Ansto

Nuclear-based science benefiting all Australians

# Radiation Safety Services

The Australian Nuclear Science and Technology Organisation (ANSTO) is the centre of Australia's nuclear science capabilities and expertise, operating the nation's only nuclear reactor, OPAL.

ANSTO has over 25 years experience in radiation safety management, offering expert advice, services, consultancy and training tailored to the needs of each client. The organisation's radiation experts monitor and provide advice on all aspects of radiation safety in many applications and in compliance with relevant Australian regulations and standards.

ANSTO staff maintain and operate many radiation facilities including OPAL, radiopharmaceutical research laboratories, a radiopharmaceutical production plant, waste management operations, gamma irradiators and a uranium processing pilot plant.

ANSTO's radiation safety services include:

- education and training courses
- consulting in radiation protection monitoring and measurement
- preparedness and response for a radiation or nuclear emergency
- instrument calibration
- gamma irradiation and high dose dosimetry services
- systems safety and reliability consulting.


Course participants using ANSTO facilities.

## Education and training courses

ANSTO is Australia's leading advisor on radiation safety matters and sets the benchmark for radiation safety officer training.

The organisation maintains Australia's most advanced radiation safety and training facilities at its Lucas Heights site. Course participants are offered a unique experience due to the wide range of radiation equipment used and activities conducted on-site.

Course lecturers are practising specialists in radiation protection whose prime responsibility is ensuring the safe operation of ANSTO's facilities and radioactive materials. ANSTO provides advice, training and consultancy services to ensure the safe and effective use of radiation in industry, mining, health care, education, research and other fields where radiation safety is needed.

ANSTO regularly runs recognised radiation safety training courses, as well as customised training programs. These courses can be held at ANSTO's Lucas Heights site or the client's premises. Clients are consulted to understand needs and provide tailor-made programs to suit the experience and requirements of the audience.

The ability to use actual radioactive materials during training courses means ANSTO can offer a realistic learning experience. Our laboratories are designed for practical instruction covering:

- types and functions of radiation detection and monitoring equipment
- dose rate surveys
- contamination and decontamination surveys
- safe use of X-ray devices including X-ray fluorescence (XRF) analysis equipment
- industrial gauges and devices.

Field training for radioactive source searches.

Participants use a variety of radiation measuring instruments.

On successful completion of the course assessment, participants are issued a certificate recognised by State and Federal regulatory authorities.

ANSTO has collaborated with the International Atomic Energy Agency (IAEA) in distance learning programs and conducted training programs throughout Asia and the Pacific. Australian clients have included CSIRO, New South Wales Fire Brigade, Australian Army, Australian Customs, hazardous materials (Hazmat) teams, bomb disposal squads, hospitals, mining companies and various other government and private organisations.

**For more information including registration forms and course calendar, visit www.ansto.gov.au, call +61 2 9717 9434 or email radsafetytraining@ansto.gov.au**

Radiation consultancy field work.

## Consultancy services

The health physics and radiation protection expertise of ANSTO is available on a consultative basis, including:

- radiation surveys and radiation protection advice
- environmental radiation surveys including for base-line measurement at mine sites
- radiation surveys and characterisation of contaminated lands
- identification and characterisation of naturally occurring radioactive material (NORM)
- advisory services as radiation safety officers
- radiation management plans for industrial, mining and medical organisations
- identification, inventory and classification of radioactive sources
- radioactive waste management advice including classification, minimisation and preparation for transportation
- assistance for compliance with regulatory bodies and information sessions for employees and members of the public
- radiation protection, monitoring and measurement of X-ray devices
- program audits against regulatory requirements and codes of practice
- assessment of practices and facilities with radioactive sources for compliance with the Source Security Code of Practice.

ANSTO aims to satisfy all of its clients' needs through providing high quality services, using qualified staff with many years of hands-on experience and accessing the wide range of radiation expertise and infrastructure within ANSTO.

**For more information visit www.ansto.gov.au, call +61 2 9717 3864 or email radiationconsultancy@ansto.gov.au.**


Training first responders and forensic experts.

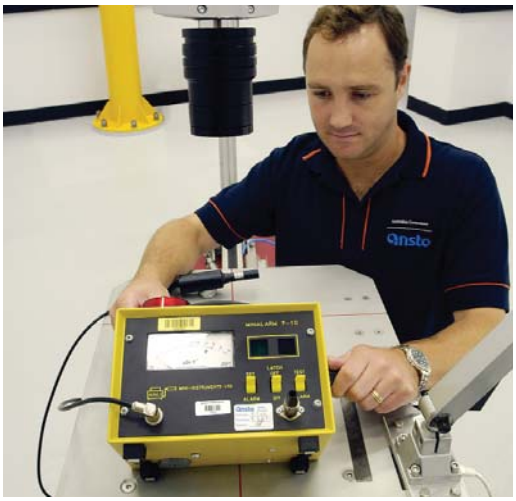
## Radiation or nuclear emergency response

ANSTO's equipment, facilities and uniquely qualified and experienced staff can enable you to:

- know what to do when 'things go wrong' when using radiation
- develop and strengthen your technical and organisational capabilities for responding to radiation related and other incidents
- train and skill your staff in a range of radiation measuring equipment and personal protection equipment in a variety of emergency circumstances.

