

HAZARDOUS OBJECTS IN MUSEUMS

Introduction

Museums, particularly military museums, can be very hazardous places to work. Sometimes the hazards associated with objects are obvious. More often than not they are subtle. Hazards can be an inherent part of an object, or they can be a result of previous treatments. The following is a list of some of the hazards/hazardous objects you may come across in a museum. This list is by no mean exhaustive.

Chemical

Toxins

- Poison tipped arrows, spears, Punji sticks.
- Many chemicals found in medical kits. They often have obscure names that belie the nature of the contents.
- Heavy metals – lead, cadmium plating, lead-based paints, uranium, chromium.
- PCB's (Polychlorinated biphenyls) found in some electrical equipment.
- Insecticides – DDT applied to nearly everything from WW2 until early 1970's. Arsenic used as a pesticide in stuffed animals skins. Also it's what gives sandbags and treated pine their green colouring.
- Pyrene and carbon tetrachloride fire extinguishers.

Explosives/flames

- Sometimes these are readily evident, e.g. propellants, primers (the primer alone in a 0.303 round can be strong enough to spit the bullet out of the barrel with some force), detonators, explosive compounds in grenades, bombs, artillery shells, etc.
- Less readily identifiable are some things found in medical kits. Picric acid was once used as an antiseptic. Whilst in solution it is quite safe, but once it dries out and crystallises it becomes very shock sensitive and explosive.
- Nitroglycerin is still prescribed to people with heart conditions. Can be shock sensitive and explosive, especially if it is old.
- Solvents, magnesium, phosphor (tracer) cellulose nitrate are all flammable. The latter two are very difficult to extinguish.
- Solvents and some compounds can also make you feel ill. You may over time build up an intolerance to them, e.g. Nitroglycerin, White spirits, Treflex (a cutting compound) gives some people headaches.

Particulates

- Asbestos, fibreglass, carbon fibre, lead-based paint (when sanded or blasted) sawdust (MDF, Western Red Cedar, Blackbutt are all carcinogens). Polyurethane paint (PUP) is also hazardous when sanded.

Biological

- Moulds and mites love old, dirty paper. The moulds can cause respiratory problems, the mites can cause itching. Also spider bites – (we had one staff member receive a Redback bite in 2007).
- Rusty metal and equipment associated with horses – tetanus. The majority of cases recorded in Australia are people over 60.
- Blood products - desiccated plasma has preservatives that are poisonous when undiluted.

Mechanical

- Sharps – sharp edges speak for themselves, e.g. ragged edges, blades, needles, broken glass.
- Weights – make sure you adequately support things like breech blocks when you dismantle them.
- Springs – are often not immediately visible and may be under compression or tension.
- Tension – cables and springs may be under tension, and can be lethal if released suddenly.
- Fluids and gasses – may be under pressure.
- Split rims – Trucks and many heavy vehicles including tractors use a type of wheel called a split rim. Instead of being in one part, the wheel rim is in two sections. If the tyre is under pressure and the locking strip or nuts are undone the parts of the wheel can fly apart with more than enough force to kill. There is also a significant danger if the tyre is re-inflated from flat.

Electrical

- Capacitors can retain charge for long periods. Degraded insulation – often has flame retardants in them, many of which are toxic, as well as asbestos.

Radioactivity (Ionizing radiation)

- The most common radioactive substance found in military museums is Radium, in the form of “glow in the dark” paint. Common on dials, instruments, compasses from late WW1 until early 70's, but beware – many early WW1 compasses, gun sights etc were refurbished between the wars and could contain radium paint. Visual inspection is not a reliable method of determining if radium based paint is present.
- Radium 226 (most commonly used isotope) has $\frac{1}{2}$ life of about 1600 years, i.e. after 1600 years 1 gram of radium will have decayed so that only 0.5 g of radium is left, along with the decay products, most of which are radioactive and chemically toxic.
- Radium was replaced by Promethium (radioactive) in the 1960's, which in turn was replaced by tritium in the 1970's
- Tritium also may be found. It is very difficult to detect, as the radioactivity is low energy beta, and usually encased. Short half life of about 12 years, so most has decayed by the time it reaches museums.
- Depleted uranium (used as ballast in aircraft, high density component of armour piercing projectiles). Low radioactivity, but a chemically poisonous substance.
- Other radioactive items that may be found in museums are some glazed pottery ceramics (uranium and/or thorium used in the glaze), some coloured glasses or high optical quality glasses (uranium and/or thorium) gas/kerosene lantern mantles (thorium) and geological specimens (Torbernite, Carnotite, Autunite, Uraninite, Monazite, Pitchblende and others). Most household smoke detectors contain radioactive Americium 241. Thorium is also used in some special steels to reduce creep under high temperatures, e.g. jet engine turbine blades and casings.
- **The radioactive decay of the elements mentioned above does not cause adjacent material to become radioactive.** The AWM has a number of artefacts collected from Hiroshima, in the weeks after the atomic bomb was dropped. Only one of these artefacts is radioactive – a glass clock that was radioactive before the bomb & has either uranium used to tint the glass, or radium used for luminous spots on the numerals & hands.
- There are many forms of ionising radiation, but the main three that concern museums are alpha (α) beta (β) and gamma (γ). Alpha particles have low penetrating power and do not travel far. However, they have a large ionising power within a local area of absorption. This means they are not an external health hazard

but should an α particle source be ingested or penetrate the skin, they become a major internal health hazard.

- β particles can travel long distances (up to 8m) but can be stopped by a barrier, generating a small quantity of γ -rays in the process. They are more penetrating than α particles but produce less ionisation per unit distance travelled. While α particles will be stopped by the hard skin layer, β particles can travel a few millimetres into the body.
- γ particles are released from the nucleus when the emission of an α or β particle is insufficient to stabilise the nucleus. These particles can be very penetrating, posing a significant external health hazard. This is the type of radiation that requires lead shielding.
- Radium 226 emits all three kinds of radiation. When radium decays, it becomes Radon 222, a heavy radioactive gas. This in turn decays into Polonium 218 (highly radioactive and toxic), Lead 214 (radioactive & toxic), Bismuth 214 (radioactive), Polonium 214 (highly radioactive and toxic), Lead 210 (radioactive & toxic), Bismuth 210 (radioactive), Polonium 210 (radioactive & toxic), and finally Lead 206 (stable, but toxic).
- Radium encased in intact glass (eg. aircraft instrument, compass) is relatively safe. The danger of it being disturbed and ingested is very low.
- Radium that is not encased is dangerous. Examples are escape compass buttons, the sights on some Japanese firearms, artillery sighting posts, and instruments with broken glass faces. The chances of the paint being disturbed and ingested are much greater. Objects with un-encased radium paint should be double bagged in zip-lock bags and identified as being radioactive.

Light (non-ionizing radiation)

- UV light sources and lasers.