	D1500	0.5 — 8.	0	2.0
Visual Condition		Clarity		CLEAR
	D1524	Sediment		NONE
		Free Wat		NO
Water Content	D1533	35 p.p.m.	max	24
Power Factor (25 C)	D924	0.5 % max		
Power Factor (100°C)	D924	5.0 % max		
		TEST EVALUATION		
L			9	

DIELECTRIC BREAKDOWN IS LOW FOR HV RATING IFT INDICATES POLAR CONTAMINANTS AND OXIDATION PRODUCTS IN THE OIL NEUTRALIZATION NUMBER IS GOOD WATER CONTENT IS GOOD

RECOMMENDATIONS: RE-SAMPLE TO VERIFY THE DIELECTRIC BREAKDOWN CONTACT LAB TO PERFORM INHIBITOR ANALYSIS ON REMAINING OIL

Notes :

Test results relate only to samples tested as received.

RONDAR INC.	333 Centennial Parkway North	Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808	Fax : (905) 561-8871	

	LVED GAS ANA M Method D36		: D 2017-1720 : 13888 : TLT02	
TALTREES POWER SERVICES 102 PARKS DRIVE		Date Rece Analysis I		
BELLEVILLE O K8N 4Z5	N	Analyzed Reviewed	By : SK	
SA	MPLE IDENTIF	ICATION		
Description : T1				
	kV Vo ERI 1953 Pr Sy TANK Sa	uid Temp. lume reservation ringe Seria mpled By mple Date	: 8500 GALLONS : SEALED 1: AA560 : C.I	
COMPONENT	MEASURED	PPM	% COMBUSTIBLES	
Hydrogen (H2)	<u></u>	9	3.1	
Oxygen + Argon (O2 + A)	24	572		
Nitrogen (N2)	52	626		
Methane (CH4)		9	3.1	
Carbon Monoxide (CO)		226	76.6	
Carbon Dioxide (CO2)	3	307		
Ethylene (C2H4)		4	1.4	
Ethane (C2H6)		4	1.4	
Acetylene (C2H2)		<1	. 0	
Propane (C3H8)		43	14.6	
Total Gas Content	8	8.08 ¥		
Combustible Gas Content		295′ ppm	.365 %	
*PPM = Part Per Million	by volume	N.D.	= Not Detectable	
		IN THE PAPE	R INSULATION. REST OF	AN
Recommendations : SAMPLE IN 6 CONTACT LAB Notes :			ASES SIS FROM REMAINING SAMP	,TE

Test results relate only to samples tested as received.

RONDAR INC. 333 Centennial Parkway North Hamilton, Ontario L8E 2X6 Telephone : (905) 561-2808 Fax : (905) 561-8871



September 27th, 2017

Rideau St. Lawrence 985 Industrial Rd. Prescott, ON. K0E 1T0

Attention: John Biccum

Re: Maintenance Inspection Report - Our Ref: 15857 Site: Cardinal D.S. #2 – 3039 John St., Cardinal, ON.

To whom it may concern,

Please find the attached report for the maintenance work and inspections completed August 23rd, 2017.

Tal Trees cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

Load Break Switch & Secondary Switch gear:



102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, As well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.



Power Transformer:

- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with anti-oxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer test was completed on the transformer.



Findings/Repairs:

- Temperature gauge on transformer is not functioning.
- Substation requires more gravel along east side. There are some areas that the station fence is 6" above gravel, this is a large opening that animals could potentially enter the station.
- The bottom tension wire is broken on east side of substation fence and should be repaired.

Recommendations:

- Repair transformer temperature gauge.
- Add gravel to substation to comply with OESC and prevent animals from entering station.
- Repair tension wire on fence.
- Continue with regular yearly maintenance.

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all of the recommended repairs listed in this report.

If you have any questions/concerns please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence.

Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville ON. K8N 4Z5



102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA





HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

- POWER SE	RVICES SPARKPOWER COMPANY	System ID	INCOMING	44KV	Device ID	CSST	2-L
Customer	Rideau St. Lawrence		Date	Augus	t 23rd, 2017		
Customer Address	985 Industrial Rd., Prescott			15857	•		
	Caridnal D.S. #2	System No	eutral Present	-			
	3039 John St., Cardinal, ON						
Nameplate Data							
Switch Mounting	Metal Enclosed Pole	X Tov	ver		Other		
Switch Type					Other		
Manufacturer			BIL Rating	N/A			kV
Date Of Manufacture			Feeder ID		-L		
Serial #			Feeds To	-			
Catalog #		Inter	rupting Rating				Α
Nom. / Max. Voltage			ious Ampacity				
-	NAMEPLATE FADED / NOT LEGIBLE		ieue / impuenty				
Lightning Arrestors							
• •	Yes X No						
Lightning Arrestors Class		X Stati	ion				
Class							
Manufacturer					20.0 /	49.0	ЬV
			MCOV Rating		39.0 /	48.0	kV
-	30003996						
Comments							
Protective Device Data							
Primary Fuse Holder Dat		Primary Fu	ise Link Dat				
Manufacturer			Manufacturer	-			
	SMD-2C			SMD 1	Α		
Nom. / Max. Voltage		/	Link Size	-			Α
Holder Max. Fuse Link				153-1			
Holder Catalog #		I	_ink Catalog #	445065	SR1		
Primary Fuse Link Spare							
Spare Primary Fuses			# of Spares				
Spare Location							
Comments							
Interlock							
Key Interlock	Yes No	X					
Interlock Type	Electrical Mechanical	Utility Lo	ock				
Devices Interlocked	H.V. Switch Breaker	Trans. E		Ot	her		
Manufacturer			Key Interloc	k #			
Comments			,				
Load Side Conductor	Data						
Conductor Turne	Cable X Bus Bar	Con	duatar Cina / D				
Conductor Type Conductor Material	Aluminum X Copper		ductor Size / D luctors per Pha		·		Phase
Tape Shield		Cond	Bond Size / D				Fliase
Concentric Neutral	Aluminum Copper Aluminum Copper	# ~	f Bond Coduct				
			eutral Conduct				
Insulation Voltage Insulation Type			leutral Size / D				
Comments							
Comments							
Recorded By:	C. SULLIVAN, R. MELVIN						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SER	VI	CES						-					-		-
FOW			CES OWER COMPA	NY				Syste	em ID	INCO	OMING	44KV	Devic	e ID	CSST	2-L
Visual Inspec	tion / Mech	ani	ical Tests	5												
-	ate Condition		Satisfacto			Not S	Satisfa	ctory	X	N/A		Con	nments I	FADED		
Insula	ator Condition		Satisfacto	y X		Not S	Satisfa	ctory		N/A		Con	nments			
Ground	Connections		Satisfacto	ry X		Not S	Satisfa	ctory		N/A		Con	nments			
Lightr	ning Arrestors		Satisfacto	ry X		Not S	Satisfa	ctory		N/A		Con	nments			
Arc	Suppressors		Satisfacto	гy		Not S	Satisfa	ctory		N/A	Х	Con	nments			
Key Interlo	ock Operation		Satisfacto	-		Not S	Satisfa	ctory		N/A	X	Con	nments			
Ground Strap	os & Materials		Satisfacto	ry X		Not S	Satisfa	ctory		N/A		Con	nments			
Switch Conditi	ion / Operati	on			,											
Switch Ope	ration As Left		Satisfacto	ry X			Satisfa	-		N/A		Con	nments			
Contact Surfa	ace Condition		Satisfacto	ry X		Not S	Satisfa	ctory		N/A		Con	nments			
Simultan	eous Closure		Satisfacto	ry X]	Not S	Satisfa	ctory		N/A		Con	nments			
Electrical Tes	sts															
Earth Resistan	ce (3-Point	Tes	t)					Arc S	Suppre	essor	Cont	act Res	sistance	;		
Earth Resistar	nce in Ohms.							Arc	c Suppr	essor	Conta	ct Resist	tance in C	Ohms.		
								Ph	ase A			N/A	1		Ω	
Earth Resistar	nce				Ω			Ph	ase B			N/A	۱		Ω	
								Ph	ase C			N/A			Ω	
Switch Insulat	ion Resistan	се						Swite	ch / Fu	ise C	ontac	t Resis	tance			
Resistance in M	eg-Ohms afte	r 1 r	ninute.					Res	sistance	in mi	cro-Oh	ms after	1 minute	Э.		
Test Voltage	1 kV	2 k	V	5 kV		10 k\	v 🗌	Tes	t Curre	nt	10	Α				
	Phase A		Phase	В		Phase (С				Phas	e A	Phas	se B	Phas	e C
Phase to GND	N/A N	Ω	N/A	MΩ		N/A	MΩ		Contac	ts	2029	μΩ	1524	μΩ	1447	μΩ
									Fus	se	1903	μΩ	1187	μΩ	1219	μΩ
									Overa	all	3577	μΩ	2466	μΩ	2460	μΩ
Load Side Con	ductor Insu	latic	on Resista	nce												
Resistance	in Meg-Ohms	@		V	DC	after 1 n	ninute	•		Phase	e A to (Ground		N/A		MΩ
										Phase	e B to (Ground		N/A		MΩ
										Phase	e C to (Ground		N/A		MΩ
Lightning Arre	stor Insulati	on l	Resistanc	е												
Resistance	in Meg-Ohms	@	10000	V	DC	after 1 n	ninute	9		Phase	e A to (Ground		247000	1	MΩ
												Ground		284000		MΩ
										Phase	e C to (Ground		258000	1	MΩ
Comments / (Observatio	15														

С mments / Observatio

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 6839

Tested By: C. SULLIVAN, R. MELVIN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	INCOMING	4160	Device ID	33F4
Customer	Rideau St. Lawrence			Data	Διιαιιά	st 23rd, 2017	
	985 Industrial Rd., Preso	ott				•	
	Caridnal D.S. #2		System Ne	utral Present	10007		
	3039 John St., Cardinal,	ON	Oystem Ne				
Namanlata Data	· · · · · · · · · · · · · · · · · · ·						
Nameplate Data			т.				
Switch Mounting		Pole	Tow	er		Other	
Switch Type		Air Break				Other	
Manufacturer				BIL Rating	-		kV
Date Of Manufacture	-			Feeder ID			
	GTB-2929R20			Feeds To	-		
	CTS-59184			upting Rating	-		Α
Nom. / Max. Voltage		kV	Continuo	ous Ampacity	600		Α
Comments							
Lightning Arrestors							
Lightning Arrestors	Yes	No X					
Class	Distribution I	ntermediate	Statio	on			
Composition	Ceramic	Polymer					
Manufacturer			Max./	MCOV Rating		1	kV
Catalog #							
Comments							
Protective Device Data	1						
Primary Fuse Holder Dat	'a		Primary Fu	se Link Data	a		
Manufacturer				Manufacturer			
	SM5S				SM-5		
Nom. / Max. Voltage		kV		Link Size	-		Α
Holder Max. Fuse Link				TCC #			<i>A</i>
Holder Catalog #		,	L	ink Catalog #	-		
Primary Fuse Link Spare			-	int catalog /			
Spare Primary Fuses		No X		# of Spares			
Spare Location							
Comments							
Interlock							
Key Interlock	Yes	No X					
Interlock Type	Electrical N	lechanical	Utility Lo	ck			
Devices Interlocked	H.V. Switch	Breaker	Trans. Er	cl.	0	ther	
Manufacturer				Key Interloc	k #	<u> </u>	
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X	Bus Bar	Cond	uctor Size / D	im 50(NCMII	
Conductor Material	Aluminum	Copper X		ictors per Pha			/ Phase
Tape Shield	Aluminum	Copper		Bond Size / D		`	7 1 11436
Concentric Neutral	Aluminum X	Copper		Bond Coduct		-	
Insulation Voltage				utral Conduct			
Insulation Type				eutral Size / D		^	
Comments	<u>IN/A</u>		INE			`	
Comments							
Recorded Bv:	D. MACLEAN, R. MELVIN	1					



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

- POW	ER SERVI	CES POWER COMPANY		System ID	NCOM	ING 4160	Device I	D	33F4	
Visual Inspec	tion / Mechan	ical Tests								
-	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Insula	tor Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Con	nments			
Lightn	ing Arrestors	Satisfactory	Not Satisfa	actory	N/A X	Con	nments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Con	nments			
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory	N/A X	Com	nments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Switch Conditi	on / Operation									
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Con	nments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Con	monto			
Simultan	eous Closure	Satisfactory X	Not Satisfa	actory	N/A	Con	nments			
Electrical Tes	ts									
Earth Resistan	ce (3-Point Tes	st)		Arc Suppres	sor C	ontact Res	sistance			
Earth Resistar	nce in Ohms.			Arc Suppres	sor Co	ntact Resist	ance in Ohr	ns.		
				Phase A		N/A			Ω	
Earth Resistar	nce		Ω	Phase B		N/A			Ω	
				Phase C		N/A			Ω	
Switch Insulati	on Resistance			Switch / Fus	e Con	tact Resis	tance			
Resistance in Me	eg-Ohms after 1	minute.		Resistance in	n micro	-Ohms after	1 minute.			
Test Voltage	1 kV 2	kV 5 kV	10 kV	Test Current		10 A				
				-						
	Phase A	Phase B	Phase C	-		hase A	Phase E	3	Phase	еC
Phase to GND	Ν/Α ΜΩ	Ν/Α ΜΩ	Ν/Α ΜΩ	Contacts				μΩ	N/A	μΩ
				Fuse				μΩ	339.4	μΩ
				Overall	653	.1 μΩ	631.6	μΩ	584.5	μΩ
Load Side Con	ductor Insulati	on Resistance								
Resistance	in Meg-Ohms @	V	DC after 1 minute	e P	hase A	to Ground	I	N/A		MΩ
				Р	hase B	to Ground	I	N/A		MΩ
				P	nase C	to Ground	I	N/A		MΩ
Lightning Arre	stor Insulation	Resistance								
Resistance	in Meg-Ohms @	v	DC after 1 minute	e P	hase A	to Ground	I	N/A		MΩ
	-			Р	hase B	to Ground	I	N/A		MΩ
				P	nase C	to Ground	I	N/A		MΩ
Comments / C	Observations									

COULD NOT TEST LOAD SIDE CONDUCTORS DUE TO GROUNDING FOR WORK PROTECTION.

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 6839

Tested By: D. MACLEAN, R. MELVIN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	INCOMING	4160	Device ID	33F5
Customer Address Site	Rideau St. Lawrence 985 Industrial Rd., Pres Caridnal D.S. #2 3039 John St., Cardinal		System Ne	Job #	15857		
Nameplate Data							
Switch Mounting Switch Type	Metal Enclosed X Load Break X	Pole Air Break	Tow	rer		Other Other	
Manufacturer	S&C			BIL Rating	60		kV
Date Of Manufacture	09/1996			Feeder ID	33F5		
Serial #	GTB-2929R20			Feeds To	LS218		
Catalog #	CTS-59184		Interr	upting Rating	40000		Α
Nom. / Max. Voltage	4.2 / 4.8	kV		ous Ampacity			Α
Lightning Arrestors							
Lightning Arrestors	Yes	No X					
			Stati	on			
Class	Distribution	Intermediate	Stati				
Composition	Ceramic	Polymer	/				
Manufacturer			Max. /	MCOV Rating		1	kV
Catalog #							
Comments	-						
Protective Device Data							
Primary Fuse Holder Dat				se Link Data			
Manufacturer				Manufacturer	-		
Туре	SM5S			Туре	SM-5		
Nom. / Max. Voltage	7.2 / 8.3	kV		Link Size	300E		Α
Holder Max. Fuse Link	400E			TCC #			
Holder Catalog #	86641R2		L	ink Catalog #	N/A		
Primary Fuse Link Spare	es / Location						
Spare Primary Fuses	Yes	No X		# of Spares			
Spare Location							
Comments							
Interlock							
IIICEIIOCK							
Key Interlock	Yes	No X					
Interlock Type	Electrical	Mechanical	Utility Lo	ck			
Devices Interlocked	H.V. Switch	Breaker	Trans. Er	ncl.	Ot	her	
Manufacturer				Key Interloc	k #		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X	Bus Bar	Cond	luctor Size / D	im. 500	KCMIL	
Conductor Material	Aluminum	Copper X		uctors per Pha	-		/ Phase
Tape Shield	Aluminum	Copper		Bond Size / D			, 1 11000
Concentric Neutral	Aluminum X	Copper		Bond Coduct			
Insulation Voltage				utral Conduct			
•							
Insulation Type	<u>N/A</u>		ING	eutral Size / D	nn. N/A	<u> </u>	
Comments							
Recorded By:	D. MACLEAN, R. MELV	IN					



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

- POW	ER SERV	ICES (POWER COMPANY		System ID		6 4160	Device	ID	33F5	;
Visual Inspec	tion / Mechar	nical Tests								
Namepl	ate Condition	Satisfactory X	Not Satisfa	actory N	I/A	Corr	nments			
Insula	ator Condition	Satisfactory X	Not Satisf	actory N	I/A	Corr	nments			
Ground	Connections	Satisfactory X	Not Satisf	actory N	I/A	Corr	nments			
Lightn	ning Arrestors	Satisfactory	Not Satisfa	actory N	I/A X	Corr	nments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory N	I/A	Con	nments			
Key Interlo	ock Operation	Satisfactory	Not Satisf	actory N	I/A X	Con	nments			
Ground Strap	s & Materials	Satisfactory X	Not Satisf	actory N	I/A	Corr	nments			
Switch Conditi	on / Operation	1								
Switch Ope	ration As Left	Satisfactory X	Not Satisf	actory N	I/A	Con	nments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory N	I/A	Corr	nments			
Simultan	eous Closure	Satisfactory X	Not Satisf	actory N	I/A	Corr	nments			
Electrical Tes	sts									
Earth Resistan	ce (3-Point Te	st)		Arc Suppress	sor Cont	act Res	sistance			-
Earth Resistar	nce in Ohms.			Arc Suppress	sor Contac	ct Resist	ance in O	hms.		
				Phase A		N/A			Ω	
Earth Resistar	nce		Ω	Phase B		N/A			Ω	
				Phase C		N/A			Ω	
Switch Insulati	ion Resistance)		Switch / Fuse	e Contac	t Resis	tance			
Resistance in Mo	eg-Ohms after 1	minute.		Resistance in	micro-Oh	ms after	1 minute.			
Test Voltage	1 kV 2	kV 5 kV	10 kV	Test Current	10	A				
	Phase A	Phase B	Phase C	_	Phas	o ^	Phase	D	Phase	<u> </u>
Phase to GND	N/A MΩ			Contacts	N/A	μΩ	N/A	μΩ	N/A	<u>μΩ</u>
				Fuse	360	μΩ	274	μΩ	365	μΩ
				Overall	645.9	μΩ	539.6	μΩ	658.3	μΩ
Load Side Con	ductor Insulat	ion Resistance		e rendin	0.000	P		P		
Resistance	in Meg-Ohms @	v	DC after 1 minut	te Ph	ase A to C	Ground		N/A		MΩ
	0				ase B to C	Ground		N/A		MΩ
				Ph	ase C to C	Ground		N/A		MΩ
Lightning Arre	stor Insulation	Resistance				1				
	in Meg-Ohms @		DC after 1 minut	te Ph	ase A to C	Ground		N/A		MΩ
	, U				ase B to C	Ground		N/A		MΩ

COULD NOT TEST LOAD SIDE CONDUCTORS DUE TO GROUNDING FOR WORK PROTECTION.

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 6839

Tested By: D. MACLEAN, R. MELVIN



TRANSFORMER DATA SHEET (Pg. 1 of 4)

	POVERSE	SPARKPOWER COMPANY	(System ID		44KV	Device ID		Т2		
	Custome	Rideau St. Lawren	60			Date		23rd, 2017				
		985 Industrial Rd.,					± 15857	2010, 2017				
		Caridnal D.S. #2	1100001			000 //	10001					
		3039 John St., Car	dinal, ON									
Namep	late Data											
	Transformer Class	Unit Padmount	Pad	mount	Station	X		Other				
Т	ransformer Cooling) ONAN	X	ONAF	LNAN	DF	RY	Other				
Bushir	ng Configuration	Dead Front	Тор	- Top X	Top - Side	Side - Si	de	Other				
	Manufacture		RIC CO.		С	ore & Windings	13950		kg		lb	X
C	Date of Manufacture	8/1952			٦	Fanks & Fittings	12030		kg		lb	Х
	Serial #	[‡] 149836			(Coolant Volume	1453		L	G	al	Х
KVA	/ Prov. KVA Rating	3000		KVA		Coolant Weight	t 13080		kg		-	Х
	Primary Voltage			V		Total Weight			kg		lb	Х
	Primary Ampacity	/ <u>N/A</u>		Α	Те	mperature Rise	-		°C	X	°F	
	Secondary Voltage	e 4160/2400Y		V		HV BIL Rating) <u>N/A</u>		kV			
	econdary Ampacity			Α		LV BIL Rating	-		kV		F	
	IV Winding Materia	-				cent Impedance	-	5.57 %	ONAN		IAF	
	V Winding Materia	-				mper Resistant			YES		NO	X
C	SA Specification(s				Trar	nsformer Colour	GRAY					
	Comments	S										
Visual I	nspection		_									
Ν	ameplate Conditior	n Satisfactory X	No	t Satisfacto	ory I	N/A	Comment	s BAR		EGIBL	E	
Fa	n / Pump Operatior	n Satisfactory	No	t Satisfacto	ory I	N/A X	Comment	S				
G	Fround Connections	Satisfactory X	No	t Satisfacto	ory I	N/A	Comment	S				
Liq	uid Levels In Tanks	s Satisfactory X	No	t Satisfacto	ory I	N/A	Comment	S				
	Interlock Operation	-	No	t Satisfacto	ory I	N/A X	Comment	S				
Temp	 Gauge Operation 	a Satisfactory	No	t Satisfacto	ory X I	N/A	Comment	s NC	OT WO	RKING	i	
Co	oolant Temperature	e <u>20</u>	°C	X °F	1	Max. Coolant Te	emperatur	e 20	°C	X	°F	
	Comments	S										
Oil Cons	servator											
	Oil Conservato	or Yes	No X		Cons	ervator Volume	;		L	G	al	
	Silica Gel Breathe		No X			reather Volume			Ľ		al	
	Silica Gel Colou		Bad	Replace		N/A X			-		- L	
	Comments	s										
	inger Data				Vector Dia	gram: De	ltaWye1	5.Dyn1				
	osition /	Tap Voltages (V)	As	As			H2		X2			_
	signation		Found	Left			Ν.	. /	,			
1/A	105.00%	44000					\ `	\rightarrow	Хо			
2 / B	102.50%	42900										
3/C	100.00%	41800	X	X		н1	<u> н</u> з		X3			
4 / D	97.50%	40700									_	
5 / E	95.00%	39600			Prim	ary Vector)	(Seconda	ry Vec	tor X	(
	Comments	•										
												-
	Recorded By	D. MALCEAN, C. IV	ANY									

TALTE	REE	5			DA	TRA TA SHEE	NSFORI T (Pg. 2 (
POWER SE	RVICES SPARKPOWER COMP	ANY		System ID	INCOMING 44	(V Device II	D T2	
Neutral Grounding Res	sistor (NGR)							
NGR Voltage			v	 /Ma	aximum Current			Α
					NGR Location			
Transformer Lightning	Arrestors							
Lightning Arrestors Class Composition	Distribution		No X Intermediate Polymer	Stat	ion			
Catalog #					/ MCOV Rating	1		kV
Interlock								
Key Interlock Interlock Type Devices Interlocked	Elec.		No Xech. Breaker	Utility Lo Trans. E		Other		
Fans								
Fans			No					
					Fan Voltage			
Fan Size					Frame Size			
Comments				_				
Transformer Load Side	e Conductor L	Data						
Conductor Type Conductor Material	Aluminum	X	Bus Bar Copper		ductor Size / Dim. ductors per Phase Bond Size / Dim.	1	/1	Phase
Tape Shield Concentric Neutral			Copper Copper	# of	Bond Size / Dim. Bond Conductors	-		
Insulation Voltage			Coppor		eutral Conductors			
Insulation Type	-			_	leutral Size / Dim.			
Comments:								
Recorded By:	D. MALCEAN, C	. IVAN	Y					



TRANSFORMER TEST SHEET (Pg. 3 of 4)

Device ID

INCOMING 44KV System ID

Т2

Electrical Tests

Turn Ra	tio Test	Test Vol	age: Automa	tic	X Oth	er <u>v</u>				
Тар Р	osition /	Tap Voltage	Calculated		H 1 To	H 2	H 2 To	H 3	Н 3 То	H 1
Desig	gnation	v	Ratio		X 0 To	X 2	X 0 To	X 3	Х О То	X 1
1/A	105.00%	44000								
2 / B	102.50%	42900								
3 / C	100.00%	41800	17.404		17.4	67	17.4	168	17.4	66
4 / D	97.50%	40700								
5/E	95.00%	39600								
					Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
		Tap Posi	tion As Found	3	0.740 mA	0.370 %	0.760 mA	0.370 %	0.600 mA	0.360 %
		Tap Posi	tion As Left		mA	%	mA	%	mA	%

Primary Winding Resistance

Resistance in ohms at Resistance in milli-ohms at 0.5 Α after 1 minute 5 Α after 1 minute H0 - H1 N/A Ω H1 - H2 3.070 Ω X0 - X1 17.100 mΩ X1 - X2 29.400 mΩ H0 - H2 N/A Ω H2 - H3 3.080 Ω X0 - X2 X2 - X3 28.700 mΩ 19.300 mΩ 30.000 mΩ H0 - H3 N/A Ω H3 - H1 3.060 Ω X0 - X3 18.600 mΩ X3 - X1 Minute

Stabilization Time > 1 Stabilization Time > 1

Secondary Winding Resistance

Minute

Capacitance Test

	Low - Grou	Ind	Low - Guar	Low - Guard		UST (High - Low)		High - Guard		nd
Capacitance in pico-farads	4991	рF	1636	рF	3358	pF	8223	рF	11572	рF
Uncorrected D.F. (%)	1.270	%	1.380	%	1.090	%	1.490	%	1.390	%
Corrected to 20 °C (%)	1.270	%	1.380	%	1.090	%	1.490	%	1.390	%

Temp. Correction Factor 1

Lightning Arrestor Insulation Resistance

Resistance in	meg-ohms @	V DC after 1 minute	Phase A to Ground	N/A	MΩ
			Phase B to Ground	N/A	MΩ
			Phase C to Ground	N/A	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	5000 V DC a	after 1 minute			
Phase A to Ground	>500000	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground	>500000	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground	>500000	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	0311	51091	5563	7776
Tested By:	D. MALCEAN, C. IVAN	Y			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

Device ID

Yes

System ID INCOMING 44KV

Т2

Dielectric Absorption Test (Insulation Resistance)

	High to Low & Gnd Low to		Low to Hig	gh & Gnd	High & Low to Gnd	
Time	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
15 sec	147.2 MΩ	147 MΩ	79 MΩ	79 MΩ	113 Μ Ω	113 MΩ
30 sec	180.1 MΩ	180 MΩ	112 MΩ	112 MΩ	140 MΩ	140 MΩ
45 sec	194.9 MΩ	195 MΩ	133 MΩ	133 MΩ	155 MΩ	155 MΩ
1 min	218 MΩ	218 MΩ	149 MΩ	149 MΩ	166 MΩ	166 MΩ
2 min	218 MΩ	218 MΩ	200 MΩ	200 MΩ	182 MΩ	182 MΩ
3 min	233 MΩ	233 MΩ	231 MΩ	231 MΩ	189 MΩ	189 MΩ
4 min	235 MΩ	235 MΩ	253 MΩ	253 MΩ	193 MΩ	193 MΩ
5 min	237 MΩ	237 MΩ	268 MΩ	268 MΩ	196 MΩ	196 MΩ
Test Voltage	10000	V	1000	V	1000	V
Multiplier	1		1		1	
Polarization Index	1.00		1.00		1.00	
TCC 1.00	Insulation Resistance Readings Corrected to 20 °C					

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohms after 1 minute.					F
High to Low & Ground	218	ΜΩ @	10000	V	
Low to High & Ground	149	MΩ @	1000	v	
High & Low to Ground	166	MΩ @	1000	v	

Resistance in meg-ohms after 1 minute	э.
Core Ground Accessible	
Test Voltage	
Core Ground Resistance	

No X V ΜΩ



Test Instrument(s)	Manufacturer / Model	Megger
	Serial #	7776

Comments: INSULATION RESISTANCE RESULTS ARE LOW. PLEASE SEE OIL RESULTS TO CONFIRM

Tested By: D. MALCEAN, C. IVANY
September 27th, 2017



Rideau St. Lawrence 985 Industrial Rd. Prescott, ON. K0E 1T0

Attention: John Biccum

Re: Oil Analysis Report - Our Ref: 15857 Site: Cardinal D.S. #2 – 3039 John St., Cardinal, ON.

To whom it may concern,

Please find attached the oil analysis results of samples taken recently at your facility.

Transformer – Moloney, Serial no. 149836 (T2)

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. With the exception of Carbon Dioxide (CO2), all of the other dissolved gases remained stable and within IEEE recommended limits. **Carbon Dioxide (2789 ppm) exceeds the IEEE recommended Condition 2 limit (2501-4000 ppm).** Elevated levels of these gases indicate that the windings paper insulation is being stressed due overheating. Possible causes can be attributed to loading issues or problems with oil circulation. Please contact us to perform a FURAN analysis with remaining sample. We recommend resampling in 6 months for **DGA to monitor these gases**.

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the insulating fluid to be in satisfactory condition, remaining clear with zero amounts of sediment detected, and having a slight amount of water content (24 ppm). All of the parameters with the exception of Interfacial Tension and Dielectric Breakdown were found within manufacturer recommended limits. Interfacial *Tension (22 dynes/cm)* remains below current recommended manufacturer guideline minimum limit (25 dynes/cm). Interfacial Tension (IFT) measures the tension at the interface between two liquids which do not mix (oil and water) and is expressed in dynes/cm. This test is used to detect the presence of oil decay products (sludge), polar contaminants from solid insulating materials and oxidation products in the oil. Please contact Tal Trees if you wish to perform an inhibitor analysis on remaining sample. The Dielectric Breakdown (36KV) is lower than recommend limit (40KV). Dielectric Breakdown of an insulating oil is a measure of the oils ability to withstand electrical stress without failure. Contaminants such as particles, contaminants and water can reduce the dielectric strength of an insulating liquid. All of the other measured parameters remained within IEEE recommended limits for acceptable in-service operation. We recommend resampling at your earliest convenience to verify Dielectric Breakdown.

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence in the future.

Yours Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville ON. K8N 4Z5





IN SERVICE - OIL Cust PO : MSL-CARDINAL MS2 Lab No : T 2017-1768 File No : 13888 Cust No : TLT02 TALTREES POWER SERVICES 102 PARKS DRIVE Date Received : AUG 31 2017 Analysis Date : SEP 12 2017
102 PARKS DRIVE Date Received : AUG 31 2017 Analysis Date : SEP 12 2017
Analysis Date : SEP 12 2017
BELLEVILLEONAnalyzed By :TMK8N 4Z5Reviewed By :Switch
SAMPLE IDENTIFICATION
Description : T1
Rating:3 MVAVolume: 1453IMP. GALLONSHV_Rating <td:< td="">:44 kVSample Port : BOTTOM - MAIN TANKManuf. / Date:MOLONEY1952Sampled By : CISerial No: 149836Sample Date : AUG 24 2017</td:<>
TEST ASTM NO. RECOMMENDED LIMITS TEST VALUES
Dielectric Breakdown D1816 2mm Gap 40 KV (Min) 1816 - 36 D877 KV (Min) 877 -
Neutralization Number D974 0.2 Max (0.5 - Scrap) 0.05 Milligrams KOH/gram
Interfacial Tension D971 25 Dynes/cm 22 (Minimum)
Specific Gravity D1298 (60/60°F) 0.882 API Gravity 28.9
Colour D1500 0.5 - 8.0 1.5
Visual Condition Clarity CLEAR D1524 Sediment NONE Free Water NO
Water Content D1533 35 p.p.m. max 28
Power Factor (25 C) D924 0.5 % max Power Factor (100°C) D924 5.0 % max
TEST EVALUATION

DIELECTRIC BREAKDOWN IS LOW FOR HV RATING IFT INDICATES POLAR CONTAMINANTS AND OXIDATION PRODUCTS IN THE OIL NEUTRALIZATION NUMBER IS GOOD WATER CONTENT IS GOOD

RECOMMENDATIONS: RE-SAMPLE TO VERIFY THE DIELECTRIC BREAKDOWN CONTACT LAB TO PERFORM INHIBITOR ANALYSIS ON REMAINING OIL

Notes :

Test results relate only to samples tested as received.

RONDAR INC.	333 Centennial Parkway North	Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808	Fax : (905) 561-8871	

	ASTM Method	ANALYSIS - OID D3612 Part C Lab No File No Cust No	L : D 2017-1721 : 13888 : TLT02
TALTREES POWER SERVICES 102 PARKS DRIVE BELLEVILLE	ON	Date Rece Analysis Analyzed	eived : AUG 31 2017 Date : SEP 05 2017 By : SK
K8N 4Z5		Reviewed	By : S_{ω}
	SAMPLE IDEN	JTIFICATION	
Description : Tl			
Rating : HV Rating : Manuf. / Date: MOLONEY Serial No : 149836 Sample Port : BOTTOM - MA		Fluid Temp. Volume Preservation Syringe Seria Sampled By Sample Date	: 1453 IMP. GALLONS : SEALED al: CG862 : C.I
COMPONENT	MEASU	JRED PPM	% COMBUSTIBLES
Hydrogen (H2)		20	7.9
Oxygen + Argon (O2 +	A)	21873	
Nitrogen (N2)		52867	
Methane (CH4)		6	2.4
Carbon Monoxide (CO)		194	76.7
Carbon Dioxide (CO2)		2789	
Ethylene (C2H4)		3	1.2
Ethane (C2H6)		3	1.2
Acetylene (C2H2)		<1	. 0
Propane (C3H8)		27	10.7
Total Gas Content		7.78 %	
Combustible Gas Content		253 ppm	.325 %
*PPM = Part Per Mill	ion by volum	ne N.D	. = Not Detectable
General Comments: CARBON D	IOXIDE HAS I	NCREASED SINC	E DEC/16 INDICATING HIGHER

General Comments: CARBON DIOXIDE HAS INCREASED SINCE DEC/16 INDICATING HIGHER THAN NORMAL TEMPERATURE WITHIN THE PAPER INSULATION. REST OF FAULT GASES HAVE REMAINED WITHIN NROAML RANGE.

Recommendations : SAMPLE IN 6 MONTHS FOR DISSOLVED GASES CONTACT LAB TO PERFORM FURAN ANALYSIS FROM REMAINING SAMPLE Notes : Test results relate only to samples tested as received.

-

RONDAR INC. 333 Centennial Parkway North Hamilton, Ontario L8E 2X6 Telephone : (905) 561-2808 Fax : (905) 561-8871



November 18th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. KOE 1T0

Attention: Darryl Reynolds

Re: Maintenance Inspection Report - Our Ref: 29995 Site: Iroquois MS #1 – 5549 Carman Rd., Iroquois, ON

Please find the attached report for the maintenance work and inspections completed October 18th, 2019.

Tal Trees cleaned, serviced, tested & inspected, the main power system. All testing and inspections were performed in accordance to NETA Maintenance Testing Specifications.

Items tested/inspected include:

- o 44KV Air Break Switches
- Lightning Arrestors
- o Main Transformers
- Secondary Cables
- Transformer Oil Analysis
- o 4.16KV Load Break Switches
- o Automatic Recloser
- o S&C pad mount switch

A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and NETA MTS.



<u> Air Break / Load Break Switches:</u>



- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, as well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.



Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with antioxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer tests were completed on the transformer including turn ratio test, winding resistance, capacitance test and dielectric absorption test (insulation resistance).
- An oil sample was obtained for fluid analysis and DGA.



Findings/Repairs:

- Order spare S&C SMD-2C 100 Amp fuses (TCC# 153-1) for T2-L. It is recommended to stock spare fuses on site.
- Transformer T1 is leaking insulating fluid from the top of the main tank. The leak is considered significant at this time as oil was observed pooling on the concrete pad. Rust has formed on the exterior of the conservator tank and radiators; these findings are confirmed by the oil analysis that indicates oxidation has contaminated the insulating fluid.
- Pad mount switch is currently interlocked to prevent the secondary connections of transformer T1&T2 from being placed in parallel. Meaning each time, the source is transferred there will be a power interruption on the secondary feeders.
- Transformer T1 does not have any ground connection to the grid.
- Primary connection on transformer T1 was replaced as one of the U-bolts was broken and the bracket was cracked.

Recommendations:

- Given the current age physical condition and oil analysis results of transformer T1 it is recommended to consider replacement. This unit has already had all bushings regasketed has reached the end of its life expectancy.
- Consult with engineering regarding the switching & loading capabilities of the pad mount switchgear.
- Continue with annual substation maintenance.

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all the recommended repairs listed in this report.

If you have any questions/concerns, please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence Utility.

Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 <u>dmaclean@taltrees.ca</u> Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA





HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY	System ID	IROQUOIS	MS#1	Device ID	T1-L
Customer	Rideau St. Lawrence Utility		Date	Octob	er 18th, 2019	
	985 Industrial Rd., Prescott, ON			29995	•	
	Iroquois MS#1	Svstem Ne	eutral Present			
	5549 Carman Rd., Iroquois, ON	,				
Nameplate Data						
Switch Mounting	Metal Enclosed Pole	Tow	ver X		Other	
Switch Type	Load Break Air Break				Other	
	EASTERN POWER		BIL Rating			kV
Date Of Manufacture			0	BROC	KVILLE M26	
Serial #			Feeds To			
Catalog #		Interr	upting Rating			Α
Nom. / Max. Voltage	44.0 / 46.0 H		ous Ampacity			A
Comments			ouorampuony			
Lightning Arrestors						
Lightning Arrestors	Yes X No					
Class	Distribution Intermediate	Stati	on X			
Composition	Ceramic Polymer					
•	OHIO BRASS		MCOV Rating		48.3 /	39.0 kV
Catalog #			woov rading		40.0 /	00.0
-	YEAR: 1995					
Protective Device Date						
Primary Fuse Holder Da			ise Link Dat			
Manufacturer			Manufacturer			
	ВМР			SMD-1	1A	
Nom. / Max. Voltage	44.0 / 46.0 k	V	Link Size			Α
Holder Max. Fuse Link			TCC #		_	
Holder Catalog #		L	ink Catalog #	45510	0	
Primary Fuse Link Spar						
Spare Primary Fuses	Yes X No		# of Spares	4		
	SUBSTATION SHED.					
Comments						
Interlock						
Key Interlock	Yes No	X				
Interlock Type	Electrical Mechanical	Utility Lo	ck			
Devices Interlocked	H.V. Switch Breaker	Trans. Er	ncl.	O	ther	
Manufacturer			Key Interloc	k #		
Comments						
Load Side Conductor	Data					
Conductor Type	Cable X Bus Bar	Cond	uctor Size / Di	im. 2/C)	
Conductor Material	Aluminum Copper	X Condu	uctors per Pha	ise 1		/ Phase
Tape Shield	Aluminum Copper		Bond Size / Di		۹.	
Concentric Neutral	Aluminum Copper		Bond Coducto			
Insulation Voltage			utral Conducto			
Ŭ	BARE CONDUCTOR		eutral Size / Di		۹.	
Comments			. – .			
Recorded By:	T. GILBERT					



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERVI	CES		System ID	IROQUOI	S MS#1	Device ID	Т	Г1-L
Visual Inspec	tion / Mechar	nical Tests							
•	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments		
•	tor Condition	Satisfactory X	Not Satisfa	,	N/A		iments		
Ground	Connections	Satisfactory X	Not Satisfa	-	N/A	Corr	ments		
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Corr	ments		
-	Suppressors	Satisfactory	Not Satisfa	actory	N/A X	Corr	ments		
Key Interlo	ck Operation	Satisfactory	Not Satisfa	actory	N/A X	Corr	ments		
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Corr	ments		
Switch Conditi	ion / Operation								
Switch Oper	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments		
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Corr	ments		
Simultane	eous Closure	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments		
Electrical Tes	sts								
Earth Resistan	ce (3-Point Te	st)		Arc Suppre	essor Cor	tact Res	sistance		
Earth Resistar	nce in Ohms.			Arc Suppr	essor Cont	act Resis	tance in Ohms		
				Phase A		N/A	L	Ω	
Earth Resistar	nce	N/A	Ω	Phase B		N/A	L	Ω	
				Phase C		N/A		Ω	
Switch Insulati	ion Resistance			Switch / Fu	se Conta	ct Resis	tance		
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro-C	hms afte	r 1 minute.		
Test Voltage	1 kV 2	kV 5 kV	10 kV 🗙	Test Curre	nt 1 (A			
				_					
	Phase A	Phase B	Phase C	_	Pha	ise A	Phase B	P	hase C
Phase to GND	118400 MΩ	110300 MΩ	147300 MΩ	Contac		μΩ	68 μΩ		
				Fus	se 884	μΩ	853 μΩ	2 79	01 μΩ
				Overa	all	μΩ	μΩ	2	μΩ
Load Side Con	ductor Insulati	ion Resistance							
Resistance	in Meg-Ohms @	10000 V	DC after 1 minut	е	Phase A to	Ground	9730)0	MΩ
					Phase B to	Ground	1030	00	MΩ
					Phase C to	Ground	1260	00	MΩ
Lightning Arre	stor Insulation	Resistance							
Resistance	in Meg-Ohms @	10000 V	DC after 1 minut	е	Phase A to	Ground	1730	00	MΩ
	- 0				Phase B to	Ground	1633	00	MΩ
					Phase C to	Ground	288	0	MΩ

Comments / Observations

C PHASE LIGHTNING ARRESTOR TESTED POORLY COMPARED TO OTHERS.

