

Radiation Protection Act 2005 – Section 17

**CERTIFICATE OF COMPLIANCE:
STANDARD FOR RADIATION APPARATUS –
X-RAY INDUSTRY
(ON STREAM ANALYSIS)**

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

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

Section I – REQUIREMENTS FOR CERTIFICATES OF COMPLIANCE FOR CLASSES OF RADIATION SOURCES

This Standard is to be used when assessing Radiation Sources, classified by Radiation Protection Act 2005 licences as “X-ray On Stream 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:

RPS 13 *Code of Practice for Safe Use of Fixed Radiation Gauges (2007).*

Comments and information provided by Otokompu (Finland) assisted in the preparation of this document.

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

ITEM	Requirements
<p>X-ray Tube and Generator Assembly Requirements</p>	<p>Any X-ray tube and generator assembly used in a fixed radiation gauge must:</p> <p>be appropriate for the particular application, with regard to beam intensity and energy spectrum of the radiation emissions; and</p> <p>RPS 13 B3.1 (a)</p> <p>be suitably durable and protected so that throughout the projected useful life of the fixed radiation gauge in which it is used, it will withstand vibration, corrosion and any other adverse affects likely to be encountered; and</p> <p>RPS 13 B3.1 (b)</p> <p>not have an operational output intensity that is greater than necessary to ensure that the fixed radiation gauge operates effectively during its projected useful life; and</p> <p>RPS 13 B3.1 (C)</p> <p>in relation to the choice of X-ray tube insert, generator and the maximum operational output intensity, depend on the:</p> <p>(i) effective radiation path length between the tube focus and detector; and</p> <p>(ii) output intensity reduction due to cathode heater and target degradation as the tube ages, for which an allowance of up to 50% loss may be made; and</p> <p>(iii) detector selected for the proposed conditions of use, while allowance may be made for a 25% loss of detection sensitivity during the lifetime of the gauge; and</p> <p>(iv) shielding effects of intra-beam material.</p> <p>RPS 13 B3.1 (d)</p> <p>if capable of higher than the required maximum output intensity, have the maximum operational output intensity limited, by the manufacturer or authorised service representative, to that required to comply with B3.1(c); and</p> <p>RPS 13 B3.1 (e)</p> <p>where a particular method or device is used to limit the maximum operational output intensity, not allow accessible user control of the output limit.</p> <p>RPS 13 B3.1 (f)</p>

Requirements for X-ray tube, tube housing and shielded enclosures.	
Shielding with depleted uranium †	<p>Radiation source containment that incorporates depleted uranium in its construction must be durably marked to:</p> <ul style="list-style-type: none"> (a) warn of the presence of depleted uranium 15; and (b) indicate the quantity incorporated; and (c) provide information on the relevant physical (i.e. may spontaneously catch fire when finely divided) and radiological safety requirements. <p>RPS 13 C1.1 (a), (b), (c)</p>
Useful beam aperture †	<p>The useful beam aperture in the shielded container for a radioactive source or the tube housing for a tube insert must be limited to a size no larger than necessary for the effective operation of the gauge.</p> <p>RPS 13 C1.2</p>
Collimator requirements †	<p>Where a collimator insert or diaphragm is required to limit the size of the useful beam, such a modification must:</p> <ul style="list-style-type: none"> (a) only be fitted by the manufacturer or authorised service representative; and (b) not interfere with the effective operation of the in stream analysis probe; and (c) not reduce the shielding properties or other safety features of the containment. <p>RPS 13 C 1.3</p>
Means for terminating exposure †	<p>A fixed radiation gauge must be fitted with:</p> <ul style="list-style-type: none"> (a) a shutter; or (b) a means of moving the source to a safe position; or (c) a means of de-energising the radiation source. <p>RPS 13 C 1.4</p>
Operation of exposure termination	<p>The means for terminating exposure must be fail safe and ensure that the primary beam is turned off automatically when:</p> <ul style="list-style-type: none"> (a) any safety guard that prevents access to the primary beam is removed; or (b) internal checks detect a problem with gauge operation that could affect radiation safety; or (c) there is failure of the power supply to the device. <p>RPS 13 C1.5</p>
Indication of beam on/off	<p>The source container or tube housing must be designed so that whenever the shutter or source control mechanism is in either the 'beam on' or 'beam off' position, the beam condition is clearly and unambiguously indicated.</p> <p>RPS 13 C1.6</p>
Protection and operation of beam on/off indicator.	<p>The beam condition indicator must be protected against mechanical damage and:</p> <ul style="list-style-type: none"> (a) where the indicator is mechanical, the 'beam on' and 'beam off' markings must be of a type that cannot be readily obscured by dust, precipitation, corrosion or paint; or (b) where the indicator is electrical, it must: <ul style="list-style-type: none"> (i) include separate lamps or signals to indicate the 'beam on' and 'beam off' conditions; and (ii) be designed to be fail safe in the event of a lamp failure. <p>RPS 13 C1.7</p>

