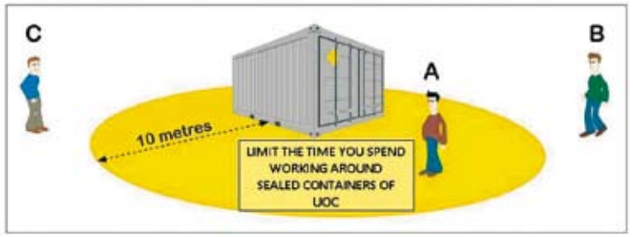
RADIATION PROTECTION, FIRST AID AND SAFETY MEASURES

UOC is harmful only if inhaled or ingested. Provided sensible precautions are taken to avoid inhalation or ingestion, it will not present a health hazard to people handling it. Skin contact should be avoided and personal hygiene is important: wash hands, do not smoke, and minimise exposure to dust.

- Occupational radiation received during the transportation of low level UOC is a factor of the time spent working around the material and the intensity of radiation emitted by the material.
- The total time involved handling or transporting the UOC containers combined with the very low levels of radiation emitted by the UOC itself therefore severely reduces the probability of receiving any hazardous exposure from the material in the normal course of events. Indeed, exposure from this source is well below the regulatory limit for transport workers.
- If appropriate precautions are taken to minimise exposure when handling, transporting or storing UOC materials there will be no risk to health. As UOC has slight chemical toxicity and is weakly radioactive, inhalation and ingestion should be avoided.
- If a spillage of UOC does occur, the main health consideration will be to prevent yourself and others from breathing in any UOC dust. The likelihood of this occurring is low due to the density of the material and the drum packing and stowage methods employed within the packed container. However it makes good practical sense, irrespective of the size of any spillage, to always remember you must wear a dust mask and gloves.
- These safety precautions are similar to the expectations and standards required by handlers of other dangerous goods and hazardous materials.

WHAT ARE THE RISKS TO YOU?

EXPECT NORMAL BACKGROUND RADIATION FROM A SEALED CONTAINER



Precautions

A: Reduce and limit time spent in close proximity.

B: Expect normal background radiation levels.

C: Expect normal background radiation levels.

POTENTIAL FOR INHALATION OR INGESTION OF DUST FROM A DAMAGED OPEN CONTAINER

Precautions

A: Reduce and limit time spent in close proximity.

B: Reduce and limit time spent.
Person downwind of spill should wear a dust mask. Wash hands and clothes.

C: No dust

Useful websites for more information

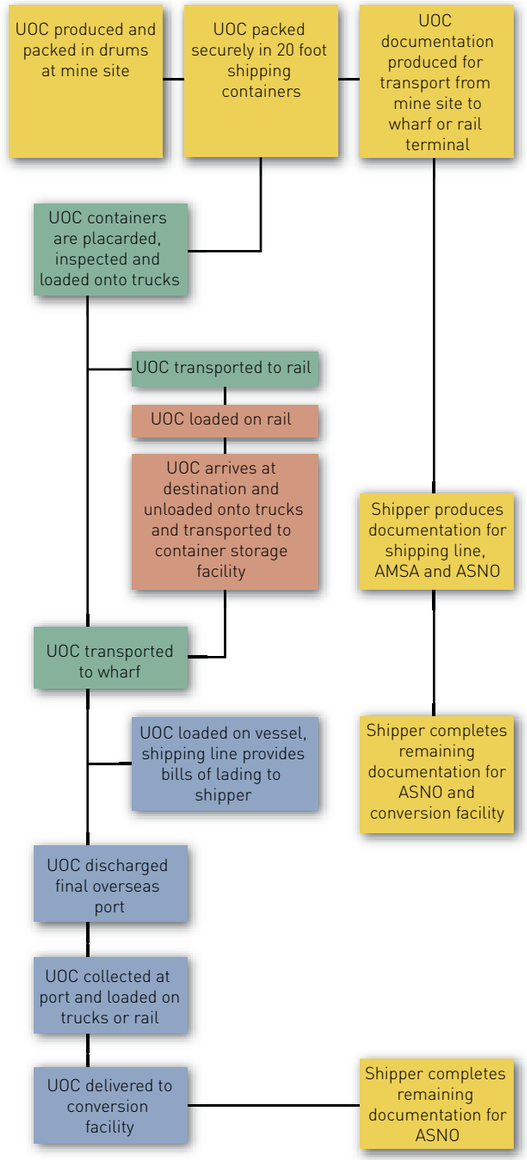
Uranium Industry Framework: www.industry.gov.au/uif (contact to obtain copies of this brochure)

Australia's uranium industry: www.aua.org.au

Safeguards and Non-Proliferation: www.asno.dfat.gov.au

Transport regulations: www-ns.iaea.org/standards/documents/default.asp

TYPICAL UOC LOGISTICS CHAIN



Australian Government
Department of Industry Tourism and Resources

SAFE AND EFFECTIVE TRANSPORT OF URANIUM

Uranium Industry Framework Implementation
Transport Working Group

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URANIUM

Uranium (U) is a naturally occurring, weakly radioactive element which is widely distributed through the earth's crust – in rocks, soils, stream sediments, rivers and oceans. Traces of uranium also occur in foods and the human body.

