The Kenchreai Glass Panels: Selection of Packing Materials

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Abstract
The opus sectile glass panels found in Kenchreai, the Eastern port of Corinth, Greece, were re-housed in the framework of an EU funded project in 2005-2006. Upgrading storage conditions for the Kenchreai glass panels necessitated the replacement of previous backing and packing materials. The commonly used materials for storage and mounting of glass artefacts are low-density polyethylene foam and acid free tissue. The surviving pieces of the glass panels varied from nearly complete panels and fragments of panels to separate pictorial scenes and a number of loose and broken glass pieces. The choice of materials was based on the size and the condition of the surviving panels, the available space and accessibility for further study.

Introduction
The Kenchreai glass panels, dating from the fourth century C.E., are considered one of the most important glass finds, due to the fact that they were an undisturbed group composed of a significant number of architectural glass panels (in total eighty-seven panels) that, besides aesthetic considerations, reveal remarkable evidence for the glass technology of the era (Ibrahim et al. 1976).

The panels have suffered continuous deterioration during the past thirty years due to insufficient conservation treatment and an uncontrolled storage environment (Koob et al. 1996, Moraitou 1999, Moraitou et al. 2002). In 2005-2006 in the framework of the EU funded project of the Directorate of Conservation of Ancient and Modern Monuments, Hellenic Ministry of Culture, titled ‘Preventive conservation of Kenchreai opus sectile panels and development of working conditions’ the panels were placed in specially designed drawers in a climatically controlled walk-in chamber in the Isthmia Archaeological Museum (to be published elsewhere).

In re-housing the panels the choice of new packing materials was important and constituted an essential part of the completion of the project (Figure 1).
Proper storage of objects is a decisive factor for an effective preventive program, in order to achieve their long-term protection and preservation. Although general guidelines for packing and storage can be found in relevant publications (Newton and Davison 1989, Guillemard 1990, Bradley 1995, Sease 1995, Kilby 1995, Navarro 1999, Watkinson and Neal 2001, NPS 2001) every object is unique and has its own special requirements. In order to accomplish an effective packing system, an accurate assessment of an object’s condition, specific needs as well as an estimation of managerial requirements during storage is essential.

Nature and Condition of the Glass Panels

Recovery and treatment details for the glass panels (on-site and post excavation) have been published elsewhere (Ibrahim et al. 1976, Newton and Davison 1989, Brill et al. 2002) while in 1995 a condition assessment of the finds was carried out (Koob et al. 1996). From 1996 onwards the Directorate of Conservation of Ancient and Modern Monuments of the Hellenic Ministry of Culture has ranked in its first priorities the preventive conservation of the panels (Moraitou 1999, Moraitou 2002, Moraitou et al. 2002).

The Kenchreai glass panels are composed of coloured flat glass pieces in juxtaposition, embedded in a rosin-marble dust mortar and backed by ceramic tiles or fragments. The panels were discovered in pairs, placed face to face, inside their wooden crates. Corrosion of the glass during burial has caused irreversible bonding of the two surfaces, therefore retrieval of the panels was carried out in pairs facing each other, and what we see today at best is the back side of panels. In most cases removal of the original support and backing with cotton gauze using polyvinyl acetate resin had been undertaken. This practice has resulted in a considerable reduction of the total width down to the thickness of the two original glass pieces (one on each side) – approximately 12 mm.

In the museum’s storeroom the panels had been placed on shallow trays made of wood and wood by-products (fibreboard) in a metal-framed unit. Wooden boards were used as shelves to support the trays on the metal structure. In addition, separate pictorial scenes and loose glass pieces were stored inside cardboard boxes and plastic jars.
Examination revealed that drawing pins were used to secure the gauze onto the trays and that smaller fragments were backed with paper. Although the original support had been removed from most of the panels and sections, there were also some thicker fragments preserving their original backing. Newspaper and tissue paper had been employed as supplementary packing materials. The labelling of the panels and fragments was at a satisfactory level but the labels were of low quality paper and cardboard.

The basic material of the panels — glass — was in the majority of the pieces further deteriorated and chemically unstable compared to the condition at the time of retrieval. According to previous assessments and analytical work the condition of the glass varied from durable to totally pulverized, the average example exhibiting an intermediate degree of alteration (Koob et al. 1996, Moraitou 1999, Moraitou et al. 2000).

Furthermore, the surviving panels could be classified according to size into four general categories: 1) nearly complete panels larger than 1.5 metres in length (maximum dimensions measured 1.83 \times 0.92 m); 2) incomplete panels equal to or smaller than 1.5 metres in length; 3) fragments of panels (smaller than 0.6 m) and separate pictorial scenes; 4) broken loose glass pieces (average length 2.0 cm) and small fragments with the original support preserved. The majority of the panels, however, were preserved in large sections (average length 1- 1.5 m) exhibiting though a relatively small weight.

Although removal of the original support had diminished the thickness of the majority of the panels, uncontrolled storage environment and consequent climate fluctuations, in combination with insufficient support had caused advanced warping of the fibreboard trays resulting in undulation and planar distortion of the panels housed in them. Therefore, some of the panels presented a variable total height according to the degree of planar distortion.

Special Storage Requirements

As the new storage chamber was designed to provide complete environmental control (temperature, humidity, light, dust and pollutants) and the aim of the project was also to develop appropriate working conditions inside the new storeroom, minimum use of packing materials for storing the glass panels inside the new drawers system was preferable. Although the packing system was designed for storage, the requirements were closer to that of an exhibition, by aiming at sufficient physical protection while simultaneously facilitating straightforward examination and handling of glass pieces.

