



# Inspection report

<b>Licence holder:</b> Australian Nuclear Science and Technology Organisation (ANSTO)	<b>Licence number:</b> F0247 and F0248
<b>Location inspected:</b> Material Fabrication Bay (F0248) and Actinide Suite (F0247)	<b>Date/s of inspection:</b> 11 and 14 November 2019
	<b>Report no:</b> R19/12684

An inspection was conducted as part of ARPANSA's baseline inspection program to assess compliance with the *Australian Radiation Protection and Nuclear Safety Act 1998* (the Act), the Australian Radiation Protection and Nuclear Safety Regulations 2018 (the Regulations), and conditions of facility licences F0247 and F0248.

The scope of the inspection included an assessment of ANSTO's performance at the Material Fabrication Bay and Actinide Suite against all inspection modules of the Performance Objectives & Criteria (PO&C). This included performance reporting and verification, configuration management, inspection testing and maintenance, training, event protection, security, radiation protection, emergency preparedness and response, including three cross-cutting modules safety culture, human performance and performance improvement. The inspection consisted of a review of records, interviews, and physical inspection of the facilities and sources.

## Background

The Actinide Suite is a research facility, comprising three laboratories and access areas. The facility is used for research into the science and chemistry of actinide-doped materials. Its main role is to assist in the development and characterisation of materials suitable for use as waste forms for the immobilisation of radioactive wastes that contain actinides.

The Materials Fabrication Bay (MFB) is a nuclear fuel cycle research and development facility designed to process, use and store nuclear and radioactive material for various research and development projects. It comprises a process development bay, multipurpose laboratory, and adjoining active characterisation laboratories. The facility is predominantly used to develop and characterise advanced nuclear waste forms. The MFB underwent a decontamination and refurbishment project that was completed in 2016.

Both facilities are licensed to manage a number of sealed and unsealed radioactive sources that are necessary to carry out the research.

Although there are two distinct facilities, they are functionally similar to each other and support each other. They are managed by Nuclear Material Development and Characterisation (NMDC) division using one management system informed by ANSTO site-wide policies, standards, guides, procedures and instructions.

The main codes and standards applicable to these facilities are those that appear in section 59 of the Regulations plus:

- Australian/New Zealand Standard: *Safety in laboratories Part 4: Ionizing radiations* (AS/NZS 2243.4:2018)

## Observations

In general, the management of safety and security at both facilities was found to be adequate. In some cases, there appeared to be room for improvement with respect to currency and clarity of the documentation, training and availability of internal service providing groups, such as radiation protection and safety assessment.

### *Performance reporting verification*

Licence Condition 3 of the both facility licences requires that the licence holder undertakes a three yearly self-assessment of compliance with the applicable standards and codes. The intent of the licence condition is to assure licence holders work against best practice. The MFB and Actinide Suite facilities conduct the review on demand when the standards are used. An example is a review against the Code of the Safe Transport of Radioactive Material that is used every time a radioactive material is transported. However, there appeared to be no formal records of such reviews. ARPANSA expects that auditable records of compliance with requirements of the licence condition will be maintained.

ANSTO has initiated a coordinated approach to ensure compliance with this licence condition across the organisation. The ANSTO site-wide event and task management system Governance Risk and Compliance (GRC) included appropriate actions associated with the commitment.

The GRC system tracks events registered by ANSTO users. All events reported by the two facilities have been assessed to have minor or lower safety significance. A number of reported events were examined and discussed with the licence holder representatives. The level of detail recorded in the system is proportionate to the event safety significance. In some cases, the information related to lessons learnt was not complete in the GRC system. This is an area for improvement. However, the actions recorded elsewhere and initiated to address the identified problems were clear and completed for events declared closed. For example, GRC 6154 involved radioactive contamination detected on waste bins that was higher than expected. The investigation of the event identified that procedures were not followed closely. The records showed that staff received refresher training to address the finding.

### *Configuration management*

The facilities carry out activities according to a set of written procedures and instructions. The documents are based on the facility safety analysis reports (SAR) and risk assessments. The SAR and supporting risk assessments provide the basis for the facilities to demonstrate they can be operated safely.

