

ELECTRICAL ENGINEERING SERVICES



PUBLIC WORKS DIRECTORATE / PUBLIEKE WERKE DIREKTORAAT



RN PEENSE Tel. 808-8331

2005-08-28

REPORT: HEAD: SYSTEMS OPERATIONS

FATALITY – L.B. LOUW (ELECTRICAL ENGINEERING SERVICES)

As part of our routine maintenance program of the transformers at the 66KV substation, it was found that one of the 7.5MVA transformers was leaking oil. Eskom was contacted to submit a quotation to repair the leak on the transformer. On 2005-07-08 a quotation was received and an order was issued on 2005-07-11 to them to perform the work.

On 2005-08-04 at 09:00 Eskom reported at the 66 KV substation in Vredenburg Road, Devon Valley to repair the oil leak on the transformer no.3. A work permit was issued and Eskom's responsible person was satisfied with all the safety procedures put in place by the Municipality. A senior electrician and his handyman of the Municipality were left on the site for the duration of Eskom being on site. At 12:30 Eskom concluded their work and handed the site over to Stellenbosch Municipality.

The Maintenance Assistant Superintendent was informed per radio that Eskom finished their task. With his arrival at the substation he proposed that general maintenance (cleaning) of the transformer can be performed whilst it is still switched off. He called Mr Louw, a qualified electrician, and his assistant to the substation to help him with the cleaning of the transformer. At their arrival he explained to them what he envisaged doing and all the safety procedures attached to the function. The safety netting was pointed out to them and the Maintenance Assistant Superintendent touched transformer no.3 to indicate that it was switched off because there was no vibration to be felt on the transformer. He pointed out the 66 KV links that was in the open position and explained that it brought about a break in the circuit to the transformer. As a further proof he pointed out to them the earthing that was brought on to the transformer. He then climbed onto transformer **no.3** and started the cleaning up process whilst still explaining to them.

At this point the Superintendent arrived at the site. The 3 gentlemen got off the transformer and the Superintendent climbed onto the transformer. After inspecting the bushings the Superintendent indicated that they were still a bit dirty and that it can be wiped with a dry cloth. Mr Louw offered to do it and went to his service vehicle to fetch a cloth. The Assistant Superintendent moved in the direction of the switching room to determine why the bird repellent mechanism was not working and the Superintendent turned to the side to observe the mentioned bird repellent that was not rotating, as it should.

The Superintendent saw Mr. Louw approaching Transformer **no.3**, as Mr. Louw walked past him. The next minute a loud bang was heard and the Superintendent found Mr Louw on the ground next to transformer **no.2** with his clothing on fire.

Mr. Louw had climbed through the barricading onto an electrically live transformer (**no. 2**) and made contact with the 66KV conductors.

The Superintendent shouted for assistance whilst he was ripping the burning clothes from Mr Louw's body and doused the flames on Mr. Louw's body with his bare hands. Water was used to cool Mr. Louw down. First Aid was applied and the ambulance service contacted.

Mr Louw sustained severe burns over 80% of his body and was transported to the Stellenbosch Medi Clinic by ambulance from where he was air-lifted to Tygerberg Hospital.

Mr Louw passed away on 2005-08-05 at 12:30 due to the injuries sustained. The incident was reported to the Department of Labour and the Compensation Commissioner on 2005-08-05 at 08:00. It was also reported to the SAPS on 2005-08-05. An inspector of the Department of Labour, came out to do a preliminary investigation. Sworn affidavits from the three officials present at the time of the incident were handed over to the SAPS.

CONCLUSION

The only explanation as to why Mr. Louw climbed **through** the safety barricade netting onto the wrong transformer, is that he was not focused on the task at hand and pre-occupied in thought.

It is evident from discussions with his colleagues that he was extremely excited about the purchase of his first ever vehicle, which was to be delivered the next day.