Test Instrument(s)

Manufacturer / Model	M
Serial #	3

legger Ductor 3678 8B04

Tested By: T. GILBERT



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY	System ID	IROQUOIS	MS#1	Device ID	T2-L
	Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON			Octob 29995	er 18th, 2019	
Site	Iroquois MS#1	System Ne	eutral Present			
Site Address	5549 Carman Rd., Iroquois, ON					
Nameplate Data						
Switch Mounting	Metal Enclosed Pole	X Tow	/er		Other	
Switch Type	Load Break X Air Break				Other	
Manufacturer	S&C ALDUTI RUPTER		BIL Rating			kV
Date Of Manufacture			Feeder ID	IROQU	IOIS MS#1	
Serial #			Feeds To			
•	145825R10-E		upting Rating			Α
Nom. / Max. Voltage	44.0 / 46.0	kV Continue	ous Ampacity	600		Α
Comments						
Lightning Arrestors						
Lightning Arrestors	Yes No	X				
Class	Distribution Intermediate	Stati	on			
Composition	Ceramic Polymer					
Manufacturer		Max. /	MCOV Rating		1	kV
Catalog #						
Comments	ARRESTORS ON TX PRIMARY					
Protective Device Data	a					
Primary Fuse Holder Da	ta	Primary Fu	ise Link Dat	ta		
Manufacturer		-	Manufacturer	S&C		
Туре	POWER FUSE		Туре	SMD-2	С	
Nom. / Max. Voltage	46.0 / 48.3 k	۲V	Link Size	100		Α
Holder Max. Fuse Link	300E		TCC #	153-1		
Holder Catalog #		L	ink Catalog #			
Primary Fuse Link Spar	es / Location					
Spare Primary Fuses	Yes No	X	# of Spares			
Spare Location						
Comments	RECOMMEND KEEPING SPARE FU	JSES ON SITE.				
Interlock						
Key Interlock	Yes No	X				
Interlock Type	Electrical Mechanical	Utility Lo	ck			
Devices Interlocked	H.V. Switch Breaker	Trans. Er		Ot	her	
Manufacturer	Diculor	Tuno. El	Key Interloc			
Comments			noy interior			
Load Side Conductor	Data					
			unter Oin / Di			
Conductor Type	Cable X Bus Bar		uctor Size / Di			(Dh
Conductor Material	Aluminum Copper		uctors per Pha			/ Phase
Tape Shield	Aluminum Copper		Bond Size / Di Bond Coducto		•	
Concentric Neutral	Aluminum Copper					
Insulation Voltage			utral Conducto			
Comments	BARE CONDUCTOR	IN6	eutral Size / Di		<u> </u>	
Comments						
Recorded By:	J. TLAMSA					



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

- POW	ER SERVI	CES POWER COMPANY		System ID	ROQUOI	S MS#1	Device I)	T2-L	
Visual Inspec	tion / Mechan	ical Tests								
Namepl	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	ments			
Insula	ator Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	iments			
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Com	iments			
Lightn	ning Arrestors	Satisfactory	Not Satisfa	actory	N/A X	Com	ments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Com	ments			
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory	N/A X	Com	ments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Com	iments			
Switch Conditi	ion / Operation									
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Com	ments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	ments			
Simultan	eous Closure	Satisfactory X	Not Satisfa	actory	N/A	Corr	ments			
Electrical Tes	sts									
Earth Resistan	nce (3-Point Tes	st)		Arc Suppres	ssor Con	tact Res	sistance			
Earth Resista	nce in Ohms.			Arc Suppre	ssor Conta	act Resis	tance in Ohn	ıs.		
				Phase A		N/A		Ω		
Earth Resistar	nce	N/A	Ω	Phase B		N/A		Ω		
				Phase C		N/A		Ω		
Switch Insulat	ion Resistance			Switch / Fus	e Conta	ct Resis	tance			
Resistance in M	eg-Ohms after 1	minute.		Resistance i	n micro-O	hms aftei	r 1 minute.			
Test Voltage	1 kV 2 l	۷ 5 kV	10 kV X	Test Current	t10	A				
	Phase A	Phase B	Phase C	-	Pha	se A	Phase B		Phase	e C
Phase to GND	1709000 MΩ	1320000 MΩ	1117000 MΩ	Contacts		μΩ		Ωι	348	μΩ
				Fuse	765	μΩ			734	μΩ
				Overal	800	μΩ	720	Ωι	749	μΩ
Load Side Con	nductor Insulati	on Resistance								
Resistance	in Meg-Ohms @	5000 V	DC after 1 minut	e P	hase A to	Ground	N	I/A		MΩ
				Р	hase B to	Ground	N	/A		MΩ
				P	hase C to	Ground	N	I/A		MΩ
Lightning Arre	stor Insulation	Resistance								
Resistance	in Meg-Ohms @	1000 V	DC after 1 minut	e P	hase A to	Ground	N	I/A		MΩ
				Р	hase B to	Ground	N	I/A		MΩ
				Р	hase C to	Ground	N	I/A		MΩ

Comments / Observations

Test Instrument(s) Manufacturer

urer / Model	
Serial #	

Megger Ductor 7776 8B04

Tested By: J. TLAMSA



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

	SPARKPOWER COMPANY	System ID	4160 FEE	DER	Device ID	11-F1
	Rideau St. Lawrence Utility				ber 18th, 2019	
	985 Industrial Rd., Prescott, ON			29995	5	
	Iroquois MS#1 5549 Carman Rd., Iroquois, ON	System Ne	utral Present			
	5549 Carman Rd., Iroquois, ON					
Nameplate Data						
Switch Mounting			er X		Other	
Switch Type	Load Break X Air Bre	eak			Other	
	S&C ALDUTI RUPTER		BIL Rating			kV
Date Of Manufacture			Feeder ID			
Serial #			Feeds To	FEED)ER #1	
Catalog #			upting Rating			A
Nom. / Max. Voltage		kV Continuo	ous Ampacity	600		Α
Comments						
Lightning Arrestors						
Lightning Arrestors	Yes X	No				
Class	Distribution X Intermedia	ate Statio	on			
Composition	Ceramic X Polym	ner				
Manufacturer	UNICAP	Max. / I	MCOV Rating		3.0 /	kV
Catalog #						
Comments						
Protective Device Dat	а					
Primary Fuse Holder Da	ta	Primary Fu	se Link Da	ta		
Manufacturer	S&C		Manufacturer	S&C		
Туре	SM-5		Туре	SM-5		
Nom. / Max. Voltage	7.2 / 8.3	kV	Link Size	200		Α
Holder Max. Fuse Link	400A		TCC #	119-4		
Holder Catalog #	86151R2	Li	ink Catalog #	26130	00R3	
Primary Fuse Link Spar	es / Location					
Spare Primary Fuses	Yes X	No	# of Spares	2		
Spare Location	SUBSTATION HUT					
Comments						
Interlock						
Key Interlock	Yes	Νο Χ				
Interlock Type	Electrical Mechanic	cal Utility Lo	ck			
Devices Interlocked				С	other	
Manufacturer			Key Interloc	k #		
Comments						
Load Side Conductor	Data					
Conductor Type	Cable X Bus E	Bar Condu	uctor Size / D	im 3/4	O OVERHEAD	
Conductor Material	Aluminum X Copp		ictors per Pha		OVERILAD	/ Phase
Tape Shield	Aluminum Copp		Bond Size / D		Α	1 1103
Concentric Neutral	Aluminum Copp		Bond Coduct			
Insulation Voltage			utral Conduct			
Ŭ	BARE CONDUCTOR				O OVERHEAD	
Comments						
Commonto						
Recorded By:						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

- POW	ER SERV	ICES POWER COMPANY		System ID	4160 FE	EDER De	evice ID	11-F1	1
Visual Inspec	tion / Mecha	nical Tests							
	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Commen	its		
Insula	ator Condition	Satisfactory X	Not Satisfa	actory	N/A	Commen	its		
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Commen	its		
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Commen	its		
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Commen	its		
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory	N/A X	Commen	its		
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Commen	ıts		
Switch Conditi	ion / Operation	1							
Switch Oper	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Commen	ıts		
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Commen	its		
Simultan	eous Closure	Satisfactory	Not Satisfa	actory	N/A X	Commen	nts INDIVID	UAL SW	S
Electrical Tes	sts								
Earth Resistan	nce (3-Point Te	st)		Arc Suppre	essor Con	tact Resista	ance		
Earth Resista	nce in Ohms.			Arc Suppr	essor Conta	act Resistance	e in Ohms.		
				Phase A		N/A		Ω	
Earth Resista	nce	N/A	Ω	Phase B		N/A		Ω	
				Phase C		N/A		Ω	
Switch Insulat	ion Resistance	;		Switch / Fu	se Conta	ct Resistand	ce		
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro-O	hms after 1 m	inute.		
Test Voltage	1 kV 2	kV 5 kV	10 kV	Test Curre	nt 10	A			
	[_]		
	Phase A	Phase B	Phase C	0.1			Phase B	Phase	-
Phase to GND	Ν/Α ΜΩ	Ν/Α ΜΩ	Ν/Α ΜΩ	Contac Fus		•	35 μΩ	36 312	μΩ
				Overa		•	813 μΩ 853 μΩ	312	Ωų μΩ
		ian Daaiatanaa		Overa	304	μ22 3	55 µ12	323	μι
		ion Resistance							
Resistance	in Meg-Ohms @	V	DC after 1 minut		Phase A to		N/A		MΩ
					Phase B to	-	N/A		MΩ
					Phase C to	Ground	N/A		MΩ
Lightning Arre	stor Insulation	n Resistance							
Resistance	in Meg-Ohms @	1000 V	DC after 1 minut	e l	Phase A to	Ground	197000)	MΩ
				I	Phase B to	Ground	2700		MΩ
					Phase C to	Ground	176900)	MΩ

Comments / Observations

B PHASE LIGHTNING ARRESTOR TESTED POORLY COMPARED TO OTHERS.

Test Instrument(s)

Manufacturer / Model Megger Serial # 6400

iger Ductor 00 8B04

Tested By: S. MULLALLY



RECLOSER DATA SHEET (Pg. 1 of 1)

	ERVI A SPARKP	OWER COMP	ANY		System ID	4160 FE	EDER	Device ID	11F2
			t. Lawrence Utili	tv	- (Date	October	r 18th, 2019	
			strial Rd., Presco				29995	1000, 2013	
		Iroquois				000 //			
Site A		-	man Rd., Iroquoi	is, ON					
Nameplate Data									
Manut	acturer	MCGRAV	V EDISON			Catalog #	GL1456	24	
:	Serial #	GLI4561			Μ	ax Voltage			V
An	npacity	100		Α	Inte	r. Capacity	5		K
	Year				Operati	ng Voltage	4800		V
C	Dil Type				(Dil Volume			
Total Weight	of Unit								
Cor	nments	AUTOMA	TIC RECLOSER	TYPE "L"					
Visual Inspection								Co	mments
Comp	are Nan	neplate wit	h Drawings	Satisfactory	Not Satis	factory	N/A	X	
Inspect Ancl	norage, <i>l</i>	Alignment,	Grounding	Satisfactory	Not Satis	factory	N/A		
Inspect Physi	cal and	Mechanica	al Condition	Satisfactory X	Not Satis	factory	N/A		
Inspect for 0	Correct I	nsulation L	iquid Level	Satisfactory X	Not Satis	factory	N/A		
Cor	nments								
Electrical Tests									
Insulation Resistance					Contact Res	sistance			
Resistance in meg-ohms a	fter 1 m	inute.			Resistance in	meq-ohms	after 1 n	ninute.	
Test Voltage	1 kV		.5 kV 5 kV	X 10 kV		Test Curr		10 A	
root voltage					_				
	Pha	ase A	Phase B	Phase C		Phase A		Phase B	Phase C
-	(A 1	to B)	(B to C)	(C to A)					
		MΩ	MΩ	MΩ	As Found	562	μΩ	547 μΩ	423
Open - Pole to Pole	4 50.04		40050 100	40000 100			•		
Open - Pole to Pole Closed - Pole to Frame	1596	0 ΜΩ	12250 MΩ	16620 MΩ			μΩ	μΩ	l
Closed - Pole to Frame	1596	0 ΜΩ	12250 MΩ	16620 MΩ		ading	•	μΩ	ł
Closed - Pole to Frame	1596		12250 MΩ Phase B	16620 ΜΩ Phase C	As Left		•	Ωų	
Closed - Pole to Frame Contact Measurement	Pha	se A	Phase B	Phase C	As Left Counter Rea Counter	as Found	•	Ωψ	
Closed - Pole to Frame Contact Measurement Contact Gap	Pha				As Left Counter Rea Counter		•	Ω	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion	Pha	se A	Phase B	Phase C	As Left Counter Rea Counter	as Found	•		
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests	Pha	se A	Phase B N/A	Phase C N/A	As Left Counter Rea Counter Counter	as Found ter as Left	Ω	Co	mments
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close	Phase N Reclose	se A I/A er with Co	Phase B N/A	Phase C N/A Satisfactory	As Left Counter Rea Counter Counter Counter	as Found ter as Left factory	μΩ N/A	Со.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by	Phase Reclose Operatir	se A I/A er with Co ng each Pr	Phase B N/A ntrol Switch rotect Relay	Phase C N/A Satisfactory X Satisfactory	As Left Counter Rea Counter Counter Counter Not Satis Not Satis	as Found ter as Left factory factory	ν μΩ Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by Trip and Close	Phase Reclose Operatire Reclose	se A I/A er with Co ng each Pr er with Co	Phase B N/A ntrol Switch rotect Relay ntrol Switch	Phase C N/A Satisfactory X Satisfactory Satisfactory X	As Left Counter Rea Counter Counter Counter Not Satis Not Satis Not Satis	as Found ter as Left factory factory factory	Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by	Phase Reclose Operatire Reclose	se A I/A er with Co ng each Pr er with Co	Phase B N/A ntrol Switch rotect Relay ntrol Switch	Phase C N/A Satisfactory X Satisfactory	As Left Counter Rea Counter Counter Counter Not Satis Not Satis	as Found ter as Left factory factory factory	ν μΩ Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by Trip and Close Trip Recloser by	Phase Reclose Operatire Reclose	se A I/A er with Co ng each Pr er with Co	Phase B N/A ntrol Switch rotect Relay ntrol Switch	Phase C N/A Satisfactory X Satisfactory Satisfactory X	As Left Counter Rea Counter Counter Counter Not Satis Not Satis Not Satis	as Found ter as Left factory factory factory	Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by Trip and Close Trip Recloser by Cor	Phase Reclose Operatir Reclose Operatir nments	se A I/A er with Co ng each Pr er with Co	Phase B N/A ntrol Switch rotect Relay ntrol Switch	Phase C N/A Satisfactory X Satisfactory Satisfactory X	As Left Counter Rea Counter Counter Counter Not Satis Not Satis Not Satis	as Found ter as Left factory factory factory	Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by Trip and Close Trip Recloser by Cor Comments / Observa	Phase Reclose Operatine Reclose Operatine nments	se A I/A er with Co ng each Pr er with Co ng each Pr	Phase B N/A ntrol Switch rotect Relay ntrol Switch	Phase C N/A Satisfactory Satisfactory Satisfactory Satisfactory	As Left Counter Rea Counter Coun Not Satis Not Satis Not Satis Not Satis	as Found ter as Left factory factory factory	Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by Trip Recloser by Cor Comments / Observation	Phase Reclose Operatine Reclose Operatine nments	se A I/A er with Co ng each Pr er with Co ng each Pr	Phase B N/A ntrol Switch rotect Relay ntrol Switch rotect Relay	Phase C N/A Satisfactory Satisfactory Satisfactory Satisfactory	As Left Counter Rea Counter Coun Not Satis Not Satis Not Satis Not Satis	as Found ter as Left factory factory factory	Ν/Α Ν/Α	Co.	
Closed - Pole to Frame Contact Measurement Contact Gap Contact Erosion Operational Tests Trip and Close Trip Recloser by Trip Recloser by Cor Comments / Observation	Phase Recloss Operatir Recloss Operatir nments	se A I/A er with Co ng each Pr er with Co ng each Pr DR 1 MIN	Phase B N/A ntrol Switch rotect Relay ntrol Switch rotect Relay	Phase C N/A Satisfactory Satisfactory Satisfactory Satisfactory	As Left Counter Rea Counter Coun Not Satis Not Satis Not Satis Not Satis	as Found ter as Left factory factory factory	Ν/Α Ν/Α	Co.	



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

Switch Mounting Switch Type Metal Enclosed X Pole Tower Other Switch Type Load Break X Air Break Air Break Other Other Manufacturer S&C KV BiL Rating 95 KV Date Of Manufacture 2016 Feeder ID MS#1 (F1 & F2) Feeder T Feeder T T Feeder T T T Feeder T T T Feeder T T T T Feeder T <	POWER SE	SPARKPOWER COMPANY		System ID			Device ID	PADMOUNT
Customer Address 985 Industrial Rd, Prescott, ON Job # 29995 Site Iroquois MS#1 System Neutral Present Site Address 584 Carman Rd, Iroquois, ON Nameplate Data Metal Enclosed Switch Type Load Break, X Manufacture 2016 Senial # 151132 Feeder ID MS#1 (F1 &F2) Satalor # LL12794 (8377) Feeder ID MS#1 (F1 &F2) Catalor # LL12794 (8377) Interrupting Rating 14000 A Nom. / Max. Voltage 13.8 / 15.0 KV Continuous Ampacity 600 A Catalor # LL12794 (8377) Interrupting Rating 14000 A Catalor # LL12794 (8377) Interrupting Rating 14000 A Catalor # Comments PMH-13 Continuous Ampacity 600 A Lightning Arrestors Usity Total & Station Max. / MCOV Rating / KV Catalog # Comments Primary Fuse Link Data Manufacturer SC Primary Fuse Holder Data Primary Fuse Link Data Manufacturer SC Type Value Value Link Catalog # 612200 A Primary Fuse Link Spares / Location Substration HUT Comments Publicy Link Catalog # 612200 Primary Fuse Link Spares / Location Substration HUT Comments Conductor Type Cable	Customer	Rideau St. Lawrend	e Utility		Date	October	r 18th. 2019	
Site Iroquois MSH1 System Neutral Present Site Address 5549 Crman Rd, Iroquois, ON Namepizite Data Switch Mounting Metal Enclosed X Switch Type Load Break X Air Break Tower Other Switch Type Load Break X Air Break Bil. Rating 95 KV Date Of Manufacturer S2C Bil. Rating 95 KV Catalog # L-12734 (8377) Interrupting Rating 14000 A Nom. / Max. Voltage PMH-13 Continuous Ampacity 600 A Lightning Arrestors Yes No X No Camments PMH-13 Station ////////////////////////////////////			-				,	
Sile Address 5549 Carman Rd., Iroquois, ON Nameplate Data Switch Nouning Switch Type Load Break X Pole Load Break X Ar Break Bil. Rating 95 V Date Of Manufacturer S&C Senial # 151132 Senial # 151132 Senial # 151132 Senial # 151132 Senial # 15132 Senial # 15132 Catalog # L-12794 (8377) Lightning Arrestors Class Distribution Polymer Catalog # Comments Ves X No X Lightning Arrestors Class Distribution Polymer Catalog # Comments Ves X No X Distribution Polymer Ves X No Holder Max. Yotage X Station Primary Fuse Link Data Manufacturer S&C Type Sonor, Max. Yotage X No X Spare Primary Fuse Link Spares / Location Spare Primary Fuse S Ves X No Holder Max. Fuse Link Carments Ves X No Holder Max. Fuse Link Spare Ves X No Holder Max. Fuse Link Carments Ves X No H			· · · ·	System Ne	eutral Present			
Switch Mounting Metal Enclosed X Pole Tower Other Switch Type Load Break X Air Break Other Other Manufacture S8C Bill. Rating 95 kV Date Of Manufacture 2016 Feeds To TSPE KV Catalog # L-12794 (B377) Interrupting Rating 14000 A Nom. / Max. Volage 13.8 / 15.0 KV Continuous Ampacity 600 A Lightning Arrestors Distribution X Interrupting Rating 14000 A Comments PMH-13 Interrupting Rating 14000 A Lightning Arrestors Yes No X Interrupting Rating 14000 A Catalog # Comments PMH-13 Station KV Station A KV Primary Fuse Holder Data Primary Fuse Link Data Manufacturer S&C Tower Max. / MCOV Rating A KV Nom. Maxu Voltage / KV Toke Secoo A Toke Secoo A <t< td=""><td>Site Address</td><td>5549 Carman Rd., I</td><td>roquois, ON</td><td>_ *</td><td></td><td></td><td></td><td></td></t<>	Site Address	5549 Carman Rd., I	roquois, ON	_ *				
Switch Type Load Break X Air Break Other Manufacturer SAC Bill. Rating 95 KV Date Of Manufacturer SAC Feeder ID MS#1 (F1 &F2) Feeder ID MS#1 (F1 &F2) Catalog # L1-12794 (8377) Interrupting Rating 14000 A Nom. / Max. Voltage 13.8 15.0 KV Continuous Ampacity 600 A Comments PMI-13 Interrupting Rating 14000 A A Lightning Arrestors Yes X No X Continuous Ampacity 600 A Catalog # Comments Interrupting Rating 14000 A Manufacturer Station Max. / MCOV Rating / Manufacturer SC Type Max. / MCOV Rating / Primary Fuse Holder Data Primary Fuse Link Data Manufacturer S&C Type SMU-20 Nom. / Max. Voltage / KV Link Size 200 A Holder Max, Fuse Link Util No X Link Size 200 A Spare Primary Fuse Link Spares / Location Yes X No # of Spares 3 Spare Primary Fuse Link Spares / Location Super Yes X No # of Spares 3 Spare Primary Fuse Link Spares / Location Bus Bar Conductor Size / Dim. Devices	Nameplate Data	-						
Manufacturer S&C Bill. Rating 95 KV Date Of Manufacturer 2016 Feeds To T127 FEBDER Feeds To T127 FEBDER Catalog # LL-12794 (B377) Interrupting Rating 14000 A Nom. / Max. Voltage 13.8 / 15.0 KV Comments PMH-13 Continuous Ampacity 600 A Lightning Arrestors Ves X Interrupting Rating 14000 A Cases Distribution Continuous Ampacity 600 A Comments PMH-13 Station A Composition Ceramic Polymer Max. / MCOV Rating / KV Catalog # Comments Primary Fuse Link Data Manufacturer Station A Primary Fuse Holder Data Primary Fuse Link Data Manufacturer A A Mom/ Max. Voltage / KV Link Size 200 A Tock f 153-2 Link Katize Station A C Primary Fuse Link Spares / Location Supare S Spare Location Supare S Spare S Spare S Spare S A Spare Location SUBSTATION HUT Mechanicial X Trans. Encl. Conductor Material A Devices Interlockk		Metal Enclosed	X Pole	Том	/er	(Other	
Date Of Manufacture 2016 Feeder ID MS#1 (F1 & F2) Serial # 161132 Feeder ID MS#1 (F1 & F2) Catalog # 13.8 / 15.0 KV Comments PMH-13 Continuous Ampacity 600 A Lightning Arrestors Yes X No X Continuous Ampacity 600 A Composition Ceramic Polymer Max. / MCOV Rating / KV Catalog # Comments Primary Fuse Link Data Manufacturer S&C Type Manufacturer S&C Primary Fuse Holder Data Primary Fuse Link Data Manufacturer S&C Type A Link Size 200 A Nom. / Max. Vottage / KV Link Size 200 A Link Size 200 A Primary Fuse Link Spares / Location Substration Hut Tope f15.2 Link Catalog # 612200 E Link Catalog # 612200 F PADMOUNT ENCLO Primary Fuse Link Spares / Location Substration Hut Breaker Trans. Encl. Other X PADMOUNT ENCLO Spare Location SubSTATION HUT Comments <td>Switch Type</td> <td>Load Break</td> <td>X Air Break</td> <td></td> <td></td> <td>(</td> <td>Other</td> <td></td>	Switch Type	Load Break	X Air Break			(Other	
Serial # 161132 Feeds To T1-T2 FEEDER Nom. // Max. Voltage 13.8 / 15.0 KV Comments PMH-13 Lightning Arrestors Class Distribution Lightning Arrestors Ves X No Class Distribution Intermediate Primary Fuse Comments Distribution Ceramic Primary Fuse Primary Fuse Holder Data Primary Fuse Link Data Manufacturer S&C Type Manufacturer Now, Vikage / KV Holder Max. Fuse Link Manufacturer S&C Type Ves X No Holder Catalog # Continuous Manufacturer S&C Primary Fuse Link Spares / Location Spare No # of Spares 3 Spare Location Spare Distribution Ves X No # of Spares 3 Spare Location Spare Location SUBSTATION HUT Comments Vullity Lock Trans. Encl. Other X PADMOUNT ENCLO Linkfork Type Electrical Mechanical X Utility Lock Trass. Encl.	Manufacturer	S&C			BIL Rating	95		kV
Catalog # LL-12794 (8377) Interrupting Rating 14000 A Nom./ Max. Voltage 13.8 / 15.0 KV Continuous Ampacity 600 A Comments PMH-13 Continuous Ampacity 600 A Lightning Arrestors Ves X No X Station A Composition Ceramic Polymer Max./ MCOV Rating / KV Comments Contacturer Max./ MCOV Rating / KV Primary Fuse Holder Data Primary Fuse Link Data Marufacturer S&C Type Type SMU-20 A Nom. / Max. Voltage / KV Eine Size 200 A A Holder Max. Fuse Link Spares / Location Spare Primary Fuse Link Spares / Location Figure Size 200 A Spare Primary Fuse Location SUBSTATION HUT Comments Comments Electrical Mechanical X Utility Lock Other X PADMOUNT ENCLOR Devices Interlock Key Interlock Yes X No Key Interlock # 110214 Conductor Size / Dim. Conductor Size / Dim. Conductor Size / Dim. Conductor Size / Dim. / Phase / Phase / Phase / Phase / Phase /	Date Of Manufacture	2016			Feeder ID	MS#1 (F	1 &F2)	
Nom. / Max. Voltage 13.8 / 15.0 kV Continuous Ampacity 600 A Lightning Arrestors Eightning Arrestors Ves X No X Lightning Arrestors Yes X No X Lightning Arrestors Yes X No X Lightning Arrestors Yes X No X Class Class Distribution Intermediate Station Manufacturer Comments Primary Fuse Link Data Max. / MCOV Rating / kV Protective Device Data Primary Fuse Link Data Manufacturer S&C Manufacturer S&C Type ToC # 153-2 Link Catalog # 612200 Electrol Electrol Breaker Trans. Encl. Other X PADMOUNT ENCLO Spare Dimary Fuse Link Spares / Location Spare Socation SUBSTATION HUT Station Trans. Encl. Other X PADMOUNT ENCLO Comments Electrical Mechanical X Utility Lock Trans. Encl. Other X	Serial #	161132			Feeds To	T1-T2 F	EEDER	
Comments PMH-13 Lightning Arrestors Lightning Arrestors Yes X No X Class Distribution Intermediate Station	Catalog #	LL-12794 (8377)		Interr	upting Rating	14000		Α
Lightning Arrestors Yes X No X Lightning Arrestors Distribution Intermediate Station	Nom. / Max. Voltage	13.8 /	15.0 kV	Continue	ous Ampacity	600		Α
Lightning Arrestors Yes X No X Class Distribution Intermediate Station Manufacturer Ceramic Polymer Max. / MCOV Rating / KV Manufacturer Catalog # Comments / KV KV Primary Fuse Holder Data Primary Fuse Link Data Manufacturer S&C Manufacturer S&C Manufacturer S&C Manufacturer S&C Manufacturer S&C Manufacturer S&C A Moder Catalog # / KV Link Size 200 A Holder Catalog # / KV Link Catalog # 612200 A Primary Fuse Link Spares / Location Spare Primary Fuses Yes X No # of Spares 3 Spare Potical SUBSTATION HUT Comments Comments Other X PADMOUNT ENCLO Interlock Yes X No X Utility Lock Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments Conductor Size / Dim. Conductor Size / Dim. Conductor Size / Dim. Conductors Size / Dim. / Phase <t< td=""><td>-</td><td>PMH-13</td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	-	PMH-13						
Class Distribution Intermediate Station Composition Ceramic Polymer Max. / MCOV Rating / KV Catalog #	Lightning Arrestors							
Composition Ceramic Polymer Max. / MCOV Rating / kV Manufacturer Max. / MCOV Rating / kV Catalog #	Lightning Arrestors	Yes X	No X					
Manufacturer Max. / MCOV Rating / kV Catalog # Comments / kV Protective Device Data Primary Fuse Link Data / / Primary Fuse Holder Data Primary Fuse Link Data / / / Manufacturer S&C Manufacturer S&C Manufacturer S&C / / / Nom. / Max. Voltage / KV Link Size 200 A / <t< td=""><td>Class</td><td>Distribution</td><td>Intermediate</td><td>Stati</td><td>on</td><td></td><td></td><td></td></t<>	Class	Distribution	Intermediate	Stati	on			
Catalog #	Composition	Ceramic	Polymer	_				
Comments Primary Fuse Lok Data Primary Fuse Link Data Manufacturer S&C Manufacturer S&C Type Type Type Type Nom. / Max. Voltage / KV Link Size 200 A Holder Max. Fuse Link TCC # 153-2 Tock # 153-2 Holder Catalog # Link Catalog # Elink Catalog # <td>Manufacturer</td> <td></td> <td></td> <td>Max. /</td> <td>MCOV Rating</td> <td> </td> <td>1</td> <td>kV</td>	Manufacturer			Max. /	MCOV Rating		1	kV
Primary Fuse Link Data Primary Fuse Link Data Manufacturer S&C Type Type Nom. / Max. Voltage / KV Holder Max. Fuse Link TCC # 153-2 Holder Catalog # Link Catalog # Link Catalog # Primary Fuse Link Spares / Location Spare Link Spares / Location # of Spares 3 Spare Primary Fuses Yes X No # of Spares 3 Spare Link Spares Yes X No # of Spares 3 Spare Link Spares Yes X No # of Spares 3 Spare Link Spares Yes X No # of Spares 3 SubStation HUT Comments Yes X No # of Spares 3 Interlock Yes X No # of Spares 3 PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 PADMOUNT ENCLO Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Type Cable X Bus Bar Conductors per Phase / Phase Tape Shield Aluminum Copper Bond Size / Dim. </td <td>Catalog #</td> <td></td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td>	Catalog #				-			
Primary Fuse Link Data Primary Fuse Link Data Manufacturer S&C Type Type Type SMU-20 A Nom. / Max. Voltage / kV Link Size 200 A Holder Max. Fuse Link TCC # 153-2 Link Catalog # 612200 A Primary Fuse Link Spares / Location Substation Voltage //// KV Link Catalog # 612200 Primary Fuse Link Spares / Location Substation Nut Conductor # 612200 A Spare Primary Fuses Yes X No # of Spares 3 Spare Location Substation Nut Substation Nut Comments Conductor Spare Substation Nut Conductor Spare Substation Nut Padmount enclow Interlock Yes X No # of Spares 3 Padmount enclow Padmount enclow Devices Interlocked H.V. Switch Breaker Trans. Encl. Other X Padmount enclow Manufacturer Substation Voltage Key Interlock # 110214 Conductor Size / Dim. Conductor Size / Dim. Conductor Size / Dim. / Phase Conductor Type Cable X Bus Bar Conductors Size / Dim. / Phase	Comments							
Manufacturer S&C Manufacturer S&C Type Type Type Type SUU-20 A Nom. / Max. Voltage / KV Link Size 200 A Holder Max. Fuse Link TCC # 153-2 E E E Primary Fuse Link Spares / Location Substation # of Spares 3 Substation SUBSTATION HUT E	Protective Device Data	а						
Manufacturer S&C Manufacturer S&C Type Type Type Type SUU-20 A Nom. / Max. Voltage / KV Link Size 200 A Holder Max. Fuse Link TCC # 153-2 E E E Primary Fuse Link Spares / Location Substation # of Spares 3 Substation SUBSTATION HUT E	Primary Fuse Holder Da	ta		Primary Fu	ise Link Da	ta		
Type Type Type SMU-20 Nom. / Max. Voltage / kV Link Size 200 A Holder Max. Fuse Link TCC # 153-2 Link Catalog # 153-2	-							
Nom. / Max. Voltage / kV Link Size 200 A Holder Max. Fuse Link TCC # 153-2 Link Catalog # 612200 Primary Fuse Link Spares / Location Spare Location Spare Location Spare Location Spare Location SUBSTATION HUT Comments Comments Substation HUT Interlock Yes X No # of Spares 3 Interlock Type Electrical Mechanical X Utility Lock Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments Conductor Data Conductor Type Cable X Bus Bar Conductor sper Phase / Phase Conductor Material Aluminum Copper Bond Size / Dim. / Phase Tape Shield Aluminum Copper # of Bond Coductors // Phase Insulation Voltage // ef Bond Coductors // ef Bond Coductors // ef Bond Coductors Insulation Type Comments // ef Bond Coductors // ef Bond Coductors<	Туре				Туре	SMU-20		
Holder Max. Fuse Link TCC # 153-2 Holder Catalog # Link Catalog # 612200 Primary Fuse Link Spares / Location Spare Primary Fuses Spare Primary Fuses Yes Spare Location SUBSTATION HUT Comments SUBSTATION HUT Interlock Yes Key Interlock Type Electrical Mechanical X Utility Lock Other Devices Interlocked H.V. Switch Breaker Trans. Encl. Other SUPERIOR Key Interlock # Key Interlock # Manufacturer SUPERIOR Conductor Data Conductor Size / Dim. Conductor Type Cable Bus Bar Conductor Type Cable Conductors per Phase Tape Shield Aluminum Copper Bond Size / Dim. Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Type Neutral Size / Dim.	••	I	kV	_				Α
Primary Fuses / Location Spare Primary Fuses Yes X No # of Spares 3 Spare Location SUBSTATION HUT Comments SUBSTATION HUT SUBSTATION HUT SUBSTATION HUT SUBSTATION HUT Substation Su	Holder Max. Fuse Link			_	TCC #	153-2		
Spare Primary Fuses Yes X No # of Spares 3 Spare Location SUBSTATION HUT Comments SUBSTATION HUT Super Location Mechanical X Utility Lock Interlock Mechanical X Utility Lock Devices Interlocked H.V. Switch Breaker Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Super Location Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments Electrical Mechanical X Utility Lock 110214 Load Side Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Size / Dim. Conductor Size / Dim. Pabeoutical / Phase Conductor Material Aluminum Copper Bond Size / Dim. Mechanical / Phase / P	Holder Catalog #			L	ink Catalog #	612200		
Spare Primary Fuses Yes X No # of Spares 3 Spare Location SUBSTATION HUT Comments SUBSTATION HUT Super Location Mechanical X Utility Lock Interlock Mechanical X Utility Lock Devices Interlocked H.V. Switch Breaker Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Super Location Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments Electrical Mechanical X Utility Lock 110214 Load Side Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Size / Dim. Conductor Size / Dim. Pabeoutical / Phase Conductor Material Aluminum Copper Bond Size / Dim. Mechanical / Phase / P	Primary Fuse Link Spar	es / Location			-			
Spare Location Comments SUBSTATION HUT Interlock Interlock Key Interlock Yes No Interlock Yes No Devices Interlocked H.V. Switch Breaker Manufacturer SUPERIOR Key Interlock # 110214 Comments SUPERIOR Key Interlock # 110214 Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT Load Side Conductor Data Conductor Size / Dim. Conductor Material Aluminum Copper Tape Shield Aluminum Copper Insulation Voltage # of Bond Coductors Insulation Type Comments			No]	# of Spares	3		
Comments Interlock Key Interlock Yes X No X Utility Lock Other X PADMOUNT ENCLO Devices Interlocked H.V. Switch Breaker Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock & 110214 Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock SON T1-L & T2-I TO ISOLATE PADMOUNT 110214 Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Bond Size / Dim. / Phase Tape Shield Aluminum Copper # of Bond Coductors / Phase Insulation Voltage # of Neutral Conductors // Phase // Phase Insulation Type Comments // Enclose // Phase // Phase Insulation Type Comments // Enclose // Enclose // Phase Insulation Type Output Neutral Size / Dim. // Enclose // Enclose Insulation Type Insulation Type Insulation Type Insulation Type Insula				_	•			
Key Interlock Yes X No X Utility Lock Other X PADMOUNT ENCLO Devices Interlocked H.V. Switch Breaker Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT Interlock # 110214 Load Side Conductor Data Conductor Size / Dim. Conductor Size / Dim. Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Conductors per Phase / Phase Tape Shield Aluminum Copper # of Bond Size / Dim.	•							
Interlock Type Electrical Mechanical X Utility Lock Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT Load Side Conductor Data Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Bond Size / Dim. Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Voltage Insulation Type Comments	Interlock							
Interlock Type Electrical Mechanical X Utility Lock Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT Load Side Conductor Data Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Bond Size / Dim. Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Voltage Insulation Type Comments	Kovintorlook	Vac	No					
Devices Interlocked H.V. Switch Breaker Trans. Encl. Other X PADMOUNT ENCLO Manufacturer SUPERIOR Key Interlock # 110214 Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT 110214 Load Side Conductor Data REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT Interlock # 110214 Conductor Type Cable X Bus Bar Conductor Size / Dim. Interlock # / Phase Conductor Material Aluminum Copper Bond Size / Dim. / Phase Concentric Neutral Aluminum Copper # of Bond Coductors // Phase Insulation Voltage # of Neutral Conductors	•							
Manufacturer Comments SUPERIOR Key Interlock # 110214 Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT 110214 Load Side Conductor Data Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Conductors per Phase / Phase Tape Shield Aluminum Copper Bond Size / Dim.						Oth		
Comments REQUIRES INTERLOCKS ON T1-L & T2-I TO ISOLATE PADMOUNT Load Side Conductor Data Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Conductors per Phase / Phase Tape Shield Aluminum Copper Bond Size / Dim. // Phase Insulation Voltage # of Bond Coductors # of Neutral Conductors Insulation Type Comments # of Neutral Size / Dim. // Phase			Dieakei	TTAILS. EI				ADMOUNT ENCLO
Load Side Conductor Data Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Conductors per Phase / Phase Tape Shield Aluminum Copper Bond Size / Dim. // Phase Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Voltage # of Neutral Conductors // Phase Comments Comments // Phase			OCKS ON TI-L &		•		14	
Conductor Type Cable X Bus Bar Conductor Size / Dim. Conductor Material Aluminum Copper Conductors per Phase / Phase Tape Shield Aluminum Copper Bond Size / Dim. // Phase Concentric Neutral Aluminum Copper # of Bond Coductors // Phase Insulation Voltage								
Conductor Material Aluminum Copper Conductors per Phase / Phase Tape Shield Aluminum Copper Bond Size / Dim. Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Voltage # of Neutral Conductors # of Neutral Size / Dim. Comments Comments						_		
Tape Shield Aluminum Copper Bond Size / Dim. Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Voltage # of Neutral Conductors				_				
Concentric Neutral Aluminum Copper # of Bond Coductors Insulation Voltage # of Neutral Conductors Insulation Type Neutral Size / Dim. Comments				_	•			/ Phase
Insulation Voltage # of Neutral Conductors Insulation Type Neutral Size / Dim. Comments	•			-				
Insulation Type Neutral Size / Dim		Aluminum	Copper					
Comments	Ŭ							
				Ne	eutrai Size / D	ım		
Recorded By: B. DOUGLAS, K. BRANT	Comments							
Recorded By: B. DOUGLAS, K. BRANT								
Recorded By: B. DOUGLAS, K. BRANT								
	Recorded Bv:	B. DOUGLAS. K. B	RANT					



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POWER SEF	A VICES		System ID		Devi	ce ID	PADMC	JUNT
Visual Inspection / Mec	hanical Tests							
Nameplate Condition	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Insulator Condition	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Ground Connections	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Lightning Arrestors	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Arc Suppressors	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Key Interlock Operation	Satisfactory	Not Satisfa	actory N	/A X	Comments			
Ground Straps & Materials	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Switch Condition / Operat	tion							
Switch Operation As Left	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Contact Surface Condition	Satisfactory X	Not Satisfa	actory N	/A	Comments			
Simultaneous Closure	Satisfactory X	Not Satisfa	actory N	/A X	Comments			
Electrical Tests								
Earth Resistance (3-Point	t Test)		Arc Suppress	or Conta	ct Resistanc	e		
Earth Resistance in Ohms.			Arc Suppress	or Contact	Resistance in	Ohms.		
			Phase A		N/A		Ω	
Earth Resistance	N/A	Ω	Phase B		N/A		Ω	
			Phase C		N/A		Ω	
Switch Insulation Resista	nce		Switch / Fuse	Contact	Resistance			
Resistance in Meg-Ohms aft	er 1 minute.		Resistance in	micro-Ohm	ns after 1 minu	te.		
Test Voltage 1 kV	2 kV 5 kV	10 kV	Test Current	10 A	·			
Phase A	Phase B	Phase C	1	Phase	A Pha	ise B	Phas	se C
Phase to GND N/A	ΜΩ Ν/Α ΜΩ	Ν/Α ΜΩ	Contacts	109	μΩ 99	μΩ	108	μΩ
			Fuse	107	μΩ 109	μΩ	108	μΩ
			Overall	104	μΩ 107	μΩ	105	μΩ
Load Side Conductor Inst	ulation Resistance							
Resistance in Meg-Ohms	s@VI	C after 1 minute	e Pha	ase A to Gr	ound	N/A		MΩ
			Pha	ase B to Gr	ound	N/A		MΩ
			Pha	ase C to Gr	ound	N/A		MΩ
Lightning Arrestor Insula	tion Resistance							
Resistance in Meg-Ohms	s@VI	C after 1 minute	e Pha	ase A to Gr	ound	N/A		MΩ
		-	Pha	ase B to Gr	ound	N/A		MΩ
			Pha	ase C to Gr	ound	N/A		MΩ
Commonto / Obcomvetic								

Comments / Observations

Test Instrument(s)

Manufacturer / Model	
Serial #	

Megger Ductor 3678 8B04

Tested By: B. DOUGLAS., K. BRANT



TRANSFORMER DATA SHEET (Pg. 1 of 4)

	OWER SE	SPARKPOWER COMPANY	,		System ID	IROQUOIS	MS#1	Device ID		т	1	
C	Customer Address Site	Rideau St. Lawren 985 Industrial Rd., Iroquois MS#1	Prescott,		-		Octob 29995	er 18th, 201	9			
	Site Address	5549 Carman Rd.,	Iroquois,	ON	-							
Namep	late Data											
1	ransformer Class	Unit Padmount	Pad	mount	Station	X		Other				
Tra	ansformer Cooling	ONAN	X	ONAF	LNAN	DF	۲Y	Other		ON	S	
Bushing	g Configuration	Dead Front	Тор	- Тор 🛛 🗙	Top - Side	Side - Si	de	Other				
	Manufacturer	BROWN BOVERI			Co	re & Windings	12150		kg		lb	X
Da	te of Manufacture	1953			Та	anks & Fittings	6450		kg		lb	X
	Serial #	C199			С	oolant Volume	•		_ L		Gal	
KVA /	Prov. KVA Rating	3000		KVA	C	Coolant Weight	8500		kg		lb	X
	Primary Voltage	44000		V	-	Total Weight	27100		kg		lb	X
	Primary Ampacity			Α	Ten	nperature Rise	55		°C	X	°F	
S	econdary Voltage	8320/4160		V		HV BIL Rating			kV			
	condary Ampacity			Α		LV BIL Rating			kV			
	Winding Material				-	ent Impedance		5.40 %	ONAN	X	ONAF	_
	Winding Material					nper Resistant			YES		NO	X
CS	A Specification(s)				Trans	sformer Colour	GREY					
	Comments											
Visual II	nspection		_									
Na	meplate Condition	Satisfactory X	No	t Satisfacto	ory N	I/A (Commen	Its				
Fan	/ Pump Operation	Satisfactory	No	t Satisfacto	ory N	I/A X (Commen	Its				
Gr	ound Connections	Satisfactory	No	t Satisfacto	ory X N	/A 0	Commen	ts NO GRO		CON	NECT	101
Liqui	d Levels In Tanks	Satisfactory X	No	t Satisfacto	ory N	I/A (Commen	its				
	nterlock Operation		No	t Satisfacto	ory N	I/A X (Commen	Its				
Temp.	Gauge Operation	Satisfactory X	No	t Satisfacto	ory N	/A 0	Commen	its				
Cod	olant Temperature	25	°C	X °F	Ma	ax. Coolant Te	mperatu	re 40	°C	X	°F	
	Comments											
Oil Cons	ervator											
	Oil Conservato	r Yes X	No		Conse	rvator Volume	•		L		Gal	
:	Silica Gel Breathe	r Yes	No X		Bre	eather Volume			L		Gal	
	Silica Gel Colou		ad	Replac		N/A X						
	Comments			-								
Tap Cha	nger Data				Vector Dia	gram: De	ltaWye	NoXo2b	16.Dy	/11		
	sition /	Tap Voltages (V)	As	As			H2	X2				
	ignation		Found	Left	-			\				
1/A	105.00%	44000	X	X	-		\		X3			
2/B	102.50%	42900					\					
3/C	100.00%	41800			-	Н	H3	XI				
4/D	97.50%	40700								. r		1
5/E	95.00%	39600			Prima	ry Vector)	(Seconda	ry Vec	tor	X	
	Comments:											
		TRANSFORMER L	EAKING	ROM TO	P OF MAIN T	ANK.						

