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2010

24 July 2009

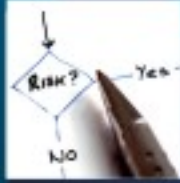
Dear Steven,

Eskom Maningi Station – Sandton.

Attached, please find the report on the aspects referred to in the public's concerns regarding electromagnetic fields and sulphur hexafluoride risk. I trust that the information meets your requirements.

Kind regards

Dirk C Haasbroek
Operations Executive: Risk Management Services.



Risk Management Services

Eskom Maningi Substation – Sandton Marsh Environmental Services

PREPARED BY: F E Waller
REPORT: 01
DATE: 24 July 2009
APPROVED BY: Dirk C Haasbroek
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WHEN YOU'RE SERIOUS ABOUT MANAGING RISK

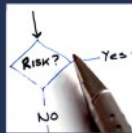


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Document Version Control

Rev No	Issue Date	Reason for Issue	Prepared By	Reviewed By
0	24/07/2009	Report	FEW	DCH

1.0 Introduction

IRCA was requested to comment on the potential risk related to sulphur hexafluoride (SF₆) and electromagnetic fields (EMFs) arising from the proposed construction of a substation in the Sandown extension 24 area. Mr. F E (Edgar) Waller, registered with Occupational Hygienist (Department of Labour and South African Institute of Hygiene) compiled this report:

2.0 Sulphur hexafluoride (SF₆)

The following pertains to SF₆

- The substance is used as an insulator and arc suppressor in circuit breakers.
- Normally would be completely contained in cylinders i.e. no routine exposure.
- SF₆ is relatively inert and non-toxic gas (as well as being colourless, odourless and non-flammable). 2009 ACGIH TLV TWA is 1000ppm.
- Main hazard is that it is an asphyxiant in high concentrations with no odour warning.
- It is also an important greenhouse gas – a global warming potential of 22,800 times that of carbon dioxide (CO₂) compared over a 100 year period. Containment as per specifications is therefore important. However, due to high density relative to air, SF₆ remains at the bottom of the atmosphere reducing the risk of global warming.
- Disulphur decafluoride (S₂F₁₀) gas is a potential decomposition product but this has only been produced under lab conditions and not under substation conditions. S₂F₁₀ should therefore not be a concern.
- Gas leak potential - it is not flammable nor is it hazardous / toxic (see previous comment). It does present a risk as an asphyxiant but this will require inhalation of concentrated levels in a confined space. Volumes in a substation are normally low and the gas pressure is normally monitored (this is needs to be confirmed in terms of the Maningi substation).

2.1. Comment on SF₆ Risk

In my opinion the SF₆ will be a low risk if the units are installed in an indoor confined space, contained in cylinders, pressure monitoring with alarms is done, periodic inspections are performed and a preventative maintenance programme is implemented. (these items also need to be confirmed in terms of the Maningi substation)

2. Electromagnetic Fields (EMF)

The following is relevant to EMFs:

- Various epidemiological studies have shown an association between childhood cancer (specifically leukaemia) and utility wires near residential areas. However the studies are inconclusive and have not confirmed causality. Scientific studies on the other hand have indicated that the weak link between EMF exposure and health risks is weak. This contradiction demonstrates that more understanding and better data is required. ESKOM acknowledges this in their information brochure and supports further university research in this regard.
- The World Health Organisation (WHO) 2007 fact sheet also accepts that: “the evidence related to childhood leukaemia is not strong enough to be considered causal..” and that more research is required to reduce the uncertainty. It also notes that childhood leukaemia is a rare disease and even if ELF EMFs are shown to increase the risk of the disease, the public health impact from a global perspective would be limited.
- It is interesting to note that the California Department of Health have disputed the scientific studies and placed more emphasis on the epidemiological studies. However, they also acknowledge that there is no conclusive evidence.
- The International Agency for Research on Cancer (IARC) lists EMF as Group 2B agent i.e. possibly carcinogenic based on limited evidence of carcinogenicity. The IARC 2B classification is based mainly on the evidence of childhood leukaemia.
- The first interim report from the Stakeholder Advisory Group on ELF EMFs (SAGE), set up by the UK Department of Health, felt that there was sufficient evidence of a link between close proximity to power lines and childhood leukaemia to consider precautionary measures. The precautionary measure that they advocate is the so-called “corridors for new build” or a required distance between power lines and other buildings (residential and some non-residential buildings such as schools). The horizontal distance to the nearest part of a building should be 30m for 66kV, 110kV and 132kV voltage lines. Underground lines, which will also have a visual benefit, could also be considered. Protection by trees was discarded as it did not reduce electromagnetic fields as effectively as the other options.
- Two organisations, ICNIRP and IEEE, have developed exposure guidelines. Many countries have adopted the ICNIRP guidelines. Few countries (such as Australia, Sweden and Denmark) as well as the state of California have also adopted precautionary measures. Australia and California require spending a portion of the project cost to reduce electromagnetic fields from new power lines.

Sweden has adopted a policy of prudent avoidance i.e. the low-cost avoidance of unnecessary exposure as long as there is scientific uncertainty about the health effects. The approach is to protect people from high magnetic exposures of long duration provided that the cost is reasonable i.e. options of lower exposure should be chosen as long as they do not incur large inconvenience or cost.

- It was noted that the levels from the substations would be way below the IRPA limit of 100 μ T for continuous general public exposure. The link between magnetic fields and an increased risk of childhood leukaemia is often expressed at long – term average fields exceeding 0.4 μ T. SAGE also recognizes that 0.4 μ T is not an absolute threshold representing a “safe” and “unsafe” limit. Protection of children was identified as one of the main priorities.

2.1. Comment on EMF Risk

In view of the uncertainty surrounding the long-term effects of EMF, especially on children, it would irresponsible to say with any certainty that there is absolutely no risk at all. In order to be prudent, the design of the new substation should incorporate measures to reduce EMF levels in particular by increasing the distance from the residential buildings if at all feasible.

4.0 Bibliography

The following sources were consulted:

- Authoritative sources – 2009 American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs).
- Eskom Information brochure: Electric and Magnetic Fields (EMFs)
- Hazardous Chemical Substances Regulations (HCS) framed under the Occupational Health and Safety Act (Act 85 of 1993).
- Health Effects from Power Frequency Electric and Magnetic Fields: Recent Findings by P H Pretorius and K R. Hubbard
- <http://en.wikipedia.org/wiki/>
- <http://mongraphs.iarc.fr/>
- <http://www.cdph.ca.gov/>
- NIEHS Report on Health Effects from Exposure to Power Line Frequency Electric and Magnetic Fields, NIH Publication No. 99-4493, 4 May 1999.
- Various literature on the NIOSH web site <http://www.cdc.gov/niosh/emf>
- Presentation Public Meeting – Maningi Substation
- Stellman, Jeanne Mager. Encyclopaedia of Occupational Health and Safety, 4th Edition, Geneva, International Labour Office, 1998
- Stakeholder Advisory Group on ELF EMSs (SAGE) Precautionary Approaches to ELF EMFS, first interim assessment dated 27/04/2007 available on <http://www.rkpartnership.co.uk/sage/>
- World Health Organization (WHO), EMF and Public Health, fact sheet No. 322 of June 2007.

ANNEXURE 1.
CV of Edgar Waller – Occupational Hygienist.

