

*Radiation Protection Act 2005 – Section 17*

## **CERTIFICATE OF COMPLIANCE:**

## **STANDARD FOR RADIATION APPARATUS -**

## **X-RAY INDUSTRY OR RESEARCH (X-RAY ANALYSIS)**

SECTION 1: REQUIREMENTS FOR CERTIFICATES OF COMPLIANCE FOR CLASSES OF RADIATION APPARATUS

SECTION 2: PARTS OF STANDARDS AND CODES OF PRACTICE ADOPTED BY THIS STANDARD

This information can also be accessed at [http://www.dhhs.tas.gov.au/peh/radiation\\_protection](http://www.dhhs.tas.gov.au/peh/radiation_protection)

## **Section 1 – REQUIREMENT FOR CLASSES OF RADIATION APPARATUS TO COMPLY WITH STANDARDS AND CODES OF PRACTICE.**

**This Standard is to be used when assessing Radiation Sources, classified by Radiation Protection Act 2005 licences as “X-ray X-ray Analysis” for the purpose of issuing a certificate of compliance.**

**In order for a certificate of compliance to be issued the Radiation Source must be shown to fully comply with the requirements in Section 2.**

**† Where an item was demonstrated to comply at the time of manufacture or supply, ongoing compliance for that item may be stated only if it is reasonable to assume there has been no change, modification, damage or unacceptable wear and tear to that item since the time of manufacture.**

**The requirements in Section 2 are taken from the following:**

RHS 9                      *National Health and Medical Research Council Code of practice for protection against ionizing radiation emitted from X-ray analysis equipment (1984)*

## Section 2 – PARTS OF STANDARDS AND CODES OF PRACTICE ADOPTED BY THIS STANDARD OF COMPLIANCE.

Item	Requirements
<b>Interlocks<sup>†</sup></b>	<p>All interlocks fitted must:</p> <ul style="list-style-type: none"> <li>▪ be designed so that it is difficult to render them ineffective;</li> <li>▪ be based on mechanical linkages, or any other mechanism that can be shown to be of equal or greater reliability, efficiency and difficulty to render ineffective;</li> <li>▪ if electrical contacts such as micro switches are used, they must be positioned so that it is very difficult to operate them except by means of the appropriate interlocked component; and</li> <li>▪ incorporate dual micro switches for each interlock in which micro switches are used.</li> </ul> <p><b>RHS 9 5.3.1, 5.3.2, 5.3.3, 5.3.4</b></p>
<b>Tube Housing<sup>†</sup></b>	<p>Each X-ray tube incorporated in an X-ray analysis unit must be enclosed in a tube housing which satisfies the following requirements:</p> <p>It must be constructed of material of sufficient strength and thickness to ensure that it cannot be fractured or deformed by normal use, accidental impact or misuse.</p> <p><b>RHS 9 5.3.2.1</b></p>
<b>X-ray aperture</b>	<p>Each aperture in the tube housing must be covered by:</p> <p>(a) a shutter or</p> <p>(b) a completely shielded enclosure, all entrances to which are interlocked so that opening one entrance immediately de-energizes the X-ray tube.</p> <p><b>RHS 9 5.3.2.2</b></p>
<b>Interlocked tube and tube housing<sup>†</sup></b>	<p>The X-ray tube and tube housing must be interlocked so that the removal of one from the other or the removal of protective covers from any port or service opening will immediately de-energize the X-ray tube.</p> <p><b>RHS 9 5.3.2.4</b></p>
<b>X-ray tube shutters</b>	<p>Each tube shutter must satisfy the following:</p> <ul style="list-style-type: none"> <li>▪ be constructed that the scattered and leakage radiation dose (including scatter from the shutter surfaces) in one hour at any accessible point five centimetres from the shutter does not exceed 25 micro Sv when the X-ray tube is operated at any of the permissible ratings specified by the manufacturer of the X-ray analysis unit;</li> <li>▪ be fitted with a positive closing device which, in the absence of an external applied force, keeps the shutter closed;</li> <li>▪ be constructed that it is impossible to remove the shutter and its operating mechanism without the use of tools</li> <li>▪ <sup>†</sup>be constructed that the shutter and its operating mechanism is interlocked with the tube housing so that their removal de-energizes the X-ray tube.</li> <li>▪ Each shutter must be linked with an illuminated sign or light which is illuminated when that shutter is open and indicates without ambiguity which shutter is open.</li> </ul> <p><b>RHS 9 5.3.3.1, 5.3.3.2, 5.3.3.3, 5.3.3.4, 5.3.6.2</b></p>

