Physical Care, Repair, and Protection of Manuscripts

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THE PURPOSE OF THIS CHAPTER is to outline briefly the ideal conditions for the preservation of paper records, giving practical recommendations as to how these conditions may be set up, and to give some advice on the repair of materials that have suffered from lack of proper care. No consideration will be given in this article to parchments, book repair, nor to photographic records.

Ideally, loose paper records should be stored in an air-conditioned building of fireproof construction with fewer than average windows and doors. Shelving should be of steel and furnishings in the storage areas should be of some non-textile materials that will not harbor nor produce much dust. A study of paper used for record purposes will indicate the reasons for these recommendations.

Paper is largely made of cellulose fibers derived from wood or rags sized with rosin, glue or casein; and sometimes contains inert mineral fillers or coatings. The cellulose, making up the body of the paper, is the only factor that will be considered here as the strength and durability of a paper is largely determined by the quality of cellulose used in its manufacture. The best grades of paper have a high alpha-cellulose content; that is, cellulose in a purified form. They are made from high quality rags or wood pulps that require little bleaching or other chemical treatment. The poorer grades are made from old or colored rags and pulp that demands longer and more drastic cooking and bleaching. The very worst type of paper from the custodian's point of view, is newsprint or groundwood paper, which contains most of the original lignins and resins of the tree from which it was made. Alpha-cellulose itself is not too much affected by light nor other factors generally considered injurious to paper, and

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if all records could be made and had been made on high alpha-cellulose paper, there would be less concern for its preservation. Obviously, however, this type of paper is very expensive, and very little has been made or used since the early days of handmade papers. Nowadays paper consumption is so great that every available material is put to use without great consideration for the quality of the end product. The librarian then, is faced with the problem of doing the best he can to minimize the inherent weaknesses of the materials in his charge. He can do a great deal, fortunately, by making himself aware of the problems and following the logical course of action that is indicated in his particular case. It may not always be possible to provide ideal conditions as outlined, but there is hardly an instance where some real improvements in record storage and use cannot be introduced without too much expense for even the small institution.

The useful life of all papers is adversely affected by exposure to heat, light, dry air, sulphur dioxide fumes, excessive dampness, dust, and careless handling. The deterioration resulting from exposure to any or all of these conditions is more noticeable in the poorer grades of paper. Discoloration and embrittlement of newsprint may be obvious in a short period. While deterioration may be less apparent in other papers during the same period, in the course of time all papers suffer and will eventually break down. Thus, after the substantial building and protection from fire and thieves has been assured, air-conditioning is probably the next most important item to be considered. Paper has its greatest strength when its moisture content is in equilibrium with air of 50 to 65 per cent relative humidity, and it has been found in actual practice that the maintenance of 50 per cent relative humidity and a temperature of 70 to 75 degrees summer and winter, day and night, provides good working conditions and an excellent atmosphere for the records. It is a wise precaution to treat the wash-water in the air-conditioning system with a dilute alkaline solution of potassium dichromate to eliminate effectively any sulphur dioxide or other acid gases present in the outside air. Sulphur dioxide is far more highly concentrated in cities and industrial areas than in rural sections and, as it is particularly destructive, librarians in metropolitan locations cannot afford to ignore it. Dust particles are another prime source of acid. They may also be hard or angular and cause an abrasion of the minute paper fibers. Their presence may be minimized by thoroughly washing incoming air as already described, and then filtering through glass wool filters all the air, both fresh and recirculated, entering the storage area. Dust will also be less of a

problem if rugs and other textile furnishings are excluded from storage areas.

Sunlight or any other light, which produces heat or ultra-violet, must never be permitted to fall on papers for any length of time. It is best that storage areas be built without windows or be carefully shaded in some way, and that lights be used only when necessary. It is also well to keep the stored records in light-tight boxes that serve to protect them from dust at the same time. Valuable documents needed for exhibit may be kept safe indefinitely in air-conditioned cases lighted with flourescent tubes that are shielded with "document glass." This glass effectively prevents the passage of the shorter wave lengths of light and the little heat that the tubes emit. The filtered light gives a clear yellow illumination of even brightness throughout the display case.

No discussion of storage conditions would be complete without some mention of the obviously destructive forces that have accounted for the loss of practically all of our vanished records. Fire comes to mind first and once it has taken hold little can be done. It is trite to say that every precaution should be taken in building, wiring, and furnishing a records storage house to render the outbreak and spread of fire impossible, but it is wise to provide additional protective devices. An alarm system, not a sprinkler system, may be installed; and carbon-dioxide extinguishers should be readily available at strategic points with the staff trained to use them. Water or soda-acid extinguishers should not be at hand because of the expense of clean-up and the repair problems that would follow their use in an emergency.