Recorded By: E. COURTNEY, M. GRAHAM



TRANSFORMER DATA SHEET (Pg. 2 of 4)

A	SPARKPOWER COMPANY		System ID	IROQUOIS MS	#1 Device ID	T1
Neutral Grounding Re	esistor (NGR)					
NGR Present	Yes	No 3	K			
Manufacturer				NGR Serial #		
NGR Voltage		١	/ Max	kimum Current		Α
NGR Resistance		C	2	NGR Location		
Comments						
Transformer Lightning	g Arrestors					
Lightning Arrestors	s Yes	No 🕽	K			
Class		Intermediate	Stati	on		
Composition	Ceramic	Polymer				
Manufacturer			Max.	/ MCOV Rating	1	kV
Catalog #				0		
Comments						
Interlock						
Key Interlock	Yes	No 🕽	K			
Interlock Type		Mech.	Utility Lo	ck		
Devices Interlocked		Breaker	Trans. Er		Other	
Manufacturer				Key Interlock #		
Comments				,		
Fans						
Fans	Yes	No 🕽	K			
# of Fans				Fan Voltage		
Fan Size				Frame Size		
Horsepower						
Comments						
Transformer Load Sid	le Conductor Da	ta				
Conductor Type	Cable	Bus Bar		uctor Size / Dim.	1" IDS	
Conductor Material				uctors per Phase		/ Phase
Tape Shield	Aluminum	Copper		Bond Size / Dim.		
Concentric Neutral	Aluminum	Copper	# of E	Bond Conductors	0	
Insulation Voltage	N/A		# of Ne	utral Conductors	0	
Insulation Type				eutral Size / Dim.		
Comments:						
Described D		CDALLAN				
Recorded By:	E. COURTNEY, M.	GKAHAM				



TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID IROQUOIS MS#1 Device ID T1

Electrical Tests

Tap F	Position /	Tap Voltage	Calculated	H 1 T	o H 2	Н 2 То	Н 3	Н З То	Н 1
Desig	gnation	V	Ratio	X1 T	o X 2	X 2 To	Х З	X 3 To	X 1
1/A	102.50%	44000	9.160	9.4	150	9.1	51	9.15	51
2 / B	100.00%	42900							
3 / C	97.30%	41800							
4 / D	94.50%	40700							
5/E	91.80%	39600							
				Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
		Tap Posi	tion As Found	1 2.200 m/	-0.110 %	2.300 mA	-0.100 %	1.700 mA	-0.100 %
		Tap Posi	tion As Left	mA	%	mA	%	mA	9

Primary Winding Resistance

Resistance in ohms at 0.5 A after 1 minute Resistance in milli-ohms at 5 A after 1 minute Ν/Α Ω Ω H0 - H1 H1 - H2 X0 - X1 62.000 mΩ X1 - X2 124.700 mΩ 3.370 H0 - H2 Ν/Α Ω H2 - H3 3.390 Ω X0 - X2 61.900 mΩ X2 - X3 124.500 mΩ H0 - H3 Ν/Α Ω H3 - H1 3.370 Ω X0 - X3 62.200 mΩ X3 - X1 125.300 mΩ Minute

Stabilization Time > 1

Stabilization Time > 1

Secondary Winding Resistance

Minute

Capacitance Test

	Low - Grou	Low - Ground		Low - Guard		UST (High - Low)		High - Guard		und
Capacitance in pico-farads	7271	рF	1904	рF	5365	рF	4672	рF	10040	рF
Uncorrected D.F. (%)	0.468	%	0.552	%	0.403	%	0.413	%	0.434	%
Corrected to 20 °C (%)	0.370	%	0.436	%	0.318	%	0.326	%	0.343	%

Temp. Correction Factor 0.79

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @	V DC after 1 minute	Phase A to Ground	N/A	MΩ
		Phase B to Ground	N/A	MΩ
		Phase C to Ground	N/A	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	V DC a	fter 1 minute			
Phase A to Ground	N/A	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground	N/A	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground	N/A	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

TEMPORARY GROUNDS APPLIED ON SECONDARY CABLES FOR WORK PROTECTION.

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	184	51006	0319	7776
Tested Bv	E. COURTNEY, M. GRA	НАМ			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID IROQUOIS MS#1

Device ID Т1

Dielectric Absorption Test (Insulation Resistance)

		High to Lo	w & Gnd	Low to Hi	gh & Gnd	High & Lo	w to Gnd
Tim	ie	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
15 s	ес	1059 MΩ	318 MΩ	775 MΩ	233 MΩ	93 MΩ	28 MC
30 s	ec	1300 MΩ	390 MΩ	889 MΩ	267 MΩ	1020 MΩ	306 MC
45 s	ec	1460 MΩ	438 MΩ	980 MΩ	294 MΩ	1060 MΩ	318 MG
1 m	in	1570 MΩ	471 MΩ	1040 MΩ	312 MΩ	1080 MΩ	324 MG
2 m	in	1820 MΩ	546 MΩ	1200 MΩ	360 MΩ	1140 MΩ	342 MG
3 m	in	1940 MΩ	582 MΩ	1320 MΩ	396 MΩ	1170 MΩ	351 MG
4 m	in	2030 MΩ	609 MΩ	1420 MΩ	426 MΩ	1180 MΩ	354 MG
5 m	in	2090 MΩ	627 MΩ	1500 MΩ	450 MΩ	1190 MΩ	357 MG
6 m	in	2140 MΩ	642 MΩ	1580 MΩ	474 MΩ	1210 MΩ	363 MG
7 m	in	2180 MΩ	654 MΩ	1640 MΩ	492 MΩ	1220 MΩ	366 Mg
8 m	in	2210 MΩ	663 MΩ	1690 MΩ	507 MΩ	1220 MΩ	366 MG
9 m	in	2240 MΩ	672 MΩ	1740 MΩ	522 MΩ	1230 MΩ	369 MG
10 m	nin	2260 MΩ	678 MΩ	1780 MΩ	534 MΩ	1240 MΩ	372 MG
Test Vo	oltage	10000	V	1000	v	1000	v
Multip	olier	1			1	1	
Polarizatio	on Index	1.4	4	1.	71	1.1	5
тсс	0.30		Insulation	on Resistance Re	adings Corrected	to 20 °C	

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohms after 1	l minute.		Resistance in meg-ohms after 1 minute.				
High to Low & Ground	471	ΜΩ @	10000	V	Core Ground Accessible	Yes	No X
Low to High & Ground	312	ΜΩ @	1000	V	Test Voltage		V
High & Low to Ground	324	ΜΩ @	1000	V	Core Ground Resistance		MΩ



Test Instrument(s)

Manufacturer / Model Megger 7776

Serial #

Comments:

Tested By: E. COURTNEY, M. GRAHAM



TRANSFORMER DATA SHEET (Pg. 1 of 4)

}	POWER SE	SPARKPOWER COMPAN	Y		System ID		/IS#1 [Device ID		т	2	
(Customer Address Site	Rideau St. Lawrer 985 Industrial Rd. Iroquois MS#1	, Prescott,		 -		Octobe 29995	r 18th, 201	9			
	Site Address	5549 Carman Rd.,	Iroquois,	ON	-							
Namep	olate Data											
	Transformer Class	Unit Padmount	Padr	nount	Station	Χ		Other				
Tr	ansformer Cooling	ONAN	X (ONAF	LNAN	DR	Y	Other				
Bushin	ng Configuration	Dead Front	Тор	- Тор	Top - Side	X Side - Sid	le	Other				
	Manufacturer	NORTHERN TRAM	SFORME	R	Co	re & Windings	4838		kg	X	lb	
Da	ate of Manufacture	2015			Ta	anks & Fittings	2677		kg	X	lb	
	Serial #	15-2707			Co	oolant Volume	3273		L	Χ	Gal	
KVA /	/ Prov. KVA Rating	3000		KVA	C	oolant Weight	2810		kg	X	lb	
	Primary Voltage	44000		v	-	Total Weight	10325		kg	X	lb	
	Primary Ampacity	39.4		Α	Terr	perature Rise	55		°C	X	°F	
S	Secondary Voltage	8320-4160		v		HV BIL Rating	250		kV			
	econdary Ampacity			Α	-	LV BIL Rating	75		kV		_	
	V Winding Material	·			-	ent Impedance		5.54 %	ONAN	X	ONAF	
	V Winding Material				-	nper Resistant			YES	X	NO	
CS	SA Specification(s)	C88-M90			Trans	former Colour	GREY					
	Comments											
Visual I	Inspection											
Na	ameplate Condition	Satisfactory X	Not	Satisfacto	ory N	/A C	Comments	S				
Fan	/ Pump Operation	Satisfactory	Not	Satisfacto	ory N	/A X C	Comments	S				
Gr	round Connections	Satisfactory X	Not	Satisfacto	ory N	/A C	Comments	S				
Liqu	uid Levels In Tanks	Satisfactory X	Not	Satisfacto	ory N	/A C	Comments	S				
I	Interlock Operation	Satisfactory	Not	Satisfacto	ory N	/A X C	Comments	S				
Temp	. Gauge Operation	Satisfactory X	Not	Satisfacto	ory N	/A C	Comments	S				
Co	olant Temperature	25	°C	X °F	Ma	ax. Coolant Ter	mperature	e 62	°C	X	°F	
	Comments											
Oil Cons	servator											
	Oil Conservator	r Yes	No X		Conse	rvator Volume			L		Gal	
	Silica Gel Breather	r Yes	No X		Bre	eather Volume			L		Gal	
	Silica Gel Colou	r Good E	Bad	Replac	ed	N/A X						
	Comments											
-	anger Data				Vector Dia	gram: Del	taWye1	5.Dyn1				
	osition / signation	Tap Voltages (V)	As Found	As Left		/	H2		X2			
1/A	105.00%	46200	round	Lon	-		\ x	. /				
2/B	102.50%	45100			-	/	1		20			
3 / C	100.00%	44000	X	X	-				•			
4/D	97.50%	42900			-	HI	H3		73			
5/E	95.00%	41800			Prima	ry Vector X		Seconda	ry Vec	tor	X	
	Comments:			1		-			, -			
	connents.											

Recorded By: B. DOUGLAS, K. BRANT



TRANSFORMER DATA SHEET (Pg. 2 of 4)

A	SPARKPOWER COMPANY		System ID	IROQUOIS MS#	#1 Device ID	T2	
Neutral Grounding Re	sistor (NGR)						
NGR Present	Yes	No X]				
Manufacturer				NGR Serial #			
NGR Voltage		v	Мах	kimum Current			Α
NGR Resistance		Ω		NGR Location			
Comments							
Transformer Lightning	g Arrestors						
Lightning Arrestors	Yes X	No					
Class	Distribution	Intermediate	Statio	on			
Composition	Ceramic	Polymer					
Manufacturer	OHIO BRASS		Max. /	MCOV Rating	48.0 /	39.0	kV
Catalog #	300039						
Comments							
Interlock							
Key Interlock	Yes	No X					
Interlock Type	Elec.	Mech.	Utility Lo	ck			
Devices Interlocked	H.V. Switch	Breaker	Trans. Er	ncl.	Other		
Manufacturer				Key Interlock #			
Comments							
Fans							
Fans	Yes	No X					
	103						
# of Fans Fan Size			_	Fan Voltage Frame Size			
			_				
Horsepower Comments			_				
Transformer Load Sid	e Conductor Dat	а					
Conductor Type	Cable X	Bus Bar	Cond	uctor Size / Dim.			
Conductor Material	Aluminum	Copper	-	uctors per Phase		/ P	hase
Tape Shield	Aluminum	Copper	-	Bond Size / Dim.			
Concentric Neutral	Aluminum	Copper	# of B	Sond Conductors			
Insulation Voltage			# of Ne	utral Conductors			
Insulation Type			Ne	eutral Size / Dim.			
Comments:							
Recorded By:	B. DOUGLAS, K. BF	RANT					



TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID IROQUOIS MS#1 Device ID Т2

Electrical Tests

Turn Ra	tio Test	Test Volt	age: Automatio	C X Oth	ner V				
Тар Р	osition /	Tap Voltage	Calculated	H 1 T	o H 2	H 2 To	H 3	Н 3 То	H 1
Desig	gnation	V	Ratio	X 0 T	o X 2	X 0 To	Х З	Х О То	X 1
1 / A	102.50%	46200							
2 / B	100.00%	45100							
3 / C	97.30%	44000	9.159	9.1	62	9.1	67	9.10	66
4 / D	94.50%	42900							
5/E	91.80%	41800							
				Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
		Tap Posi	tion As Found	3 2.200 mA	0.020 %	2.200 mA	0.070 %	2.700 mA	0.070 %
	Tap Position As Left		mA	%	mA	%	mA	%	

Primary Winding Resistance

5 Resistance in ohms at 0.5 A after 1 minute Resistance in milli-ohms at Α after 1 minute Ν/Α Ω Ω H0 - H1 H1 - H2 X0 - X1 43.400 mΩ X1 - X2 85.800 mΩ 2.950 H0 - H2 Ν/Α Ω H2 - H3 2.940 Ω X0 - X2 42.800 X2 - X3 85.500 mΩ mΩ H0 - H3 Ν/Α Ω H3 - H1 2.970 Ω X0 - X3 43.100 mΩ X3 - X1 86.100 mΩ Minute

Stabilization Time > 1

Stabilization Time > 1

Secondary Winding Resistance

Minute

Capacitance Test

	Low - Ground		Low - Guard US		UST (High - Low)		High - Guard		High - Ground	
Capacitance in pico-farads	3821	рF	1448	рF	2378	pF	13232	рF	15606	рF
Uncorrected D.F. (%)	0.312	%	0.390	%	0.190	%	0.165	%	0.182	%
Corrected to 20 °C (%)	0.246	%	0.308	%	0.150	%	0.130	%	0.144	%

Temp. Correction Factor 0.79

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @	10000	V DC after 1 minute	Phase A to Ground	131700	MΩ
			Phase B to Ground	800000	MΩ
			Phase C to Ground	708000	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	5000	V DC	after 1 minute			
Phase A to Ground	7	77400	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground	ŧ	58600	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground	e	67800	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

TEMPORARY GROUNDS APPLIED ON SECONDARY CABLES FOR WORK PROTECTION.

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	184	51006	0319	3678
Tested By:	B. DOUGLAS, K. BRAN	т			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID IROQUOIS MS#1 Device ID

D T2

Dielectric Absorption Test (Insulation Resistance)

	High to Lo	w & Gnd	Low to Hi	gh & Gnd	High & Lo	w to Gnd		
Time	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected		
15 sec	19700 MΩ	5910 MΩ	22100 MΩ	6630 MΩ	15200 MΩ	4560 MΩ		
30 sec	39100 MΩ	11730 MΩ	36000 MΩ	10800 MΩ	26800 MΩ	8040 MΩ		
45 sec	47300 MΩ	14190 MΩ	47000 MΩ	14100 MΩ	32100 MΩ	9630 MΩ		
1 min	53600 MΩ	16080 MΩ	54700 MΩ	16410 MΩ	36100 MΩ	10830 MΩ		
2 min	68200 MΩ	20460 MΩ	74300 MΩ	22290 MΩ	46800 MΩ	14040 MΩ		
3 min	78400 MΩ	23520 MΩ	87000 MΩ	26100 MΩ	53600 MΩ	16080 MΩ		
4 min	88000 MΩ	26400 MΩ	98400 MΩ	29520 MΩ	58900 MΩ	17670 MΩ		
5 min	96500 MΩ	28950 MΩ	108400 MΩ	32520 MΩ	64300 MΩ	19290 MΩ		
Test Voltage	10000	v	1000	V	1000	v		
Multiplier	1			1	1			
TCC 0.30	TCC 0.30 Insulation			on Resistance Readings Corrected to 20 °C				

Insulation Resistance

Core Ground Insulation Resistance









Comments:

Tested By: B. DOUGLAS, K. BRANT



November 18th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re: Oil Analysis Report - Our Ref: 29995 Site: Iroquois MS #1 – 5549 Carman Rd., Iroquois, ON

Please find attached the oil analysis results of samples taken recently at your facility.

> Transformer – Asea Brown Boveri, Serial no. C199 (T1)

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the insulating fluid is clear with zero amounts of sediment detected and having a slight amount of water content (*10 ppm*). All the parameters **except for** *Interfacial Tension & Neutralization Number* were found within manufacturer recommended limits. *Interfacial Tension (20 dynes/cm)* is below current recommended manufacturer guideline minimum limit (*25 dynes/cm*). Neutralization Number (0.24 Milligrams KOH/gram) is above recommended manufacturer guideline maximum limit (0.2 Milligrams KOH/gram). *Interfacial Tension (IFT)* measures the tension at the interface between two liquids which do not mix (oil and water) and is expressed in dynes/cm. This test is used to detect the presence of oil decay products (sludge), polar contaminants from solid insulating materials and oxidation products in the oil. *Neutralization Number (Acidity)* is a measure of acids in the oil which originate from decomposition/oxidation products. High values of acidity increase the rate of deterioration and can induce corrosion inside the transformer when water is present. Please contact Tal Trees if you wish to perform an inhibitor analysis on remaining sample.

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. All the dissolved gases remained within IEEE recommended limits. **We recommend resampling annually (every 12 months), to monitor gases.**



> <u>Transformer – Northern Transformer, Serial no. 152707 (T2)</u>

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, remaining clear with zero amount of sediment detected, and having a slight amount of water content (*<1 ppm*). All the measured parameters remained within IEEE recommended limits for acceptable inservice operation.

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. All the dissolved gases remained within IEEE recommended limits. **We recommend resampling annually (every 12 months), to monitor gases.**

Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence Utility in the future.

Yours Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 dmaclean@taltrees.ca Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



		IPLE ANALYSIS I SERVICE - OI			Y
Cust PO : 29995-					-1590 20042 TLT02
TALTREES POWER SER	VICES				
102 PARKS DRIVE				eived : OCT 23	
	0.11		Analysis		
BELLEVILLE K8N 4Z5	ON		Analyzed Reviewed		Swn
	SA	MPLE IDENTIF:	CATION		
Description : MS1 TX	1				
Rating : HV_Rating : Manuf. / Date: ASEA B Serial No : C199	3 M 44 k ROWN BOVER	V Samı 21 1953 Samı	ple Port : pled By :	BOTTOM - MAIN TA	ANK
TEST	ASTM NO.	RECOMMENI	DED LIMITS	TEST VAI	JUES
Dielectric Breakdown	D1816 D877	2mm Gap 40	KV (Min) KV (Min)	1816 - 64 877 -	
Neutralization Number	D974	0.2 Max Milligrams	s KOH/gram	0.24	
Interfacial Tension	D971	25 Dyr (Minir	nes/cm num)	20	
Specific Gravity API Gravity	D1298	(60/60	PF)	0.889 27.6	
Colour	D1500	0.5 — 8	3.0	3.0	
Visual Condition	D1524	Clarity Sedimer Free Wa	nt	CLEAR NONE NO	
Water Content	D1533	35 p.p.r	n. max	10	
Power Factor (25 C) Power Factor (100°C)	D924 D924	0.5 % max 5.0 % max			
	I	EST EVALUATIO	DN		
Le contra c					

DIELECTRIC BREAKDOWN IS GOOD WATER CONTENT IS GOOD NEUTRALIZATION NUMBER IS POOR INDICATING EXCESSIVE OXIDATION IFT INDICATES POLAR CONTAMINANTS AND OXIDATION PRODUCTS IN THE OIL RECOMMENDATIONS: SAMPLE AS PER SCHEDULE

Notes :

CONTACT LAB TO PERFORM INHIBITOR ANALYSIS ON REMAINING OIL

Test results relate only to samples tested as received.

RONDAR INC.	333 Centennial Parkway North	Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808	Fax : (905) 561-8871	

Cust PO : 29995-RSLU	DISSOLVED GAS ASTM Method IROQUOIS		C : D 2019-1581 Jo : 20042
TALTREES POWER SERVIC 102 PARKS DRIVE BELLEVILLE K8N 425	es on	Date F Analys Analyz	Received : OCT 23 2019 sis Date : OCT 24 2019 sed By : SK wed By : Sk
	SAMPLE IDEN	TIFICATION	
Description : MS1 TX1			
Rating : HV Rating : Manuf. / Date: ASEA BROW Serial No : C199 Sample Port : BOTTOM -		Fluid Temp Volume Preservati Syringe Se Sampled By Sample Dat	: 8500 LITRES on : CONSERVATOR erial: CJ825 7 : EC
COMPONENT	MEASU	RED PPM	% COMBUSTIBLES
Hydrogen (H2)		15	4.6
Oxygen + Argon (O2	+ A)	22201	
Nitrogen (N2)		42953	
Methane (CH4)		5	1.5
Carbon Monoxide (CO)	255	78.2
Carbon Dioxide (CO2)	2417	
Ethylene (C2H4)		4	1.2
Ethane (C2H6)		<1	. 0
Acetylene (C2H2)		1	.3
Propane (C3H8)		46	14.1
Total Gas Content		6.79 %	
Combustible Gas Content		326 ppm	۱ .480 %
*PPM = Part Per Mi	llion by volum	ie N	I.D. = Not Detectable

General Comments: FAULT GAS CONCENTRATIONS HAVE REMAINED WITHIN NORMAL RANGE SINCE DEC/16.

Recommendations : SAMPLE AS PER SCHEDULE FOR DISSOLVED GASES

Notes :

Test results relate only to samples tested as received.

Cust PO : 29995-F	I	File No : 20042					
TALTREES POWER SERV 102 PARKS DRIVE	/ICES	Cust No : TLT02 Date Received : OCT 23 2019 Analysis Date : OCT 25 2019					
BELLEVILLE K8N 4Z5	ON	Analyzed By : VN Reviewed By : SW					
SAMPLE IDENTIFICATION							
Description : MS1-TX2	2						
Rating : HV_Rating : Manuf. / Date: NORTHEF Serial No : 152707	44	MVA Volume : 3273 LITRES kV Sample Port : BOTTOM - MAIN TANK 2015 Sampled By : KB/BD Sample Date : OCT 18 2019					
TEST	ASTM NO.	. RECOMMENDED LIMITS TEST VALUES					
Dielectric Breakdown	D1816 D877	2mm Gap 40 KV (Min) 1816 - 66 KV (Min) 877 -					
Neutralization Number	D974	0.2 Max <0.01 Milligrams KOH/gram					
Interfacial Tension	D971	25 Dynes/cm 43 (Minimum)					
Specific Gravity API Gravity	D1298	(60/60°F) 0.876 30.0					
Colour	D1500	0.5 - 8.0 < 0.5					
Visual Condition	D1524	ClarityCLEARSedimentNONEFree WaterNO					
Water Content	D1533	35 p.p.m. max <1					
Power Factor (25 C) Power Factor (100°C)	D924 D924	0.5 % max 5.0 % max					
		TEST EVALUATION					

OIL IS IN SATISFACTORY CONDITION FOR CONTINUED USE

RECOMMENDATIONS: SAMPLE AS PER SCHEDULE

Notes :

Г

Test results relate only to samples tested as received.

Cust PO : 29995-RSLU	DISSOLVED GAS ASTM Method IROQUOIS	D3612 Pa Lal Fi		: D 20) :	19-1582 20042 TLT02
TALTREES POWER SERVICES 102 PARKS DRIVE BELLEVILLE ON		Date Rece Analysis Analyzed Reviewed		Date : OCT : By :	23 2019 24 2019 SK
K8N 4Z5			viewed .	ву :	Swl
SAMPLE IDENTIFICATION					
Description : MS1-TX2					
Rating : HV Rating : Manuf. / Date: NORTHERN Serial No : 152707 Sample Port : BOTTOM -		44 kV Volume 2015 Preservation Syringe Seria			(°C) LITRES 9
COMPONENT MEASURED PPM % COMBUSTIBLES					
Hydrogen (H2)		10		3.2	
Oxygen + Argon (O2 + A)		18716			
Nitrogen (N2)		60147			
Methane (CH4)		5		1.6	
Carbon Monoxide (CO)		293		94.8	
Carbon Dioxide (CO2)		1074			
Ethylene (C2H4)		1		. 3	
Ethane (C2H6)		<1		. 0	
Acetylene (C2H2)		<1		. 0	
Propane (C3H8)		<2		. 0	
Total Gas Content		8.02	010		
Combustible Gas Content		309	ppm	.385	00
*PPM = Part Per Million by volume N.D. = Not Detectable					

General Comments: FAULT GAS CONCENTRATIONS HAVE REMAINED WITHIN NORMAL RANGE SINCE DEC/16.

Recommendations : SAMPLE AS PER SCHEDULE FOR DISSOLVED GASES

Notes :

Test results relate only to samples tested as received.



November 15th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re: Maintenance Inspection Report - Our Ref: 29995 Site: Morrisburg MS#1 – 11 Fifth St. E., Morrisburg, ON

Please find the attached report for the maintenance work and inspections completed October 17th, 2019.

Tal Trees cleaned, serviced, tested & inspected, the main power system. All testing and inspections were performed in accordance to NETA Maintenance Testing Specifications.

Items tested/inspected include:

- o 44KV Air Break Switch
- Lightning Arrestors
- Main Transformer
- Secondary Cables
- Transformer Oil Analysis
- 4.16KV Load Break Switches

A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and NETA MTS.



<u> Air Break / Load Break Switches:</u>



- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, as well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.

102 Parks Drive, Belleville ON K8N 4Z5OFFICE. 613-968-9648TALTREES.CA



Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with antioxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer tests were completed on the transformer including turn ratio test, winding resistance, capacitance test and dielectric absorption test (insulation resistance).
- An oil sample was obtained for fluid analysis and DGA.



Findings/Repairs:

- 44KV Lightning arrestors on substation tower are porcelain composition and should be replaced at earliest convenience with polymer style. If this type of arrestor fails, it can explode, causing damage to surrounding components including transformer bushings & tower insulators.
- Transformer tank currently has one ground connection to the grid.
- Feeder 46F3 fuse (AØ) was found to be in poor condition (cracked) and was replaced with a spare link from the substation hut.
- Three porcelain insulators were replaced on the secondary (4160V) structure. The insulators required replacement due to their age, the epoxy that holds the metal cap separates.
- Secondary structure is missing warning signs "Do not operate fuses under load" sign as required by OESC Rule #: 36-006.
- Feeder 46F4 does not have a nomenclature to designate device ID.

Recommendations:

- *Replace 44KV lightning arrestors with polymer style.*
- Install second ground connection on transformer to comply with current trade grounding practice.
- Consider replacing porcelain insulators with cypoxy insulators for increased longevity.
- Install warning/nomenclature signs on secondary tower to comply with OESC requirements for all feeders.
- Continue with annual substation maintenance.

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all the recommended repairs listed in this report.



If you have any questions/concerns, please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence Utility.

Sincerely,

Dave MacLean,

(309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 dmaclean@taltrees.ca Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca




A SPARKPOWER COMPANY		System ID MORRISBUR	G MS#1	MS#1 Device ID 46T1-L		
Customer	Rideau St. Lawrence Utility	Date	Octobe	er 17th, 2019		
	985 Industrial Rd., Prescott, ON		29995	,		
	Morrisburg MS#1	System Neutral Present				
Site Address	11 Fifth St E., Morrisburg, ON	•				
Nameplate Data						
Switch Mounting	Metal Enclosed Pole	Tower X		Other		
Switch Type	Load Break Air Break	(Other		
Manufacturer	EASTERN POWER DEVICES	BIL Rating			kV	
Date Of Manufacture		Feeder ID				
Serial #	65807	Feeds To	T1			
Catalog #		Interrupting Rating			Α	
Nom. / Max. Voltage	46.0 / 48.3 kV	Continuous Ampacity	600		Α	
Comments	VERY RUSTY					
Lightning Arrestors						
Lightning Arrestors	Yes X No					
Class	Distribution Intermediate	Station X				
Composition	Ceramic X Polymer					
Manufacturer	ASEA	Max. / MCOV Rating	I	46.0 /	39.0 kV	
Catalog #	5249872					
Comments						
Protective Device Date	а					
Primary Fuse Holder Da	ta	Primary Fuse Link Dat	ta			
Manufacturer	S&C	Manufacturer	S&C			
Туре	SMD	Туре	SMD-1	Α		
Nom. / Max. Voltage	46.0 / 48.3 kV	Link Size	150		Α	
Holder Max. Fuse Link	200E	TCC #				
Holder Catalog #	86705-R1	Link Catalog #	445150	R1-46		
Primary Fuse Link Spar	es / Location	_				
Spare Primary Fuses	Yes X No X	# of Spares	3			
Spare Location	SUBSTATION HUT.					
Comments	1977					
Interlock						
Key Interlock	Yes No 🕽	C				
Interlock Type	Electrical Mechanical	Utility Lock				
Devices Interlocked		Trans. Encl.	Oth	her		
Manufacturer		Key Interloc				
Comments						
Load Side Conductor	Data					
Conductor Type	Cable Bus Bar	Conductor Size / D	im. 1/2 "	' IPS		
Conductor Material	Aluminum Copper				/ Phas	
Tape Shield	Aluminum Copper	Bond Size / D			, 1103	
Concentric Neutral	Aluminum Copper	# of Bond Coduct				
Insulation Voltage		# of Neutral Conduct				
Ŭ	BARE CONDUCTOR	Neutral Size / D				
Comments						
C						
Recorded By:	T. GILBERT					



System ID MORRISBURG MS#1 Device ID

e ID 46T1-L

Visual Inspection / Mechar	nical Tests						
Nameplate Condition	Satisfactory	X	Not Satisfactory		N/A	Comments	
Insulator Condition	Satisfactory	Х	Not Satisfactory		N/A	Comments	
Ground Connections	Satisfactory	Х	Not Satisfactory		N/A	Comments	
Lightning Arrestors	Satisfactory		Not Satisfactory	Х	N/A	Comments	PORCELAIN
Arc Suppressors	Satisfactory		Not Satisfactory		N/A X	Comments	
Key Interlock Operation	Satisfactory		Not Satisfactory		N/A X	Comments	
Ground Straps & Materials	Satisfactory	X	Not Satisfactory		N/A	Comments	
Switch Condition / Operation							
Switch Operation As Left	Satisfactory	X	Not Satisfactory		N/A	Comments	
Contact Surface Condition	Satisfactory	X	Not Satisfactory		N/A	Comments	
Simultaneous Closure	Satisfactory	X	Not Satisfactory		N/A	Comments	

Electrical Tests

Earth Resistance (3-Poi	nt Test)		Arc Suppressor (Arc Suppressor Contact Resistance				
Earth Resistance in Ohm	IS.		Arc Suppressor C	ontact Resistance in	Ohms.			
			Phase A	N/A	Ω			
Earth Resistance	N/A	Ω	Phase B	N/A	Ω			
			Phase C	N/A	Ω			

Switch Insulation Resistance	Switch / Fuse Contact Resistance
Resistance in Meg-Ohms after 1 minute.	Resistance in micro-Ohms after 1 minut

Resistance in Meg-Ohms after 1 minute.				Resistance in	micro-Oh	ms after	1 minute					
Test Voltage	1 kV 2 kV 5 kV 10 kV X				<v th="" x<=""><th>Test Current</th><th>10</th><th>Α</th><th></th><th></th><th></th><th></th></v>	Test Current	10	Α				
	Phase A	Phase	В	Phase	С		Phas	e A	Phase	e B	Phas	e C
Phase to GND	1400000 MΩ	1650000	MΩ	2100000	MΩ	Contacts	18	μΩ	16	μΩ	16	μΩ
						Fuse	620	μΩ	880	μΩ	609	μΩ
						Overall		μΩ		μΩ		μΩ

Load Side Conductor Insulation Resistance

Resistance in Meg-Ohms @	10000	V DC	after 1 minute	Phase A to Ground	1400000	MΩ
			Phase B to Ground	1600000	M	
				Phase C to Ground	1500000	MC

Resistance in Meg-Ohms @	10000	V DC after 1 minute	Phase A to Ground	10320	MΩ
			Phase B to Ground	10240	MΩ
			Phase C to Ground	9680	MΩ

Comments / Observations

Test Instrument(s)

Manufacturer / Model	М
Serial #	

leggerDuctor36787293

Tested By: T. GILBERT



A SPARKPOWER COMPANY		System ID 4160 FEEDER			ER Device ID 46F1		
Customer Address	Rideau St. Lawrence 985 Industrial Rd., Pr Morrisburg MS#1		Svetem No.		29995	er 17th, 2019	
	11 Fifth St E., Morrist	ourg, ON	- Oystenn Net	anan resent			
Nameplate Data			-				
Switch Mounting Switch Type	Metal Enclosed Load Break X	Pole Air Break	Towe	er X		Other Other	
Manufacturer			7	BIL Rating		-	kV
Date Of Manufacture			-	Feeder ID	46F1		
Serial #			-	Feeds To	FEED	ER #1	
Catalog #	36011		Interru	pting Rating	600		Α
Nom. / Max. Voltage	7.2 / 8.3	3 kV	Continuo	us Ampacity	600		А
Comments							
Lightning Arrestors							
Lightning Arrestors	Yes X	No					
Class		Intermediate	Statio	n			
Composition	Ceramic X	Polymer	-				
Manufacturer			Max. / M	ICOV Rating		3.0 /	kV
Catalog #				-			
Comments							
Protective Device Dat	а						
Primary Fuse Holder Da	ita		Primary Fus	so Link Da	ta		
	S&C POWER FUSE		•	Anufacturer			
	SM5		. IV		SM5		
Nom. / Max. Voltage		3 kV	-	Link Size			Α
Holder Max. Fuse Link			-		119-4		
Holder Catalog #			Lir	nk Catalog #		0R4	
Primary Fuse Link Spar				in outlandy //		••••	
Spare Primary Fuses		No		# of Spares	4		
	SUBSTATION HUT				-		
Comments							
Interlock							
Interiock			1				
Key Interlock		No X	-				
Interlock Type	Electrical	Mechanical	Utility Loc				
Devices Interlocked	H.V. Switch	Breaker	Trans. End			ther	
Manufacturer				Key Interloc	k #		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X	Bus Bar	Condu	ictor Size / D	im. 3/C)	
Conductor Material	Aluminum X	Copper	Conduc	ctors per Pha	ase 1		/ Phase
Tape Shield	Aluminum	Copper	В	ond Size / D	im. N/A	۹	
Concentric Neutral	Aluminum	Copper	# of E	Bond Coduct	ors O		
Insulation Voltage	N/A		# of Neu	tral Conduct	ors 1		
Insulation Type	BARE CONDUCTOR		Neu	utral Size / D	im. 3/C)	
Comments							
_							
Recorded By:	T. GILBERT, D. MACL	LEAN					



POW	ER SERVI	CES		System ID	4160	FEEDER	Devic	e ID	46F 1	
Visual Inspec	tion / Mechan	nical Tests								
Namepla	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Insula	tor Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Con	nments			
Key Interlo	ck Operation	Satisfactory	Not Satisfa	actory	N/A	Con	nments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Switch Conditi	ion / Operation									
Switch Oper	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Com	nments			
Simultane	eous Closure	Satisfactory	Not Satisfa	actory	N/A	Con	nments	INDIVID	JAL SW	S
Electrical Tes	sts									
Earth Resistan	ce (3-Point Tes	st)		Arc Suppre	essor C	Contact Re	sistanc	e		
Earth Resistar	nce in Ohms.			Arc Suppr	essor C	ontact Resis	tance in	Ohms.		
				Phase A		N/A	۱		Ω	
Earth Resistar	nce	N/A	Ω	Phase B		N/A	۱		Ω	
				Phase C		N/A	۹	!	Ω	
Switch Insulati	ion Resistance			Switch / Fu	se Cor	ntact Resis	stance			
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro	o-Ohms afte	r 1 minut	e.		
Test Voltage	1 kV 2 I	kV 5 kV	X 10 kV	Test Curre	nt	10 A				
	Phase A	Phase B	Phase C	-	F	Phase A	Phas	se B	Phas	еC
Phase to GND	157600 MΩ	52100 MΩ	185400 MΩ	Contac	ts 8	i0 μΩ	65	μΩ	60	μΩ
				Fus	se 2	56 μΩ	259	μΩ	226	μΩ
				Overa	all	μΩ		μΩ		μΩ
Load Side Con	ductor Insulati	ion Resistance								
Resistance	in Meg-Ohms @	VI	DC after 1 minut	e	Phase A	to Ground		N/A		MΩ
					Phase E	to Ground		N/A		MΩ
				l	Phase C	to Ground		N/A		MΩ
Lightning Arre	stor Insulation	Resistance								
	in Meg-Ohms @		DC after 1 minute	e	Phase A	to Ground		130000		MΩ
	÷ 0				Phase B	to Ground		110000		MΩ
				1	Phase C	to Ground		6040		MΩ

Comments / Observations

AØ ARC CONTACT ON SWITCH IS DAMAGED (HOLE) - RECOMMEND REPLACING.

Test Instrument(s)

Manufacturer / Model	Me
Serial #	7

leggerDuctor77767293

Tested By: D. MACLEAN,T. GILBERT



- FOVER SE	SPARKPOWER COMPANY	System ID	4160 FEEI	DER	Device ID	46F2
Customer Address Site	Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON Morrisburg MS#1 11 Fifth St E., Morrisburg, ON	System Ne		Octob 29995	oer 17th, 2019 ;	
Nameplate Data Switch Mounting Switch Type	Metal Enclosed Pole Load Break X Air Break	Tow	er X		Other Other	
Manufacturer Date Of Manufacture	S&C		BIL Rating Feeder ID			kV
Serial #	26044	Interr	Feeds To		ER #2	•
# Catalog Nom. / Max. Voltage Comments	7.2 / 8.3 k		upting Rating ous Ampacity			A A
Lightning Arrestors						
Lightning Arrestors Class Composition Manufacturer Catalog # Comments	Yes X No Distribution X Intermediate Ceramic X Polymer UNICAP	Statio Max. / I	on		3.0 /	kV
Protective Device Dat	а					
Primary Fuse Holder Da	ta	Primary Fu	se I ink Dai	a		
-	S&C POWER FUSE	-	Vanufacturer			
Туре	SM5		Туре	SM5		
Nom. / Max. Voltage	7.2 / 8.3 kV	/	Link Size			Α
Holder Max. Fuse Link	400A		TCC #	119-4		
Holder Catalog #	87511	Li	nk Catalog #	26160	0R4	
Primary Fuse Link Spar	es / Location					
Spare Primary Fuses Spare Location Comments	Yes X No SUBSTATION HUT		# of Spares	4		
Interlock						
Key Interlock Interlock Type Devices Interlocked Manufacturer Comments	Electrical Mechanical	X Utility Loo Trans. En			ther	
Load Side Conductor	Data					
			utor Sine / Di	m 3/	`	
Conductor Type Conductor Material	Cable X Bus Bar Aluminum X Copper		uctor Size / Di ctors per Pha		J	/ Phase
Tape Shield	Aluminum Copper		Bond Size / Di		Δ	/ Fliase
Concentric Neutral	Aluminum Copper		Bond Coducto			
Insulation Voltage			utral Conducto			
e e	BARE CONDUCTOR	Ne	utral Size / Di	im. 3/C)	

Recorded By: D. MACLEAN, E. COURTNEY, T. GILBERT



- POW	ER SERVI	CES		System ID	4160 F	EEDER	Device	ID	46F2
Visual Inspec	tion / Mechan	ical Tests							
•	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Comr	nents		
Insula	tor Condition	Satisfactory X	Not Satisfa	actory	N/A	Comr	ments		
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Comr	nents		
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Comr	nents		
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Comr	ments		
Key Interlo	ck Operation	Satisfactory	Not Satisfa	actory	N/A X	Comr	ments		
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Comr	nents		
Switch Conditi	ion / Operation					_			
Switch Oper	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Comr	nents		
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Comr	ments		
Simultane	eous Closure	Satisfactory	Not Satisfa	actory	N/A X	Comr	ments INI	DIVIDUA	L SW'S
Electrical Tes	sts								
Earth Resistan	ce (3-Point Tes	it)		Arc Suppre	essor C	ontact Res	istance		
Earth Resistar	nce in Ohms.			Arc Suppr	essor Co	ntact Resista	ance in Oh	ms.	
				Phase A		N/A		Ω	-
Earth Resistar	nce	N/A	Ω	Phase B		N/A		Ω	_
				Phase C		N/A		Ω	
Switch Insulati	ion Resistance			Switch / Fu	ıse Con	tact Resist	ance		
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro	-Ohms after	1 minute.		
Test Voltage	1 kV 2 k	V 5 kV	X 10 kV	Test Curre	nt	10 A			
	Phase A	Phase B	Phase C	-	Р	hase A	Phase	в	Phase C
Phase to GND	157600 MΩ	52100 MΩ	185400 MΩ	Contac	ts 18	0 μΩ	205	μΩ	189 μΩ
				Fus	se 34	2 μΩ	323	μΩ	322 μΩ
				Overa	all	μΩ		μΩ	μΩ
Load Side Con	ductor Insulati	on Resistance							
Resistance	in Meg-Ohms @	V	DC after 1 minute	е	Phase A	to Ground		N/A	MΩ
					Phase B	to Ground		N/A	MΩ
					Phase C	to Ground		N/A	MΩ
Lightning Arre	stor Insulation	Resistance							
Resistance	in Meg-Ohms @	1000 V	DC after 1 minut	е	Phase A	to Ground		814	MΩ
	- 0				Phase B	to Ground		928	MΩ
					Phase C	to Ground		744	MΩ

Comments / Observations

Test Instrument(s) Manufacturer / Model

ifacturer / Model Serial # Megger Ductor 7776 7293

Tested By: D. MACLEAN, E. COURTNEY, T. GILBERT



- FOVER SE	SPARKPOWER COMPANY	System ID	4160 FEEI	DER	Device ID	46F3
Customer Address Site	Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON Morrisburg MS#1 11 Fifth St E., Morrisburg, ON	System Ne		29995	oer 17th, 2019 ;	
Nameplate Data						
Switch Mounting Switch Type	Metal Enclosed Pole Load Break X Air Break	Tow	er X		Other Other	
Manufacturer Date Of Manufacture	S&C		BIL Rating Feeder ID			kV
# Serial # Catalog	36011	Interri	Feeds To upting Rating		ER #3	Α
Nom. / Max. Voltage Comments	7.2 / 8.3 k		ous Ampacity			A
Lightning Arrestors						
Lightning Arrestors Class Composition Manufacturer Catalog # Comments	Yes X No Distribution X Intermediate Ceramic X Polymer UNICAP	Statio Max. / 1	on		3.0 /	kV
Protective Device Dat	a					
Primary Fuse Holder Da	ta	Primary Fu	se Link Dat	ta		
-	S&C POWER FUSE	-	Manufacturer			
Туре	SM5		Туре	SM-5		
Nom. / Max. Voltage	7.2 / 8.3 kV	/	Link Size	400		Α
Holder Max. Fuse Link	400A		TCC #	119-4		
Holder Catalog #		Li	nk Catalog #	26160	0R4	
Primary Fuse Link Spar						
Spare Primary Fuses Spare Location Comments	Yes X No SUBSTATION HUT		# of Spares	4		
Interlock						
Key Interlock Interlock Type Devices Interlocked Manufacturer Comments	Electrical Mechanical	X Utility Loo Trans. En			ther	
Load Side Conductor	Data					
Conductor Type	Cable X Bus Bar	Cond	uctor Size / Di	im 2/6	h	
Conductor Material	Aluminum X Copper		ctors per Pha		5	/ Phase
Tape Shield	Aluminum Copper		Bond Size / Di		Δ	/ Fild3e
Concentric Neutral	Aluminum Copper		Bond Coducto			
Insulation Voltage			utral Conducto			
e e	BARE CONDUCTOR		utral Size / Di)	

Recorded By: D. MACLEAN, E. COURTNEY, T. GILBERT



POW	ER SERVI	CES POWER COMPANY		System ID	4160	FEEDER	Devic	e ID	46F3	
Visual Inspec	tion / Mechan	ical Tests								
Namepla	ate Condition	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Insula	tor Condition	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Ground	Connections	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Arc	Suppressors	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Key Interlo	ck Operation	Satisfactory	Not Satisfa	ctory	N/A 🗡	Con	nments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Switch Conditi	ion / Operation									
Switch Oper	ration As Left	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	ctory	N/A	Con	nments			
Simultane	eous Closure	Satisfactory	Not Satisfa	ctory	N/A	Con	nments I	NDIVIDU	AL SW'	S
Electrical Tes	sts									
Earth Resistan	ce (3-Point Tes	st)		Arc Suppre	essor C	ontact Re	sistance	;		
Earth Resistar	nce in Ohms.			Arc Suppre	essor Co	ontact Resis	tance in (Ohms.		
				Phase A		N/A	۹.	Ω	2	
Earth Resistar	nce	N/A	Ω	Phase B		N/A	۱	Ω	2	
				Phase C		N/A	۱	Ω	2	
Switch Insulati	ion Resistance			Switch / Fu	se Cor	tact Resis	stance			
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro	o-Ohms afte	r 1 minute	э.		
Test Voltage	1 kV 2 I	V 5 kV	X 10 kV	Test Currer	nt	10 A				
	Phase A	Phase B	Phase C		F	hase A	Phas	e B	Phase	эC
Phase to GND	157600 MΩ	52100 MΩ	185400 MΩ	Contact	ts 20)4 μΩ	107	μΩ	146	μΩ
				Fus	e 30)1 μΩ	271	μΩ	212	μΩ
				Overa	all	μΩ		μΩ		μΩ
Load Side Con	ductor Insulati	on Resistance								
Resistance	in Meg-Ohms @	VI	C after 1 minute	ə l	Phase A	to Ground		N/A		MΩ
				I	Phase B	to Ground		N/A		MΩ
				F	Phase C	to Ground		N/A		MΩ
Lightning Arre	stor Insulation	Resistance								
Resistance	in Meg-Ohms @	1000 V I	DC after 1 minute	e l	Phase A	to Ground		>200000		MΩ
	- 0			I	Phase B	to Ground		>200000		MΩ
				F	Phase C	to Ground		166000		MΩ
							-			

Comments / Observations

AØ FUSE HAS A HAIRLINE CRACK. REPLACED INSULATOR ON BOTTOM SWITCH BLADE (BØ). REPLACED TWO INSULATORS ON CØ FUSE HOLDER.

