[This version of the report was reconstructed from a 2002 original in 2019]

CONSERVATION ASSESSMENT PROGRAM

INSTITUTE OF MUSEUM SERVICES & HERITAGE PRESERVATION
2002

NEW ENGLAND WIRELESS & STEAM MUSEUM, INC.
1300 Frenchtown Road
East Greenwich,
Rhode Island 02818

Contact Terry Jones (781) 784-2739

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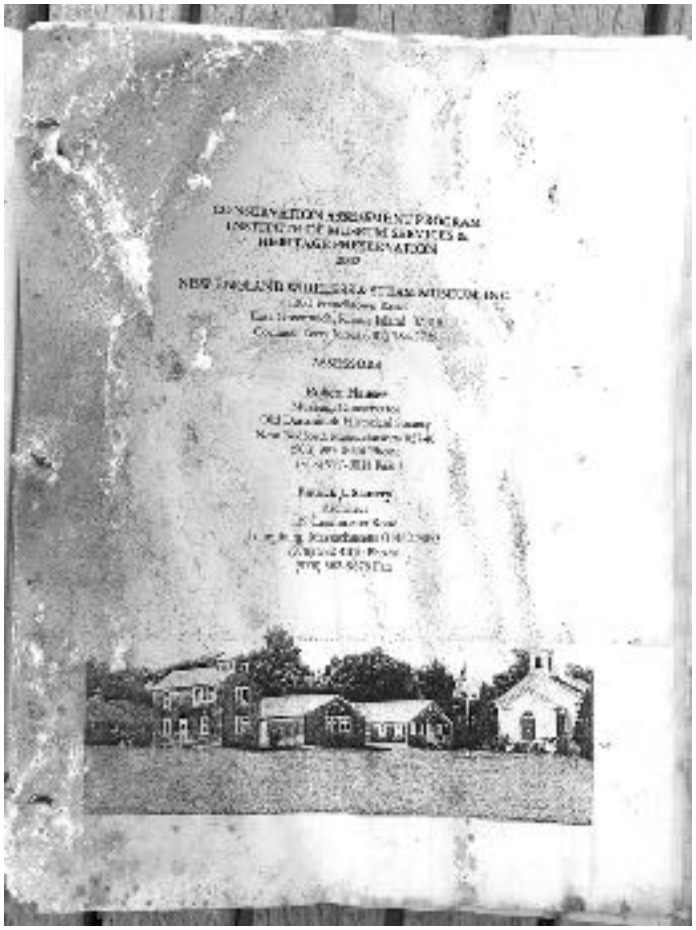

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CAP CONTENTS

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ART & ANTIQUE PRESERVATION

December 23, 2002

CAP SUMMARY LETTER

Terry Jones
Robert & Nancy Merriam
New England Steam and Wireless Museum
1300 Frenchtown Road
East Greenwich, R.I. 02818-1424

Dear Mr. Jones and Mr & Mrs Merriam:

The NESWM is to be congratulated for being awarded a Heritage Preservation CAP (Conservation Assessment Program) held on October 17-18,2002. Special thanks to Mr.Jones and Mr. & Mrs Merriam for making my visit a friendly and constructive experience.

The NESWM has made fine progress developing a museum of technology devoted to the history of steam and wireless. My written report is primarily concerned with suggestions and comments that will promote care of the collection.

The contents of my report follows the CAP format including a binder with selected supporting resources, technical information and photo documentation. Study of the supporting materials will explain in more depth standards and procedures mentioned in the report.

Each CAP chapter begins with my first recommend priorities (i.e. 1.1) followed by other suggestions and comments (i.e.2.1 etc). This doesn't mean other suggestions and comments are less important and shouldn't be considered priorities now or at a later date. The chapter on Sites & Structures will be provided by CAP architect Patrick Slattery.

THE NESWM BOARD OF DIRECTORS SHOULD REVIEW MY PRIORITY SUGGESTIONS (ie. 1.1) AND SET LONG-TERM PLANNING GOALS THAT ADDRESS THESE SUGGESTIONS AND OTHER ISSUES WITHIN FIVE YEARS OR LESS.

Considering all the suggestions and priorities for preserving the collection I would first give attention to fire and water damage prevention. This includes relocation of the library and solving environmental and mold problems.

My best,

/s/Robert Hauser/s/

Robert Hauser
Conservator/CAP Assessor/Fellow AIC
508-763-3146 phone/fax e-mail: rhauser@neaccess.net

I. GENERAL INFORMATION SUGGESTIONS AND COMMENTS

1.1
The NEWSM “mission statement” was written some 15 years ago. The present format shares promotional and mission statement language that repeats information that could be omitted or more concisely written (i.e. "...by reason, not rote ” or “...let other institutions scramble after whatever is the rage of the moment”).

Review how other institutions have written mission statements (i.e. Slater Mill, Hagley Museum, Rhode Island Historical Society, Heritage Harbor Museum, Boston Museum of Science, etc.)

The mission statement needs to be revised and words like archival, preservation, teaching, educational, scholarship, collecting, scientific need to be better defined. Review with the American Association of Museums (AAM) guidelines for writing mission statements.

1.2.
Is the mission statement going to serve as a legal document or guideline? Should the mission statement be part of the by-laws? A mission statement should be reviewed every five years and the governing board vote on any changes. The by-laws should limit the time someone can serve or how often.

1.3.
I am pleased to read “Preservation is a big part of our mission ”. However, NEWSM doesn’t have a written preservation program or line budget for preservation. Review if funds and preservation priorities are being given equal attention. Funds seem more dedicated toward steam machinery and building operations.

Significant improvements at preserving the library will be required (photos 5.6.7.22.34.35.36.37.38.39.40.41.42.). Consider moving the library into the Mayes Building and developing the site as a research center. With improved building and environmental controls (is an addition possible?) the archival collection can be better organized, preserved and accessible to scholars, teachers and the public.

The Meeting Hall basement library space could then be used for storing less environmentally sensitive objects. This site could be used for selling deaccessioned objects or the museum store location. This wold keep retail activities separate from collection and research activities. Could handicap bathrooms be installed for customers or people renting The Meeting Hall. With bathrooms this would increase renting and income opportunities.

1.4.
Consider if the Wireless Building (photo 18.) needs to be rebuilt with new exhibit and storage spaces that would include the story of steam as part of the building’s purpose. The building could then be named The Steam and Wireless History Building.

2.1.
NEWSM has many collection, preservation, exhibit and educational goals. Review how many of these goals should be attempted before developing an endowment that can support them.

2.2.
Consider working toward AAM accreditation as an institutional goal.

II. STAFFING SUGGESTIONS AND COMMENTS

1.1.
NEWSM is without an organizational chart that illustrates governance of the museum. Developing a formal organizational chart would document roles of the owners, governing board, staff and volunteers. Are written job descriptions needed for some positions?

1.2.
Does the governing board follow by-laws regarding voting, number of years served, nomination protocol, maintaining meeting notes, etc.?

1.3.
Consider if committees should be formed to study:

a. Financial and endowment planning.
b. Long-range building and facility management.
c. Long-range collection preservation.
d. Educational programs and membership.
e. Development of a collection committee.

1.4.
Should NEWSM join more professional organizations and provide dedicated funds for staff and volunteers to attend annual meetings and workshops? Individuals attending these events can share learning experiences with the entire staff and volunteers. This will demonstrate to the community, donors and funding agencies NEWSM is committed to promoting professional standards.

2.1.
NEWSM volunteers are primarily interested in operation of the steam machinery and wireless equipment. Equal volunteer or professional assistance is needed for organizing and preserving the library Collection.

Would it be possible to find professional volunteers within the community or regional educational institutions. I understand the University of Rhode Island has a library studies program and their interns might be interested in NEWSM's library projects.

2.2.
Consider sponsoring a technology workshop for regional school teachers. Teachers would then be encouraged to develop programs about NEWSM's mission and visit annually. Student projects in technology could be developed with annual scholarship prizes awarded by NEWSM..

2.3.
Consider developing a facility volunteer group that would assist with the care of the grounds, buildings and security.

2.4.
Are volunteers organized in a way that avoids conflicts over authority, procedures or goals? Is it better for volunteers to remain autonomous? How would a potential volunteer be refused from joining and/or asked to leave without causing criticism. If a volunteer is injured or discriminated against is NEWSM liable in anyway?

III. SITES & STRUCTURES

The New England Wireless & Steam Museum, Inc. (hereafter referred to as NEWSM) is situated on approx. 5 acres of open, rural land and is made up of 6 wood framed buildings of varying ages and utilizations. They include the following:

1	Wireless Building	(former milking bam ca. 1940)
2	Massey Wireless Station	(former wireless station at Point Judith, RI ca. 1907)
3	Steam Building	(built for Museum purposes ca. 1972 & 1981)
4	Mayes Building	(built for Museum purposes ca. 1989)
5	Meeting Hall	(former Baptist Church ca. 1825)
6	Barn	(built for Museum purposes 2002)

Each of the 6 buildings was visited, viewed and measured as part of this report. Degrees of code compliance, building condition and accessibility were noted and reviewed.

The buildings are unique unto themselves and have provided for the display needs of the Museum during its existence. Condition of the structures varies. Although in excellent repair for the most part, certain elements have and will require and increasing degree of maintenance if the utilization of the Museum is going to continue to develop.

A couple of the structures have historic significance and will need to be scrutinized carefully if they are going to maintain their historic character and meet the necessary compliance issues as publicly accessed buildings.

It is not, in my opinion, reasonable or necessary to analyze each structure individually as there are common elements within each building which affect all of the buildings as they related to Energy Codes and Building, ADA and Fire Code compliance. Taken as a whole they adequately serve the present needs as defined. An analysis and long range plan is necessary to determine the viability of enhanced use however.

The NEWSM is facing a crossroads in its continued development. If the Museum wishes to become a full service year round facility, then substantial upgrades are going to be necessary to insure proper compliance with applicable codes. Recent occurrences in Rhode Island have led to a heightened awareness with respect to code compliance and the NEWSM will be faced with upgrading and in some cases retrofitting building elements related to emergency lighting, fire protection, handicapped accessibility, and general egress from Assembly areas.

An inevitable aspect of growing the Museum, if that is part of the long range plan, will be the realization that some of the quaintness of the facility is bound to be lost as the code mandates are introduced. There are some allowances and trade offs as referenced for historic structures, however energy codes in particular would be very difficult to comply with the existing structures.

Even if the Museum chooses to maintain its current status as a seasonal use with limited heat controls and minimal insulation, other elements related to emergency lighting, handicapped accessibility and fire prevention will be a major component of any increase in building size or additional site structures which might be considered.

SUGGESTIONS:

1. Consider providing a lightning protection system for the buildings. Even if, as represented, lighting is not a usual occurrence, it would be an appropriate expenditure due to the buildings location, proximity to each other and accessibility for fire vehicles.

2. Consider hiring an Architect or Engineer to provide an in-depth code study and report based on-applicable Rhode Island Building, Fire, Energy and Accessibility Codes as they affect each of the structures which serve within an Assembly Use Group and have access for and by the public. This would include in particular a check of applicable flame spread and smoke contributed ratings of all interior finishes. A recent catastrophe in Rhode Island has heightened awareness of interior finishes within buildings open to and used by the public.

5. All building repairs and maintenance are performed on a regular as needed basis. Deferred maintenance necessitated by schedule conflicts or funds availability can be detrimental to the long term viability of the structures. Develop a planned maintenance schedule for routine items and monitor its effectiveness.

