



MEMORANDUM

To	Algis Lencus	Date	12 August 2010
cc:	Basil Ellis; Alamgir Kabir		
From	Chris Penny	Ref/File No.	10/431
Subject	Risk Assessment for Lifting of Cyclotron from Vault at ANSTO Camperdown		

This memorandum documents the Risk Assessment performed for the lifting of the existing 30 MeV cyclotron from the ANSTO Camperdown cyclotron vault. As a result of the study a list of actions to be addressed has been prepared and can be found in Table 1. A disposition addressing these actions should be prepared by the project team in consultation with the author this memorandum.

1. BACKGROUND

The ANSTO Camperdown Facility, formerly called the National Medical Cyclotron (NMC) is located within the boundaries of the Royal Prince Alfred Hospital precinct. Construction of the facility started in 1990 and was completed in 1992. The facility used a 30 MeV cyclotron (IBA30) and process related GMP and SPECT hot cells. The first proton beam was produced in mid-1991 and limited radionuclide production began some months later. In 1996 an addition of the south beam rooms was made and commissioned in 1997.

The 30 MeV Cyclotron and some of the hot cells will be decommissioned to facilitate the installation of a new 18 MeV cyclotron and associated hot cells suitable for the proposed research works.

As part of the safety approval process for the decommissioning of the 30 MeV Cyclotron the need for a risk assessment for the lift of the existing cyclotron out of the vault was identified.

As well as this study a site specific lifting study is to be produced by the contractor prior to the lift. A site specific safe work method statement or suitable equivalent will be produced prior to the lift, and will involve all contractors performing the work and ANSTO staff including the Camperdown Construction Coordinator and the ANSTO Lifting Equipment Approval Officer. The Lifting Equipment Approvals Officer (LEAO) will also be required to verify all appropriate certification is in place prior to the lift.

2. SCOPE

The scope of the risk assessment was limited to the lifting and movement of the cyclotron, the vault roof plugs and the cranes used in the lifting process at the ANSTO Camperdown site. For a timeline of the activities to take place during the lift please refer to the Lift & Transport plan (Toll, 2010)

The risk assessment of the transport of the cyclotron from Camperdown to the LHSTC is not included in this study.

3. METHODOLOGY:

The hazards were identified using a HAZOP type process based upon guide words used in previous lifting assessments as well as some guidewords more specific to the site and lift to be performed.

The study consisted of a walkthrough of the process, involving the specialist contractors involved in the lift and other the other participants, followed by a meeting in which the guide words were discussed.

The HAZOP table produced as result of this assessment is found in Appendix A. The HAZOP record table records all guidewords used during the study.

The results of the study were reviewed by project staff. Where deemed appropriate actions were consolidated or comment was made to show they have already been addressed.

Based upon the result of the HAZOP, and comments from project staff, a risk assessment was performed. The risk assessment followed the guidance given in ANSTO/S/TN/2005-24 rev 1 (Perera, 2005). It is located in Appendix B.

4. RESULTS:

One scenario was identified as having a medium level of inherent risk. This was the dropping of the load (cyclotron) onto a person. This assessment is conservative, and provided all identified mitigations are put in place the risks associated with this scenario is considered As Low as Reasonably Practicable. All other scenarios were identified as having a low level of risk.

As a result of the study actions were identified. These should be addressed, and a disposition prepared, by the project, prior to the lift. This should be done in consultation with the author of this memorandum. For convenience a list of the actions to be addressed by the project team is given as follows

Table 1 – Actions to be Addressed

Cyclotron Lift Actions	
1.	Determine the Dangerous Goods Rating of the crane in the configuration to be used during the lift.
2.	Determine the locations of easements in area to be used by crane.
3.	Ensure there is no loose contamination in the vault, trench or other areas that could be exposed to the weather prior to opening of roof plug
4.	Determine the arrangements for car parking and access to other facilities, such as the child care center
5.	ANSTO to maintain a single point of contact during the lift
6.	Determine if local manning of security barriers in the area will be required.