HEAD: SYSTEMS OPERATIONS

FINAL DRAFT ITEM/2004

MI EO(.....) FATAL ELECTRICAL ACCIDENT: 11 000 VOLT CABLES: BRAKPAN CCC (LANGAVILLE): SPECIAL WORKMAN: MR. W J PRETORIUS

PURPOSE

To report to Council the fatal electrical accident that occurred on 8 December 2004 in Langaville, at the corners of Gauteng Avenue and Northern Province Avenue when a Special Workman Mr. WJ Pretorius was fatally electrocuted after he inadvertently came in contact with live 11 000 volt cables whilst performing normal duties with a hydraulic crane fitted onto a Council vehicle with registration number DGN 683 GP.

MOTIVATION

An unfortunate incident occurred on 8 December 2004, at approximately 11h00, in Brakpan, Langaville area, when a Special Workman Mr. W J Pretorius died at his workplace after he unintentionally came into contact with live 11 000 volt cables whilst attempting to lift a concrete plinth over live 11 000 volt cables.

On instructions of the Director: Operations and Maintenance: Electricity Division, Municipal Infrastructure, Infrastructural Services, an investigation team was formed on 10 December 2004 to investigate the fatal incident in Brakpan.

❖ INVESTIGATION TEAM

S Delport	(Chief Engineer: Operations: Corporate Office: Boksburg)
Johan Dreyer	(Chief Area Engineer: Alberton CCC)
David van Vuuren	(Engineer: Operations and Maintenance: Tembisa CCC)
Hennie van Staden	(Senior Operations Officer: Network Control: Kempton Park CCC)

Also present:

J. D. de Villiers (Regional Director: MI: Electricity Division: Eastern Region)
P J H Lubbe (Engineers Technician: MI: Elec, Brakpan CCC)
R du Preez, (Test Technician: MI: Elec, Brakpan CCC)
L L Mahloele, (Act Senior Operational Officer: Plan and Constr, MI: Elec, Brakpan CCC)
S E Nleko, (Act Sen. Opsl Officer: Ops & Maint, MV Sect. MI: Elec, Brakpan CCC)
G N Mosia, (OHSACT Practitioner, HRM&D Brakpan)
P Woest, (Contractor, Top Steel Projects)
H C Esterhuizen, (Engineer: Operations and Maintenance, MI: Elec, Brakpan CCC)
W L Mathers, (Senior Manager: Customer Care, MI: Elec, Brakpan CCC)
S P Kriek, (Engineer Technician: Plan & Constr., MI: Elec, Brakpan CCC)
P G. Mtsweni (Sen Ops Officer: Ops and Maint. LV Sect., MI: Elec, Brakpan CCC)
M du Toit, (Admin Officer, MI: Elec, Brakpan CCC)
A.N. Mphalampela (General Worker: MI: Elec, Brakpan CCC)

❖ INCIDENT PARTICULARS

Date of incident : 8 December 2004
Time of incident : Approximately 11:00
Place/address of incident : Brakpan, Langaville area c/o Gauteng Avenue and Northern Province Avenue
Name of person deceased : Mr. WJ Pretorius
Position of injured person : Special Workman
Operational personnel involved : Mr. SE Nleko, (Act Senior Operational Officer: Ops & Maint, MV Section, MI: Elec, Brakpan CCC)
Statements received :
1 Mr Peter Mtsweni
2 S A Police, Tsakane Police Station
3 Mr Lindsey Mahloele
4 Mr Andine Ngomane
5 Mr N Mphalampela
6 Mr Abel Maqabane
7 Mr Salmon Pienaar Kriek
8 Mr Pieter Hendrik Woest
9 Mr Hermanus Johannes Els
10 Inspector Jabulani C Buthelezi, S A Police, Tsakane
Case Number : SAP, Tsakane : 120/12/2004

On the morning of 8 December 2004, Mr. S E.Nhleko, the Acting Senior Operational Officer: Ops & Maint, MI: Elec, Brakpan CCC, discussed with the deceased person, Mr W J Pretorius work that had to be done with a crane in Langaville. Mr W J Pretorius was to meet the Contractor at a site in Langaville where similar work was previously performed.