Curriculum vitae: *F. Edgar Waller*

1. Personal Details

- **Name** *Waller, Frederick Edgar*
- **Residential Address** *30 Sanatorium Lane, Kensington, Johannesburg, 2094*
- **Postal Address** *30 Sanatorium Lane, Kensington, Johannesburg, 2094*
- **Telephone** *(011) 614 – 8174*
- **Identity Number** *611231 5087 087*

- **Age** *48 years*
- **Date of birth** *31 December 1961*
- **Place of birth** *Mount Currie, Kwazulu - Natal, South Africa*
- **Sex** *Male*
- **Marital Status** *Married*
- **Nationality** *South African*

2. Educational Background

2.1. Secondary Education

- **High school attended** *Barberton High School*
- **Level Attained** *Matric, 1979*

2.2. Tertiary Education

- *National Diploma Environmental Health - Natal Technikon, 1985*

- *National Higher Diploma Environmental Health - Witwatersrand Technikon, 1989*
- *National Certificate In Noise Control – Technikon RSA, 1992*

2.3. Professional Qualifications

- *Certificate in Operational Competence – British Institute of Occupational Hygiene (BIOH), 1997. First South African to arrange and write the Core Exam in South Africa – 1993.*

2.4. Other Training/Education

- *Certificate In Audiometry – Natal Technikon, 1984*
- *Supervisors Safety Training Course – National Occupational Safety Association (NOSA), 1984*
- *Advanced Safety Training Course - National Occupational Safety Association (NOSA), 1984*
- *Basic Ambulance Course – Natal Provincial Association, 1985*
- *Safety Management Training Course - National Occupational Safety Association (NOSA), 1987*
- *Instructional Techniques In Safety - National Occupational Safety Association (NOSA), 1987*
- *Communicating About Performance (CAP) – Middelburg Steel & Alloys, 1987*
- *Practical Loss Control Leadership – International Loss Control Institute (ILCI), 1988*
- *Phase Two Training Licence (to present the Advanced Safety Training Courses) - National Occupational Safety Association (NOSA), 1989*
- *Occupational Hygiene Monitoring Course – Ergosaf, 1989*
- *Introduction To Microcomputers and DOS - Middelburg Steel & Alloys, 1989*
- *Air Quality Analysis and Surface Practical – Chamber Of Mines, 1991*
- *Certificate In Occupational Hygiene Legislation – Pretoria Technikon, 1995*
- *Environmental Auditor Training Programme (EARA Approved) – Aspects International, 1995*

2.4.1. Continuing Education

- *Noise Exposure Assessment and Control – Unilever Safety and Environmental Assurance Centre (SEAC), 2000*
- *Applied Ergonomics for the Industrial Hygiene Professional - American Industrial Hygiene Association (AIHA) Continuing Education, 2004*
- *Noise Exposure: Sampling Strategy & Data Acquisition – AIHA Continuing Education Course, 2005*
- *Practical Applications of OEHS Math, EIH part II –AIHA Continuing Education Course, 2006*

- *Case Studies in the Application of Industrial Hygiene Control Methods, EIH part III – AIHA Continuing Education Course, 2007*
- *Indoor Air Quality (IAQ) and Heating, Ventilating & Air Conditioning (HVAC) systems by D. Jeff Burton – also approved for 5 continuing education units (CEU) and 4 American Board of Industrial Hygienists certificate maintenance (ABIH CM) points - 2008*
- *Anticipation, Recognition, Evaluation and Control of Welding Hazards –AIHA Continuing Education Course, 2008*
- *Exposure Assessment Strategies and Statistics – AIHA Continuing Education Course, still busy completing 2009*
- *Heat Stress solutions workshop – AIHA Professional Development Workshops, 2008*
- *Risk Assessment symposium –AIHA Continuing Education Course, 2008*
- *ACGIH TLVs: Practical Applications in the Workplace - American Conference of Governmental Industrial Hygienists (ACGIH) Continuing Education, 2009*

3. Professional & Legislated Organisations

- *Institute Of Occupational Hygienists Southern Africa (IOHSA) – Registered Occupational Hygienist (Membership number 0102)*
- *Department of Labour – Approved Inspection Authority(AIA) in terms of all legislated occupational hygiene aspects (certificate number CI 062 OH)*
- *British Institute of Occupational Hygienists (BIOH) – Licentiate Grade*
- *American Industrial Hygiene Association (AIHA) – Full Member*
- *American Conference of Governmental Industrial Hygienists (ACGIH) – Associate Member*
- *Medical and Dental Council – Registered Environmental Health Officer*