5. REFERENCES

Toll Project Services, 2010, *Cyclotron Removal & Transport, Lift & Transport Plan*, Draft 5 – 26.7.10

Perera J, 2005, *Conduct of a Risk Study*, ANSTO/S/TN/2005-24 rev 1

APPENDIX A - HAZOP STUDY RECORD

HAZOP STUDY RECORD: ANSTO Decommissioning								
Plant Section/ Activity	Lift of cyclotron out of vault		PRESENT: Chris Penny, Algis Lencus, Graeme Owen, Shane Gillespie					
Date	28/7/2010							
Line No.	Guideword/ Deviation	Possible Causes	Possible Consequences	Safeguards/ Checks	Action No.	Action	By	Comments
1.	Overload	Human error. Lifting equipment does not meet requirements.	Lift failure Damage to the load	LEAO to verify loads, capacity of crane, configuration, lifting devices etc. Certified operators Crane is rated to lift up to 400 Tonnes. Cyclotron load is 55 tonnes Lift study to be prepared and presented to ANSTO prior to lift.	1	Determine the Dangerous Goods Rating of the crane in the configuration to be used during the lift.		
2.	Load hang up	Load stuck (entangled) Crane Stops Crane runs out of fuel	Damage to Crane Load left suspended	Certified operators Crane is Certified Crane fuel capacity is sufficient for operation and fuel can be delivered if required				

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Line No.	Guideword/ Deviation	Possible Causes	Possible Consequences	Safeguards/ Checks	Action No.	Action	By	Comments
3.	Load snatching	Cyclotron attached to floor Grit and Grime around roof plugs Trees Cyclotron vault plug hole	Crane damage Damaged to Load Load drop	Certified Operators Guide-ropes to ground level. Membrane over Roof Plug to reduce level of dirt and grime build-up Ability to jack up roof plugs if required Roof plug directly above cyclotron.				
4.	Low/No load	No Load	Slack Cable Delays to Respool	Crane is capable of operating with minimal load				
5.	Swinging/Heaving load	Human error; Crane control fault Wind	Collision with buildings or crane	Crane is speed limited Load to be kept as low as possible Cyclotron Vault is robust Other adjacent building next door is vacant (due for demolition) Guide ropes (drop lines) to be used guide cyclotron				

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Line No.	Guideword/ Deviation	Possible Causes	Possible Consequences	Safeguards/ Checks	Action No.	Action	By	Comments
6.	Too high speed	Winch Drum Failure	Damage to Truck Damage to Load	Crane is certified Low inherent drum speed. Truck tyres can be replaced if required				
7.	Too low speed	Crane control fault; human error	Operational delays	No Issue				
8.	Load drop	Crane hoist failure Lifting devices failure	Possible injury Damage to load	LEAO to verify loads, capacity of crane, configuration, lifting devices etc. Certified operators Crane is rated to lift up to 400 Tonnes. Cyclotron load is 55 tonnes Lift study to be prepared and presented to ANSTO prior to lift.				
9.	Radiation	Activated components inside cyclotron	Dose to contractors	Cyclotron to be cleared prior to transport. Cyclotron to meet appropriate packaging standard prior to transport				

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10.	Contamination	Loose contamination inside and outside of cyclotron	Spread of contamination outside cyclotron	All easily accessible areas to be decontaminated prior to transport Weather Proof Covering for Cyclotron during transport				
11.	Siting	Underground infrastructure	Damage to underground infrastructure such as Storm water drains	Load spreading plates under crane supports. Crane may be moved to avoid easements	2	Determine the locations of easements in area to be used by crane.		
12.	Weather	Rain	Water in Vault Water around Cyclotron	Vault trench has pump out locations Top ceiling plug can be put back in place overnight Should be minimal need to use electrical systems in vault during lift	3	Ensure there is no loose contamination in the vault, trench or other areas that could be exposed to the weather prior to opening of roof plug		
						Ensure appropriate electrical isolations are in place to allow for weather ingress.		A separate construction power system will be in use. Action considered to be covered and not included in Action List
13.	Traffic	Car parks in use	Traffic Collision	Majority of car park to be closed	4	Determine the access arrangements for car parking and access to other facilities, such as the child care center		Consolidated Action

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14.	Security	Spectators Local Pedestrian Traffic	Members of public in construction zone. Exposure to hazards associated with lift	Lift to be performed on the weekend.	5	ANSTO to maintain a single point of contact during the lift		
		Removal of Security barriers to allow Truck access	Unauthorised access to car parking areas. Damage to vehicles left in area	Time barriers are removed to be minimised Local traffic control	6	Determine if local manning of security barriers in the area will be required.		