❖ DESCRIPTION OF EVENTS ON 8 DECEMBER 2004

- Mr. S E Nhleko received a cell phone call from the Contractor, Mr P Woest, to cancel the requested work for the day as it started raining in the Langaville Area situated in Brakpan.
- On the same day Mr. S E Nhleko was busy with other MV switching operations required to be done at another substation namely Vulcania 1.
- Mr W J Pretorius met with some of the personnel of the Contractors at the pre-arranged place from where they accompanied him to the location discussed, in the Langaville area c/o Gauteng Avenue and Northern Province Avenue.
- Mr WJ Pretorius removed the steel kiosk covering the taped insulated connected 11000 volt cables. Apparently as reported, the kiosk was not locked and therefore Mr Pretorius have had access to the 11000 volt cables without keys or being accompanied by an authorised person.
- Mr WJ Pretorius apparently allowed workers to attach a steel sling around the concrete plinth whilst knowing that the 11 000 volt cables were still live (dangerous conditions prevailed). His co-worker Mr. Aaron Dihlike Mphalampela mentioned to the investigation team that Mr W J Pretorius warned him to take great care in removing an earthed connection as the cables were still live.
- Mr W J Pretorius allowed the workers to attach a steel sling around the concrete plinth to be removed with the hydraulic crane. Standing next to Council vehicle, registration number DGN 683 GP Mr Pretorius started to lift the concrete plinth

with the crane over the live 11000 volt cables by operating the required levers fitted onto the vehicle.

- The general worker Mr Aaron Ndihlake Mphalampela, positioned on the vehicle at the time of the incident, mentioned to the investigation team that a “bang” noise was heard (which were also confirmed by the contractors’ personnel) where after he saw Mr Pretorius falling down. He unsuccessfully tried to assist Mr Pretorius and immediately called for help on the two-way radio. The ambulance arrived shortly afterwards but Mr Pretorius could not be resuscitated.
- An after investigation by Mr. P J H Lubbe confirmed and indicated that the 11 000 volt cable did trip the affected feeder circuit breaker on sensitive earth fault protection at the Vulcania 33/11kV supply substation to Langaville.

PARTICULARS OF MR W J PRETORIUS

ID number	12 February 1996
Date appointed	1 March 1988
Position	Pole Painter
Years applicable experience	Approximately 8 years
Date promoted to new position	12 February 1996
Position	General Workman (Special Workman)
Years applicable experience	8 years 9 months

PARTICULARS OF MR SE NLEKO	Acting Senior. Operational Officer: Ops & Maint, MV Sect. MI: Elec, Brakpan CCC)
ID number	7108135427080
Date appointed	1 July 1996
Position	Electrician
Years applicable experience	9 years

OCCUPATIONAL HEALTH AND SAFETY ACT No. 85 of 1993 AND REGULATION

The abovementioned Act is their to provide for the health and safety of persons at work and for the health and safety of persons in connection with the use of plant and machinery; the protection of persons other than persons at work against hazards to health and safety arising out of or in connection with the activities of persons at work; and to provide for matters connected therewith.

With reference to the OHSACT and REGULATIONS the investigation team felt that two specific regulations are to be highlighted with reference to this accident:-

1.) Occupational Health and Safety Act, 1993: Electrical Machinery Regulations, 1988: 4. Notices

Without derogating from any specific duty imposed on users of machinery by the Act, the user shall cause notices in both official languages to be exhibited within, and at all designated entrances to the premises, as the case may be, on which generating plant and transforming, switching or linking apparatus are situated, which notices -

d. contain directions on how to resuscitate persons suffering from the effects of electric shock:

Provided that this regulation shall not apply to miniature substations and distribution boxes, on condition that their access doors can be locked or bolted and that only authorised persons are permitted to open them and work thereon.

2.) Occupational Health and Safety Act, 1993: General Safety Regulations: 3. First aid, emergency equipment and procedures

1. An employer shall take all reasonable steps that are necessary under the circumstances, to ensure that persons at work receive prompt first aid treatment in case of injury or emergency.

4. Where more than 10 employees are employed at a workplace, the employer of such employees shall take steps to ensure that for every group of up to 50 employees at that workplace, or in the case of a shop or an office as contemplated in the Basic Conditions of employment Act, 1983 (Act No. 3 of 1983), for every group of up to 100 employees, **at least one person is readily available during normal working hours, who is in possession of a valid certificate of competency in first aid**, issued by -
 - a. the SA Red Cross Society
 - b. the St. John Ambulance;
 - c. the SA First Aid League; or
 - d. a person or organization approved by the chief inspector for this purpose.