Shutter	<p>If primary shielding is provided by a tube housing only, a shutter that is designed to be fail safe, regardless of whether it is manually operated or power operated (i.e. electrical or pneumatic), must be fitted to the tube housing.</p> <p>RPS 13 C3.1</p>
Interlocked enclosure	<p>If primary shielding is provided by a shielded enclosure only, interlocks that are designed to be fail-safe and tamper proof must be fitted to the enclosure to ensure that access to the primary beam is prevented by de-energising the X-ray tube.</p> <p>RPS 13 C3.2</p>
	<p>If primary shielding is provided by both tube housing and shielded enclosure, the gauge must use tube housing shutters or interlocks or a combination of both to prevent access to the primary beam and provide the level of safety required by this Code.</p> <p>RPS 13 C3.3</p>
	<p>The shutter, if fitted to the tube housing, and the associated mechanism for its manual or power operation must be designed, constructed and, if necessary, protected by a rugged covering, so that:</p> <p>its operation is not adversely affected by corrosive substances, dust, moisture, other contaminants, vibration or heat, to which it may be exposed during its projected useful life;</p> <p>RPS 13 C3.4 (a)</p> <p>and it satisfies the test requirements which are:</p>
Shutter and Source Control Mechanism Test †	<p>A sample manual operated shutter or source control mechanism must be tested for a minimum of 500 cycles of operation; or</p> <p>A sample power operated (i.e. electrical or pneumatic) shutter or source control mechanism must be tested for a minimum of 5,000 cycles of operation.</p> <p>RPS 13 D5.1 (a), (b)</p> <p>A shutter or source control mechanism will be considered to comply with this test requirement if it operates for the specified number of cycles without the component either failing to operate in the intended manner or showing undue signs of deterioration.</p> <p>RPS 13 D5.2</p>
	<p>The shutter, if fitted to the tube housing, must be:</p> <p>provided with an effective lock so that it can be secured in the 'beam off' position; and</p> <p>designed so that it cannot be locked in the 'beam on' position.</p> <p>RPS 13 C2.2 (a), (b)</p>

Exposure rates	<p>When the X-ray tube assembly is energised, operating at its maximum output intensity and with the shutter closed, the radiation levels must not result in an ambient dose equivalent rate or directional dose equivalent rate, as appropriate, exceeding:</p> <p>(a) 500 microsieverts per hour at any point 0.05 m from the gauge surface; and</p> <p>(b) 10 microsieverts per hour at any point 1 m from the gauge surface.</p> <p>RPS 13 C3.6 (a), (b)</p> <p>NOTE: The maximum output intensity for the X-ray tube assembly is that found when operated at the maximum rated kilovoltage and current of the tube and generator combination, as specified by the manufacturer. Measurements may be made using the maximum rated kilovoltage and at least one half the maximum tube current, and the results scaled accordingly for maximum current.</p>
Access panels	<p>Panels, provided for maintenance access or other purposes, which could permit access to the primary beam must:</p> <p>(a) be secured so that tools or keys are required to open them; and</p> <p>(b) be provided with:</p> <p>(i) at least two safety interlocks; and</p> <p>(ii) a label that warns of the presence of an X-ray tube within.</p> <p>RPS 13 C3.7 (a), (b)</p>
Labels and markings	<p>A label or labels must be permanently attached to the gauge indicating</p> <p>(a) "CAUTION X-ray" or similar</p> <p>(b) manufacturer name and model of the radiation gauge</p> <p>(c) maximum rated tube potential (kVp) and current (mA)</p> <p>(d) maximum radiation dose at one metre from the surface of the tube housing or shielded enclosure (with all shutters closed)</p> <p>RAR</p>