

# DISASTER PLAN HANDBOOK

Dalhousie University Library  
Halifax, N.S.

Prepared by the Killam Library Disaster Team

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**Disaster Management Team Members**

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## Introduction

This handbook addresses the issue of disaster contingency planning for the Killam Library, its occupants and contents. It outlines how staff should respond when faced with a disaster or emergency situation. Of prime importance are the procedures for the safe evacuation of the building of all staff and users. (The Safety Committee section addresses this.) The plan includes telephone numbers and addresses of those people, services and organizations who can provide assistance during and after the disaster. The plan also supplies guidance for the salvage of damaged materials. (The Disaster Plan section addresses this.)

The *Disaster Plan Handbook* was first developed in 1987 by the Disaster Plan Working Group at the request of the University Librarian (Donna Bourne-Tyson). It relied heavily on two very useful existing plans, the *Disaster Plan Workbook* prepared by the Preservation Committee, New York University Libraries, 1984, and *An Ounce of Prevention*, edited by John P. Barton and Johanna G. Wellheiser and published by the Toronto Area Archivists Group, 1985.

The current (revised in 2007-2008) *Disaster Plan Handbook* should be read carefully and thoroughly by all staff, especially by those on the Disaster and Recovery Teams, the Floor Wardens and supervisory staff. It has been designed for quick reference and easy use. The labelled pages should enable the *Handbook* to function as a working manual. It provides brief instructions to the staff member first discovering a disaster or emergency situation and it provides more detailed instructions for those charged with special responsibilities. A link to Dalhousie University's [Emergency Procedures](#) manual is included as Appendix **D**. For additional information see also Dalhousie University's [Safety Policy and Procedures Manual](#).

## FIRE

### Checklist

1. If you suspect, or discover a fire, evacuate the area. Close the door to the room where the fire is located and immediately sound the building fire alarm.
2. Locations of alarm bells are listed in Appendix F.
3. Call **4109**, giving your name and the location of the fire. Also notify Library Administration (**3601**).
4. If the fire is small, and you feel you are not placing your safety in jeopardy, you may fight it with a fire extinguisher. Be sure you are using the proper extinguisher for the type of fire you are fighting. If you are not sure, sound the alarm and evacuate the building.
5. Locations of fire extinguishers are listed in Appendix F.
6. If the fire is large, very smoky, or spreading, evacuate the building immediately. Even if the alarm stops, continue the evacuation. When evacuating the building, WALK, DO NOT RUN to the nearest exit.
7. When alarm sounds, **DO NOT USE AN ELEVATOR**. It may become inoperative and/or a smoke trap. Use the stairs. Assist people with disabilities by moving them to a safe location and report their location immediately to **4109**. Persons in wheelchairs are to be assisted to the safe zone (adjacent to the elevators – ensure that both sets of doors in this area are closed) using the buddy system, i.e. on Warden stays with the Person while sending a message to the Chief Warden. Fire Department staff will be responsible for evacuating individuals in wheelchairs. Give assistance to (help carry if necessary) disabled persons in using stairs. **If you are trapped in a room or the building, phone (9) 4103** to contact and notify the fire department directly.
8. Wardens (Appendix A) should follow the procedures listed in Section 12.1 – 12.14 (Evacuation Instructions). All other personnel should follow the directions of the Floor Wardens.

## FLOODING

### Instructions for Disaster Team

In order to cope successfully with a flood emergency it is essential that the Disaster Team be very familiar with recovery procedures including location and sources of supplies and air drying and freeze drying techniques. Disaster preparedness must include a regular means of updating and communicating this information. The procedures in this section constitute an overview, not exhaustive instructions.

1. The Emergency Director (Donna Bourne-Tyson) or Assistant Emergency Director summons the Disaster Team (Section 9).
2. In case of a flood, certain materials should be available from the emergency supplies (see Appendix K.1). Further information on material resources, including inventory of supplies, is also in Appendix K.2.
3. The Emergency Director and Recovery Coordinator (Susan Harris) will evaluate the situation and decide whether the materials can be air dried on-site or if they must be removed to a freezer facility. If the materials damaged are not too numerous or too thoroughly soaked, air drying will be a viable option and a drying area will be required.
4. For detailed instructions on procedures to follow see Peter Waters' *Procedures for Salvage of Water-Damaged Library Materials* (Washington: Library of Congress, 1979, Z 701 W37). A summary of key steps adapted from the Waters book follows:
  - a. As soon as it is safe to enter the flooded area use mops or wet vacs to remove water.
  - b. In order to retard the growth of mould the temperature and humidity must be low. To accomplish this turn the heat off in winter and the air conditioning on in summer; use open doors and windows and fans to maximize air circulation and remove wet debris and/or carpet from the area.
  - c. Carefully move damaged materials to a work area which also has low temperature, low humidity and good air circulation.
  - d. Thoroughly soaked books and books with coated paper should be frozen as soon as possible. Wrap them loosely in freezer paper or wax paper and pack them flat in boxes, preferably plastic mil crates, for transport to a freezing facility. If they cannot be frozen before they dry, interleave the pages with un-printed newsprint or paper towels. If possible keep an inventory of books packed and removed to freezer facilities.
  - e. Wet books with covers intact can be air dried. Cover work table with un-printed newsprint or paper towels. Stand books wet end down. Do not fan pages; open the covers slightly and let stand while draining. Place paper towels between the front and back covers and the adjacent flyleaves. Change these towels and the towels or paper under the books frequently. As the books dry, slowly and carefully begin interleaving with newsprint or paper towels at intervals of 50 pages starting from the back of the book. Keep book upright during the interleaving/drying stage.
  - f. Books which are only wet around the edges can be interleaved with newsprint or paper towels working from the back of the book. Page 11.4 covers rehabilitation of salvaged materials in somewhat more detail.
5. Arrangements should be made to monitor the flood area for potential after-effects of water damage.
6. In the event that mould develops, see section 6 on rodents, insects and moulds.

