

TRENCH DRY TYPE AIR CORE SHUNT REACTOR STATUS REPORT

- (vii) This value was calculated from the specified values of the Unit.
- (viii) This value was not measured by either. Both parties used this current to convert the measured values obtained during testing at different current.
- (ix) This frequency was applied during testing.
- (x) This frequency was applied during the conversion of various values obtained from the Tests at 60 Hz frequency.
- (xi) This value was calculated based on a 29°C Cold ambient Temperature, and 41.3°C Hot ambient Temperature.
- (xii) This value was calculated based on a 11.8°C Cold ambient Temperature, and calculated 42.04°C Hot ambient Temperature.

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The copy of the "BID REQUEST" prepared by Mr. Roger Robinson, CMS, provided me with the following information:

Z. The Reactor weight was 27,000 Lb.

The copy of the Email response from Mr. Roger Robinson, CMS, to Mr. Fred Pfaffle, President. The Email from Mr. Roger Robinson, CMS, provided me with the following information:

AA. The Reactor was originally installed in an electrical power generation plant.

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### OBSERVATIONS:

During my inspection of the subject Reactor, on January 5, 2001, I made the following observations:

1. The Reactor was at the premises of Cratex Industrial Packing Ltd. in Coquitlam (near Vancouver), BC.
2. The Reactor was unpacked.
3. The Reactor was Air Core/Dry Type.
4. One spot on the side which was facing east exhibited likely the paint repair of the scratch shown in Appendix "A", Photograph No. 14.
5. One minor, unrepaired scratch, was on the side which was facing east, and was above the repaired scratch described in the immediate preceding Paragraph. This scratch, however, was not deep enough to expose the metal part of the winding.
6. A small scratch, was near the top of the side which was facing south. The paint had pealed at one spot which was adjacent to the foregoing scratch.
7. The winding did not exhibit any physical damages such as bulging, and/or deformation, and/or bending.
8. One busbar exhibited minor bend.
9. Some minor paint scratches were near one of the lifting eyes. These scratches were also visible in Appendix "A", Photograph No. 14, as the Unit arrived in Vancouver, and were unlikely, related to the accident.
10. From a top view, the inner wall finish appeared to be in good condition.
11. Other than the above, the Reactor did not exhibit any physical damages.

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### ANALYSIS:

In what follows, unless otherwise indicated, **BOLD** capital letters in parentheses refer to information obtained from Appendices "A" to "C" inclusive, and listed in the body of this letter. **BOLD** numbers in parentheses refer to the observations described in this letter. **BOLD** small Roman number in parentheses refer to the earlier comments concerning the measured and the calculated values associated with the Shunt Reactor in question.

Due to the earlier described differences in the measured, and subsequently the calculated values, these indicated in this report, of Trench and Powertech, Trench Shunt Reactor was declared completely damaged.

It should be noted, however, that during the testing, which was performed by both Companies, the following values differed:

- \* Ambient Temperature **(ii)(xi)(xii)**.
- \* The applied current **(i)(ii)**.
- \* The Frequency **(iv)(v)(vi)**.

The differences in the above described values, likely, affected the outcome of the Tests, and subsequently the variation in the calculated values. Regardless, the conceived results of the Tests, and subsequently the calculated values were still within the specified values as indicated below:

<u>DESCRIPTION</u>	<u>SPECIFIED VALUE</u>	<u>TRENCH'S VALUES</u>	<u>POWERTECH'S VALUES</u>
AVERAGE TEMP. RISE	70°C	30.4°C	36.4°C (A)
TEMPERATURE AT HOTTEST SPOT SHALL BE BELOW <b>(B)</b>	130°C	88°C	64°C (B)
LOSS BELOW 0.4% of 20,000 kVA <b>(C)</b>	80kW	≈73.98kW	76.9kW (C)

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<u>DESCRIPTION</u>	<u>SPECIFIED VALUE</u>	<u>TRENCH'S VALUES</u>	<u>POWERTECH'S VALUES</u>
PERMISSIBLE REACTANCE TOLERANCE $\pm$ 5% OF 72.6 $\Omega$	68.97 $\Omega$ OR 76.23 $\Omega$	72.185852 $\Omega$	71.9594 $\Omega$ (D)
INDUCTANCE	231.1 mH	229.7915 mH	229.17 mH (K)

Note that the value of the Inductance measured by Trench was -0.5662% of the specified value; the value of the Inductance measured by Powertech was -0.8351% of the specified value. Both of the foregoing were less than 1% of the specified value. Consequently, these deviations are unlikely to affect the performance of Trench Shunt Reactor in question.