4. With respect to any contractors or subcontractors employed to work at the building, be certain that they are staff supervised and provide workmen's compensation and public liability insurance certificates.

5. Develop a Capital Plan Budget, listing those items requiring periodic replacement and the anticipated time frame for doing so and create a timeline/budget spreadsheet that can be used for maintenance budget planning purposes. An example of a typical planning budget was provided to the Museum. As part of this analysis include a parking plan and a schedule for providing a degree of paved parking for handicapped parking and site accessibility.

6. Currently the NEWSM has plumbing and electrical contractors available on an "on call" basis. Consider having a priority response arrangement with back up contractors in the event of a major problem. Individuals would be posted in the NEWSM and with Director, Asst Curator, Treasurer, Directors, etc. (See Emergency Preparedness Section).

[See building drawings in building_drawings.pdf]

IV. ENVIRONMENTAL

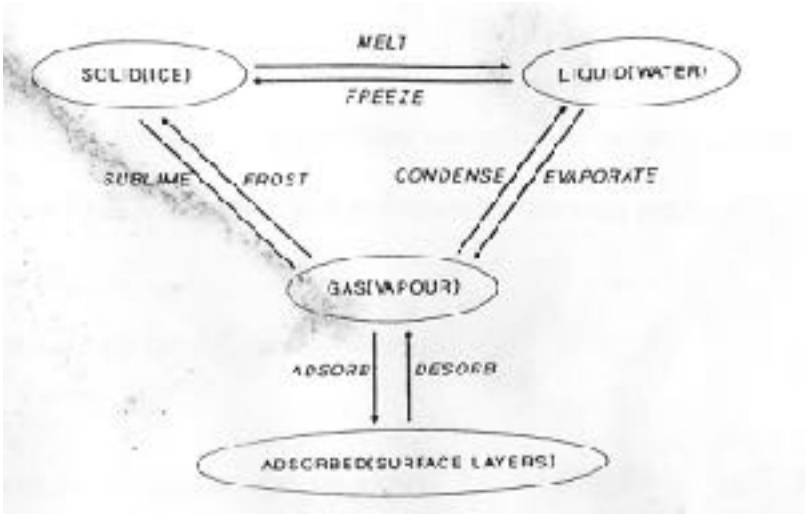
A. AIR QUALITY AND LOCAL CLIMATE SUGGESTIONS & COMMENTS

1.1.
NEWSM should document the air quality (i.e. pollutants, particulates, etc) and local climate (i.e. temperature, humidity, rainfall, etc) of East Greenwich to determine how these conditions might effect the care of collections and buildings.

Monitoring information about these conditions can be obtained from the Environmental Protection Agency (EPA) and R.I. Department of Environmental Affairs.

B. TEMPERATURE & RELATIVE HUMIDITY

All materials are eventually affected by the environment in which they are stored or exhibited. The environmental agents - relative humidity and temperature as well as pollutants and light can cause, at different levels, varying degrees of physical, chemical and biological deterioration.



Various processes undergone by moisture involving phase changes.

The storage and exhibition of collections in environments that stabilize and reduce these deterioration processes will extend the material life and quality of the objects in question. The optimum environment based on open storage and exhibition sites for diverse collections is suggested by the Library of Congress as:

A. Environmental Standard: 45(50)55%RH 66(68)70 F.

B. Environmental Changes:
Daily +/- 3%RH +/- 2F *
Annual +/- 5%RH +/- 2F.

*Smithsonian Conservation Laboratory research suggests variations in environmental control can be greater depending on the materials from which objects are made.

These standards assume the following exceptions:

A. When storing and exhibiting dozens or thousands of differently composed materials with different tolerances the temperature goals generally should be subordinated to the humidity goals.

B. If material types can be stored (sometimes essential) or exhibited within specific and isolated environments, the standard will change for each type being considered for environmental care.

Some suggested standards for different materials:

1. Books, Documents, Works of Art on paper	45-55%RH	66-70 degrees F
2. Photographic Mediums	30-40%RH	50-55 degrees F
3. Textiles	40-60%RH	60-65 degrees F
4. Wood Artifacts	40-60%RH	60-68 degrees F
5. Glass & Ceramic	30-40%RH	50-65 degrees F
6. Canvas Paintings	40-60%RH	60-65 degrees F
7. Ivory & Bone i	60-70%RH	50-55 degrees F

While extremes in temperature may promote oxidation reactions (i.e. hastening discoloration of painting pigments, acid hydrolysis of paper, etc.) or desiccation (hastening wood, ivory, & photo emulsions shrinkage), it is relative humidity that is the catalyst which accelerates the processes of deterioration.

This is demonstrated by the changes in the moisture content of objects (material objects have a “moisture equilibrium content” which in turn is affected by the relative humidity of the air. The more the moisture is absorbed or released from an object, by changes in relative humidity, the more chemical, dimensional and biological damage will occur).

"*At times, depending on the collection, low temperature may need to be subordinated to low humidity needs. For example, when air is at 60 degrees F and 60%RH, it would typically suit most paper-based collections better to have the air warmed to 65 degrees F so that its humidity will drop to less than 50%RH. This is the technique used at some major research libraries on moist, cool days to reduce relative humidity in their stacks.*" – W. Lull

If relative humidity exceeds 65% relative humidity for 24 or more hours, within room temperature, it will promote the germination of some two dozen fungi spores commonly found within museum environment Once fungi has germinated into mold it can only be controlled by reducing relative humidity (once mold has formed it will remain active to a lesser degree below 65% relative humidity) and/or using vacuuming and applied fungicides (although fumigation with ethylene oxide was an effective way to kill spores and insects, it has been discontinued for safety reasons and another toxic/gas fumigant for killing spores has not been developed). The higher the moisture content of an object, the higher the potential for mold development.

Once an object has become saturated, it can possibly take hours or months for the moisture to be released or evaporated into a controlled environment. In theory, a book that weighs one pound (16 ounces) can typically have a 10% moisture content or 1.6 ounces in moisture content and 14.4 in other materials. As the moisture percent increases so does the moisture vapor and weight of the book increase as illustrated.

MOISTURE CONTENT	Moisture content by weight		OTHER SOLIDS	TOTAL BOOK WEIGHT Ounces
10%	1.6 Ounces	+	14.4	16.0
20%	3.2 Ounces	+	14.4	17.6
30%	4.8 Ounces	+	14.4	19.2
40%	6.4 Ounces	+	14.4	20.8
50%	8.0 Ounces	+	14.4	22.4
60%	9.6 Ounces	+	14.4	24.0
70%	11.2 Ounces	+	14.4	25.6
80%	12.8 Ounces	+	14.4	27.2
90%	14.4 Ounces	+	14.4	28.8
100%	16.0 Ounces	+	14.4	*30.4

ENVIRONMENTAL SUGGESTIONS AND COMMENTS

Summary

NEWSM is closed during the winter months. When needed electric baseboard heating is used in the Mayes Building (photo 1.). Heating in the Meeting House basement library uses oil heating with hot air wall vents (photo 37.). Some vents are blocked by library materials. During summer months temperature and humidity are as nature provides.

1.1.
Environmental readings were taken (October 19,2002 at 10:00-12:00pm) using a Dickson portable meter. These are “snapshot "readings and shouldn’t be used without further documentation to manage NEWSM environments.

Readings:

Mayes Building	63F	59%RH
Steam Building	60F	48%RH
Wireless Building	58F	54%RH
Massey Station	57F	43%RH
Church Library	66F	48%RH

The temperatures range from 57-66F (9F drift) and relative humidity from 43-50%RH (16% drift). At these levels it is unlikely mold will be active. However, during a humid summer I assume humidity levels will be high for the development of mold. A high moisture content or the "object humidity ” within hydroscopic materials will promote biological, mechanical and chemical forms of deterioration. Humidity and moisture condensation can corrode metal machinery, wireless and radio metal components including mold on library cloth, leather and paper bindings or documents.

Suggest a conservation specialist be consulted to evaluate deterioration effecting wireless and radio objects. I have contacted conservator Ebenezer Kotei at the Hagley Museum (refer e-mail letter dated October 25,2002) as someone who has this kind of knowledge. Review Hagley Museum website at https://www.hagley.org/about-us, The Antique Wireless Association at http://www.antiquewireless.org/ and W1TP Telegraph Museum at http://w1tp.com/.

1.2.
Homasote ceilings in the Wireless Building and Meeting House basement library have acquired mold and mildew problems (photos 19.20.21.). Portable dehumidifiers are used at these locations (photos 42.43.). However, I am not sure they have the capacity to handle high humidity levels. Evidence of mold (i.e. Mucorales) and mildew (i.e. Erysiphaceae) in these locations suggests these dehumidifiers do not control humidity within museum standards.

Homasote ceilings are very hydroscopic and become easily saturated absorbing a percent of the ambient humidity in the colder seasons and releasing this humidity during the warmer seasons. This environmental cycling contributes to the biological, mechanical and chemical deterioration of objects.

NEWSM needs to consider replacement of these ceiling to avoid having a “sick building”. A recent example of a sick town hall building is documented in the three attached articles published by The Sentinel on October 17,21,24,2002. The articles illustrate a collection and public health problem at the Rochester Town Hall that NEWSM should try to avoid.

It may be possible with professional cleaning and environmental controls the ceilings could be saved. However, be sure mold and mildew have not developed deeper within the building structures. Consider having a environmental engineer and restoration company study these

conditions. Remember without proper environmental controls the mold and mildew will eventually return.

2.1.
Consider developing a environmental monitoring program that will document the best and worst environmental conditions before making decisions about correcting problems. Suggest use of digital data loggers (direct reading, wired or transmitted data) like those made by the Onset Corporation. The Hobo or LCD series should be reviewed including other data logger products. Environmental data can be collection monthly and review if it can be used with the PassPerfect 971 software.

2.2.
NEWSM has direct draining dehumidifiers operating in the Mayes Building basement (photo 11.), Meeting Hall Building basement library (photo 42.43.) and the Wireless Building (photo. 20.). The lack of visible mold and mildew in the Mayes Building basement suggests this dehumidifier is controlling biological activity. However, without more checking and environmental monitoring this condition can't be confirmed.

2.3.
A library of 20,000 objects has the potential to collect high levels of moisture content that will increase the risk of mold and mildew development including insect and pest activity.

Hygroscopic materials will hold different amounts of "object humidity" that will promote mold and mildew activity.

2.4.
Review the effectiveness of present dehumidifiers and if they need to be better maintained or if newer or more commercial models are needed. Dehumidifiers now have digital controls for selecting a desired relative humidity and alarms can be added to them if humidity exceeds standard.

From: U of D Mail [kotei@UDel.Edu]

Sent: Friday, October 25,2002 10:58 AM
To: rhauser@neaccess.net
Subject: wireless radios

Dear Mr. Hauser,

Sorry I did not reply this enquiry earlier. I was..away for a few days and I do not have a way of reading my mail while away from my desk.The collection you described sounds very interesting.

Most of the earlier radios would normally be made of metal and plastic parts. The plastics would range from colorful or [??}ry-looking types which are based on nitrocellulose, to Lucite which are acrylics. Other materials you would find are wood, coated fabrics to simulate leather, and other fabric types such as silk or nylon that are normally placed over speaker fronts.