**Assistance from the Canadian Conservation Institute**

[http://www.cci-icc.gc.ca/services/emergency\\_e.aspx](http://www.cci-icc.gc.ca/services/emergency_e.aspx)

If in spite of careful planning, the Recovery Coordinator (Susan Harris) has trouble locating supplies and salvage expertise, assistance may be obtained by placing a collect call to the Canadian Conservation Institute (C.C.I.) in Ottawa (866) 998-3721 or (613) 998-3721. This organization is ready 24 hours a day to provide advice, trained personnel, supplies, and other forms of assistance in the event of a disaster. (See Appendix J for a list of Conservation Consultants). Anyone calling the C.C.I. should provide the following information:

1. Your name, institution, location, and a telephone number where you can be reached.
2. The nature of the collection affected.
3. The type, extent, and severity of damage.
4. What action, if any, has been taken so far.



### Checklist

1. Determine the location and if possible the cause of the flooding.
2. Contact Library Administration (**3601**) or, after hours, Security (**4109**).
3. Library Administration will ensure that all electrical circuits in the affected area are turned off by Facilities Management. Avoid walking through any water until the electrician has been called in and has pronounced the area safe.
4. When safe to do so, the Disaster Team (Section 9) will remove the holdings from the affected area.

## **POWER FAILURE**

### **Checklist: General**

1. Inform Facilities Management (3345) to determine seriousness and length of power failure.
2. Institute security measures to take the place of any automatic security systems.
3. While emergency lighting is still available (approximately 30 minutes duration), evacuate the building, utilizing the warden system, flashlights and bullhorns. Offices, stack areas, stairwells and washrooms will have no light whatsoever once emergency power fails.
4. Check to see if anyone is trapped in elevators. Advise Library Administration (3601) and/or Circulation (3617), who will contact Facilities Management (3345) during regular hours and Security (4109) during evenings and weekends, who in turn will contact the elevator company to free any trapped people.
5. Listen to the battery-operated radio (located in the Circulation Department) for information.

NOTE: The impact of a power failure on an institution's holdings will depend on the difference between climatic conditions inside the building and those prevailing outside. In winter, the main danger will come from flooding caused by water pipes freezing and bursting. (See next page.)

### **Checklist: Stabilizing the Environment**

1. Monitor and record temperature and relative humidity. A thermo hygrograph is the ideal instrument for such measurements. One may be borrowed from the Dalhousie Art Gallery or Parks Canada (see Appendix **K.6**).
2. Close doors and vents. Allow only one door to be used for entering or leaving the building.
3. Limit the number of people in the building to reduce the need for fresh air.
4. Install an emergency power generator, available from Facilities Management (3345). Use it to power dehumidifiers, fans and other equipment to maintain constant temperature and humidity. This equipment may also be rented (see Appendix **K**).
5. If auxiliary heating equipment is inadequate, allow the building to cool slowly, while removing all sensitive materials to a “safe room” where above-freezing temperatures can be maintained.

If the weather outside is warmer and more humid than inside, the procedures will be similar to those outlined above, except that the generator will be used to power portable air conditioners and fans, rather than electric heaters.

The need to take steps to maintain a stable internal environment will vary according to the size and design of the building involved. The larger the building, the longer it will retain its original levels of temperature and relative humidity.

## VANDALISM

### Checklist

Vandalism is defined as malicious or ignorant destruction of property, especially that which is beautiful or artistic. Unlike theft, personal gain is usually not a strong motivating factor. Spite, vengeance, or simply thoughtlessness are more likely the reasons behind acts of vandalism. While theft may be deterred through stringent access control and by measures to make re-sale of collection materials difficult, such efforts will be less effective in deterring the potential vandal.

Short of monitoring all users in the institution, preventative measures for vandalism are few. Television monitors, patrolling guards and vigilant staff throughout the building should have some deterrent value. Priority should be given to the development and maintenance of a comprehensive user education programme. Such a programme will not, of course, eliminate all occurrences of vandalism; however, it should reduce the careless treatment of materials such as highlighting of selected passages, splitting of a book's spine when photocopying, etc.

1. In the case of minor vandalism (e.g. writing in a book, using a book as a doorstep), ask the patron to stop.
2. In the case of serious destruction of library materials or facilities, do not attempt to apprehend or interfere with the suspect.
3. If safe to do so, stop and take time to get a good description of the suspect. Note height, weight, sex, race, approximate age, clothing, method and direction of travel, and name if known. All this takes only a few seconds, and is of the utmost help to the investigating officers. If the suspect is entering a vehicle, note the license number, type and make of vehicle, colour, and outstanding characteristics.
4. Notify Library Administration (3601).
5. Find another staff member, preferably senior, who can act as a support and a witness where necessary.
6. Library Administration should follow through with disciplinary action through the University or the Police Department.

## **COLLAPSE OF SHELVING AND OTHER STRUCTURAL ACCIDENTS**

Collapse of shelving and other structural accidents, such as the collapse of a ceiling or a wall, can be the result of explosions, earthquakes, floods, or natural deterioration.

1. When structural damage occurs call Library Administration (**3601**) who will have the damage assessed and determine when it is safe to enter the area. If an accident of this nature occurs after hours call Dalhousie Security (**4109**) and the University Librarian (Donna Bourne-Tyson).
2. The Recovery Coordinator (Susan Harris) will assess the damage to the affected materials.
3. The recovery operation for library materials may include:
  - re-shelving
  - evaluation of damage and indication of repair options by the Disaster Team
  - decision making on individual items by subject specialists.