ANSTO has worked with emergency response organisations at local, state and federal levels, health and industry sectors, as well as internationally to ensure effective and appropriate preparedness and response for a radiation or nuclear emergency. We are accredited by the IAEA as part of the Regional Assistance Network (RANET).

**For more information visit www.ansto.gov.au, call +61 2 9717 3542 or email nieprgroup@ansto.gov.au**




ANSTO can calibrate a wide variety of instruments.

## Instrument calibration

An important aspect of safety control comes from the provision of accurately calibrated ionising radiation detection instruments that are regularly checked. To maintain the accuracy of your instruments it is essential to participate in a periodic calibration program based on approved methods and standards.

ANSTO has a fully interlocked, purpose built Health Physics Instrument Calibration Rig which facilitates efficient and safe calibrations of gamma and neutron dose rate meters.

With many years of experience in the measurement of ionising radiation, ANSTO offers a comprehensive radiation instrument calibration service to clients. This includes:

- a reliable service with expert advice concerning evaluation of instrument performance
- a service that meets the requirements of Federal and State government regulators and international standards
- a short turnaround time
- accurate calibrations of radiation survey monitors against Cs-137 sources of various activities traceable to the Australian Standard of exposure
- instrument response reports for contamination monitors using wide area reference sources including Am-241 (alpha or gamma), Cl-36, C-14, Sr-90/Y-90, Pu-238, I-129, Cs-137 and Co-60.

**For more information or a quotation visit www.ansto.gov.au, call +61 2 9717 3208 or email calibration@ansto.gov.au.**

Looking down into the gamma irradiator showing the blue glow from Cerenkov radiation.

Irradiator control panel.

# Gamma irradiation and high dose dosimetry

## High dose irradiation service

ANSTO operates a cobalt-60 irradiator for small scale irradiation of a wide range of products to various doses. Our unique facilities enable us to accurately deliver high doses of radiation with a precision not achievable in industrial scale irradiators. Controlled dose rates and temperatures allow users to test ideas, develop applications and perform irradiations under non-standard conditions.

### Irradiation service capabilities

| | |
|---|---|
| Dose rates | 0.1 to 4 kGy.h-1 |
| Doses | 10 to 106 Gy |
| Temperature | –78°C (under dry ice) up to room temperature |
| Product size | Up to 1m$^3$ |

## High dose dosimetry service

ANSTO manufactures and calibrates radiation dosimeters for use in monitoring doses in high dose irradiation applications. Our dosimeter measurements are traceable to the Australian standard for absorbed dose. These reference standard dosimeters can provide traceable calibrations for routine dosimeters used by any provider of gamma irradiation services world-wide.

Our dosimeters can be used to calibrate any gamma radiation field from small blood irradiators to large industrial pallet or tote irradiators. Manufacturers of sterile medical products may conduct quality control checks on the dose delivered to their products in industrial irradiators.

Dosimeters are manufactured following international best practice for dosimetry (ISO 17025 and ISO/ASTM standards for dosimetry for radiation processing).

ANSTO provides a supply and measurement service which supplies calibrated dosimeters to customers for irradiation and upon return a dosimeter reading report.

Human bone samples packed in dry ice awaiting irradiation at ANSTO.

Surgical instruments, gloves and masks are sterilised with gamma radiation.

## Dosimetry systems

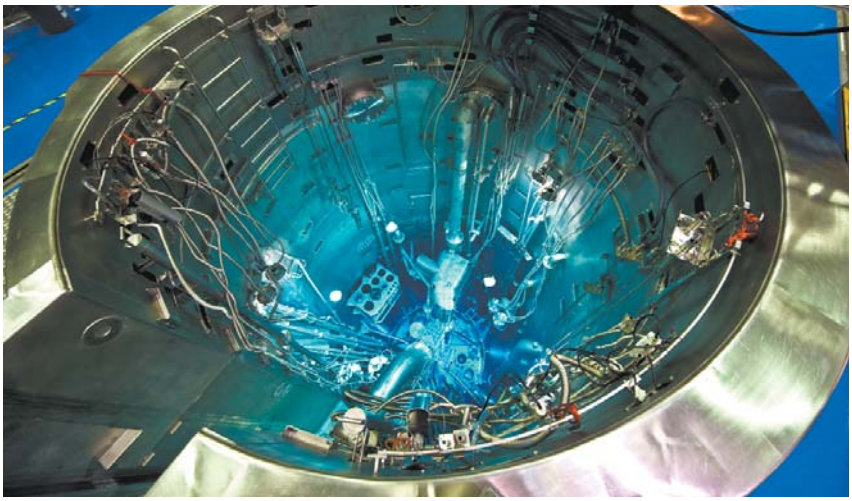
| Dosimeter | Dose range | Uncertainty (95 per cent confidence) |
|---|---|---|
| Fricke | 50 – 350 Gy | 2.0 per cent |
| Ceric Cerous (low dose) | 1 – 12 kGy | 3.0 per cent |
| Ceric Cerous (high dose) | 10 – 35 kGy | 3.5 per cent |