You might observe some corrosion on iron rods and screw hardware. Nitrocellulose plastic will, after some period of time, lose its plasticity and begin a process of disintegration. This process normally starts with color change (yellowing for light-colored ones), followed by crystallization. Initial stages of crystallization would look like short lines (cracks) in the plastic. In the final stages nitrocellulose will break into pieces and fall apart. At this stage, it is a fire hazard and should be removed from storage. Rob, none of your collection may have nitrocellulose plastic in it so don't be alarmed.

Old lucite acrylics sheets normally become hard and brittle. They don't fall apart the way nitrocellulose does, but they crack and break sometimes. Sometimes these breaks are due to dimensional movements of other parts such as wood, which are attached to the lucite casing, normally by screws.

Storage for these things always poses a problem, due to the fact that they are normally composite objects. Plastics are best kept in cool temperatures. In fact, here at Hagley, our nitrocellulose plastics are in cold storage. But it is not always possible to do this, nor is it necessary if only a small part of the item is plastic. Moreover, not all plastics need to be in cold storage. My recommendations are:
- Cool temperatures 65 deg. F, 45% rh. You might want higher rh for objects with mostly wooden parts.
- Clean environment at all times

I only wanted to dwell on the plastics because I know that you know all about wood, metals and fabrics. But coated fabrics can present problems sometimes. As they become dry and brittle, the coatings may crack and flake off the surface of the fabric substrate. Watch out for those. If I can be of any more help please don't hesitate to write.

Ebenezer Kotei
Objects Conservator
Hagley Museum & Library
Wilmington, Delaware 19807

To: 83917@udel.edu
Subject: N.E.Wireless & Steam Museum Request

October 20,2002

Dear Ms. Kotei:

I am conservator(speciality paper) with the New Bedford Whaling Museum in Massachusetts. I am currently doing a CAP Assessment of the New England Wireless and Steam Museum in Rhode Island.

The NEWSM has hundreds of wireless instrument, radios,
etc and will require a object conservator with this kind of preservation knowledge.

I have friends who belong to The Society of Industrial Archeologist and have visited your institution in the past.

As objects conservator at the Hagley Museum I thought you might advise me about conservators (including yourself) with this kind of special knowledge and skills (i.e. what is best environment for radios and
how do some the early "plastics" deteriorate, etc.?).

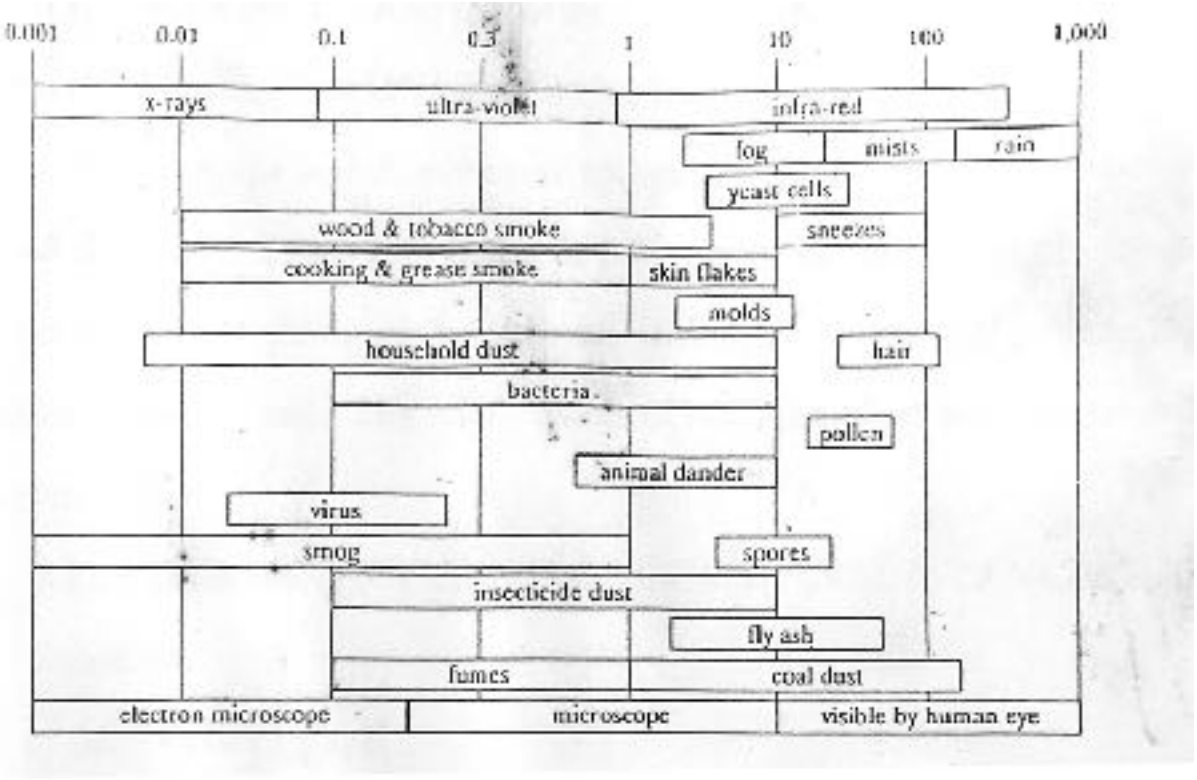
I thank you for any advise you can provide or interest you might have in the NEWSM.

My best,

Robert Hauser
rhauser@neaccess.net

(IV.) C. POLLUTANTS & PARTICULATES

Particle Size of Common Air Contaminants
(in microns)



Under ideal conditions, the unaided eye can see particles as small as 10 microns (1 micron = 1 micrometer = 1 millionth of a meter). The eye of a sewing needle measures about 749 microns. The height of an average U.S. postage stamp measures 24,400 microns.

Air is mostly composed of gaseous nitrogen, oxygen, argon, & carbon dioxide. This natural air can include forms of gaseous pollutants caused by outdoor and indoor sources. These include hydrogen sulfide, nitrogen oxides, ozone, ammonia, & sulfur dioxide (the latter when combined with water vapor and oxygen produces sulfuric acid). When these acidic and oxidant pollutants reach certain concentrations they will cause silver to tarnish, leather to red-dot, brittle hydrolysis of paper, fading of fabric dyes and watercolor pigments, glass silica corrosion, etc. Conventional HVAC systems do not normally filter gaseous pollutants found in renewed or circulated air since these can be smaller than 0.1 micron (1 micron = 1/25,0OO of an inch). Institutions with HVAC systems should consider filtering 80% or more of particulate matter that can be introduced or that passes through most mechanical filters and is deposited within the exhibits and collections. The filters used should attempt filtering visible dust at 10 microns or lower.

Reducing the size and amount of particulate is important since particulates can carry pollutants and spores. A great deal of the latter is reduced when filtering particulates at 10 microns or lower since "mold" spores are within these sizes. The less spores found within a building, the less chance these spores will germinate at 65% relative humidity at 68 degrees F. The combination of poor environmental controls, filtering, ventilation, circulation, & cleaning, can increase acidity, corrosion, oxidation and bio-deterioration of collections. The relative sizes of pollutants and particulates is further illustrated.

RELATIVE PARTICLE SIZES OF COMMON SUBSTANCES

1. Mist (water spray)	40-500 microns
2. Hair	60-100
3. Pollen/Plant Spores	*10-100
4. Mold	4- 4
5. Fog (visible steam vapor)	2-40
6. Asbestos Fibers	3-20
7. Dust	1-100
8. Bacteria	0.3-50
9. Industrial Fumes	0.1-1
1O.Tobacco Smoke	0.01-1
11. Viruses	0.005-0.03
12: Gas Molecules (steam gas)	0.0006

** Particles of 10 microns or larger are visible with the human eye. The most common airborne particle size is 2.4 microns. The average vacuum cleaner only filters particles from 30-50 microns. A metric micron is a millionth part of a meter i.e. 1 meter=39.37 inches. A micron is so small that 400 would fit on this dot (.).*

Pollutants and particulates are not greatly reduced by central air conditioning or window units with filters (the latter only reuses and circulates air within a room). Understanding the physical dynamics of pollutants and particulates will improve preservation of collections, selections of control methods and avoid "sick building syndrome" that might affect health of staff & visitors.

"Air pollution inside a building is normally greater by about ten times than outside air. The air-borne impurities are contained and concentrated, and accumulation occurs. The outdoor air is constantly being purged and it gets washed when it rains or snows. The indoor air must depend on gravity to eventually settle the air-borne particulates. Indoor air can be purged and the accumulation of pollution can be diluted by bringing in clean air with exhaust and make-up air systems, or filtration can be employed. Air pollution is identified primarily by an overabundance of small air-borne particulates and/or gases, vapors and mists. These particulates are air-borne because they are very light.

"Gravity causes these fine particulates to fall to the floor at speeds slower than five feet per minute. The very fine particulates, as in tobacco smoke and oil smoke fall as slowly at 0.1 inch per minute. Because of their light weight the slightest air turbulence or air current in a building will cause the impurities to remain in the air for a long period of time. In a building the air circulates from one side to another and from the floor to the ceiling. The heavier particulates will settle sooner than the light ones." – Toyenco,Inc.

HVAC designs have certain airflow potentials and the better the filter the more this airflow will be restricted. Far better to select your filter efficiency first and then be sure your airflow allows

for this filtering. Central air filtering and use of room air purifiers share many of the same mechanical and electronic technologies.

"Purifiers are indeed effective at trapping dust and pollen - if the particulates remain airborne. But don't expect a purifier to have much effect on smoke smell. The molecules that cause odors are gases, and cannot be trapped effectively, even by the thin 'carbon' filters, that most purifiers advertise. Just as odor molecules are beyond the practical abilities of home, air purifiers, other gas molecules are too elusive to be effectively trapped by these units. We tested the air purifiers for their effectiveness at removing smoke particulate and dust. Our tests measured each model's 'clean air delivery rate', or CADR, the equivalent in cubic feet per minute (cfm), of how much fresh air the unit is providing. It is no coincidence, that the models with the highest CADR's also tend to have the highest airflow rate.

"Other factors being equal, the more air a purifier processes, the faster it can remove pollutants. To remove particles, the models use one or more variations on two basic technologies, i.e., mechanical filtration and electrical attraction. Here is how the various types work:

1. HEPA 'high efficiency particulate arresting' filters are made of densely packed fibers that are pleated to increase their surface area.

A. PF HEPA, more loosely packed.

B. EF HEPA, made of polyester mesh that's electrically charged during manufacture

2. EP 'electrostatic precipitators' charge air and particles as they enter, electrically polarized metal plates then attract and hold charged particles.

3. IONIZERS 'high voltage through needles or fine wire and the charge air molecules then attract airborne particles'". – Consumer Reports "Air Purifiers" 2/89

Another reason for filtering building and outdoor air, is concern with formaldehyde off-gassing, commonly found in plywood, particle board, latex paints; used in the construction of exhibit and storage materials. It is also widely known that formic and acetic acids, which can be released by wood products, may cause serious damage to lead-containing alloys and other metal, stone, ceramic, shell and organic materials.