## RODENTS, INSECTS, AND MOULDS

### Instructions for Disaster Team

1. When standards of temperature, humidity and cleanliness are less than ideal, the collection may be subject to damage from insect and rodent infestation and mould. Many species of insects and fungi attack library materials. Insects such as cockroaches and silverfish will eat paper (for its cellulose content), starch paste, animal glue and leather bindings; mould will weaken and discolour paper; rodents can also destroy library materials.
2. In addition to a regular program of extermination the Library should be prepared to have infested material fumigated. The RLG Preservation Manual offers the following cautions in regard to fumigants:
  - a. They should be rapid and powerful in their fumigating action;
  - b. They should have no residual toxicity for humans;
  - c. They should have no adverse effects on the constituent elements of the material being treated. Consult a professional paper conservator or conservation scientist for suggested chemicals, application procedures, and precautions (see Appendix J.2 for Conservation Consultants).
  - d. Great care should be exercised in the application of fumigants, since even when a fumigant is listed as having low toxicity it can be extremely dangerous to human life if misused or handled without the proper protective equipment. These materials must be applied by an individual with the proper professional training.
3. When evidence of rodent or insect infestation is noticed, attempt to do the following:
  - a. Isolate the infested material from the rest of the collection.
  - b. Identify the type and extent of the infestation.

## Insects

Cockroaches consume all forms of paper and binding materials, especially those with pastes and glues. They are, in fact, omnivorous and will consume food remains, as well as other dead insects. Booklice, silverfish and firebrats consume carbohydrates (paper size, adhesives) in binding materials, magazine papers and photographs. They are found in conditions of elevated temperature and relative humidity. Bookworms, including the Furniture, Drugstore and Deathwatch Beetle, will consume and damage most collection materials including paper, cardboard, adhesives, etc. Flies pose a threat mainly to art and photograph collections. They are rapid breeders and their droppings are corrosive. Other insects hazardous to collection materials are clothes moths and carpet beetles.

A regular programme of building maintenance and good housekeeping should provide early warnings of any infestations and minimize the attraction of insect pests. All incoming materials, whether acquisitions or loans, should be checked carefully for signs of dormant or active infestation.

### In the event of infestation

1. Capture a specimen and have it identified. Date and location of capture should be included on the label. NOTE: A conservator or entomologist may find it difficult to identify a crushed specimen.
2. Immediately carry out an inspection to determine the extent of the infestation and transfer all infected materials to an isolation room or bag.
3. Identify the source(s) of infestation and eliminate it.
4. Where necessary have the materials treated by a professional fumigator. Ensure that chemicals proposed for any treatment are not harmful to collection materials.
5. Carefully vacuum the affected area and materials to remove dust, dirt, eggs, etc., before replacing the fumigated materials.
6. For minor infestations, use non-chemical means of control such as glue-boards wherever possible. For major infestations, extensive chemical treatments may be required. A conservator must be consulted. Chemical treatments may be hazardous to collection materials and human health and life.
7. After treatment, check collection materials regularly for at least six months.

## Rodents

As with insects, good housekeeping practices and regular building maintenance should also discourage infestation by rodents. Rodents are generally a seasonal problem in Canada. As winter approaches, the warmth inside a building becomes increasingly attractive to rodents seeking shelter from the cold.

### In the event of infestation

1. Eliminate all access points that rodents may use to enter the building. Plug all holes in foundation walls, particularly around water, sewer, and gas mains. Consultation with a pest control company may be helpful (Appendix **K.4**).
2. Eliminate accumulations of waste and debris. Ensure that eating and drinking are not allowed in collection areas and that left-over food from other areas is disposed of promptly and properly.
3. Use non-chemical means of control such as live traps wherever possible. Chemical treatments may be hazardous to collection materials and human health and life.
4. When necessary call in a professional fumigator (Appendix **K.4**).
5. Ensure that dead rodents are located and disposed of, as they may be a source of insect infestation.



## Moulds

### In the event of the development of mould or mildew

1. Immediately transfer all infected materials to an isolation room. As a last resort, seal materials temporarily in multiple garbage bags.
2. The affected area should immediately be thoroughly cleaned and sterilized, including the climate control system where possible.
3. Consult a conservator (Appendix J.2) when dealing with severely affected materials. If the number of affected items is small, Lysol may be used as a safe mouldicide under the conservator's direction.
4. Check remaining and treated materials periodically for evidence of new or recurrent growth.

### **Other**

Pigeons, raccoons and snakes are only some of the many animals that have been reported in Canadian libraries and archives. Live animal traps appear to be the best way of dealing with these “nuisance” problems. If the problem persists, one should call in a professional exterminator.

## **COMPUTER SECURITY**

### **Checklist**

1. Maintain an electronic inventory of all computer hardware, with serial numbers. Back-up copies of this inventory are located on the server housed in ITS.
2. Maintain an electronic inventory of all software installed.
3. Maintain back-ups of all computer files.

## **DISASTER RESPONSE TEAM RESPONSIBILITIES**

### **Emergency Director - University Librarian Donna Bourne-Tyson – 3601**

- takes overall charge of emergency situation and recovery operation (see Disaster Plan Flowchart, p. 8.3)
- proceeds with Recorder and Recovery Coordinator to assess the situation
- decides on rescue operation headquarters (taking into consideration site requirements)
- summons Disaster Team; issues authorized permit badges
- requests necessary arrangements from Facilities Management (heating, plumbing, electricity, communications, etc.)
- obtains necessary keys
- relays decisions to Recorder

### **Assistant Emergency Director - Associate University Librarian**

- organizes supplies and services as requested by Emergency Director (Donna Bourne-Tyson) and Recovery Coordinator (Susan Harris)
- advises Evacuation Coordinator (Janet Larsen) of dispersal and/or deployment of staff
- relays decisions to Recorder (Janice Slauenwhite)
- acts as information officer and coordinates release of information to University spokesperson in Communications & Marketing for release to press

### **Recovery Coordinator - Chair, Disaster Management Team Susan Harris – 2862**

- co-opts staff to assist with recovery operations
- marshals and directs the recovery operation
- estimates extent of damage
- in cooperation with Emergency Director establishes priorities of action
- decides on treatment area
- advises Assistant Emergency Director of supplies requirements
- advises Assistant Recovery Coordinator of sequence and methods of salvage
- relays decisions to Recorder