<p><b>Indicators</b></p>	<p>Every X-ray analysis unit must be fitted with an illuminated sign or a combination of a sign and a light which is activated only if the X-ray tube is energized and which then indicates that the X-ray tube is operating. This sign must be legible and readily discernible for at least two metres on all accessible sides of the X-ray analysis unit.</p> <p><b>RHS 9 5.3.6.1</b></p> <p>Each shutter must be linked with an illuminated sign or light which is illuminated only when that shutter is open and indicates without ambiguity which shutter is open.</p> <p><b>RHS 9 5.3.6.2</b></p> <p>The indicator lights must be designed to be 'fail safe' (i.e. to de-energize the X-ray if a light fails); alternatively, adequate warning that a light has failed must be indicated in a clear and unambiguous manner.</p> <p><b>RHS 9 5.3.6.6</b></p>
<p><b>Partly Enclosed Units</b></p>	<p>Partly enclosed units which incorporate fixed shields and/or barriers must be designed to give a clear and positive warning if the barriers or shields are incomplete.</p> <p>A clear and unambiguous notice must also be displayed on or near the unit indicating the hazards of operating the unit while barriers or shields are incomplete.</p> <p><b>RHS 9 5.3.6.7</b></p> <p>Partly enclosed units which are partly enclosed by interlocked or fixed barriers and/or shields must have displayed on or near them a prominent notice which warns of the hazard of placing any part of the body, such as the hand, inside the barriers or shields.</p> <p><b>RHS 9 5.3.6.8</b></p> <p>Each X-ray analysis unit must be clearly labelled to indicate whether it is an enclosed unit, or a partly enclosed unit.</p> <p><b>RHS 9 5.3.6.9</b></p> <p>It must be so constructed that it incorporates an enclosure or enclosures which partly enclose the primary X-ray beams sufficiently to ensure that no person may inadvertently expose any part of their body to a primary beam.</p> <p>The enclosure must:</p> <ul style="list-style-type: none"> <li>(a) be interlocked in accordance with RHS 9 5.4.2. or fixed so as to require the use of tools for removal.</li> <li>(b) incorporate collimator shields in accordance with RHS 9 5.4.5, and</li> <li>(c) contain appropriate shielding material or be located at a sufficient distance from the X-ray tube that the dose of radiation at any accessible point five centimetres from the surface of each partial enclosure must not exceed 25 micro Sv in one hour.</li> </ul> <p><b>RHS 9 5.5.1</b></p> <p>It should be so sited that if for any reason a shutter is opened while an entrance to an enclosure is uncovered or barriers are incomplete, the resultant, primary beam is directed away from areas that may be occupied. If such siting is not possible, beam stops or fixed shields must be placed to adequately protect persons in these areas from the beam.</p> <p><b>RHS 9 5.5.2</b></p> <p>It must be so constructed that all operations are most easily and quickly carried out with all shields in place and all interlocks in operation.</p> <p><b>RHS 9 5.5.4</b></p>

<p><b>Enclosed Units</b></p>	<p>Each enclosed unit must satisfy the relevant requirements of RHS 9 5.3 and the following additional requirements:</p> <p>It must incorporate an enclosure or enclosures which completely enclose the primary X-ray beams, preventing access to them. These enclosures may be composed, partly or wholly, of the analysing components and collimators of the X-ray analysis unit or may enclose the analyzing components and collimators. Each enclosure may enclose one or more shutters and may enclose the tube housing.</p> <p><b>RHS 9 5.4.1</b></p> <p>The sections of the enclosure or enclosures specified in RHS 9 5.4.1 must be permanently attached to each other or must be interlocked either:</p> <p>(a) so that removal of any part of a complete enclosure can only be done when the shutter admitting the primary beam to that enclosure is closed and a shutter can only be opened when the enclosure is complete, or</p> <p>(b) so that removal of any part of the complete enclosure de-energizes the X-ray tube.</p> <p><b>RHS 9 5.4.2</b></p> <p>The enclosure or enclosures specified in 5.4.1 must provide adequate shielding to ensure that the dose of radiation in one hour at any accessible point five centimetres from the surface of each complete enclosure does not exceed 25 micro Sv when the X-ray tube is operated at any of the permissible ratings specified by the manufacturer of the X-ray analysis unit.</p> <p><b>RHS 9 5.4.3</b></p> <p>Enclosed units must be so constructed that all operations which involve energizing the X-ray tube can be readily done while the enclosure or enclosures specified in 5.4.1 are complete and all interlocks are in operation.</p> <p><b>RHS 9 5.4.4</b></p> <p>At each aperture in the tube housing of an enclosed unit which is fitted with a shutter, the shutter mechanism must incorporate a permanent shield in the form of a sleeve over-lapping the collimator. This shield should be recessed to permit the introduction, to a depth of at least five millimetres, of each X-ray beam collimator which is used with the analysis unit when that collimator is attached to any of the cameras or other analysis devices to which it can be fitted. This collimator shield must be constructed to attenuate all Leakage and scattered radiation from the collimator and shutter to 25 micro Sv in one hour at any accessible point five centimetres from the shield.</p> <p><b>RHS 9 5.4.5</b></p>
<p><b>Radiation Shields</b></p>	<p>Radiation shields must be made of lead backed by supporting material having greater resistance to distortion than lead, or of dense materials not readily distorted, such as steel, brass or lead glass.</p> <p><b>RHS 9 5.3.7</b></p>
<p><b>Barriers</b></p>	<p>All barriers must be constructed of material of sufficient strength and configuration, and be adequately affixed to prevent access to the protected region.</p> <p><b>RHS 9 5.3.8</b></p>