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THE SALVAGE OF FIRE AND WATER DAMAGED ARCHIVES FROM KEYSIGN HOUSE

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Summary

This report covers the salvage of fire and water damaged archives, which included both paper records and photographic materials. The damp papers were air-dried, while the wet ones were freeze-dried, and where possible the photographic materials were treated separately. Includes recommendations for the compilation of paper archives with regard to salvage after disasters.

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Introduction

After the fire had been extinguished, the wet and charred files were removed to a warehouse in Whitechapel, which appeared to be cool and well aired. Soon after this the files were sorted into the following categories:

1. Good condition - neither wet nor burnt, so no need for remedial work	5 boxes
2. Salvageable but wet	13 boxes
3. Possibly salvageable	4 boxes
4. Beyond salvage	13 boxes

The boxes of wet salvageable files were returned to Fortress House for storage in the Ancient Monuments Laboratory cold room, and the remainder were left in the warehouse until the following week. The boxes themselves, contained burnt ceiling debris as well as complete files and loose papers, and had to be sorted before any salvage work could proceed.

Although none of the fire and water damaged files were considered essential documents, it was decided that the AML would undertake the drying of the salvageable material in order to gain some experience of this problem. This work was undertaken by the authors, and Ulf Andersson concentrated on the photographic materials.

Cold storage

The wet and salvageable files were returned to Fortress House and stored in the AML cold store. Here they were kept in the dark and at a constant 6°C, so that fungal growth could not take hold. However the material left in the warehouse did develop active fungal growth after a week or so. It is worth noting that spores from such fungi could pose a health hazard to staff involved in sorting this material, and steps should always be taken to avoid such growths becoming established.

At Fortress House the files were sorted by the Registry staff, and conservators divided

these into damp and wet groups which were to be treated separately. The damp files were put back into cold storage and the wet files were individually packed in polythene bags and put into the deep freeze prior to freeze-drying. At the same time photographic prints and negatives were removed wherever possible, but it was not possible to open some of the very wet files without tearing the papers so some photographic material was freeze-dried unknowingly.

Drying damp files

It was decided to air-dry the damp files, rather than go through the more complicated procedure of freeze-drying. The Central Archaeology Services loaned us a quantity of bread trays, which are stackable and provide good air circulation round material stored in them. Files of a similar thickness were arranged in the bread trays, stacked as two towers in BO2 Fortress House. Most of the year this room is warm and fairly dry, so that most of the files were dry within 48 hours, even those that were around 3-5 cm thick. Originally we had intended to do the drying in the cold room, but the humidity was too high for successful drying (in fact the papers remained damp for several weeks without fungal growth).

Using this system it took between 2-3 weeks to air-dry about 8 crates of the damp files, and we had no problems with fungal growth. Table 1 includes the wet and dry weights of some typical damp files, and this illustrates how much water they had taken up, usually between 10-20%, on some of the thicker files this was around a quarter of a litre.

When dry, the files were much more handleable although they were very fragile where charred, and many with plastic bindings had fused together. Papers inserted between plastic covers took longer to dry, and in many cases they had to be individually opened and separated from the plastic leaves or fanned out to finish drying.

Dyeline plans were severely affected by the wetting, and in most cases were reduced to a light blue stain on the paper. This obviously happened as soon as the dye came in contact with water and it is doubtful if even immediate freezing could have saved them.

File	wet wt.	dry wt.	water	%
A (BP Oxon)	1766.1g	1605.8g	160.3g	9%
B (Peckforth)	1576.3g	1317.8g	258.5g	16%
C (Stroud)	1154.5g	1041.7g	112.8g	10%
D (Tulip Cottage)	1133.7g	1028.1g	105.6g	9%

Table 1: Water content of damp files

Freeze-drying of wet files

Some of the files were so wet they were almost dripping, and it was thought advisable to freeze-dry these rather than attempt air-drying.

The freeze-drying process, in the case of these files, involves three stages: a.freezing; b. freeze-drying; and c. return to ambient conditions.

a. The files were individually wrapped in polythene and put in domestic freezers, where all the water in the documents was frozen. This prevents inks from bleeding and stops microorganism activity. Wrapping in polythene stops them freeze-drying in the freezer, and prevents them freezing together.

b. As space became available in the freeze-dryer, the files were removed from the freezer and their polythene wrappings, weighed and put into the freeze-dryer. There they were further chilled to -28°C and a vacuum applied, ice was then removed as a frozen vapour and collected as a block of ice in an external condenser. The progress of drying is monitored by removing material from the chamber every week and weighing.

c. After drying, usually to absolute dryness, the material was allowed to adapt to normal room conditions, then weighed again.

In most cases the files were adequately dried within a week, and then left to finish air-drying at room temperatures. When dry it could be seen that up to half the weight of the wet files was water, see table 2.; and in the case of some files this meant that they held over a litre of water. Files containing papers between plastic covers took up to four times as long to complete their drying.

The files were freeze-dried at -28°C, as the freeze-dryer was being used for archaeological material at the same time. As no cryo-protectors were used, wet files could probably be freeze-dried at higher temperatures, up to -10°C. In this way it should be possible to increase the rate of freeze-drying without undue problems.

