Conservation Procedures on Selected Ceramic and Metal Artifacts Stored in Exploration and Excavation Branch, Karachi: A Note.

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Abstract

Preventive measures and methods to conserve artefacts of iron and terracotta have remarkably improved compared to the past. Every adopted method should have a reversible method also using a more comprehensive range of materials and techniques. Following this methodological approach, this note presents a selection of the conservation treatments applied to metal and ceramic objects stored at the Excavation and Exploration Branch in Karachi before they were moved to the new Museum.

Keywords: *Metal, Ceramic, Archaeological conservation.*

1. Introduction

Frequent monitoring of archaeological findings is crucial for preserving museum or reserve collections. Regular evaluations help identify issues and implement basic rescue measures before any serious damage occurs to valuable artefacts. Since November 2022, a similar activity has been ongoing at the Excavation and Exploration branch in Karachi where several ceramic vessels and metal objects are under controlled monitoring and conserved as per requirements. This note focuses on the conservation measurements applied to selected artefacts such as a small ceramic jar from Mohenjo Daro and a bowl from Al-Mansurah, two brass swords, and scabbards. We devised treatments to ensure the preservation of ceramic and metal objects, also addressing the conservation issues and potential hazards to the archaeological materials. Furthermore, some artefacts are presented as an example in the conservation framework.

The material survey begun at the time of the rehousing of the museum artefacts in December 2022, when a careful preservation of the antiques was required before the objects were placed in the museums display. For that purpose, a survey of the artefacts placed in the Exploration and Excavation Branch Karachi, Sindh, was conducted to select the well-preserved artefacts for display in the newly established museums in Sindh. However, most had yet to receive conservation attention, such as desalination to prevent the salts and other dangerous minerals from reassembling the fragmented artefacts.[1] Moreover, the failing of the adhesive treatments previously used on the vessels prompted a general investigation of the

[1] In archaeological areas characterized by the presence of saline water, desalination is an important practice to prevent damages on ancient artefacts.

ceramic collection and unstable vessels. It was observed that several vessels had unstable powdery surfaces caused by the humidity and salts absorbed before the excavation. This together with the dirt, dust, and abrasion can determine the damage of artifacts.

In the Exploration and Excavation branch in Karachi, the artefact collection comprises the material excavated from the sites throughout Pakistan after independence (Mughal 2011). The ceramics are part of the reserve collection housed in the Branch. This Branch is maintained by the Culture Tourism, Antiquities & Archives Department Government of Sindh's personnel. This storage collection is not open to the public but will soon be moved to newly established museums across Sindh.

2. General Considerations

We should start by making some general considerations on how archaeological artifacts should be stored and handle and on how ideal storage rooms should be organised. Indeed, there are several identified issues with the storage areas and museums in Pakistan regarding, for instance, the designs of museum buildings and other archaeological complexes, handling the artefacts, and proper care, etc.

Artefact storage area

The artefacts' storage areas should be designed per the requirements to store the artefacts only. The storage area should not be an open building space with wooden windows and doors. Rather, the windows must be airtight. In open space, artefacts are exposed to dirt, dust and humidity, which can damage the ceramics and other archaeological artefacts stored.

Even in in-door storage areas, the wooden shelves must be lined with polyethene plastic sheeting to provide a clean, motionless surface to place objects. This would prevent contact with wooden shanty shelving and organic acid vapour emanating from wood, which can cause problems in ceramic objects with residual salts from burial (Griffin et al. 1993). Plastic sheets hanging from the tops of the shelf units while covering the front to protect the artefacts from the dust would also provide an easy access. Also, the back of the shelves should be isolated from the walls (in the case of wall-mounted shelves) with plastic sheets to prevent the moisture and salts in the walls from contacting the objects. Furthermore, the archaeological artifacts require continuous preventive conservation.

Conservation of ceramic vessels

Soaking sherds directly in water to remove the dirt and soil on pottery is considered the first step in non-invasive cleaning processes. Often the pottery is treated at the site while excavating, and the first washing is practised using fresh river water and (very rarely) distilled water. The conservation, instead, usually starts when the material reaches the laboratory. After washing, pottery should be dried in the shade and packed only when thoroughly dried to avoid mould growth. Softer brushes should be used to remove the loose soil and dirt over the surfaces of the pottery sherds. Stiff brushes can be quite abrasive to rub and wipe slips and should be avoided on the painted pottery. However, at many sites ceramics are encrusted with hard, calcareous deposits (phosphates, sulphates, or carbonates) and fossilized sand, which are sometimes only possible to remove with certain chemical cleaners.

