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Collection Care

Environmental Monitoring,
Risk Assessment
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Storage, Moving and Re-storage of Municipal Oporto Collections



Maria Aguiar, Inês Ferreira, Mariana Teixeira, Carolina Barata, and Ana Cabral

Abstract Within a wider collections management programme conducted by the *Divisão Municipal de Museus* (DMM) from Oporto City Hall, a collaboration has been started with the Portuguese Catholic University (UCP) for reorganisation of the municipal storage facilities and to set up the process of transferring collections to permanent housing in a refurbished building. The main goals of the project are to prepare the collections to be transferred, organise two temporary storages, establish procedures for moving the collections between temporary and permanent spaces, organise the final storage space and support the setup of guidelines for preventive conservation. In parallel, several training actions in the field of preventive conservation have been organised, to provide updated knowledge to the entire team of the DMM and to standardise the procedures to be implemented. Interconnections created during the project enabled us to capitalise personal skills and empower the DMM team with competences to lead autonomous work. The three-year project started in January of 2020, only 2 months before the pandemic outbreak in Portugal, and required permanent adjustments to adapt to this unexpected context. The work was done in close articulation with the conservation team of the Museum of the City and also with the register and inventory staff.

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1 Introduction

Until 2016, Oporto City Hall had a central storage space in a building belonging to a palace that was then sold. Since then, assets were transferred twice to provisional warehouses while Oporto City Hall searched for alternatives to keep its collections on a long-term basis with adequate conditions for conservation, access and study.

The choice for the permanent storage facility fell upon a pre-existing building that had been constructed to provide social and educational support for young people in the city, but which was abandoned a decade ago. The building, called—*Abrigo dos Pequeninos*—went through an architectural project that devised seven technical storage spaces for ceramics, textiles, paintings, metals, furniture, paper and diverse objects. It also considered a conservation laboratory, a quarantine room, a photographic studio, a research/study room, with documentation and staff rooms.

The construction works began in September 2021 and the conclusion of the renovation was estimated for early 2023.

2 Characterization of Collections and Storage Spaces

Municipal collections in storage come from the *Museum of the City* (<https://museudacidadeporto.pt/>) that comprehends, among other spaces, the *Casa Marta Ortigão Sampaio*, the *Extensão do Romantismo*, the *Extensão do Douro* and *Atelier António Carneiro*. Items in storage also include collections related to the poet Eugénio de Andrade, to the painter and collector, Vitorino Ribeiro, to the Measurement Gauging Center and to the *Casa de São Roque*. Other collections come through donations, in small or large scale and do not have a specific attributed location.

Typologies are quite diverse, ranging from textiles, costume accessories, furniture, easel paintings, books, drawings, prints, paper, photographs, clichés, photographic equipment, zinc etchings, basketry, ceramic, pottery, tiles, chandeliers, plaster sculptures, gilded and polychrome wooden sculptures, objects in alabaster, silver, glass, metal, ivory, and leather.

In 2018, such collections were moved to a temporary warehouse with no conditions for permanent housing and the great majority remained packed and not easily accessed. Adding to that, the documentation system was incomplete, in line to what ICCROM and UNESCO international survey in 2011 showed—1 in 4 museums had the same problem (ICCROM and UNESCO 2011).

Regarding other storage facilities apart from this central warehouse, the Museum of the City possess smaller spaces within (some) museums to keep their assets out of the exhibition spaces. However, these small rooms are already full and do not provide extra space for preparation of collections, for condition survey, etc. While waiting for the renovation of the *Abrigo dos Pequeninos* for permanent storage, the DMM had already foreseen the use of another space that could temporarily house

some of the items before proceeding to the permanent space, thus allowing for a better management of both spaces and their collections.

3 Set the Plan While Dealing with Pandemic Constraints

Based on the RE-ORG method developed by ICCROM, UNESCO and CCI (ICCROM et al. 2018) an action plan was devised concerning the (re)-organization of both temporary storages. The other goals related to the preparation of collections for transport and transference to the *Abrigo dos Pequeninos* and the setup of preventive conservation guidelines required other approaches also due the timelapse of the project.

At the start of the project, staff at the main warehouse consisted of three people and just on the day before Oporto city lockdown, the two first conservator-restorers hired by the DMM began their functions. They did not have time to meet the colleagues that they would go on to work with.

