Statement on cabinet X-ray equipment for examination of letters, packages, baggage, freight and other articles for security, quality control and other purposes (1987)

The NHMRC has rescinded this publication in accordance with its policy of reviewing documents published more than 10 years ago. The NHMRC policy with regard to rescinded documents/publications can be found at www.nhmrc.gov.au. ARPANSA has taken over responsibility for the review process for this publication. Continued use of publications is subject to the individual requirements of the relevant regulatory authority in each jurisdiction. The relevant authority should be consulted regarding the use of the advice contained in this publication. All publications in the Radiation Health Series will be progressively reviewed by ARPANSA's Radiation Health Committee and, where appropriate, will be re-published as part of the ARPANSA Radiation Protection Series. Enquiries about the Radiation Health Series publications should be forwarded to the ARPANSA Best Practice Regulation Section, 619 Lower Plenty Road, Yallambie, Victoria, 3085. Tel: 03 9433 2211, Fax: 03 9433 2353, Email: secretariat@arpansa.gov.au.

NATIONAL HEALTH AND MEDICAL RESEARCH COUNCIL

National Health and Medical Research Council

Statement on cabinet X-ray equipment for examination of letters, packages, baggage, freight and other articles for security, quality control and other purposes (1987)

Australian Government Publishing Service
Canberra

© Commonwealth of Australia 1989
ISBN 0 644 09665 9

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without written permission from the Director Publishing and Marketing, AGPS. Inquiries should be directed to the Manager, AGPS Press, Australian Government Publishing Service, GPO Box 84, Canberra, ACT 2601.

The objective of the National Health and Medical Research Council is to advise the Australian community on the achievement and maintenance of the highest practicable standards of individual and public health and to foster research in the interests of improving those standards.

Printed in Australia by R. D. RUBIE, Commonwealth Government Printer, Canberra

APPENDIX XVII

Statement on cabinet X-Ray equipment for examination of letters, packages, baggage, freight and other articles for security, quality control and other purposes (1987)

Contents

1. Introduction

This statement replaces the statement on cabinet X-ray equipment approved by the National Health and Medical Research Council in June 1978.

Cabinet X-ray equipment means an X-ray unit in a shielded enclosure (cabinet) into which articles, products or other materials may be placed, or through which they may pass, for fluoroscopic or radiographic imaging. Compliance of such equipment with the requirements of this statement will ensure that the operators of the equipment and the general public will be exposed to negligible doses of ionizing radiation.

2. Radiation shields

Except within ports* where flexible shields may be used, radiation shields installed to achieve compliance with the external radiation limits in section 3 shall be fixed and shall be made of lead affixed to material having greater resistance to distortion than lead (e.g. steel or plywood), or of dense materials not readily distorted, such as steel, brass or lead filled rigid plastic or glass.

Reduction of radiation emitted through a port to the level permitted in this statement may be achieved by the use of baffles, multiple curtains of durable flexible shielding material,

* A 'port' means any opening in the outside surface of the cabinet which is designed to remain open during generation of X-rays for the purposes of conveying materials to be irradiated into and out of the cabinet.

tunnels providing distance protection or other equivalent methods. Where curtains of flexible shielding material are used the presence of an item to be examined displacing any such curtain shall not permit the emission limit to be exceeded.

3. External radiation

The radiation level at any accessible point 5 centimetres from the external surface[**] of the cabinet shall not exceed 5 microgray in one hour when averaged over an area of 100 square centimetres. Measurements for compliance with this section shall be made with an object in the beam typical of those to be examined and any flexible or moveable screen displaced as would reasonably occur during the operation of the equipment.

Where pulsed X-ray systems are used, compliance with the above requirement shall be determined with the X-ray tube operated at its maximum rating at the maximum kilovoltage to which it can be set by the control for that tube in the busing in which it is installed.

4. Safety interlocks

In this statement a safety interlock means a device intended to prevent exposure of any part of the human body to the primary X-ray beam by preventing production of X-rays while any door or access panel leading to the interior of the cabinet is open. Failure of any component of the equipment shall not cause the failure of more than one safety interlock.

5. Access

5.1 Where a door is provided for insertion of items to be examined or tested it shall have a minimum of two safety interlocks, one but not both of which shall be arranged to disconnect the supply of the high voltage transformer when the door is opened.

5.2 Where entry ports are provided for insertion of items or materials to be examined or tested the equipment shall be so constructed that:

(a) insertion of any part of the human body into the primary beam is not possible; or

(b) in the case of a conveyor system used to convey the items to be examined into the primary beam, insertion of any part of the human body into the primary beam shall not be readily achieved, and the dose rate shall be so limited that, 20 centimetres above the conveyor, an object shall not receive a dose in excess of 10 microgray in a single pass through the beam when the conveyor is moving at the slowest rate at which it can be operated in normal conditions. When the conveyor is stationary the equipment shall not produce X-rays except by manual control as provided for in section 6.

5.3 Panels provided for maintenance purposes which could permit access to the primary beam shall be so secured that tools or keys are required to open them. Where access is by means of a key the panel shall be provided with at least one safety interlock.

Where tools are required for access these shall not be common hand tools, and each panel should be provided with at least one interlock.

Any panel which allows access to the X-ray tube and is not protected by an interlock shall be provided with a label warning of the presence of the X-ray tube within.

[**] The 'external surface' means the outside surface of the cabinet X-ray system, including the high voltage generator, doors, access panels, handles, control knobs and other permanently mounted hardware and including the plane across any aperture or port.

6. Controls

Controls referred to in this section are those which initiate and terminate the generation of X-rays other than by functioning of a safety interlock or mains power control.