In terms of the OHSACT No. 85 of 1993 definitions, unless the context otherwise indicates, **“reasonably practicable”** means

- (a) the severity and scope of the hazard or risk concerned;
- (b) the state of knowledge reasonably available concerning that hazard or risk and of any means of removing or mitigating that hazard or risk;
- (c) the availability and suitability of means to remove or mitigate that hazard or risk; and
- (d) the cost of removing or mitigating that hazard or risk in relation to the benefits deriving there from.

From the statement received from, Mr Ndihilike Mpalampela, who was at the scene, and who unsuccessfully tried to assist Mr Pretorius, it seems that he did not have sufficient knowledge **on how to resuscitate a person suffering from the effects of electric shock, by applying Cardio Pulmonary Resuscitation (C.P.R).**

However it should be mentioned that the results of the post mortem report were not available to the investigation team and consequently it is also not known whether Mr Pretorius may have suffered from other organ failures or damaged to such an extent that C.P.R would not have been of assistance to him.

Mr Ndihilike Mpalampela stated that he tried to assist by pressing Mr Pretorius chest. He then felt that Mr Pretorius was not breathing and when he saw nothing happening he then removed Mr Pretorius shoes and called other people on the hand radio.

Note: To prevent unnecessary or nuisance power supply interruptions it is **not** always practicable to design electrical networks with the lowest possible current sensitivity levels or high speed protection to guarantee the safety of personnel against electric shock.

One of the physiological effects of an electric shock on human beings is the possibility of heart fibrillation. This is also recognised as one of the major causes of fatalities.

Steps to be taken to prevent the recurrence of similar accidents:

A written instruction is to be issued to all non-competent operating staff confirming that no person other than a person authorised thereto by the user shall enter, or be required or permitted by the user to enter, premises housing switchgear or transformers unless all live conductors are insulated against inadvertent contact or are screened off: Provided that the person so authorised may be accompanied by any other person acting under his control.

A written instruction is to be issued to all competent operating staff confirming that they are not allowed to authorize non-competent persons or unauthorised persons to unlock or enter, premises housing switchgear or transformers unless all live conductors are insulated against inadvertent contact or are screened off.

Additional recommended steps to be taken:

In light of the previously stated OHSACT regulations the investigation team also recommends that all employees, from level 18 up to and including level 9, who are involved with electricity network operations, maintenance or construction work be required to attend a basic training session **on how to resuscitate a person suffering from the effects of electric shock, by means of training sessions during normal working hours**, at an approved and suitably registered company for this purpose. Sufficient funds is available for such training on vote number 1321302556575 : Training, to accommodate the expenses.

The Electrical Machinery Regulations 4(d), Notices: refers to both official languages and is referring to English and Afrikaans, which is not inline with the Constitution. The situation now calls for these notices to be in all the official languages that are applicable to that area where such notices will have to be erected. Although this is not yet legislated, it is important that the Constitution be adhered to and that an attempt is made prior to this regulation being amended to comply with the Constitution as well as to constantly remind and advice all personnel involved of the required resuscitation procedure.

Therefore it is also recommended that the notices, on how to resuscitate persons suffering the effect of electrical shock, as required being erected at all designated places be erected in all the official languages that are applicable.

Note: notices need not be placed at miniature substations and distribution boxes, on condition that their access doors can be locked or bolted and that only authorised persons are permitted to open them and work on them.

Summary

From the information provided to the investigation team it seems that Mr W J Pretorius had knowledge of the dangers involved in working close to live electricity networks. For some unknown reason Mr. Pretorius commenced and proceeded with the task of lifting the concrete plinth over the live 11 00 volt cables.

The risk taken by Mr Pretorius to do work close to or near live 11 000 volt cables went horribly wrong when the concrete plinth damaged the cable insulation, exposed the live conductor and consequently through the steel cable sling made the vehicle and crane live and brought Mr

Pretorius in-direct contact with a live 11 000 volt conductor ($11\ 000/\sqrt{3}$ volt) relative to earth. Under such hazardous live conditions dangerous high leakage current will flow through the body of a person.