### **Assistant Recovery Coordinator - Head of Special Collections Karen Smith – 8803**

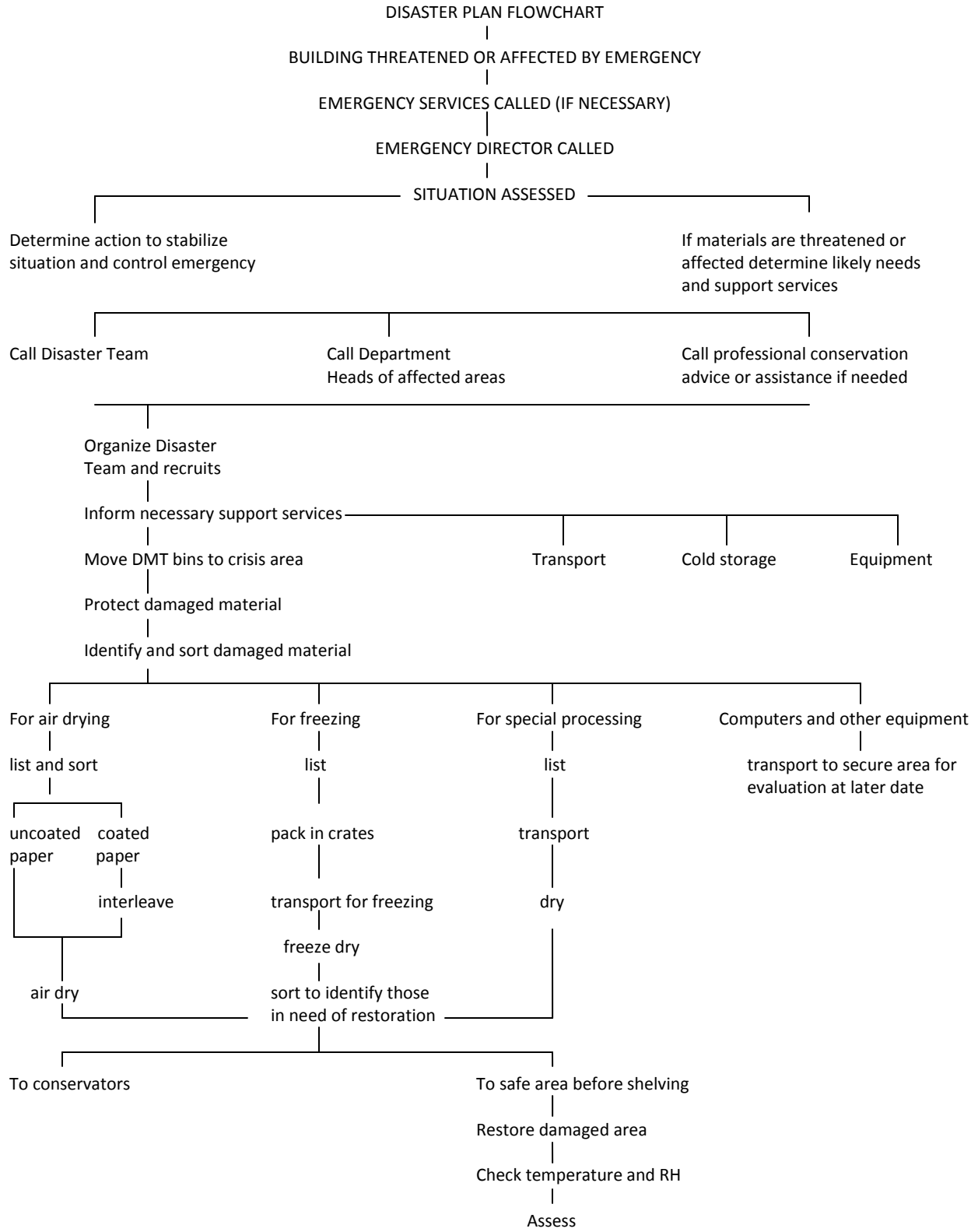
- receives information from Emergency Director and Recovery Coordinator re treatment centre, sequence of salvage operation, supplies and dispersal arrangements
- contacts outside agencies for assistance

**Evacuation Coordinator** - **Chief Warden**  
**Janet Larsen – 3617**  
**(Back-up – Assistant Head of Circulation**  
**Helen Wojcik – 3617)**

- marshals and directs floor wardens in building evacuation
- receives information from Emergency and Recovery Coordinators and coordinates further responsibilities of floor wardens
- supervises shutting down of elevators and the building

**Recorder & Secretary** - **Library Administration Secretary**  
**Janice Slauenwhite – 3601**

- proceeds with Emergency Director et al to record assessment of situation
- records information re extent of damage; recommended procedures; treatment centre; services and supplies requirements; agencies contacted; dispersal arrangements, etc., as directed by Emergency Director
- coordinates information compiled by above
- writes report following each disaster or incident
- acts as secretary and typist for Disaster Team
- assists Assistant Emergency Director with supplies and services
- assists with updating the Disaster Plan Handbook



## EVACUATION PROCEDURES

### General

The architecture of the Killam Library, with 30 peripheral external windows only 1.5 feet in width, makes evacuation of library materials more than usually difficult for the upper floors. In addition, the enclosed courtyard and the second floor west terrace are stressed for 100 pounds per square foot only and could not bear the weight of heavy machinery.

#### Basement

- without elevators, material would have to be hand carried up the staircases on the northwest, south or northeast sides of the building. If elevators are working, material can be evacuated from the lobby or the loading bay on the ground floor.

#### Ground floor

- large windows facing the atrium and facing west (from Technical Services) and north (from Library Administration) could be reached relatively easily for fast removal of material. Book trucks could be negotiated through the main front entrance and the public rear entrance on the north side.