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 7293

Tested By: D. MACLEAN, E. COURTNEY, T. GILBERT



	System ID 4160 FEI	EDER Device ID	46F4
985 Industrial Rd., Prescott, ON Morrisburg MS#1	Job #	# 29995	
11 Fifth St E., Morrisburg, ON	_		
Metal Enclosed Pole Load Break X Air Break	Tower	Other Other	
	Feeder II	46F4	kV
14.4 / 17.0 kV	Interrupting Rating	g 600	A A
Distribution Intermediate Ceramic Polymer	Station	g/	kV
а			
ita	Primary Euse Link Da	ata	
	=		
SM5	Туре	SM5	
7.2 / 8.3 kV	Link Size	e 400	Α
400E	TCC #	[#] 119-4	
86152R2	Link Catalog #	261600R4	
es / Location	_		
	# of Spares	s <u>4</u>	
Electrical Mechanical	Utility Lock Trans. Encl.	Other	
Data			
Aluminum Copper	Conductors per Pr Bond Size / I	Dim. N/A	/ Phase
	Load Break X Air Break S&C 136332R2 14.4 / 17.0 kV Pes No X Distribution Intermediate Ceramic Polymer a a a a a bta S&C POWER FUSE SM5 7.2 / 8.3 kV 400E 86152R2 res / Location Yes X No SUBSTATION HUT Yes No SUBSTATION HUT Yes No Mechanical H.V. Switch Breaker Data Cable X Bus Bar Aluminum Copper X Aluminum Copper	System ID 4160 FEI Rideau St. Lawrence Utility Date 985 Industrial Rd., Prescott, ON System Neutral Presen 11 Fifth St E., Morrisburg, ON Metal Enclosed Pole Metal Enclosed Pole Tower X Load Break Air Break Bil. Rating S&C Bil. Rating Feeds TC 136332R2 Interrupting Rating Continuous Ampacity 14.4 17.0 KV Max. / MCOV Rating S&C POWER FUSE No X X Max. / MCOV Rating Max. / MCOV Rating Max. / MCOV Rating S&C POWER FUSE Manufacture Tock 7 SM5 Tock 7 Link Size 7.2 8.3 KV Link Size 400E Electrical Mechanical Utility Lock Tock 7 SUBSTATION HUT Station # of Spares Yes No X Key Interlo Yes No X Conductor Size / I Mechanical Utility Lock Trans. Encl. Key Interlo Yes No Sub Bar Cond	SPARKFOWER COMPANY System ID 4160 FEEDER Device ID Rideau St. Lawrence Utility Date October 17th, 2019 985 Industrial Rd, Prescott, ON Job # 29995 Morrisburg MS#1 System Neutral Present 11 Fifth St E, Morrisburg, ON Tower X Other Metal Enclosed Pole Tower X Other S&C Bill Rating 110 Feeder ID 46F4 Feeder ID 46F4 Feeds To FEEDER #4 136332R2 Interrupting Rating 600 Continuous Ampacity 400 Yes No X Distribution Intermediate Max. / MCOV Rating / Max. / MCOV Rating / Manufacturer S&C SM5 Type SM5 Manufacturer S&C SM5 T2 / 8.3 kV Link Size 400 TCC # 119-4 86152R2 No # of Spares 4 SUBSTATION HUT Yes No Yes No # of Spares 4 SUBSTATION HUT Breaker Utility Lock Trans. Encl. Other Key Interlock #

Recorded By: D. MACLEAN, E. COURTNEY, T. GILBERT



POW	ER SERVI	CES		System ID	4160 FEI	EDER D	evice ID	46F	4
Visual Inspec	tion / Mechar	nical Tests							
•	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Comme	nts		
•	tor Condition	Satisfactory X	Not Satisfa	-	N/A	Comme	nts		
Ground	Connections	Satisfactory X	Not Satisfa	-	N/A	Comme	nts		
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Comme	nts		
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Comme	nts		
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory	N/A X	Comme	nts		
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Comme	nts		
Switch Conditi	ion / Operation								
Switch Oper	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Comme	nts		
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Comme	nts		
Simultane	eous Closure	Satisfactory	Not Satisfa	actory	N/A X	Comme	nts INDIVID	UAL SW	l'S
Electrical Tes	sts								
Earth Resistan	ice (3-Point Tes	st)		Arc Suppre	ssor Con	tact Resist	ance		
Earth Resistar	nce in Ohms.			Arc Suppre	essor Conta	ect Resistanc	e in Ohms.		
				Phase A		N/A		Ω	
Earth Resistar	nce	N/A	Ω	Phase B		N/A		Ω	
				Phase C		N/A		Ω	
Switch Insulati	ion Resistance			Switch / Fus	se Contad	t Resistan	се		
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro-O	nms after 1 r	ninute.		
Test Voltage	1 kV 2 I	kV 5 kV	X 10 kV	Test Curren	it 10	Α			
	Phase A	Phase B	Phase C	_	Pha	se A	Phase B	Phas	se C
Phase to GND	157600 MΩ	52100 MΩ	183400 MΩ	Contact	s 81	μΩ	98 μΩ	83	μΩ
				Fuse	e 311	μΩ	311 μΩ	380	μΩ
				Overa	11	μΩ	μΩ		μΩ
Load Side Con	ductor Insulati	ion Resistance							
Resistance	in Meg-Ohms @	V	DC after 1 minut	e F	hase A to	Ground	N/A		MΩ
				F	hase B to	Ground	N/A		MΩ
				P	hase C to	Ground	N/A		MΩ
Lightning Arre	stor Insulation	Resistance							
	in Meg-Ohms @		DC after 1 minut	e F	hase A to	Ground	N/A		MΩ
	÷ 0			F	hase B to	Ground	N/A		MΩ
				F	hase C to	Ground	N/A		MΩ

Comments / Observations

Test Instrument(s) Manufacturer / Model

facturer / Model Serial # Megger Ductor 7776 7293

Tested By: D. MACLEAN, E. COURTNEY, T. GILBERT



TRANSFORMER DATA SHEET (Pg. 1 of 4)

— P	OWER SEI	RVICES			System ID		46T1-L		Device IE)	T	1	
	Customer Address Site	Rideau St. Lawren 985 Industrial Rd., Morrisburg MS#1 11 Fifth St E., Morr	Prescott					October 29995	[.] 17th, 20	19			
Namer	olate Data												
Tr	Transformer Class ansformer Cooling ng Configuration	-	X	mount DNAF - Top X	Station LNAN Top - Side		DR ide - Sid		Other Other Other				
KVA / Se H\ L\	ate of Manufacture	2201-1 5000 44000 65.6 4160/2400 694		NADA LTE KVA V A V	Ta C C Ten Perce Tar	anks & coolant Coolant Total nperatu HV BIL LV BIL ent Imp mper Re	indings Fittings Volume Weight Weight re Rise Rating Rating edance essistant Colour	12095 1184 10182 38300 55 250 95	5.87 %	kg kg kg °C kV kV ONAN YES	X	Ib Gal Ib °F ONAF NO	
Na Fan Gr Liqu I Temp	Inspection meplate Condition / Pump Operation round Connections id Levels In Tanks nterlock Operation . Gauge Operation olant Temperature Comments	Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory X	Not Not Not Not	Satisfacto Satisfacto Satisfacto Satisfacto Satisfacto Satisfacto	ry N ry X N ry N ry N ry N	J/A J/A J/A J/A J/A X J/A X A X	C C C C C	omments omments omments omments omments omments	ONLY 1	GND (°F	
Oil Cons		r Yes r Yes r Good B	No X No X ad	Replace	Br		Volume Volume X			L		Gal Gal	
Tap Cha	anger Data				Vector Dia	aram:	Delt	taWye3					
Po Des	osition / signation	Tap Voltages (V)	As Found	As Left		<u>.</u>	A ^{H2}	_	Xo				
1 / A 2 / B 3 / C 4 / D	105.00% 102.50% 100.00% 97.50%	44000 42900 41800 40700	X	X		4	-			X3			1
5/E	95.00%	39600			Prima	ary Vect	or X		Seconda	iry Vec	tor	Х	
	Comments: Tested By:	VECTOR DIAGRAM											



TRANSFORMER DATA SHEET (Pg. 2 of 4)

AS	PARKPOWER COMPANY		System ID) 46T1-L	Device ID	T1
Neutral Grounding Re	sistor (NGR)					
NGR Present	Yes	No	X			
Manufacturer		L		NGR Serial #		
NGR Voltage			V Ma	ximum Current		Α
NGR Resistance			Ω	NGR Location		
Comments						
Transformer Lightning	g Arrestors					
Lightning Arrestors	Yes	No	X			
Class	Distribution	Intermediate	Stat	tion		
Composition	Ceramic	Polymer				
Manufacturer		• L	Max.	/ MCOV Rating	1	kV
Catalog #				• _		
Comments						
Interlock						
Key Interlock	Yes	No	X			
Interlock Type	Elec.	Mech.	Utility L	ock		
Devices Interlocked	H.V. Switch	Breaker	Trans. E	incl.	Other	
Manufacturer				Key Interlock #		
Comments						
Fans		-]			
Fans	Yes	No	X			
# of Fans				Fan Voltage		
Fan Size				Frame Size		
Horsepower						
Comments						
Transformer Load Sid	le Conductor Dat	ta				
Conductor Type	Cable	Bus Bar	X Cond	ductor Size / Dim.	1" ROUND IPS	
Conductor Material	Aluminum	Copper	X Cond	ductors per Phase	1	/ Phase
Tape Shield	Aluminum	Copper		Bond Size / Dim.	N/A	
Concentric Neutral	Aluminum	Copper	# of	Bond Conductors	0	
Insulation Voltage	N/A		# of Ne	eutral Conductors	1	
Insulation Type	BARE BUS		N	eutral Size / Dim.	1" ROUND IPS	
Comments						

Tested By: D. MACLEAN, M. GRAHAM



TRANSFORMER TEST SHEET (Pg. 3 of 4)

F	OWER	R SERVIC	CES								-			
	0 11 21		WER COMPANY				System	ID	46T1-L	Dev	vice ID		T1	
Electric	cal Tests													
Turn Ra	tio Test	Test Vol	tage: Automa	atic	X	Oth	er	V						
Тар Р	Position /	Tap Voltage	Calculated	I	H 1	То	H 2	Н	2 To	Н3	Н3	То	Нŕ	1
Desig	gnation	v	Ratio		X 1	То	X 0	Х	2 To	X 0	Х З	То	Х	D
1 / A	105.00%	44000												
2 / B	102.50%	42900	42900.000			17.8	862		17.8	89		17.8	89	
3 / C	100.00%	41800												
4 / D	97.50%	40700												
5/E	95.00%	39600												
					Excitat Currre		Percent Deviatio		tation rrent	Percent Deviation	Excita Curr		Perce Devia	
		•	tion As Found	2	2.800	mA	0.150		00 mA	0.150 %		0 mA	0.1	50 %
		Tap Posi	tion As Left			mA		%	mA	%		mA		q
-	sistance in o	Resistance hms at 0.5	A after 1	minu	ıte			stance in		esistance ns at 5	5 A	after	r 1 minu	ute
H0 - H1		Ν/Α Ω	H1 - H2	1.65	Ω 0]	X0 - X1	7.2	10 m	Ω X1 -	X2	14.3	20 mg	2
H0 - H2		Ν/Α Ω	H2 - H3	1.64	Ω 0		X0 - X2	7.2	50 m	Ω X2 -	X3	14.3	10 mg	2
H0 - H3		Ν/Α Ω	H3 - H1	1.66	Ω 0		X0 - X3	7.20	50 m	a X3 -	X1	14.2	80 m9	2
Capacita	Stabiliz ance Test	zation Time >	1	_Min	ute			Stabiliza	tion Tin	ne > <u>1</u>		_Minu	ıte	
•			Low - Groun	d	Low	- Gua	ard US	ST (High	- Low)	High - G	uard	High	- Grou	Ind
C	Capacitance	in pico-farads	7450	pF		2685	pF	4769	рF	10381	pF	1	5142	p
		rected D.F. (%)		%	0	.208	%	0.342	%	0.444	%		0.412	%
	Correcte	ed to 20 °C (%)	0.226	%	0	.146	%	0.239	%	0.311	%		0.288	%
.ightnin	·	rection Factor r Insulation F	0.7 Resistance											
Re	esistance in	meg-ohms @	V	DC a	after 1 r	ninut	e	Phase	A to Gr	ound	N/.	Α		MC
		- 0						Phase	B to Gr	ound	N/	A		MC
								Phase	C to Gr	ound	N/.	Α		MΩ
Seconda	ary Condu	ictor Insulatio	on Resistance	e										
Re	esistance in	meg-ohms @	5000 V	DC	after 1 r	ninut	e							
	Phas	e A to Ground	15760	0		MΩ		Phase /	A to Pha	se B	N/	A		M
		e B to Ground	5210			MΩ		Phase E			N/			MC
				-										

Comments / Observations

Phase C to Ground

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	184	51006	7123	3678
Tested By: D	. MACLEAN, M. GRAHAI	N			

MΩ

Phase C to Phase A

MΩ

N/A

185400



TRANSFORMER TEST SHEET (Pg. 4 of 4)

Т1

Device ID

Dielectric Absorption Test (Insulation Resistance)

		High to Lo	w & Gnd	Low to Hi	gh & Gnd	High & Lo	w to Gnd
Tir	ne	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
15 :	sec	15710 MΩ	25136 MΩ	6650 MΩ	10640 MΩ	11740 MΩ	18784 MΩ
30 :	sec	25200 MΩ	40320 MΩ	13140 MΩ	21024 MΩ	18380 MΩ	29408 MΩ
45 :	sec	28600 MΩ	45760 MΩ	14940 MΩ	23904 MΩ	21000 MΩ	33600 MΩ
1 n	nin	31200 MΩ	49920 MΩ	16480 MΩ	26368 MΩ	22600 MΩ	36160 MΩ
2 n	nin	36200 MΩ	57920 MΩ	20200 MΩ	32320 MΩ	26500 MΩ	42400 MC
3 n	nin	39200 MΩ	62720 MΩ	22700 MΩ	36320 MΩ	28700 MΩ	45920 MC
4 n	nin	41400 MΩ	66240 MΩ	24800 MΩ	39680 MΩ	30400 MΩ	48640 MΩ
5 n	nin	43200 MΩ	69120 MΩ	26700 MΩ	42720 MΩ	31600 MΩ	50560 MΩ
6 n	nin	44600 MΩ	71360 MΩ	28300 MΩ	45280 MΩ	32400 MΩ	51840 MΩ
7 n	nin	45800 MΩ	73280 MΩ	29700 MΩ	47520 MΩ	33500 MΩ	53600 MC
8 n	nin	47200 MΩ	75520 MΩ	31000 MΩ	49600 MΩ	34300 MΩ	54880 MC
9 n	nin	48500 MΩ	77600 MΩ	32200 MΩ	51520 MΩ	35100 MΩ	56160 MΩ
10 r	min	49000 MΩ	78400 MΩ	33300 MΩ	53280 MΩ	35700 MΩ	57120 MΩ
Test V	Test Voltage 10000 V		V	1000 V		1000	v
Multi	plier	1		1	1		
Polarizati	on Index	1.5	7	2.02 1.58			
TCC	1.60		Insulati	on Resistance Re	adings Corrected	to 20 °C	

System ID

46T1-L

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohms after	1 minute.				Resistance in meg-ohms after 1 minu	ute.	
High to Low & Ground	49920	ΜΩ @	10000	v	Core Ground Accessible	Yes	No X
Low to High & Ground	26368	ΜΩ @	1000	V	Test Voltage		V
High & Low to Ground	36160	ΜΩ @	1000	V	Core Ground Resistance		MΩ



Test Instrument(s)

Manufacturer / Model Megger

3678

Serial #

Comments:

Tested By: D. MACLEAN, M. GRAHAM

November 15th, 2019



Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re: Oil Analysis Report - Our Ref: 29995 Site: Morrisburg MS#1 – 11 Fifth St. E., Morrisburg, ON

Please find attached the oil analysis results of samples taken recently at your facility.

Transformer - Porter, Serial no. 22011 (T1)

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, remaining clear with zero amount of sediment detected, and having a slight amount of water content (*17 ppm*). All the measured parameters remained within IEEE recommended limits for acceptable inservice operation.

• Dissolved Gas Analysis (DGA)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, except for *Dielectric Breakdown. The transformer oil has* remained clear with zero amount of sediment detected and having a slight amount of water content (11 ppm). The Dielectric Breakdown (33KV) is lower than recommend limit (40KV). Dielectric Breakdown of an insulating oil is a measure of the oils ability to withstand electrical stress without failure. Contaminants such as particles, contaminants and water can reduce the dielectric strength of an insulating liquid. All the other measured parameters remained within IEEE recommended limits for acceptable in-service operation. We recommend resampling at your earliest convenience to verify Dielectric Breakdown.

Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence Utility in the future.

Yours Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 <u>dmaclean@taltrees.ca</u> Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



	-	MPLE ANALYSIS RESULTS N SERVICE - OIL
Cust PO : 29995-1	MORRISBURG	
TALTREES POWER SER	VICES	
102 PARKS DRIVE		Date Received : OCT 23 2019
		Analysis Date : OCT 25 2019
BELLEVILLE	ON	Analyzed By : VN
K8N 4Z5		Reviewed By : $S_{\omega}()$
	SI	AMPLE IDENTIFICATION
Description : MS1 - 7	Γ1	
Rating :	5 I	MVA Volume : 1984 IMP. GALLONS
HV Rating :	44]	kV Sample Port : BOTTOM - MAIN TANK
Manuf. / Date: PORTER		1976 Sampled By : DM
Serial No : 22011		Sample Date : OCT 15 2019
TEST	ASTM NO.	RECOMMENDED LIMITS TEST VALUES
	D1016	2mm Gap 40 KV (Min) 1816 - 33
Dielectric Breakdown	D1816 D877	2mm Gap 40 KV (Min) 1816 - 33 KV (Min) 877 -
Neutralization Number	D974	0.2 Max 0.01 Milligrams KOH/gram
Interfacial Tension	D971	25 Dynes/cm 37 (Minimum)
	D1200	(60/60°F) 0.860
Specific Gravity API Gravity	D1298	(60/60°F) 0.860 33.0
Colour	D1500	0.5 - 8.0 1.0
Visual Condition		Clarity CLEAR
	D1524	Sediment NONE
		Free Water NO
Water Content	D1533	35 p.p.m. max 1
Power Factor (25 C)	D924	0.5 % max
Power Factor (100°C)	D924 D924	5.0 % max
	Г.	TEST EVALUATION

NEUTRALIZATION NUMBER IS GOOD INTERFACIAL TENSION IS GOOD WATER CONTENT IS GOOD DIELECTRIC BREAKDOWN IS LOW FOR HV RATING

RECOMMENDATIONS: RE-SAMPLE TO VERIFY THE DIELECTRIC BREAKDOWN

Notes :

Test results relate only to samples tested as received.

D Cust PO : 29995-RSLU M	DISSOLVED GAS ASTM Method ORRISBURG	D3612 P La Fi		I	:	D 20	20	1583 0042 JT02
TALTREES POWER SERVICE 102 PARKS DRIVE BELLEVILLE K8N 425	ON	Da An An	te Rece alysis alyzed viewed	Date By	: :	OCT OCT		
	SAMPLE IDEN	TIFICAT	ION					
Description : MS1 - T1								
Rating : HV Rating : Manuf. / Date: PORTER Serial No : 22011 Sample Port : BOTTOM - M	44 kV 1976	Sample		: : S: 1: C' : D)	EALE W219 M	1984 D		. GALLONS
COMPONENT	MEASU	RED PPM		olo	COME	USTIE	BLES	
Hydrogen (H2)		3				12.5	5	
Oxygen + Argon (O2 +	· A)	32167					-	
Nitrogen (N2)		50686					-	
Methane (CH4)		1				4.2	2	
Carbon Monoxide (CO)		18				75.0)	
Carbon Dioxide (CO2)		635					-	
Ethylene (C2H4)		2				8.3	3	
Ethane (C2H6)		<1				. ()	
Acetylene (C2H2)		<1				. ()	
Propane (C3H8)		<2				. ()	
Total Gas Content		8.35	00					
Combustible Gas Content		24	ppm			.029	9 8	
*PPM = Part Per Mil	lion by volum	າຍ	N.D.	= N	ot I)etect	able	9

General Comments: FAULT GAS CONCENTRATIONS ARE WITHIN NORMAL RANGE.

Recommendations : SAMPLE AS PER SCHEDULE FOR DISSOLVED GASES

Notes :

Test results relate only to samples tested as received.

. . .

RONDAR INC.	333 Centennial Parkway North Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808 Fax : (905) 561-8871	



November 12th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. KOE 1T0

Attention: Darryl Reynolds

Re: Maintenance Inspection Report - Our Ref: 29995 Site: Morrisburg MS#2 – Village Rd, Morrisburg, ON

Please find the attached report for the maintenance work and inspections completed October 16th, 2019.

Tal Trees cleaned, serviced, tested & inspected, the main power system. All testing and inspections were performed in accordance to NETA Maintenance Testing Specifications.

Items tested/inspected include:

- o 44KV Air Break Switch
- Lightning Arrestors
- Main Transformer
- Secondary Cables
- Transformer Oil Analysis
- 4.16KV Load Break Switches

A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and NETA MTS.



<u>Air Break / Load Break Switches:</u>



- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, as well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.



Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with antioxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer tests were completed on the transformer including turn ratio test, winding resistance, capacitance test and dielectric absorption test (insulation resistance).
- An oil sample was obtained for fluid analysis and DGA.



Findings/Repairs:

- 44KV dead end insulators on tower structure were found to be in unsatisfactory condition.
- Minor rust/corrosion was observed inside the metal clad switchgear enclosure. The secondary feeder conduits entering the concrete pad were sealed with duct seal compound to prevent moisture from entering.
- Arc compressor on feeder MS2F2-L mini-rupter switch is broken on phase 'A'. This component allows the switching duty of the device to open/close under load up to 600A.
- Cable termination in MS2F2-L (phase 'C') was found to be in poor condition. The terminator has been taped over the compression lug and tested very poorly (<10k Ω after 1min @ 5000V). Results are highlighted in yellow in the attached test report. There is evidence on the adjacent fiber board that this connection has been producing excessive heat.
- Transformer tank currently has one ground connection to the grid.
- Tower is missing warning signs "Do not operate fuses under load" sign as required by OESC Rule #: 36-006.
- Potential transformer fuse inside metering cabinet is blown, causing ground fault lights to indicate a fault.
- Dominion fuses on 44KV tower structure are not making a secure connection.

Recommendations:

- Replace 44KV dead end insulators on tower at your convenience.
- Replace arc compressor on feeder MS2F2-L mini-rupter switch to ensure proper load breaking capability of the device and personnel safety.
- *Re-terminate cable in MS2F2-L on phase 'c' and replace adjacent fiberboard divider to ensure power reliability.*
- Install second ground connection on transformer to comply with current trade grounding practice.
- Install warning sign on tower to comply with OESC requirements.
- Replace Westinghouse 0.5amp type CLE-PTI fuse for PT inside metering cabinet. (Style No.: 758C433A19, S.C. No.: T1215)
- Replace 44KV dominion fuses and holders to S&C style for a more secure fit.
- Continue with annual substation maintenance.



All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all the recommended repairs listed in this report.

If you have any questions/concerns, please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence Utility.

Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 dmaclean@taltrees.ca Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA





	A SPARKPOWER COMPANY			Morrisbug	MS#2 Device ID W20T1-L				
Customer	Rideau St. Lawrence Util	lity		Date	Octob	oer 16th, 2019			
Customer Address	985 Industrial Rd., Presc	ott, ON		Job #	29995				
	Morrisburg MS#2		System Ne	utral Present					
	Village Rd., Morrisburg,	ON							
Nameplate Data									
Switch Mounting	Metal Enclosed	Pole	Tow	er X		Other			
Switch Type	Load Break	Air Break X				Other			
Manufacturer	KEARNEY NATIONAL CA			BIL Rating	250				
Date Of Manufacture	1988			Feeder ID	BROC	KVILLE M26			
Serial #				Feeds To	T1				
Catalog #	3149501		Interru	upting Rating	600				
Nom. / Max. Voltage		kV		bus Ampacity					
Comments			-	, ,					
Lightning Arrestors									
Lightning Arrestors	Yes X	No							
Class	Distribution Int	termediate	Statio	on X					
Composition	Ceramic	Polymer X							
Manufacturer	OHIO BRASS	-	Max. / I	MCOV Rating		48.3 /	39.0 I		
Catalog #	300039								
Comments									
Protective Device Dat	а								
Primary Fuse Holder Da	ta		Primary Fu	se Link Dat	ta				
Manufacturer	DOMINION CUTOUT		1	Manufacturer	DOMI	NION			
Туре				Туре					
Nom. / Max. Voltage	46.0 / 48.3	kV		Link Size	125				
Holder Max. Fuse Link				TCC #	STAN	DARD			
Holder Catalog #	BPD46100		Li	nk Catalog #	6789				
Primary Fuse Link Spar	es / Location								
Spare Primary Fuses		No X		# of Spares					
	METERING CABINET								
Comments									
Interlock									
Key Interlock	Yes	No X							
Interlock Type		No X echanical	Utility Lo						
Devices Interlocked		Breaker	-		0	ther			
Manufacturer	H.V. Switch	Dieakei	Trans. En						
Comments				Key Interloc	К #				
Load Side Conductor	Data								
Conductor Type	Cable	Bus Bar X		uctor Size / Di		4 ROUND			
Conductor Material	Aluminum X	Copper		ctors per Pha		•	/ Ph		
Tape Shield	Aluminum	Copper		Bond Size / Di		4			
Concentric Neutral	Aluminum	Copper		Bond Coducto					
Insulation Voltage				utral Conducto					
•••	BARE CONDUCTOR		Ne	utral Size / Di	im. N //	4			
Comments									
Decended D.									
Recorded By:									



	A SPARKPOWER COMPANY				System ID Morrisbug M			J MS#2	MS#2 Device ID			1-L	
Visual Inspec	ction / Mecha	nical Test	s										
•	ate Condition	Satisfactor		Not Satisfa	actory		N/A		Com	ments			
Insula	ator Condition	Satisfactor	-y	Not Satisfa	actory	X	N/A		Com	ments	44KV DE		DS
Ground	Connections	Satisfactor	y X	Not Satisfa	actory		N/A		Com	ments			
Lightr	ning Arrestors	Satisfactor	ry X	Not Satisfa	actory		N/A		Com	ments			
Arc	Suppressors	Satisfactor	у	Not Satisfa	actory		N/A	Χ	Com	ments			
Key Interlo	ock Operation	Satisfactor	у	Not Satisfa	actory		N/A	X	Com	iments			
Ground Strap	os & Materials	Satisfactor	ry X	Not Satisfa	actory		N/A		Com	ments			
Switch Condit	ion / Operatio	n											
Switch Ope	ration As Left	Satisfactor	ry X	Not Satisfa	actory		N/A		Com	ments			
Contact Surfa	ace Condition	Satisfactor	ry X	Not Satisfa	actory		N/A		Com	ments			
Simultan	eous Closure	Satisfactor	y X	Not Satisfa	actory		N/A		Com	ments			
Electrical Tes	sts												
Earth Resistar	nce (3-Point T	est)			Arc	Suppre	essor	[.] Con	tact Res	sistand	e		
Earth Resista	nce in Ohms.				Ar	c Suppr	essor	Conta	act Resis	tance in	Ohms.		
					Ph	ase A			N/A			Ω	
Earth Resistance N/A			Ω	Ph	nase B			N/A			Ω		
					Ph	ase C			N/A			Ω	
Switch Insulat	ion Resistanc	е			Swit	ch / Fu	ıse C	ontad	t Resis	tance			
Resistance in M	eq-Ohms after	1 minute.			Re	sistance	e in mi	cro-Ol	nms aftei	· 1 minu	ite.		
Test Voltage	•		5 kV	10 kV 🗴	Test Current 10 A				•				
Test voltage			JKV		163		· · · · ·	10	A				
	Phase A	Phase	В	Phase C	-			Pha	se A	Pha	ase B	Phas	e C
Phase to GND	594000 MΩ	621000	MΩ	557000 MΩ		Contac	ts	90	μΩ	94	μΩ	98	μ
						Fus	se	1077	μΩ	1131		1066	μ
						Overa	all		μΩ		μΩ		μ
Load Side Cor	nductor Insula	tion Resist	ance						_		_		
		40000	v	DC after 1 minut	e		Phase	Ato	Ground		286000	D	м
Resistance	in Mea-Ohms @	Resistance in Meg-Ohms @ 10000 V DC after 1 minut				Phase B to Ground			3450000			M	
Resistance	in Meg-Ohms @	2 10000					Phase	e B to i	Ground				
Resistance	in Meg-Ohms @	210000_							Ground		210000	0	Μ
									-			0	M
Lightning Arre		n Resistanc	e.	DC after 1 minut	e		Phase	e C to	-			-	
Lightning Arre	estor Insulatio	n Resistanc	e.	DC after 1 minut	te		Phase Phase	e C to	Ground		210000)	M: M: M:

Test Instrument(s)

Manufacture	r / Model
	Serial #

Megger Ductor 7776 8B04

Tested By: T. GILBERT



A	A SPARKPOWER COMPANY		System ID	4160 FEE	DER	Device ID	MS2F1-L
Customer Address Site	Customer Address Rideau St. Lawrence Utility Customer Address Site Address Site Address Village Rd., Morrisburg, ON				October 16th, 2019 29995		
Namonlato Data							
Nameplate Data Switch Mounting Switch Type Manufacturer	Metal Enclosed X Pole Load Break X Air Breal		Towe	er BIL Rating	95	Other Other	kV
Date Of Manufacture	1989			Feeder ID	F1		
Serial #				Feeds To			
# Catalog Nom. / Max. Voltage	2554R22R2 14.4 / 17.0	kV		pting Rating us Ampacity			A
Comments			Continuo	aorinpaony			
Lightning Arrestors							
Lightning Arrestors Class Composition	Yes No Distribution Intermediate Ceramic Polyme	e :r	Statio			,	LA /
Manufacturer Catalog #				ICOV Rating		1	kV
Comments							
Protective Device Date	а						
Primary Fuse Holder Da	ta	I	Primary Fus	se Link Da	ta		
Manufacturer	S&C		Ν	lanufacturer	S&C		
Туре	SM-5S			Туре	SM-5	3	
Nom. / Max. Voltage	14.4 / 17.0	kV		Link Size			Α
Holder Max. Fuse Link			1 :-	# TCC #		004	
Holder Catalog #			LI	nk Catalog #	13260	UR4	
Primary Fuse Link Spar Spare Primary Fuses	Yes X No			# of Spares	2		
	ENCLOSURE DOOR			# 01 Spares	3		
Comments							
Interlock							
Key Interlock Interlock Type Devices Interlocked Manufacturer Comments	Yes No Electrical Mechanica H.V. Switch Breake		Utility Loc Trans. En			ther	
Load Side Conductor	Data						
Conductor Type Conductor Material Tape Shield Concentric Neutral Insulation Voltage Insulation Type		er X	Conduc B # of E # of Neu	ictor Size / D ctors per Pha cond Size / D Bond Coducte tral Conducte utral Size / D	ase 1 im. 4/0 ors 1 ors 0	D	/ Phase
Comments	D. MACLEAN						



POW	POWER SERVICES A SPARKPOWER COMPANY				416	0 FEEDER	Device ID	MS2F	1-L		
Visual Inspec	tion / Mechar	nical Tests									
Namepla	ate Condition	Satisfactory X	Not Satisfa	ictory	N/A	Corr	nments				
Insula	tor Condition	Satisfactory X	Not Satisfa	ictory	N/A	N/A Comments					
Ground	Connections	Satisfactory X	Not Satisfa	ictory	N/A	Corr	nments				
Lightn	ing Arrestors	Satisfactory	Not Satisfa	ictory	N/A	N/A X Comments					
Arc	Suppressors	Satisfactory X	Not Satisfa	ictory	N/A	N/A Comments					
Key Interlock Operation Satisfactory Not Satisfac		ictory	N/A	N/A X Comments							
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	ictory	N/A	Corr	nments				
Switch Conditi	on / Operation				-						
Switch Operation As Left Satisfactory X Not Satisf				ictory	N/A	Corr	nments				
Contact Surfa	ce Condition	Satisfactory X	Not Satisfa	ictory	N/A	Corr	nments				
Simultane	eous Closure	Satisfactory X	Not Satisfa	ictory	N/A	X Com	nments				
Electrical Tes	sts										
Earth Resistan	ce (3-Point Tes	st)		Arc Suppre	essor	Contact Res	sistance				
Earth Resistar	nce in Ohms.			Arc Suppr	essor (Contact Resis	tance in Ohms	•			
				Phase A		N/A	L	Ω			
Earth Resistar	nce	N/A	Ω	Phase B		N/A	۱ <u>ــــــــــــــــــــــــــــــــــــ</u>	Ω			
				Phase C		N/A		Ω			
Switch Insulati	ion Resistance			Switch / Fu	se Co	ontact Resis	tance				
Resistance in M	eg-Ohms after 1	minute.		Resistance in micro-Ohms after 1 minute.							
Test Voltage	1 kV 2 I	kV 5 kV	X 10 kV	Test Curre	nt	10 A					
	Phase A	Phase B	Phase C	-		Phase A	Phase B	Pha	se C		
Phase to GND	562000 MΩ	640000 MΩ	650000 MΩ	Contac	ts	35 μΩ	32 μΩ		μΩ		
				Fus	e :	310 μΩ	290 μΩ		μΩ		
				Overa	all 4	440 μΩ	382 μΩ	2 356	μΩ		
Load Side Con	ductor Insulati	ion Resistance									
Resistance i	in Meg-Ohms @	5000 V I	DC after 1 minut	e l	Phase	A to Ground	5120	00	MΩ		
					Phase	B to Ground	5160	00	MΩ		
					Phase	C to Ground	1802	00	MΩ		
Lightning Arre	stor Insulation	Resistance									
Resistance i	in Meg-Ohms @	VI	DC after 1 minute	e I	Phase	A to Ground	N/#	MΩ			
					Phase	B to Ground	N/#	MΩ			
				I	Phase	C to Ground	N/#	4	MΩ		

Comments / Observations

INSTALLED DUCT SEAL IN ALL CONDUITS TO PREVENT MOISTURE INSIDE ENCLOSURE.

Test Instrument(s)

Manufacture	r / Model	Meg
	Serial #	36

gger Ductor 578 7293

Tested By: D. MACLEAN



A	A SPARKPOWER COMPANY		4160 FEE	DER	Device ID	MS2F2-L
Customer Address Site	Customer Rideau St. Lawrence Utility Customer Address 985 Industrial Rd., Prescott, ON Site Morrisburg MS#2 Site Address Village Rd., Morrisburg, ON			29995	per 16th, 2019	
Nameplate Data Switch Mounting Switch Type Manufacturer	Metal Enclosed X Pole Load Break X Air Break	Towe	er BIL Rating	95	Other	kV
Date Of Manufacture Serial #			Feeder ID Feeds To	F2	2	
Catalog # Nom. / Max. Voltage Comments	2554R22R2 14.4 / 17.0		upting Rating ous Ampacity			A
Lightning Arrestors						
Lightning Arrestors Class Composition Manufacturer	YesNoDistributionIntermediateCeramicPolymer	X Static	on	I	I	kV
Catalog # Comments						
Protective Device Data	9					
		Primary Eu	co Link Da	ta		
Primary Fuse Holder Da Manufacturer		Primary Fu	Anufacturer			
	SM-5S			SM-58	2	
Nom. / Max. Voltage		V	Link Size		,	Α
Holder Max. Fuse Link				153-4		
Holder Catalog #		Li	nk Catalog #		0R4	
Primary Fuse Link Spar			Ū			
Spare Primary Fuses	Yes X No ENCLOSURE DOOR		# of Spares	3		
Interlock						
Key Interlock Interlock Type Devices Interlocked Manufacturer Comments	Yes No Electrical Mechanical H.V. Switch Breaker	X Utility Loc Trans. En			ther	
Load Side Conductor	Data					
Conductor Type Conductor Material Tape Shield Concentric Neutral	Cable X Bus Bar Aluminum Copper Aluminum Copper Aluminum Copper 28KV	X Condu E X # of I	uctor Size / D ctors per Pha Bond Size / D Bond Coduct utral Conduct	ase 1 im. 4/ C ors 1		/ Phase



- POW	POWER SERVICES				416	0 FEEDER	EDER Device ID		2-L		
Visual Inspec	tion / Mechar	nical Tests									
Namepla	ate Condition	Satisfactory X	Not Satisfa	ictory	N/A	Cor	nments				
Insula	tor Condition	Satisfactory X	Not Satisfa	ictory	N/A	Cor	nments				
Ground	Connections	Satisfactory X	Not Satisfa	ictory	N/A	Cor	nments				
Lightn	Lightning Arrestors Satisfactory Not Satisfa					X Cor	nments				
Arc	Suppressors	Satisfactory X	Not Satisfa	ictory	N/A	Cor	Comments				
Key Interlo	ock Operation	Satisfactory	Not Satisfa	ictory	N/A	/A X Comments					
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	ictory	N/A	Cor	nments				
Switch Conditi	ion / Operation										
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	ictory	N/A	Cor	nments				
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	ictory	N/A	Cor	nments				
Simultan	eous Closure	Satisfactory X	Not Satisfa	ictory	N/A	X Cor	nments				
Electrical Tes	sts										
Earth Resistan	ice (3-Point Te	st)		Arc Suppre	essor	· Contact Re	sistance				
Earth Resista	nce in Ohms.			Arc Suppr	essor	Contact Resis	stance in Ohms.				
				Phase A		N//	4	Ω			
Earth Resista	nce	N/A	Ω	Phase B		N//	4	Ω			
				Phase C		N//	4	Ω			
Switch Insulat	ion Resistance	9		Switch / Fu	ise C	ontact Resi	stance				
Resistance in M	eg-Ohms after 1	minute.		Resistance in micro-Ohms after 1 minute.							
Test Voltage	1 kV 2	kV 5 kV	X 10 kV	Test Curre	nt	10 A	_				
	Phase A	Phase B	Phase C			Phase A	Phase B	Phas	se C		
Phase to GND	399000 MΩ	755000 MΩ	505000 MΩ	Contac	ts	30 μΩ	29 μΩ		μΩ		
				Fus		308 μΩ	333 μΩ		μΩ		
				Overa		416 μΩ	391 μΩ		μΩ		
Load Side Con	ductor Insulat	ion Resistance				· ·			•		
Resistance	in Meg-Ohms @	5000 V I	DC after 1 minute	е	Phase	A to Ground	1234	00	MΩ		
						B to Ground	5540		MΩ		
						C to Ground	0.01		MΩ		
Lightning Arre	stor Insulation	Resistance									
	in Meg-Ohms @		DC after 1 minute	е	Phase	A to Ground	N/A		MΩ		
	, U				Phase	B to Ground	N/A		MΩ		
					Phase	C to Ground	N/A		MΩ		
							1				

Comments / Observations

PLASTIC PIECE IS BROKEN ON AØ SWITCH ASSEMBLY. CABLE TERMINATION ON CØ IS IN POOR CONDITION AND TESTED POORLY. INSTALLED DUCT SEAL IN ALL CONDUITS TO PREVENT MOISTURE INSIDE ENCLOSURE.