Uranium contributes to what is termed natural background radiation. It decays over geological time, producing a series of variably radioactive daughter or decay products. During processing of uranium ore, the daughter products are separated out and a weakly radioactive uranium oxide concentrate (UOC or U_3O_8) is produced. Uranium is exported in the form of UOC which is both chemically and physically stable. It cannot undergo a chain reaction as in weapons grade uranium.

USE IN ELECTRICITY GENERATION

Uranium was first used for commercial electricity generation in the 1950s. Currently 15 per cent of the world's electricity is generated from uranium in nuclear reactors. Australia's uranium is used exclusively for peaceful purposes.

NUCLEAR FUEL CYCLE

Uranium ore is mined via underground, open pit or in situ leaching methods. The end product of the mining stage is UOC. This is the form in which uranium is packed, shipped to a conversion facility and sold. Before it can be used in a reactor for electricity generation, it must undergo a series of processes to produce a useable fuel. At the conversion facility UOC is converted into a gas, uranium hexafluoride (UF_6), which enables it to be enriched.

At the enrichment facility UF_6 is enriched from its natural level of 0.7 per cent in the isotope uranium-235 to 3-4 per cent. After enrichment, the UF_6 is converted to uranium dioxide (UO_2) which is formed into fuel pellets. These fuel pellets are placed inside thin metal tubes which are assembled in bundles to become the fuel elements for the core of the nuclear power reactor.

SAFEGUARDS

The International Atomic Energy Agency (IAEA) is the international agency responsible for nuclear safeguards under the Nuclear Non-Proliferation Treaty (NPT) and other agreements. Australian uranium is only supplied to countries with which Australia has a bilateral safeguards agreement, and for non-nuclear weapon states, that have in force an additional protocol for strengthened IAEA safeguards. Australian uranium is used for electricity generation in nuclear power reactors and must be subject to IAEA safeguards in recipient countries.

PACKAGING

UOC is packaged in sealed 205 litre steel drums. Each drum has a tight fitting lid which is secured to the drum by means of a steel locking ring that is clamped by a locking ring bolt. Drums filled with UOC are stowed securely to international standards, within 20 foot International Organization for Standarization (ISO) sea freight containers by means of a webbed Kevlar-based strapping system, commercially known as 'CORDSTRAP'.

This is the preferred packing method and complies with the requirements of the International Maritime Dangerous Goods (IMDG) code and relevant United Nations guidelines for Packing of Cargo Transport Units. This packing method has been formally approved by the Australian Maritime Safety Authority (AMSA).

Packed container showing securing of top row of drums.

The packed containers are placarded, inspected and sealed with consecutively numbered bolt-type seals affixed to the door of each container at the mine site. Containers remain sealed throughout the journey from mine to final overseas point of delivery. Container seals are checked for integrity at all transhipment and discharge points.

The Transport Index (TI) is an indicative measure of the potential gamma radiation level at 1 metre from a shipping container. The following table provides a guide to the length of time a person would need to spend continually standing at a distance of 1 metre from a shipping container of UOC in order to exceed the international worker annual limit of 20 millisieverts (mSv).

Transport Index (TI)	Equivalent hours at 1 metre	Equivalent days at 1 metre
2.0	1000	40
4.5	444	19
6.0	333	14

Source: Values derived using TI as defined in the Code of Practice for the Safe Transport of Radioactive Material, Radiation Protection Series No. 2, Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), 2001

TRANSPORT

UOC is transported worldwide by road, rail and sea. It is classed as a dangerous good under the Australian Dangerous Goods Code (Class 7) and UN number UN2912. The proper shipping name is 'Radioactive Material, Low Specific Activity (LSA-1) Non-Fissile or Fissile - Excepted'. Within Australia, the transportation of UOC by road or rail from mine site to intermodal export facilities is regulated in accordance with Australian Government, state and territory legislation as well as international standards. Sea transport of UOC is regulated according to international standards.

International standards require that each container packed with UOC bear a UN2912 Radioactive Class 7 placard and a Radioactive Category III Yellow placard affixed in a vertical orientation to each side wall and each end wall of the container. Specific documentation, manifesting the load details, is carried in the driver's cabin of each vehicle.

Dangerous Goods placarding on UOC containers.

TRANSPORT PLAN

Each producer/shipper of UOC based in Australia has prepared an individual Transport Plan that specifically focuses on the numerous activities and responsibilities that need to be addressed and covered by all parties and individuals involved in the transportation of UOC containers from their mine site to the applicable export shipping port or terminal.

PERMIT TO TRANSPORT NUCLEAR MATERIAL

In Australia, all parties involved in production, transport, handling or storage of UOC are required to obtain either a 'Permit to Possess Nuclear Material' or a 'Permit to Transport Nuclear Material' from the Australian Safeguards and Non-Proliferation Office (ASNO). These permits detail the responsibilities of the Permit Holder, including security and control of the UOC, maintaining documentation and records for UOC shipments, and notifying ASNO of any changes in conditions or incidents relating to the storage or carriage of UOC.