#### 2<sup>nd</sup> – 5<sup>th</sup> floors

- since standard cranes cannot be used in the atrium, jib cranes could be installed on the roof for removal of material on the upper floors, lowering boxes to waiting smaller vehicles or conveyors located in the courtyard or on the perimeter of the building. Facilities Management will advise on details of equipment and its placement.

### **Evacuation Procedures for Emergency Director (Donna Bourne-Tyson)**

Fires or severe flooding necessitate the evacuation of all personnel from the building. This is done both to minimize the risk to human life and to enable firemen or other trained personnel to concentrate all their efforts on eliminating the source of the emergency. Considerable time can pass before it is safe to re-enter the building and commence salvage procedures. The Fire Marshall will not allow re-entry until the cause of the fire has been determined and the building is safe for personnel.

This lapse of time can be profitably used by the Emergency Director in assisting the Disaster Team. Firemen or police should be given details of the layout of the building, the location of valuable materials, chemicals and flammable materials. Tarpaulins can be provided by the fire department to cover shelving units and so protect materials from water damage. The Conservation Unit can also supply heavy plastic for this purpose if that area is accessible. Contacts must be made so that everyone involved in the salvage operation will be available once the go-ahead is given to re-enter the building.

#### **Immediate Action**

The Emergency Director will assess the situation.

The Emergency Director must call in the Disaster Team. The onus must be on this person to contact members of the Disaster Team and not the reverse. Well-meaning volunteers can tie up phone lines and thus disrupt salvage preparations.

The Emergency Director will advise staff of the situation and give any further instructions.

Depending on the nature of the disaster it may be necessary to contact and alert the following people to the situation:

- Insurance officer
- Suppliers of containers
- Representative from transportation company for freezer trucks
- Representative from cold storage facility (see appendix L)



## Priority for Removal of Library Materials

### Collections Inventories (A Group\*)

- Invoices (Serials, Order)

### Administrative Records (B Group\*)

- Personnel files
- Files from desk drawer of Administrative Officer

### Library Collection (C Group\*)

- Vault
- Archives
- Rare Books
- Special Collections
- Music

### Library Collection (D Group\*)

- Reserve
- Reference
- Stacks – begin from 4<sup>th</sup> – 2<sup>nd</sup> floors or vice versa depending on location of disaster
- Microforms
- Current Serials
- Technical Services backlog

\*The four groups, A – D will be working simultaneously to remove listed materials.

## **Organization of Evacuation Procedures for the Collection**

1. The Emergency Director (Donna Bourne-Tyson) should set up (in consultation with University Administration) a command centre with the following facilities:
  - Space
    - office space
    - conference room seating 10 – 15 people
    - small secure storage area (for items such as Administration personnel files)
  - Communications
    - telephone facilities
    - computer for live CD website
    - if off-campus need Ethernet connection
  - Furnishings
    - workstation
    - filing cabinet
    - conference table
    - 10 – 15 chairs
  - Equipment and supplies
    - 2 computers (1 to be used as web server)
    - printer
    - fax machine
    - stationery supplies
    - salvage materials
2. The Emergency Director (Donna Bourne-Tyson), the Recovery Coordinator (Susan Harris), an insurance officer, and the Recorder (Janice Slauenwhite) should assess the damage and evacuation priorities.
3. Support services, e.g. Facilities Management, Trucking and Security, cold storage facilities, should be alerted by Assistant Emergency Director.
4. The Emergency Director (Donna Bourne-Tyson) should inform Library staff and volunteers to assemble at a specific time in a treatment area selected by the Recovery Coordinator (Susan Harris).

### Sequence of Events at Treatment Site and Evacuation Site

1. At the Treatment Site the recruits, staff, etc., are divided into two groups – evacuation group (A) and recovery group (B). Care will be taken that each group has an equal number of able-bodied volunteers. Group A will be led by the Evacuation Coordinator (EC) (Janet Larsen) and Group B by the Assistant Recovery Coordinator (ARC) (Karen Smith). Coordinators will instruct recruits in the basic principles for determining degree of damage and how to handle wet material safely. The EC will give detailed instruction on packing techniques and the ARC will focus on damage assessment and air drying techniques.
  - a. The Emergency Director (Donna Bourne-Tyson) will consult with the Stack Supervisor (Janet Larsen) and Facilities Management personnel re the most effective mode for moving material out and will inform the EC; the Assistant Emergency Director will consult with Facilities Management to ensure that evacuation equipment is available; the Recovery Coordinator will contact outside agencies for assistance and request necessary supplies for treatment site.

2. Prior to leaving for the evacuation site all the recruits are registered, issued with an identification badge (different colours for each site), and teamed up into pairs, preferably one library staff member with each non-library volunteer. It is the responsibility of the EC and the ARC to ensure that all new recruits are registered and trained.
3. To ensure the continuity of the process at each site and in the event of the need for shifts, at least two library unit heads will be recruited for each site and instructed in the entire set of procedures instituted at each site. The Emergency Director (Donna Bourne-Tyson) will designate which unit heads will be selected.
4. The Assistant Emergency Director ensures that communication lines (radio or telephone contact) are established between the command centre and the two work sites and that catering is arranged for each site (e.g. coffee, juice, doughnuts, etc.).
5. At the evacuation site recruits are briefed on the conditions inside, the layout of the evacuation site and exits, the location of the material to be removed. Priority collections will be removed first. Two teams are assigned a stack. The EC checks each team to ensure that they fully understand the levels of damaged material to be salvaged, instructed in what is considered damp, wet, dry, and that they are supplied with boxes and markers to mark the cartons wet or dry. Full boxes of each damage type are marked and carried to a pre-determined safe, dry area (could be table tops) from where they can be transported out of the area.
  - a. The areas below and above the evacuation site are checked periodically and preventive action is taken if necessary under the direction of the Emergency Director. Parallel procedures to the other evacuation site are set up if required. The areas will continue to be monitored throughout the operation by the Stack Supervisor.
6. Depending on the volume of wet material, the Recovery Coordinator will determine if all the damaged material will be sent to the treatment site first for inspection or if wet material will be sent directly to the freezer. Dry and questionable material will be sent to the treatment site for inspection and immediate sorting for dryness. Air drying can be started immediately. The ARC will ensure that Facilities Management has properly ventilated the treatment site. The ARC will ensure that all teams are knowledgeable as to the level of wetness that can be effectively air-dried, what coated paper requires interleaving, and what materials need special processing (microforms, negatives, vellum, bindings, etc.).
7. The trained sorters will do an initial assessment of the level of damaged material in each box in a sorting area near the door. The damaged material types will then be carried to an area set up for air-drying or to an area for special processing or re-packed to be sent to the freezer.
8. The Recovery Coordinator, in consultation with outside conservation experts, will determine which materials require treatment beyond the resources of the treatment site.