"*There is always some formaldehyde in any outdoor or indoor environment: outdoor levels vary from 0.01 parts per million (ppm), or higher, in congested urban areas, to as low as 0.0005 ppm in Antarctica. The current OSHA level is 3ppm for workplace exposure, although NIOSH recommends a maximum of 1 ppm for the workplace. Formaldehyde can build up inside exhibition cases over a period of years. The corrosion of metal objects housed in plywood or particleboard storage cabinets and exhibitions cases usually happens after relatively long periods of time, rather than immediately after installation. It should be noted that formic and acetic acids are found in wood and may lead to the presence of formaldehyde alone.*"
– P. Hatchfield & J. Carpenter

To achieve filtration of gaseous pollutants with the systems mentioned (remember ionizers and electrostatic precipitators generate ozone) the use of "activated charcoal filters" will likely be needed.

In conjunction with central gaseous and particulate filtering, the proper type of portable vacuum cleaner used for cleaning "dust" particulate in exhibit and storage spaces can reduce or distribute particulate into the air. The conventional vacuum cleaner with paper bag containers will usually only collect particulate up to 50 microns at 30% efficiency with smaller particulate exhausted into the room. The HEPA and "water filtering" vacuums can collect particulate at 0.3 microns at 99% efficiency (remember visible dust can begin at 10 microns).

VACUUM CLEANING TOPICS

1. The average six-room home in a city, or in the suburbs, accumulates forty pounds of dust a year.

2. The average vacuum cleaner only filters particles from 30 to 50 microns, thus exhausting harmful, respirable allergens and dust back into the air.

3. The contents of a vacuum cleaner bag must be considered potentially dangerous. One gram of household dirt, as collected by a vacuum cleaner was demonstrated to contain as many as 5,000,000 germs. All samples of dust obtained showed high, undesirable counts of bacteria.

4. High efficiency particulate air (HEPA) filtered vacuum cleaners are very efficient. In order for a filter to be so named , it must retain all particulates to 0.3 microns in size, at an efficiency rating of 99.7%, and some HEPA filters have been rated at 99.99% efficiency. The use of "water filtering" vacuums are another choice and can be as efficient as HEPA mechanical filtering types.

POLLUTANTS AND PARTICULATE SUGGESTIONS & COMMENTS

Summary
The Wireless, Massey and Steam buildings have no heating. The Meeting Hall basement library has central heating, and the Mayes building has electric heating. Smoking is not allowed in any of the buildings.

1.1
Review efficiency of central heating air filters in the Meeting Hall (photos 10.43.44.). Most mechanical filters should filter particulate at 10 microns or the size of visible dust. If the heating system allows for smaller particulate filtration is should be considered. The better air quality the more objects are protected from grime, pollutants and dust and the more people are protected from allergens, odors and airborne spores.

1.2.
Some sources for pollutants and particulates might be from within the buildings. Emissions from the heating furnace in the Meeting Hall might be exposing staff to unsafe pollutant levels. Confirm if the fresh air exchange meets health regulations.

Is evidence of mold on library book (photo 39.) a sign of poor ventilation? Could this happen in other locations (photos 2.3.5.7.9.19.22.25.36.)?

1.3.
Suggest installing a carbon monoxide alarm (might discuss this with fire department) in the furnace and library. Fire departments will assist with testing carbon monoxide and other pollutants.

Review the potential for oil furnace "puff backs" and how this might be prevented with careful maintenance. Does NEWSM insurance include cleaning soot from a "puff back"?

Consider purchasing a ventilation chemical cabinet for the storage of products that might be contributing to poor air quality and present a fire hazard (photos 9.44.46.).

2.1.
Review techniques and products used for dusting and cleaning collection. Are some techniques to aggressive (rag for dusting) and might impact dust and grime into objects? Are some products, to intrusive(chemical cleaning solutions) and might discolor or corrode some objects?

Review removing dust with an air can or small brush using a vacuum hose to collect airborne particulate. Review the use of a "tacking cloth" or "soot sponge" that will trap or confine particulate preventing it from becoming airborne.

Review vacuum cleaning equipment and if a HEPA vacuum cleaner (filters particulate at 1 micron or less) would be more efficient and cost effective maintaining the collection.

2.2.
When fabricating exhibits or indoor structures consider the potential for “off-gassing" of sulphur, acetic acid, formaldehyde, etc.from adhesives, chemicals, woods, varnishes, plastics and paints. The “off-gassing" might corrode, oxidize or discolor objects. Obtain Material Safety Data Sheets (MSDS) for building and cleaning products to avoid or reduce these public and collection hazards.

(IV.) D. ILLUMINATION

The electromagnetic spectrum, or light, when it enters the earth's atmosphere, generally is reflected (25%), absorbed by the atmosphere (25%) and finally absorbed by the earth (50%). The wavelengths of light are expressed in nanometers, i.e., na. = a millionth part of a millimeter, with light not reaching earth at about 270 na. From about 270-300 na. light will not pais through glass, and at 400 na. it leaves the ultraviolet spectrum and begins the/visible spectrum.

Table 3. SUMMARY OF UV CHARACTERISTICS FOR VARIOUS LIGHT SOURCES

Light Source		**Typical UV µW/L**	**Typical %UV**
Sunlight			
	Direct or South	400	10%+
	Overcast or North	800	20%+
	Blue Sky	1600	40%+
Incandescent			
	Standard	60-80	4%
	Tungsten-Halogen	130*	4%
	Low Voltage	60-120	4-8%
Fluorescent			
	General	40-250	2–12%
	Special Low UV	<10	<0.5%
High intensity Discharge			
	Mercury Vapor	400+	10–20%+
	Metal Halide	400+	10-20%+
	Sodium Vapor (LPS & HPS)	<10	<0.5%

**with glass filter*

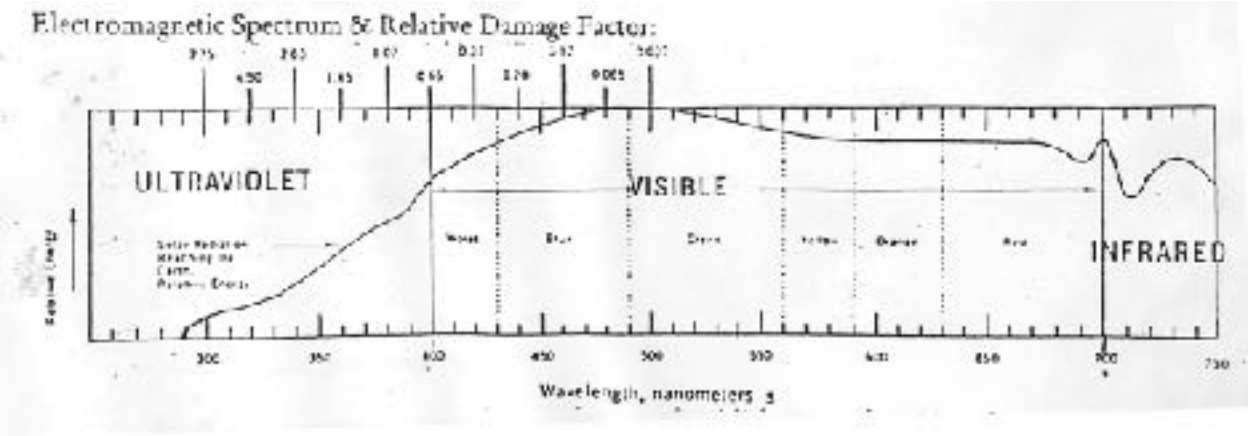
(Table was developed from Reference 2, pages 168 and 175; and from table provided by Edward K. Robinson, March 1981.)

Summary of UV characteristics for various light sources. The visible spectrum ranges from 400-700 na. which the human eye or retina sensors detect, as different light frequencies or colors (i.e.: violet, blue, green, yellow, orange, & red). From 700 na. and beyond, the spectrum is composed of infrared and radio wavelengths. Wavelengths within 300-500 na. are considered the most damaging photochemically and are composed of high frequency, short wavelengths, diminishing to low frequency, long wavelengths (this rule is typical of the entire spectrum).

The photochemical damaging wavelengths are high in electromagnetic-radiant energy and when absorbed by an object, increase the molecular activity of the object and in turn increase temperature and photo-oxidation resulting in faded pigments, brittle paper, textiles, leather, etc.

Relative light damage by different wavelengths is based on a logarithmic scale with the relative damage doubling for every 28 nanometers decreased. The exposure of collections to light must always be considered, as well as the period of time collections are exhibited. Conservation scientists are suggesting that, depending on their light sensitivity, objects should only be exhibited in, & limited to, certain foot-candle hours per day, month, year, decade, & century. All light sources will eventually exact photochemical damage according to the "Law of Reciprocity." Strong light over a short period will do about as much damage as weak light over a long period. Strong light might be considered only "invisible ultraviolet energy and weak light might be considered only "daylight visible light energy. However, daylight contains both. Ultraviolet must be measured using a UV microwatt meter (75 microwatts/lumen standard for museum objects) and visible light must be measured using a foot-candle or lux meter (1 fc = 10.76 lux). What five foot-candles and 80 microwatts might exact in 10 years, then possibly 50 foot-candles and 160 microwatts might exact in 10 weeks. The reduction of ultraviolet light levels must always be attempted.

"Light speeds up oxidation and thus the chemical breakdown of paper & all organic materials, a process which is sometimes called a "slow fire. Oxidation is a complicated series of interactions, which results in the breakdown of the polymeric structure of organic materials. In our context "organic materials" include everything that comes from animal or plant sources."
– Jared Bark



The reduction of ultraviolet spectrum/energy from artificial lighting and visible infrared levels is desirable as UV content is higher in fluorescent sources than incandescent sources and this is reversed for amount of radiant heat emitted. When attempting to reduce foot-candle/lux levels to achieve recommended illumination standards, it often means the overall watt output is reduced and this is a money saving bonus.

The Illumination Standards for Foot-candle/Lux and Materials:

A. Extremely Sensitive: Paper, textiles, watercolors, color photographs, parchment, etc.	2.5 - 5.0 fc. or 25-50 lux.
B. Moderately Sensitive: Furniture, oil & acrylic paintings, ivory, reed-grass materials, leather, lacquered, polychrome & wooden objects, etc.	5 -15 fc or 50 -150 lux.
C. Least Sensitive: Ceramic, glass, porcelain, etc.	15 - 30 fc. or 150 -300 lux.
D. Negligibly Sensitive: Stone, metal, etc.	30 -100 fc. or 300 - 1000 lux.

Consider survey of bulb sources used for watt reduction, substitution between incandescent and fluorescent types, use of UV incandescent filters and low-zero fluorescent bulbs, review of objects and proximity to light sources, etc. Control of artificial light sources is much easier compared with natural daylight.

"*The use of natural light from windows to light exhibitions in museums is usually out of the question for several reasons. There is no control over the angle of light or the amount of light in changing weather conditions - and it is impossible to control glare...*" – B. Appelbaum

ILLUMINATION SUGGESTIONS AND COMMENTS

Summary
The Wireless (photos 19.20.21.22.), Mayes (photos 1.2.9.) and Meeting Hall basement library (photos 36.41) Buildings have fluorescent lighting. The Wireless (photo 19.), Meeting Hall (photo 1.), Steam and Mayes Buildings have incandescent lighting. The Massey, Steam, Mayes and Meeting Hall Buildings have daylight illumination (very little with the Wireless Building). Some outdoor emergency lighting is used (photo 14.).