In such specific situations, many archaeologists suggest cleaning the pottery at the site, using baths of hydrochloric acid (HCl) diluted in water. However, Jane Blame writes that HCl is not preferred use in the field, first and foremost for the safety of the field. Secondly, because HCl destroys certain information and negatively affects subsequent laboratory analysis by chemically altering slips (with possibly calcium-based minerals added by the potter) and by dissolving calcium-based tempering materials and natural inclusions that are important for identifying the clay source. Thirdly, such strong acid baths have harmful, long-term effects on the ceramic fabric once in museum storage. HCl can turn the pottery to a powdery surface, even on well-fired ceramics (Blame & Paterson 2009).

3. Conservation Procedures on Selected Ceramics

The ceramic fragments were first surveyed to determine the stability level and other damaging elements which affect them. As a first step, drawings of sherds were made to know the dimensions and other measurements, such as rim and base radius and thickness, and to understand the shape of a vessel; these shapes were drawn from the base and rim fragments. A photographic documentation of the entire process (from the collection of the sherds from the shelf; to the conservation process was also undertaken.

Materials used for desalination are: Distilled water, Plastic basins, Trays, Document cards, Muslin cloth.

Materials used for adhesive consolidation: Acetone, B72 Paraloid, Cab-o-Sil fumed silica, UHU glue, Muslin Cloth & cotton wool, Plaster of Pairs, Basins, Sand for supporting.

Desalination

One of the most time-consuming, technically laborious treatments is the desalination of the ceramic contaminated with the salts while buried[2] (Koob and Ng 2000). However, comprehending the origin and the identification of the salts

[2] Pottery can absorb various chemical compounds during manufacture and burial.

in ceramics is a subject of careful study involving chemistry and thoroughly scientific laboratory-based tasks. Although these practices have yet to be applied in our area of concern, this report introduces the simple traditional methods to reduce the salts from the essential vessels.

Procedure
Firstly, we set up the washing desalination station where we housed the basins for desalination. Vessel fragments or groups were soaked together, and several precautions were taken, such as placing together pieces from a single vessel, using waterproof labels and set fragments in individual plastic basins to avoid any danger of ceramic bumping into each other.

Fig. 1 - Vessel fragments soaking in the plastic basin.

Treatment
Desalination involved using soft brushes to wash away dirt and debris from the vessels before soaking the fragments. One vessel was observed with a little friable surface on some spots, and those specific spots were consolidated with a dilute concentration of B-72 in acetone 5% by weight carefully applied with soft brushes on those spots. Furthermore, the vessels had falling joints, and we had to disassemble and reconstruct them.

Preparation for the reassembly
The failed joints were softened and disassembled through two methods: first, with the cotton poultices wetted with acetone and, second, with the airtight enclosure. The latter method involves wrapping a polyethylene plastic sheet around the bin, placing acetone inside the container, and sealing it tightly. This slows the solvent evaporation process compared to the first method (Figure 4). After fragments had been separated, acetone was applied on the edges of those joined with B-72 to dilute the adhesive and thereby consolidate the edges. When other adhesive had been used, it was removed with solvent, and the edges were consolidated with a dilute solution of B-72 (5 to 10% by weight). Consolidation was done to strengthen the edges and to ensure the newly applied adhesive would remain in the joints and in the cracks of the joints thoroughly.