Unfortunately Mr Pretorius passed away and this prevents the investigation team to obtain more detailed information on what exact instructions he had received or why did he decided to commence with the work whilst the cable was still live.

For the sole purpose of preventing accidents of this nature it is recommended that the Regional Director: Eastern Electricity Division, Municipal Infrastructure, or his delegated person in Brakpan CCC, prepare an informative presentation of the accident and share the lessons learned with all CCC's Electricity Division staff members in his own region as well as in all the other regions CCC's to prevent further injury or fatal accidents of their employees.

It is also recommended that the three Regional Directors: Electricity maintains a record of attendance to ensure that all relevant personnel under their control attend such a presentation.

The investigation team found that the importance of immediate communication between Mr S E Nleko and Mr W J Pretorius to inform him that the work has been cancelled might have prevented the accident.

However should personnel decide to ignore standing instructions or safety procedures and to proceed with work under obvious dangerous or risky conditions, the results of their actions may be unavoidably disastrous. Therefore it is recommended that a constant effort should be made to make all personnel regularly aware of the dangers involved in working on electricity networks by means of safety training material such us videos or other training materials.

It also seems that training on how to resuscitate a person suffering from the effects of electric shock, is essential for all operational workers in the electricity division.

1. **Annexure A:** Photo 1, indicating the arrangement at the site of the accident.

COMMENTS FROM RELEVANT DEPARTMENTS

Corporate and Legal Services:

Human Resources:

Finance:

RECOMMENDATION

1. **That** the contents of the report by the Executive Director: Municipal Infrastructure to report to Council the electrical accident that occurred on 8 December 2004 at the Brakpan CCC, in Langaville on the corner of Gauteng Avenue and Northern Province Avenue when a Special Workman Mr. WJ Pretorius was fatally electrocuted from inadvertently coming into contact with live 11 000 volt cables whilst performing normal duties with a hydraulic crane fitted onto vehicle registration number DGN 683 GP, **BE NOTED.**

2. **That** for the sole purpose of preventing accidents of this nature the Regional Director: Eastern Electricity Division, Municipal Infrastructure, or his delegated person in Brakpan CCC, prepare an informative presentation on the accident and share the lessons learned with all CCC's Electricity Division staff members in his own region as well as in all the other regions CCC's to prevent injury or fatal accidents of their employees.
3. **That** a written instruction be issued to all non-competent operating staff confirming that no person other than a person authorised thereto by the user shall enter, or be required or permitted by the user to enter, premises housing switchgear or transformers unless all live conductors are insulated against inadvertent contact or are screened off: Provided that the person so authorised may be accompanied by any other person acting under his control.
4. **That** a written instruction be issued to all competent operating staff confirming that they are not allowed to authorized non-competent persons or unauthorised persons to unlock or enter, premises housing switchgear or transformers unless all live conductors are insulated against inadvertent contact or are screened off.
5. **That** the Regional Directors in the Electricity Division of Municipal Infrastructure keep record of attendance to ensure that all relevant personnel under their control attend the presentation referred to in recommendation 2.
6. **That** the Executive Director: Municipal Infrastructure BE PERMITTED to call for quotations and to appoint an approved and suitably registered company to train applicable employees on first aid as required for electricity incidents.
7. **That** all employees, from level 18 up to and including level 9, who are involved with electricity network operations be required to be attend a basic training session, two yearly, during normal working hours, at an approved and suitably registered company, on how to resuscitate a person suffering from the effects of electric shock, by applying Cardio Pulmonary Resuscitation (C.P.R).
8. **That** the Regional Directors in the Electricity Division of Municipal Infrastructure keep record of attendance to ensure that all employees in the electricity division, of Municipal Infrastructure, from level 18 up to and including level 9, who are involved with electricity network operations, maintenance or construction work be required to be attend a basic training session, on how to resuscitate a person suffering from the effects of electric shock, funded from the Training vote number 1321302556575.
9. **That** as far as practicable possible an attempt being made by all Regional Directors and Chief Area Engineers in the Electricity divisions of all the CCC's to replace all notices, on how to resuscitate persons suffering the effect of electrical shock, as required by the Electrical Machinery Regulations 4(d), Notices, with notices in all the official languages that are applicable.

ANNEXURE "A" Photo 1

