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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 13870.1-2008

**Effects of current on human beings and livestock -- Part 1:
General aspects**

电流对人和家畜的效应 第1部分：通用部分

(English Translation)

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1 Scope

For a given current path through the human body, the danger to persons depends mainly on the magnitude and duration of the current flow. However, the time/current zones specified in the following clauses are, in many cases, not directly applicable in practice for designing measures of protection against electrical shock. The necessary criterion is the admissible limit of touch voltage (i.e. the product of the current through the body called touch current and the body impedance) as a function of time. The relationship between current and voltage is not linear because the impedance of the human body varies with the touch voltage, and data on this relationship is therefore required. The different parts of the human body (such as the skin, blood, muscles, other tissues and joints) present to the electric current a certain impedance composed of resistive and capacitive components.

The values of body impedance depend on a number of factors and, in particular, on current path, on touch voltage, duration of current flow, frequency, degree of moisture of the skin, surface area of contact, pressure exerted and temperature.

The impedance values indicated in this technical specification result from a close examination of the experimental results available from measurements carried out principally on corpses and on some living persons.

Knowledge of the effects of alternating current is primarily based on the findings related to the effects of current at frequencies of 50 Hz or 60 Hz which are the most common in electrical installations. The values given are, however, deemed applicable over the

frequency range from 15 Hz to 100 Hz, threshold values at the limits of this range being higher than those at 50 Hz or 60 Hz.

Principally the risk of ventricular fibrillation is considered to be the main mechanism of death of fatal electrical accidents.

Accidents with direct current are much less frequent than would be expected from the number of d.c. applications, and fatal electrical accidents occur only under very unfavorable conditions, for example, in mines. This is partly due to the fact that with direct current, the let go of parts gripped is less difficult and that for shock durations longer than the period of the cardiac cycle, the threshold of ventricular fibrillation is considerably higher than for alternating current.

NOTE: The GB/T 13870 series contains information about body impedance and body current thresholds for various physiological effects. This information can be combined to derive estimates of a.c. and d.c. touch voltage thresholds for certain body current pathways, contact moisture conditions, and skin contact areas. Information about touch voltage thresholds for physiological effects is contained in GB/T 3805.

2 Normative references

The following standards contain provisions which, through reference in this Part of GB/T 13870, constitute provisions of this Part. At the time of publication, the editions indicated are valid. All standards are subject to revision. The parties who are using this Part shall explore the possibility of using the latest version of the following standards.

GB/T 3805-1993, Extra-low voltage (ELV) - Limit values (eqv IEC 61201:1992)

IEC Guide 104:1997 The preparation of safety publications and the use of basic safety publications and group safety publications

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 General definitions

3.1.1

longitudinal current current flowing lengthwise through the trunk of the human body such as from hand to feet

3.1.2

transverse current current flowing across the trunk of the human body such as from hand to hand

3.1.3

internal impedance of the human body, Z_i impedance between two electrodes in contact with two parts of the human body, neglecting skin impedances

3.1.4

impedance of the skin, Z_s impedance between an electrode on the skin and the conductive tissues underneath

3.1.5

total impedance of the human body, Z_T