Test Instrument(s)

Manufacturer	/ Model
	Serial #

Megger Ductor 3678 7293

Tested By: D. MACLEAN



TRANSFORMER DATA SHEET (Pg. 1 of 4)

POWER SERVICES A SPARKPOWER COMPANY			System ID MS#2				Device ID			T1			
	Customer Address Site	Rideau St. Lawren 985 Industrial Rd., Morrisburg MS#2 Village Rd., Morris	Prescott,	ON	-			Octobe 29995	er 16th, 20	19			
N		village Ru., Morris	burg, ON		-								
-	plate Data Transformer Class	Unit Padmount	Dodr	nount	Station	X			Other				
	ansformer Cooling	Onit Padmount ONAN		DNAF X	LNAN	^	DR		Other				
	ng Configuration	Dead Front		- Top	Top - Side	X	Side - Sid		Other				
	Manufacturer	TRANSELECTRIX	TECHNOL	.OGY INC	Co	ore &	Windings	6091		kg	X	lb	
Da	ate of Manufacture	1988			Ta	anks	& Fittings	3545		kg	Х	lb	
	Serial #	A32S0020			C	oola	nt Volume	3673		L	X	Gal	
KVA /	Prov. KVA Rating	5000/6667		KVA	C	Coola	ant Weight	3205		kg	Χ	lb	
	Primary Voltage	44000		V		To	tal Weight	12841		kg	Х	lb	
	Primary Ampacity	87.5		Α	Ten	npera	ature Rise	65		°C	Х	°F	
5	Secondary Voltage	4160		v		HV E	BIL Rating	250		kV			
Se	econdary Ampacity	925.2		Α	-	LV E	BIL Rating	50		kV			
H١	V Winding Material	AL			Perce	ent Ir	mpedance		7.39 %	ONAN		ONAF	X
L١	V Winding Material	AL					Resistant			YES		NO	X
CS	SA Specification(s)				Trans	sform	ner Colour	GREEN	1				
	Comments												
Visual I	Inspection												
Na	meplate Condition	Satisfactory X	Not	Satisfacto	ory N	I/A	C	Comment	s				
Fan	/ Pump Operation	Satisfactory X	Not	Satisfacto	ory N	I/A	C	Comment	s				
Gr	round Connections	Satisfactory	Not	Satisfacto	ory X N	I/A	C	Comment	s ONLY 1	GND (CON	NECT	ION
Liqu	iid Levels In Tanks	Satisfactory X	Not	Satisfacto	ory N	I/A	C	Comment	s				
	nterlock Operation		Not	Satisfacto	ory N	I/A	X	Comment	s				
Temp	. Gauge Operation	Satisfactory X	Not	Satisfacto	ory N	I/A	C	Comment	S				
Co	olant Temperature Comments	32	°C	X °F	Ma	ax. C	Coolant Ter	mperatur	e 55	°C	X	°F	
Oil Cons	servator												
	Oil Conservato	r Yes I	No X		Conse	ervat	or Volume			L		Gal	
	Silica Gel Breathe	r Yes I	No X		Bre	eath	er Volume			L		Gal	
	Silica Gel Colou	r Good B	ad	Replac	ed	N/	ΑΧ						
	Comments												
•	anger Data				Vector Dia	gra	m: Del	taWye1	5.Dyn	1			_
	osition / signation	Tap Voltages (V)	As Found	As Left				H2		X2			
1/A	105.00%	46200			-			\ x	<u> </u>	Yo			
2 / B	102.50%	45100			-			\mathbf{i}	$\overline{}$	70			
3 / C	100.00%	44000			-					X3			
4 / D	97.50%	42900			-		Н	Н3					
5/E	95.00%	41800			Prima	ry V	ector X	1	Seconda	ary Vec	tor	Х	
	Comments:												
	Tested Rue	E. COURTNEY. M.	GRAHAM										



TRANSFORMER DATA SHEET (Pg. 2 of 4)

AS	PARKPOWER COMPANY		System ID	MS#2	Device I	D T1
Neutral Grounding Re	sistor (NGR)					
NGR Present	Yes	No X				
Manufacturer				NGR Serial #		
NGR Voltage		V	Max	imum Current		Α
NGR Resistance		Ω	1	NGR Location		
Comments						
Transformer Lightning	g Arrestors					
Lightning Arrestors	Yes	No X				
Class	Distribution	Intermediate	Statio	on		
Composition	Ceramic	Polymer				
Manufacturer			Max. /	MCOV Rating	1	kV
Catalog #				-		
Comments						
Interlock						
Key Interlock	Yes	No X				
Interlock Type	Elec.	Mech.	Utility Lo	ck		
Devices Interlocked	H.V. Switch	Breaker	Trans. En	icl.	Other	
Manufacturer				Key Interlock #		
Comments						
Fans						
Fans	Yes X	No				
# of Fans	4			Fan Voltage 2	30	
Fan Size	24"			Frame Size		
Horsepower						
Comments						
Transformer Load Sid	le Conductor Dat	a				
Conductor Type	Cable	Bus Bar X	Condu	uctor Size / Dim.	4" X 1/2"	
Conductor Material	Aluminum X	Copper	Condu	uctors per Phase	1	/ Phase
Tape Shield	Aluminum	Copper	E	Bond Size / Dim.	N/A	
Concentric Neutral	Aluminum	Copper	# of B	ond Conductors	0	
Insulation Voltage	N/A		# of Neu	tral Conductors	0	
Insulation Type	BARE BUS		Ne	utral Size / Dim.	N/A	
Comments						

Tested By: E. COURTNEY, M. GRAHAM



TRANSFORMER TEST SHEET (Pg. 3 of 4)

							System		n	/IS#2		2011	ce ID		T1	
lectric	cal Tests															
Turn Ra	atio Test	Test Volt	age: Automa	atic	X	Oth	er	v								
Tap F	Position /	Tap Voltage	Calculated		H 1	То	H 2		H 2	То	H	3	Н3	То	Н	1
	gnation	V	Ratio		X 0	То	X 2		X 0	То	X	3	X 0	То	Х	1
1/A	105.00%	46200														
2/B	102.50%	45100														
3 / C 4 / D	100.00% 97.50%	44000 42900	17.862			17.8	70			17.8	72			17.8	72	
4/D	97.50%	42900	17.002			17.0	012			17.0	13			17.0	13	
					Excitat	ion	Percen	ıt	Excita	tion	Perc	ent	Excita	ation	Perc	ent
					Currre	ent	Deviatio	on	Currr	ent	Devia	ation	Currr		Devia	
		-	ion As Found	4	1.000		0.060		0.700		0.0	60 %	1.00	0 mA	0.0	
		Tap Posit	ion As Left			mA		%		mA		%		mA		
							_			_						
-		Resistance	A - 54 4		4 -		Second	-		-			•	- 61 -		4 .
Res	sistance in o	hms at 0.5	A after 1	minu	ite	_	Res	Istan	ce in m	IIII-onr	ns at	5	Α	апе	r 1 mini	ute
		Ν/Α Ω	H1 - H2	1.62	0 Ω		X0 - X1		6.430			X1 - X		12.4		Ω
									0 400) m!	\sim		(n	40 -	~~ ~ ~ ~	
H0 - H1 H0 - H2		N/A Ω	H2 - H3	1.63		_	X0 - X2		6.400			X2 - X		12.5		
H0 - H2	Stabiliz	N/A Ω	H3 - H1	1.63 1.60 Min	0 Ω		X0 - X2 X0 - X3	Sta	6.400 6.440 abilizati) m!	Ω	X3 - X			80 m	
H0 - H2 H0 - H3	Stabiliz tance Test	N/A Ω N/A Ω	H3 - H1	1.60 _Mint	0Ω ute	- Gua	X0 - X3		6.440 abilizati	on Tim	Ω ne > _	X3 - X 1	(1	12.4 _ Minu	80 m! ite	Ω
но - н2 но - н3 Сарасію	ance Test	N/A Ω N/A Ω	H3 - H1 1 Low - Groun	1.60 _Mint	0Ω ute	- Gua 2355	X0 - X3	IST (6.440	on Tim	Ω ne > Hig	X3 - X	(1	12.4 Minu High	80 m	Ω und
но - н2 но - н3 Сарасію	t ance Test Capacitance	N/A Ω N/A Ω zation Time >	H3 - H1 1 Low - Groun	1.60 _ Min	0Ω ute Low		X0 - X3 Ird U	IST (6.440 abilizati High - I	on Tim on Tim _ow)	Ω ne > _ Hig	X3 - X 1 h - Gua	(1	12.4 Minu High	80 m! . ite i - Grou	Ω und p
но - н2 но - н3 Сарасію	t ance Test Capacitance Uncorr	N/A Ω N/A Ω zation Time >	H3 - H1 1 Low - Groun 6893	1.60 Minu pF	0Ω ute Low	2355	X0 - X3 Ird U pF	IST (4 0	6.440 abilizati High - I 4541	on Tim on Tim _ow) pF	Ω ne > <u>-</u> Hig	X3 - X 1 h - Gua 8500	(1 ard pF	12.4 Minu High	80 m! ite i - Grou 13038	Ω und p %
но - н2 но - н3 Сарасію	ance Test Capacitance Uncorr Correcte	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%)	H3 - H1 1 Low - Groun 6893 0.277	1.60 Minu d 	0Ω ute Low	2355).131	X0 - X3 Ird U pF %	IST (4 0	6.440 abilizati High - I 4541 0.285	on Tim on Tim _ow) pF %	Ω ne > <u>-</u> Hig	X3 - X 1 h - Gua 8500 0.357	ard pF %	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω
H0 - H2 H0 - H3 Capacit	Capacitance Uncorr Correcte Temp. Cor	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%)	H3 - H1 1 Low - Groun 6893 0.277 0.161 0.58	1.60 Minu d 	0Ω ute Low	2355).131	X0 - X3 Ird U pF %	IST (4 0	6.440 abilizati High - I 4541 0.285	on Tim on Tim _ow) pF %	Ω ne > <u>-</u> Hig	X3 - X 1 h - Gua 8500 0.357	ard pF %	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und p %
H0 - H2 H0 - H3 Capaciti (.ightnir	Capacitance Uncorr Correcte Temp. Cor	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%) rection Factor r Insulation R	H3 - H1 Low - Groun 6893 0.277 0.161 0.58 Pesistance	1.60 Minu pF %	0Ω ute Low	2355).131).076	X0 - X3	IST (0 0	6.440 abilizati High - I 4541 0.285	on Tin ow) ow) F %	Ω he > <u>-</u> Hig	X3 - X 1 h - Gua 8500 0.357	ard pF %	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und p %
H0 - H2 H0 - H3 Capacit	Capacitance Uncorr Correcte Temp. Cor	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%) rection Factor	H3 - H1 Low - Groun 6893 0.277 0.161 0.58 Pesistance	1.60 Minu pF %	0Ω ute Low	2355).131).076	X0 - X3	UST (0 0	6.440 abilizati High - I 4541).285).165	on Tim on Tim _ow) pF % %	Ω ne > _ Hig	X3 - X 1 h - Gua 8500 0.357	ard pF %	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und p %
H0 - H2 H0 - H3 Capacit	Capacitance Uncorr Correcte Temp. Cor	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%) rection Factor r Insulation R	H3 - H1 Low - Groun 6893 0.277 0.161 0.58 Pesistance	1.60 Minu pF %	0Ω ute Low	2355).131).076	X0 - X3	P P P	6.440 abilizati High - I 4541 0.285 0.165	on Tim on Tim ow) pF % %	Ω he > _ Hig ound ound	X3 - X 1 h - Gua 8500 0.357	(1 ard pF % %	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und P % %
H0 - H2 H0 - H3 Capacit	Capacitance Uncorr Correcte Temp. Cor ng Arresto esistance in	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%) rection Factor r Insulation R	H3 - H1 1 Low - Groun 6893 0.277 0.161 0.58 Pesistance V	1.60 _Minu d pF % %	0Ω ute Low	2355).131).076	X0 - X3	P P P	6.440 abilizati High - I 4541 0.285 0.165 Phase A Phase B	on Tim on Tim ow) pF % %	Ω he > _ Hig ound ound	X3 - X 1 h - Gua 8500 0.357	(1 pF % % N//	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und P %
H0 - H2 H0 - H3 Capacit Capacit Capacit Capacit Capacit Capacit Capacit Capacit Capacit	Capacitance Uncorr Correcte Temp. Cor ng Arresto esistance in	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%) rection Factor r Insulation R meg-ohms @	H3 - H1 1 Low - Groun 6893 0.277 0.161 0.58 esistance V	1.60 _Minu d pF % % %	0Ω ute Low	2355 0.131 0.076	X0 - X3	P P P	6.440 abilizati High - I 4541 0.285 0.165 Phase A Phase B	on Tim on Tim ow) pF % %	Ω he > _ Hig ound ound	X3 - X 1 h - Gua 8500 0.357	(1 pF % % N//	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und P % %
H0 - H2 H0 - H3 Capacit Capacit Capacit Capacit Capacit Capacit Capacit Capacit	ance Test Capacitance Uncorr Correcte Temp. Cor ng Arresto esistance in	N/A Ω N/A Ω zation Time > in pico-farads rected D.F. (%) ed to 20 °C (%) rection Factor r Insulation R meg-ohms @	H3 - H1 1 Low - Groun 6893 0.277 0.161 0.58 esistance V	1.60 _Minu d pF % % %	0Ω ute Low Ω αfter 1 r	2355 0.131 0.076	X0 - X3	UST (0 0 0 P P P P	6.440 abilizati High - I 4541 0.285 0.165 Phase A Phase B	on Tim	D Ine Hig Ine Ound Ound	X3 - X 1 h - Gua 8500 0.357	(1 pF % % N//	12.4 Minu High	80 m! ite i - Grou 13038 0.333	Ω und P % %
H0 - H2 H0 - H3 Capacit Capacit Capacit Capacit Capacit Capacit Capacit Capacit	Capacitance Uncorr Correcte Temp. Cor ng Arresto esistance in Cary Condu esistance in Phas	N/A Ω N/A Ω zation Time > in pico-farads - rected D.F. (%) - ed to 20 °C (%) - rrection Factor - r Insulation R - meg-ohms @ - rector Insulation - meg-ohms @ -	H3 - H1 1 Low - Groun 6893 0.277 0.161 0.58 resistance V on Resistance V	1.60 _Minu d pF % % %	0Ω ute Low Ω αfter 1 r	2355 0.131 0.076 minute	X0 - X3	IST (0 0 P P P P	6.440 abilizati High - I 4541 0.285 0.165 Phase A Phase B Phase C	on Tim	Image Image Hig Hig ound ound ound ound	X3 - X 1 h - Gua 8500 0.357	(1 pF % % N// N//	12.4 Minu High A A A	80 m! ite i - Grou 13038 0.333	Ω Ind P % %

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger				
	Serial #	184	51006	0319	3678				
Tested By E. COURTNEY, M. GRAHAM									



TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID	MS#2	Device ID	T1

Dielectric Absorption Test (Insulation Resistance)

		High to Lo	High to Low & Gnd Low to High & Gnd			High & Low to Gnd		
Tin	ne	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected	
15 s	ec	13900 MΩ	28912 MΩ	6700 MΩ	13936 MΩ	5800 MΩ	12064 MC	
30 s	ec	26200 MΩ	54496 MΩ	11700 MΩ	24336 MΩ	10400 MΩ	21632 MC	
45 s	ec	31300 MΩ	65104 MΩ	13970 MΩ	29058 MΩ	12300 MΩ	25584 MΩ	
1 m	nin	33900 MΩ	70512 MΩ	15600 MΩ	32448 MΩ	13300 MΩ	27664 MC	
2 m	nin	41400 MΩ	86112 MΩ	20300 MΩ	42224 MΩ	15500 MΩ	32240 MC	
3 m	nin	46300 MΩ	96304 MΩ	24200 MΩ	50336 MΩ	16700 MΩ	34736 MΩ	
4 m	nin	50400 MΩ	104832 MΩ	26500 MΩ	55120 MΩ	17500 MΩ	36400 MC	
5 m	nin	53900 MΩ	112112 MΩ	29100 MΩ	60528 MΩ	17800 MΩ	37024 MC	
6 m	nin	57200 MΩ	118976 Μ Ω	29400 MΩ	61152 MΩ	18900 MΩ	39312 MG	
7 m	nin	59900 MΩ	124592 MΩ	33100 MΩ	68848 MΩ	19200 MΩ	39936 MG	
8 m	nin	62500 MΩ	130000 MΩ	34800 MΩ	72384 MΩ	18900 MΩ	39312 MG	
9 m	nin	65200 MΩ	135616 MΩ	36300 MΩ	75504 MΩ	18500 MΩ	38480 MG	
10 n	nin	67500 MΩ	140400 MΩ	38200 MΩ	79456 MΩ	19100 MΩ	39728 MC	
Test Vo	oltage	10000	v	1000	v	1000	v	
Multi	plier	1		1		1		
Polarizati	on Index	1.9	9	2.4	45	1.44		
TCC	2.08		Insulatio	on Resistance Rea	adings Corrected	to 20 °C		

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohms after	1 minute.				Resistance in meg-ohms after 1 min	ute.	
High to Low & Ground	70512	ΜΩ @	10000	V	Core Ground Accessible	Yes	No X
Low to High & Ground	32448	ΜΩ @	1000	v	Test Voltage		V
High & Low to Ground	27664	ΜΩ @	1000	V	Core Ground Resistance		MΩ



Test Instrument(s)

Manufacturer / Model Megger

Serial # 3678

Comments:

Tested By: E. COURTNEY, M. GRAHAM



November 14th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re: Oil Analysis Report - Our Ref: 29995 Site: Morrisburg MS#2 – Village Rd, Morrisburg, ON

Please find attached the oil analysis results of samples taken recently at your facility.

> Transformer - Transelectrix Technology, Serial no. A32S0020 (T1)

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, remaining clear with zero amount of sediment detected, and having a slight amount of water content (2 *ppm*). All the measured parameters remained within IEEE recommended limits for acceptable inservice operation.

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. Except for Carbon Monoxide (CO), Carbon Dioxide (CO2) and Total Dissolved Combustible Gas (TDCG), all the other dissolved gases remained stable and within IEEE recommended limits. **Carbon Monoxide (1210 ppm) is within the IEEE recommended Condition 3 limit (571-1400 ppm), Carbon Dioxide (3661 ppm) is within the IEEE recommended Condition 2 limit (2501-4000 ppm) while Total Dissolved Combustible Gas (1304 ppm) is within the IEEE recommended Condition 2 limit (721-1920 ppm).** Elevated levels of these gases indicate that the windings paper insulation is being stressed due overheating, accelerating the decomposition process. Possible causes can be attributed to loading issues or problems with oil circulation. Please contact us to perform a FURAN analysis with remaining sample. **We recommend resampling in 3 months to monitor these gases**.

Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence Utility in the future.

Yours Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 dmaclean@taltrees.ca Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



Cust PO : 29995-	II	PLE ANALYSIS RESULTS SERVICE - OIL SBURG Lab No . File No . Cust No .	
TALTREES POWER SER 102 PARKS DRIVE	VICES		eived : OCT 23 2019
BELLEVILLE K8N 4Z5	ON	Analyzed Reviewed	By : VN
	SI	MPLE IDENTIFICATION	,
Description : MS2 - 1	MAIN TX		
Rating : HV_Rating : Manuf. / Date: TRANSE Serial No : A32S003		V Sample Port : B	BOTTOM - MAIN TANK C
TEST	ASTM NO.	RECOMMENDED LIMITS	TEST VALUES
Dielectric Breakdown	D1816 D877	2mm Gap 40 KV (Min) KV (Min)	1816 - 64 877 -
Neutralization Number	D974	0.2 Max Milligrams KOH/gram	0.01
Interfacial Tension	D971	25 Dynes/cm (Minimum)	40
Specific Gravity API Gravity	D1298	(60/60°F)	0.866 31.8
Colour	D1500	0.5 — 8.0	2.0
Visual Condition	D1524	Clarity Sediment Free Water	CLEAR NONE NO
Water Content	D1533	35 p.p.m. max	2
Power Factor (25 C) Power Factor (100°C)	D924 D924	0.5 % max 5.0 % max	
		EST EVALUATION	

OIL IS IN SATISFACTORY CONDITION FOR CONTINUED USE

RECOMMENDATIONS: SAMPLE AS PER SCHEDULE

Notes :

Ir

Test results relate only to samples tested as received.

A Cust PO : 29995-RSLU MOR TALTREES POWER SERVICES 102 PARKS DRIVE		D3612 Pa Lak Fil Cus Dat Ana	art C D No Le No St No ce Receiv alysis Da	ate :	2 0 0 0 7	20042 TLT02 2019 2019
BELLEVILLE K8N 4Z5	ON		alyzed By viewed By			Sw()
	SAMPLE IDEN	NTIFICAT	ION			
Description : MS2 - MAIN T	X					
Rating : HV Rating : Manuf. / Date: TRANSELECTRI Serial No : A32S0020 Sample Port : BOTTOM - MAI		Volume Preserv Syringe Sampleo	vation : e Serial: 1 By :	SEALE 5423 EC	32 (°C 3673 LII D 6 2019	
COMPONENT	MEASU	JRED PPM		% COMB	USTIBLES	5
Hydrogen (H2)		16			1.2	
Oxygen + Argon (O2 + A)	821				
Nitrogen (N2)		61484				
Methane (CH4)		27			2.1	
Carbon Monoxide (CO)		1210			92.8	
Carbon Dioxide (CO2)		3661				
Ethylene (C2H4)		38			2.9	
Ethane (C2H6)		<1			.0	
Acetylene (C2H2)		<1			.0	
Propane (C3H8)		13			1.0	
Total Gas Content		6.73	010			
Combustible Gas Content		1304	ppm		1.938 8	5
*PPM = Part Per Milli	on by volum	ne	N.D. =	Not D	etectabl	e
	NOXIDE IS A AL TEMPERAJ GASES ARE V	FURE WITH	IIN THE F	PAPER I		

Recommendations : SAMPLE IN 3 MONTHS FOR DISSOLVED GASES CONTACT LAB TO PERFORM FURAN ANALYSIS FROM REMAINING SAMPLE Notes : Test results relate only to samples tested as received.

RONDAR INC. 333 Centennial Parkway North Hamilton, Ontario L8E 2X6 Telephone : (905) 561-2808 Fax : (905) 561-8871


November 14th, 2017

Rideau St. Lawrence Utility 985 Industrial Rd Prescott, ON K0E 1T0

Attention: John Biccum

Re: Maintenance Inspection Report - Our Ref: 15374 Site: Prescott MS #1 – 675 Corrine St., Prescott, ON

To whom it may concern,

Please find the attached report for the installation and inspections completed November 13th 2017.

Tal Trees removed existing 5KV switchgear from within the brick electrical building on Corrine St, Prescott. Concrete was removed around existing underground cables to accommodate the installation of new feeder conductors. New concrete was poured and finished prior to installation of new switchgear units. S&C switchgear was supplied and installed in compliance with OESC regulations. The switchgear is complete including one main load break switch with CT's & PT's as well as three feeder fused load break switches complete with Amp Meters for each feeder. Tal Trees crew also installed 28KV XLPE conductors from existing transformer secondary to main load break switch in switchgear.

The new S&C switchgear and cables were commissioned and deemed in satisfactory condition to be energized by Tal Trees Power Services. As well, the existing power transformer & tower were overhauled, tested and inspected. A single line diagram was posted to substation fence and limacodid nomenclature for feeder's and switch gear were installed. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

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Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary & secondary connections were inspected for tightness and indications of overheating and reinstalled with anti-oxidant grease.
- Primary & secondary bushings inspected for damage and cleaned.
- Transformers was tested electrically (Turn ratio test, winding resistance, capacitance bridge & dielectric absorption test).

Air Break Switch:



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- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, As well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.



<u>S&C Switchgear:</u>

- S&C Switchgear was installed and while contact alignment, toggles, stops, linkage and general ease of operation were inspected.
- The contacts were inspected for contact pressure, and simultaneous closure. Fusing contacts were checked for contact pressure as well as lubricated with electrical grease.
- Bus bar was bolted and torqued to manufacturers recommended specifications.
- Switchgear & fuses were tested electrically for insulation resistance and with a micro ohm meter for contact resistance.
- All 28KV cables were installed in compliance with OESC regulations, terminated and tested for insulation resistance.

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Findings/Repairs:

- Tal Trees installed a second ground connection with 2/O copper to station transformer to comply with OESC requirements.
- Oil level in transformer conservator is getting low as shown by liquid level gauge.
- Porcelain standoff insulator on transformer secondary was found to be broken & was replaced.
- All transformer & H.V. test results were satisfactory.

Recommendations:

- The installation of cables and switchgear was found to be in satisfactory condition for energization.
- Continue with regular maintenance on all transformers and high voltage switches.

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all of the recommended repairs listed in this report.

If you have any questions/concerns please do not hesitate to contact us. We look forward to being of continued service to Calabogie Peaks Resort.

Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville ON. K8N 4Z5



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HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

- POWER SE	RVICES —		0			Derder		
Α	SPARKPOWER COMPANY		System ID	MS#1		Device		Fower Switch
Customer	Rideau St. Lawrence			Date	Octobe	er 25 2017		
	985 Industrial Rd. Prescot	t			15374			
	MS #1		System Ne					
	675 Corrine St.		oystem re					
	oro comine ot.							
Nameplate Data								
Switch Mounting	Metal Enclosed X	Pole	Tow	rer		Other		
Switch Type	Load Break X	Air Break				Other		
Manufacturer	DOMINION CUTOUT LTD.			BIL Rating	250			kV
Date Of Manufacture	N/A			Feeder ID	B201T	1-L		
Serial #	N/A			Feeds To	T1			
Catalog #	57-K46600		Interr	upting Rating	40000			Α
Nom. / Max. Voltage	44.0 / 48.3	kV	Continue	ous Ampacity	600			Α
Comments	CSA C22.2 NO.31 Series							
Lightning Arrestors								
	Yes X	No						
Lightning Arrestors		No	Ctati					
Class		ermediate	Statio	on X				
Composition		Polymer X	N			40.0	,	• • • • •
	OHIO BRASS		Max. /	MCOV Rating		48.0	/ 39.	0 kV
Catalog #								
	YEAR: 2009							
Protective Device Data	1							
Primary Fuse Holder Dat	a		Primarv Fu	se Link Data	9			
Manufacturer				Manufacturer				
	SMD-50				SMD-5	0		
	46.0 / 48.3	kV		Link Size				Α
Holder Max. Fuse Link								
Holder Catalog #			1	ink Catalog #				
Primary Fuse Link Spare								
Spare Primary Fuses		No		# of Sparag	2			
				# 01 Spares	2			
	INSIDE BUILDING							
Comments								
Interlock								
Key Interlock	Yes	No X						
Interlock Type		chanical	Utility Lo	ck				
Devices Interlocked		Breaker	Trans. Er		Ot	her		
Manufacturer		Bround	Trano. Er	Key Interloc				
Comments				ney menoo				
Load Side Conductor	Data							
Conductor Type	Cable	Bus Bar X	Cond	luctor Size / Di	im. 1" F	ROUND		
Conductor Material	Aluminum	Copper x	Condu	uctors per Pha	ise 1			/ Phase
Tape Shield	Aluminum	Copper		Bond Size / Di	im. 2/0			
Concentric Neutral	Aluminum	Copper	# of	Bond Coducto	ors 2			
Insulation Voltage	N/A		# of Ne	utral Conducto	ors 0			
Insulation Type			Ne	eutral Size / Di	im. N/A			
Comments								
Recorded By:	D. MACLEAN							



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERV	ICES		System ID	MS#1		Device ID	Tower S	witch
Visual Inspec	tion / Mechar	nical Tests							
Namepl	late Condition	Satisfactory X	Not Sati	sfactory	N/A	Comn	nents		
Insula	ator Condition	Satisfactory X	Not Sati	sfactory	N/A	Comn	nents		
Ground	Connections	Satisfactory X	Not Sati	sfactory	N/A	Comn	nents		
Lightr	ning Arrestors	Satisfactory X	Not Sati	sfactory	N/A	Comn	nents		
Arc	Suppressors	Satisfactory	Not Sati	sfactory	N/A X	Comn	nents		
Key Interlo	ock Operation	Satisfactory	Not Sati	sfactory	N/A X	Comn	nents		
Ground Strap	s & Materials	Satisfactory X	Not Sati	sfactory	N/A	Comn	nents		
Switch Conditi	on / Operation	1							
Switch Ope	ration As Left	Satisfactory x	Not Sati	sfactory	N/A	Comn	nents		
Contact Surfa	ace Condition	Satisfactory x	Not Sati	sfactory	N/A	Comn	nents		
Simultan	eous Closure	Satisfactory x	Not Sati	sfactory	N/A	Comn	nents		
Electrical Tes	sts								
Earth Resistan	ce (3-Point Te	st)		Arc Suppres	sor Conta	act Resi	stance		
Earth Resistar	nce in Ohms.			Arc Suppres	ssor Contac	ct Resista	nce in Ohms.		
				Phase A		_		Ω	
Earth Resistar	nce	N/A	Ω	Phase B				Ω	
				Phase C				Ω	
Switch Insulati	ion Resistance	•		Switch / Fus	e Contaci	t Resista	nce		
Resistance in M	eg-Ohms after 1	minute.		Resistance i	n micro-Oh	ms after 1	minute.		
Test Voltage	1 kV 2	kV 5 kV	10 kV	Test Current	t 10 .	Α			
								Dhaa	se C
	Phase A	Phase B	Phase C		Phas	eА	Phase B	Phas	
Phase to GND	Phase A N/A MΩ		Phase C N/A M	Ω SW. Contacts		e Α μ Ω	Phase B 36 μΩ		μΩ
Phase to GND				Ω SW. Contacts Fuse	s 39			Ω 42	
Phase to GND					39 2 1484	μΩ	36 μΩ	1583	Ωμ Ωμ Ωμ
	Ν/Α ΜΩ		N/A M	Fuse Overal	39 2 1484	μΩ μΩ	36 μΩ 1463 μΩ	1583	μΩ
Load Side Con	Ν/Α ΜΩ	N/A MΩ	N/A M	Fuse Overal Bus)	39 2 1484	Ωμ Ωμ Ω	36 μΩ 1463 μΩ	2 42 2 1583 2 N/A	2μ 2μ
Load Side Con	N/A MΩ nductor Insulat	N/A MΩ	N/A Ms	Fuse Overal Bus) ute P	s 39 e 1484 N/A	μΩ μΩ βround	36 μΩ 1463 μΩ Ν/Α μΩ	2 42 2 1583 2 N/A	μΩ
Load Side Con	N/A MΩ nductor Insulat	N/A MΩ	N/A Ms	Fuse Overal Bus) ute P P	39 2 1484 1 N/A 2 hase A to C	μΩ μΩ Ground Ground	36 μΩ 1463 μΩ Ν/Α μΩ	2 42 2 1583 2 N/A	2μ 2μ 2μ 2μ ΜΩ
Load Side Con Resistance	N/A MΩ Inductor Insulation	N/A MΩ ion Resistance V	N/A Ms	Fuse Overal Bus) ute P P	39 1484 N/A Phase A to C Phase B to C	μΩ μΩ Ground Ground	36 μΩ 1463 μΩ Ν/Α μΩ Ν/Α Ν/Α Ν/Α	2 42 2 1583 2 N/A	2μ 2μ 2μ 2μ ΜΩ
Load Side Con Resistance Lightning Arre	N/A MΩ Inductor Insulation	N/A MΩ ion Resistance V Resistance	N/A Ms	Fuse Overal Bus) ute P P P	39 1484 N/A Phase A to C Phase B to C	μΩ μΩ μΩ Ground Ground Ground	36 μΩ 1463 μΩ Ν/Α μΩ Ν/Α Ν/Α Ν/Α	2 42 2 1583 2 N/A	2ע 2ע 2M 2M 2M
Load Side Con Resistance Lightning Arre	N/A MΩ aductor Insulation	N/A MΩ ion Resistance V Resistance	N/A M (Switchgear I DC after 1 min	Fuse Overal Bus) ute P P P ute P	s 39 e 1484 I N/A thase A to C thase B to C hase C to C	μΩ μΩ μΩ Ground Ground Ground Ground	36 μΩ 1463 μΩ Ν/Α μΩ Ν/Α Ν/Α Ν/Α	2 42 2 1583 2 N/A A A A	μΩ μΩ Δμ

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7776 6839

Tested By: D. MACLEAN, T. LANTHIER



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

- POWER SE	RVICES —	Svotom ID	MC#4		Device ID	H.V Switch #1
A	SPARKPOWER COMPANY	System ID	MS#1		Device ID	H.V Switch #1
Customer	Rideau St. Lawrence		Date	Octobe	er 25 2017	
Customer Address	985 Industrial Rd. Prescott		Job #	15374		
Site	MS #1	System Net	utral Present			
Site Address	675 Corrine St.					
Nameplate Data						
Switch Mounting	Metal Enclosed X Pole	Towe	er		Other	
Switch Type		_			Other	
Manufacturer			BIL Rating	60		kV
Date Of Manufacture			Feeder ID	-		
Serial #			Feeds To	H.V Sw	vitch #2,3,4	
Catalog #	CDT- 595041	Interru	upting Rating			Α
Nom. / Max. Voltage	4.2 / 4.8	Continuo	us Ampacity	600		Α
Comments	CSA C22.2 NO.31 Series					
Lightning Arrestors						
Lightning Arrestors	Yes No	x				
Class		Statio	n			
Composition						
Manufacturer		Max. / N	ACOV Rating		1	kV
Catalog #			0			
Comments	Located on primary side at tower sw	itch, on load sid	e at dip swit	ch		
Protective Device Data	1					
		Duine a ma Fra	a Link Date	_		
Primary Fuse Holder Dat		Primary Fus				
Manufacturer	the second s	N	Manufacturer	-		
	/ k'	/				
	/ K		TCC #			
Holder Catalog #		 				
Primary Fuse Link Spare			int outdrog "			
Spare Primary Fuses			# of Spares			
Comments						
Interlock						
Key Interlock	Yes No	x				
Interlock Type	Electrical Mechanical	Utility Loc	:k			
Devices Interlocked	H.V. Switch Breaker	Trans. En	cl.	Ot	her	
Manufacturer			Key Interloc	k #		
Comments						
Load Side Conductor	Data					
Conductor Type	Cable Bus Bar	x Condu	uctor Size / Di	im 2 X	1/4"	
Conductor Material	Aluminum Copper		ctors per Pha			/ Phase
Tape Shield	Aluminum Copper		Bond Size / Di			
Concentric Neutral	Aluminum Copper		Bond Coducto			
Insulation Voltage			utral Conducto			
Insulation Type			utral Size / Di			
Comments						
Recorded By:	TL					



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POWER			,		System ID	MS#1	I	Device IE	О Н.	V Swite	ch #1
Visual Inspection /	Mechan	ical Tests									
Nameplate Cor	ndition	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Insulator Cor	ndition	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Ground Conne	ctions	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Lightning Arr	estors	Satisfactory		Not Satisfa	actory	N/A X	Con	nments			
Arc Suppre	essors	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Key Interlock Ope	eration	Satisfactory		Not Satisfa	actory	N/A X	Con	nments			
Ground Straps & Ma	terials	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Switch Condition / O	peration										
Switch Operation A	s Left	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Contact Surface Cor	ndition	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Simultaneous C	losure	Satisfactory	x	Not Satisfa	actory	N/A	Con	nments			
Electrical Tests											
Earth Resistance (3-I	Point Tes	st)			Arc Suppres	ssor Cont	act Res	sistance			
Earth Resistance in C	Dhms.				Arc Suppre	ssor Conta	ct Resist	tance in Ohm	IS.		
					Phase A			\sim	Ω		
Earth Resistance			Ω	_	Phase B				Ω		
					Phase C				Ω		
Switch Insulation Re	sistance				Switch / Fus	se Contac	t Resis	tance			
Resistance in Meg-Ohn	ns after 1	minute.			Resistance i	in micro-Oh	ms after	1 minute.			
Test Voltage 1 kV	2	kV 5	kV	10 kV	Test Curren	t 10	Α				
Ph	ase A	Phase B		Phase C		Phas	e A	Phase B		Phas	e C
Phase to GND	MΩ	N	IΩ	MΩ	Contacts	s 105.4	μΩ	103 J	Ωu	95.7	μΩ
					Fuse	e N/A	μΩ	N/A	ΩL	N/A	μΩ
					Overa	I	μΩ	ł	Ωι		μΩ
Load Side Conducto	r Insulati	on Resistan	ce (Sv	vitchgear Bu	is)						
Resistance in Meg-	Ohms @		V DC	after 1 minute	e F	hase A to (Ground	214	0000		MΩ
					F	hase B to (Ground	368	0000		MΩ
					F	hase C to (Ground	465	0000		MΩ
Lightning Arrestor In	sulation	Resistance									
Resistance in Meg-	Ohms @		V DC	after 1 minute	e F	hase A to (Ground				MΩ
					F	Phase B to 0	Ground				MΩ
											MΩ

Test Instrument(s)

Manufacturer / Model Meg Serial # 77

Megger Ductor 7776 6839

Tested By: D. MACLEAN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

FOVER SE	SPARKPOWER COMPANY		System ID	MS#1		Device ID	H.V Switch #2
Customer	Rideau St. Lawrence			Date	Octob	er 25 2017	
	985 Industrial Rd. Pres	scott		Job #			
	MS #1		System Neut				
Site Address	675 Corrine St.		-,				
Nameplate Data							
Switch Mounting	Metal Enclosed x	Pole	Tower			Other	
Switch Type						Other	
Manufacturer	6 ° C			BIL Rating	60		LA/
Date Of Manufacture	10/17			Feeder ID	-		
Serial #					-	witch #2,3,4	
Catalog #	CDT- 595041		Interrup	oting Rating	-		_
-	4.2 / 4.8	kV		is Ampacity			Α
	CSA C22.2 NO.31 Serie	es					
Lightning Arrestors							
Lightning Arrestors	Yes	No X					
Class	Distribution	Intermediate	Station				
Composition		Polymer					
Manufacturer			Max. / M	COV Rating		1	kV
Catalog #							
Comments							
Protective Device Data	1						
Primary Fuse Holder Dat	ta		Primary Fuse	e Link Data	а		
Manufacturer			-	anufacturer			
Туре	SMD-40			Туре	SMU-4	10	
Nom. / Max. Voltage	4.8 / 5.5	i kV		Link Size	250E		Α
				TCC #	153-1		
Holder Catalog #			Lin	k Catalog #			
Primary Fuse Link Spare	es / Location						
Spare Primary Fuses	Yes X	No	-	# of Spares	9		
Spare Location	INSIDE BUILDING						
Comments							
Interlock							
Key Interlock	Yes	No X					
Interlock Type	Electrical	Mechanical	Utility Lock				
Devices Interlocked		Breaker	Trans. Encl		0	ther	
Manufacturer		Dicakci		Key Interloc			
Comments					~ <u> </u>		
Load Side Conductor	Data						
			0				
Conductor Type	Cable X	Bus Bar		ctor Size / D)	/ Dhase
Conductor Material Tape Shield	Aluminum	Copper		tors per Pha ond Size / D		`	/ Phase
Concentric Neutral	Aluminum	Copper Copper		ond Coduct			
Insulation Voltage		Copper		ral Conduct			
Insulation Type				tral Size / D			
Comments	<u></u>		INCU			`	
Comments							
Recorded By:	TL						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

	Company ical Tests Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory	x x x x x	Not Satisfa Not Satisfa Not Satisfa Not Satisfa Not Satisfa Not Satisfa Not Satisfa	ictory ictory ictory	N/A N/A N/A N/A N/A		Corr Corr	Device ments ments	ID	H.V Swite	ch #2
ition itions tors sors ation rials	Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory	x x x	Not Satisfa Not Satisfa Not Satisfa Not Satisfa Not Satisfa	ictory ictory ictory	N/A N/A N/A		Corr Corr	ments			
ition ions tors sors ition rials	Satisfactory Satisfactory Satisfactory Satisfactory Satisfactory	x x x	Not Satisfa Not Satisfa Not Satisfa Not Satisfa Not Satisfa	ictory ictory ictory	N/A N/A N/A		Corr Corr	ments			
ions tors sors ition rials	Satisfactory Satisfactory Satisfactory Satisfactory	x	Not Satisfa Not Satisfa Not Satisfa Not Satisfa	ictory ictory ictory	N/A N/A		Corr				
tors sors ition rials eration	Satisfactory Satisfactory Satisfactory	x	Not Satisfa Not Satisfa Not Satisfa	ictory	N/A	x		ments			
sors Ition rials Pration	Satisfactory Satisfactory		Not Satisfa Not Satisfa	ctory		x	~				
ition rials eration	Satisfactory		Not Satisfa	-	N/A		Corr	ments			
rials e ration	-	x		ctory			Com	ments			
eration	Satisfactory	X	Not Satisfa	,	N/A	x	Corr	ments			
			Not Oatisia	ctory	N/A		Com	ments			
Left											
	Satisfactory	x	Not Satisfa	ctory	N/A		Com	ments			
ition	Satisfactory	х	Not Satisfa	ctory	N/A		Com	ments			
sure	Satisfactory	x	Not Satisfa	ctory	N/A		Com	ments			
oint Tes	t)			Arc Suppr	esso	r Conta	ct Res	istance			
ms.				Arc Suppr	essor	Contact	Resist	ance in Ol	nms.		
				Phase A						Ω	
		Ω		Phase B						Ω	
				Phasee						Ω	
stance				Switch / Fu	ıse C	ontact	Resis	tance			
after 1	minute.			Resistance	in m	cro-Ohm	is after	1 minute.			
21	<v 5="" td="" ł<=""><td>٨V</td><td>10 kV</td><td>Test Curre</td><td>nt</td><td>10 A</td><td></td><td></td><td></td><td></td><td></td></v>	٨V	10 kV	Test Curre	nt	10 A					
se A	Phase B		Phase C			Phase	А	Phase	В	Phas	e C
MΩ		Ω	MΩ	Contac	ts	86.8	μΩ	79.3	μΩ	75.6	μΩ
				Fu	se		μΩ	334.3	μΩ	314.1	μΩ
				Over	all	N/A	μΩ	N/A	μΩ	N/A	µΩ
nsulati	on Resistand	ce							-		
hms @		V DC	after 1 minute	9	Phas	e A to Gi	ound		N/A		MΩ
•					Phas	e B to Gi	ound		N/A		MΩ
					Phas	e C to Gi	ound		N/A		MΩ
ulation	Resistance										
hms @		V DC	after 1 minute	;	Phas	e A to Gi	ound				MΩ
					Phas	e B to G	ound				MΩ
					Phas	e C to G	ound				MΩ
	istance s after 1 2 se A MΩ Insulation	oint Test) ims. istance istance s after 1 minute. 2 kV 5 l se A Phase B MΩ M Insulation Resistance M Ohms @	point Test) mms. Ω istance s after 1 minute. 2 kV 5 kV 2 kV 5 kV se A Phase B MΩ MΩ Insulation Resistance Nms @ V DC Ulation Resistance Dhms @ V DC	point Test) mms. Ω istance s after 1 minute. 2 kV 5 kV 2 kV 5 kV 10 kV se A Phase B MΩ MΩ MΩ MΩ Insulation Resistance Dhms @ V DC after 1 minute ulation Resistance Dhms @ V DC	Arc Supprendimentation Arc Supprendimentation Arc Supprendimentation Arc Supprendimentation Phase A Phase B Phase C Switch / Full s after 1 minute. Resistance Switch / Full s after 1 minute. 2 kV 5 kV 10 kV Se A Phase B Phase C MQ MQ MQ Contact Insulation Resistance V DC after 1 minute Dhms @ V DC after 1 minute	Arc Suppresson nms. Arc Suppresson Ω Arc Suppresson Phase A Phase B Phase C Phase C istance Switch / Fuse C se A Phase B Phase C MΩ MΩ MΩ Contacts Fuse Overall Insulation Resistance Phase Dhms @ V DC after 1 minute Phase Phase Phase Phase Phase Phase Phase Phase Phase Dhms @ V DC after 1 minute Phase Phase Phase Phase Phase Phase	Arc Suppressor Contact nms. Arc Suppressor Contact Ω Arc Suppressor Contact Phase A Phase B Phase C Phase C istance Switch / Fuse Contact s after 1 minute. Resistance in micro-Ohm 2 kV 5 kV 10 kV Se A Phase B Phase C MΩ MΩ MΩ Se A Phase B Phase C MΩ MΩ MΩ Se A Phase B Phase C MΩ MΩ MΩ Se A Phase B Phase C MΩ MΩ MΩ Insulation Resistance N/A Dhms @ V DC after 1 minute Phase A to Gr Phase B to Gr Phase B to Gr Phase B to Gr Phase B to Gr Phase B to Gr Phase C to Gr	Arc Suppressor Contact Residence Ω Arc Suppressor Contact Residence Ω Arc Suppressor Contact Residence Phase A Phase A Phase B Phase C istance Switch / Fuse Contact Resistence istance Phase A Se A Phase B Phase C MΩ MΩ MΩ Contacts 86.8 µΩ Substance Phase C Phase A 86.8 µΩ Overall N/A µΩ N/A µΩ Insulation Resistance Phase A to Ground Phase B to Ground Phase C to Ground Phase B to Ground Phase B to Ground Phase B to Ground Phase C to Ground	Arc Suppressor Contact Resistance Imms. Arc Suppressor Contact Resistance in Of Phase A Phase A Phase C Phase C istance Switch / Fuse Contact Resistance istance Phase A Phase istance Phase B Phase C Phase A Phase istance Phase B Phase C Phase A Phase istance Phase B Phase C Phase A Phase istance V DC after 1 minute Phase A to Ground Phase C istance V DC after 1 minute Phase A to Ground Phase C istance V DC	Arc Suppressor Contact Resistance nms. Arc Suppressor Contact Resistance in Ohms. Ω Phase A Phase B Phase C istance Switch / Fuse Contact Resistance safter 1 minute. Resistance in micro-Ohms after 1 minute. 2 kV 5 kV 10 kV Test Current 10 A see A Phase B Phase C Phase A Phase B MΩ MΩ MΩ MΩ Contacts 86.8 µΩ µΩ 306.2 µΩ 334.3 µΩ Insulation Resistance V DC after 1 minute Phase A to Ground N/A µΩ Insulation Resistance V DC after 1 minute Phase A to Ground N/A Phase B to Ground N/A Phase B to Ground N/A Phase B to Ground Phase B to Ground Phase B to Ground Phase B to Ground Phase C to Ground Phase C to Ground	Arc Suppressor Contact Resistance oint Test) Arc Suppressor Contact Resistance omms. Arc Suppressor Contact Resistance in Ohms. Phase A Phase A Q Phase B Q Phase B Q Phase C Q Phase B Q istance Switch / Fuse Contact Resistance Q istance Resistance in micro-Ohms after 1 minute. Test Current 10 A istance Phase B Phase A Phase B Phase B MQ MQ MQ MQ Contacts B6.8 µQ 79.3 µQ 75.6 MQ MQ MQ MQ MQ N/A Phase A to Ground N/A Insulation Resistance V DC after 1 minute Phase A to Ground N/A Pha