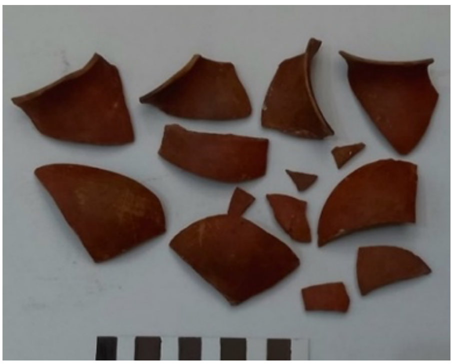
Reassembly
Fragments were joined using adhesive, the dilute concentration of B-72 50% (by weight) in acetone with Cab-o-Sil fumed silica. This solution produced stable glue to be applied easily with a very small and soft brush. The joint edges were first covered with a thin layer of B-72 solution. Fragments were temporarily joined, pulled apart to facilitate evaporation of access acetone and then rejoined (Griffin at el. 1993).[3]

Structural filling/reinforcement
Some fragments were unstable from joints due to eroded edges or losses. However, losses were filled with pigmented Paris plaster when structural support and aesthetic integration were required. Break edges were thoroughly consolidated with B-72 before filling. Further, the finished fills were toned with acrylic emulsion paints.

Two results of this process are illustrated below (Figs. 2-7):

[3] Harappa Conservation Laboratory Pakistan.

Fig. 2 – Mohenjo Daro small jar. Re-assembling or adhering the joints, procedure.



Before

After

Fig. 3 - Photos before and after conservation.

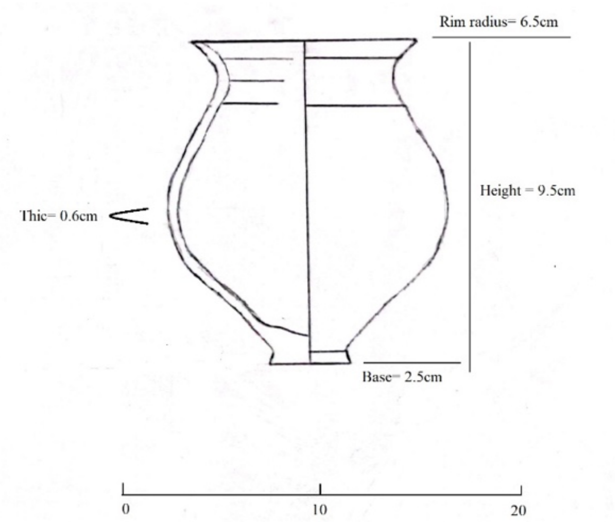


Fig. 4 - Complete profile the vessel (Drawing by Mehar Ali).

Another vessel was found with failed joints, and previously applied adhesive has also observed as brutally effecting the vessel. This vessel is a medieval period bowl of Al-Mansurah/Brahmanabad site (see Fig. 5).

Fragments of the bowl

Marking to the fragments on joints

Fig. 5 - Al-Mansurah bowl, medieval period/Brahmanabad. Preparing for the reassembly, started from the marking on joints before applying adhesive.

Fig. 6 a (above) b (below) - After conservation treatment.

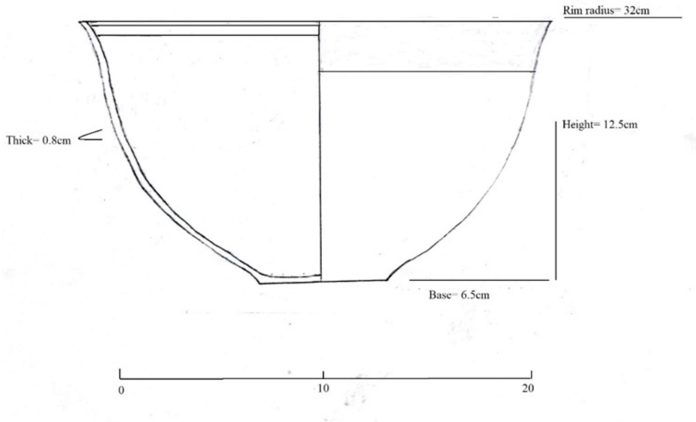


Fig. 7 - Complete profile of the bowl (Drawing by Mehar Ali)

4. Metal conservation

Conservation of any archaeological metal object is a careful treatment demanding scientific considerations before cleaning starts (Scott et al. 1991). In the case of ancient objects, cleaning means to stabilize the ancient object. Furthermore, almost without exception, the metal objects placed in the storage areas are in the process of deterioration.[4] There are two conditions which affect the metal objects. Firstly, the deterioration is due to the minerals found in the earth, where objects have been buried for different periods. Secondly, this deterioration process is due to the air and moisture in the storage areas (Warren 1993).