1.1.
The potential for daylight damage to the collection is mostly found in three of the five buildings.

a. The Massey Wireless Station (photos 24.25.) windows allow daylight and ultraviolet levels of exposure to a few photo sensitive objects.

b. The Mayes Building (photos 1.5.) windows allow daylight and ultraviolet levels of exposure to a large variety of photo sensitive objects.

c. The Meeting hall windows (photos 27.28.29.30.) allow daylight and ultraviolet levels of exposure to a few photo sensitive objects. However, the basement library windows (photos 35.41.) allow daylight and ultraviolet levels of exposure to a large photo sensitive book and document collection.

Review and test window daylight foot-candles and ultraviolet levels and if museum illumination standards are being followed. Are objects periodically rotated to reduce light exposure that would cause photo oxidation or fading of mediums and finishes?

Review if some objects are being exposed to "light strikes" for ten minutes or two hours. Light strikes over time will cause the same damage higher levels of light do in a short time.

1.2.

Review use of window filtering shades, drapes and blinds that offer outdoor visibility while reducing illumination. Review applying ultraviolet filtering window film. Film on windows provides additional security from glass breakage during a storm, accident or burglary. A study of filtering and security films should be made before installing "just any film."

When appropriate use ultraviolet filtering glass when framing. This will further protect the framed object and prepare it for use under different lighting conditions.

2.1.
Suggest an inventory of artificial incandescent and fluorescent lighting bulbs being used. A inventory will determine which bulbs contain unacceptable levels of illumination or ultraviolet light.

Fluorescent and incandescent lamps are used without ultraviolet filtering bulbs, lens filters or covers. Review the use of filtering bulbs, lens or covers that will remove or reduce ultraviolet emissions. Consider the use of fiber optic lighting (has no heat or ultraviolet emissions) with future exhibits, etc.

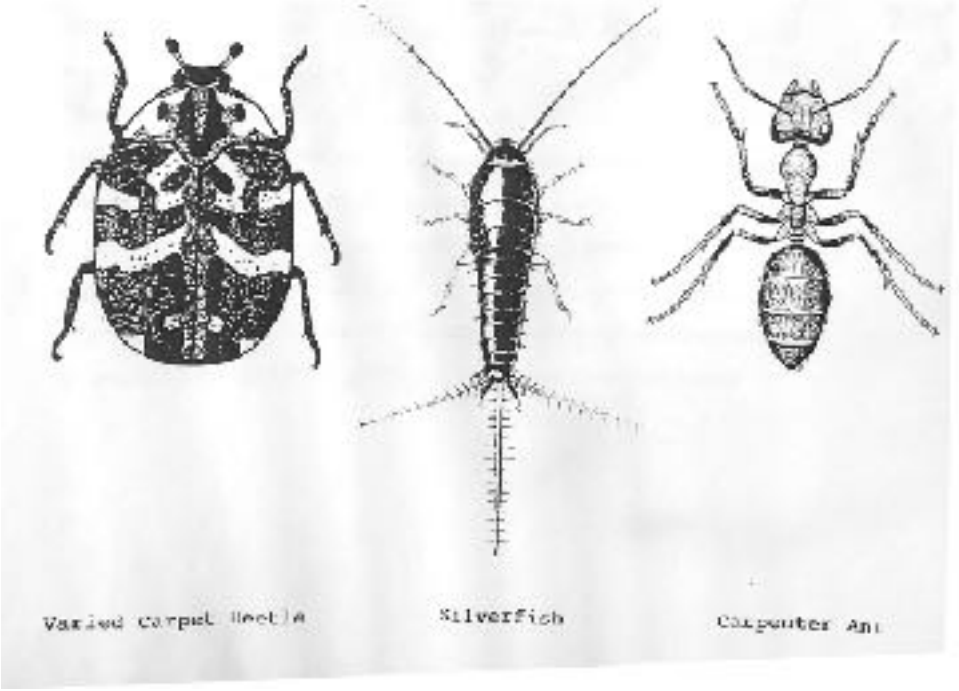
Study if heat from lamps in the Wireless Building are to close to objects. Consider the improved use of dimmers or automatic motion detection lighting as a way to reduce artificial illumination.

2.2.
Consider if task (illumination on object) and ambient (general illumination) lighting are well designed. The proper use of task and ambient illumination should bring down the overall foot-candle readings and still meet aesthetic, visual and safety needs.

(IV.) E. PEST/INSECT CONTROL & FUMIGATION

Insects are considered arthropods or having "joint limbs and require oxygen, in turn, producing carbon dioxide through the use of a tracheae tube system instead of lungs. Insects develop in two distinct ways by:

1. Gradual or Incomplete Metamorphosis
These stages or cycles include: a. egg, b. nymph (nymphs increase in size with each moult and shed each new moult skin), and c. adult insect. These include silverfish, booklice, firebrats, cockroaches, etc.



2. Complete Metamorphosis
These stages or cycles include: a. egg, b. larva (larva increase in size with each moult and shed each new moult skin), c. pupa, d. adult insect. These include beetles, moths, ants, etc.

Insects are attracted to various types of nutrients like wood, paper, textile cellulose, fur, feather, baleen, & wool proteins. Generally insects will breed best above 77F (25C), slowly at 59-68F (15-20C)1and unlikely below 50F (1OC). Insects are dependent on water to different degrees, some using air moisture and others by conversion of the moisture content in nutrients. The lower the air relative humidity (suggested 50%RH) and moisture content of the object, the more likely insects will become inactive.

There can be hundreds of wood-boring species that infest soft or hard woods in different conditions, at different temperatures and relative humidities. The most common infestation of wooden structures and artifacts is caused by the insects "Lyctus (Powder Post Beetle) and "Anobiid (Furniture Beetle). They typically have eggs hatching in 6-15 days; a larval period of 60-270 days; a pupal period of 12-27 days; eggs to adult 78-300 days (complete metamorphosis cycle) with adults measuring 2.0-5.0 mm and larvae 3.0-5.0 mm. Additional information about these insects:

1. "*Powderpost and Furniture Beetles represent several families of wood-eaters in North America. Their presence is detected from small round holes in wood surfaces and fine powder ("frass") that pours out of the holes. The adults lay eggs in the wood, and the larvae eat*

channels in the wood parallel to the grain, but avoiding the surface. New adults eat holes in the surface of the wood, fly away, and burrow into another object to lay their eggs, or go back to the same hole. Most become inactive at wood moisture contents levels below 10% or below 55% RH and long periods at low-RH levels make some unable to reproduce... However, eggs can lie dormant for long periods, and the hatched larvae can still eat a great deal."
– B. Appelbaum

2. "*There are two common wood-boring beetles, the Powder and Furniture beetle. The true Powder Post Beetle attacks mainly sapwood in unseasoned hardwood (false Powder Post Beetles may attack the soft woods, pine and fir). The Furniture Beetle larvae attack both hard and soft woods. They are able digest cellulose and prefer old wood. The female lays eggs on the end grain of old flight holes or unpainted rough surfaces. The emergent larvae chew into the wood below the egg case and tunnels are filled with powdered wood fibers and fecal pellets. The fecal pellets are cigar shaped, whereas the feces of the Powder Post Beetle larvae are soft and silky. The larvae pupates are just below the surface of the wood in an oval chamber. The emerging adults chew through the surface of the wood to make the flight holes. (Note: After about one year's development, the adults leave 1.0 to 1.5 mm diameter exit holes. '...it is difficult to determine if there are viable larvae present in the interstices of wood; even the presence of fresh frass may be misleading, and may only be the result of vibration.')"*
– D.Pinniger & M. Florian

If possible collect a specimen of the insect or residue for identification by an entomologist and contact a qualified exterminator (ask if firm is state certified, a member of the National Pest Control Association, etc). Further detection of insect types and extent of infestation might be studied by inspection of collections and use of sticky, pitfall and pheromone attracting traps. Once an evaluation has been made of the insect(s) involved and extent of infestation, decisions will need to be made if chemical insecticides and methods (i.e spraying, dusts, aerosols, strips, fogging, etc) or if toxic fumigation methods (with or without a vacuum chamber using methyl bromide, paradichlorobenzene, sulphuryl fluoride, etc.) need to be employed. Any toxic methods used must research the potential effects of insecticides or gas fumigants on staff, public and collections, keeping in mind that all methods do not prevent re-infestation, especially if the original causes have not been corrected. Any museum insecticide or fumigation program should involve a licensed pest control firm, independent entomologist and conservator familiar with museum pest control methods and chemical agents.

If collections are stored in poor locations and/or environments (i.e near damp walls, floors, etc.) without being inspected and cleaned of dust and grime, these sites otherwise will attract infestation by the common museum insects, silverfish, carpet beetles, powderpost beetles, booklice, clothes moths, etc. Cleaning the interior of the building, by removing grime (possibly dead insects which attract other insects as a food source) from voids in walls, flooring, & behind furniture is critical if infestation is to be prevented. These precautions are preferred over the routine use of perimeter chemical spray insecticides which may carry health & safety concerns.

Besides using toxic chemicals to repel or kill insects, conservation scientists have been researching alternative non-toxic fumigation methods, which will eventually replace the need for most toxic solutions. These include the use of inert nitrogen, argon and carbon dioxide gases in a fumigation chamber or vapor proof plastic bubble and bag. Other non-toxic methods employ low oxygen depletion within a chamber or bubble, causing respiratory asphyxiation of insects; and/or freezing certain artifacts at -10/20F (-23/29C) for 24 hours or more. Any method used should be designed to kill the egg, larval, nymph, pupa and adult stages.

VARIED CARPET BEETLE

Scientific Name: Anthrenus verbasci (L.)

Description: Adult varied carpet beetles are about 1/8-inch long and generally round in appearance. The wing covers meet at the rear end of the body in a smoothly rounded fashion with no apparent cleft. The back of these insects are spotted with gray-yellow, brown, and white scales. The underside of the body is gray to yellow.

The larvae are 3/16- to 1/4-inch long and wider at the end of the body than at the head. They are covered with a series of light-and dark-brown stripes that run across its body. They have three dense tufts of bristles at the rear-end of the body that extend outward when they are disturbed.

Biology: The adult beetles live 14 to 40 days and are pollen feeders. They are good fliers and can enter homes through open windows. The females lay about 40 eggs in a lifetime and these eggs hatch in 10 to 20 days. The larvae feed on a wide variety of foods, including carpets, woolens, skins, furs, stuffed animals, leather bindings on books, feathers, silk, and plant products, including cacao, corn and red pepper. The favorite larval food, however, is dried insects or spiders, thus these insects are terrible pests in dried insect collections. The larvae develop in 200 to 300 days and remain as pupae for 10 to 13 days. There is one generation per year.

Control: Inspection is the important first step in the control of varied carpet beetles. These insects are usually first noticed when adults appear. The larval infestation can be just about anywhere, and therefore, stored clothing and carpets, especially in non-traffic areas and stored foods should all be checked.

Thorough sanitation to remove and destroy as many larvae as possible is a good second step. Infested food materials should be discarded and rugs, carpets, and clothing should all be brushed or cleaned. Insecticides should be applied carefully to cracks and crevices along baseboards, under furniture, and other areas likely to be infested. Allethrin, bendiocarb, bioallethrin, chlorpyrifos, diazinon, fenvalerate, malathion, phenothrin, propetamphos, pyrethrins, and resmethrin can all be used for varied carpet beetle control.

SILVERFISH

Scientific Name: Lepisma saccharina L.