Test Instrument(s)

Manufacturer / Model Megger Serial # 7776

MeggerDuctor77766839

Tested By: D. MACLEAN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	MS#1		Device ID	H.V Switch #3
Customer	Rideau St. Lawrence			Date	Octob	er 25 2017	
	985 Industrial Rd. Prescott			Job #	-		
	MS #1		System Ne	eutral Present			
	675 Corrine St.		-)				
Nameplate Data							
Switch Mounting	Metal Enclosed X	Pole	Tow	er		Other	
Switch Type		ir Break	101				
Manufacturer				BIL Rating	60	<u> </u>	kV
Date Of Manufacture				Feeder ID			K V
Serial #	-					vitch #2,3,4	
	CDT- 595041		Interr	upting Rating			Α
Nom. / Max. Voltage		kV		ous Ampacity			A
•	CSA C22.2 NO.31 Series	κ.v.	Continue		000		~ ~
	CSA C22.2 NO.31 Series						
Lightning Arrestors							
Lightning Arrestors	Yes	No X					
Class		mediate	Stati	on			
Composition	Ceramic	Polymer					
Manufacturer			Max. /	MCOV Rating		1	kV
Catalog #							
Comments	Located on primary side at	tower switch	, on load sid	de at dip swit	ch		
Protective Device Data	1						
Primary Fuse Holder Dat	a		Primary Fu	se Link Data	3		
Manufacturer	S&C			Manufacturer	S&C		
Туре	SMD-40			Туре	SMU-4	0	
Nom. / Max. Voltage	4.8 / 5.5	kV		Link Size	250E		Α
Holder Max. Fuse Link				TCC #	153-2		
Holder Catalog #			L	ink Catalog #	N/A		
Primary Fuse Link Spare	es / Location						
Spare Primary Fuses	Yes X	No		# of Spares	9		
Spare Location	INSIDE BUILDING						
Comments							
Interlock							
Key Interlock	Yes	No X					
Interlock Type		hanical	Utility Lo	ck 🗌			
Devices Interlocked		Breaker	Trans. Er		0	ther	
Manufacturer		Dieakei	TTATIS. LI	Key Interloc			
Comments				Rey Interioc	\#		
Load Side Conductor I	Data						
Conductor Type	Cable X	Bus Bar		uctor Size / Di			
Conductor Material	Aluminum	Copper X		uctors per Pha			/ Phase
Tape Shield	Aluminum	Copper		Bond Size / Di	m. N/A		
Concentric Neutral	Aluminum	Copper	# of	Bond Coducto	ors N/A		
Insulation Voltage			# of Ne	utral Conducto	ors N/A	۱	
Insulation Type	BARE BUS		N	eutral Size / Di	m. <u>N//</u>	۱	
Comments							
Recorded By:	 TI						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POWER SERV	ICES KPOWER COMPANY		System ID	MS#1		Device	ID	H.V Switc	ch # 3
Visual Inspection / Mecha	nical Tests								
Nameplate Condition	Satisfactory x	Not Satisfa	actory 1	N/A	Com	nments			
Insulator Condition	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Ground Connections	Satisfactory x	Not Satisfa	actory 1	N/A	Com	nments			
Lightning Arrestors	Satisfactory	Not Satisfa	actory 1	N/A X	Com	nments			
Arc Suppressors	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Key Interlock Operation	Satisfactory	Not Satisfa	actory 1	N/A X	Corr	nments			
Ground Straps & Materials	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Switch Condition / Operation	1								
Switch Operation As Left	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Contact Surface Condition	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Simultaneous Closure	Satisfactory x	Not Satisfa	actory	N/A	Corr	nments			
Electrical Tests									
Earth Resistance (3-Point Te	est)		Arc Suppres	sor Conta	act Res	sistance			
Earth Resistance in Ohms.			Arc Suppres	sor Contac	t Resist	ance in Ol	nms.		
			Phase A					Ω	
Earth Resistance	9	Ω	Phase B					Ω	
			Phase C					Ω	
Switch Insulation Resistance	9		Switch / Fus	e Contact	Resis	tance			
Resistance in Meg-Ohms after 1	I minute.		Resistance ir	n micro-Ohi	ms after	1 minute.			
Test Voltage 1 kV 2	2 kV 5 kV [10 kV	Test Current	10	A				
Phase A	Phase B	Phase C	_	Phas	e A	Phase	в	Phase	e C
Phase to GND MΩ	MΩ	MΩ	Contacts	98.3	μΩ	85.6	μΩ	87.8	μΩ
			Fuse	319.4	μΩ	333.9	μΩ	322.4	μΩ
			Overall	N/A	μΩ	N/A	μΩ	N/A	μΩ
Load Side Conductor Insula	tion Resistance								
Resistance in Meg-Ohms @	. V C	C after 1 minut	e Pl	nase A to G	Ground		N/A		MΩ
			Pl	nase B to G	Ground		N/A		MΩ
			Pł	nase C to G	Ground		N/A		MΩ
Lightning Arrestor Insulation	n Resistance								
Resistance in Meg-Ohms @	y v c	C after 1 minut	e Pl	nase A to G	Ground				MΩ
				DI C	round				MΩ
			PI	nase B to G	Jouna				

Test Instrument(s)

Manufacturer / Model Me Serial # 77

Megger Ductor 7776 6839

Tested By: D. MACLEAN



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	MS#1		Device ID	H.V Switch #4
Customer	Rideau St. Lawrence			Date	Octob	er 25 2017	
	985 Industrial Rd. Preso	ott		Job #			
	MS #1		System Neut				
	675 Corrine St.		e yeten neur				
Nameplate Data							
Switch Mounting	Metal Enclosed x	Pole	Tower			Other	
Switch Type		Air Break	Tower			Other	
Manufacturer				BIL Rating	60		
Date Of Manufacture				Feeder ID			κ.v.
Serial #						vitch #2,3,4	
	CDT- 595041		Interrun	ting Rating			Α
Nom. / Max. Voltage		kV		s Ampacity			A
	CSA C22.2 NO.31 Series		Continuou	o / impuolity			<u> </u>
Lightning Arrestors		-					
	Vac	No X					
Lightning Arrestors	Yes		Ctotion				
Class Composition	Distribution Ceramic	Intermediate	Station				
•		Polymer	Mox / M	COV Dating		I	kV
Manufacturer Catalog #						I	ĸv
e e	Located on primary sid	a at towar switch		at din swit	ch		
Protective Device Data	,	e at tower switch	, on load side	at up swit			
Primary Fuse Holder Dat			Primary Fuse				
Manufacturer			Ma	anufacturer			
,,	SMD-40				SMU-4	10	
Nom. / Max. Voltage		kV		Link Size			Α
Holder Max. Fuse Link				TCC #			
Holder Catalog #			LINI	k Catalog #	N/A		
Primary Fuse Link Spare							
Spare Primary Fuses		No	7	# of Spares	9		
	INSIDE BUILDING						
Comments							
Interlock							
Key Interlock	Yes	No 🗙					
Interlock Type	Electrical	Mechanical	Utility Lock				
Devices Interlocked	H.V. Switch	Breaker	Trans. Encl		O	ther	
Manufacturer			I	Key Interloc	k #		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable x	Bus Bar	Conduc	tor Size / D	im 2/0	,	
Conductor Material	Aluminum	Copper X		tors per Pha		•	/ Phase
Tape Shield	Aluminum	Copper		ond Size / D		١	/ Flidse
Concentric Neutral	Aluminum	Copper		ond Coduct			
Insulation Voltage		Copper		ral Conduct			
Insulation Type				tral Size / D			
Comments	11/7		ineu			`	
Comments							
Recorded By:	TL						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POWER SERV	ICES KPOWER COMPANY		System ID	MS#1		Device	ID I	H.V Switc	ch # 4
Visual Inspection / Mecha	nical Tests								
Nameplate Condition	Satisfactory x	Not Satisfa	actory 1	N/A	Com	nments			
Insulator Condition	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	ments			
Ground Connections	Satisfactory x	Not Satisfa	actory I	N/A	Com	ments			
Lightning Arrestors	Satisfactory	Not Satisfa	actory 1	N/A X	Com	ments			
Arc Suppressors	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Key Interlock Operation	Satisfactory	Not Satisfa	actory 1	V/A X	Corr	nments			
Ground Straps & Materials	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Switch Condition / Operation	1								
Switch Operation As Left	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	nments			
Contact Surface Condition	Satisfactory x	Not Satisfa	actory 1	N/A	Corr	ments			
Simultaneous Closure	Satisfactory x	Not Satisfa	actory	N/A	Corr	ments			
Electrical Tests									
Earth Resistance (3-Point Te	est)		Arc Suppres	sor Cont	act Res	sistance			
Earth Resistance in Ohms.			Arc Suppres	sor Contac	t Resist	ance in Ol	nms.		\sim
			Phase A					Ω	
Earth Resistance	9	Ω	Phase B					Ω	
			Phase C					Ω	
Switch Insulation Resistance	9		Switch / Fuse	e Contaci	Resis	tance			
Resistance in Meg-Ohms after 1	I minute.		Resistance ir	micro-Oh	ms after	1 minute.			
Test Voltage 1 kV 2	2 kV 5 kV	10 kV	Test Current	10 .	A				
Phase A	Phase B	Phase C	_	Phas	e A	Phase	В	Phas	e C
Phase to GND ΜΩ	MΩ	MΩ	Contacts	73.2	μΩ	81.4	μΩ	76.8	μΩ
			Fuse	313.7	μΩ	322.9	μΩ	360	μΩ
			Overall	N/A	μΩ	N/A	μΩ	N/A	μΩ
Load Side Conductor Insula	tion Resistance								
Resistance in Meg-Ohms @	e V C	C after 1 minut	e Pi	nase A to C	Ground		N/A		MΩ
			PI	nase B to C	Ground		N/A		MΩ
			Pł	nase C to C	Ground		N/A		MΩ
Lightning Arrestor Insulation	n Resistance								
Resistance in Meg-Ohms @	e V C	C after 1 minut	e Pi	nase A to C	Ground				MΩ
									MΩ
			PI	nase B to C	Fround				

Test Instrument(s)

Manufacturer / Model Meg Serial # 77

Megger Ductor 7776 6839

Tested By: D. MACLEAN



TRANSFORMER DATA SHEET (Pg. 1 of 4)

		SPARKPOWER CO	MPANY			System IE	MS#1		Device ID	E	3201	TI - X	
	Custome	r Rideau St. La	wrenc	e			Date	Octobe	r 25 2017				
	Customer Address			-			Job #						
	Site	e MS #1											
	Site Address	675 Corrine S	St.										
Namep	olate Data												
	Transformer Class	s Unit Padr	nount	Pad	mount X	Station			Other				
Т	ransformer Cooling	g C	NAN	X	ONAF	LNAN	DF	RΥ	Other				
Bushi	ng Configuration	Dead	Front	Тор	- Top X	Top - Side	Side - Si	de	Other				
	Manufacture	r FERRANTI P	ACKAF	RD ELECI	IRIC LTD.	C	ore & Windings	9950		kg		lb	X
[Date of Manufacture	e 1965				-	Tanks & Fittings	5350		kg		lb	Х
	Serial #	# 1-2445					Coolant Volume	915		L		Gal	Х
KVA	/ Prov. KVA Rating	5000			KVA		Coolant Weight	7850		kg		lb	Х
	Primary Voltage	e 44000			v		Total Weight	23150		kg		lb	Х
	Primary Ampacity	40.4			Α	Те	mperature Rise	55		°C	Χ	°F	
	Secondary Voltage	e 4160/2400			v		HV BIL Rating	250		kV			
S	Secondary Ampacity	y 417			Α		LV BIL Rating	75		kV			
F	HV Winding Materia	N/A				Per	cent Impedance		5.41 %	ONAN	Х	ONAF	:
l	LV Winding Materia	N/A				Та	amper Resistant			YES		NO	X
C	CSA Specification(s) <u>N/A</u>				Tra	nsformer Colour	GREEN					
	Comments	S											
Visual I	Inspection												
N	lameplate Condition	n Satisfacto	ry	No	t Satisfacto	ory X	N/A	Comment	s	FAD	ED		
Fa	in / Pump Operation	n Satisfacto	ry	No	t Satisfacto	ory	N/A X	Comment	S				
Ģ	Ground Connection	s Satisfacto	ry X	No	t Satisfacto	ory	N/A	Comment	s				
Liq	uid Levels In Tank	s Satisfacto	ry	No	t Satisfacto	ory X	N/A	Comment	s OIL LEV	EL IS G	BETT	ING LO	wc
	Interlock Operation	n Satisfacto	ry	No	t Satisfacto	ory	N/A X	Comment	s				
Tem	p. Gauge Operatio	n Satisfacto	ry X	No	t Satisfacto	ory	N/A	Comment	s				
С	oolant Temperature	e 25		°C	X °F		Max. Coolant Te	emperatur	e 60	°C	X	°F	
	Comments	S											
Oil Con	servator												
	Oil Conservato	or Yes X	1	No		Cons	ervator Volume			L		Gal	
	Silica Gel Breathe	er Yes X	1	No		E	reather Volume			L		Gal	
	Silica Gel Colou	ır Good X	B	ad	Replace	ed	N/A			_			
	Comment	S											
	anger Data					Vector Dia	ngram: De	ltaWyeN	oXo2b	16.Dy	11		
	osition / signation	Tap Voltages	(V)	As Found	As Left		•	H2	X2				
1/A	105.00%	45100		Found	Leit				\mathbf{X}				
2/B	102.50%	44000						<u>۱</u>	<u> </u>	X 3			
3/C	102.30 %	42900		х	x								
4 / D	97.50%	42900		~	^		Hı	H3	Xı				
5/E	95.00%	40700				Drim	ary Vector	r	Seconda		tor	Х	1
0, 2	Comments								Seconda	ily vec		~	1
	Comments	•											
	Recorded By	E. COURTNE	Y. T. I		1								
			,										

Neutral Grounding Resistor (NGR) NGR Present Yes No X Manufacturer NGR Serial # NGR Voltage V Maximum Current NGR Resistance Ω NGR Location Comments	
NGR Present Yes No X Manufacturer NGR Serial # NGR Voltage V NGR Resistance 0 Comments NGR Location	
Manufacturer NGR Serial # NGR Voltage V NGR Resistance Ω Comments	A
NGR Voltage V Maximum Current NGR Resistance Ω NGR Location Comments	
NGR Voltage V Maximum Current NGR Resistance Ω NGR Location Comments	
Comments	
	kV
	kV
Transformer Lightning Arrestors	kV
Lightning Arrestors Yes No X	kV
Class Distribution Intermediate Station	kV
Composition Ceramic Polymer	kV
Manufacturer Max. / MCOV Rating /	
Catalog #	
Comments	
Interlock	
Key Interlock Yes No X	
Interlock Type Elec. Mech. Utility Lock	
Devices Interlocked H.V. Switch Breaker Trans. Encl. Other	
Manufacturer Key Interlock #	
Comments	
Fans	
Fans Yes No X	
# of Fans Fan Voltage	
Fan Size Frame Size	
Horsepower	
Comments	
Transformer Load Side Conductor Data	
Conductor Type Cable Bus Bar X Conductor Size / Dim. 1 1/2" ROUND BUS	
Conductor Material Aluminum Copper X Conductors per Phase 1	/ Phase
Tape Shield Aluminum Copper Bond Size / Dim.	
Concentric Neutral Aluminum Copper # of Bond Conductors 0	
Insulation Voltage N/A # of Neutral Conductors 1	
Insulation Type BARE BUS Neutral Size / Dim. 11/2" ROUND BUS	
Comments:	
Recorded By: E. COURTNEY, T. LANTHIER	

TRANSFORMER



TRANSFORMER TEST SHEET (Pg. 3 of 4)

	POWER SERVICES											Γ		
		A SPARKP	OWER COMPANY				System ID	N	IS#1		Devi	ice ID	B2	20ITI - X
Electric	al Tests													
Turn Rat	tio Test	Test Vol	tage: Automa	atic	X	Oth	er V	-						
Тар Р	osition /	Tap Voltage	Calculated		Н 1	То	H 2	H 2	То	Н	3	H 3	То	H 1
Desig	Ination	v	Ratio		X 1	То	X 2	X 2 To		Х	3	Х3	То	X 1
1 / A	105.00%	45100												
2 / B	102.50%	44000												
3 / C	100.00%	42900	17.862		17.903			17.906				17.902		
4 / D														
5 / E	5 / E 95.00% 40700													
					Excitation Currrent		Percent Deviation	Excitat Currre		Perc Devia		Excita Currr		Percent Deviation
		Tap Posi	ition As Found	3	3 0.310 mA		0.230 %	0.300 mA 0.250		50 %	% 0.220 mA		0.230 %	
		Tap Posi	ition As Left		mA %			mA		%		mA	%	
-	Primary Winding Resistance						Secondary		-				- () -	4
Res	sistance in o	hms at 0.5	A after 1	mii	nute		Resist	ance in m	illi-oh	ims at	5	Α	afte	r 1 minute
H0 - H1		Ν/Α Ω	H1 - H2	3.	500 Ω		X0 - X1	11.070	m	Ω	X1 - X	(2	21.5	500 mΩ
H0 - H2		Ν/Α Ω	H2 - H3	3.4	450 Ω		X0 - X2	10.650	m	Ω	X2 - X	(3	21.3	300 mΩ
H0 - H3	H0 - H3 N/A Ω H3 - H1 3.4			450 Ω		X0 - X3	10.700	m	Ω	X3 - X	(1	21.5	500 mΩ	
	Stabilization Time > 1Mi				nute		St	tabilizatior	n Tim	e >	1		Minu	ute

	1100		ii oliilio at		~	
Ω	X0 - X1	11.070	mΩ	X1 - X2		21.500 mΩ
Ω	X0 - X2	10.650	mΩ	X2 - X3		21.300 mΩ
Ω	X0 - X3	10.700	mΩ	X3 - X1		21.500 mΩ
			-			

Capacitance Test

	Low - Grou	nd	Low - Guar	Low - Guard		Low)	High - Gua	rd	High - Ground		
Capacitance in pico-farads	5165	рF	1800	рF	3362	pF	4752	рF	8123	рF	
Uncorrected D.F. (%)	0.502	%	0.292	%	0.526	%	1.070	%	0.895	%	
Corrected to 20 °C (%)	0.397	%	0.231	%	0.416	%	0.845	%	0.707	%	

Temp. Correction Factor 0.79

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @	V DC after 1 minute	Phase A to Ground	N/A	MΩ
		Phase B to Ground	N/A	MΩ
		Phase C to Ground	N/A	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	10000 V DC af	ter 1 minute			
Phase A to Ground	315000	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground	557000	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground	647000	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	0311	51006	5563	7776
Tested By:	E. COURTNEY, T. LAN	THIER			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

Yes

No X

۷ MΩ

System ID MS#1 **Device ID** B20ITI - X

Dielectric Absorption Test (Insulation Resistance)

	High to Lov	w & Gnd	Low to Hig	gh & Gnd	High & Lo	w to Gnd		
Time	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected		
15 sec	7950 MΩ	10335 MΩ	495 MΩ	644 MΩ	565 MΩ	735 MG		
30 sec	12920 MΩ	16796 MΩ	522 MΩ	679 MΩ	607 MΩ	789 M		
45 sec	14850 MΩ	19305 MΩ	537 MΩ	698 MΩ	622 MΩ	809 M		
1 min	16330 MΩ	21229 MΩ	549 MΩ	714 MΩ	632 MΩ	822 M		
2 min	19450 MΩ	25285 MΩ	590 MΩ	767 MΩ	656 MΩ	853 M		
3 min	21300 MΩ	27690 MΩ	605 MΩ	787 MΩ	680 MΩ	884 M		
4 min	22600 MΩ	29380 MΩ	616 MΩ	801 MΩ	690 MΩ	897 M		
5 min	23600 MΩ	30680 MΩ	632 MΩ	822 MΩ	689 MΩ	896 M		
Test Voltage	10000	v	1000	v	1000	١		
Multiplier	1		1		1			
Polarization Index	1.0	0	1.0	0	1.00			
TCC 1.30		Insulat	ion Resistance Rea	dings Corrected to				

Insulation Resistance

Core Ground Insulation Resistance Resistance in meg-ohms after 1 minute.

Core Ground Accessible

Core Ground Resistance

Test Voltage

Resistance in meg-ohms after 1 minute.									
High to Low & Ground 21229 MΩ @ 10000 V									
Low to High & Ground	714	ΜΩ @	1000	V					
High & Low to Ground 822 MΩ @ 1000 V									



Test Instrument(s)	Manufacturer / Model	Megger
	Serial #	7776

Comments:

Tested By: E. COURTNEY, T. LANTHIER



July 17, 2017

Rideau St. Lawrence 985 Industrial Rd. Prescott, ON K0E 1T0

Attention: John

Re: Maintenance Inspection Report - Our Ref: 15374 Site: Rideau St. Lawrence – MS#2 – 101 Churchill Rd E., Prescott (T1)

To whom it may concern,

Please find the attached report for the installation and inspections completed July 28, 2017.

Tal Trees installed and commissioned a 5000 KVA power transformer. Oil sealing gaskets were replaced for on secondary bushings to repair leaks. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

Power Transformer:



102 Parks Drive, Belleville ONK8N 4Z5OFFICE. 613-968-9648TALTREES.CA



- Transformers were inspected for oil leaks, and visual damage from transportation.
- All grounding of transformers was performed according to OESC standards.
- Primary conductors were replaced to accommodate positioning and dimensions of new transformer.
- Transformers were tested electrically (Turn ratio test, winding resistance, capacitance bridge & dielectric absorption test).

Findings/Repairs:



- Gaskets were replaced on all secondary bushings (4) to repair leaks.
- All transformer test results were satisfactory.

Recommendations:

- Equipment was found to be in satisfactory condition and suitable to be energized.
- Continue with regular scheduled maintenance.





All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all of the recommended repairs listed in this report.

If you have any questions/concerns please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence.

Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville ON. K8N 4Z5







TRANSFORMER DATA SHEET (Pg. 1 of 4)

		A SPARKPOWER COMPANY	,		System ID	MS2	[Device ID		тх	1	
	Custome	r Rideau St. Lawren	20			Date	June 28,	2017				
		s 985 Industrial Rd.,		ON			≠ 15374					
		M.S. #2 (Giant Tige										
		s 101 Churchill Rd. E		cott								
Namer	olate Data											
•	Transformer Class	s Unit Padmount	Pad	mount	Station	x		Other				
Т	ransformer Cooline		x	ONAF	LNAN	DF	RY	Other				
Bushii	ng Configuration	Dead Front	Тор	- Тор 🗙	Top - Side	Side - Si	de	Other				
	Manufacture	r Reliance Power			C	ore & Windings	3		kg		lb	
0	Date of Manufacture	e 1990				anks & Fittings			kg		lb	
	Serial	# C-5201			Ċ	Coolant Volume	1080		Ĺ		Gal	Х
KVA	/ Prov. KVA Rating	g 5000		KVA	(Coolant Weight	t		kg		lb	
	Primary Voltage	e 44000		v		Total Weight	t 35000		kg		lb	Х
	Primary Ampacit	y 65.6		Α	Ter	mperature Rise	55		°C	Χ	°F	
	Secondary Voltage	e 4160		v		HV BIL Rating]		kV			
S	Secondary Ampacit	y 695		Α		LV BIL Rating]		kV			
F	IV Winding Materia				Perc	ent Impedance	;	7.75 %	ONAN		ONAF	
L	LV Winding Materia	1			Та	mper Resistant	t		YES		NO	
C	CSA Specification(s)			Tran	sformer Colour	GRAY					
	Comment	6										
Visual I	Inspection											
N	lameplate Condition	n Satisfactory X	No	t Satisfacto	ory N	J/A	Comments					
Fa	in / Pump Operation	n Satisfactory	No	t Satisfacto	ory N	J/A X	Comments					
G	Ground Connection	s Satisfactory X	No	t Satisfacto	ory N	J/A	Comments					
Liq	uid Levels In Tank	s Satisfactory X	No	t Satisfacto	ory N	J/A	Comments					
	Interlock Operation	n Satisfactory	No	t Satisfacto	ory N	J/A X	Comments					
Tem	p. Gauge Operation	n Satisfactory X	No	t Satisfacto	ory N	I/A	Comments					
C	oolant Temperatur	e 32	°C	X °F	N	lax. Coolant Te	emperature	59	°C	X	°F	
	Comment	S					-					
Oil Con	servator											
	Oil Conservate	or Yes X	No		Conse	ervator Volume	;		L		Gal	
	Silica Gel Breathe	er Yes	No X		Bi	reather Volume	;		L		Gal	
	Silica Gel Colo		lad	Replac		N/A X			-			
	Comment	s										
Tap Cha	anger Data				Vector Dia	gram: De	ltaWye1_	_5.Dyn1				
	osition / signation	Tap Voltages (V)	As Found	As Left			∧ ^{H2}		X2			
1/A	105.00%	46200	i ounu									
2/B	102.50%	45100						$\overline{}$	XO			
3 / C	100.00%	44000							•			
4 / D	97.50%	42900	x	x		Н	H3		X3			
5/E	95.00%	41800			Prima	ary Vector	(Seconda	rv Vec	tor	х	1
	Comments	:		I		,			,			
	Recorded By	D. MACLEAN, C. M	ERCIER									



TRANSFORMER DATA SHEET (Pg. 2 of 4)

POWER SE						
A	SPARKPOWER COMPANY		System ID	MS2	Device ID	TX1
Neutral Grounding Res	sistor (NGR)					
NGR Present	Yes	NoX				
Manufacturer			1	NGR Serial #		
NGR Voltage		v	Ma			
			-			
Comments			-			
Transformer Lightning	Arrestors					
Lightning Arrestors	Yes	No X				
Class	Distribution	Intermediate	Stati	ion		
Composition	Ceramic	Polymer				
Manufacturer			Max.	/ MCOV Rating	1	kV
Catalog #				0_		
Comments						
Interlock						
Key Interlock	Yes	No X				
Interlock Type		Mech.	Utility Lo	ock		
Devices Interlocked	H.V. Switch	Breaker	Trans. E	ncl.	Other	
Manufacturer				Kev Interlock #		
Comments				5		
Fans						
Fans	Yes	No X				
# of Fans				Fan Voltage		
Fan Size						
Horsepower						
Comments			-			
Transformer Load Side	e Conductor Data					
Conductor Type	Cable	Bus Bar X	Con	ductor Size / Dim.	1/2"	
Conductor Material	Aluminum	Copper X		ductors per Phase	-	/ Phase
Tape Shield	Aluminum	Copper		Bond Size / Dim.		7111000
Concentric Neutral	Aluminum	Copper		Bond Conductors		
Insulation Voltage			1	eutral Conductors		
Insulation Type			-	eutral Size / Dim.		
	DARE					
Comments:						



TRANSFORMER TEST SHEET (Pg. 3 of 4)

	OVE	A SERVI	CES OWER COMPANY			Syste	em ID	N	IS2		Dev	ice ID		TX1
Electric	al Tests													
Turn Rat	tio Test	Test Vol	tage: Autom	atic	X Oth	ner	v							
Тар Р	osition /	Tap Voltage	Calculated	ł	H 1 To	ь н	2	H 2	То	Н	3	Н3	То	H 1
Desig	Ination	V	Ratio		X 0 To) X	2	X 0	То	Х	3	X 0	То	X 1
1/A	105.00%	46200												
2 / B	102.50%	45100												
3 / C	100.00%	44000												
4 / D	97.50%	42900	17.862		17.8	877			17.8	79			17.8	82
5/E	95.00%	41800												
					Excitation Currrent	Perc Devi		Excitati Currre		Pero Devi		Excita Currr		Percent Deviation
		Tap Posi	tion As Found	4	2.100 mA	0.0	80 %	1.700	mA	0.0	90 %	2.30	0 mA	0.110 %
		Tap Posi	tion As Left		mA		%		mA		%		mA	%
Primary	Winding I	Resistance				Seco	ndary	Windin	g Re	sistai	nce			
Res	sistance in o	hms at 0.5	A after	1 mir	ute		Resista	ance in m	illi-ohi	ns at	5	Α	after	1 minute
H0 - H1		Ν/Α Ω	H1 - H2	1.9	94 Ω	X0 - X	< 1	7.630	m	Ω	X1 - X	(2	14.8	90 mΩ
H0 - H2		Ν/Α Ω	H2 - H3	1.9	98 Ω	X0 - X	<2	7.610	m	Ω	X2 - X	(3	14.8	60 mΩ
H0 - H3		Ν/Α Ω	H3 - H1	1.9	96 Ω	X0 - X	<3	7.630	m	Ω	X3 - X	(1	14.9	10 mΩ
Capacita	Stabiliz	ation Time >	1	_Mii	nute	1	St	abilization	ı Time	>	1		Minu	ıte
			Low - Grour	nd	Low - Gua	ard	UST	(High - Lo	ow)	Hie	gh - Gua	ard	Hiah	- Ground
С	apacitance	in pico-farads	7685	pF	2.49	pF		5541	pF	;	4915	pF	•	10457 pF
	•	ected D.F. (%)	1.620	%	1.520	%		1.650	%		1.190	%		1.430 %
	Correcte	ed to 20 °C (%)	0.940	%	0.882	%		0.957	%		0.690	%		0.829 %
1 :		rection Factor	0.58											
Lignthin	y Arresto	r Insulation I	resistance											

Resistance in meg-ohms @	N/A	V DC after 1 minute	Phase A to Ground	N/A	MΩ
			Phase B to Ground	N/A	MΩ
			Phase C to Ground	N/A	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	N/A	V DC	after 1 minute			
Phase A to Ground		N/A	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground		N/A	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground		N/A	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	0412	51006	5563	1261
Tested By:	D. MACLEAN, C. MER	CIER			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

Yes

No X

٧ MΩ

A SPARKPOWER COMPANY	System ID	MS2	Device ID	TX1	
Dielectric Absorption Test (Insulation Resistance)					

	High to Lo	w & Gnd	Low to Hig	gh & Gnd	High & Low to Gnd		
Time	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected	
15 sec	1480 MΩ	3078 MΩ	1010 MΩ	2101 MΩ	1570 MΩ	3266 M	
30 sec	1730 MΩ	3598 MΩ	1290 MΩ	2683 MΩ	1990 MΩ	4139 M	
45 sec	1890 MΩ	3931 MΩ	1490 MΩ	3099 MΩ	2170 MΩ	4514 M	
1 min	1980 MΩ	4118 MΩ	1670 MΩ	3474 MΩ	2280 MΩ	4742 M	
2 min	2150 MΩ	4472 MΩ	2030 MΩ	4222 MΩ	2470 MΩ	5138 M	
3 min	2210 MΩ	4597 MΩ	2310 MΩ	4805 MΩ	2550 MΩ	5304 M	
4 min	2230 MΩ	4638 MΩ	2520 MΩ	5242 MΩ	2590 MΩ	5387 M	
5 min	2260 MΩ	4701 MΩ	2680 MΩ	5574 MΩ	2610 MΩ	5429 M	
Test Voltage	10000	v	1000	V	1000	١	
Multiplier	1		1		1		
Polarization Index	1.0	0	1.0	0	1.0	0	
TCC 2.08		Insulat	ion Resistance Rea	dings Corrected to	20 °C		

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohm	s after 1 min	Resistance in meg-ohms after 1 minute.			
High to Low & Ground	4118	ΜΩ @	10000	v	Core Ground Accessible
Low to High & Ground	3474	ΜΩ @	1000	v	Test Voltage
High & Low to Ground	4742	ΜΩ @	1000	v	Core Ground Resistance



Test Instrument(s)	Manufacturer / Model	Megger
	Serial #	1261

Comments:

Tested By: D. MACLEAN, C. MERCIER

July 17, 2017



Rideau St. Lawrence 985 Industrial Rd. Prescott, ON

Attention: John

Re: Oil Analysis Report - Our Ref: 15374 Site: Rideau St. Lawrence - MS#2 - 101 Churchill Rd E., Prescott (T1)

To whom it may concern,

Please find attached the oil analysis results of samples taken recently at your facility.

> Transformer – Reliance Power, Serial no. C-5201 (Main TX)

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. All of the dissolved gases remained within IEEE recommended limits. **We recommend resampling annually (every 12 months).**

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, remaining clear with zero amount of sediment detected, and having a slight amount of water content (27 *ppm*). All of the measured parameters remained within IEEE recommended limits for acceptable inservice operation.

Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence in the future.

Yours Sincerely,

John Portt, CET, PME Vice President, Operations

Phone: (613) 968-9648 Ext: 6202 Mobile: (613) 968-0548 102 Parks Dr. Belleville, ON. K8N 4Z5



102 Parks Drive, Belleville ONK8N 4Z5OFFICE. 613-968-9648TALTREES.CA



Cust PO : 15374 R TALTREES POWER SERV 102 PARKS DRIVE BELLEVILLE K8N 425	IDEAU ST.	SERVICE - LAWRENCE	Lab No File No Cust No Date Rec	
102 PARKS DRIVE BELLEVILLE			Date Red	
102 PARKS DRIVE BELLEVILLE				ceived : JUL 07 2017
BELLEVILLE	ON			
	ON		Analysis	Date : JUL 07 2017
KON A7E			Analyzeo	
Kom 425			Reviewed	
	SA	MPLE IDENTI	IFICATION	
Description : T1				
Rating :	0.5 M	VA Vo	olume :	1080 US GALLONS
HV Rating :	44 k			BOTTOM - MAIN TANK
Manuf. / Date: RELIANC			ampled By :	
Serial No : C5201			ample Date :	
		DEIGOMME		TEST VALUES
TEST 2	ASTM NO.	RECOMME	ENDED LIMITS	IESI VALUES
Dielectric Breakdown	D1816 D877	1mm Gap	23 KV (Min) KV (Min)	1816 - 24 877 -
Neutralization Number	D974		(0.5 - Scrap ams KOH/gram	o) 0.01
Interfacial Tension	D971		Dynes/cm nimum)	34
modifie Crowity	D1298	(60/6	<u>ረሀሪቷ</u>)	0.869
Specific Gravity API Gravity	UT720	(00/0	50 E)	31.3
AFI GLAVILY				31.3
Colour	D1500	0.5 -	- 8.0	1.0
Visual Condition		Clari	ity	CLEAR
	D1524	Sedim	ment	NONE
		Free	Water	NO
Vater Content	D1533	35 p.p	p.m. max	27
Power Factor (25 C)	D924		nax	
Power Factor (100°C)	D924	5.0 % m	nax	
	T	EST EVALUAI	rion —	

OIL IS IN SATISFACTORY CONDITION FOR CONTINUED USE

RECOMMENDATIONS: SAMPLE AS PER SCHEDULE

Notes :

Test results relate only to samples tested as received.

	VED GAS ANA Method D36 JAWRENCE		C No No	: : :	D 201	7-1108 13888 TLT02
TALTREES POWER SERVICES 102 PARKS DRIVE BELLEVILLE ON		Date Analy Analy	Receive ysis Dat yzed By	:e :		
K8N 4Z5		Revie	ewed By	:	1	Jul
SAMI	PLE IDENTIF	ICATION	1			
Description : Tl						
Rating : 0.5 M HV Rating : 44 M Manuf. / Date: RELIANCE POWER Serial No : C5201 Sample Port : BOTTOM - MAIN TA	V Vo 1990 Pr Sy: NK Sa	lume eservat ringe S	cion : Gerial: By :	CONS 32 D.L		PC) 5 GALLONS
COMPONENT	MEASURED	PPM	2	f COM	BUSTIBLI	IS
Hydrogen (H2)		3			2.6	
Oxygen + Argon (O2 + A)	31	510				
Nitrogen (N2)	47	104				
Methane (CH4)		3			2.6	
Carbon Monoxide (CO)		97			82.9	
Carbon Dioxide (CO2)	1	924				
Ethylene (C2H4)		<1			.0	
Ethane (C2H6)		<1			.0	
Acetylene (C2H2)		<1			.0	
Propane (C3H8)		14			12.0	
Total Gas Content	8	.07 9	6			
Combustible Gas Content	:	117 pr	om		.145	00
*PPM = Part Per Million b	oy volume		N.D. =	Not	Detectal	ole

General Comments: FAULT GAS CONCENTRATIONS ARE WITHIN NORMAL RANGE.

Recommendations : SAMPLE AS PER SCHEDULE FOR DISSOLVED GASES

Notes :

Test results relate only to samples tested as received.

RONDAR INC.	333 Centennial Parkway North	Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808	Fax : (905) 561-8871	



November 12th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. KOE 1T0

Attention: Darryl Reynolds

Re: Maintenance Inspection Report - Our Ref: 29995 Site: Prescott MS#3 – 103 Churchill Rd. E, Prescott, ON

Please find the attached report for the maintenance work and inspections completed October 23rd, 2019.

Tal Trees cleaned, serviced, tested & inspected, the main power system. All testing and inspections were performed in accordance to NETA Maintenance Testing Specifications.

Items tested/inspected include:

- o 44KV Air Break Switch
- Lightning Arrestors
- Main Transformer
- Secondary Cables
- Transformer Oil Analysis
- 4.16KV Load Break Switches

A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC) and NETA MTS.



<u>Air Break / Load Break Switches:</u>



- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, as well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.



Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with antioxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer tests were completed on the transformer including turn ratio test, winding resistance, capacitance test and dielectric absorption test (insulation resistance).
- An oil sample was obtained for fluid analysis and DGA.



Findings/Repairs:

- Ground mat installed at 44KV air break switch is currently a temporary mat (chainlink fence) with only one corner connected to ground. Ontario Electrical Safety Code (OESC) rule #36-310 (2) requires the metallic gradient control mat to be connected to the switch handle by two separate conductors not less than 2/0 copper and have dimensions approximately 1.2M x 1.8M.
- Arc contacts on feeder switched 40F1 & 40F2 are in poor condition. At least two of these contacts have been damaged during switch operation.
- Feeder 40F3 fuse was found to be in poor condition and was replaced with a spare link from the substation hut.
- Two fused cutouts were replaced that feed metering on 4.16KV structure.
- Transformer test results were satisfactory except for those highlighted in yellow in the results report. Further investigation may be required to determine the irregularities in these results.

Recommendations:

- Install a proper gradient control mat for the purpose of operating the gang operated air break switch. This mat should be installed in compliance with OESC regulations to ensure safe operation of the switch.
- Replace arc contacts on feeder switches at your convenience to ensure proper load breaking capability of the device.
- Continue with annual substation maintenance.

All other equipment that we tested appears in satisfactory condition, suitable for continued service.

Please give us a call should you wish us to provide you pricing and services for any or all the recommended repairs listed in this report.

If you have any questions/concerns, please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence Utility.

Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 dmaclean@taltrees.ca Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA





HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	RVICES	System ID	PRESCOTT	MS#3	Device ID	E201T1-L	-
Customer Address	Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON Prescott MS #3	System Ne		Octobe 29995	er 23rd, 2019		
	103 Churchill Rd. E., Prescott, ON						
Nameplate Data							
Switch Mounting	Metal Enclosed Pole		ver X		Other		
Switch Type	Load Break Air Break	K			Other		
Manufacturer	DOMINION		BIL Rating				kV
Date Of Manufacture			Feeder ID	BROC	KVILLE		
Serial #	820-1		Feeds To	T1			
Catalog #			upting Rating				Α
Nom. / Max. Voltage	46.0 / 48.3 kV	Continue	ous Ampacity				Α
Comments							
Lightning Arrestors							
Lightning Arrestors	Yes X No						
Class	Distribution Intermediate	Stati	on X				
Composition	Ceramic Polymer	K					
Manufacturer	OHIO BRASS	Max. /	MCOV Rating		48.3 /	39.0	kV
Catalog #	300039						
Comments							
Protective Device Data	а						
Primary Fuse Holder Da	ta	Primary Fu	ise Link Dat	ta			
Manufacturer		-	Manufacturer				
Туре	SMD-1A		Туре	SMD-2	С		
Nom. / Max. Voltage	46.0 / 48.3 kV		Link Size	100			Α
Holder Max. Fuse Link	300E		TCC #	153-1			
Holder Catalog #	118925R1	L	ink Catalog #	465100	R3		
Primary Fuse Link Spar	es / Location						
Spare Primary Fuses	Yes No Z	K	# of Spares				
Spare Location							
Comments	RECOMMEND KEEPING SPARES OF	I SITE.					
Interlock							
Key Interlock	Yes No Z	K					
Interlock Type	Electrical Mechanical	Utility La	ock				
Devices Interlocked		Trans. Er		Ot	her		
Manufacturer			Key Interloc				
Comments			,	··			
Load Side Conductor	Data						
Conductor Type		K Cond	luctor Size / Di	im 1/2'			
Conductor Material			uctors per Pha		JULID KUU	/ Ph	
Tape Shield	Aluminum Copper 2		Bond Size / Di			/ 71	1036
Concentric Neutral	Aluminum Copper	_	Bond Coducto		•		
Insulation Voltage			utral Conducto				
•	BARE CONDUCTOR		eutral Size / Di				
Comments					-		
commonito	CHAINLINK FENCE INSTALLED AS 1	EMPORARY	GROUND MA	T - REC		STALLING	
	STANDARD 4FTX6FT GRADIENT GR						

Recorded By: J. ROGERS



HIGH VOLTAGE SWITCH TEST SHEET (Pa. 2 of 2)

ROW	ER SERVI	CES		_	-		•••==•	1- 3		/
- F O VV		CES FOWER COMPANY		System ID	PRESCOTT	MS#3	Device II)	E201T1	I-L
Visual Inspec	tion / Mechan	ical Tests								
-	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Insula	tor Condition	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Arc	Suppressors	Satisfactory	Not Satisfa	actory	N/A X	Con	nments			
Key Interlo	ck Operation	Satisfactory	Not Satisfa	actory	N/A X	Corr	nments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Switch Conditi	ion / Operation									
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Simultan	eous Closure	Satisfactory X	Not Satisfa	actory	N/A	Corr	nments			
Electrical Tes	sts									
Earth Resistan	ce (3-Point Tes	st)		Arc Suppre	ssor Conta	ct Re	sistance			
Earth Resista	nce in Ohms.			Arc Suppre	essor Contac	t Resis	tance in Ohn	ıs.		
				Phase A		N/A		Ω		
Earth Resista	nce	N/A	Ω	Phase B		N/A		Ω	-	
				Phase C		N/A	L	Ω		
Switch Insulat	ion Resistance			Switch / Fus	se Contact	Resis	tance			
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro-Ohr	ns afte	r 1 minute.			
Test Voltage	1 kV 2 k	KV 5 kV	10 kV X	Test Curren	it 10 A	۱				
	Phase A	Phase B	Phase C	-	Phase	e A	Phase B		Phase	e C
Phase to GND	6840 MΩ	511000 MΩ	45900 MΩ	Contacts		μΩ		Ωι	317	μΩ
				Fuse	e 738	μΩ	732	ΩL	718	μΩ
				Overa	1030	μΩ	1150	Ωι	1010	μΩ
Load Side Con	ductor Insulati	on Resistance								
Resistance	in Meg-Ohms @	10000 V I	C after 1 minute	e F	hase A to G	round	6	340		MΩ
				F	hase B to G	round	51	1000		MΩ
				P	hase C to G	round	45	9000		MΩ
Lightning Arre	stor Insulation	Resistance								
Resistance	in Meg-Ohms @	10000 V I	DC after 1 minute	e F	hase A to G	round	16	5500		MΩ
				F	hase B to G	round	15	9700		MΩ
				P	hase C to G	round	13	9000		MΩ
O	0.h.o.o.m.co.tio									

Comments / Observations

Test Instrument(s)

Manufacturer / Model	
Serial #	

Megger Ductor 7776 8B04

Tested By: J. ROGERS



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	4160 FEE	DER	Device ID	40F1
Customer	Rideau St. Lawrence	e Utilitv		Date	Octob	oer 23rd, 2019	
	985 Industrial Rd., P	•	_		29995	•	
	Prescott MS #3		System Ne	utral Present			
	103 Churchill Rd. E.	, Prescott, ON					
Nameplate Data							
Switch Mounting	Metal Enclosed	Pole	Tow	er X		Other	
Switch Type	Load Break					Other	
	S&C ALDUTI RUPTE			DII Doting	05		kV
Date Of Manufacture	Sac ALDUTI RUPTE	.R	_	BIL Rating Feeder ID			ĸv
Serial #			_	Feeds To		ED #1	
Catalog #			Intorr	upting Rating			•
•		′.5 kV	-	ous Ampacity			A A
Nom. / Max. Voltage Comments		. J KV	Continue	us Ampacity	400		A
	I TPE KS						
Lightning Arrestors			٦				
Lightning Arrestors	Yes X	No	_				
Class	Distribution X	Intermediate	Statio	on			
Composition	Ceramic X	Polymer					
Manufacturer			Max. / I	MCOV Rating	l	1	kV
Catalog #							
Comments							
Protective Device Dat	а						
Primary Fuse Holder Da	ita		Primary Fu	se Link Da	ta		
Manufacturer	S&C		1	Manufacturer	S&C		
Туре	SMP-W		_	Туре	SM-5		
Nom. / Max. Voltage	7.2 / 7	′.5 kV	_	Link Size	400		Α
Holder Max. Fuse Link	400A		_	TCC #	119-4		
Holder Catalog #	86151		Li	nk Catalog #	26160	0R4	
Primary Fuse Link Spar	es / Location						
Spare Primary Fuses		No		# of Spares	6		
Spare Location							
	SUBSTATION HUT						
Interlock							
			٦				
Key Interlock	Yes	No X	-				
Interlock Type	Electrical	Mechanical	Utility Lo				
Devices Interlocked	H.V. Switch	Breaker	Trans. Er			ther	
Manufacturer				Key Interloc	k #		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X	Bus Bar	Cond	uctor Size / D	im. 1/C	OVERHEAD	
Conductor Material	Aluminum X	Copper		ctors per Pha			/ Phase
Tape Shield	Aluminum	Copper	-	Bond Size / D		A	
Concentric Neutral	Aluminum	Copper	-	Bond Coduct			
Insulation Voltage				utral Conduct			
Ŭ	BARE CONDUCTOR	2	_			OVERHEAD	
Comments							
Recorded By:	D. MACLEAN, E. CO	URTNEY					

Rev Date (06/1/15)



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERVI	CES							
1011		POWER COMPANY		System ID	4160 FEEDER	2 Dev	ice ID	40F 1	
Visual Inspec	ction / Mechar	nical Tests							
Namepl	ate Condition	Satisfactory X	Not Satisfa	actory 1	N/A	Comments			
Insula	ator Condition	Satisfactory X	Not Satisfa	actory I	N/A	Comments			
Ground	Connections	Satisfactory X	Not Satisfa	actory I	N/A	Comments			
Lightn	ning Arrestors	Satisfactory X	Not Satisfa	actory I	N/A	Comments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory I	N/A	Comments			
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory I	N/A X (Comments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory I	N/A	Comments			
Switch Conditi	ion / Operation								
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory I	N/A (Comments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory I	N/A (Comments			
Simultan	eous Closure	Satisfactory	Not Satisfa	actory	N/A X (Comments	INDIVID	JAL SW	'S
Electrical Tes	sts								
Earth Resistan	nce (3-Point Tes	st)		Arc Suppres	sor Contact	Resistan	се		
Earth Resista	nce in Ohms.			Arc Suppres	ssor Contact Re	esistance i	n Ohms.		
				Phase A		N/A		Ω	
Earth Resistance Ν/Α Ω		Phase B	N/A			Ω			
			Phase C		Ω				
Switch Insulat	ion Resistance	•		Switch / Fus	e Contact Re	sistance			
Resistance in M	eg-Ohms after 1	minute.		Resistance in	n micro-Ohms a	after 1 min	ute.		
Test Voltage 1 kV 2 kV 5 kV X 10 kV			Test Current						
				_					
	Phase A	Phase B	Phase C	0	Phase A		ase B	Phas	-
Phase to GND	3760 MΩ	3840 MΩ	3310 MΩ	Contacts Fuse		Ω 72	•	70	μΩ
				Overall		Ω 353 Ω	β μΩ μΩ	380	Ωμ μΩ
		iam Daaiatamaa		Overall	۲	22	μι		μ12
		ion Resistance							
Resistance in Meg-Ohms @ 5000 V DC after 1 minut					3760		MΩ		
		Phase B to Ground Phase C to Ground			3840		MΩ		
				Pr	lase C to Grou	na	3310		MΩ
	stor Insulation								
Resistance	in Meg-Ohms @	1000 V	DC after 1 minut		hase A to Grou		2000		MΩ
					hase B to Grou		847		MΩ
				Pł	nase C to Grou	nd	2000		MΩ

Comments / Observations

BØ ARC CONTACT ON SWITCH IS DAMAGED (HOLE)

Test Instrument(s)

Manufacturer / Model N Serial #

Megger Ductor 6400 8B04

Tested By: D. MACLEAN, E. COURTNEY


HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY		System ID	4160 FEE	DER	Device ID	40F2
Customer	Rideau St. Lawrence	e Utilitv		Date	Octor	oer 23rd, 2019	
	985 Industrial Rd., P	•	=		29995	•	
	Prescott MS #3		System Ne	utral Present			
	103 Churchill Rd. E.	, Prescott, ON					
Nameplate Data							
Switch Mounting	Metal Enclosed	Pole	Tow	er X		Other	
Switch Type	Load Break		101			Other	
	S&C ALDUTI RUPTE			DII Doting	05		kV
Date Of Manufacture	Sac ALDUTI RUPTE	.R	-	BIL Rating Feeder ID			K V
Serial #			-	Feeds To		ED #2	
Catalog #	26004		Intorr	upting Rating		ER #2	•
•		.5 kV	-	ous Ampacity			A
Nom. / Max. Voltage Comments		.5 KV	Continue	us Ampacity	400		A
	I IFE K3						
Lightning Arrestors			1				
Lightning Arrestors	Yes X	No					
Class	Distribution X	Intermediate	Statio	on			
Composition	Ceramic X	Polymer					
Manufacturer			Max. / I	MCOV Rating		1	kV
Catalog #							
Comments							
Protective Device Dat	а						
Primary Fuse Holder Da	ta		Primary Fu	se Link Da	ta		
Manufacturer	S&C		1	Manufacturer	S&C		
Туре	SMP-W			Туре	SM-5		
Nom. / Max. Voltage	7.2 / 7	.5 kV	_	Link Size	400		Α
Holder Max. Fuse Link	400A		_	TCC #	119-4		
Holder Catalog #	86151		Li	ink Catalog #	26160	0R4	
Primary Fuse Link Spar	es / Location						
Spare Primary Fuses	Yes X	No]	# of Spares	6		
Spare Location			1				
	SUBSTATION HUT						
Interlock							
			1				
Key Interlock	Yes	No X					
Interlock Type	Electrical	Mechanical	Utility Lo		_		
Devices Interlocked	H.V. Switch	Breaker	Trans. En			ther	
Manufacturer				Key Interloc	k #		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X	Bus Bar	Condu	uctor Size / D	im. 1/C	OVERHEAD	
Conductor Material	Aluminum X	Copper	Condu	ictors per Pha	ase 1		/ Phase
Tape Shield	Aluminum	Copper	-	' Bond Size / D		A	
Concentric Neutral	Aluminum	Copper	-	Bond Coduct			
Insulation Voltage		• •		utral Conduct			
Ŭ	BARE CONDUCTOR		_			OVERHEAD	
Comments				, D			
Recorded By:	D. MACLEAN, E. CO	URTNEY					

Rev Date (06/1/15)



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERVI	CES		L					
		POWER COMPANY		System ID	4160 FEED	ER Devi	ice ID	40F2	2
Visual Inspec	tion / Mechar	nical Tests							
-	ate Condition	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Insula	tor Condition	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Ground	Connections	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory	N/A X	Comments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Switch Conditi	ion / Operation								
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory	N/A	Comments			
Simultan	eous Closure	Satisfactory	Not Satisfa	actory	N/A X	Comments	INDIVIDU	JAL SW	S
Electrical Tes	sts								
Earth Resistan	ice (3-Point Tes	st)		Arc Suppres	ssor Contac	ct Resistan	се		
Earth Resista	nce in Ohms.			Arc Suppre	ssor Contact	Resistance ir	n Ohms.		
				Phase A		N/A	9	2	
Earth Resista	nce	N/A	Ω	Phase B		N/A	1	2	
				Phase C		N/A	1	Ω	
Switch Insulat	ion Resistance			Switch / Fus	se Contact l	Resistance			
Resistance in M	eg-Ohms after 1	minute.		Resistance	in micro-Ohm	s after 1 minu	ute.		
Test Voltage	1 kV 2 I	kV 5 kV	X 10 kV	Test Curren	t 10 A				
				_					
	Phase A	Phase B	Phase C	_	Phase		ase B	Phas	-
Phase to GND	3760 MΩ	3840 MΩ	3310 MΩ	Contacts	-	μΩ 103	•	88	μΩ
				Fuse		μΩ 546	•	566	μΩ
				Overa		μΩ	μΩ		μΩ
Load Side Con	ductor Insulati	ion Resistance							
Resistance	in Meg-Ohms @	5000 V	DC after 1 minut	e P	hase A to Gro	ound	3760		MΩ
				P	hase B to Gro	ound	3840		MΩ
				Р	hase C to Gro	ound	3310		MΩ
Lightning Arre	stor Insulation	Resistance							
Resistance	in Meg-Ohms @	1000 V	DC after 1 minut	e P	hase A to Gro	ound	1150000		MΩ
	_			P	hase B to Gro	ound	668000		MΩ
				P	hase C to Gro	ound	1578000		MΩ

Comments / Observations

AØ ARC CONTACT ON SWITCH IS DAMAGED (HOLE)

Test Instrument(s)

Manufacturer / Model Serial #

Megger Ductor 6400 8B04

Tested By: D. MACLEAN, E. COURTNEY



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

- FOVER SE	SPARKPOWER COMPANY	System ID	4160 FEE	DER	Device ID	40F3
Customer Address Site	Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON Prescott MS #3	System Neu	Job #	Octob 29995	per 23rd, 2019	
	103 Churchill Rd. E., Prescott, ON	_				
Nameplate Data Switch Mounting Switch Type	Metal Enclosed Pole Load Break X Air Break	Towe	r X		Other Other	
Date Of Manufacture	S&C ALDUTI RUPTER 1961		BIL Rating Feeder ID	40F3	FD #2	kV
# Serial # Catalog	36011R4	Interru	Feeds To pting Rating		ER #3	Α
Nom. / Max. Voltage Comments		Continuou	us Ampacity	600		A
Lightning Arrestors						
Lightning Arrestors Class Composition Manufacturer	YesXNoDistributionXIntermediateCeramicXPolymer	Station Max. / M	n		1	kV
Catalog # Comments						
Protective Device Dat	 A					
Primary Fuse Holder Da		Primary Fus	o Link Da	-a		
Manufacturer		-	lanufacturer			
	SMP-W			SM-5		
Nom. / Max. Voltage	7.2 / 7.5 kV		Link Size			Α
Holder Max. Fuse Link	400A		TCC #	119-4		
Holder Catalog #	86151	Lin	ik Catalog #	26160	0R4	
Primary Fuse Link Spar	es / Location					
Spare Primary Fuses Spare Location	Yes X No		# of Spares	6		
Comments	SUBSTATION HUT					
Interlock						
Key Interlock Interlock Type Devices Interlocked Manufacturer Comments	Electrical Mechanical	Utility Loc Trans. End			ther	
Load Side Conductor	Data					
Conductor Type Conductor Material Tape Shield Concentric Neutral Insulation Voltage Insulation Type Comments	CableXBus BarAluminumXCopperAluminumCopperAluminumCopperN/ABARE CONDUCTOR	Conduc B # of B # of Neut	ctors per Pha ond Size / Di Bond Coducto tral Conducto	ise 1 m. N// ors 0 ors 1	O OVERHEAD	/ Phase

Recorded By: D. MACLEAN, E. COURTNEY



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERVI	CES					•	-	
		POWER COMPANY		System ID	4160 FEEDE	ER Devi	ice ID	40F;	3
Visual Inspec	tion / Mechar	nical Tests							
-	ate Condition	Satisfactory X	Not Satisfa	actory N	N/A	Comments			
Insula	ator Condition	Satisfactory X	Not Satisfa	actory N	N/A	Comments			
Ground	Connections	Satisfactory X	Not Satisfa	actory 1	N/A	Comments			
Lightn	ning Arrestors	Satisfactory X	Not Satisfa	actory N	N/A	Comments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory 1	N/A	Comments			
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory N	N/A X	Comments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory 1	N/A	Comments			
Switch Conditi	ion / Operation		_						
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory 1	N/A	Comments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory N	N/A	Comments			
Simultan	eous Closure	Satisfactory	Not Satisfa	actory 1	N/A X	Comments	INDIVID	UAL SW	'S
Electrical Tes	sts								
Earth Resistan	nce (3-Point Tes	st)		Arc Suppres	sor Contac	t Resistan	се		
Earth Resista	nce in Ohms.			Arc Suppres	sor Contact	Resistance ir	n Ohms.		
				Phase A		N/A		Ω	
Earth Resista	nce	N/A	Ω	Phase B		N/A		Ω	
				Phase C		N/A		Ω	
Switch Insulat	ion Resistance			Switch / Fus	e Contact F	Resistance			
Resistance in M	eg-Ohms after 1	minute.		Resistance in	n micro-Ohm	s after 1 minu	ute.		
Test Voltage	1 kV 2	kV 5 kV	X 10 kV	Test Current	10 A				
	Phase A	Phase B	Phase C	_	Phase /	A Pha	ase B	Phas	se C
Phase to GND	3760 MΩ	3840 MΩ	3310 MΩ	Contacts	45	μΩ 74	μΩ	66	μΩ
		•		Fuse	826	μΩ 109	0 μΩ	257	μΩ
				Overall		μΩ	μΩ		μΩ
Load Side Con	nductor Insulati	ion Resistance							
Resistance	in Meg-Ohms @	5000 V	DC after 1 minut	e Pł	nase A to Gro	ound	3760		MΩ
				Pł	nase B to Gro	ound	3840		MΩ
				Ph	nase C to Gro	ound	3310		MΩ
Lightning Arre	stor Insulation	Resistance							
	in Meg-Ohms @		DC after 1 minut	e Pł	nase A to Gro	ound	86300		MΩ
	- 0			Pł	nase B to Gro	ound	2600		MΩ
				Pł	nase C to Gro	ound	4800		MΩ
	<u> </u>								

Comments / Observations

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 6400 8B04

Tested By: D. MACLEAN, E. COURTNEY



HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	SPARKPOWER COMPANY	System ID	4160 FEEI	DER	Device ID	40F4
Customer	Rideau St. Lawrence Utility		Date	Octob	per 23rd, 2019	
	985 Industrial Rd., Prescott, ON			29995		
Site	Prescott MS #3	System Ne	utral Present			
Site Address	103 Churchill Rd. E., Prescott, O	N				
Nameplate Data						
Switch Mounting	Metal Enclosed Po	le Tow	er X		Other	
Switch Type	Load Break X Air Brea	ık			Other	
Manufacturer	S&C ALDUTI RUPTER		BIL Rating	95		kV
Date Of Manufacture			Feeder ID	40F4		
Serial #			Feeds To		ER #4	
Catalog #	36001		upting Rating			Α
Nom. / Max. Voltage	7.5 / 7.5	kV Continuo	ous Ampacity	400		Α
Comments	TYPE RS					
Lightning Arrestors						
Lightning Arrestors	Yes X N	0				
Class	Distribution X Intermediat	te Statio	on			
Composition	Ceramic X Polyme	er				
Manufacturer		Max. / Max.	MCOV Rating		Ι	kV
Catalog #						
Comments						
Protective Device Date	а					
Primary Fuse Holder Da	ta	Primary Fu	se Link Dat	a		
Manufacturer	S&C		Manufacturer	S&C		
Туре	SM-5		Туре	SM-5		
Nom. / Max. Voltage	7.2 / 8.3	kV	Link Size	400		Α
Holder Max. Fuse Link	400E		TCC #	119-4		
Holder Catalog #	86151R2	Li	nk Catalog #	26160	0R4	
Primary Fuse Link Spar	es / Location					
Spare Primary Fuses	Yes X N	0	# of Spares	6		
Spare Location						
Comments	SUBSTATION HUT					
Interlock						
Key Interlock	Yes	οΧ				
Interlock Type	Electrical Mechanica		ck 🗌			
Devices Interlocked				0	ther	
Manufacturer			Key Interloc			
Comments			,			
Load Side Conductor	Data					
Conductor Type	Cable X Bus Ba	or Condu	uctor Sizo / Di	m 3/		
Conductor Type Conductor Material	Cable X Bus Ba Aluminum X Coppe		ctors per Pha		OVERHEAD	/ Phase
Tape Shield	Aluminum Coppe		Bond Size / Di		Δ	/ FliaSe
Concentric Neutral	Aluminum Coppe		Bond Coducto		<u>n</u>	
Insulation Voltage			utral Conducto			
Ŭ	BARE CONDUCTOR				OVERHEAD	
Comments						
Comments						

Recorded By: D. MACLEAN, E. COURTNEY



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERV	ICES				_	-	-	
		POWER COMPANY		System ID	4160 FEEDER	Devi	ice ID	40F4	ļ
Visual Inspec	tion / Mechai	nical Tests							
Namepl	ate Condition	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Insula	ator Condition	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Ground	Connections	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Lightn	ing Arrestors	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Arc	Suppressors	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Key Interlo	ock Operation	Satisfactory	Not Satisfa	actory N	/A X Co	mments			
Ground Strap	s & Materials	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Switch Conditi	ion / Operation		-						
Switch Ope	ration As Left	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Contact Surfa	ace Condition	Satisfactory X	Not Satisfa	actory N	/A Co	mments			
Simultan	eous Closure	Satisfactory	Not Satisfa	actory N	/A X Co	mments	INDIVIDU	JAL SW'	S
Electrical Tes	sts								
Earth Resistan	nce (3-Point Te	st)		Arc Suppress	sor Contact R	esistan	се		
Earth Resista	nce in Ohms.			Arc Suppress	sor Contact Res	istance ir	n Ohms.		
				Phase A	N			2	
Earth Resista	nce	N/A	Ω	Phase B	N	Ά	2	2	
				Phase C	N	Ά	2	2	
Switch Insulat	ion Resistance	;		Switch / Fuse	Contact Res	istance			
Resistance in M	eg-Ohms after 1	minute.		Resistance in	micro-Ohms aft	er 1 minu	ute.		
Test Voltage	1 kV 2	kV 5 kV	X 10 kV	Test Current	10 A	_			
	Phase A	Phase B	Phase C	_	Phase A	Pha	ase B	Phase	e C
Phase to GND	3760 MΩ	3840 MΩ	3310 MΩ	Contacts	61 μΩ	57	μΩ	57	μΩ
				Fuse	226 μΩ	250) μΩ	290	μΩ
				Overall	μΩ		μΩ		μΩ
Load Side Con	nductor Insulat	ion Resistance							
Resistance	in Meg-Ohms @	5000 V	DC after 1 minut	e Ph	ase A to Ground		3760		MΩ
				Ph	ase B to Ground		3840		MΩ
				Pha	ase C to Ground		3310		MΩ
Lightning Arre	stor Insulation	Resistance							
Resistance	in Meg-Ohms @	1000 V	DC after 1 minut	e Ph	ase A to Ground	1	3560		MΩ
	-			Ph	ase B to Ground		3830		MΩ
				Pha	ase C to Ground		10000		MΩ
	0 k								

Comments / Observations

Test Instrument(s)

Manufacturer / Model Serial # Megger Ductor 7739 8B04

Tested By: D. MACLEAN, E. COURTNEY



TRANSFORMER DATA SHEET (Pg. 1 of 4)

	POWER SE	RVICES										
	А	SPARKPOWER COMPANY	r	:	System ID	PRESCOTT	NS#3	Device ID		T	1	
	Customer	Rideau St. Lawrer	ce Utility			Date	Octobe	r 23rd, 201	9			
	Customer Address	985 Industrial Rd.	Prescott,	ON		Job #	29995					
	Site	Prescott MS #3										
	Site Address	103 Churchill Rd.	E., Prescot	tt, ON								
Name	olate Data											
-	Transformer Class	Unit Padmount	Padn	nount	Station	X		Other				
	ransformer Cooling			DNAF	LNAN	DR	Y	Other		ONS	3	
	ng Configuration	Dead Front		- Тор 🗙	Top - Side	Side - Sic	le	Other				
	Manufacturer	ARCHER			Co	re & Windings	14300		kg		lb	X
D	ate of Manufacture	1963				anks & Fittings			kg		lb	X
_		NO SERIAL NUME	BER			oolant Volume			L			Х
KVA	/ Prov. KVA Rating			KVA		oolant Weight			kg			х
	Primary Voltage			v		Total Weight			kg		lb	X
	Primary Ampacity			A	Ten	perature Rise			°C	X	°F	
	Secondary Voltage			V		HV BIL Rating			kV		- (
	econdary Ampacity			A		LV BIL Rating			kV			
	V Winding Material				Perce	ent Impedance		6.30 %	ONAN	X	ONAF	
	V Winding Material					, nper Resistant			YES		NO	Х
	SA Specification(s)					former Colour	GREY				- (
	Comments											
Na Far G	Inspection ameplate Condition n / Pump Operation round Connections uid Levels In Tanks	Satisfactory Satisfactory	Not Not	Satisfactor Satisfactor Satisfactor Satisfactor	y N y X N	I/A X C	Comment Comment Comment Comment	s s 1 GROU	OT LE			DN
	Interlock Operation	-	-	Satisfactor	-	/A X C	Comment	s				
Temp	b. Gauge Operation	Satisfactory	Not	Satisfactor	y X N	I/A C	Comment	s NC	OT WO	RKI	NG	
Co	oolant Temperature Comments		°C	X °F	Ma	ax. Coolant Ter	mperatur	e 60	°C	X	°F	
Oil Con	servator											
	Oil Conservato Silica Gel Breathe Silica Gel Colou Comments	r Yes r Good E	No X Bad	Replace	Bre	ervator Volume eather Volume N/A X			_ L		Gal Gal	
Tap Cha	anger Data				Vector Dia	gram: Del	taWye1	5.Dyn1				
	osition / signation	Tap Voltages (V)	As Found	As Left		^	H2		X2			
1/A	105.00%	45200	round	2011			\ x	1 /	Ve			
2/B	102.50%	44000					\	$\overline{}$	X0			
3/C	100.00%	42800	X	X					¥2			
4/D	97.50%	41600				н	H3		X3			
5/E	95.00%	40400			Prima	ry Vector X		Seconda	ry Vec	tor	x	
L	Comments:		1			,, ,			,			
	Comments.											

Recorded By: D. MACLEAN, M. GRAHAM



TRANSFORMER DATA SHEET (Pg. 2 of 4)

A	SPARKPOWER COMPANY		System ID	PRESCOTT MS	#3 Device ID	T1
Neutral Grounding Re	esistor (NGR)					
NGR Present		No	K			
Manufacturer				NGR Serial #		
NGR Voltage				kimum Current		Α
NGR Resistance		2	2	NGR Location		
Comments						
Transformer Lightning	g Arrestors					
Lightning Arrestors	s Yes	No 2	K			
Class		Intermediate	Stati	on		
Composition	Ceramic	Polymer				
Manufacturer			Max.	/ MCOV Rating	1	kV
Catalog #						
Comments						
Interlock						
Key Interlock	Yes	No	K			
Interlock Type		Mech.	Utility Lo	ck		
Devices Interlocked	H.V. Switch	Breaker	Trans. Er	ncl.	Other	
Manufacturer				Key Interlock #		
Comments				,		
Fans						
Fans	Yes	No 2	K			
# of Fans				Fan Voltage		
Fan Size				Frame Size		
Horsepower						
Comments						
Transformer Load Sid	le Conductor Da	ta				
Conductor Type	Cable	Bus Bar	K Cond	uctor Size / Dim	1" ROUND BAR	
Conductor Material	Aluminum			uctors per Phase		/ Phase
Tape Shield	Aluminum	Copper		Bond Size / Dim.		
Concentric Neutral	Aluminum	Copper	# of E	Bond Conductors	0	
Insulation Voltage	N/A		# of Ne	utral Conductors	0	
Insulation Type	BARE BUS		Ne	eutral Size / Dim.	N/A	
Comments:						
Recorded By:	D. MACLEAN, M. G	RAHAM				



TRANSFORMER TEST SHEET (Pg. 3 of 4)

System ID PRESCOTT MS#3 Device ID T1

Electrical Tests

Tap Position / Tap Voltage		Calculated		H 1 To	H 2	H 2 To	H 3	Н 3 То	H 1	
Desig	gnation	v	Ratio		X 0 To	X 2	X 0 To	Х З	X 0 To	X 1
1/A	102.50%	45200								
2 / B	100.00%	44000								
3 / C	97.30%	42800	17.820		17.6	31	17.	630	17.6	14
4 / D	94.50%	41600								
5/E	91.80%	40400								
					Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviatior
		Tap Posit	tion As Found	3	2.200 mA	<mark>-1.060</mark> %	1.500 mA	<mark>-1.070</mark> %	1.600 mA	<mark>-1.160</mark> %
		Tap Posit	tion As Left	3	mA	%	mA	%	mA	9

Primary Winding Resistance

Resistance in ohms at 0.5 A after 1 minute Resistance in milli-ohms at 5 A after 1 minute H0 - H1 Ν/Α Ω Ω H1 - H2 X0 - X1 6.800 mΩ X1 - X2 13.400 mΩ 1.910 H0 - H2 Ν/Α Ω H2 - H3 1.910 Ω X0 - X2 6.900 mΩ X2 - X3 13.400 mΩ H0 - H3 Ν/Α Ω H3 - H1 1.920 Ω X0 - X3 6.900 mΩ X3 - X1 13.500 mΩ Minute

Stabilization Time > 1

Stabilization Time > 1

Secondary Winding Resistance

Minute

Capacitance Test

	Low - Grou	Ind	Low - Gua	rd	UST (High -	Low)	High - Gua	rd	High - Grou	und
Capacitance in pico-farads	7267	рF	1743	рF	5524	pF	8372	pF	13872	рF
Uncorrected D.F. (%)	0.413	%	1.040	%	0.160	%	4.730	%	3.280	%
Corrected to 20 °C (%)	0.413	%	1.040	%	0.160	%	4.730	%	3.280	%

Temp. Correction Factor 1

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @	V DC after 1 minute	Phase A to Ground	N/A	MΩ
		Phase B to Ground	N/A	MΩ
		Phase C to Ground	N/A	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	5000	V DC	after 1 minute			
Phase A to Ground		3760	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground		3840	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground		3310	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger 7776
	Serial #	184	51006	7123	7776
Tested By	C D. MACLEAN. M. GRAH	AM			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

System ID PRESCOTT MS#3

Device ID T1

Dielectric Absorption Test (Insulation Resistance)

	-	-	-							
		High to Lo	w & Gnd	Low to Hi	gh & Gnd	High & Lo	w to Gnd			
Tin	ne	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected			
15 s	sec	2900 MΩ	870 MΩ	1960 MΩ	588 MΩ	1760 MΩ	528 MΩ			
30 s	sec	3810 MΩ	1143 MΩ	2470 MΩ	741 MΩ	2300 MΩ	690 MΩ			
45 s	sec	4440 MΩ	1332 MΩ	2790 MΩ	837 MΩ	2550 MΩ	765 MΩ			
1 m	nin	4830 MΩ	1449 MΩ	3040 MΩ	912 MΩ	2750 MΩ	825 MΩ			
2 m	nin	5820 MΩ	1746 MΩ	3810 MΩ	1143 MΩ	3220 MΩ	966 MΩ			
3 m	nin	6430 MΩ	1929 MΩ	4400 MΩ	1320 MΩ	3500 MΩ	1050 MΩ			
4 m	nin	6850 MΩ	2055 MΩ	4880 MΩ	1464 MΩ	3690 MΩ	1107 MΩ			
5 m	nin	7140 MΩ	2142 MΩ	5290 MΩ	1587 MΩ	3870 MΩ	1161 MΩ			
6 m	nin	7390 MΩ	2217 Μ Ω	5580 MΩ	1674 MΩ	4000 MΩ	1200 MC			
7 m	nin	7570 MΩ	2271 MΩ	5870 MΩ	1761 MΩ	4120 MΩ	1236 MG			
8 m	nin	7770 MΩ	2331 MΩ	6110 MΩ	1833 MΩ	4240 MΩ	1272 MG			
9 m	nin	7910 MΩ	2373 MΩ	6340 MΩ	1902 MΩ	4330 MΩ	1299 MC			
10 r	min	8030 MΩ	2409 MΩ	6550 MΩ	1965 MΩ	4430 MΩ	1329 MC			
Test V	oltage	10000	V	1000	V	1000	V			
Multi	plier	1			1	1				
Polarizati	on Index	1.6	6	2.	15	1.6	61			
TCC	0.30		Insulation Resistance Readings Corrected to 20 °C							

Insulation Resistance

Core Ground Insulation Resistance

Resistance in meg-ohms after	1 minute.				Resistance in meg-ohms after 1 minu	ite.	
High to Low & Ground	1449	ΜΩ @	10000	V	Core Ground Accessible	Yes	No X
Low to High & Ground	912	ΜΩ @	1000	v	Test Voltage	V	
High & Low to Ground	825	ΜΩ @	1000	V	Core Ground Resistance	MΩ	



Test Instrument(s)

Manufacturer / Model Megger Serial # 7776

Comments:

Tested By: D. MACLEAN, M. GRAHAM



November 14th, 2019

Rideau St. Lawrence Utility 985 Industrial Rd., Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re: Oil Analysis Report - Our Ref: 29995 Site: Prescott MS#3 – 103 Churchill Rd. E, Prescott, ON

Please find attached the oil analysis results of samples taken recently at your facility.

Transformer - Archer, Serial no. N/A (T1)

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, remaining clear with zero amount of sediment detected, and having a slight amount of water content (*17 ppm*). All the measured parameters remained within IEEE recommended limits for acceptable inservice operation.

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. All the dissolved gases remained within IEEE recommended limits. **We recommend resampling annually (every 12 months), to monitor gases.**

Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence Utility in the future.

Yours Sincerely,

Dave MacLean, (309A) Construction & Maintenance Electrician



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 849-9666 dmaclean@taltrees.ca Darren Galbraith, P. Eng. Project Manager



102 Parks Dr., Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca

102 Parks Drive, Belleville ONK8N 4Z5OFFICE. 613-968-9648TALTREES.CA



Cust PO : 29995-PRESCOTT MS#3 Lab No : T 2019-1624 TALTREES POWER SERVICES 102 PARKS DRIVE Date Received : OCT 29 2019 Analysis Date : OCT 30 2019 BELLEVILLE ON Analyzed By : KNN 425 SAMPLE IDENTIFICATION Description : T1 SAMPLE IDENTIFICATION Description : T1 Sample Port : BOTTOM - MAIN TANK Mainf. / Date: ACCT 23 2019 TEST ASTM NO. RECOMMENDED LIMITS TEST VALUES Dielectric Breakdown D1816 D877 2mm Gap 40 KV (Min) 1816 - KV (Min) 877 - Neutralization Number D971 0.2 Max Olour D1500 0.5 - 8.0 2.0 Visual Condition D1524 Sediment NONE Secial condition D1524 Secial max 17 Power Factor (25 C) D924 0.5 % max 17			MPLE ANALYSIS RESULTS IN SERVICE - OIL
102 PARKS DRIVE Date Received : OCT 29 2019 BELLEVILLE K8N 425 ON Analysis Date : OCT 30 2019 Malysis Date : OCT 30 2019 Analysis Date : OCT 30 2019 Sample Date : OCT 30 2019 Description :: T1 Sample Date : Rating : 5 MVA Volume :: 870 IMP. GALLONS HV Rating : 44 kV Serial No : PRESCOTT Sample Date : OCT 23 2019 Itest ARCHER 1963 Sample Date : OCT 23 2019 Itest ARCHER 1963 Sample Date : OCT 23 2019 Itest ARCHER 1963 Sample Date : OCT 23 2019 Dielectric Breakdown D1816 2mm Gap 40 KV (Min) 1816 - 62 D877 KV (Min) 877 - Neutralization Number D974 0.2 Max (Minimum) Specific Gravity API Gravity D1298 (60/60°F) 0.860 33.0 Colour D1500 0.5 - 8.0 2.0 Visual Condition Clarity CLEAR NOME Free Water	Cust PO : 29995-		MS#3 Lab No : T 2019-1624 File No : 20042
Analysis Date : OCT 30 2019 BELLEVILLE ON Analyzed By : Reviewed By : SMPLE SAMPLE IDENTIFICATION Description : T1 Rating : 5 MVA Volume : 870 IMP. GALLONS HV_Rating : 44 kV Sample Port : BOTTOM - MAIN TANK Manuf. / Date: ARCHER 1963 Sample Dort : BOTTOM - MAIN TANK Manuf. / Date: ARCHER 1963 Sample Dort : BOTTOM - MAIN TANK Manuf. / Date: ARCHER 1963 Sample Date : OCT 23 2019 TEST ASTM NO. RECOMMENDED LIMITS TEST VALUES Dielectric Breakdown D1816 2mm Gap 40 KV (Min) 1816 - 62 D877 KV (Min) 877 - 62 Neutralization Number D974 0.2 Max 0.07 Milligrams KOH/gram 0.07 111 33.0 Colour D1500 0.5 - 8.0 2.0 Visual Condition D1524 Sediment NONE D1524 Sediment NONE NONE Free Water NO NO 17 Ower F	TALTREES POWER SER	VICES	
Reviewed By : SAMPLE IDENTIFICATION Description : T1 Rating : 5 MVA Volume : 870 IMP. GALLONS HV_Rating : 44 kV Sample Port : BOTTOM - MAIN TANK Manuf. / Date: ARCHER 1963 Sample Date : OCT 23 2019 TEST ASTM NO. RECOMMENDED LIMITS TEST VALUES Dielectric Breakdown D1816 2mm Gap 40 KV (Min) 1816 - 62 Neutralization Number D974 0.2 Max 0.07 0.07 Milligrams KOH/gram 0.07 Milligrams KOH/gram 0.07 Interfacial Tension D971 25 Dynes/cm (Minimum) 28 Specific Gravity D1298 (60/60°F) 0.860 AFI Gravity D1500 0.5 - 8.0 2.0 Visual Condition D1524 Sediment NONE D1524 Sediment NO NO Water Content D1533 35 p.p.m. max 17 Power Factor (25 C) D924 0.5 % max 7	102 PARKS DRIVE		
Description : T1Rating :5 MVAVolume : 870IMP. GALLONSHV_Rating :44 kVSample Port : BOTTOM - MAIN TANKManuf. / Date: ARCHER1963Sampled By : MGSerial No :PRESCOTTSample Date : OCT 23 2019TESTASTM NO.RECOMMENDED LIMITSTEST VALUESDielectric BreakdownD1816 D8772mm Gap 40KV (Min)1816 - R77 -Neutralization NumberD9740.2 Max Milligrams KOH/gram0.07Interfacial TensionD97125Dynes/cm (Minimum)28Specific Gravity API GravityD1298(60/60°F)0.860 33.033.0ColourD15000.5 - 8.02.02.0Visual Condition Water ContentD153335p.p.m. max17Power Factor (25 C) P0924D9245.0 * max17		ON	
Rating:5 MVA 44 kVVolume: 870 Sample PortIMP. GALLONS MAIN TANK Manuf. / Date: ARCHER Serial No:1963 Sample Date:OTHOR MAIN TANK Sample Date:OTHOR MAIN TANK Sample Date:OTHOR MAIN TANK MAIN TANKTESTASTM NO.RECOMMENDED LIMITSTEST VALUESDielectric Breakdown D877D1816 D8772mm Gap 40 KV (Min)1816 - 877 -62Neutralization Number D974D974 O.2 Max Milligrams KOH/gram0.07Interfacial Tension API GravityD971 D150025 Dynes/cm (Mininum)28Specific Gravity API GravityD1298 D1500(60/60°F)0.860 33.0ColourD1500 D15240.5 - 8.0 Sediment Free Water2.0Water ContentD1533 D153335 p.p.m. max17Power Factor (25 C) P024D924 5.0 * max17		S	CAMPLE IDENTIFICATION
HV Rating:44 kVSample Port : BOTTOM - MAIN TANKManuf. / Date: ARCHER Serial No1963Sampled By : MG Sample Date : OCT 23 2019TESTASTM NO.RECOMMENDED LIMITSTEST VALUESDielectric BreakdownD1816 D8772mm Gap 40KV (Min)1816 - RT62Dielectric BreakdownD9740.2 Max Milligrams KOH/gram0.07Interfacial TensionD97125Dynes/cm (Minimum)28Specific Gravity API GravityD1298(60/60°F)0.860 33.00.06ColourD15000.5 - 8.02.0Visual Condition D1524Clarity Sediment Free WaterCLEAR NONE NONE17Power Factor (25 C) P094D9240.5 % max 5.0 % max17	Description : Tl		
LDielectric BreakdownD1816 D8772mm Gap 40KV (Min)1816 - KV (Min)62 62Neutralization NumberD9740.2 Max Milligrams KOH/gram0.07Interfacial TensionD97125Dynes/cm (Minimum)28Specific Gravity API GravityD1298(60/60°F)0.860 33.0ColourD15000.5 - 8.02.0Visual ConditionD1524Clarity Sediment Free WaterCLEAR NONE NONE Free WaterNONE NOWater ContentD153335p.p.m. max17Power Factor (25 C) Poy24D9240.5 % max 5.0 % max17	HV_Rating : Manuf. / Date: ARCHER	44	kV Sample Port : BOTTOM - MAIN TANK 1963 Sampled By : MG
D877KV (Min)877 -Neutralization NumberD9740.2 Max Milligrams KOH/gram0.07 Milligrams KOH/gramInterfacial TensionD97125 Dynes/cm (Minimum)28Specific Gravity API GravityD1298(60/60°F)0.860 33.0ColourD15000.5 - 8.02.0Visual ConditionD1524Clarity 	TEST	ASTM NO.	RECOMMENDED LIMITS TEST VALUES
Notertaining for a milligramsMilligrams KOH/gramInterfacial TensionD97125 Dynes/cm (Minimum)28Specific Gravity API GravityD1298(60/60°F)0.860 33.0ColourD15000.5 - 8.02.0Visual Condition D1524Clarity Sediment Free WaterCLEAR NONE Free WaterWater ContentD153335 p.p.m. max17Power Factor (25 C) Power Factor (100°C)D9240.5 % max 5.0 % max17	Dielectric Breakdown		-
Minimum) Specific Gravity API Gravity D1298 (60/60°F) 0.860 33.0 Colour D1500 0.5 - 8.0 2.0 Visual Condition D1524 Clarity Sediment Free Water CLEAR NONE NO Water Content D1533 35 p.p.m. max 17 Power Factor (25 C) Power Factor (100°C) D924 0.5 % max	Neutralization Number	D974	• • = • • • • • • • • • • • • • • • • •
API Gravity 33.0 Colour D1500 0.5 - 8.0 2.0 Visual Condition D1524 Clarity Sediment NONE Free Water NONE NO Water Content D1533 35 p.p.m. max 17 Power Factor (25 C) D924 0.5 % max 20	Interfacial Tension	D971	
Visual ConditionClarity D1524CLEAR Sediment Free WaterWater ContentD153335p.p.m. maxPower Factor (25 C)D9240.5% maxPower Factor (100°C)D9245.0% max		D1298	
D1524Sediment Free WaterNONE NOWater ContentD153335p.p.m. max17Power Factor (25 C)D9240.5% max 5.08Power Factor (100°C)D9245.0% max	Colour	D1500	0.5 - 8.0 2.0
Power Factor (25 C) D924 0.5 % max Power Factor (100°C) D924 5.0 % max	Visual Condition	D1524	Sediment NONE
Power Factor (100°C) D924 5.0 % max	Water Content	D1533	35 p.p.m. max 17
TEST EVALUATION			
			TEST EVALUATION

OIL IS IN SATISFACTORY CONDITION FOR CONTINUED USE

RECOMMENDATIONS: SAMPLE AS PER SCHEDULE

Notes :

Test results relate only to samples tested as received.

