

Radiation Survey Report

Mineral House, George Street, Brisbane

May 2008

Executive Summary

Background

In response to concerns amongst staff of the ground floor Mineral House in George Street Brisbane raised by staff in May 2008, Department of Public Works requested that Queensland Health conduct a radiation survey to assess possible radiation exposures in the workplace.

Conclusions

1. The measurements of 50 Hz magnetic fields and radiofrequency power flux density taken on the ground floor of Mineral House were well below national limits for safe exposure.
2. The roof area measurements of radiofrequency power flux density were also well below national limits for safe exposure.

1. Radiation survey report Mineral House, George Street, Brisbane

Introduction

Due to concerns raised by staff at Mineral House, George Street, Brisbane, Radiation Health was requested by the Department of Public Works to perform an initial investigation of the electromagnetic fields at Mineral House.

Due to the presence of an electrical substation below ground floor, it was determined that this would be the most likely source of electromagnetic radiation. Consequently, 50 Hz magnetic flux density measurements were taken at certain points within occupied areas. These measurements were taken on the ground floor of Mineral House, in the area above the transformer and compared with the exposure limits referenced in the NHMRC *Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields (1989)*.

It is not normal practice to measure the 50 Hz electric fields as it is only the magnetic fields which have been implicated as being associated with health effects in epidemiological studies associated with extremely low frequency electromagnetic radiation; the electric fields have not been implicated. Furthermore, the ground floor is reportedly shielded with steel or similar material, and is presumably grounded. It is most unlikely that electric fields from the substation beneath would permeate the floor.

Additionally, radiofrequency power flux density levels were measured at various locations on the ground floor and, subsequently, on and around the roof, to determine if there were any elevated radiofrequency fields in the vicinity.

Exposure Limits

Extremely low frequency electromagnetic fields

There is currently no Australian Standard relating to exposure to extremely low frequency electromagnetic fields. However, the National Health and Medical Research Council (NHMRC) *Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields (1989)* has been used as a general guide in Australia and recommends magnetic flux density exposure limits that should not be exceeded. These limits are set at a level well below those at which any adverse effects are observed.

A summary of the NHMRC limits recommended for occupational and general public exposure to 50/60 Hz magnetic fields is given in the following table:

Table 1. Limits of exposure to 50/60 Hz magnetic fields

Exposure characteristics	Magnetic flux density microtesla (rms)
OCCUPATIONAL	
Whole working day	500
Short term	5,000 (a)
For limbs	25,000
GENERAL PUBLIC	
Up to 24 hours/day (b)	100
Few hours/ day (c)	1,000

Notes:

- (a) Maximum exposure duration is two hours per work day
- (b) This restriction applies to open spaces in which members of the general public might reasonably be expected to spend a substantial part of the day, such as recreational areas, meeting grounds and the like
- (c) These values can be exceeded for a few minutes per day provided precautions are taken to prevent indirect coupling effects

For the purposes of this report, 100 microtesla was used as the exposure limit as it is the most restrictive limit. It should be noted that it is expected that the Commonwealth's Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) will publish a Radiation Protection Standard which will set the human exposure limits for electric and magnetic fields (0 Hz to 3 kHz) this year and the limits are likely to be of this order.

Radiofrequency Fields

The ARPANSA *Radiation Protection Standard for Maximum Exposure Levels to Radiofrequency Fields – 3kHz to 300 GHz (2002)* specifies limits of human exposure to radiofrequency fields in the frequency range 3kHz to 300 GHz to prevent adverse health effects.

This Standard recognises that, for general public exposure, the reference level expressed in terms of power flux density for exposure to radiofrequency fields (effectively the member of the public limit) is 2 W/m² in the frequency range expected.

Measurement Results

50Hz Magnetic Flux Density Measurement Results

Measurements of 50 Hz magnetic flux density were made on the ground floor of Mineral House on the 8th and 9th of May 2008 with an Emdex II EPRI magnetic field meter (serial number 2913), calibrated on the 31 October 2007.

The 50 Hz magnetic fields measured on the ground floor are less than 2% of the recommended limits (100 microtesla) for the general public as outlined in the NHMRC *Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields (1989)*.

The maximum magnetic flux density in occupied areas measured on the ground floor above the Energex transformer area (1.5 microtesla) is slightly above the expected normal exposure for office workers (0.06 to 0.2 microtesla) but well below the NHMRC limits. Measurements taken in occupied areas on levels 1 and 5 were between 0.02 and 0.15 microtesla, which is within the expected range for office workers.

Radiofrequency Power Flux Density Measurement Results

Measurements of the radiofrequency power flux density were made on the ground floor of Mineral House on the 9th of May 2008 with a Narda EMR -21C (s/n 0009), with a Narda Type 18 E-field probe capable of measuring radiofrequency radiation between 100 kHz - 3 GHz (s/n S-0009), calibrated on the 16 January 2008.

Measurements of the radiofrequency power flux density were also made in accessible areas on and around the roof areas of the building on 14th May 2008.

In all instances, the radiofrequency power flux density measurements were all below 0.001 W/m², and well below exposure limits specified in the ARPANSA *Radiation Protection Standard for Maximum Exposure levels to Radiofrequency Fields – 3 kHz to 300 GHz (2002)*.

Summary

The 50 Hz magnetic fields measured at occupied areas were less than 2% of the member of the public limits as outlined in the NHMRC *Interim Guidelines on Limits of Exposure to 50/60 Hz Electric and Magnetic Fields (1989)*. The ground floor measurements for the 50Hz magnetic fields in normally occupied areas above the transformer, at up to 1.5 microtesla, are slightly above the expected level of exposure for office workers (0.06 to 0.2 microtesla). The boundary of this area of increased level is very distinct, and the fields appear to be generated in the basement.

The measurement pattern of the 50 Hz magnetic fields on the ground floor is not symptomatic of a point source, and may be due to cabling from the transformer and AC plant room under the floor. The measurements on floors 1 and 5 in occupied areas were unremarkable.

Electrical junction cupboards and switchboards on floors where measurements were made exhibited the characteristics of a point source, giving higher readings close to the source and falling off rapidly with distance. Magnetic field measurements taken in the vicinity of these features were as high as 2.7 microtesla but they dropped off rapidly to 0.2 microtesla within a metre or so.

The Control Operational Room located on the ground floor exhibited the typical measurement profile for this type of room, with higher 50 Hz magnetic flux densities measured near electronic components, as expected, but rapidly decreasing with distance.

The radiofrequency power flux density measurements, on the ground floor and on and around the roof, were all below 0.001 W/m², and well below the 2 W/m² reference level specified in the ARPANSA *Radiation Protection Standard for Maximum Exposure levels to Radiofrequency Fields – 3 kHz to 300 GHz (2002)*.