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galleries. Although no real damage occurred to displays, the wooden floor of the affected gallery began to lift as it dried out. Four weeks later, the raised floorboards are a minor hazard and still appear to be moving.

What have we learned?

1. The prompt action of staff meant that little serious damage has occurred to specimens or paintings. Had the incident occurred at a weekend or overnight, however, the potential damage was considerable.
2. The museum is reviewing the need for high pressure fire hoses in the building, particularly as the water authority and not the museum controls the stop valve.
3. The large quantities of water made ceilings unsafe.
4. Sturdy cases, raised off the floor, protected Natural History specimens from the immediate effects of the flood. Had specimens been on open display, they would have been badly damaged, many probably destroyed.
5. The museum's management team is gathering comments and feedback on the incident from

staff. The museum's disaster plan will shortly be reviewed in the light of experience gained by the flood.

Gabriela MacKinnon
Birmingham Museum



Editor's Note

Following their flood, Bristol are thinking of purchasing absorbent water protection cushions. These are thin pillows which, with a dry weight of 400 grams, can absorb 23 litres of water in 3 minutes. *Spirebourne Ltd* who sell this product (Sorbarix@A20) can provide more information; tel/fax: 01428 644483. I would be interested in hearing from anyone who has used this product.

Some Considerations on Water Damage to Museum Collections

Disaster pre-planning is vital to ensure that damage to artefacts is kept to a minimum and that environmental conditions are stabilised as soon as possible. Risks need to be evaluated and a contingency plan carefully developed to reflect the needs and characteristics of the collection(s) and building(s) (ref.1 + 2). One of the greatest risks to Museum collections is water and the following are some ideas for consideration when assessing risks and salvage operations for museum collections.

Water in disaster situations is often primarily considered in terms of its relationship with fire. Indeed, the major damage to objects can be caused by the water used to extinguish the fire, rather than the fire itself. Of course, water damage can occur totally in its own right, arising from leaking roofs or gutters, burst pipes or even a tap left running.

Water may rise or it may fall. Storing and displaying objects away from floor level is an immediate advantage for protection against flooding. If water is rising, lower

shelves can be emptied first, or the bottom drawer of a plan chest or cabinet may be emptied or removed, together with its contents. Take care that cabinets or shelves do not become top heavy and unstable. If water is falling, polythene sheeting can be useful to create a barrier and direct water away from objects.

If items are enclosed within a container - e.g. a cabinet, box, display case or frame, considerable protection can be offered against water ingress. The containers need to be solid enough to withstand water penetration and display cases need to have reliable ceilings. Boxes made from good quality card will protect their contents for a surprising length of time. Of course it depends on the quantity of water involved, as most materials and constructions used for Museum storage and display cannot withstand submersion. Call out procedures by which staff can be contacted on a 24 hour basis are vital - the faster objects can be salvaged and treated the better.

Floors below the flooded area must be checked and areas cleared or sheeted over as a precaution until the flood has been fully cleared up and the source dealt with.

Humidity in flood situations can be

a great problem. Reducing the temperature in the area can help control rises in Relative Humidity. Ensuring speedy access to dehumidifiers, aquavacs and pumping equipment is important. Many types of object can be adversely affected by high RH levels, for example : metals, archaeological material, paper, photographs, plant specimens, skins, wood and plant models made fully or partly of celluloid. Materials react differently depending on their particular characteristics and prevalent conditions. Damage may be by swelling, warping, distortion, corrosion, or blocking (e.g. swollen paper or photographic emulsion adhering to the glazing of its frame). These states will leave the objects even more vulnerable to physical and chemical degradation.

Some items or their components may be soluble in water e.g. fungi, watercolour and manuscript pigments, mould damaged gelatine photographic emulsions and scales would become detached from butterfly wings. Fungi would also be damaged by high humidity or localised wetting, being then prey to the growth of other parasitic fungi. Some minerals may deliquesce and dissolve, such as halite; or change in nature, such as

pyrite, which oxidises above 60% RH; high RH also causes compressional stress in outer layers of hygrostatic geological specimens (ref. 3). Items from seed collections can change in appearance as well as the internal chemical make up and possibly prove impossible to re-dry to their natural state.

An increase in acidity or alkalinity introduced to materials by flood water can produce irreversible changes to colour, density and material state. Water seeping through masonry can carry salts into the environment. The combination of high humidity and pollutants from materials like wet wood or dust can exacerbate corrosion problems for metals.