Photographic materials

Many of the files contained photographic prints, and in some cases the original negatives as well. Most were an integral part of glossy reports, where copies would be available; but others were the before and after records of conservation work. In order to try and retrieve this archive, where possible the prints were separated from the papers to prevent them sticking during the drying process. All the segregated photographic material was then treated individually.

Drying damp photographic prints

Some of the prints were mounted as part of reports, and for the most part were damp rather than wet. It was thought advisable to dry them separately and flat, so the sheets of prints were air-dried on open shelves. In this way it was possible to

File	wet wt.	dry wt.	equil. wt.	water	% water
A (mh)	2654.4g	1648.5g	1619.6g	1034.8g	40%
B (381/0087)	2119.9g	1332.6g	1291.3g	828.6g	39%
C (Penwith)	957.9g	534.0g	523.0g	434.9g	45%
D (DV/20382)	2606.9g	1771.6g	1780.5g	835.5g	32%
E	1442.8g	1018.0g	1018.0g	424.8g	29%
F	1433.8g	933.2g	920.3g	513.5g	36%
G (Penzance)	737.7g	478.8g	445.3g	292.4g	40%
H (Milton Abbas)	285.2g	176.7g	176.2g	108.5g	38%
I	2271.5g	1525.4g	1525.5g	746.1g	33%
J (728/0001)	1183.5g	921.5g	904.8g	278.7g	24%
K (381/0037)	714.6g	491.1g	442.0g	272.6g	38%
L (381/62)	1898.0g	1286.7g	1267.2g	630.8g	33%
M (N.Cornwall 1)	2774.1g	1903.1g	1837.4g	936.7g	34%
N (N.Cornwall 2)	2156.5g	1511.2g	1422.3g	734.2g	34%
O (Harylyn House)	1376.8g	957.8g	855.5g	521.3g	38%
P (Ormskirk)	690.7g	507.2g	512.2g	183.5g	27%
Q (Saxlingham)	430.7g	275.8g	276.3g	154.9g	40%
R	782.8g	430.0g	412.9g	369.9g	47%
S (Smithy Cottage)	304.6g	177.8g	179.8g	126.8g	42%
T (Seavue GH)	869.5g	585.3g	595.4g	284.2g	33%
U (728/001)	573.1g	273.5g	275.0g	299.6g	52%
V	1086.0g	678.6g	661.4g	424.6g	39%

Table 2: Water content of wet files, dried by freeze-drying

dry a batch of prints every day. When dry the sheets with prints were returned to their reports.

Separating photographic prints

All the packets of damp and wet photographic prints had fused together and the condition of the emulsion had been further degraded by the heat and possibly fumes.

At first we tried soaking the fused blocks of prints sealed in polythene bags in hot water. The water was constantly changed, but this was not sufficient to release them.

Then we tried brushing hot water onto the back of the prints, and when it was possible to lift a corner, water was also brushed between the prints. This method worked but very slowly.

Finally the prints were put into a bowl of warm water, and the water was changed three times during the hour. Then it was possible to begin separating the prints and it was easier to do this under water.

During soaking the prints become so wet that the emulsion can start to come away from the paper base, especially around burnt edges. Separating the photographs can stretch the emulsion slightly so that the prints tend to curve, and to compensate for this they were gently reshaped while wet.

The separated prints were then air-dried at room temperature and the dry prints were put into new paper envelopes. Most of the prints had developed a blue white cast to them, probably as a result of the heat and prolonged wetting prior to conservation.

Negatives

Some of the negatives that were fire damaged were also fused together, and these were separated by soaking in warm water and gently separating. They were then rinsed in changes of cool water and allowed to air-dry. When dry they were re-packed in clean envelopes.

Recommendations

Future salvage procedures

After a fire most of the material is collected together in a hurried and haphazard fashion, and there is very little opportunity to sort the material, segregating items that have different conservation needs. Under these circumstances the only advice one can give is to try and ensure that valuable documents and books are packaged in polythene and frozen as soon as possible to prevent inks bleeding. The remaining papers should be put into cold storage, to prevent mould growth, until they can be sorted into damp, wet and photographic materials.

Materials used in archives

During the course of salvaging these files we recognised that some of the materials that were used added to the fire and water damage problems. Polythene storage envelopes act like capillaries and literally suck water inside them, so that they only marginally protect the papers from wetting. At the same time plastic covers greatly reduce the available surface area for drying. Plastics when burnt, not only melt and fuse onto the paperwork, they also produce toxic vapours. Metal bindings conduct heat during a fire and increase the amount of charring damage on documents. Also having been soaked the metals corrode and this adds to the damage to the documents.

In the future it would be advisable to avoid the use of these materials in archives, to minimise the damage caused by fire and improve the drying rate of all water damaged papers.

In particular, concern was raised over the inclusion of negatives and original transparencies within some of the files. Ideally these should be stored separately in fire proof cabinets, and at the very least this should be considered for negatives. Keeping other photographic materials separately in the front pocket of the files would mean that they could easily be removed for individual treatment.

Useful contact numbers

National Preservation Office	071 323 7612
Salvage consultants:	
Data & Archival Damage Control Centre	071 837 8215
Document SOS	071 824 8333
Cold Stores:	
National Cold Storage Federation	0344 869533
Sea Containers Cold Stores (Dagenham)	081 593 1181
Drying services:	
AEA Technology (Harwell)	0235 432245