After two months, the common goal that united the entire team around the project was affected by the worldwide pandemic that forced everyone to stop. The doubt lay not in the purpose that was outlined, but in the way we were all going to deal with the new situation that we had never experienced, as we did not know the contours, or how long it would last. The works that had been started had to be interrupted as they were all taking place in the storage spaces and access was prohibited to all staff.

In this first phase, all staff went home, museums were closed to the public and all those who worked in front office functions were exempt from these services, and had to be assigned to other functions. So, contrary to what is the most common scenario, there was a greater availability of human resources for the museum area, which is much more used to dealing with the opposite situation: the lack of people.

Priority was to choose the actions that could be carried out at home and to verify which resources were needed to carry them out. The need for computers was great, not only for the DMM, but for all municipal departments, as they were all going through the same difficulties, so it was necessary to carefully select their distribution. One of the uses in which they had priority was to update the inventory, with several people being responsible for updating the online database, Inarte® (https://sistem.asfuturo.pt/index_en.html) and for checking aspects that would be important for the development of the project, such as listing which items had or did not have a photographic record. This type of information would serve to know how many items were left to be photographed and what resources and time were needed to do so.

Simultaneously with the selection of actions that could be carried out at home and considering that there was a greater number of people available within the DMM, a survey was carried out about personal skills that could serve the interests of the project. People with competences in design, languages or sewing were found, which proved to be very useful.

This was the moment to take advantage and review preventive conservation procedures, calling on all the spaces of the Museum of the City to collaborate. The greater

availability of people to respond to these requests was possible because they were not busy with the daily commitments required by their functions in museums. It was possible to put together an important source of information that served as a basis, for example, for the new team of conservators-restorers that had just arrived, to plan training actions that responded directly to the needs felt by the people who dealt with the collections on a daily basis. On the other hand, the training actions were designed to meet the project's needs, providing people with the appropriate skills to develop the planned actions.

The various surveys that were carried out allowed us to verify which procedures were in use regarding preventive conservation activities and compare them with other practices, with the aim of standardising and defining those that would be the guidelines to adopt. For this work, it was possible to count on a larger work team that was also responsible for the literature review on each topic, the translation of publications (when necessary), as well as discussion and review of the final texts.

No one knew how long the pandemic would last. At the outset, everyone went home and only much later did people go to the sites, on a rotating basis and always with a reduced number of people, while the first phase of deconfinement was in force. At this stage, the work was programmed in such a way that people who had to deal with a certain collection would do so out of phase with each other or the various actions would be distributed among several people. Working documents (such as spreadsheets) were created with all the information considered relevant about the various collections, which were shared by everyone involved, with a person responsible for reviewing and updating them. A colour code was created that allowed the marking of situations related to the actions in progress, tasks to be carried out, completed, etc. and which facilitated the progress assessment for each collection. At this time, it was decided to hold hybrid meetings, in which some people participated by videoconference, while a small group was at the storage site. The system proved to be very useful to engage all the team in the work and to guarantee their safety.

At this stage, when it became possible to go to the storage spaces, albeit rotating, it was also possible to survey the storage structures present in the main warehouse and to measure, number and mark them. This preparatory work was very important for taking decisions about whether the existing furniture storage capacity was sufficient for the needs, whether it was adequate or whether more needed to be purchased. On the other hand, its marking allowed the location of the structures to be more easily found in the floor plans that were produced by the team member who revealed herself to have skills in design and digital tools.

With the reopening of public spaces, the teams were demobilised, as there was a need for frequent rotation of the team members, which required enormous flexibility in planning and setting goals.

4 Plan in Progress

Concerning the reorganisation of the main warehouse, its state was documented and the major threats affecting collections were identified (NPS 2005) as being related to building and space conditions (poor protection against light and weather extremes, occasional water infiltrations, no access or possibility to move objects, no circulation areas, large areas occupied by non-collection items and lack of storage space), collections (poor object documentation, no identification of furniture storage units, uncertainty of object location, pest evidence) and to furniture storage (the majority of collection laid down directly on the floor, insufficient and inadequate storage units and absence of padding or packing systems) (Fig. 1).