Description: Silverfish are primitive (older than cockroaches), wingless insects that are 1/2-inch long when fully grown. They are covered with silvery scales and are flattened and somewhat "carrot shaped. Three long, slender "antennae-like appendages project from the end of the abdomen, giving them the name "bristle tails."

Biology: Silverfish are tropical insects that are able to survive in the environment man creates in his home. They are found living in warm (71-90 degrees Fahrenheit), moist locations in the home and are most often found damaging books, cloth, and sometimes dried meats or dead insects. They seem especially fond of the sizing on books and paper as well as the glues and pastes found on wallpaper, labels, and paper products.

The female lays eggs singly or two to three at a time, often depositing them in crevices or under objects. The female molts after laying a batch of two or three eggs and may shed her skin as many as 50 times after becoming an adult. The eggs hatch in about 43 days at 72-90 degrees Fahrenheit. The young silverfish look exactly like the adults, except smaller, and feed on the same foods. Under ideal conditions they molt every two to three weeks and become adults in three to four months. These insects are very long-lived, commonly living two to three

years. The silverfish are unlike other insects in that they continue to molt after they become adults.

Control: Silverfish are easily controlled with carefully applied residual insecticide sprays and dusts, including acephate, allethrin. bendiocarb, boric acid, chlorpyrifos, diazinon, fenvalerate, malathion, propetamphos, propoxur, pyrethrins, pyrethrins plus diatoms, or pyrethrins with silica gel. Care should be taken to treat wall voids, cracks and crevices, and other suspected harborage areas thoroughly. The same careful application of residual insecticides used for good cockroach control is needed to effectively control silverfish. Sanitation is helpful but may not greatly reduce the problem because these pests feed on so many paper products.

LYCTID POWDERPOST BEETLES

Scientific Names: Lyciusplanicollis (LeConte) — Southern Lyctus
Lyctus cavicollis (LeConte) — Western Lyctus Beetle
Lyctus brunneus (Stephens) — Brown Lyctus Beetle
Trogoxylon parallelopipedum — Velvety
Powderpost Beetle

Description: There are several other species in the family Lyctidae besides those named that infest seasoned hardwoods. Adult lyctid beetles range in size from 1/16- to 5/16-inch long. They are red-brown to brown or black in color with an easily-seen, prominent head. The 11-segmented antennae are each tipped with a two-segmented club. The tibiae, which are the fourth leg segments, have prominent spurs.

The larvae are tiny "C shaped grub-like larvae that are found feeding in tunnels in the wood. They are usually less than 3/16-inch long, with an enlarged first body segment (prothorax) and eight spiracles (breathing holes) in the abdomen. The last spiracle is very large compared to the others. These larvae have three-segmented antennae and three-segmented legs.

Biology: Lyctid powderpost beetles infest seasoned hardwoods including oak, hickory, ash, mahogany, and bamboo. They can re-infest the same piece of wood until it is reduced to a shot-hole riddled shell filled with frass the consistency of face powder. The adult females lay their eggs soon after mating, deep within the pores of these hardwoods. The eggs are never deposited on polished, waxed, varnished, or painted surfaces, so damaged items with these type finishes were infested before they were finished. The larvae feed on the wood, the suitability of which is determined by its starch content. They prefer recently dried wood and will not infest wood with less than three percent starch content. Total development may take two to four years but it is not unusual to have two generations per year in the South.

Control: Seasoned hardwoods may first show symptoms of a lyctid powderpost beetle infestation when small, "bird shot" size holes appear in the wood when the adults emerge. Very fine-faced, powder-like frass is often seen falling from the holes.

Infestations in lumber can be eliminated by kiln drying and prevented by treating raw lumber with protective sprays of chlorpyrifos or lindane. The lumber used in floors or furniture can be protected with varnishes, waxes, or paints.

Galleries with existing infestations can be treated with pyrethrins with silica gel, but fumigation with sulfuryl fluoride or methyl bromide is the most effective means of controlling infestations of lyctid powderpost beetles in structures because these gases will penetrate the most inaccessible areas. Sulfuryl fluoride must be used at high rates to kill lyctid beetle eggs. They do not provide any residual protection and therefore unprotected hardwoods may be re-infested unless appropriately labeled protectants such as chlorpyrifos or lindane are used.

CARPENTER ANTS

Scientific Name: Camponotus sp

Description: For general description, see argentine ant.

Carpenter ants are among the largest ants found in the United States, ranging from 1/4- to 1/2-inch long. They are usually black. The queens are the largest ants in the colony and the workers in an established colony will be of two sizes. Carpenter ants usually have a thorax that is evenly rounded when seen from the side. They have one node in the petiole and a circle of tiny hairs on the tip of the abdomen.

Biology: The black carpenter ant, Camponotus pennsylvanicus (De Geer), has been the most thoroughly studied. This species is common in the central and eastern United States. Other species of Camponotus are distributed throughout the United States. Carpenter ants are social insects that usually nest in wood. They commonly excavate galleries or tunnels in rotting or sound trees and will readily infest the wooden portions of structures. They prefer to excavate wood damaged by fungus and are often found in conjunction with moisture problems.

The adult winged female or queen loses her wings soon after mating with the smaller male and selects a nesting site where she secludes herself while raising the first brood of workers. These workers are very small but take over the care of the immatures and the queen after they mature. Future workers are usually larger than those from the first brood because they receive better care. All workers are wingless.

When raised at 90 degrees Fahrenheit black carpenter ants can complete their life cycle in about two months. The eggs hatch in 24 days; the larval and pupal stages last 21 days.

The workers do all nest excavation, foraging for food, and care for the young. Carpenter ants feed on sugar solutions from honey dew-producing insects such as aphids, sweets, and the juices of insects they capture. They do not eat the wood they excavate from nests.

Carpenter ants may enter homes while foraging for food. However, the appearance of large numbers of winged adults inside a home indicates that the nest exists in the home. The workers will often expel fibrous sawdust from the nest through slit-like openings in the surface of the wood. These piles of sawdust are good signs to look for when trying to locate a colony in an infested structure.

Control: Carpenter ant control can be very difficult. It is important to locate the source of the ants — that is, find the nest. The most complete control is accomplished when the nest itself is treated with a residual spray or dust.

Infestations can be reduced by treating travel routes that the workers follow while foraging. Infestations that originate outdoors can be reduced by the application of barrier treatments of residual insecticides. Acephate, bendiocarb, bioallethrin, boric acid, cypermethrin, carbaryl, chlorpyrifos, diazinon, fenvalerate, malathion, permethrin, propetamphos, propoxur, pyrethrins, pyrethrins plus diatoms or silica gel, and resmethrin can be used in the control of these insects.

PEST AND INSECT CONTROL SUGGESTIONS & COMMENTS

Summary
No problems with food use in the Wireless, Massey Station, Steam and Meeting Hall basement library buildings. The Mayes building does have a food kitchen and flowers are allowed. The Meeting Hall basement library has evidence of fungi or mold and the Steam Building might have insects (wasps?) in the truss construction..

1.1
Based on my two day visit NEWSM did not seem to have evidence of insects or pests. However, the potential exists in all buildings. It is more likely insects and pests will be found in three of the five buildings because of different conditions.

The Wireless Building has evidence of high humidity or moisture content (photos 18.19.20.21.22.). The Mayes Building has a kitchen for staff lunches and events including a very congested collection stored in the basement (photos 1.5.6.7.9.10.11.12.). The Meeting Hall library basement has evidence of high humidity, mold and very congested stacks (photos 27.31.32.33.34.35.36.37.38.39.40.41.42.). I did not visit the Massey Wireless Station basement as a source for insect and pest problems.

1.2.
Institutions should practice some degree of Integrated Insect & Pest Management that will detect different types of insect and pest populations. A monitoring program might use glue traps in certain locations that are checked every month. If using "have a heart" rodent traps check them twice a week or sooner.

If hand 'captured' insects are collected save them for identification in an envelope or plastic bag and note date and location.

2.1.
NEWSM may need to work with a professional Pest Control Company so insects and pests can be identified and solutions found. However, be concerned if only chemical and poisoning solutions are recommended by a pest control company. If chemicals and poisons are used obtain a Material Safety Data Sheet and confirm if state and federal regulations are being followed that consider public, animal and environmental safety.

Instead, consider using further trapping, use of ultraviolet attracting glue cabinets (for flying insects), pheromone traps, dehumidification, improved cleaning and other non-toxic solutions. If fumigation of objects is required review professional services that use nitrogen and carbon dioxide gases,

2.2.
The Mayes Building kitchen was clean and responsibly used. However, kitchens need to be carefully monitored and someone assigned the daily task of checking electrical and gas appliances including removal of trash. I understand flowers and plants are checked for infestation and properly discarded.

3.1.
The potential for insects and pests in basements is higher because they may be less used, have higher humidity levels and be congested with materials. Review the need to seal exterior and interior doors and openings around pipes to discourage the entry of insects (ie. silverfish, beetles, etc.) and pests (mice, etc).

MOLD

The development of mold is possible in humid and poor ventilated spaces. Any location with a relative humidity higher than 60%RH can have mold activity depending on the materials involved. Inspect new objects or archives accepted into the collection for mold and insect activity. Become familiar with how to handle and treat mold on objects or building materials (or when to ask for professional help).

V. COLLECTION CARE SUGGESTIONS AND COMMENTS

1.1.
I consider the library materials and engineering drawings (photos 1.3.) to be the most fragile part of the NEWSM collection. Please refer articles "A Historical and Technical Review of Tracing and Duplication Papers and Their use in Preservation" and "Conservation on the Materials and Techniques use in 19th Century American Architectural Presentation Drawings." [Articles not scanned–see “paper_articles.pdf”]

A preservation study of these materials should be completed as part of a long-range preservation plan for the entire collection. The development of a preservation plan would include completing cataloging (20% completed) and inventory (50% completed) of the collection.

1.2.
Consider training volunteers or students from a professional school (ie. University of Rhode Island Library School) in the use of "Past Perfect" software (photo 8.). Consider adding a digital photograph of each object in the software program with a written description and condition of the objects. Please refer The Getty Object ID Checklist for describing objects.

2.1.
Consider forming a "Collection Committee" that would make decisions about objects being accepted or rejected or deaccessioned. The donor should receive a letter stating what has been added to the collection and what is being returned and NEWSM has the right to sell anything to raise funds or improve the quality of objects in the collection. Ask the donor for contributions to care for the object(s) being accepted.

Accepting objects into the collection brings with it public trust responsibilities and negligent care of these objects can ruin a museum’s reputation and/or become reasons for legal action.

Avoid accepting objects that are not appropriate to the institution’s mission (unless you want them only for selling to raise funds).

Ask the person wanting to bring you objects for consideration to complete a checklist of the items with estimated values. The checklist will help NEWSM better understand and confirm the number of objects, conditions, and provenance of the objects.

2.2.
Consider visiting other industrial museums to review their collection management methods (i.e. accession and cataloging forms, etc) and care programs (i.e. condition reports, conservators, treatments, etc).

2.3.
I understand the "Past Perfect" software was purchased several years ago and only some of the catalogue records have been entered. Review the current state of "Past Perfect and compare it with other management software to determine if another software should be considered ("what does the Hagley Museum Library use?").

2.4.
NEWSM has highly motivated steam and wireless volunteers that are skilled and responsible with the care and handling of objects. However, should a maintenance log be kept by the volunteers? A maintenance log will allow future volunteers to understand the condition of objects and why, when and how a repair was made.

