AS/NZS 60479.3:2002
IEC 60479-3:1998

Australian/New Zealand Standard™

Effects of current on human beings and livestock

Part 3: Effects of currents passing through the body of livestock

Standards Australia
STANDARDS NEW ZEALAND
Paerewa Aotearoa

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-001, Wiring Rules. It was approved on behalf of the Council of Standards Australia on 10 September 2002 and on behalf of the Council of Standards New Zealand on 3 September 2002. It was published on 3 October 2002.

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We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia International or Standards New Zealand at the address shown on the back cover.

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-001, Wiring Rules.

The objective of this Standard is to provide basic guidance on the effects of electric currents on livestock for the establishment of electrical safety requirements.

This Standard has been reproduced from IEC 60479-3:1998, *Effects of current on human beings and livestock—Part 3: Effects of currents passing through the body of livestock.*

Variations to IEC 60479-3:1998 are indicated at the appropriate places throughout this Standard. Strikethrough (~~example~~) identifies IEC tables, figures and passages of text which, for the purposes of this Australian/New Zealand Standard, are deleted. Where Australian/New Zealand tables, figures or passages of text are added, each is set in its proper place and identified by shading (example). Added figures are not themselves shaded, but are identified by a shaded border.

This Standard is Part Three of a series that includes the following:

AS/NZS	
60479	Effects of current on human beings and livestock
60479.1	Part 1: General aspects
60479.2	Part 2: Special aspects
60479.3	Part 3: Effects of currents passing through the body of livestock (this Standard)

In January 1997, the IEC commenced numbering its Standards from 60000 by adding 60000 to the number of each existing Standard. This coordinates IEC numbering with ISO numbering. During the transition period an IEC Standard might be identified by its new number or its old number (for example, IEC 60050 or IEC 50).

As this Standard is reproduced from an International Standard, the following applies:

(a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.

(b) In the source text ‘this technical report’ should read ‘this Australian/New Zealand Standard’.

(c) A full point should be substituted for a comma when referring to a decimal marker.

In this Standard, the following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type;*

– explanatory matter: in smaller arial type.

CONTENTS

INTRODUCTION

This technical report provides basic guidance on the effects of electric currents on livestock and is for use in the establishment of electrical safety requirements.

There are, however, other aspects to be taken into account, such as probability of faults, probability of contact with live or faulty parts, touch voltage, fault voltage, experience gained, technical feasibility and economics. These parameters need to be considered carefully when fixing safety requirements, for example operating characteristics of protective devices for electrical installations.

For protection against indirect contact of livestock, the threshold of ventricular fibrillation is the criterion on which safety requirements should be fixed. For this reason, information is presented in this part of IEC 60479 on the body impedance of livestock and on the current magnitude of the threshold of ventricular fibrillation. As there is only little information on the impedance of animals, the lowest impedance value for cattle, forelegs to hindlegs (see table 2), has been used as the basis for calculation.

For the purpose of this report the following species of animals are considered to be livestock which might in rural installations suffer from an electric shock: cattle, sheep, pigs and horses.

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Any IEC table, figure or passage of text that is struck-through is not part of this Standard. Any Australian/New Zealand table, figure or passage of text that is added (and identified by shading) is part of this Standard.

1 General

1.1 Scope

This technical report indicates values for the electrical impedance of the body of livestock as a function of the touch voltage, the degree of moisture of the hide or skin and the current path.

At this time values are only available for cattle.

It describes the effects of sinusoidal alternating current within the frequency range from 15 Hz to 100 Hz passing through the body of livestock.

NOTE – Unless otherwise specified, the current values defined in this technical report are r.m.s. values.

1.2 General remarks

For a given current path through the body of livestock, the danger depends mainly on the magnitude and duration of the current flow. However, the time/current relations specified in clause 5 are, in many cases, not directly applicable in practice for designing protection against electric shock. The necessary criterion is the admissible limit of touch voltage (i.e. the product of the current through the body and the body impedance) as a function of time. The relationship between current and voltage is not linear because the impedance of the body of livestock varies with the touch voltage, and data on this relationship is accordingly required.

The different parts of the body of livestock (such as the hide, skin, blood, muscles, other tissues and joints) present to the electric current an impedance composed of resistive and capacitive components. The dry hides in particular, in the range of voltages up to several hundred volts, frequently present a high resistance.

The value of these impedances depends on a number of factors, in particular the species of the animal, the current path, the touch voltage, the duration of current flow, the frequency, the degree of moisture of the hide and/or the skin, the surface area of contact, the pressure exerted and the temperature.

The impedance values indicated in this report result from close examination of the experimental results available from measurements carried out principally on living animals.

Clause 5 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 deemed applicable to the frequency range from 15 Hz to 100 Hz, threshold values at the limits of this range being higher than those at 50 Hz and 60 Hz.

This clause considers principally the risk of ventricular fibrillation which is the main cause of fatal accidents in that range of frequencies.