Salvage areas (i.e. areas where wet items are moved to for treatment and packing) should be carefully chosen so that unaffected collection material is not endangered by rising humidity levels.

Where water is used to combat a fire, hazards can include shattering of materials being too rapidly cooled, such as marble or glass.

Air drying alone can cause objects to retain water borne contaminants, therefore immersion in clean cold water may be necessary to remove surface deposits and pollutant

components which may have been absorbed. Of course this must be evaluated according to the type and nature of the objects in question.

Although air drying offers the greatest control (one may consider reducing the RH slowly by use of microclimates), freezing followed by controlled thaw or freeze drying are options for many forms of organic material. Freezing can be useful to create time if there are too many items for conservators to control dry before further damage takes place, or other factors such as mould growth asserts a presence. Careful wrapping is necessary in clear polythene with all openings sealed using polythene tape, parcel tape or heat sealing (ref.4). Speed of freezing is critical to keep ice crystal size to a minimum. There are several disaster recovery companies in the UK, and appropriate telephone numbers should be recorded in the contingency plan (ref.5).

Supplies for emergency use should be identified and purchased, and where possible kept solely for this use. NMGM keeps stocks of blotting paper, polythene sheeting and gloves in major collection stores. There is also a back up store of a much larger range of materials, equipment and personal protective

clothing. This store is kept in large sealed container trolleys which can be loaded onto a van and quickly transported to the emergency site.

Sprinkler systems provide early fire supervision and operates at the seat of the fire, controlling it while in its infancy and thereby enabling a building to defend itself. New technology has introduced reliable systems with low maintenance requirement (ref.6).

Water detection systems are also useful where a risk of flooding is high and the systems range from a self contained battery operated unit to multi zone alarm detection which can be interlinked with the buildings existing security systems. (ref.7)

Health and safety must be considered. Water which may be in contact with electrical circuitry must be isolated - risks should never be taken. Other dangers may be present, such as slippery floors or contamination by sewerage or other contaminants which could cause diseases such as Weil's, which is spread by rats.

NMGM has suffered several floods during recent years. One example

being at the Museum of Liverpool Life, sited on the waters edge of the River Mersey, where a combination of springtime high tide and wind direction took waves over the dock wall to beat against the walls and windows of the Museum. Water penetrated through damaged pointing of the wall structure. Thankfully no objects were affected, the alarm being raised and removable objects taken to a safe area. Lessons learnt included provision of more sandbags and a strict procedure of closing the external window shutters at the earliest sign of danger. Building maintenance inspections have also been brought within a tighter time scale and a battery operated water detector has been installed.

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The Great Red River Valley Deluge of '97

Museums in the Canadian Province of Manitoba have this year been intensely preoccupied with preparations against possible flood damage, as reported in the CAC (Canadian Association for Conservation of Cultural Property) Bulletin, Vol. 33, No. 2, June 1997. The flooding in the Red River Valley could turn out to be the worst in recorded history. The concern is not only the threat of overland flooding but also sewer backup.

At the Manitoba Museum of Man and Nature they were concerned that a flood backup augmented by heavy rain would cause flooding within the building faster than they could react to it. They decided to remove the thousands of artifacts out of the lower level storage below ground level. To this end four artifact removal teams were created from all available museum staff. Each team had twelve members comprising two supervisors (a conservator and a curator), two registrars to record artifacts as they were a) removed from storage and b) placed in temporary locations, respectively, and eight artifact movers. Half of the movers in a team worked in the lower level

removing artifacts while the other half re-stored the artifacts in the upper levels. Each of the four teams worked a rotating half day shift and although five days had been allocated for the operation the bulk of the work was done in two and a half days. The museum now plans to use this opportunity to reorganise and upgrade the storage areas as the artifacts are moved back in place.

The Provincial Archives of Manitoba had no such need for relocation, as their records are stored on the second and third floors of the building. However, their concern was for the operation and general security of the building, as, if the basement flooding reaches over one foot the power must be shut off. Emergency power would not be adequate to maintain heating and ventilation nor day to day operations. In a very severe flood the powerhouse would be shut down and the electronic security system would fail! The Emergency Management Organisation would take charge at that point. Museum staff prepared a one page Emergency Plan for distribution to key government staff detailing people to be contacted and when.

The collection areas at Whinipeg Art Gallery are all below ground and when the seriousness of the