

Working with lead: Health and Safety considerations

The handling of lead finds from metal detecting in general raises only minimal concerns.¹ However, the processing and recording of large quantities of lead bullets could represent a potential risk, and mitigating measures should be taken.² The risks arise from contact with the lead material itself, and particularly from corrosion products, such as lead oxide or carbonate, that may have formed on the objects while in the ground or during storage. The present advice is relevant to those working with material over a few days to a few weeks, rather than more prolonged exposure and to situations where minor cleaning (dusting and light brush work) is undertaken. More information about working with lead is covered by the **Control of Lead at Work Regulations 2002**.³

Risk assessment should be undertaken in advance of carrying out any recording of lead artefacts. The guidance provided here relates primarily to finds recording work. However, given that the number of bullets likely to be collected in a battlefield survey over an extended period may reach the thousands, the issue should be included in the risk assessment for archaeological metal detecting surveys of battlefields. Advice as to the potential health threats from lead should also be given to detectorists who are collecting lead bullets. As most finds provided by metal detectorist to the Portable Antiquities Scheme for recording are returned to those detectorists, and as ownership of artefacts recovered by metal detecting normally remains with the landowner, who may wish to retain the artefacts, after recording the finds should be returned together with clear advice as to the health and safety risks.

Threats and mitigation

Bullets recovered from archaeological contexts typically have highly oxidised surfaces. This lead oxide has often been subject to mechanical damage in the ground, thus the oxide can become mobile, either as dust when the bullets are dry or as a solution when the bullets are wet. Where held in private or even museum collections, especially if the bullets have been stored in bulk without packing or separate bagging, mechanical damage typically occurs and lead oxide dust builds up, often being found loose in the bottom of storage containers, while the bullets themselves have a coating of dust. Particular care must be taken in handling the artefacts when such dust is present in quantity.

¹ The Portable Antiquities Project advises the use of gloves when handling lead objects: see <http://www.finds.org.uk/conservation/note1.php>

² This guidance draws upon work conducted by the author for English Heritage/University of Leeds as part of the Fields of Conflict Project (2005-2008), and incorporates information collated by Jim Williams, English Heritage Archaeological Science Advisor for the East Midlands Region, in particular, advice provided by Neil Craig, HM Principal Inspector of Health and Safety, Northamptonshire and Rutland.

³ <http://www.opsi.gov.uk/si/si2002/20022676.htm>



Figure 125: Lead dust in the boxes where bullets from the Vasa, an early 17th century wreck in Stockholm, have been carefully stored in controlled conditions but not separately bagged, showing the health and safety threat posed by lead oxide dust

The first action should be to minimise the potential for the creation of mobile particles of lead oxide by ensuring that all new finds of bullets are individually bagged in re-sealable bags, lightly perforated, together with plastozote foam, and boxed to minimise mechanical damage to the bullet surface. Ideally all existing collections not already stored in this way should be individually bagged when recording is undertaken.

Absorption

Absorption directly through the skin, and especially via cuts or abrasions, or via the mouth.

Mitigation:

- Good hygiene is essential. The material should be kept within a defined work area, which on completion of the work should be thoroughly cleaned. All surfaces where the bullets have been handled and all other equipment used such as scales, callipers, pens etc should be wiped down carefully afterwards, to remove all lead oxide as dust or in solution.
- Whenever handling or washing bullets, to minimise lead absorption through the hands, chemical resistant gloves should be worn (eg: nitrile powder free disposable gloves).
- Food should not be kept in the same area as the objects are being handled and no smoking, eating or drinking should take place in the area where the work is being undertaken. Hands should always be washed before eating and drinking.
- To prevent contamination of areas outside where the material is being handled, protective gloves, masks, clothing equipment etc should be stored very close to the work area and remain there when the operative leaves the work area.

If large quantities of dust are present:

- To prevent contamination of clothing by lead dusts, individuals should wear disposable coveralls.

Inhalation

Breathing in the dust is a significant threat if large quantities of dust are present. Particles above 15 microns will rapidly settle as dust; those from 15 – 5 microns will remain in the air sufficiently to get into nose and mouth etc, but will be rapidly

expelled with sneezing and transported with mucous; those of 4 microns and below will generally reach the lungs. It has not been established what range of particles are typically present in the lead oxide dust from bullets, but a precautionary approach should be taken.

Mitigation:

- A particulate respirator conforming to a minimum standard of EN149 FFP1 should be used when handling bullets where lead oxide dust is visible, and especially where dealing with large collections of bullets which had been stored in bulk and where quantities of loose dust is present in the storage containers. (The 3M 9322 is an example of a disposable respirator, meeting the higher requirements of EN149:2001, category FFP2, which has been found to be a comfortable item to use in bullet recording work).
- Where large quantities of dust are produced, researchers should carry out this work using a dust extraction system.

If reasonable precautions are taken then ill effects should not occur from working with or handling lead bullets. It is unlikely that people undertaking recording of such artefacts will exceed greater than half of the occupational exposure limit for concentration of lead in the atmosphere of 15 mg/m³ - so medical surveillance in the form of tests of blood-lead concentrations are not required. However as lead progressively accumulates in the body it may be wise if, in exceptional circumstances, someone is working over an extended period with thousands of bullets and where large quantities of oxide dust is present, for them to have periodic blood tests to check that it is not resulting in unacceptable exposure.

Environmental threats

Lead is a classified waste material. Thus in addition to health threat for those working with the artefacts, there could be environmental threats from the processing of large quantities of lead finds. Whereas the washing of the small numbers of bullets normally encountered in metal detecting may not represent a significant environmental threat, the processing in bulk of many hundreds of bullets from a field of conflict may yield significant quantities of lead oxide in solution, while recording of existing collections of bullets may yield a large quantity of lead oxide as dust.

Mitigation:

- The solution or dust should be disposed of responsibly. Large quantities of dust or solution from large quantities of bullets should not be binned, poured down the drain or onto the ground to soak away. Advice should be sought from the relevant environmental health officer about appropriate disposal.