## The Recovery Operation<sup>1</sup>

### Collection Identification

Salvage procedures should ensure that all identification labels and markings on collection materials remain as they are found. Should it be necessary to mark collection materials containers, it is recommended that soft (HB) pencils only be used. Waterproof labels are recommended. No attempt should be made to mark actual wet materials. Materials that have defaced labels or no label at all should be assigned a special number/letter and their location marked on a plan of the damaged area. This may appear to be a time-consuming task; however such action may save considerable time and expense later in re-cataloguing the materials.

### Care and Handling

Extreme care must be taken in the handling of all materials. Wet paper is extremely fragile, will tear easily and will not slide. Items found in aisles should be removed in the condition in which they were found. Books should not be opened, or if already swollen and opened should not be closed. Single sheet material should not be separated nor covers removed.

Materials should be removed by human chain or conveyor belt starting from the nearest accessible point to a nearby “dry” area where they can be packed. As each range of shelves or cabinets is emptied, the boxes/crates should be coded, according to original location and recorded. Wet boxes should not be re-used, rather the contents, perhaps only damp, should be re-packed in new containers and coded.

Materials should not be stacked on the floor to await removal and packing, nor should collection materials be stacked in large piles, as this will promote mechanical damage and reduce air flow around each item. All work areas should be kept as clean and neat as possible, and all debris, especially that which is wet, must be disposed of immediately.

The removal of large flat materials, such as maps or blueprints, may pose some problems. Do not try to separate such materials individually. In the case of map cabinets, the drawers with their contents may be removed for freezing. Excess water must be gently sponged off. If stored on open shelves, the flat materials may be transferred to bakers’ bread trays, empty drawers, large flat storage boxes, or plywood sheets covered with polyethylene sheeting in preparation for freezing.

Following the removal of the wettest materials, the partially wet and extremely damp items should be carefully removed. The remainder of the collections, the drier materials, can now be examined and removed to an unaffected storage area with a controlled environment. These materials should be provided with good air circulation as mould growth on external surfaces may be a possibility. Those dry or only lightly damp materials may not require further treatment. Following the disaster they must be checked for mould growth and moisture content for a period of six months to a year. As already stated, the temperature and R.H. of the affected and drying areas should be monitored. These R.H. readings are not indicative of the actual moisture content of the collection materials. The normal water content

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<sup>1</sup> Taken from An Ounce of Prevention. See bibliography for publications which give more thorough coverage.

of paper is between 5 - 7% by weight. Materials which feel only slightly damp may in fact contain 10 – 30% water. Moisture-content meters may be used on books or layered materials. The probe of the meter must be inserted extremely carefully so as not to damage the paper.

### **Cleaning and Washing of Collection Materials**

All cleaning and washing procedures must be carried out by carefully supervised, competent personnel and only on those materials that will not be further damaged by such treatment. No attempts should be made at this point to clean or wash opened volumes, manuscripts, art on paper, photographs or materials with water soluble components. An experienced conservator must be consulted and he/she will be able to advise personnel which materials can or cannot be treated.

Dirt and mud deposits may be removed from a closed book by washing it in clear, running water. To clean, the book should be held tightly under cool running water and the mud removed with a sponge, using a gentle dabbing motion. Rubbing and brushing should not be attempted. Stains or stubborn deposits should be left for later treatment. The remaining water should be gently squeezed from books with the hands only. No mechanical pressing should be carried out.

A more extensive washing procedure may be carried out using a series of large rust-proof containers (plastic garbage cans). Each container must be equipped with a securely-fastened hose to provide low-pressure continuous water flow. Books should be passed from one container to the next and the operations as above repeated. The books should be rinsed with a fine stream of water at the final station. This process is obviously wet and messy and ideally should be carried out in a suitable area with good drainage.

Note: Fine silt deposits should be removed before the materials have dried, but not on-site.

### **Photographic Materials**

Water-soaked photographic material should preferably be air dried as soon as possible, but freezing may be necessary if the material cannot be treated immediately.

At one time it was believed that photographic materials could not be safely frozen because ice crystals might rupture the emulsions. However, research undertaken by Klaus Hendriks and Brian Lesser of the Public Archives of Canada has demonstrated that freezing, far from seriously damaging still photos, helps to retard further deterioration.

### **Microfilm and Motion Picture Film**

To date, there has been little research on the effect of freezing on microfilm or motion picture film. In 1978, several hundred reels of motion-picture film were unearthed in Dawson City and found to be in remarkable condition, despite their lying in permafrost for half a century.

At present, Kodak recommends that microfilm and motion picture film be kept in clean, cold water and sent to the nearest film processing laboratory as soon as possible. For long trips, the materials should be sealed in polyethylene bags filled with 15 ml of 37% formaldehyde solution per litre of water. The bags should then be placed in a plastic container, such as a garbage can, filled with cold water and ice.