The traditional method to clean the artefacts also includes using lemon juice as it contains natural acids, which also effectively work on grime. Moreover, because of its antibacterial properties, lemon is also a disinfectant. This method is easily accessed and can also be used on an emergency basis. However, the direct use of lemon has been replaced with several updated ways.

Material used in conservation of metals: Distilled water, Acetone, Lemon, Baking soda, Triton X-100, Toothbrushes & bristle brushes, Sponge, Microfiber cloth.

Cleaning

There are several methods of cleaning ancient metal artifacts, such as the electrolytic process, but the most effective way is zinc and caustic soda treatment. This process also works on the encrustation or hard and thick layer on the surface of metals built up over a long period of time when the metal has been buried and contaminated in the soils and other minerals. This method was applied to some of the objects of the collection to remove the encrustation, and the process took five days. After this process, the layer of red oxide left by this zinc and caustic soda was noticed and then it was quickly removed through frequent washings with water. Another method of chemical cleaning of metal objects consists in the use of distilled water, Ethanol, and Acetone applied with a soft brush and stiff brush to remove the dirt, rust, and consolidated dust on the object's surface.

A shield, brass-made sword, and Scabbard

A late-historic period shield was received in December 2022 for the conservation treatment to prevent corrosion. The chemical cleaning removed the rust, dirt, and dust over the shield’s surface. Resorting the shield to its original form was very important because it contains calligraphic designs, and other decorative symbols which were covered and distorted due to the encrustation of the hydrated iron oxide and iron oxide-hydroxide (see Fig. 8).

A brass-made sword and a sheath were received for the conservation treatment; the sword's handle and scabbard were dirty and encrusted with oily dirt, dust, and corrosion. Firstly, the condition was analysed and documented before treatment. However, the sword's blade was in good condition and well-preserved due to being inside the scabbard. The chemical treatment was done to clean the surface and to make visible the decoration over the sheath and handle of the sword.

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[4] Dust, dirt contaminated with humidity, and other environmental factors badly turn artefacts to damage, such as copper disease.

The cleaning process started after careful analysis and documentation of the condition of the artefacts.

Solvents and chemicals were used to clean the artefacts. Soap and water are the most effective and conservation-approved methods. The 3% solution of plain triton X-100 in deionised distilled water was made. After applying the soap solution, the rinsing was employed with distilled water. Further, 10% Calgon solution in distilled water was used to remove hard and stable deposits on the handle and scabbard. Lemon treatment also removed grime and dirt inside the carved design lines. Fresh lemon juice was obtained and squeezed onto the surface with a sponge and then rubbed with toothbrushes, bristle brushes and sponge; this procedure was continuously used until the dirt was removed entirely (see Figs. 8-9).

Fig. 8 - Photo showing before and after treatment.

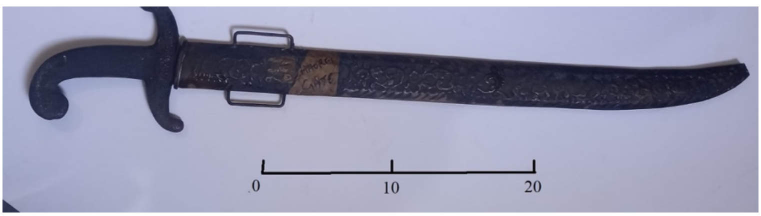

Figure 9: Before conservation treatment

Fig. 10 - After conservation treatment.

5. Conclusions

Conservation and preservation start when artefacts are excavated from the sites. Following the removal of artefacts from the soils, it is essential to address the issues of stability and to identify the potential hazards and conservation issues of the objects. Responsibility of monitoring the artefacts starts from the very first step and periodically continues in the laboratory, storage and on displays in the museums. Moreover, conservation issues may arise over time in storage areas or while on display. Thus, it is crucial to diligently monitoring the artifacts. Regular monitoring enables the identification of potential problems, allowing the conservator to address and resolve any issues promptly.

This note describes the methods of conservation being under practice for a long in the archaeological preservation of artefacts. Despite the more advanced and updated equipment and laboratory spaces, the traditional techniques in this note are safe, effective and sustainable.

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