The Getty ID

The Getty Object ID is an international standard for describing art, antiques, and antiquities.

Object ID Checklist

Take photographs.

Include the following details.

a. Type of object—what kind of object (e.g., a painting, sculpture, clock, mask) is it?

b. Materials and techniques—what material (e.g., brass, wool, oil on canvas) is the object made of? How was it made (e.g., carved, cast, etched)?

c. Measurements—what is the size and/or weight of the object? Specify which unit of measurement (e.g., centimeter, inch) is being used and to which dimension (e.g., height, width, depth) the measurement refers.

d. Inscriptions, and markings—are there any identifying markings, numbers, or inscriptions (e.g., a signature, dedication, title, maker's marks, purity marks, property marks) on the object?

e. Distinguishing features—does the object have any physical characteristics (e.g., damage, repairs, manufacturing defects) that could help to identify it?

f. Title—does the object have a title (e.g., The Scream) by which it is known and might be identified''

g. Subject—what is pictured or represented (e g., landscape, battle, woman)?

h. Date or period—when was the object made (e.g. 1842, early 17th century) ?

i. Maker—do you know who (e.g., the name of a known individual, a company, or a cultural group) made the object?

Write a short description.
This can also include any additional information (e.g., color and shape of the object, where it was made, etc.) that helps to identify the object.

Keep it secure.
Having identified or described the object, keep this information in a secure place.

Additional recommended categories

a. Inventory number
b. Related written material
c. Place of origin/discovery
d. Date documented

[See also: the Object ID website at http://archives.icom.museum/object-id]

VI. EXHIBIT SUGGESTIONS AND COMMENTS

1.1.
NEWSM takes precautions with the safety of some 5,000 annual visitors to events and buildings. Visitors to the Steam Building are assigned guides, occupancy is limited, fire codes regulated, rope and metal barriers provided.

However, when machinery is operating moving flywheels, gears and pistons can be within reach by adults and children (photos 16.17.). Improving the "in situ" safety of visitors might require the use of full wire cages, wire barriers or fabricated plastic Lexan cases and barriers. More needs to be done with keeping hands and feet away from moving mechanical machinery. Should audible electronic motion alarms be used when a visitor is within a certain distance of machinery?

A serious review of hazards to visitors during "Steam Up Day" needs to done and ways found to make it safer. If your insurance company will not cover a claim from these kinds of injuries NEWSM needs to consider having this event.

1.2.
Consider signage on the Steam Building walls (should this be required reading by visitors?) explaining the hazards, rules of conduct and safety. Should visitors be offered ear and eye protection? Should operation of machinery require hard hats by staff and visitors? Should the floor be painted so visitors stay within a restricted path? Should first aid kits be visible?

1.3.
NEWSM should develop a five year plan concerned with improving exhibits, care of the collection, maintenance of the facilities, public safety, fire prevention, cataloging, moving the library, etc.

1.4.
Review liability insurance for the museum owners, staff, visitors and volunteers. Investigate a hypothetical claim situation by an injured visitor and learn the actual merits of your policy. I am concerned with keeping the museum financially solvent. A claim could cause financial hardship and put the museum in jeopardy. I was pleased to learn members of the board have liability insurance.

2.1.
The collection of wireless and steam objects is very impressive and has taken a lifetime to assemble. However, as a visitor understanding a coherent history or time line of these technologies or industries can be difficult. Few labels or plaques explain the purpose (except for the names wireless and steam) or history of the buildings and collections within them.

The Wireless Building exhibits are more successful and communicate the history of wireless using appropriate objects to support the story (photos 18.19.20.) As improved storage space becomes available in the Mayes Building basement many duplicate or unneeded objects now on exhibit could be retired.

2.2.
The Wireless Building eventually needs to be rehabilitated to solve the mold (photo 21.) problem and other structural issues. A HVAC environmental system needs to be installed with new exhibits. The machinery and supporting pictures in the Mayes Building should be a dedicated exhibit on the history of steam. However, new exhibits in the Wireless Building might include a history about steam and the building could then be called the Steam and Wireless History Building. The proximity of a future Steam and Wireless History Building next to the Steam and Massey Wireless Buildings physically compliment each other.

I favor the Mayes Building becoming a library research center. I don't feel the present size of the Mayes Building can accommodate a steam history exhibit and library research center together.

3.1.
The staff's excellent policy of photographing objects on exhibit has been practiced for years. This was successfully demonstrated when I asked for information or proof of ownership concerning a locomotive photograph in the Mayes Building.

I suggest documentation photographs be placed in dedicated archival binders for each building. This will improve updating and retrieval of photographs when needed. Consider including a copy of the acquisition or catalogue record with each photograph. Review if photographs can be downloaded in the Pass Perfect collection management software.

3.2.
Consider adding security hangers to pictures that might be a thief s first choice (photo 2.)

Are all objects or pictures on exhibit really needed to educate the public about the history of wireless and steam? If an object has financial or historical value should it remain on exhibit all year and/or could a substitute be found? Without a policy for rotating objects on permanent exhibit they will eventually become faded and discolored.

Consider removing some of the more environmentally sensitive, valuable or historic objects during the winter months to a more secure location.

3.3.
Should information billboards (the design or appearance of these would be critical) be placed outside the entrance of each building to inform visitors about the building's history and/or objects within. This might include safety information, rules of conduct or most frequently asked questions.

Place a main billboard (durable exterior baked enamel is often used for these purposes) at the main entrance informing visitors about NEWSM's mission, map of buildings, parking and rest room locations, rules, etc.

VII. STORAGE SUGGESTIONS AND COMMENTS

1.1.
The Mayes Building is the best location for a research library ,administration offices, orientation and public meeting center (photo 1.).

This would require renovations to make the building environmentally controlled with protection from natural and artificial light. New library shelfs and metal flat storage drawers would be needed for the engineering drawings. Review how original wooded flat storage cabinets might be archivally adapted. If not used for engineering drawings they could be used for storage of less archival materials.

The engineering drawings need to be catalogued and identified by medium and stored in archival folders and/or polyester envelopes with smaller numbers in each drawer. Some of the more fugitive mediums may need to be copied on polyester film or a archival paper if possible.

1.2.
I would keep the present administration office and make the other room (now storing books) a temporary processing room for cataloging (photos 5.6.) library materials. This room might become a study room from visiting students with computer and copying services.

1.3.
The present library would be relocated in the Mayes Building including archival materials stored in other buildings (photo 22.). However, before these changes are made NEWSM should have a deaccessioning policy that the board of directors have voted on and follows AAM's standards.

When moving library and other archival materials try to physically separate items to be considered for deaccessioning from the primary collection.

1.4.
The Mayes Building basement is now full of archival, wireless and steam materials (photos 9.10.). With the eventual cataloging, inventory and deaccessioning of these materials half of this space may be gained for other storage. This gained space could then be used for preparing exhibits, cataloging, photography, materials to be deaccessioned and sorting "jewels from junk".

The consolidation of archival materials in the Mayes Building will provide more security and the best environment for fragile organic materials.

2.1.
The design of the Mayes Building for these purposes makes it difficult to imagine how the building can serve storing and exhibiting the history of steam. The history of steam needs it's own building (as suggested by use of the Wireless Building).

The Steam Building demonstrates the operation of steam machinery and attempts in a limited way to tell visitors about the history of steam. The new Machinery Building for maintaining the machinery is a fine development and separates these activities from public view and makes the Steam Building safer for visitors.

VIII. EMERGENCY PREPAREDNESS

There are many kinds of disasters that can effect a museum building, collection and staff. Some of the natural disasters include hurricanes, rain flooding, wind storms, earthquakes, hail and snow storms, lightning, tornadoes, ocean and river flooding (THSM is not in a flood plain) and all with fire and water damage consequences. Some of the man-made disasters include arson, vandalism, fire from smoking, electrical, lighting, cleaning accidents, water pipes and sprinklers, gas explosions, faulty roof or building construction, basement sump pump flooding, bomb explosions, dam break, airplane crashes, all with fire and water consequences

Illustration by T.Bloom

While hurricanes are. more common in New England, earthquakes are least understood and considered potential threats, although some 290 earthquakes have been recorded in Massachusetts since 1627 (some significant years, in this century have been 1925,1940, 1982, & 1983). Many of these earthquakes have Richter magnitude of 4.5 - 6.0 (scale-3.0/9.0) or intensity of V-VIII (scale I-XII).

"*While it may be surprising to most people, an average of 5 earthquakes are felt somewhere in New England each year. Many more (approximately 40) earthquakes, too small to be felt, are detected annually*" – Mass. Office of Emergency Preparedness

Prevention is the best policy and having a written disaster plan stocking emergency supplies and understanding disaster recovery methods are the best ways to prepare for small or major disasters. The more thinking and practice that can be given to the different kinds of potential disasters, the more there will be success in preventing losses. (Example: a pipe break can induce water damage to 1 or 10,000 books making different responses needed as part of any planning).

"*Planning ahead for disaster not only reduces permanent damage or loss to collections, but also sometimes actually prevents disasters from happening. It is therefore essential that librarians, curators and others, who are entrusted by the public to preserve our cultural inheritance, take an active role in developing disaster plans. Planning includes assessing*

building problems which might endanger collections, citing and correcting existing hazards, and listing steps required to save collections should fire or flood occur." – M. O'Connell

As a disaster plan is prepared and recovery of books, photographs, prints, textiles, paintings, etc. is understood, so will the needed skills, specialists and services be better organized and ready to respond in short notice.

"*Among services which might be needed are fire and police departments, electricians, plumbers, carpenters, janitorial services, ambulance services, glaziers, conservators, insurance representatives and security guards. Suppliers of electrical fans, plastic milk cartons, trucks, plastic sheeting, and absorbent paper should be identified, and some of these supplies possibly purchased and kept on hand. A local cold storage warehouse and freeze-dry facility should be contacted. This compilation of resources and supplies should be made available to all members of the disaster team.*" – M. O'Connell

EMERGENCY PREPAREDNESS SUGGESTIONS AND COMMENTS

Summary:

Hurricane and lighting strikes ("...low risk other than tree falling on Mayes Building.") cited as weather risk. Airport cited as only man-made risk ("...five miles away.").

No object cited as damaged by natural or man-made causes in the last five years. The institution doesn't have a written emergency plan. Emergency supplies not stocked and records not held offsite.

The fire department does annual inspection. The fire detection and suppression systems are tested annually. Only the Mayes Building has a fire detection system and ABC extinguishers are provided in all buildings.

Institution doesn't have emergency lighting (some outdoor lighting) and no vandalism reported in five years. Plans for preventing or responding to vandalism, bomb threats or hostage situations not written..

(VIII.) A. FIRE

1.1.
Review wiring uses in the basement library (photo 33.) and Massey Building (photo 26.) for potential fire hazard sources. Review storage and use of cleaning materials in basement library (photo 44.) and Machinery Building (photo 46.) for flammable materials. Review proper storage of flammable materials in safety cabinets with automatic suppression system and proper rated fire extinguishers nearby. Should other buildings be provided with audible fire/smoke alarms with direct dialing to fire department?

1.2.
Review electrical condition of appliances in Mayes kitchen and safety practices for turning off any heating appliances. Review if an automatic fire suppression system should be installed over kitchen stove. Someone should be designated to check appliances (or any other electric tools) at the end of the day. Without these safety precautions accident and fire claims may be challenged by NEWM's insurance company.