Regarding the second temporary space, it provided an additional 400 m² storage area and is located 6 km from the main warehouse. At the start of the project, the building was empty and needed to be prepared to serve the intended purpose. After assessing its conditions, improvements were made to block daylight sources, to avoid environmental fluctuations through the construction of a more impervious entrance area, to increase security systems by installing intruder and smoke detectors and requesting daily police surveillance, to control pests by an integrated pest management plan and to allocate permanent staff to carry out storage-related activities.



Fig. 1 View of part of the main warehouse before its reorganization

With this second storage in preparation, the action plan could finally take place and some of the threats posed to collections housed in the main warehouse could be addressed.

Priorities were set to deal with the most immediate threats, such as pest contamination and poor access to the collections. The physical reorganisation of the main warehouse could only take place after releasing areas to allow us to unpack and assess the collections. A layout for the main warehouse was defined, which included storage spaces, proper circulation corridors, work areas for the inventory, labelling, marking, photography, packaging/unpacking processes, quarantine and anoxia area, storage of equipment and materials (Elkin 2019) (Canadian Conservation Institute). Within this reorganisation, objects that did not belong to the Museum of the City were returned to their owners and display cases, while exhibition equipment and other non-collection items were also removed.

The art historian, inventory and conservation staff of Museum of the City selected the items that should be transferred to the new temporary storage site, based on the following criteria: quality, materials, fragility or condition state. This selection was essential to help calculate the areas needed to accommodate the works, to predict which were the most adequate storage structures, as well as to make a more rational management of the space. A principle underlying this selection was not to occupy the entire new temporary storage site with this first selection of items, as it was necessary to guarantee free space for the rest of the reorganisation process of the main warehouse.

5 Anoxia

The detection of pest infestation required treatment and the risk of contamination had to be contained, thus the DMM asked for support to the Divisão Municipal de Arquivo Histórico (DMAH) to use its anoxia chamber. However, the dimensions of the chamber only allowed small and medium objects to be treated as it was constructed for library and archive assets. Besides that, availability had to be shared among DMAH campaigns timetables. As it was planned to install an anoxia chamber at *Abrigo dos Pequeninos*, its acquisition was anticipated to allow the treatment of the contaminated objects. The acquisition of a detachable and portable anoxia structure was considered, instead of the rigid and compact structure initially foreseen, to allow its future dismantling and re-installing at the permanent storage. The chamber was designed to fit large objects, measuring 2,70 m height by 2,50 m width and depth. From March of 2020 to November of 2021, 297 objects were treated and in the last campaign it was possible to provide the service to other municipal departments that suffer from the same problem.

The conservation team working at the main warehouse received training to operate the chamber and to produce anoxia bubbles, in order to work autonomously. The methodology to identify, isolate, and monitor infestations was defined, as also the

cleaning and documentation procedures. Based on the training received, the in-house conservation team produced an illustrated operating manual (DMM 2021a).

The decontamination process allowed the safe transference of furniture and other objects to the temporary storage, which between November of 2020 and October of 2021, received more than 3.700 items of furniture, textiles, costume accessories, tapestries, gilded and polychrome wooden objects, zinc engravings, chandeliers, and oil paintings on paper and copper.

6 Reorganization of Storages and Assessment of Collections

After releasing the main warehouse from part of its contents, it was possible to start its physical reorganization. Storage areas were devised taking into account space rationalization, the necessity of wide passages for circulation of people and objects and the avoidance of daylight entrances in the roof (IMC 2007) (Fig. 2). Floor plans occupied by furniture storage were drawn in both storage spaces.

During the process, it was necessary to calculate areas provided by the different typologies of furniture as to evaluate if there were enough storage surfaces for the collections and also, to decide how these typologies will fit in the space to accommodate all the items properly. This allowed to consider the possibility of re-adapting storage furniture and the acquisition of new units. All the decisions considered the



Fig. 2 View of part of the main warehouse after its reorganization

final transference to the permanent storage, so dimensions and characteristics of the new-purchased storage furniture were taking that in consideration (ICOM 2012).

Storage furniture has been numbered and different typologies received a colour code to facilitate future tracking of object's location on the floor plans that were designed for this purpose.

