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CANADIAN ELECTRICAL CODE
PART IV

RADIO

C22.4 No. 106—1949

TOLERABLE LIMITS OF
RADIO INTERFERENCE FROM
RADIO FREQUENCY GENERATORS—
INDUSTRIAL, SCIENTIFIC AND MEDICAL

CSA STANDARD
1949



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**MEMBERS OF SUB-PANEL 6 OF PANEL NO. 5
CANADIAN ELECTRICAL CODE, PART IV**

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W. H. MEYER	Canadian General Electric Co. Limited, Toronto.
G. E. PIPE	Rogers Majestic Ltd., Leaside.
L. M. PRICE	Radio Valve Company of Canada Ltd., Toronto.
J. M. THOMSON	Ferranti Electric Limited, Toronto.
W. M. MARSHALL (Secretary)	Radio Division, Dept. of Transport, Ottawa.

PREFACE

This Code is intended to co-ordinate the use of radio frequency energy for communication and non-communication purposes.

Until recently, the entire radio spectrum of ten (10) kilocycles per second and higher was allotted for communication purposes. Recently, however, the Radio Division of the Department of Transport, Ottawa, and the Federal Communications Commission, Washington, have assigned six frequency bands for industrial, medical and scientific purposes.

These assignments are in agreement with decisions reached at the Atlantic City conferences in 1947.

It is understood that these frequencies may be used under licence for communication purposes with the understanding that no protection will be afforded from interference.

The tolerable limits of radiation herein specified are intended to protect radio receivers from interference to an extent required by Federal Legislation.

The radiation and conduction from electro-medical and industrial RF generators includes both sinusoidal carrier and complex wave forms. The former although giving little indication on measuring instruments dependent on modulated input may cause serious interference to reception. Therefore, it is necessary that tolerable limits be set for both types of wave forms in order that this specification shall be effective in achieving the desired result.

When specific cases of interference to communications are being dealt with according to Rule 404, consideration will be given on one hand to the practical and economical means of further reducing the interfering radiation and on the other hand to the priority of communication services being affected. The following priority of communication services was included in the report of the third Inter-American Radio Conference, Rio de Janeiro, 1945:—

1. Radio services involving the preservation of human life and property, where no other means of communication are available.
2. Essential communication services which must use radio because no other method of communication can be used.
3. Radio broadcasting, excluding high-frequency (HF) broadcasting.
4. Essential communication services which find it inexpedient to use other means of communication. High frequency (HF) broadcasting is placed in this category.
5. Other radio services.

This Code will be revised from time to time as the art develops. Comments or data bearing on this subject will be welcomed and correspondence on this matter should be sent in duplicate to:—

The General Manager,
Canadian Standards Association,
National Research Building, Sussex St.,
Ottawa, Ontario.

and will be recorded and brought to the attention of the Committee in charge of drafting this specification.

It is recognized that these recommendations represent the voluntary contribution of the radio and equipment manufacturers, radio communication services and allied industries towards the solution of a problem which has arisen through the development of these services.

This Code was formally approved, by letter ballot, by Sub-panel 6, Panel 5 C.E. Code Part IV in June, 1947; by Panel 5, C.E. Code Part IV in Sept. 1947; by the Committee on C.E. Code Part IV in March, 1949, and by the CSA Main Committee, with authority to publish it as a CSA Standard, in April, 1949.

OTTAWA, June, 1949.

Note:—Publication of this Code was held up pending recent developments towards international unification of procedures and practices relative to the subject and it is now considered practical for the CSA to publish the Code for the purpose of obtaining field experience in the application of its details.

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SECTION 1

SCOPE

Rule 101

GENERAL

General

(a) This Code applies to radiation, liable to cause interference, from any apparatus not licensed by the Department of Transport for radio communication but which contains a radio frequency generator liable to cause radiation at any communication frequency. Specifically excepted are small devices intended for domestic use, for transmitting signals, operating relays, etc.

(b) The following is a partial list of apparatus to which this Code applies:

Electro-medical Apparatus

- (1) Diathermy—electric field application;
- (2) Diathermy—both induction and electric field application;
- (3) Diathermy—induction application;
- (4) Surgery —cutting, coagulation, desiccation, and fulguration;

Industrial Apparatus

- (5) Induction Heating Apparatus;
- (6) Dielectric Heating Apparatus;

Scientific Instruments

- (7) Cyclotrons;
 - (8) Other scientific instruments using radio frequency.
- (c) Apparatus from which radiation is less than 100 microvolts per metre at a distance of 30 feet will probably not cause interference beyond the tolerable limits herein specified.

Rule 102

RADIO FREQUENCY

Radio
Frequency

(a) Allotted frequency bands:—

(mc/s)		(ms/c)	(mc/s)
13.560	Emission must be kept within the band	13.5667	13.5532
27.120	" " " " " " "	27.2827	26.9573
40.680	" " " " " " "	40.7003	40.6597
915.000	" " " " " " "	940.000	890.0000
2,450.000	" " " " " " "	2,580.0000	2,400.0000
5,850.000	" " " " " " "	5,925.0000	5,775.0000

NOTE:—The first three bands have full international application, the latter three apply in zone 2 which includes Canada and the United States. Additional bands may be allotted by the Department of Transport for non-communication use.