Insects and rodents can also be very destructive and any necessary steps should be taken to prevent their depredations. Good housekeeping is the best precaution: allow no food nor trash about the place and examine newly-acquired materials for signs of infestation. Any acquisitions from tropical areas should bear especially close scrutiny or be promptly fumigated to be on the safe side. If a vacuum-fumigating tank for the use of ethylene oxide and carbon dioxide is not available, the papers may be exposed to the vapors of ethylene dichloride and carbon tetrachloride in an air-tight box for twenty-four hours, and then thoroughly aired before placing them in permanent storage.

Mildew of paper is a fungus growth that develops readily in damp stagnant air. Buildings having controlled temperature and relative humidity do not permit the growth of molds, but others may provide favorable conditions during warm damp periods. It is best, unless

the building is completely air-conditioned, to store all records above ground level, to have the first shelf six inches above floor level with an air space beneath, and a similar air space above the top shelf. Fans should be used to keep the air in motion during the summertime and, in extremely damp locations, dehumidifiers may be brought into use in addition. It is inadvisable to place any shelves for records against any outside wall where there is always danger of local dampness, or even condensation, whenever the outside temperature drops suddenly. Proper insulation may minimize this danger, but it is good practice to keep this area free for working space. Attics likewise, even if insulated, are usually too hot and dry in summer to be used for record storage. Heat and dry air, as well as drastic temperature changes that might occur in an attic space, will lead to the yellowing and embrittlement of the papers.

Once the reasons behind the general requirements for record storage are understood and proper conditions are provided, it remains for the custodian to select suitable containers for the various types of papers. The function of the containers is to protect the material within and render it easily available for use. They should also be light in weight for convenience and inexpensive for economy. For most material, legal or letter size, cardboard containers with hinged tops provide an excellent solution. The papers may be filed vertically in these boxes, in their original kraft paper folders if desired, or new ones may be provided. They should be packed tightly enough so that all material will stay smooth and upright. For convenience in handling, the boxes should be approximately six inches wide, and they should be placed on the shelves with this narrow side labeled and facing outward. It will be observed that the bottom edges of the papers will be set against this side of the box. Flat-filing may be used if the collection is not large nor active. It has been found that the servicing of flat-filed records requires a good deal more time and handling, and involves a greater risk of damage than does the use of properly filed and labeled, vertically stored records. Maps and other large documents must, however, be filed flat; but it is well, if the materials are of considerable value, to provide individual folders made of heavy kraft paper large enough to enclose the documents completely. By labeling these folders, it is possible to find and extract flat-filed materials without the usual wear and tear on the records on the top of the pile. If the drawers are shallow, or the shelves closely spaced, so that few documents are stored in any unit, there will also be much less danger of damage in handling. Maps should never be

stored in rolls for any length of time as they take up more space than necessary, are difficult to use, and may eventually break in irregular places. It is better to fold over-sized items and store them flat in the usual way. If they should break along the fold lines, it is a simple matter to hinge them neatly and thus maintain the original fold where desired.

If a group of valuable or irreplaceable documents is in constant use, so that even with the most careful attention to storage conditions and handling, there seems to be danger of loss or considerable damage, it is a wise precaution to have the material microfilmed and then take the originals out of general circulation. Such photographic reproduction is available almost everywhere and large prints may be made from the small negatives at little expense. Actually, by the use of suitable lights and filters, and using high contrast fine-grained film, the photocopy, in many instances, may be made more legible than the original. This is certainly a distinct advantage to anyone who must study a batch of yellowed, badly faded papers of an early period. The negatives, made on 35 millimeter film with an acetate base, may be kept safely in metal cans that take up little space in any room suited to the storage of paper records.

Although librarians may set up and maintain ideal storage conditions for the preservation of manuscripts, they are frequently faced with the necessity of providing some sort of repair or reinforcement to certain items that may have suffered from fire or other catastrophe, improper handling, or poor storage conditions in the past.

Papers dating from the last half of the nineteenth century will generally cause the greatest concern, because it was during this period that the paper-making machine came into widespread use and many inferior fibers were adopted at random to meet the needs of the suddenly increased production and the accelerated demand for paper products. Records were made on these papers without much thought of their quality, as the factors affecting paper permanence were not well understood. These records, on inferior paper, were then usually folded and put away in poorly designed containers to be eventually relegated to some attic or equally unsuitable place. When they are brought out for examination now, the dust that may have settled on them must be removed before the papers are disturbed in any way. The safest method is to blow a stream of air along the exposed edges of the papers. Rubbing the records with a cloth or using any suction method may merely spread the dust into the papers or tear them along the edges. After dusting, if the papers are removed

from their file and put to any considerable use, they will usually crack along the fold lines and need some reinforcement to render them serviceable. Maps, too, which have been kept rolled and in a dry atmosphere, will sometimes break when opened.

There are also certain special problems not peculiar to any period or to any type of record, which must be considered. Fire-, water-, or insect-damaged records, and papers with stains or faded, illegible inks, all require individual study and treatment.