1.3.
Does staff and volunteers know the location of fire pull alarms and the location of extinguishers nearest their place of work. Everyone should be trained in the use of extinguishers, know exit routes and how to evacuate the public from buildings.

During an emergency decide on a central location outside the buildings (or one of the buildings) for staff and public to gather. This allows everyone to be accounted for and emergency tasks organized.

Review during a fire alarm if it would be appropriate for someone to check all or most buildings for people still inside? Would a handicapped or frail person manage all fire exit routes?

1.4.
Are building fire occupancy codes being enforced?

1.5.
Develop a written fire evacuation plan with a display of exit routes (even fire extinguishers and fire pulls) posted within the buildings. The plan should be given to the fire and police departments.

1.6.
Develop a staff "Emergency Contact Sheet " that would include staff and volunteer numbers, addresses, fax, cell and e-mail, fire and police departments, etc. This will allow everyone involved to communicate better during an emergency and is useful information for general day to day operating purposes.

A copy of the "Emergency Contact Sheet" should be given everyone (including police and fire departments) to keep at work and one at home.

2.2
Do a written inventory of all extinguishers and locations. The location of extinguishers should periodically be confirmed (not just once a year for inspection). Some extinguishers may have been stolen, played with or hidden by visitors during the year.

2.1.
Review what the fire department response time might be. What would the response time be during a snow storm or hurricane? Know the location of water hydrants. Consider if additional "backup" extinguishers should be stocked for fighting a fire. Staff and volunteers should be trained by the fire department about how and when to "fight or flee a fire".

2.2.
Consider having the fire department install a "lock box" that select staff and fire department could open. The contents might include the "Emergency Contact Sheet", a map of buildings, location of fire extinguishers, etc.

(VIII.) B. SECURITY

1.1.
A potential thief might be interested in stealing tools from the Machinery Building, fine prints or money from the Mayes Building or artifacts from the Massey and Wireless Buildings. Should all of these buildings be provided with a audible security alarm with direct dialing to the police department and select staff?

Should more valuable objects be attached with a motion alarm (on back of frame or under object) that would sound if object was moved? Should certain locations be equipted with video camera monitoring?

1.2.
Should the front entrance be provided a security gate so unwanted visitors aren't invited to approach buildings by car during evenings or when institution is closed? The gate could be

locked by key or electronically or remain unlocked to keep honest people from using the driveway.

If the gate is locked discuss this with the fire department and police and if using the home driveway would be sufficient.

1.3.
Are staff offices or galleries empty any time during the day and should this be a security concern?

1.4.
Is a nightly security check made of all buildings, doors, objects by a designated staff member? What is the response time of police and who should enter a building that might have a burglar inside?

1.5.
List what are considered the most important objects in the collection so these can be quickly removed during an emergency event. Consider making this list known to select staff, police and fire department. The list should contain photographs of the objects and exact locations.

1.6.
Staff and volunteers should be trained in how to respond to vandalism, theft, bomb, fire, and hostile behavior and hostage situations.

2.1.
Has an inventory of keys be made and who has permission to use them? How many years has the present key system been in use (are some keys missing) and is it time to consider a new key system? Consider using a keyless system that uses electronic cards for entry. This allows you to cancel anyone's card entry should the person loss a card or not be with the institution anymore.

2.2.
When the owner/directors are away who becomes acting director with authority to make decisions during an emergency or illness. Should some staff who go away leave numbers and addresses (be required to have a cell phone) they can be reached at?

2.3.
Should a more elaborate automatic emergency lighting system be installed indoors and outdoors? Should motion detection lighting be installed for security purposes?

(VIII.) C. UTILITIES

1.1.
The Mayes Building basement has drainage and water pipes above artifacts (photo 9.). Review what objects (if any) should be stored under water pipes and what objects would best survive water damage. Should a pipe break is the sump pump system operating (photo 12.) and could it handle the situation?

1.2.
Has the source of water damage to the Wireless Building ceiling been located and corrected?

1.3.
Portable dehumidifiers (photos 11.20.42.): should be set in metal or plastic trays to prevent flooding during malfunctioning or spillage during handling. Review if dehumidifiers are operating and if they have been cleaned, filters changed, drainage lines open, etc.

1.4.
Staff should know how to shut off all water, electric and gas sources.

1.5.
Tag all water, electric and gas valves so staff and fire department can better locate these sources.

1.6.
Is a water alarm required in the Mayes Building kitchen or basement and in the library basement. If a pipe broke between 6:00pm-6:00am (twelve hours of flooding) theoretically know one would know about it and the collection or building would be flooded. When possible or desired add floor water drainage to locations flooding should be avoided.

1.7.
Are all NEWSM building grounded from lighting strikes? Review installing a building surge protection system.

2.1.
Should NEWSM have a portable or fixed generator to maintain electricity during emergencies. Review sources for renting a generator and prepare the buildings electric systems for this emergency connection if needed.

2.2.
Provide staff with hand flashlights they can keep in offices for emergency purposes. Provide more powerful flashlights in all other buildings for emergency and routine maintenance needs.

(VIII.) D. DISASTER PLANNING

1.1.
Develop checklist of the most important objects that would be a priority for saving during an emergency. Knowing these priorities before a disaster will allow these objects to be removed or recovered first and damage prevented or mitigated.

These objects should be photo documented, catalogued and condition reports completed before other objects in the collection are given this attention.

1.2.
Develop a written emergency plan and distribute to staff, board, police, and fire department. Review how other regional institutions have prepared disaster plans, trained staff in response and recovery techniques and what conservation specialists would be needed.

2.1.

Study services of commercial disaster fire and water recovery companies in your region and make them (or select one) familiar with your disaster plan, collection, staff and buildings. These companies will then be better informed and capable of responding to an emergency.

2.2.
Provide onsite and dedicated supplies for disaster recovery purposes (i.e.plastic sheeting, wet/dry vacuum pump, mops, sponges, staple gun, buckets, wet socks, tools, lamps, paper towels, camera, etc.

(VIII.) E. HEALTH & SAFETY

1.1.
The active mold found in the Wireless Building and library basement ceilings need to be studied and corrected because they present a potential health hazard to staff and visitors (photos 21.38.39.).

1.2.
Confirm that proper ventilation (or HVAC filtration) of all air exchange systems is operating and providing regulated air quality for staff and visitors (especially those with allergy and respiratory problems).

1.3.
Review if during "Steam Up Day" proper precautions are being taken to protect the public from operating machinery. Would those persons operating machines for demonstration be willing to sign a liability waiver that would hold harmless NEWSM?

When selling tickets should the public be informed of the hazards and would your insurance apply to injuries from these sources?

1.4.
Are volunteers trained in the proper use of tools and operating machinery (photo 16.46.). Have precautions been taken to protect volunteers and what would be your liability if a volunteer was injured? Should volunteers be asked to sign a liability waiver that would hold harmless NEWSM? Have volunteers been provided gloves, safety masks, respiratory masks, aprons, hard hats, etc.?

2.1.
Review if more or better first aid kits are needed and in what locations. Should someone on staff be trained in CPR and first aid and is this a concern?

2.2.
Is NEWSM aware of any staff or volunteer health problems that should exclude someone from performing certain tasks? Should staff and volunteers be required to complete a form regarding any health issues, supply references, free of criminal or drug crimes, etc?

2.3.
Confirm that 911 calls can identify address source of call. Could 911 become confused between owner's home and other NEWSM buildings.

(VIII.) F. INSURANCE

1.1.
Review with insurance company liability to owners and museum should a visitor or volunteer be injured (refer Health & Safety issues) during "Steam Up Day " or for any other reason.

1,2.
Review insurance policy exclusions and do they include water, mold, insect, earthquake, ice storm, etc? Does policy cover "all risk" and is the value of damaged objects depreciated and is full conservation expenses covered? If you call the fire and smoke recovery company who pays for it?

1.3.
Review if the most historic or monetary objects in the collection are properly appraised and insured. Is more study needed to determine the value of certain objects and does the insurance company require a list of these objects.

2.2.
Review if a higher deductible should be considered to reduce premium or if self insuring needs to be considered?

2.3.
Review with insurance company if your premium allows them to provide a risk management assessment that might reduce your claim exposure. This cooperation can result in lower premiums and better coverage.

IX. FACILITY & COLLECTION RISK MANAGEMENT

Introduction:

During the last decade aspects of facility and collection risk management have been reviewed and implemented. Further learning, training and policies remain to be accomplished. The following points and suggestions are taken from my experiences with other institutions and training with the National Park Service and Heritage Preservation Programs.

1. Wall mount fire extinguishers so they are visible to staff, visitors, etc. Many extinguishers are stored on the floor behind materials and hidden from view.

2. Staff should learn the location of at least two extinguishers from their work locations.

3. Staff should be trained in the use of extinguishers and understand "fight or flee" choice's.

4. Staff should know exit doors or windows and a fire drill conducted annually.

5. An evacuation plan with signage needs to be planned for exiting the public and staff.

6. Information in the outside "lockbox" needs to be reviewed and floor plans provided the fire department.

7. All flammable and explosive solutions should be stored in fire cabinets and/or offsite.

8. Agreed meeting locations during an event should be selected so staff can check in and event managed from one location.

9. Selected staff should know the location of water electric and gas sources and how to shut them off (including location of outdoor water shutoff). Water, electric and gas sources should be properly labeled. This information should be included in the lockbox.

10. Consider providing staff with-small desk emergency flashlights. Provide battery emergency lamps (with 8 or more hours of battery life) in one or more door entrance locations.

11. Test fire/smoke alarm and emergency light systems annually.

12. A stock of dedicated emergency supplies should be purchased and stored in portable containers for early response and recovery purposes.

13.The newly developed Museum Emergency Disaster Staff List should be updated as needed and expanded to include response and recovery services. Staff should keep a copy at work desk and one at home.

14. Visits with "smoke & water recovery companies"'should be made for preventative planning and understanding recovery techniques. In some cases contracts could be made in advance so response, recovery and insurance issues don’t delayed needed services. This planning should include working with FEMA, Massachusetts and New Bedford Emergency Management Agencies.

15. Consider having a "quick response hookup"for a rented generators that would maintain environmental systems effecting collections.

16. Train or expose staff to collection handling and recovery techniques in planned workshops or presentations. Consider training conservation volunteers and/or staff in advanced recovery techniques should they be needed in a disaster.

17. Develop written policies and training for bomb threats, theft, vandalism, hostage, robbery, medical, terrorist and aggressive behavior situations.

18. Consider forming a Safety & Risk Management Committee responsible for reviewing policies and practices.

19. Consider a phased hurricane response plan (i.e. Mystic Seaport) that takes increased daily precautions as a storm advances and conditions change. Likewise, consider if security staff should remain onsite a hurricane to protect collections and building from storm damage, burglary, vandalism, looting, etc

20. Research offsite storage locations and transport methods should collections be at physical or environmental risk during an emergency.

21. Consider further coating of windows with film and/or custom fabrication of widow covers to prevent breakage and intrusion of environment, burglary, vandalism, etc.

X. Photo Documentation

Numbered photos referred to in the text are in 'photos.pdf'

XI. Support Materials

Websites referenced in the text	
	Hagley Museum website at https://www.hagley.org/about-us
	The Antique Wireless Association at http://www.antiquewireless.org/
	W1TP Telegraph Museum at http://w1tp.com/.
	Object ID website at http://archives.icom.museum/object-id