The physical reorganization of the main warehouse was done while unpacking collections, thus it was necessary to predict object dislocations and temporary settlements for them. The strategy was to start unpacking the more fragile collections, as ceramics, earthenware, and glass, as to reduce the number of dislocations and potential accidents during boxes movements.

Collection's assessment followed a sequence based on a preliminary documentation survey that crossed data from manual card records with the database Inarte® that included checking the register(s) number(s), the need to group objects together, the dimensions of each object, the condition state, the marking and labelling methods, the existence of photographic records, among other information. In general, it was found that there were many inaccuracies in the inventory, namely in the typologies and in associations of sets and composites/elements. As the items were packed, this reviewing process could only take place after the entire collection become visible and, for instance, (un)group elements of a set, depending on each situation.

The registration and inventory staff participated in the process and helped in the final decision-making process. A relevant contribution was provided by two external specialists on ceramics and pottery that helped to clarify issues related to provenance, date, function, quality, manufacturer, marks, technical and material characteristics, and elements of a set. A later technical visit to the pottery museum (Museu da Olaria), in Barcelos (Portugal) guided by the museum director reinforced the valorisation of such collection and contributed for current and future networking.

After unpacking and reviewing data of the 1813 items of ceramic and pottery, the other collections followed the same paths. However, depending on the condition state and size of each collection, different approaches were taken to make it feasible on time—small collections were more easily renumbered and updated, such as the 119 gilded and polychrome religious wooden objects, while the totality of the ceramics/pottery, the 3083 textiles (up to now), the 651 metal, 529 glass items and others collections will wait for the moving to the permanent storage to be marked with the new register number, for instance. Until then, they have received acid-free labels to help their current and future identification (Buck and Gilmore 2010).

The 81 metallic drawers with documents, photographs, engravings, postcards, and drawings will be reviewed later at the *Abrigo dos Pequeninos* because they include much more than the 1097 pieces registered in Fig. 3. The collection of textiles is quite large (3083 items are being reviewed) and there are still many costume accessories to be addressed. A similar situation occurs with furniture, where 184 pieces from a total of 345, are documented. The 430 zinc etchings require initiation of the documentation process as they do not yet possess, a register number.

Thus, decisions are being made according to the work demand of each collection and the awareness of the level required to be continued after moving. Until November of 2021, 97% of the items became visible and more accessible which allowed to carry

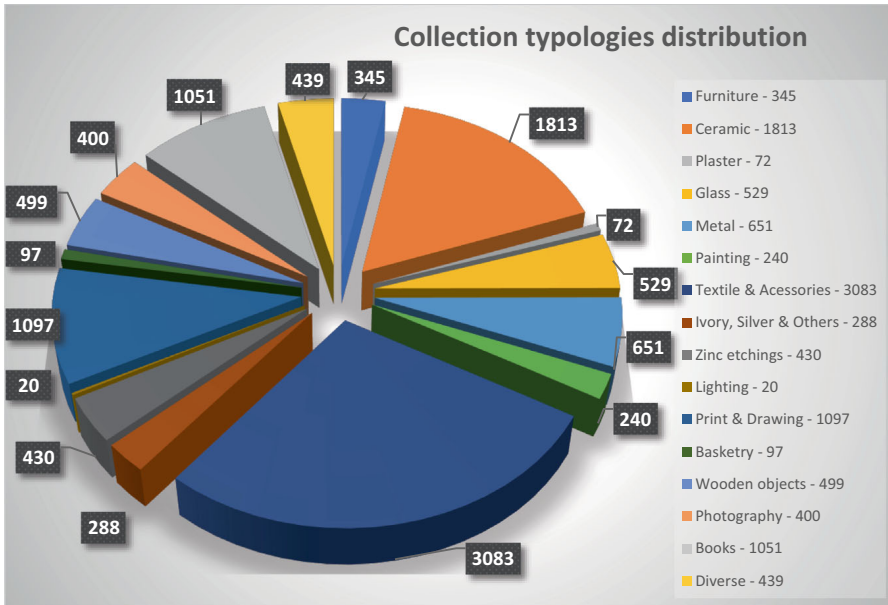


Fig. 3 Pie chart showing the collections distributed by type and the corresponding number of items

on photographic campaigns, condition state surveys and start a plan on mounting and packing systems for storage and for moving.

