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# Australian Standard 2344—1980

# LIMITS OF ELECTROMAGNETIC INTERFERENCE FROM OVERHEAD A.C. POWER LINES

STANDARDS ASSOCIATION OF AUSTRALIA
*Incorporated by Royal Charter*

THE FOLLOWING SCIENTIFIC, INDUSTRIAL AND GOVERNMENTAL ORGANIZATIONS and departments were officially represented on the committee entrusted with the preparation of this standard:

Australian Broadcasting Commission

Commonwealth Scientific and Industrial Research Organization

Confederation of Australian Industry

Department of Defence

Department of Productivity

Department of Transport

Electricity Supply Association of Australia

Electronics Importers Association

Federation of Australian Commercial Television Stations

Federation of Australian Radio Broadcasters

Institution of Radio and Electronics Engineers

Postal and Telecommunications Department

Telecom Australia

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AUSTRALIAN STANDARD

# LIMITS OF ELECTROMAGNETIC INTERFERENCE FROM OVERHEAD A.C. POWER LINES

AS 2344—1980

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# PREFACE

This standard was prepared under the authority of the Telecommunications and Electronics Technical Committee on Electromagnetic Interference, as one of a series of standards intended to facilitate the electromagnetic compatibility of electric and electronic equipment.

The purpose of the standard is to limit electromagnetic interference (EMI) from electric power lines and associated equipment within the electrical power transmission and distribution system. It is intended to provide for the protection of radio-communication services.

During preparation of the standard, the Department of Transport indicated its concern that power supply authorities should not assume that by complying with the standard they will have taken all necessary steps to eliminate interference to facilities provided by the Department. Electricity supply authorities should consult with the appropriate regional office when planning overhead lines in the vicinity of such facilities to ensure that all requirements under the Air Navigation Act are taken into account.

Currently also, the Australian Inter-Departmental Telecommunications Advisory Committee (TAC) has issued a Code of Practice for the Installation of Power, Telephone and Remote Control Cables near Ground Radio Stations. This document makes recommendations on desirable distances between various categories of overhead power lines and various types of radiocommunications receiving stations. Where such distances have been applied they have proved useful in minimizing the harmful effects of EMI emanating from power lines. It is not intended that this standard should provide a basis for the derivation of alternative distances which may be used to justify the degradation of protection afforded by the TAC Code of Practice, except where full agreement of all parties involved has been obtained.

For the purpose of this standard reference may be necessary to the following Australian standards:

AS 1052 Electromagnetic Interference Measuring Equipment
Part 1—Equipment for the Frequency Range 10 kHz to 150 kHz
Part 2—Equipment for the Frequency Range 0.15 MHz to 1000 MHz

AS 1053 Interference Limits and Measurements for Television and Radio Receivers

AS 1852 International Electrotechnical Vocabulary
1852(60) Radiocommunications
1852(902) Electromagnetic Interference

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STANDARDS ASSOCIATION OF AUSTRALIA

# Australian Standard
# for
# LIMITS OF ELECTROMAGNETIC INTERFERENCE FROM OVERHEAD A.C. POWER LINES

## FOREWORD

This standard is intended to indicate acceptable levels of interference radiated from overhead electric power lines in regard to the protection of radiocommunication services.

In considering the limits specified and the conditions of measurement, it has been necessary to take into account the following:

(a) The values of field strength requiring protection for the radiocommunication services. Those for broadcasting are shown in Table 1 of AS 1053.

(b) Appropriate protection ratios for the radiocommunication services.

(c) Inevitable interference levels produced by high voltage power lines of modern design.

Consideration has also been given to the variable nature of the interference, and to the consequent number of measurements necessary to determine a representative interference level and the practical difficulties this imposes in terms of the time needed to make the measurements.

Having regard to all these factors, an electric power line of modern design and maintained in good condition is most likely to comply with this standard. However for interference to television broadcast reception at the lower end of the VHF band (45 MHz to 70 MHz)*, these limits and method of measurement may not provide the required protection under all reception conditions. In relation to this, the standard may be used to determine the required distance of the receiver antenna from a power line for acceptable reception. For just perceptible interference a protection ratio of 50 dB should be used, this being the ratio of television signal field strength at a height of 10 m to the quasi-peak power line interference (per 120 kHz bandwidth†) measured at a height of 2 m.

Limits specified in this standard are 8 dB above the average of interference levels expected from lines in good condition. For measurements made under fair weather conditions, there is a greater variation of interference with time at VHF than at MF, the standard deviations being approximately 8 dB at VHF and 4 dB at MF.

Interference from power lines is divided into two categories with different energy spectral distributions. That caused by corona discharges in the air at the surface of conductors and fittings has a field strength peak in the LF band, falling off rapidly with frequency in the HF and VHF bands. It is usually confined to lines operating at or above 100 kV. That caused by spark discharges at highly stressed sections of insulators, or at loose or imperfect contacts, has a broad but uneven field strength distribution extending throughout the MF, HF and VHF bands, falling off above 100 MHz but extending to 1000 MHz. The latter type of interference is caused by high potential gradients in leakage current paths, which can be due to scale deposits between metal contacts, loose connections, voids in insulator material or broken insulators, and insulator encrustation with salt or dust. The ball and socket joints of disc insulators are known locations of spark discharges. When such a discharge occurs the large potential difference across the scale deposit vanishes, the arc extinguishes and the charge sequence begins.

Interference levels due to corona discharge from power lines may be expected to vary appreciably from time to time, particularly at VHF, depending upon the condition of the conductor surface and insulator surface, and to increase by approximately 17 dB to 25 dB from fair weather to foul weather conditions. Any protrusions on the conductors increase the electrical gradient and consequently the corona noise.

The general observation in regard to television reception is that the interference from insulators encrusted by salt or dust is reduced after heavy rain.

An increase in interference may also be expected under windy conditions. These aspects are under investigation.

In general, power line interference decreases with increase in radio frequency over the bands covered by this standard (150 kHz to 1000 MHz). Limits are specified at only two frequencies, viz 1 MHz and 60 MHz, for simplicity and because of the spectral distribution of the interfering power. (See Fig. C1 of Appendix C.)

Interference to medium frequency services from power lines is similar in nature to random noise. In severe cases, modulation of the interference may be evident at the half-cycle repetition rate of the line voltage.

Interference to VHF services from power lines is entirely impulsive in nature. In the case of television broadcast reception, it usually appears as two bands of short duration pulses across a receiver screen.

*See Appendix A for details of frequency bands and Appendix B for details of designation and frequency limits for the television channels used in Australia.
†Prescribed in AS 1052.