The ingenious and careful repairman can develop the means of improving the usefulness and serviceability of practically any paper regardless of its condition. The selection of the best possible method in each instance is not arbitrary, but rather it is based on factors in addition to an objective examination of its physical condition. The value of the paper, the amount of use it is expected to receive, and the way it is to be stored, all enter into the decision. The methods of repair and their variations are many, but the amount of money and equipment available for repair work may impose limitations on what may be feasible.

For example, let us take a few hypothetical cases and see how they might be treated. First, there is a map 40 by 60 inches drawn on heavy map paper, rolled. The map drawer is 36 by 48 inches, and the map must be fitted into the drawer. The map should be carefully dampened on the back with a moist sponge to minimize cracking when it is unrolled, then laid flat between white blotters to dry for 24 hours. There must be enough weight on top to keep the map flat as it begins to dry. After flattening, it is dissected through the middle of the long dimension using a sharp knife with a steel straight-edge as guide. If it seems desirable from the point of view of the context, the dissection may be made a few inches either side of the middle. The two pieces of map are then mounted together on heavy muslin, leaving a space of one-eighth inch between the pieces to act as a hinge for folding. The map, placed in a kraft paper folder, will then fit nicely into its drawer. It is a good thing to bear in mind that the weight of the cloth backing should approximate the weight of the paper. Thin papers should be mounted on very light muslin, or even batiste, if they are to remain perfectly flat without any tendency to curl. A thin white paste is probably still the best adhesive for this type of repair work.

As another example, take a group of folded papers dated about 1870 that crack when opened for examination; but which, aside from the brittleness, are in pretty good shape. If a laminating machine of

some kind that is designed to apply cellulose acetate sheeting to papers by means of heat and pressure is available, lamination of most of the papers in the group would provide an excellent solution. Large quantities of this type of material may be run through the machine at little expense and the cellulose acetate covering will strengthen the sheets without decreasing their legibility in any way. It will also prepare them nicely for either flat or vertical storage. If such equipment is not available, the material should be flattened by dampening and ironing, and only those sheets that are actually broken should be singled out for further treatment. This will usually consist of reinforcing the torn places by pasting strips of a thin but durable translucent paper, such as a light-weight rag manifold, over the breaks on the less important side of each document. Transparent cellophane tape must never be used for such a purpose as it is not permanent, and the adhesive will leave an oily stain as it ages. In whatever manner the group of folded papers has been handled it will, in the end, be placed in a kraft paper folder for filing vertically in a cardboard container. Here it will be accessible yet be well protected.

Another problem which, though not frequent, may be very baffling, is the treatment of fire and water-damaged records. The problems may occur separately or together. Fire-damaged materials may have nothing but charred edges or they may be completely burned all the way through to an ash. The first sort may be laminated, mounted, or treated in some conventional way, but the only thing to do for the latter is to set the pieces up between sheets of glass and have them photographed on infra-red film. Amazingly enough, the print will show light paper and dark ink, somewhat distorted because of the shrinkage, but frequently quite legible. Water-soaked papers must be promptly separated and laid flat between blotters to dry before mildew develops. In addition to the mildew problem, if there is any great delay in separating the sheets, the sizing may soften and stick the sheets together more firmly. In such a case the safest thing to do is to resoak the whole mass before trying to separate the sheets. This will dissolve the sizing, so unless the papers are to be laminated, they might well be dipped in either a thin glue or starch solution before drying to replace the sizing.

Except for oily stains, which may be removed with a drycleaning solvent, it is best not to tamper with stains or discolorations. The chemicals required, mainly acids and bleaches, will seriously weaken the cellulose fibers and destroy the sizing. It is likewise inadvisable

to try to restore the legibility of faded iron-gall inks by chemical means, but if a faded document can be photographed by ultra-violet light using a fluorescence filter, the print will be considerably more legible than the original. If an examination or reading of the document will suffice, it will be observed that the ink residue will fluoresce and become legible to the eye as well as to the camera.

It may be noted that the use of crepeline has not been mentioned in any instance, and it is difficult to think of any repair problem where crepeline is definitely indicated. Its use is attended by many limitations and drawbacks that tend to render it unsuitable for record repair in more progressive institutions. In the first place, it is very expensive, and the labor needed to apply it is expensive and difficult to find. In the second place, the paste used in its application darkens in time, dries out and embrittles the whole sheet. Crepeline triples the thickness of the document and lessens its legibility somewhat. With these facts in view, it is easy to understand why its use has fallen into disfavor in recent years.

There is no doubt but that some form of lamination using transparent plastic sheeting is its modern counterpart. The materials are cheaper, the process is quicker, less highly-skilled labor is needed, and the end product provides excellent permanence and increase in strength without impairing the legibility. As new plastic materials become available, are tested adequately and put to use, there is no doubt but that the process may be improved, that even the present nominal cost will be decreased, and that lamination will find even more widespread acceptance among librarians.