APPENDIX B - RISK ASSESSMENT

Hazard Identification and Risk Assessment								
Plant Section/Activity		ANSTO Camperdown - Decommissioning - Cyclotron Lift						
Hazard	Scenario	Mitigation	Consequence Type	Consequence	Consequence Score	Likelihood Score	Risk	Action
Radiation	Cyclotron breaks open as a result of a drop	Lift to be performed using Certified lifting system and operators. Accessible activated components to be removed prior to transport Health physics support during transport	Radiation	Radiation exposure from exposed activated components	Moderate	Very Unlikely	Low	
Heavy Load	Load drops on person	Only certified operators to be used. Crane is has a maximum load of 400 tonnes Restricted access to area during lifting operations	Injury	Cyclotron or Roof Plug Drops on an operator causing severe injury or death	Severe	Extremely Unlikely	Medium	
Heavy Load	Cyclotron swings and collides with building	Crane moves slowly Load to be kept as low as possible. Load guided using drop lines. ANSTO Camperdown vault construction is robust.	Plant Damage	Damage to building	Moderate	Very Unlikely	Low	

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Hazard	Scenario	Mitigation	Consequence Type	Consequence	Consequence Score	Likelihood Score	Risk	Action
Heavy Load	Cyclotron lowered to quickly (or dropped) onto truck	LEAO to verify loads, capacity of crane, configuration, lifting devices etc. Low inherent drum speed. Tyres can withstand some impact load and can be replaced.	Plant Damage	Damage to truck due to cyclotron being lowered too quickly	Moderate	Very Unlikely	Low	
Radiation	Exposure to radiation/contamination during transport	Cyclotron to be cleared by Health Physics prior to transport. Cyclotron to meet appropriate packaging standard for transport All easily accessible areas to be decontaminated prior to transport Weatherproof covering for Cyclotron during transport Health Physics Support during transport	Radiation	Radiation exposure	Minor	Unlikely	Low	
Underground Infrastructure	Ground load affects underground infrastructure	Crane uses load spreading plates Easements to be avoided if possible	Plant Damage	Damage to underground infrastructure. eg cracked storm water lines	Moderate	Very Unlikely	Low	
Traffic	Vehicle collision at ANSTO Camperdown	Area to be cordoned off as construction zone Car park should be empty	Injury	Injury to occupants during a traffic collision	Moderate	Very Unlikely	Low	

Hazard Identification and Risk Assessment								
Plant Section/Activity		ANSTO Camperdown - Decommissioning - Cyclotron Lift						
Hazard	Scenario	Mitigation	Consequence Type	Consequence	Consequence Score	Likelihood Score	Risk	Action
		<p>Low vehicle speed</p> <p>Traffic management of local street during arrival/departure of equipment</p> <p>Most movement in and out of ANSTO Camperdown to be in quiet hours</p>	Plant Damage	Damage to a member of public vehicle	Moderate	Very Unlikely	Low	
Water	Rainwater in Vault as a result of bad weather during lift	<p>Health physics clearance of vault</p> <p>Trench has a sump water collection sump</p>	Radiation	Spread of Loose contamination in vault	Minor	Unlikely	Low	
		<p>The existing weather plug to be put back in place when access through roof plug is not required</p> <p>No electrical equipment expected to be used while roof plug is removed</p> <p>A separate construction power system will be in use during decommissioning</p>	Injury	Electrocution due to Exposure to non-weatherproof electrical lines	Major	Extremely Unlikely	Low	
Working at height	Fall from the roof height during lift	<p>Use of boom lift and appropriate harnessing.</p> <p>Riggers are trained and experienced in working at height.</p>	Injury	Rigger falls from building height to ground level.	Major	Extremely Unlikely	Low	