

Safety Guidelines for Electric and Magnetic Fields

2022

What do the experts say on safe levels of Electric and Magnetic Fields (EMF)?

The New Zealand Ministry of Health, recommends the use of the exposure guidelines provided by the International Commission for Non-Ionizing Radiation Protection (ICNIRP).

These guidelines are also identified as the appropriate basis for public health protection by Policy 9 of the National Policy Statement on Electricity Transmission under the Resource Management Act.

How are the safety guidelines set?

The ICNIRP guidelines set fundamental limits on electrical fields induced in the body by EMF. The limits on induced electric fields in the body are termed 'basic restrictions' and are measured in volts per meter in units of (V/m).

Since induced electric fields in the body are difficult to measure or calculate, ICNIRP also provides reference levels. Reference levels are in terms of the more easily measured ambient electric and magnetic fields that give rise to the induced body currents.

Provided field strengths are below the reference levels, resulting induced electric fields will be within the basic restriction. If exposures exceed the reference level, this does not necessarily mean that the basic restriction is being exceeded, but that a more careful evaluation is required.

What are the exposure guidelines from ICNIRP?

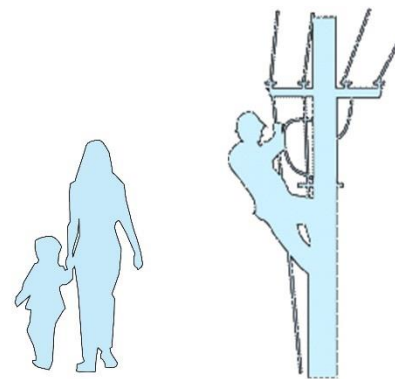
The ICNIRP guidelines applying at 50 Hz (the frequency of the fields from all equipment carrying or using mains electricity) are summarised in the table over the page:

ICNIRP is:

- a formally recognised non-governmental organisation of the World Health Organization (WHO) and the International Labour Organization.
- an independent scientific organisation.
- responsible for providing guidance and advice on the health hazards of non-ionising radiation.
- established to advance non-ionising radiation protection for people and the environment.



ICNIRP Guidelines



		Public	Occupational
Basic restriction	Central Nervous System tissues of head	0.02 V/m	0.1 V/m
	All tissues of head and body	0.4 V/m	0.8 V/m
Reference level	Electric field	5.0 kV/m	10.0 kV/m
	Magnetic field	200 μ T	1000 μ T

For exposures of the general public, the ICNIRP reference levels for 50 Hz magnetic and electric fields are 200 μ T and 5 kV/m respectively. These limits apply to both children and adults. Since the established effects of interest, as described in Factsheet 5, are instantaneous, the purpose of controls is to limit maximum exposure at any point in time. As such there is no greater effect associated with long term exposures than with short term exposures.

ICNIRP's limiting thresholds for general public exposure, are widely accepted as providing complete protection against all known adverse health effects of electric and magnetic fields. Indeed, so do the occupational levels, which allow for higher exposure for trained workers, the difference being provision of a greater safety margin for the general public.

ICNIRP continues to review the research in this area. The guidelines have been widely accepted and implemented in many countries. For example, the guideline values are reflected in the European Union's Directive on occupational exposure.

Besides the National Policy Statement on Electricity Transmission as identified above, the National Environmental Standards for Electricity Transmission Activities (NES) under the RMA also control EMF exposures around transmission lines. They require that following certain types of upgrade or maintenance work to pre-2010 overhead or underground transmission lines, the electric and magnetic fields should comply with the 1998 ICNIRP guidelines, (in which the magnetic field public exposure guideline is 100 μ T). It is anticipated that at some time the Ministry for the Environment will update the transmission NES to bring it in line with the current 2010 ICNIRP guidelines recommended by the Ministry of Health, (in which the magnetic field public exposure guideline is 200 μ T).

What about studies showing links between health and lower levels of exposure?

People find it difficult to reconcile the ICNIRP reference level of 200 μ T with the findings from some epidemiological research showing an apparent correlation between an approximate doubling in the very low risk of childhood leukaemia and long-term exposure to average fields greater than 0.4 μ T. The nature of epidemiological research is described in Fact Sheet 4.

'The epidemiological and biological data concerning chronic conditions were carefully reviewed and it was concluded that there is no compelling evidence that they are causally related to low-frequency EMF exposure'.
ICNIRP Guidelines 2010

ICNIRP considered the epidemiological data suggesting possible associations with childhood leukaemia when preparing their guidelines. While ICNIRP recognises the association, they do not consider that a risk has been established. Rather, there is a possibility that there might be a very low risk. Other health bodies who have reviewed the research come to the same conclusion.

The review of scientific knowledge is an ongoing process that entails the periodic review of the full body of scientific literature by national and international bodies.

Scientific uncertainty around the association between EMF and childhood leukaemia has led to significant debate. From a risk management perspective, prudent avoidance and precautionary approaches have been advocated.

The idea of prudent avoidance was advanced by risk management academic Professor Granger Morgan at Carnegie Mellon University in the 1980s. It provides for an approach that allows caution to be applied, even when this is not absolutely indicated by scientific considerations, on the basis that this is a proportionate response to the likelihood of there being a real risk, and the magnitude of that risk if it does exist.

An example of prudent avoidance is the reverse phasing of conductors and attention to routing, of new transmission lines currently practised by Transpower. These measures effectively reduce field exposures around the lines.

The approach can be simply defined as *"the idea of avoiding human exposure to power-frequency electric and magnetic fields when it can be done at modest cost and little inconvenience"*.

In Australia, prudent avoidance was defined by the former Chief Justice of the High Court of Australia, Sir Harry Gibbs, as doing what can be done without undue inconvenience and at modest expense to avert the possible risk to health from exposure to new high voltage transmission facilities.

In line with this approach, in New Zealand, the Ministry of Health encourage the voluntary adoption of such low or no cost measures to reduce or avoid exposures. They also do not support setting exposure limits, below those determined by the analysis of the health effects research.

In a June 2007 report on possible EMF health effects the World Health Organization make the following statements.

'In recommending precautionary approaches, an overriding principle is that any actions taken should not compromise the essential health, social and economic benefits of electric power.'

'Provided that these benefits are not compromised, implementing precautionary procedures to reduce exposures is reasonable and warranted.'

In New Zealand the Ministry of Health encourages the adoption of no or low cost measures to reduce or avoid exposures.

'Given the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukaemia and the limited potential impact on public health, the benefits of exposure reduction on health are unclear and thus the cost of reducing exposure should be very low.'

'However, it is not recommended that the limit values in exposure guidelines be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection.'

Prudent avoidance can embrace a range of actions that it is sensible to take, having regard to the current state of scientific knowledge. For Transpower, such actions include monitoring research, continually reviewing policies in the light of the most up to date research findings (with particular emphasis on the findings of scientific review panels), providing awareness training for electricity supply business employees and keeping them informed, sharing information freely with the community, measuring fields levels and attention to design and careful siting of new transmission facilities.

This is one of five fact sheets produced by Transpower to provide the public with information about electric and magnetic fields. This fact sheet details the international guidance on safe levels of electric and magnetic fields. Other fact sheets that are available and provide more detailed information include:

- **Fact Sheet 1 on electric and magnetic fields and Transpower**
- **Fact Sheet 2 on the nature of electric and magnetic fields**
- **Fact Sheet 3 on the typical strength of electric and magnetic fields**
- **Fact Sheet 4 on electric and magnetic fields and the question of health effects.**

If you have further questions concerning EMF please call Transpower on 0508 526 369 or contact us through our website www.transpower.co.nz.