## Regulatory requirements

In a highly regulated environment, ANSTO maintains a quality management system that complies with the following licences, standards and guidelines:

| | |
|---|---|
| TGA licence | for the radiation treatment of therapeutic goods |
| APVMA licence | for the radiation treatment of veterinary goods |
| AQIS licence | for the radiation treatment of goods subject to Australian quarantine |
| ARPANSA licence | for the safe operation of radiation facilities |
| ISO 13485 : 2003 | regulatory requirements for the control of radiation processing of medical devices |
| ISO 9001 : 2000 | quality management system requirements |
| ISO 11137 : 2006 | substantiation of the sterilising dose for medical devices |
| ISO 17025 and ISO/ASTM | international best practice for dosimetry and radiation processing |

**For more information visit www.ansto.gov.au, call +61 2 9717 3441 or email radtech@ansto.gov.au**



ANSTO's state-of-the-art OPAL research reactor's processes are carefully monitored and controlled through best practice procedures and stringent national and international standards.

## Systems safety and reliability consulting

ANSTO provides expert consultancy services and training in:

**Risk analysis** - ANSTO can assist with support safety case documentation, design reviews and technical risk studies for all aspects of risk assessment for complex facilities and situations. Risk assessments can be completed using either quantitative analysis for high consequence hazards or qualitative analysis using AS4360:2004 and similar techniques for routine hazards.

**Safety case preparation, hazard identification and risk analysis** – ANSTO can prepare hazard identification and documented safety cases to demonstrate duty of care (or advise in-house). We can assist in determining appropriate strategies for management of high consequence events and general risk minimisation and advise on all aspects of preliminary hazard analysis, hazard and operability analyses (HAZOP), risk assessment, rapid ranking, and other techniques to support safety cases.

**Reliability, availability and maintainability (RAM) analysis** - consideration of reliability issues from the concept stage helps achieve increased asset utilisation and minimised maintenance support costs. Consideration of maintainability ensures rapid turn around in the event of a failure to minimise downtime. Availability is achieved through a combination of increased up-time and reduced downtime. Our reliability engineers can assist in reliability analysis, reliability improvements, reliability predictions, review of RAM contracts and review of RAM deliverables by your contractors. ANSTO has expertise in failure modes effects and criticality analysis, fault tree analysis, event tree analysis, Weibull analysis, human factor analysis, life cycle costing and simulation.

**Design review support** - the most cost-effective time to improve reliability, safety, operability and maintainability is when the system is just a concept or is still on the drawing board. New designs often repeat many of the problems of earlier versions. A formal review process is an excellent method of ensuring that experience is incorporated into new designs, the most cost-effective approach is adopted, the design is fit for its purpose and

The OPAL reactor building is made from reinforced concrete and has a steel mesh cover which together protect the reactor from external events such as earthquakes and aircraft collisions.

the risk is as low as reasonably achievable. We can facilitate design reviews, risk ranking workshops and HAZOP.

Other areas where we can assist are system criticality assessment, root cause analysis, failure impact analysis, Pareto analysis, life cycle costing, maintenance management, sparing and insurance spares analysis.

**Engineering asset management** - ANSTO also provides tuition in systems reliability engineering within the University of Wollongong post-graduate courses in Engineering Asset Management. This subject provides a working knowledge of the reliability engineering philosophies, tools and techniques underpinning systems engineering and engineering asset management.

**For more information visit www.ansto.gov.au, call +61 2 9717 3490 or email reliability@ansto.gov.au**

Nuclear-based science benefiting all Australians

The Australian Nuclear Science and Technology Organisation (ANSTO) is the home of Australia's nuclear science expertise. This unique expertise is applied to radiopharmaceutical production and research, climate change research, water resource management, materials engineering, neutron scattering and a range of other scientific research disciplines.

ANSTO is a Federal Government agency and operates Australia's only nuclear reactor OPAL - used for research and isotope production. ANSTO applies nuclear science in a wide range of areas for the benefit of all Australians.

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ANSTO produces regular updates on our science and technology, has available a range of publications and conducts free tours of our site for school groups, community groups and members of the public. For bookings or more information, please contact us.

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