Whereas the MFB safety documents are dated 2017, the Actinide Suite SAR and risk assessment were found to be nine and ten years old, respectively. ANSTO explained that the Actinide Suite Risk Assessment was near completion in 2017 however was never finalised because of changes in work priorities in ANSTO System Safety and Reliability (SSR) which is ANSTO's internal service provider. It is understood that ANSTO is currently reviewing the organisation risk assessment and management process that will later be adopted by both MFB and Actinide Suite.

The type of activities performed in the Actinide Suite has not changed since 2009 but the facility risks may vary due to changes to the ANSTO risk matrix and risk appetite. The Actinide Suite facility licence includes work activities with high and very high risks to personnel. Although these tasks are not performed very often, it is not good practice to operate the facility with safety documents out of date. This constitutes an area for improvement.

The work procedures and instructions have been developed based on the task-focused operational risk assessments presented in Safe Work Method and Environment Statements (SWMES). MFB and Actinide Suite have over thirty SWMES. The SWMES are reviewed three-yearly and updated if necessary. The personnel involved sign the SWMES to acknowledge the risks associated with the activity. All documents sampled were found to be up to date and signed by the relevant personnel.

The work procedures and instructions examined during the inspection were found to have been revised within the three-year period required by section 61 of the Regulations or in the three or five year frequencies required by the relevant ANSTO procedure. Although some of the Actinide Suite work procedures and instructions were reviewed recently, the high-risk task instructions did not include safety warnings and caution statements informed by the safety assessment that are expected for high-risk tasks. The documents contained some safety statements; however, these could be improved. A lack of sufficient safety statements in work instructions was identified as a contributing factor to the event the former ANSTO Health reported in August 2017.

Organisation learning is effective when implementation of lessons learnt from internal and relevant external events is carried out. That requires sharing of accurate and timely information about the operational experiences. Both MFB and Actinide Suite staff were well-informed about the ANSTO Health contamination event and some improvements based on that event were observed in place. However, the Actinide Suite could better use relevant ANSTO operational experience. This is an area for improvement.

One of the improvements implemented on the basis of an ANSTO Health event was development of the High Risk Identification and Notification process. The process is very new and has been developed to provide the ANSTO Executives accurate information on risks and controls for individual work activities. The process records document associated decisions made in the matter. This is considered potentially an effective tool to improve high-risk management at the organisational level.

The MFB and Actinide Suite are authorised to handle a small amount of fissile material. The ANSTO Criticality Officer re-issued the Criticality Certificates for the facilities in 2019 supported by valid criticality assessments. The Criticality Certificates place conditions on the use and storage of the fissile material within both facilities. These conditions must be bounded by the safety operation boundaries established in the SAR. It could be interpreted from the MFB Criticality Certificate that the criticality assessment did not consider the maximum allowable amount of fissile material described in the SAR. While the amount of the fissile material, both authorised and actually handled in MFB, is so low that nuclear criticality is not a concern, the documents should be clear and consistent to prevent any misinterpretation. Therefore, this is identified as an area for improvement.

The ANSTO internal Safety Assurance Committee (SAC) assesses the safety of facilities and activities conducted by ANSTO and issues internal approvals. Six SAC approvals for these two facilities were provided. The approvals for the two facilities were issued with a three-year expiry date and a condition that formal reviews of the safety assessment and risk control measures be conducted within three years from the date of the SAC approvals. The two approvals related to the MFB were current. However, all four of the approvals for the Actinide Suite expired in 2018 and 2015 and no formal reviews have been carried out. It is acknowledged that there has been no change to the work activities in the Actinide Suite since the current SAR was issued in 2010. Although the validity of the SAC approvals ran out, the processes were performed as approved. It is recognised that ANSTO has initiated changes to the current safety assurance process and the revised process is in an advanced stage of development. This new process may affect the way approvals will be issued for the facility in future. However, deviation from the current internal requirements is considered an area for improvement.

### ***Inspection, testing and maintenance***

ANSTO Maintenance and Engineering (AME) carries out maintenance of the MFB and most Actinide Suite equipment. The Actinide Suite personnel maintain the other equipment and tools; this mainly includes maintenance of glovebox seals and glovebox internal equipment and tools.