**OPINIONS:**

Based on the foregoing, I have formed the following opinion:

- I. Trench Dry Type, Air Core, Shunt Reactor, with the New Serial Number 42602-01, described in Appendices "B" to "D" of this report, was not completely damaged, and useless.
- II. In light of the original specifications, in conjunction with Powertech's test results, Trench Dry Type, Air Core, Shunt Reactor, with the New Serial Number 42602-01, described in Appendices "B" to "D" of this report, should function suitably, when installed at a facility that is complimentary with these test results.



A handwritten signature in black ink, appearing to read "H. Khashan", written over a horizontal line.

H. (Sam) Khashan, P.Eng.  
S. K. ENGINEERING LTD.

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**STATEMENT OF WRITER'S QUALIFICATIONS:**

My name is Husam (Sam) Khashan.

In 1976, I graduated from the University of Mechanical & Electrical Engineering in Plzen, Czechoslovakia, receiving a Master of Science degree in Electrical Engineering/The Application of Electrical Energy.

I have attended various Fire and Arson investigation courses, and obtained certificates of training from the University of Wisconsin, National Fire Academy-USA, BC Fire Investigation Seminar, and the Northwest Fire Investigation Seminar-Portland/Oregon.

**Since my graduation, I have been involved in the following fields of practices:**

- \* The design of industrial equipment;
- \* The thermal production of electrical power at a thermal power plant;
- \* The design and supervision during construction of electrical systems for residential, commercial, and institutional buildings;
- \* Provided assistance to underwriters, adjusters, members of the legal profession, manufacturers, and users in cases involving fire and electrical matters;
- \* Lecturing

**During the years of my practice, I have held the positions of:**

- \* Design Engineer;
- \* Chief Operation Engineer;
- \* Electrical Construction Project Manager;
- \* Senior Design and Investigative Engineer;
- \* Associated Engineer.

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### PROFESSIONAL ACCOMPLISHMENTS:

- \* Determined the cause and origin of numerous fires through detailed investigation.
- \* Proven causes included electrical failure, arson, and others.
- \* Assisted BC and Alberta Law Firms in cases involving up to eight million dollars liability.
- \* Concluded manufacturer's design error was at fault in electrical equipment failure where some also led to a fire
- \* Lectured at the Canadian Fire Investigation School - BC Division.
- \* Lectured at the BC Fire Academy.
- \* Lectured at the Seminars of the International Association of Arson Investigators (I.A.A.I) - BC Chapter 15.
- \* Lectured at the Arson Investigating Course for the North and West Vancouver RCMP, City of North Vancouver Fire Department, City of West Vancouver Fire Department, District of North Vancouver Fire Department.
- \* Lectured at the Conferences of the Fire Prevention Officers' Association of BC.
- \* Estimated the cost of repairs to damaged electrical equipment at a fraction of the insurance claim.
- \* Accepted as an "**Expert Witness**" in the BC Supreme Court.

### MEMBERSHIPS:

- \* Member of the Association of Professional Engineers and Geoscientists of the Province of British Columbia.
- \* Member of the International Association of Arson Investigators (IAAI).
- \* Member of the National Fire Protection Association (NFPA).

In 1992, I established my own consulting engineering firm, S.K. Engineering Limited. The firm provides assistance in cases involving electrical and fire investigation matters. I am personally involved in all of the firm's activities which relate to this type of assistance.

S. K. Engineering Ltd. address is: 206 - 145 15<sup>th</sup> Street, North Vancouver, BC V7M 1R9, Canada

  
H. (Sam) Khashan, P.Eng.

**APPENDIX "A"**

**COLOUR COPIES OF THE PHOTOGRAPHS  
OF THE REACTOR AFTER THE INCIDENT**

**TAKEN BY**

**MR. ROGER ROBINSON, CMS.**

**APPENDIX "B"**  
**PAGES NO. 21, AND NO. 22**  
**OF THE**  
**ORIGINAL SPECIFICATIONS**