AS 5407.3:2026

Australian STANDARD®

STANDARDS Australia

Methods of testing infant sleep surfaces

Method 3: Test for carbon dioxide and associated requirements



AS 5407.3:2026

This Australian Standard® was prepared by CS-310, Child Care Articles. It was approved on behalf of Standards Australia's Standards Development and Accreditation Committee on 12 May 2026.

This Standard was published on 22 May 2026.

The following are represented on Committee CS-310:

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Australian Toy Association
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This Standard was issued for comment as DR AS 5407.3:2025

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ISBN: 978 1 76175 763 1

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Originated as AS 5407.3:2026.

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A requirement is any statement in the Standard which uses the word "shall".

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(a) "should" means that something is recommended.

(b) "may" means that something is permitted.

(c) "can" means that something is possible.

Structure of Standards

A Standard always has the following parts:

(i) The Preface states who developed the Standard, what the Standard is aiming to do, and how it relates to other documents.

(ii) The Scope states what the Standard is about, what it covers and what it does not cover.

(iii) The Normative references clause lists other documents that are referenced in the Standard as part of requirements.

(iv) The Terms and definitions clause defines important terms to help with understanding the Standard.

A Standard may also include other parts, such as the following:

(1) A normative appendix sets additional requirements that need to be conformed to.

(2) An informative appendix provides additional information or guidance. They usually do not contain requirements. If an informative appendix does contain requirements, the Standard will explain when those requirements apply.

(3) A Bibliography lists documents referenced in the Standard but not as part of requirements.

Many Standards include notes. Notes provide recommendations and/or guidance only. They never contain requirements.

Preface

This Standard was prepared by the Standards Australia Committee CS-310, Child Care Articles.

The objective of this document is to provide a method for assessing the potential carbon dioxide rebreathing hazard of sleep-related products. This document is the third part of a series of sleep-safety Standards. A list of all parts in the AS 5407 series can be found in the Standards Australia online catalogue.

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Introduction

Product-safety Standards are often motivated by new information, and such is the case with this document. Over the last few decades, researchers have raised concerns regarding carbon dioxide rebreathing as a potential contributing factor to sudden unexpected infant deaths that occur during sleep.

Normal breathing requires the intake of fresh air and the exhalation of "stale" air containing carbon dioxide (CO_2). In order to continually breathe fresh air, the exhaled air needs to rapidly dissipate. If that exhaled air is trapped and rebreathed, CO_2 levels can accumulate and cause physiological distress. In the context of a sleeping infant, CO_2 rebreathing can occur when the infant breathes against or through surfaces that have the potential to capture and release CO_2.

Instead of inhaling fresh air under such conditions, the infant inhales a mixture of gas with increasing levels of CO_2. This causes the infant to work harder by increasing their respiratory rate and depth of breaths in order to clear the accumulating CO_2. This hazard has been experimentally demonstrated in a 2025 study (Barker et al.) using a mechanical model that simulates an infant breathing through a range of sleep surfaces of varying thicknesses.

Earlier infant studies (i.e. Patel et al. and Colditz et al.) also demonstrated increased levels of CO_2 in the space around infants who were sleeping face down. An earlier study (Kemp et al.) showed that items of bedding in common use are capable of causing lethal rebreathing by prone-sleeping infants whose nose and mouth become covered.

Testing using the device described in this document has demonstrated variable CO_2 rebreathing hazards depending on the design of the infant product and the end combination of products that can be used by the infant.

For example, covering a mattress with an ordinary cot sheet can increase the CO_2 rebreathing hazard. However, the extra risk that can result from using a sheet directly over a mattress can be very effectively mitigated with the addition of an air-impermeable mattress protector placed under the sheet. Given that the revelation of CO_2 interactions between bedding components is only very recent, safety advice on this topic has not yet been widely promulgated.

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Method 3: Test for carbon dioxide and associated requirements

1 Scope

This document specifies the method for assessing whether there is excessive risk of CO_2 rebreathing (based on a specified limit which is reported in Section 9) by an infant sleeping on or against a product. It is primarily intended to assess infant sleep-related products but can be applied to other infant products depending on their size and configuration.

This document is intended to assess the potential CO_2 rebreathing hazard of products that an infant might sleep on or against. Included are traditional infant mattresses, but also other infant products or components thereof. Furthermore, the device and test methodology used in this document can be adapted to assess the potential CO_2 rebreathing hazard of products intended for disabled or older users.

2 Application

The test method described in this document is intended to be referenced by product-safety Standards. Where no Standard exists for a particular product type, the test can nevertheless be used to identify the potential CO_2 rebreathing hazard of a sleep-related surface or of another type of product on or against which an infant's face can be expected to rest.

The test method described in this document is intended to assess sleep-related products that have met the minimum firmness requirements of AS 5407.1 or AS 5407.2, or equivalent firmness requirements. For sufficient infant safety, sleep-related products should meet the specified requirements for both firmness and CO_2 rebreathing. Both the firmness and CO_2 methodologies can be applied to common mattress protectors, sheets, and mattresses, as well as to other sleep-related surfaces.

Objects with a curved profile may be testable, depending on their size, firmness, smoothness, and geometry. Such objects need to be firmly supported from below, such that their orientation relative to the bottom of the test probe allows for effective contact when the test probe is lowered onto them.

3 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

AS 5407.1, *Methods of testing infant sleep surfaces, Method 1: Test for firmness and flatness*

AS 5407.2, *Methods of testing infant sleep surfaces, Method 2: Test for firmness of objects that cannot be tested to AS 5407.1*

4 Terms and definitions

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

4.1
billowed fabric
raised area on the sleep-related surface due to puffing of the covering fabric

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