Black and white negative film can be kept in this state for up to three days before the emulsion separates from the film backing. Colour negative or positive film can remain in water for only 48 hours.

### Freezing

Freezing and cold storage at low temperatures has been found to be an effective method for the stabilization of water-damaged books, manuscripts, maps, prints and drawings (unframed), photographic materials, textiles and leather. These materials can remain in a frozen state for years without sustaining significant damage. Freezing and cold storage as a salvage method has many advantages:

1. Prevents further damage caused by diffusion of water soluble components.
2. Controls mould growth by inducing the dormant state in the spores. It is not a drying method and will not kill mould spores. If the materials are infested by mould, sterilization, i.e. ethylene oxide is recommended.
3. Arrests condition of materials, so that further damage will not occur.
  - Note: Saturated volumes damaged by immersion will increase in thickness still more in freezing; however this has been found to contribute no further damage.
4. Provides time in which to organize systematic drying operations, carry out further damage assessments and evaluate possible replacement requirements, estimate recovery costs and plan for rehabilitation of the building and future restoration of the collection materials.

### Preparation for Freezing

The condition of the damaged materials will determine how much time can be spent in preparation for freezing. Ideally, dirt and mud deposits should be removed. Bound volumes should be wrapped or separated with double-sided silicone release paper, freezer paper or wax paper to prevent their sticking together in the freezing process. Collections of sheet materials (e.g. manuscripts) should also be wrapped, the packages not to exceed 2" in thickness. Materials should not be stored tightly and containers packed approximately  $\frac{3}{4}$  full. Each wrapped volume/package should be coded and recorded. They may then be packed in interlocking plastic milk crates which are also coded and recorded. Strong cardboard boxes may also be used; however there are obvious disadvantages to this approach. Materials (e.g. over-size maps) that could not be removed from drawers may be transported as is.

The crates/boxes may now be moved and stacked on pallets in freezer trucks for transport to the cold storage facility. Dry ice may be used to freeze material for transport in unrefrigerated trucks.

Note 1: If the damaged materials are to be vacuum or freeze dried after freezing, materials may be carefully placed unwrapped, in milk crates.

Note 2: Recommended freezing temperatures range between  $-7^{\circ}\text{C}$  ( $20^{\circ}\text{F}$ ) and  $-20^{\circ}\text{C}$  ( $-20^{\circ}\text{F}$ ).

Note 3: If only a few items are water-damaged freezing can be done in a home freezer.

Once at the freezing facility the crates, boxes, drawers, etc., should be carefully stacked. Those containers without perforated sides should be separated from each other with wood slats to prevent crushing and to promote air circulation.

### **Rehabilitation of Salvaged Materials**

Not all materials are affected in the same way by water, smoke and fire. Shrinkage, loss of texture, charring, warping, cockling, insolubility and staining are only some of the forms that this damage may take. Moreover, much of the harm done to materials by fire, smoke or water is permanent and cannot be reversed. Even where charring is not evident, heat will have accelerated the aging process of paper and other materials and so will shorten an item's useful life.

Consequently, there is no panacea that can return a damaged item totally to its original state. Even if the rehabilitated document is still legible there will likely be some loss of aesthetic value. For this reason it may be worthwhile to first consider whether the item itself justifies the costs involved or whether alternatives to rehabilitation such as replacement are more realistic for information retrieval.

#### ***Alternatives to Rehabilitation***

In most instances the cost of conservation is greater than the cost of replacing the damaged item. The cost of drying out a water damaged book depends largely on its bulk, the distance from drying facilities, and the season of year. The cost of purchasing a replacement will vary according to its age, market demand, and its availability. Recent periodicals, for example, are inexpensive relative to their bulk and are usually easy to re-order.

If re-purchase is not possible, one may request another institution to photocopy, microcopy or photograph its copy of the damaged or missing items. However, if this other copy is fragile, oversize or already damaged, permission may prove difficult to obtain. Furthermore, not all materials lend themselves to photocopying, particularly if the inks are faded or the paper discoloured.

Sometimes the costs of restoration or replacement cannot be justified. Consequently, it may be better to accept the loss, rather than rehabilitate or attempt re-purchase of the item. However, no item should be discarded without thoughtful assessment. Such items must be carefully recorded and their values established in order to substantiate any insurance claim.

#### ***Drying of Paper and Books***

Many factors will determine which of the various methods of drying is best for wet paper, books and film in a given situation. Such factors as the number, the condition, the value, the importance and the frequency of use of water-damaged items, as well as time constraints, should all be taken into account. One should not overlook the possibility of using more than one drying method. The following includes the more common methods currently in use:

### **Vacuum Freeze-Drying**

Vacuum freeze drying is the most effective way to dry large quantities of water-damaged materials. In this process, the frozen materials are placed in a chamber from which the air is removed to create a vacuum and carefully controlled heat is applied. As water goes from the ice phase to the vapour phase (sublimation), heat is lost. If this heat is not replaced, the temperature of the material is continually lowered, thus slowing the drying process due to evaporative freezing. Because of the lowered air pressure (vacuum), the water sublimates directly from the solid to the gaseous state (i.e. from ice to vapour), thus eliminating further water damage. Extreme care must be taken to ensure that the materials are neither under nor over dried. Excess water removal will result in the embrittlement of paper.

The main drawback of vacuum freeze-drying is its high cost. For small numbers of items neither rare nor valuable, other methods of drying should be considered. As most vacuum freeze-drying facilities in Canada are associated with food-processing plants, there is the additional problem of keeping water-damaged items separate from food being stored or processed, so as to eliminate the possibility of contamination. Regulations under the Meat Hygiene Act require the plant to send a letter to the Health of Animals Branch of the federal Department of Agriculture, seeking permission to process non-food items.