7 Packing and Moving

Regarding packing and mounting systems, the deadline and resources allocated for moving to the new refurbished building do not allow to treat all the collections at the same level. Only a small percentage of the collections had permanent or temporary boxing or mounts, thus the amount of work required is overwhelming. During the project, 68 cotton dust covers for chairs and 38 for textiles have been produced, which added to the existing ones, allowed the protection of 85 hanged costumes (Robinson and Pardoe 2000).

The goal is to protect the most vulnerable collections or objects and provide adequate systems for permanent storage while others would receive a temporary packing to be further developed after being moved.

Sustainability of the process is one of the aims to be achieved through the reduction of the materials used, the creation of standard packing models according to typologies, through systems that could facilitate examination and access of the objects and through the re-use of transport containers properly padded and size-shaped to accommodate the permanent boxes/supports and mounts, during moving (Fig. 4).



Fig. 4 Mounting and packing systems in progress

8 Preventive Conservation Training Program

Throughout this process, a parallel inner training program has been developed by the conservation and inventory team leaders in order to provide updated knowledge to the entire team of the DMM and to standardize the procedures to be implemented and the materials to be used concerning labelling and marking (NML 2010); environmental monitoring and control (Michalski 1993); integrated pest management (<https://museumpests.net/>) (Museum Pests.net.); cleaning; handling, packing and transporting (Illes 2006) (<https://stashc.com/the-publication/>).

For each topic, the surveys taken among museum's staff helped to direct training to reality. Training sessions took place after the first lockdown and during the second one.

This first edition led to the writing of two manuals (DMM 2021b, c) made available to all services, which cross the specific needs of the Museum of the City and the most recent practices disseminated through bibliography and electronic resources provided by reference institutions in this field.

The practical sessions are still ongoing, some in mock-ups as the marking methods while others are being used to speed-up some actions needed in storage, as cleaning and packing.

The sessions regarding pest control and climate monitoring were developed in different spaces of the Museum of The City. This contributed to risk assessment processes and standardizing procedures regarding relative humidity (RH), temperature (T), light, integrated pest management and proposing continuous improvements.

After RH and T analysis, it was obvious that the main warehouse was not fitted for collection storage and that the second temporary storage can be improved with small adjustments to be categorized as class A (using ASHRAE specifications) (Michalsky 2007).

During the reorganization of the textiles collection, it became evident that some of the white textiles required treatment before they could be re-accommodated, used for exhibitions, for study or for other purposes. An external textile conservator-restorer was called for a conservative washing of a selection of pieces and to provide training to the conservation staff of the DMM that is taking care of the collection on the municipal storage.

9 Conclusion

Despite the enormous constraints due to the pandemic, there was a strong willingness to join forces so that the storage project could progress. The cessation of the museums' daily routine allowed time to reflect, discuss and define issues that would probably have taken longer to be addressed and would not have been addressed with in such a large team.

The survey of staff' skills, often extra-professional, played a major role, not only for the valorisation of this knowledge, but also for directing it towards the project goals, to which they ended up being associated after the deconfinement. The possibility to match personal interests and skills within a project is a key-factor to engage professionals and to progress much further due people's involvement.

The interconnections created during the project were a chance to optimize personal skills and empower the DMM staff with competences through a purposed-designed training program, leading to a more collaborative, but also, autonomous work.

Up to now and within RE-ORG ten quality criteria, the ongoing project allowed to meet 5 of them: *one qualified member of staff is in charge; the storage rooms contain (almost) only collection objects; separate spaces are dedicated to support functions: office, workroom, storage of equipment and other materials (non-collection); no object is placed directly on the floor; objects are arranged by category.* A sixth could be considered—*every object is free from active deterioration*—as pest infestation was a major threat for the collections and it is controlled, but other types of damage must not be forgotten such as corrosion, for instance.

The protection offered by the storage and the building was also improved after the partial moving to new temporary storage and will improve much more, after the transference for the requalified permanent storage. The key policies and procedures need to be adapted to this new context and the inner training plan, followed by the writing and dissemination of the labelling/markings and preventive conservation manuals already provide a good basis.

The project is being a valuable chance to gain a much deeper knowledge about these collections behind scenes and to provide relevant data to support decision-making within a wider collection management program.

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