(b) Consideration shall be given to radiation from interfering apparatus on harmonic, side-band, and spurious frequencies, in addition to radiation on fundamental frequencies.

(c) Consideration shall be given also to interference on communication frequencies by radio frequency generators, caused by heterodyne and cross modulation effects, etc., which are covered by Rule 404.

SECTION 2

GENERAL REQUIREMENTS

Rule 201

GENERAL

General

(a) For general information regarding requirements of the Canadian Electrical Code Part IV, see C22.4 No. 100—"General Requirements, Definitions and Procedure Relative to the Control of Radio Interference".

Rule 202

MEASUREMENT

Measurement

(a) For details of measuring equipment and technique, see C22.4 No. 101—"Interference Measuring Instruments and Methods of Measurement".

SECTION 3

METHODS OF MEASUREMENT

Rule 301

FREQUENCIES BELOW 30 MEGACYCLES

Frequencies
Below 30
Megacycles

(a) At any frequency below 30 megacycles per second measurement shall be made of:

- (1) Radiation of radio-frequency carrier (radio field intensity);
- (2) Radiation of interference field which may consist of radiation of any complex wave forms (**Interference Field Intensity**).

Rule 302

METHOD

Method

(a) Radiation covered by Rule 301(a) shall be measured according to standard practice of measuring radio field intensity as described in "Standards on Radio Wave Propagation—Measuring Methods—1942" published by the Institute of Radio Engineers.

(b) Radiation covered by Rule 301(b) shall be measured according to C22.4 No. 101 "Interference Measuring Instruments and Methods of Measurement".

Rule 303

FREQUENCIES ABOVE 30 MEGACYCLES

Frequencies
Above 30
Megacycles

(a) At frequencies above 30 megacycles per second (mc/s) estimates of radio field intensity and of interference field intensity shall be made with a calibrated radio receiver approved by and operated under conditions approved by the Radio Division of the Department of Transport.

SECTION 4

TOLERABLE LIMITS OF RADIO INTERFERENCE

Rule 401

RADIATION FROM APPARATUS NOT DESIGNED TO OPERATE
WITHIN THE ALLOTTED FREQUENCY BANDS

Limits

(a) The interference field intensity and the radio field intensity on communication frequencies shall not exceed fifteen (15) microvolts per metre at any location more than 1,000 ft from the r.f. generators, provided, however, that the antenna of the measuring instrument is not within 20 ft of any electrical conductor.

Rule 402

RADIATION FROM APPARATUS DESIGNED TO OPERATE
WITHIN THE ALLOTTED FREQUENCY BANDS

Limits

(a) The tolerable limit of the interference field intensity and the radio field intensity shall be that stated in Rule 401(a) for all communication frequencies except the harmonics of the frequencies assigned for non-communication purposes. The interference field intensity and the radio field intensity on the harmonics of the allotted frequencies shall not exceed 25 microvolts per metre at any location more than 1,000 ft from the r.f. generator and more than 20 ft from any electrical conductor. But no limit is set on radiation within the allotted bands.

- NOTE 1:—*The maximum frequency deviation during type acceptance tests of apparatus designed to operate within the frequency bands listed in Rule 102(a) shall not exceed 40 per cent of the total band width plus or minus, from centre frequency, except in the 27 mc/s band where the limit shall be 35 percent of total band width.*
- NOTE 2:—*This value of 25 microvolts per metre has been suggested by the Federal Communications Commission, but there appears to be a doubt as to its practicability. This value may be revised if found impractical.*
- NOTE 3:—*This greater tolerance on harmonic frequencies for apparatus designed to operate on the allotted frequencies is to encourage the use of these assigned frequencies, and is also due to the fact that it is difficult to suppress the harmonics from generators which are not shielded.*

Rule 403

RADIATION FROM INDUSTRIAL HEATING EQUIPMENT UTILIZING HIGH POWER

Limits

(a) In cases where it is found impractical to suppress radiation from industrial heating equipment delivering more than 5 kilowatts power output* according to Rules 401 and 402, individual consideration shall be given to the advisability of allowing greater tolerances, provided, however, that the radiation does not exceed 10 microvolts per metre on communication frequencies measured at any location greater than one mile from the r.f. generator. The antenna of the measuring instrument shall not be within 20 ft of any electrical conductor.

* Where output cannot be conveniently measured, an input of 10 kw may usually be taken as equivalent.

Rule 404

INTERFERENCE MUST BE SUPPRESSED

Suppression of Interference

(a) Notwithstanding anything herein specified, where radiation is found to be interfering with communications, contrary to the provisions of Dominion Government acts and regulations, the interference shall be suppressed. Such cases shall receive individual consideration and the curative measures shall be applied to either the source or the service affected as indicated by good engineering practice.

NOTE:—*Where measurements cannot be made at the specified distance of 1,000 ft or one mile the investigators will use judgment based on good engineering practice in selecting practical locations for measurements, and estimate the radiation intensity for the specified distances.*