There shall be a key operated control so connected that X-rays cannot be produced when the key is removed.

There shall be a separate switch for the control of the X-ray beam. This may provide for manual control, in which case the switch shall be of the 'dead man' type.

Alternatively, the X-ray beam 'on' and 'off' may be activated by automatic devices (e.g. where the items to be examined may trigger the production of X-rays when the items are transported on a conveyor belt).

7. Ground fault

An accidental earthing of an electrical conductor shall not result in the production of X-rays.

8. X-ray indicator lights

The production of X-rays shall be indicated by two independently operated lights that are clearly discernible from each point at which production of X-rays may be initiated. One of these lights shall be so connected that it indicates when voltage is applied to the primary windings of the X-ray tube high tension transformer. Failure of any single component shall not result in the failure of both indicator lights to operate. These indicator lights shall be labelled 'X-RAYS ON'.

If the period of exposure is intended to be less than one second, all X-ray indicator lights shall be activated for at least one second for each exposure.

9. Warning sign

A clearly visible sign bearing an ionizing radiation warning symbol (trefoil) and the word 'CAUTION' shall be fixed to the equipment adjacent to the controls. In addition, the following words should be included on the sign:

X-RAY APPARATUS
This unit produces radiation when energised

The lettering and symbol shall be in black on a yellow background. The statutory authority (see Annex) should be consulted with respect to this requirement.

10. Equipment for examination of carry-on baggage

The following requirement shall be met by equipment designed primarily for the inspection of carry-on baggage at airline, shipping, bus terminals etc.:

The equipment shall be so arranged that the operator who initiates the X-ray exposure must be in a position where he can readily observe all ports and doors during generation of X-rays. In the case of equipment in which the X-ray beam is activated by an automatic device, this requirement will be met by the primary viewing position for the X-ray image permitting all ports and doors to be readily observed during generation of X-rays.

11. Equipment which allows the admission of human beings to the interior

All the following additional requirements shall be met by equipment which allows the admission of human beings to the interior for purposes associated with the operation of the equipment (e.g. equipment used for the examination of LARGE items of freight):

(a) There shall be a control within the cabinet which can be used to terminate or prevent the production of X-rays. This control shall not be overridden from the outside of the cabinet.

(b) There shall be no other means by which X-ray generation can be controlled from within the cabinet.

(c) There shall be audible and visible signals within the cabinet activated for at least ten seconds prior to the production of X-rays. Failure of any single component of the cabinet X-ray system shall not cause failure of both audible and visible signals.

(d) There shall be a further visible warning signal within the cabinet which shall be activated when X-rays are produced. If the period of exposure is intended to be less than one second, this warning signal shall be activated for a least one second for each exposure.

(e) There shall be clearly visible, legible signs describing the meaning of the warning signals required in this statement. These signs shall be adequately illuminated when the main power control is in the 'on' position.

12. Radiation monitoring

Periodical radiation monitoring and a check of the correct operation of all safety interlocks shall be carried out on cabinet X-ray equipment at intervals not exceeding two years. Radiation monitoring shall also be carried out following:

(a) replacement of an X-ray tube; and

(b) modification or reassembly of any shielding component, barrier, door or port.

The advice of the statutory authority shall be sought on suitable equipment and procedures for the radiation monitoring referred to above.

Where equipment complies with this statement, personal monitoring of operators of the equipment is not necessary.

13. Instructions

Manufacturers and suppliers of X-ray equipment subject to this statement shall provide the purchaser with adequate written instructions on the operation of the equipment and on radiation safety procedures.

14. Maintenance

Maintenance of X-ray equipment is subject to radiation safety legislation in the various States and Territories. Maintenance may only be carried out by persons who hold a licence for the purpose issued by the appropriate statutory authority.

Annex

Statutory authorities

Advice or assistance from the relevant statutory authority may be obtained by contacting the following officers:

1. **Australian Capital Territory**
   Consultant, Radiation Safety
   ACT Community and Health Services
   PO Box 825
   CANBERRA CITY ACT 2601
   Telephone (062) 47 2899
   Fax (062) 47 2851
2. **New South Wales**
   Officer-In-Charge
   Radiation Health Services
   Department of Health
   PO Box 163
   LIDCOMBE NSW 2141
   Telephone (02) 646 0222
   Fax (02) 646 0333
3. **Northern Territory**
   Director
   Occupational and Environmental Health
   NT Department of Health and
   Community Services
   GPO Box 1701
   DARWIN NT 5794
   Telephone (089) 80 2911
   Fax (089) 41 0560
4. **Queensland**
   Director
   Division of Health and Medical Physics
   Department of Health
   535 Wickham Terrace
   BRISBANE QLD 4000
   Telephone (07) 224 5611
   Fax (07) 839 5847

5. **South Australia**
   Senior Health Physicist
   Occupational Health and Radiation
   Control Branch
   South Australian Health Commission
   GPO Box 1313
   ADELAIDE SA 5001
   Telephone (08) 226 6521
   Fax (08) 232 0334
6. **Tasmania**
   Health Physicist
   Division of Public Health
   Department of Health Services
   PO Box 191 B
   HOBART TAS 7001
   Telephone (002) 30 6421
7. **Victoria**
   Chief Radiation Officer
   Radiation Safety Section
   Health Department Victoria
   555 Collins Street
   MELBOURNE VIC 3000
   Telephone (03) 616 7777
   Fax (03) 616 7147
8. **Western Australia**
   The Director
   Radiation Health Branch
   Health Department of Western Australia
   Verdun Street
   NEDLANDS WA 6009
   Telephone (09) 389 2713
   Fax (09) 381 1423

For after hours emergencies only, the police will provide the appropriate emergency contact number.