The storage space and drawers were already designed and commissioned. Due to the limited room space and the need to house such a large number of glass panels each new chest of drawers was ordered with a drawer height of 65 mm.

Assessment of Packing Materials

Since the majority of the panels have a large surface area and a small thickness, combined with reduced strength due to the lack of original support and corrosion of glass, the packing material had to function mainly as a backing material. Furthermore, the backing material had to be of a specific thickness (2.0 cm thick) taking into account the free air circulation needed for effective environmental control, the variable height of some panels and the fixed size of the drawers.
The material, apart from availability in the required dimensions, also had to be chemically inert with proven long-term stability, adequately rigid to support even the largest panels with limited bending, medium to light in weight for easy handling, and easily cut and shaped.

A particular difficulty was encountered in the choice of backing material suitable to support the largest glass panels preserved (group 1) due to the fact that boards are not always commercially available larger than 1.5 m long and, even if they are, the specific thickness demanded further limited the choice because of insufficient rigidity. Rigidity of a material for a given thickness and density is usually reduced as the dimensions of the board increases.

In addition, the abundance of broken glass pieces and separate pictorial scenes necessitated different packing materials with reduced hardness and smooth texture, as in the case of common fragile fragments of glass vessels.

At the same time, re-housing of the panels and replacement of the existing backing materials demanded a plan for their removal from the old trays. In order to achieve a smooth removal, the thought was to insert a very thin, relatively stiff and manageable sheet to act as a stretcher between the gauze support and the tray. However, apart from the drawing pins it was unknown whether any other material had been used to secure the cotton gauze support of the panels onto the trays and excess consolidant, occasionally detected, was a concern. For reasons of safety additional examination of the panels and a few tests were carried out prior to the final choice of the method.

Final Selection of Materials

The recommended packing materials that are currently considered safe can be classified according to their chemical compositions as cellulose (archival-quality tissue and cardboard), polyethylene, polystyrene, polypropylene, acrylic copolymers, inert polyester (polyethylene terephthalate) and polycarbonates (Guillemard 1990, Tétreault 1992, Kilby 1995, NPS 2001, Pasiuk 2004). Typical boards employed for the support of flat objects like corrugated boards, archival quality cardboards etc. are not characterised by high rigidity and good resistance to distortion. On the other hand archival quality panels are usually provided buffered, with an alkaline reserve and thus are not recommended for the storage of archaeological finds (Kilby 1995), while transparent acrylic sheets are known to create static electricity.

In recent years, honeycomb core panels (used in the aircraft industry) have been used for the support of large and/or heavy finds (mosaics, wall painting etc.). These panels, based on a sandwich structure, combine relative lightness with extreme rigidity and strength. They are typically made of a reinforced resin or an aluminium skin and a honeycomb aluminium core.

Among appropriate packing materials, polyethylene foam is commonly used for the cushioning and support of archaeological finds during storage, shipping and exhibition. Polyethylene foam is considered as the most stable packing material for conservation and museum applications, particularly the nitrogen-expanded type (Plastazote®), as it is regarded to be pure and chemically inert, with excellent physical properties. The most widespread type used for permanent storage is the low density Plastazote LD 45®. However this is only one type of the wide range of Plastazote® foams available in sheet form. Plastazote® is available in different grades (denoting a range of densities in Kg/m³), colours and thickness and standard products nomenclature as given by Zotefoams plc is: LD (low density), HD (high density), HL (blended high and low density), etc.
The Kenchreai Glass Panels: Selection of Packing Materials

In order to encounter the rigidity requirements (high stiffness and low creep), a high-density (HD) grade of Plastazote® was chosen (based on personal communication with Zotefoams plc and Zotefoams plc Product Guide). However as it was not available for purchase in the required thickness (1.0 and 2.0 cm), a blended high and low density (HL) grade was also selected. A honeycomb aluminium board with reinforced epoxy resin skin was selected as a backing material for the exceptionally large panels. The products selected were:

- Plastazote HD 80® in black (2.0 cm thick)
- Plastazote HL 47® in black (1.0 cm thick)
- Plastazote LD 45® in black (3.0 cm, 1.2 cm and 0.5 cm thick)
- AXSON Cellite® fibre panel, reinforced epoxy skin with honeycomb aluminium core (1.39 cm thick).

For transferring the panels onto the new support a thick archival-quality transparent polyester sheet Polymex® (polyethylene terephthalate PET), in thickness of 125 µm and the antistatic type in thickness of 175 µm, especially for panels exhibiting pulverisation, were chosen. As polyester sheet is widely used for artefacts encapsulation, it was decided to leave it in situ, under the panels, in order to act as a barrier layer to facilitate future handling.

Additional packing materials selected were: acid free tissue (non-buffered, 18 gr/m²), for cushioning fragments with original support, archival quality double faced adhesive tape (3M™ Double Coated Tape 415 Clear) for securing the panels on their new support (by holding the different layers together – backing sheet, separating layer and glass panel with cotton gauze) and envelopes of archival quality transparent polyester (75 µm thick) for the encapsulation of old labels made of inappropriate quality of paper and cardboard.

Finally, prior to the purchase of the materials, estimation of the required quantities was carried out along with the establishment of guidelines for storage techniques according to size categories of the surviving pieces.

Conclusion

Upgrading of storage conditions for the Kenchreai glass opus sectile panels offered an excellent opportunity for exploring suitable packing materials for excavated architectural flat glass. Due to the variable size and condition of the surviving pieces four different packing materials in sheet form, mainly to function as a support, were chosen along with complementary packing materials. The selection of available products through evaluation of their properties in association with storage demands has resulted in a satisfactory agreement between diverse objectives, physical protection of the artefacts, access and handling requirements.

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Materials

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www.axson.com

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