AME work tasks are managed using the site-wide electronic maintenance management system SAP. This includes the tasks related to systems important to safety and established in the Operational Limits and Conditions (OLC). The SAP schedule and records showed no deviation from the OLC requirements. No outstanding maintenance was identified at the time of the inspection.

The Actinide Suite personnel maintain their equipment using a manual management system. The records of the system were examined, found complete and in a good order. There were no outstanding maintenance tasks identified at the time. Testing of risk controls has been carried out periodically according to the requirements and/or within the pre-operational checks. Inspectors examined the records and found no discrepancy.

External contractors providing service to the facilities are managed according to the ANSTO site-wide contractor management protocols. Appropriately qualified facility personnel supervise contractors in their respective areas. However, regular contractors and service providers such as the Emergency Response Team undergo induction training and refreshers for unsupervised access to the facilities.

### ***Training***

Both facilities manage the training of personnel using a combination of the site-wide Learning Management System (LMS) and local manual system for task-focused training. The Actinide Suite manages the latter using a paper-based system. This system is considered adequate considering only a limited number of staff are authorised to work in the facility. The paper-based records examined during the inspection were found complete and the relevant training was up to date.

The facilities have developed a shared training report sheet that combines LMS training requirements and training with task-specific training that is not paper based. This report gives managers and NMDC leadership a good visibility of the status of training, including those whose training is overdue. The report sheet also differentiates the facility users from other ANSTO personnel with access to the facilities for better oversight.

The effectiveness of the training is gauged through task observations and questionnaires. The training system defines the capability champions, the experienced individuals, who deem trainees as being competent. A general coaching approach follows for ongoing staff development.

The electronic records indicated that there were a relatively high percentage of employees with overdue training modules, which included radiation and nuclear material refreshers. This included both the facility users and ANSTO service-providing personnel such as Emergency Response Personnel and Health Physics Surveyors (HPS). While a small number of overdue training is not unusual for organisations, a large number of overdue training is potentially a sign indicating competencies are not maintained. This is an area where the facilities could improve.

As discussed above, the new High Risk Identification and Notification process is being implemented on the entire site by ANSTO Governance, Risk and Compliance Assurance (GRCA). It will deliver information from the facilities to decision makers at the executive level of the organisation. Therefore, appropriate training for the relevant facility personnel is essential to ensure the accurate information is presented to executives. Although the training of designated personnel has begun, facility staff were unclear on many aspects of the process, e.g. level of details to be provided in the applicable quality management form.

### **Event protection**

The SARs of both facilities consider a variety of external initiating events such as loss of offsite power, earthquake, high winds, flooding and fire. Both SARs consider the risk of an aircraft crash to be incredible. It is known that at least one military activity involving several helicopters performing low altitude manoeuvres occurred in the area adjacent to the facility. ANSTO staff were unsure if this had affected the risk documented in the safety documents. Consideration should be given to recent operational experience when revising the facility safety assessments. This is identified as an area for improvement.

A whole of site approach exists to the identification and management of pests and any consequent damage they have caused. Pests are then treated when identified. Fire equipment was present throughout the facilities. The testing arrangements for the equipment were surveyed and observed to be current.

### **Security**

ANSTO has a process for assessing the security requirements of radioactive material (i.e. sealed sources) and nuclear material. ARPANSA's *Code of Practice for the Security of Radioactive Sources 2019* (RPS 11) and the IAEA's *Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5)* (NSS 13) are respectively used to determine security needs. ANSTO has assessed the requirements of these documents. However, for one of the facilities, ANSTO staff were unclear on which requirements were applicable and whether the requirements were met. Therefore, the clarity of requirements for radioactive material and source management could be improved.

### **Radiological protection**

The principles of radiation protection are justification, optimisation and application of dose limits. The first two principles are 'source-related' while the third is 'individual related'. A combined document contains the Plans and Arrangements for both licensed facilities. This indicates that

“...radiological exposures to staff are anticipated during the operation of each facility. Exposures are considered to be justified on the basis that the operation of each facility will enable world class research in the national interest, provide advice to the Australian Government on key nuclear and radiological issues and provide specialist support for key national infrastructure.”