### **Vacuum Drying** (not generally recommended)

Vacuum drying offers a less expensive alternative for drying large numbers of wet materials. Much confusion exists in the literature between vacuum freeze-drying and vacuum drying. The main difference between the two is that the latter uses a vacuum to pull the water out, after which, warm, dry air is pumped into the chamber to complete the drying. If frozen materials are vacuum dried, some water will sublimate from ice to vapour. Most of the water, however, will first pass through the liquid state before vapourizing. Consequently, vacuum dried materials will show some feathering of inks and other water-soluble dyes.

The main problem with the vacuum drying process is the limited capacity of currently available facilities. Given a collection of one hundred thousand water-damaged books, it would take more than 3½ years to dry them out. This may be an unacceptable length of time for a collection frequently consulted by many users. (See Appendix L for freezer facilities.)

Note: Radiant heat may be used inside the vacuum chamber to speed up the drying process (vacuum freeze-drying and vacuum drying). However, the use of such heat may cause acids to migrate from papers having a high acid content to those having a low acid content. Early manuscripts and rare printed books should not be mixed with acidic and embrittled materials. In addition, the gelatine sizing in the paper of early printed books may move towards the edges and thus stain or embrittle the paper. Vellum and leather bindings undergo shrinkage when dried under radiant heat.

### **Air Drying**

Air-drying is an old and still popular drying method, particularly where the number and value of the damaged items do not warrant more expensive methods. The principal drawback of the air-drying



method is the large amount of space required for drying. It is also very labour intensive, and, unless one has volunteer help, the cost in staff-hours can be quite high.

In air-drying, the frozen (or wet) books are stood upright in a well ventilated room. As the frozen (or wet) pages open naturally, they are interleaved with white blank absorbent paper (e.g. paper towels and blank newsprint) which is changed frequently. Fans should be set up to assist circulation of air. Gentle settings are recommended. No attempt should be made to wipe off mildew, as such treatment will only rub the spores and staining deep into the pages and covers. Items showing signs of mildew or mould should be isolated and bagged, apart from the other books and sent for evaluation by the RC or ARC (see page 6.4).

Care must be taken not to interleave too much as this will cause the spine of the book to warp. Interleaving should not exceed one-third of the book's thickness. If the spine when viewed from the bottom has a concave shape, due to interleaving or to water swelling the leaves, the volume should be hung to finish drying on three or more short lines. Ideally, monofilament fishing line should be used with dimensions of not more than one thirty-second of an inch in diameter, not more than six feet long, and about one-half inch apart from each other. Books that are saturated with water or weigh more than six pounds should not be dried in this manner, owing to the stresses that such a weight places on the binding. Moreover, in the case of wet books, adhesives may migrate down from the spine and cause staining, as well as adhesion of adjacent pages. Heavy, saturated books should be stood upright on head end and air-dried with front edges supported.

The separation and drying of single sheet material, such as manuscripts, prints or drawings should only be undertaken under the supervision of a conservator. If the sheets can be separated they can be laid out on clean white blotting paper or un-printed newsprint on table tops in a warm room, with good ventilation to remove the excess moisture. Dehumidifiers may be necessary to bring the relative humidity down to a reasonable level.

The drying of books printed on coated paper also demands special care (i.e. frequent fanning of the pages) to ensure that the pages do not stick together.

Note 1: A range of 21° - 25°C (70° - 77°F) is recommended for air-drying wet items.

Note 2: The suggested conditions for air-drying books with wet edges are 50° - 65°C (10° - 18°F) and R.H. of 25% - 35%.

Note 3: Coated pages may be separated and interleaved with paper towel while still wet or frozen when wet, followed by vacuum freeze-drying or vacuum drying. If coated paper is allowed to dry, it will be impossible to separate.

Note 4: The rate of water removal during drying may be determined by weighing (before and after). This is however, impractical for large collections.

### **Other Drying Methods**

Other methods of drying have, to date, proven unsatisfactory. Microwave and dielectric drying can lead to charring and burning of materials other than paper in books (e.g. leather covers, certain adhesives, metal foil). Moreover, the rapid evaporation of water by this process produces vapour explosions in the covers and inside pages of coated paper.

## **Prints and Processed Film**

If one does not have access to professional drying facilities, the following procedures may be tried:

### Black and White Prints

1. Place the prints in a tray and fill it with cold water.
2. Agitate the tray and change the water several times.
3. After half an hour, drain off the water and hang the prints up to air-dry.

### Colour Prints

As above but with reduced wash time.

### Processed Films

To be sent out for professional evaluation / treatment.

## **Drying of Magnetic Tape**

Seek advice from appropriate professionals. Based on their assessment the following actions may be taken:

1. Wash the exposed edges with clean water and leave the tapes to dry without heating.
2. Once dried, fast wind the tape against a felt pad (without the tape contacting the heads) to remove dried foreign matter from the oxide and base surfaces. Little can be done to clean cassettes and cartridges because most designs do not permit them to be opened up to clean off mud or other contaminants. As a last resort, they may be opened and cleaned as above.
3. Once cleaning has been completed, re-record on to a new tape. A decision can then be made as to whether the original will be discarded or saved.

Care must be taken during cleaning to ensure that the tape labels are not lost or put back on the wrong tapes. A wax crayon may be used to identify the tapes temporarily while they are cleaned and dried.

## **Drying of Phonographic Records**

Unfortunately, there is little that can be done to effectively treat abraded and deformed phonographic discs. Undamaged discs with surface deposits can be washed in a 1% solution of a non-ionic wetting agent such as Kodak Photoflo solution or Lissapol TN 450 in distilled water. A soft brush should be used to carefully dislodge particles. This solution should be thoroughly rinsed off with distilled water and the disc placed vertically in a rack and left to dry slowly at ambient temperature, away from heat and sources of contamination.

Note: Shellac, acetate and vinyl discs should be washed in separate containers.

**Drying of CDs and DVDs**

Seek advice from appropriate professionals.

**Drying and Evaluation of Computer Equipment**

Seek advice from Dalhousie University Libraries' Systems Manager.