

Radiation Safety Act 1999

**RADIATION SAFETY STANDARD**

HR003:2010

*Standard for radiation apparatus used to carry out computed tomography*

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## Preface

Under section 17 of the *Radiation Safety Act 1999*, a possession licensee who, under a licence, possesses an ionising radiation apparatus to carry out a radiation practice, must ensure that the apparatus is not used for this purpose, unless the radiation apparatus complies with the relevant standard.

This radiation safety standard HR003:2010 *Standard for radiation apparatus used to carry out computed tomography* is made under section 16 of the *Radiation Safety Act 1999*.

This standard sets the minimum safety criteria for radiation apparatus used to carry out computed tomography. Compliance with this standard will assist in ensuring that public and occupational exposure to radiation is minimised.

Queensland Health has prepared this standard based on information derived from reputable sources such as Standards Australia, Standards New Zealand and the International Electrotechnical Commission.

The standard will be reviewed periodically to re-evaluate its currency and its appropriateness as the standard for radiation apparatus used for computed tomography.

By ensuring compliance with this radiation safety standard, the standard of radiation apparatus used for computed tomography in Queensland will be significantly enhanced.

I, Paul Lucas, Deputy Premier and Minister for Health, pursuant to section 16(1) of the *Radiation Safety Act 1999*, make the radiation safety standard HR003:2010 *Standard for radiation apparatus used to carry out computed tomography*, for the purposes of the Act.

**SIGNED**

**PAUL LUCAS MP**  
**Deputy Premier**  
**Minister for Health**

19 / 08 / 2010

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# Standard for radiation apparatus used to carry out computed tomography

## Section 1 – General

### 1.1 Scope

This radiation safety standard sets out the minimum requirements for ionising radiation apparatus that is used for computed tomography.

To remove doubt, this standard also applies to radiation apparatus that is used to carry out research involving computed tomography on humans.

### 1.2 Expiry

This radiation safety standard expires on 1 September 2020.

### 1.3 Documents

Documents which may provide some useful information are listed in Appendix A.

### 1.4 Definitions

In this standard –

**"baseline value"** means the reference value provided by the manufacturer or the value measured at acceptance testing. In the absence of these values, the values derived at the first compliance test.

**"computed tomography"** means reconstructive tomography in which recording and processing is effected by a computing system.

**"computed tomography number"** (CT number) means the number used to represent the mean X-ray attenuation associated with each elemental area of the computed tomography image. The CT number is normally expressed in Hounsfield units.

**"loading"** means the act of supplying electrical energy to the anode of an X-ray tube.

## Section 2 - Standard – Computed tomography

Test	Compliance Test	Criteria for Passing the Test
<b>General Requirements</b>		
1	Examination can be interrupted by operator	The operator must be able to interrupt the examination at any time.
2	Loading indication	Loading indication must be by an amber light and an audible signal both at the control console and in the computed tomography scanner room.
3	Couch positioning accuracy	The couch positioning accuracy must not deviate by more than $\pm 2$ millimetres.
4	Room warning lights	Warning lights installed outside all unlocked entrances to the computed tomography scanner room must be connected into the X-ray generator circuit so that they illuminate for the duration of the exposure.
<b>Slice characterisation</b>		
5	Light localisation accuracy	The error of scan localisation light and scan plane must not exceed $\pm 2.0$ millimetres.
6	Scout localisation accuracy	The error in the correspondence of localisation image parameters with actual slice position must not exceed $\pm 2.0$ millimetres with the gantry in the vertical position.
7	Radiation beam width	The width of the radiation beam must not exceed the slice thickness plus 1 millimetre.
8	Slice thickness	The actual width of an imaged slice compared with the width selected must be within:  (a) 1.0 millimetres for thicknesses above 2 millimetres; and  (b) 50 percent for thicknesses of 2 millimetres or less.
<b>System performance</b>		
9	Noise	The value of noise must not deviate from the baseline value by more than 10 percent or 0.2 Hounsfield units whichever is the larger.

Test	Compliance Test	Criteria for Passing the Test
10	Uniformity	With respect to uniformity, the difference between the mean computed tomography number of the central region of interest and the outer regions of interest must not vary by more than 2 Hounsfield units from those of the baseline values.
11	Computed tomography number	The mean computed tomography number of the central region of interest must fall within $\pm 4$ Hounsfield units of the baseline.
12	Computed tomography number linearity	The plot of computed tomography number versus linear attenuation coefficient must be a straight line (correlation coefficient greater than 0.99) passing through computed tomography number zero for water.
13	System resolution	The resolution must be equal to or greater than the baseline value.
14	Computed tomography dose index	The computed tomography dose index must be within $\pm 20$ percent of the baseline value.
15	Half value layer	<p>The first half value layer in the X-ray beam incident to the patient must be greater than or equal to:</p> <p>(a) 3.8 millimetres of aluminium at 120kVp; or</p> <p>(b) 4.2 millimetres of aluminium at 130kVp.</p>

## Appendix A

### Documents

American Association of Physicists in Medicine. *Specification and acceptance testing of computed tomography scanners*. AAPM Report No. 39, 1993.

Australian/New Zealand Standard. *Approval and test specification - Medical electrical equipment, Part 2.7: Particular requirements for safety - High-voltage generators of diagnostic X-ray generators*. AS/ANZ 3200.2.7:1994.

International Electrotechnical Commission. *Medical Electrical Equipment – Part 2-44 Ed.2: Particular requirements for the safety of X-ray equipment for computed tomography*. IEC 60601-2-44 Ed.2/CDV.

Standards Australia. *Evaluation and Routine Testing in Medical Imaging Departments - Part 2.6: Constancy Tests - X-ray equipment for computed tomography*. AS 4184.2.6:1995.

Health Department of Western Australia. *Diagnostic X-ray Compliance Testing Workbook*. 1996.