This is a generic approach to justification and given the difference between the two facilities, it is not necessarily appropriate to group them together in the consideration of benefits and risks. It is, however, acknowledged that assessment of access to the MFB does have some consideration of the justification of the experimental work proposed. Furthermore, in accordance with RPS C-1 *Radiation Protection in Planned Exposure Situation* (2016), ANSTO has assessed doses incurred in the two facilities over the last five years and established a source-related constraint for worker doses. This is an important part of the optimisation process.

The facilities differ in that the MFB was refurbished in recent years so is essentially brand new; while the Actinide Suite is approximately 50 years old yet was designed so that radioactivity was contained within the gloveboxes which are maintained under negative pressure. In both instances contamination control plays an important part in achieving the safety objective. This is supplemented by surveys for measurement of contamination. Both facilities have a variety of radiation monitors to detect surface and airborne contamination. The calibration of all instruments observed was confirmed.

There are a few events recorded in the GRC system associated with radiation surveys carried out in the facilities. According to the radiation survey schedule, the surveys are to be conducted every month. However in two instances in 2018, the monthly surveys were not completed due unavailability of HPS staff. ANSTO has recently changed the organisation of HPS for all ANSTO facilities. Instead of having HPS designated to facilities, the surveyors are now centralised and facilities can access a pool of HPS. This arrangement has the potential to improve availability of HPS services. However, a similar event occurred again in November 2019 indicating the organisational change did not fully address the shortfall. Therefore, this still presents an opportunity for improvement.

In the MFB, the benches and storage cupboards have a top surface that appeared to be made of stainless steel but the Inductively Coupled Plasma (ICP) lab in the Actinide Suite has a plastic laminate benchtop. The working area was covered in disposable plastic sheeting however some small rips in the surface were present and the laminate has become detached from the side of the bench leaving the chipboard surface exposed. The ICP lab is categorised as a 'red' or high contamination area but this is due to the adjacent laboratory. Also, write-up areas were observed to be in use in the Actinide Suite. ANSTO personnel were not aware of the grading (i.e. low, medium or high) of each of the laboratories in accordance with the Australian/New Zealand Standard *Safety in Laboratories Part 4: Ionising Radiations (AS/NZS 2243.4:2018)*. The grading dictates the laboratory design requirements such as requirements for write-up areas. This is an area for improvement.

Spill kits were present in the MFB, the ICP lab and the process lab in the Actinide Suite but the contents of each spill kit was not displayed or routinely audited to ensure all contents were present and fit for purpose.

### **Emergency preparedness & response**

Both facilities are categorised in accordance with ARPANSA's Regulatory Assessment Principles (2001) which has been withdrawn from use and international best practice recommended instead. The IAEA has published General Safety Requirements Part 7 *Preparedness and Response for a Nuclear or Radiological Emergency (2015)*. The facility has not been categorised in accordance with the recommended IAEA methodology.

### **Findings**

The licence holder was found to be in compliance with the requirements of the Act, the Regulations, and licence conditions.

The inspection revealed the following **areas for improvement**:

1. Some safety documents should be revised. Identified examples:
  - Actinide Suite: Safety assessment and Safety Analysis Report are out of date
  - MFB: Alignment of information presented in Criticality Certificate with the SAR
  - Both facilities: The revision of SAR should include review of likelihoods of the postulated external hazard scenarios as they may have changed.
2. Event related information presented in the GRC system should be complete
3. Actinide Suite instructions and procedures should reflect learning from operational experience in other ANSTO facilities
4. SAC approvals for activities in the Actinide Suite should be kept up to date
5. Oversight of training for both MFB and Actinide Suite personnel should be strengthened
6. Requirements for radioactive material and source management should be clear

7. Awareness of AS/NZS 2243.4:2018 requirements for the laboratories could be improved
8. ANSTO should improve consistency of safety related service provided to the facilities. This includes availability of HPS under the Radiation Protection Service and safety and risk assessment expertise of ANSTO Safety System and Reliability.

It is expected that improvement actions will be taken in a timely manner.

*No written response to this report is required*

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