4. Occupational Experience

4.1. Current Position

- **Company** *PSM Industrial Hygiene Services c.c.*
- **Position** *Managing Member*
- **Period** *January 1998 to date*
- **Main Responsibilities:**
 - *Marketing of occupational hygiene services.*
 - *Client liaison.*
 - *Workplace occupational hygiene surveys to determine compliance with the Occupational Health and Safety Act, 1993 (Act 85 of 1993).*
 - *Development of occupational hygiene programmes to demonstrate compliance with legal requirements.*
 - *Auditing of occupational hygiene programmes.*
 - *Implementation and maintenance of systems to meet the requirements of IOHSA and Department of Labour (for clients and self).*
 - *Development and auditing of environmental programmes to meet ISO14001 requirements, specifically for the construction industry.*

- **List of regular/ongoing clients:**

- ABSA
- Assamang Cato Ridge
- Chemserve Perlite
- Coca - Cola
- Crabtree Electrical Appliances
- Delta EMD
- DHL
- DMS
- Hudson and Knight
- IHD
- Unilever South Africa (Nationally)
- L' Oreal
- Manganese Metal Company (MMC)
- Metalloys
- National Starch
- Richards Bay Minerals (RBM)
- SAB Miller Chamdor, West, Baragwanath, Alrode depot, Wadeville, Vereeninging, Potchestroom, Mafikeng, Puthditjhaba, Welkom, Denver
- Transwerk Langlaagte and Koedoespoort
- Wilec
- Xertech
- York Timbers (Mills and Plantations)

4.2. Previous Employers

4.2.1. IRCA (Pty) Ltd

- **Position** *Divisional Director – Occupational Hygiene*
- **Period** *September 1995 to December 1997*

- **Main Responsibilities:**

- *Develop an approved occupational hygiene laboratory.*
- *Management of occupational hygiene facility.*
- *Marketing of occupational hygiene services.*
- *Client liaison.*
- *Workplace occupational hygiene surveys to determine compliance with the Occupational Health and Safety Act, 1993 (Act 85 of 1993).*
- *Development of occupational hygiene programmes to demonstrate compliance with legal requirements.*
- *Auditing of occupational hygiene programmes.*
- *Implementation and maintenance of systems to meet the requirements of IOHSA and Department of Labour (for clients and IRCA).*

- **Reason for resignation** *Started own practice*

4.2.2. Columbus Joint Venture

- **Initial Position** Senior Risk Control Officer
- **Final Position** Superintendent Group Occupational Hygiene
- **Period** October 1987 to August 1995

- **Main Responsibilities:**
 - Development of occupational hygiene programmes to ensure legal compliance.
 - Management of occupational hygiene facility.
 - Monitoring of workplace stress factors.
 - Compile occupational hygiene risk profiles.
 - Development occupational hygiene “right – to – know” training modules.
 - Auditing of occupational hygiene programmes.

- **Areas of responsibility:**
 - Columbus Stainless
 - Middelburg Ferrochrome
 - Thos Begbies

- **Reason for resignation** Prospect of job enrichment and development.

4.2.3. Transnet

- **Initial Position** Student
- **Final Position** Environmental Health Officer
- **Period** January 1982 to September 1987

- **Responsibilities:**
 - Public health – food hygiene, water supplies, infectious diseases, pest control & rail truck decontamination.
 - Perform occupational hygiene duties (identification, evaluation and recommendations on environmental hazards) at various depots.
 - Perform occupational safety functions (inspections, incident/accident investigations, analysis, prepare statistical reports, ensure compliance with safety legislation, participate on all safety committees in area of responsibility, etc.)

- **Areas of responsibility:**
 - Empangeni & Kwazulu – Natal North Coast

- **Reason for resignation:** Career development and improved remuneration.