	/ED GAS / Method 1 IS #3	D3612 P La Fi		:	2	1632 0042 LT02
TALTREES POWER SERVICES 102 PARKS DRIVE BELLEVILLE ON K8N 4Z5		Da An An	te Rece	Date : By :	OCT 29 OCT 30	
SAME	PLE IDEN	TIFICAT	ION			
Description : T1	4947 IV				. €. €.1882.	
Rating : 5 M HV Rating : 44 k Manuf. / Date: ARCHER Serial No : PRESCOTT Sample Port : BOTTOM - MAIN TA	1963	Volume Preser Syring Sample		: : CONS 1: 7132 : MG	(°C 870 IMP ERVATOR 23 2019) . GALLONS
COMPONENT	MEASU	RED PPM		% COM	BUSTIBLES	
Hydrogen (H2)		10			4.6	
Oxygen + Argon (O2 + A)		34025				
Nitrogen (N2)		57621				
Methane (CH4)		2			. 9	
Carbon Monoxide (CO)		192			88.5	
Carbon Dioxide (CO2)		1875				
Ethylene (C2H4)		13			6.0	
Ethane (C2H6)		<1			. 0	
Acetylene (C2H2)		<1			. 0	
Propane (C3H8)		<2			. 0	
Total Gas Content		9.37	olo			
Combustible Gas Content		217	ppm		.231 %	
*PPM = Part Per Million b	by volum	e	N.D.	= Not	Detectabl	e

General Comments: FAULT GAS CONCENTRATIONS ARE WITHIN NORMAL RANGE.

Recommendations : SAMPLE AS PER SCHEDULE FOR DISSOLVED GASES

Notes :

Test results relate only to samples tested as received.

RONDAR INC. 333 Centennial Parkway North Hamilton, Ontario L8E 2X6 Telephone : (905) 561-2808 Fax : (905) 561-8871



May 30th, 2018

Rideau St. Lawrence Distribution Inc 985 Industrial Rd. Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re:Maintenance Inspection Report - Our Ref: 18001Site:Prescott M4 – 800 Boundary Rd., Prescott, ON.

Please find the attached report for the maintenance work and inspections completed May 24th, 2018.

Tal Trees cleaned, serviced and tested as required the main power system. A summary of the site findings is listed below for your review. All findings are referenced to the Ontario Electrical Safety Code (OESC).

Load Break Switch:

- Switch Contact alignment, toggles, stops, linkage and general ease of operation were inspected and serviced.
- The contacts were closely inspected for burning, wear contact pressure, and simultaneous closure. The integrity of the silver plating was inspected, cleaned and lubricated with electrical grease.
- All insulators were inspected and cleaned, as well tightness and condition of pole ground including the switch matt checked.
- Fusing contacts were checked for burning, wear, and contact pressure as well cleaned and lubricated with electrical grease.
- Fuse holders were cleaned and inspected for excessive wear, fatigue and alignment, as well all insulators were inspected and cleaned.



Power Transformer:



- Transformer tank was inspected for oil leaks, rust and visual damage.
- Primary connections were inspected for tightness and indications of overheating and reinstalled with anti-oxidant grease.
- Primary bushings inspected for damage and cleaned.
- Full transformer tests were completed on the transformer including: turn ratio test, winding resistance, capacitance test and dielectric absorption test (insulation resistance).
- An oil sample was obtained for fluid analysis and DGA.



Findings/Repairs:

- Recloser 30F1 has lower insulation resistance results on Phase "A" & "B" from pole to ground. These results are considerably lower than results on phase "C" and in comparison to other unit.
- Gradient ground mat is not installed to current OESC requirements. Currently the mat is smaller than required (1.2m X 1.8m). Rule OESC #: 36-310 (2)(b)(iii).
- Gang operated switch handle does not comply with OESC grounding requirements as it only has one point of attachment to ground. A second connection to ground is required by OESC Rule #: 36-310(2)(a).
- Upper fence extension is not currently bonded to ground. The fence that was extended vertically has no grounding installed. This is a violation of OESC Rule #: 36-312(2),(4).
- Substation gate does not currently have flexible copper grounding conductor installed. This is a violation of OESC Rule #:36-312(3).
- Paint on transformer T1 is in unsatisfactory condition and there is visible rust on the bottom of radiators.
- West side of substation had heavy pine needle build up which was removed at the time of maintenance to maintain step and touch voltage hazards and reduce probability of fire spread.
- Pine trees located on West side of substation are growing close to incoming 44KV overhead conductors creating a fire hazard.

Recommendations:

- Please see dielectric breakdown results from oil sample taken from 30F1 and continue to monitor insulation resistance of recloser in future maintenance work.
- Complete all substation grounding in accordance to OESC requirements.
- Trim pine trees away from incoming 44KV overhead conductors.
- Continue with regular yearly maintenance.

All other equipment that we tested appears in satisfactory condition, suitable for continued service.



Please give us a call should you wish us to provide you pricing and services for any or all the recommended repairs listed in this report.

If you have any questions/concerns, please do not hesitate to contact us. We look forward to being of continued service to Rideau St. Lawrence.

Sincerely,

Darren Galbraith, P. Eng.

Project Manager 102 Parks Drive Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca www.sparkpower.ca





HIGH VOLTAGE SWITCH DATA SHEET (Pg. 1 of 2)

POWER SE	RVICES		Г			_	
	SPARKPOWER COMPANY		System ID	QL30	C	evice ID	H201T-L
Customor	Rideau St. Lawrence Dis	trtibution Inc		Data	May 24th,	2019	
	985 Industrial Rd., Presc				18001	2010	
	MS#4		System No				
	Boundary Rd., Prescott,		System Ne				
	Boundary Ru., Trescott,						
Nameplate Data							
Switch Mounting		Pole X	Towe	er	Ot	her	
Switch Type	Load Break	Air Break X			Ot	her	
Manufacturer	S&C SWITCH			BIL Rating			kV
Date Of Manufacture	1986			Feeder ID			
Serial #				Feeds To			
	320305R9			upting Rating			Α
		kV	Continuc	ous Ampacity	600		Α
Comments							
Lightning Arrestors							
Lightning Arrestors	Yes	No X					
Class		ntermediate	Statio	n			
Composition	Ceramic	Polymer					
Manufacturer			Max. / M	ACOV Rating		1	kV
Catalog #				-	-		
Comments							
Protective Device Data	1						
Primary Fuse Holder Dat	ta		Primary Fus	e Link Data	а		
Manufacturer			-	Manufacturer			
Туре							
Nom. / Max. Voltage		kV					Α
Holder Max. Fuse Link				TCC #			
Holder Catalog #			Li	nk Catalog #			
Primary Fuse Link Spare	es / Location						
Spare Primary Fuses	Yes	No		# of Spares	X2 65A X2	125A	
	METERING CABINET						
Comments							
Interlock							
Interiotk							
Key Interlock	Yes	No X					
Interlock Type		lechanical	Utility Loc				
Devices Interlocked	H.V. Switch	Breaker	Trans. En		Other		
Manufacturer				Key Interloc	k#		
Comments							
Load Side Conductor	Data						
Conductor Type	Cable X	Bus Bar	Condu	uctor Size / D	im. 1/O		
Conductor Material	Aluminum	Copper X	Condu	ctors per Pha	ise 1		/ Phase
Tape Shield	Aluminum	Copper		Bond Size / D			
Concentric Neutral	Aluminum	Copper	# of	Bond Coduct	ors 0		
Insulation Voltage	N/A		# of Net	utral Conduct	ors 0		
Insulation Type	BARE CU		Ne	utral Size / D	im. N/A		
Comments							
		. <u></u>					
Recorded By:	J. HARDER						



HIGH VOLTAGE SWITCH TEST SHEET (Pg. 2 of 2)

POW	ER SERV	ICES			System ID		QL30		Device	ID	H201T	ſ-L
Visual Inspec	ction / Mechar	nical Tests										
-	late Condition	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Insula	ator Condition	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Ground	Connections	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Lightr	ning Arrestors	Satisfactory		Not Sati	sfactory	N/A	X	Con	nments			
Arc	Suppressors	Satisfactory		Not Sati	sfactory	N/A	х	Con	nments			
Key Interlo	ock Operation	Satisfactory		Not Sati	sfactory	N/A	X	Con	nments			
Ground Strap	os & Materials	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Switch Condit	ion / Operation											
Switch Ope	eration As Left	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Contact Surfa	ace Condition	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Simultan	eous Closure	Satisfactory X	(Not Sati	sfactory	N/A		Con	nments			
Electrical Tes	sts											
Earth Resistar	nce (3-Point Te	st)			Arc Suppi	ressoi	^r Conta	ct Res	sistance			
Earth Resista	nce in Ohms.				Arc Supp	ressor	Contact	Resist	ance in Oh	ims.		
					Phase A			N/A			Ω	
Earth Resista	nce		Ω		Phase B			N/A			Ω	
					Phase C			N/A			Ω	
Switch Insulat	ion Resistance				Switch / F	use C	ontact	Resis	tance			
Resistance in M	eg-Ohms after 1	minute.			Resistanc	e in mi	cro-Ohm	ns after	1 minute.			
Test Voltage	1 kV 2	kV 5 kV	,	10 kV	Test Curr	ent	10 A					
5				- L			-					
	Phase A	Phase B	F	hase C			Phase	А	Phase	В	Phas	e C
Phase to GND	Ν/Α ΜΩ	Ν/Α ΜΩ	N	/A M	Ω Conta	cts	20	μΩ	40	μΩ	32	μΩ
					Fu	ise	1651	μΩ	1450	μΩ	1630	μΩ
					Ove	rall		μΩ		μΩ		μΩ
Load Side Con	nductor Insulati	ion Resistance	•									
Resistance	in Meg-Ohms @	V	DC a	fter 1 mir	ute	Phase	e A to Gi	round		N/A		MΩ
						Phase	e B to Gi	round		N/A		MΩ
						Phase	e C to Gi	round		N/A		MΩ
	estor Insulation	Resistance										
Lightning Arre				fter 1 mir	uto	Dhase	e A to G	round		N/A		MΩ
	in Meg-Ohms @	V	DC a		lute	1 11030						
	in Meg-Ohms @	V	DC a		lute		e B to G	round		N/A		MΩ

Test Instrument(s)

Manufacturer / Model Megger Serial #

Ductor N/A 7293

Tested By: J. HARDER



TRANSFORMER DATA SHEET (Pg. 1 of 4)

	FOVER SI	A SPARKPOWER COMPANY	Y		System ID	PRESCOTT	M4 [Device ID		т	1	
	Customer Addres	r Rideau St. Lawren 985 Industrial Rd., MS#4					May 24th 18001	n, 2018				
		Boundary Rd., Pre	scott, ON									
Namep	olate Data											
	Transformer Clas	s Unit Padmount	Pad	mount	Station	X		Other				
Т	ransformer Cooling	ONAN	X	ONAF	LNAN	DF	RY	Other				-
Bushi	ng Configuration	Dead Front	Тор	- Тор 🛛 🗙	Top - Side	Side - Sid	de	Other				
	Manufacture	RELIANCE POWER	R EQUIPMI	ENT	Co	ore & Windings			kg		lb	
0	Date of Manufacture	e <u>10/1991</u>			Т	anks & Fittings			kg		lb	
	Serial	292867			C	oolant Volume	1100		L		Gal	х
KVA	/ Prov. KVA Rating	g 5000		KVA	(Coolant Weight			kg		lb	
	Primary Voltage	e 44000		v		Total Weight	33650		kg		lb	х
	Primary Ampacit	65.6		Α	Ter	nperature Rise	55		°C	Х	°F	
	Secondary Voltage	e 4160/2400		v		HV BIL Rating			kV			
S	Secondary Ampacit	y 694		Α		LV BIL Rating			kV			
F	IV Winding Materia	N/A			Perc	ent Impedance		8.31 %	ONAN	Χ	ONAF	
L	V Winding Materia	N/A			Tai	mper Resistant		<u> </u>	YES		NO	Х
C	SA Specification(s)			Tran	sformer Colour	GRAY					
_	Comment	3										
Visual I	Inspection											
N	lameplate Conditio	n Satisfactory X	No	t Satisfacto	ory N	I/A (Comments	;				
Fa	n / Pump Operatio	n Satisfactory	No	t Satisfacto	ory N	I/A X (Comments	;				
Ģ	Ground Connection	s Satisfactory X	No	t Satisfacto	ory N	I/A (Comments	;				
Liq	uid Levels In Tank	s Satisfactory X	No	t Satisfacto	ory N	I/A (Comments	;				
	Interlock Operation	n Satisfactory	No	t Satisfacto	ory N	I/A X (Comments	;				
Tem	p. Gauge Operation	n Satisfactory X	No	t Satisfacto	ory N	I/A (Comments	;				
C	oolant Temperatur Comment	-	°C	X °F	N	lax. Coolant Te	mperature	35	°C	X	°F	
Oil Con	servator											
	Oil Conservate	or Yes X	No		Conse	ervator Volume			L		Gal	
	Silica Gel Breathe	er Yes	No X		Br	eather <u>Vol</u> ume			L		Gal	
	Silica Gel Colo	ır Good E	Bad	Replac	ed	N/A X						
	Comment	S										
Tap Cha	anger Data				Vector Dia	gram: Del	ltaWye2_		11			
	osition /	Tap Voltages (V)	As	As		_ н	2	X2				
	signation	Tup Voltages (V)	Found	Left		∧		\				
1/A	105.00%	45048					xo		X 3			
2 / B	102.50%	44000					\ ~					
3 / C	100.00%	42952				Н	НЗ	XI				
4 / D	97.50%	41904								F		7
5/E	95.00%	40857			Prima	ary Vector X	Σ	Seconda	ry Vec	tor	Х	
	Comments	:										
	Recorded By	D. MACLEAN, C. N	IERCIER									

TALTE	REE	5				DA	ATA SI		ISFOR (Pg. 2	
— POWER SE		ANY		Sys	stem ID			vice ID	. с Т [,]	
Neutral Grounding Re	sistor (NGR)									
NGR Present	Yes		No	X						
Manufacturer						NGR Serial #				
NGR Voltage				V		ximum Current				Α
						NGR Location				
Transformer Lightning	g Arrestors									
Lightning Arrestors	s Yes	X	No							
Class			Intermediate		Statio	on X				
Composition	Ceramic		Polymer	X						
	OHIO BRASS				Max.	/ MCOV Rating	48.0	Ι	39.0	kV
Catalog #										
Interlock			Г							
Key Interlock			No Mech.	X						
Interlock Type Devices Interlocked			Breaker	_	Utility Lo Trans. Er		Other			
			L				L			
Manufacturer Comments						Key Interlock #				
Fans										
Fans	Yes		No	Х						
# of Fans						Fan Voltage				
Fan Size						Frame Size				
Horsepower										
Comments										
Transformer Load Sid	e Conductor L	Data								
Conductor Type	Cable	X	Bus Bar		Cond	uctor Size / Dim.	350 KCM	IIL		
Conductor Material			Copper	Х		luctors per Phase				/ Phase
Tape Shield			Copper			Bond Size / Dim.				
Concentric Neutral			Copper			Bond Conductors				
Insulation Voltage						utral Conductors				
Insulation Type					Ne	eutral Size / Dim.	N/A			
Comments:										
Recorded By:	D. MACLEAN, C	. ME	RCIER							



TRANSFORMER TEST SHEET (Pg. 3 of 4)

PRESCOTT M4 System ID **Device ID** Τ1

Electrical Tests

Turn Ra	tio Test	Test Vol	tage: Automa	tic	X Oth	er <u>v</u>				
Tap P	Position /	Tap Voltage	Calculated		H 1 To	H 2	H 2 To	H 3	Н 3 То	H 1
Desig	gnation	v	Ratio		X 1 To	X 0	X 2 To	X 0	X 3 To	X 0
1/A	105.00%	45048								
2 / B	102.50%	44000								
3 / C	100.00%	42952	17.883		17.8	395	17.8	394	17.8	98
4 / D	97.50%	41904								
5/E	95.00%	40857								
					Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation	Excitation Currrent	Percent Deviation
		Tap Posi	tion As Found	3	0.400 mA	0.060 %	0.270 mA	0.060 %	0.290 mA	0.080 %
		Tap Posi	tion As Left		mA	%	mA	%	mA	%

Primary Winding Resistance

Resistance in ohms at 0.5 Α Resistance in milli-ohms at 5 Α after 1 minute after 1 minute H0 - H1 N/A Ω H1 - H2 2.010 Ω X0 - X1 7.780 mΩ X1 - X2 14.190 mΩ H0 - H2 N/A Ω H2 - H3 2.010 Ω X0 - X2 X2 - X3 14.270 mΩ 7.850 mΩ 14.320 mΩ H0 - H3 N/A Ω H3 - H1 2.010 Ω X0 - X3 7.890 mΩ X3 - X1 Minute

Stabilization Time > 1 Stabilization Time > 1

Secondary Winding Resistance

Minute

Capacitance Test

	Low - Ground		Low - Guard		UST (High - Low)		High - Guard		High - Ground	
Capacitance in pico-farads	6986	рF	2138	рF	4859	рF	4716	рF	9569	рF
Uncorrected D.F. (%)	1.260	%	0.745	%	1.450	%	0.864	%	1.160	%
Corrected to 20 °C (%)	0.995	%	0.589	%	1.146	%	0.683	%	0.916	%

Temp. Correction Factor 0.79

Lightning Arrestor Insulation Resistance

Resistance in meg-ohms @	10000	V DC after 1 minute	Phase A to Ground	2000	MΩ
			Phase B to Ground	2520	MΩ
			Phase C to Ground	7540	MΩ

Secondary Conductor Insulation Resistance

Resistance in meg-ohms @	5000	V DC a	after 1 minute			
Phase A to Ground	>5	00000	MΩ	Phase A to Phase B	N/A	MΩ
Phase B to Ground	>5	00000	MΩ	Phase B to Phase C	N/A	MΩ
Phase C to Ground	4	51000	MΩ	Phase C to Phase A	N/A	MΩ

Comments / Observations

Test Instrument(s)	Manufacturer / Model	Ratio	Winding	Cap Bridge	Megger
	Serial #	0311	51006	5563	1261
Tested By:	D. MACLEAN, C. MER	CIER			



TRANSFORMER TEST SHEET (Pg. 4 of 4)

PRESCOTT M4 System ID

Device ID T1

Dielectric Absorption Test (Insulation Resistance)

	High to Lov	w & Gnd	Low to Hig	gh & Gnd	High & Low to Gnd				
Time	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected			
15 sec	1860 MΩ	2418 MΩ	467 MΩ	607 MΩ	3380 MΩ	4394 MΩ			
30 sec	2350 MΩ	3055 MΩ	525 MΩ	683 MΩ	3510 MΩ	4563 MΩ			
45 sec	2700 MΩ	3510 MΩ	611 MΩ	794 MΩ	3720 MΩ	4836 MΩ			
1 min	3050 MΩ	3965 MΩ	717 MΩ	932 MΩ	4110 MΩ	5343 MΩ			
2 min	3670 MΩ	4771 MΩ	967 MΩ	1257 MΩ	4370 MΩ	5681 MΩ			
3 min	4350 MΩ	5655 MΩ	1310 MΩ	1703 MΩ	4530 MΩ	5889 MΩ			
4 min	4810 MΩ	6253 MΩ	1580 MΩ	2054 MΩ	4640 MΩ	6032 MΩ			
5 min	5070 MΩ	6591 MΩ	1690 MΩ	2197 MΩ	4710 MΩ	6123 MΩ			
Test Voltage	10000	V	1000	v	1000	V			
Multiplier	1		1		1				
TCC 1.30		Insulation Resistance Readings Corrected to 20 °C							

Insulation Resistance





Test Instrument(s)	Manufacturer / Model	Megger
	Serial #	1261

Comments:

Tested By: D. MACLEAN, C. MERCIER



RECLOSER DATA SHEET (Pg. 1 of 1)

POWER S	SERV	ICES					[Г		
	A SPARI	CPOWER CO	IPANY				System ID	PRESCO	OTT M4	Dev	ice ID	30F	1
Ci	ustomer	Rideau S	t. Lawrend	ce Dist	rtibution Inc.			Date	May 24	th, 2018	3		
Customer A	Address	985 Indu	strial Rd.,	Presco	tt, ON				18001				
	Site	MS#4											
Site A	Address	Boundar	y Rd., Pres	scott, C	DN								
Nameplate Data													
Manu	facturer	COOPER		SYSTE	MS			Catalog #			SFR T	/PF "W"	
	Serial #						М	ax Voltage					v
	npacity					Α		r. Capacity					KA
	Year	1991					Operati	ng Voltage	4.16KV	1			V
(Oil Type	NON-PC	В					Dil Volume	N/A				
Total Weigh		N/A											
Co	mments												
Visual Inspection											Co	mments	
Com	pare Nar	neplate wi	th Drawing	s	Satisfactory	/ X	Not Satis	factory	N//	4	00		
Inspect And	horage,	Alignment	, Grounding	9	Satisfactory	/ X	Not Satis	factory	N//				
Inspect Phys	ical and	Mechanic	al Conditio	n	Satisfactory	/ Χ	Not Satis	factory	N//	4			
Inspect for	Correct	Insulation I	_iquid Leve	el	Satisfactory	Χ (Not Satis	factory	N//	4			
Co	mments												
Electrical Tests													
Insulation Resistance							Contact Res	sistance					
Resistance in meg-ohms a	after 1 m	inute.					Resistance in	mea-ohms	s after 1	minute.			
Test Voltage	1 kV		.5 kV 🗙	5 kV	10 k∨	/		Test Cur		10	Α		
Test voltage	INV		.5 KV X	JKV		′ L		l oot ou		10			
	Pha	ase A	Phase	в	Phase C	;		Phase A	1	Phase	в	Phase	C
		to B)	(B to	,	(C to A)								
Open - Pole to Pole Closed - Pole to Frame	30200		357000 1800	ΜΩ ΜΩ		MΩ MΩ	As Found	414 414	μΩ μΩ	406 407	Ωμ Ωμ	615 588	μΩ
	1020	/ 14122	1000	11132	337000	10132	As Left		μ	407	μ	000	μΩ
Contact Measurement					1		Counter Rea	ading					
	Pha	se A	Phase	В	Phase C		Counter	as Found	93				
Contact Gap	١	N/A	N/A	1	N/A			ter as Left					
Contact Erosion													
Operational Tests											Co	mments	
Trip and Close	e Reclos	er with Co	ntrol Switch	n	Satisfactory	/ X	Not Satis	factory	N//	Δ	00	mments	
Trip Recloser by					Satisfactory	·	Not Satis		N//				
Trip and Close	e Reclos	er with Co	ntrol Switcl	, 1	Satisfactory	/ X	Not Satis		N//				
Trip Recloser by	operati	ng each P	rotect Rela	у	Satisfactory	/	Not Satis	factory	N//	A X			
Co	mments								_				
		-											
Comments / Observa	ations												
CONTACTS IN S													
FEEDER CABLE	ES TEST	ED @10k	V - A - 276	000ΜΩ	, B - 1200000	ΜΩ,	C - 232000ΜΩ						
-	(-)			M. 1 1	Maggar		Ductor						
Test Instrument	(s)	Mar	/ ufacturer		Megger 1261		Ductor 6839	_					
				erial #	1201		0000]					
Tested E	3y: D.M	ACLEAN,	C. IVANY										



RECLOSER DATA SHEET (Pg. 1 of 1)

POWER S							Questern ID	DDEOO		Devi		005	•
	A SPARI	(POWER CO	WPANY				System ID	PRESC		Lev	ice ID	30F	2
Cu	ustomer	Rideau S	t. Lawrenc	e Disti	tibution Inc.			Date	May 2	4th, 2018	8		
Customer A	Address	985 Indu	strial Rd., F	Presco	tt, ON			Job #	18001				
		MS#4											
Site A	Address	Boundar	y Rd., Pres	cott, C	N								
Nameplate Data													
Manu	facturer	COOPER		YSTE	NS			Catalog #	KYLE	R RECLO	SER TY	'PE "W"	
	Serial #						Ma	ax Voltage	-				V
Ar	npacity	400				Α		. Capacity	-				KA
	Year	1991						ng Voltage		V			V
(Dil Type	NON-PC	В				C	Dil Volume	N/A				
Total Weigh	t of Unit	N/A											
Col	mments												
Visual Inspection											Co	mments	
Com	oare Nar	neplate wi	th Drawings	3	Satisfactory	X	Not Satis	factory	N	/A			
Inspect And	horage,	Alignment	, Grounding	1	Satisfactory	Х	Not Satis	factory	N	/A			
Inspect Phys	ical and	Mechanic	al Condition	n	Satisfactory	Χ	Not Satis	factory	N	/A			
Inspect for	Correct	nsulation	Liquid Leve	I	Satisfactory	Χ	Not Satis	factory	N	/A			
Co	mments												
Electrical Tests													
Insulation Resistance							Contact Res	istance					
Resistance in meg-ohms a	ifter 1 m	nute.					Resistance in	meg-ohms	s after 1	minute.			
Test Voltage	1 kV		.5 kV 🗙	5 kV	10 kV			Test Cur		10	Α		
	Pha	ase A	Phase	В	Phase C		ſ	Phase A		Phase	в	Phase	C
		to B)	(B to C	/	(C to A)		-						
Open - Pole to Pole	29600 >5000		422000	MΩ		ΛΩ ΛΩ	As Found	365	μΩ	391	μΩ	394	μΩ
Closed - Pole to Frame	>5000	00 ΜΩ	>500000	MΩ	360000 N	122	As Left	371.2	μΩ	383.2	μΩ	391	μΩ
Contact Measurement					1		Counter Rea	nding					
	Pha	se A	Phase	В	Phase C		Counter	as Found	88				
Contact Gap	N	I/A	N/A		N/A		Count	er as Left	91				
Contact Erosion													
Operational Tests											Co	mments	
Trip and Close	e Reclos	er with Co	ntrol Switch	n	Satisfactory	X	Not Satis	factory	N	/A	00		
Trip Recloser by					Satisfactory		Not Satis		-	/A X			
Trip and Close	e Reclos	er with Co	ntrol Switch	n	Satisfactory	X	Not Satis	-	-	/A			
Trip Recloser by	Operati	ng each P	rotect Relay	/	Satisfactory		Not Satis	factory	-	/A X			
Col	mments	INSTALL		ASS O	N THIS UNIT.				_				
Comments / Observa													
CONTACTS IN S													
FEEDER CABLE	ES TEST	ED @10k	V - A -2400	000ΜΩ	а, В - 1240000	ΜΩ,	C - 84900MΩ						
Test Instrument	(c)	N/~~	ufacturer /	Model	Megger		Ductor						
restinstrument	(5)	iviar		erial #	1261		6839						
.				ciial #	1201								
Tested E	By: D. M	ACLEAN,	C. IVANY										



June 20th, 2018

Rideau St. Lawrence Distribution Inc 985 Industrial Rd. Prescott, ON. K0E 1T0

Attention: Darryl Reynolds

Re: Oil Analysis Report - Our Ref: 18001 Site: Prescott M4 – 800 Boundary Rd., Prescott, ON.

To whom it may concern,

Please find attached the oil analysis results of samples taken recently at your facility.

> Transformer - Reliance, Serial no. 292867 (Main TX)

• Chemical Analysis (ASTM/Water)

The chemistry (ASTM) tests show the oil to be in satisfactory condition, except for *Dielectric Breakdown. The transformer oil has* remained clear with zero amount of sediment detected and having a slight amount of water content (30 ppm). The Dielectric Breakdown (26KV) is lower than recommend limit (40KV). *Dielectric Breakdown of an insulating oil is a measure of the oils ability to withstand electrical stress without failure. Contaminants such as particles, contaminants and water can reduce the dielectric strength of an insulating liquid.* All the other measured parameters remained within IEEE recommended limits for acceptable in-service operation. We recommend resampling at your earliest convenience to verify Dielectric Breakdown.

• Dissolved Gas Analysis (DGA)

The gas in oil analysis indicates that the oil appears to be in satisfactory condition. All the dissolved gases remained within IEEE recommended limits. **We recommend resampling annually (every 12 months), to monitor gases.**

• Polychlorinated biphenyl Analysis (PCB)

The PCB analysis indicates the oil appears to be in satisfactory condition for continued service. The insulation fluid contains trace amounts *(17ppm)* of PCB content. Insulating fluid containing between 2-50ppm PCB may continue to be used in equipment until it is removed from the equipment for any reason (including maintenance and repair). If any insulating fluid is removed from the unit, it must be replaced with new liquid containing less than 2ppm PCB.



> Recloser - Cooper, Serial no. 12178 (30F1)

• Chemical Analysis

The dielectric breakdown of recloser unit tested with a 2mm gap shows the insulating fluid to be in unsatisfactory condition. Dielectric breakdown is (27KV), which is below the recommended limit of 40KV. All the measured parameters remained within IEEE recommended limits for acceptable in-service operation. We recommend resampling at your earliest convenience to verify Dielectric Breakdown.

• Polychlorinated biphenyl Analysis (PCB)

The PCB analysis indicates the oil appears to be in satisfactory condition. With insulation fluid containing *(<1ppm)* of PCB content. Insulating fluid containing less than 2ppm is considered to be non-PCB liquid.

> Recloser - Cooper, Serial no. 12176 (30F2)

• Chemical Analysis

The dielectric breakdown of recloser unit tested with a 2mm gap shows the insulating fluid to be in unsatisfactory condition. Dielectric breakdown is (27KV), which is below the recommended limit of 40KV. All the measured parameters remained within IEEE recommended limits for acceptable in-service operation. We recommend resampling at your earliest convenience to verify Dielectric Breakdown.

• Polychlorinated biphenyl Analysis (PCB)

The PCB analysis indicates the oil appears to be in satisfactory condition. With insulation fluid containing *(<1ppm)* of PCB content. Insulating fluid containing less than 2ppm is considered to be non-PCB liquid.

Please call us if you have any questions regarding this analysis.

We look forward to being of continued service to Rideau St. Lawrence in the future.

Yours Sincerely,



102 Parks Drive Belleville, ON K8N 4Z5 (613) 403 7804 dgalbraith@taltrees.ca www.sparkpower.ca

102 Parks Drive, Belleville ON K8N 4Z5 OFFICE. 613-968-9648 TALTREES.CA



		PLE ANALYSIS RESULTS SERVICE - OIL
Cust PO : RSCU 18		Lab No : T 2018-0825 File No : 16913 Cust No : TLT02
TALTREES POWER SERV 102 PARKS DRIVE	ICES	Date Received : JUN 01 2018 Analysis Date : JUN 12 2018
BELLEVILLE K8N 4Z5	ON	Analyzed By : MC Reviewed By : SJO
	SAM	IPLE IDENTIFICATION
Description : MS3-800	BOUNDARY	RD
Rating : HV_Rating : Manuf. / Date: RELIANC Serial No : 292867	5 MV 44 kV E	
TEST	ASTM NO.	RECOMMENDED LIMITS TEST VALUES
Dielectric Breakdown	D1816 D877	2mm Gap 40 KV (Min) 1816 - 26 KV (Min) 877 -
Neutralization Number	D974	0.2 Max (0.5 - Scrap) 0.02 Milligrams KOH/gram
Interfacial Tension	D971	25 Dynes/cm 32 (Minimum)
Specific Gravity API Gravity	D1298	(60/60°F) 0.852 34.5
Colour	D1500	0.5 - 8.0 1.0
Visual Condition	D1524	Clarity CLEAR Sediment NONE Free Water NO
Water Content	D1533	35 p.p.m. max 30
Power Factor (25 C) Power Factor (100°C)	D924 D924	0.5 % max 5.0 % max

TEST EVALUATION

NEUTRALIZATION NUMBER IS GOOD INTERFACIAL TENSION IS GOOD WATER CONTENT IS GOOD DIELECTRIC BREAKDOWN IS LOW FOR HV RATING

RECOMMENDATIONS: RE-SAMPLE TO VERIFY THE DIELECTRIC BREAKDOWN

Notes :

Test results relate only to samples tested as received.

Cust PO : 18001 RSCU		ANALYSIS - OII D3612 Part C Lab No File No Cust No	: D 2018-0857 : 16913 : TLT02
TALTREES POWER SERVIC 102 PARKS DRIVE	ES	Date Rece Analysis	
BELLEVILLE K8N 4Z5	ON	Analyzed Reviewed	By : MJ
	SAMPLE IDEN	VTIFICATION	6
Description : MS3-800 B	OUNDARY RD		
Rating : HV Rating : Manuf. / Date: RELIANCE Serial No : 292867 Sample Port : BOTTOM -	5 MVA 44 kV MAIN TANK	Fluid Temp. Volume Preservation Syringe Seria Sampled By Sample Date	: : SEALED 1: CM125 : C.M
COMPONENT	MEASU	JRED PPM	% COMBUSTIBLES
Hydrogen (H2)		6	9.7
Oxygen + Argon (O2	+ A)	38084	
Nitrogen (N2)		56315	
Methane (CH4)		1	1.6
Carbon Monoxide (CO)	53	85.5
Carbon Dioxide (CO2)	2466	
Ethylene (C2H4)		2	3.2
Ethane (C2H6)		<1	. 0
Acetylene (C2H2)		<1	. 0
Propane (C3H8)		<2	. 0
Total Gas Content		9.69 %	
Combustible Gas Content		62 ppm	.064 %
*PPM = Part Per Mi	llion by volur	ne N.D.	= Not Detectable
General Comments: FAULT	GAS CONCENTRA	TIONS HAVE REMA	AINED WITHIN NORMAL RANGE

SINCE DEC/16.

Recommendations : SAMPLE AS PER SCHEDULE FOR DISSOLVED GASES

Notes :

Test results relate only to samples tested as received.

201	.8-0289 Tl		29	92867	RELIANCE POWE	r eq	1100 US		1260	1	7
La	ib No	Location		Serial No	Manufacture	r	Volume	A	roclor	PPM	F
	BELLEVILI K8N 425	LE	ON			Samp	oled By ole Date ewed By		C.M MAY 24	2018 SwD	
	TALTREES 102 PARKS	POWER SERVI S DRIVE	CES			Anal	Received ysis Date yzed By	:			
	Cust PO	: RSCU 18001				Shee File Cust		: : :		18107 16913 02	

TEST METHOD per ASTM D4059 DETECTION LIMIT 1 PPM

,

Location :

.:

Notes :	Test results relate only to samples tested as received.
Comments :	According to the Canadian Environmental Protection Act, 1999, insulating fluid containing 50 ppm or more PCB is considered to be PCB liquid. Under amendments to the Act made in September, 2008, insulating liquid containing 2 ppm or more, but less than 50 ppm PCB may continue to be used in equipment until such time as it is removed from the equipment. Any such liquid removed from the equipment, in whole or in part, for any reason (including maintenance and repair activities), may not be returned to the equipment. It must be disposed of in accordance with Environmental Regulations and replaced with liquid containing less than 2 ppm PCB.
L. RONDA	R INC. 333 Centennial Parkway North Hamilton, Ontario L8E 2X6 Telephone : (905) 561-2808 Fax : (905) 561-8871

		1PLE ANALYSIS R 1 SERVICE - OIL		
Cust PO : RSCU 1			Lab No File No Cust No	: 16913
TALTREES POWER SER	VICES			
102 PARKS DRIVE			Date Received Analysis Date	
BELLEVILLE K8N 4Z5	ON		Analyzed By Reviewed By	:MC
	SI	AMPLE IDENTIFIC	ATION	
Description : 30F1				
Rating :		IVA Volum		
HV_Rating :			e Port : RECLOS	ER
Manuf. / Date: COOPER Serial No : 12178	- x		ed By : CI e Date : MAY 24	2018
Sellal NO : 12176				2010
TEST	ASTM NO.	RECOMMENDE	D LIMITS	TEST VALUES
Dielectric Breakdown	D1816 D877		KV (Min) 1816 KV (Min) 877	
Neutralization Number	D974	0.2 Max (0. Milligrams	5 - Scrap) KOH/gram	
interfacial Tension	D971	25 Dyne (Minimu		
pecific Gravity API Gravity	D1298	(60/60°F)	
Colour	D1500	0.5 - 8.	0	
'isual Condition	D1524	Clarity Sediment Free Wat		
later Content	D1533	35 p.p.m.	max	
	D924	0.5 % max	7	
Power Factor (25 C)	DJAH			
Power Factor (25 C) Power Factor (100°C)	D924 D924	5.0 % max		

DIELECTRIC BREAKDOWN IS LOW FOR HV RATING

RECOMMENDATIONS: RE-SAMPLE TO VERIFY THE DIELECTRIC BREAKDOWN

Notes :

Test results relate only to samples tested as received.

RONDAR INC.	333 Centennial Parkway North	Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808	Fax : (905) 561-8871	

2018 0200 20E1 DE CLOS	10170	COORER		
Lab No Location	Serial No	Manufacturer Volume	Aroclor	PPM F
BELLEVILLE K8N 4Z5	ON	Sampled By Sample Date Reviewed By	: C.I : MAY 24 :	2018 Sul
TALTREES POWER SER 102 PARKS DRIVE	VICES	Date Received Analysis Date Analyzed By	: JUN 04	
Cust PO : RSCU 180	01	Sheet No File No Cust No		18108 16913 02

2018-0290 30F1 RE-CLOSURE 12178

COOPER

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	TEST METHOD per ASTM D4059	DETECTION LIMIT 1 PPM
Location	:	
Notes	: Test results relate only to samples tested	d as received.

Comments : According to the Canadian Environmental Protection Act, 1999, insulating fluid containing 50 ppm or more PCB is considered to be PCB liquid. Under amendments to the Act made in September, 2008, insulating liquid containing 2 ppm or more, but less than 50 ppm PCB may continue to be used in equipment until such time as it is removed from the equipment. Any such liquid removed from the equipment, in whole or in part, for any reason (including maintenance and repair activities), may not be returned to the equipment. It must be disposed of in accordance with Environmental Regulations and replaced with liquid containing less than 2 ppm PCB.

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		MPLE ANALYSIS R N SERVICE - OIL		
Cust PO : RSCU 1				2018-0828 16913 TLT02
TALTREES POWER SER	VICES			10102
102 PARKS DRIVE	VICHO		Date Received : J	
	017		Analysis Date : J	
BELLEVILLE K8N 4Z5	ON		Analyzed By : Reviewed By :	MC S.O
	Si	AMPLE IDENTIFIC	ATION	
Description : 30F2				
Rating : HV_Rating : Manuf. / Date: COOPER Serial No : 12176	4.16]	1991 Sampl	e : e Port : RECLOSER ed By : CI e Date : MAY 24 201	8
TEST	ASTM NO.	RECOMMENDE	D LIMITS TE	ST VALUES
Dielectric Breakdown	D1816 D877	-	KV (Min) 1816 - KV (Min) 877 -	27
Neutralization Number	D974	0.2 Max (0. Milligrams		
Interfacial Tension	D971	25 Dyne (Minimu		
Specific Gravity API Gravity	D1298	(60/60°F)	
Colour	D1500	0.5 - 8.	0	
Visual Condition	D1524	Clarity Sediment Free Wat		
Water Content	D1533	35 p.p.m.	max	
Power Factor (25 C)	D924	0.5 % max		
Power Factor (100°C)	D924	5.0 % max		
]	TEST EVALUATION		
L				

DIELECTRIC BREAKDOWN IS LOW FOR HV RATING

RECOMMENDATIONS: RE-SAMPLE TO VERIFY THE DIELECTRIC BREAKDOWN

Notes :

Test results relate only to samples tested as received.

RONDAR INC.	333 Centennial Parkway North	Hamilton, Ontario	L8E 2X6
	Telephone : (905) 561-2808	Fax : (905) 561-8871	

	.8-0291 30		1 0	176	COOPER					<	
La	b No	Location		Serial No	Manufacture	r Volume		Aroclo	or	PPM	F
	BELLEVIL K8N 4Z5	LE	ON			Sampled By Sample Date Reviewed By		C.I MAY	24	2018 SuD	
	TALTREES 102 PARK	POWER SERVI S DRIVE	CES			Date Received Analysis Date Analyzed By	:	JUN			
	Cust PO	: RSCU 18001				Sheet No File No Cust No	: : :	ŗ		18110 16913 02	

	per ASTM D4059	DETECTION LIMIT	1 PPM
IESI MEINUD	DEL ASIM D4059	DELECTION DIMIT	I FFM

Location : RE-CLOSURE

Notes :

Test results relate only to samples tested as received.

According to the Canadian Environmental Protection Act, 1999, insulating Comments : fluid containing 50 ppm or more PCB is considered to be PCB liquid. Under amendments to the Act made in September, 2008, insulating liquid containing 2 ppm or more, but less than 50 ppm PCB may continue to be used in equipment until such time as it is removed from the equipment. Any such liquid removed from the equipment, in whole or in part, for any reason (including maintenance and repair activities), may not be returned to the equipment. It must be disposed of in accordance with Environmental Regulations and replaced with liquid containing less than 2 ppm PCB.

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APPENDIX C: OPERATING SYSTEM MAPS

CONFIDENTIAL







Default

Conductor Breaker Elbow Fuse Junction Meter Recloser Riser Service Point Switches Transformers Map Base Pole Junction Cabinet Substations Transformer Multiline Text Transformer ID# Switches_Text Fuse_Text Service Point_Text Pole_Text Substations_Text Project ID Text Service Areas Streets Major Roads STREET_NAME PARCEL BUILDING SYSTEM_PROJECTS 2016 2017 2018 2019 2020 FUTURE Lakes Roads





Plot Date:4/21/2016

Iroquois Operating Map

Prepared By: Oakley Engineering





Plot Date:4/7/2016

Morrisburg Operating Map

Prepared By: Oakley Engineering

