Sustainable Preservation Practices for Managing Storage Environments
Series # 3 - Webinars

Best Practices for Data Collection and Analysis
April 8, 2015
Sustainable Preservation Practices for Managing Storage Environments

• The third series of workshops & webinars
• Funded by a National Endowment for the Humanities Education & Training Grant
• Presented by the Image Permanence Institute
Today’s Presenter

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- Assisted by Angelique Armstrong, Product Support Technician
The Image Permanence Institute

• Part of the Rochester Institute of Technology
• Nonprofit Preservation Research Laboratory since 1985
Technical Support & Information

• Cable internet preferred rather than wireless or dial-up
• Participants can use their computer’s speakers (VoIP) or telephone.
• United States Toll: +1 (415) 655-0051
• Access Code: 318-027-856
• Audio PIN: Shown after joining the webinar

Need Help?
Contact Lauren Parish at lmppph@rit.edu or 585-475-7175
Questions?

Submit questions using the Question Box located in the Go To Webinar control panel.
Reminder!

• Today’s webinar is designed for people who are new to the topic or in need of a refresher
Summary of Today’s Topics

• Use the best tools available
• Collect the right data from the right locations
• Learn to use the data for collection risk analysis and to improve storage conditions
The most effective strategy for museums, libraries and archives is a proactive approach based on preventive conservation.
Data Collection and Analysis
Why?

• To understand and improve the storage environment and its affect on the preservation of collections

Involves much more than just data collection

Requires an environmental management approach
Use the Best Data Collection Tools Available
Hygrothermograph

- Traditional monitoring device
- Requires frequent maintenance
- Difficult to examine long-term trends or analyze data
- Incompatible with computer software
Dataloggers

• Electronic Devices that measure T & RH for graphing and analysis on computer
• Main Types
  – Standalone, battery-powered
  – Hard wired to ethernet
  – Radio Frequency (transmitters and base station)
RF and Ethernet-Connected

- Useful for real-time or inaccessible places
- Radio Frequency models fussy to configure
- Ethernet-connected models not always practical
Standalone Dataloggers

• Most popular and practical
• Options
  – Display
  – Range of brands and prices ($100 to $1000)
  – Direct path to analysis & reporting platforms
  – Various methods to get data to computer
  – Some offer remote probes
Full Disclosure:

- IPI developed the PEM and PEM2 specifically for use in cultural institutions
- 5-point NIST Traceable Calibration
- USB Flash Drive Upload
- Highly accurate T & RH sensors
- Compatible with IPI’s Preservation Metrics® and eClimateNotebook® online data management system
IPI’s web-based data management system

- Data storage
- Risk analysis
- Preservation Metrics
- Reporting
Data Collection Suggestions
Collect Appropriate Data

You need temperature and RH data

- Heat and humidity are primary drivers of decay
- T & RH levels relate directly to HVAC operation and energy use
Indoor Data Is Not Enough

Get outdoor data:
- Outdoor air becomes indoor air
- Compare with indoor
- Helps you assess HVAC system operation

Data from over 1,700 NOAA weather stations in real time in eClimateNotebook®
Monitor Continuously

• Effective data analysis requires a full year of data
• Include seasonal extremes
  • Summer heat & humidity
  • Winter dryness
• Document heating & cooling seasons
• Do more than respond to short-term situations
How Many Loggers Do I Need?

- No simple answer
- Monitor for what you need to know

Consider:
- Locations housing important or vulnerable collections
- Spaces that have had environmental problems
- Vertical stratification concerns / microclimates
- Locations served by multiple mechanical systems
Logger Placement

- Near collections, 4-6 feet from floor, or in a display case
- Away from supply ducts, windows, heat sources
- Wherever there is reason to believe conditions may differ within a space
Collect Data Routinely

• Weekly, monthly, quarterly
• More often if situation warrants
  – Periods of high temp/humidity
  – Particularly vulnerable collections

Remember to periodically recalibrate your loggers
Use Temperature to Find Local Trouble Spots

Infrared (IR) Thermometer

- Locate warmer or colder spots that may have a microclimate (different % RH)
- Measure surface temperatures of walls and objects
Use Temperature to Find Local Trouble Spots

Thermometer

- Great to leave in one place as a quick reference.
- More robust than most measurement tools.
Building Management Systems

- Modern BMS software can store and export data
- Real-time export to eClimateNotebook now possible
BMS Data & Export Issues

• Export can be difficult, time-consuming
• Security and access restrictions
• Sensors not always where you want them
Other Important Tools

- Prints
- HVAC Drawings
- HVAC Schedule
- HVAC Zone Maps
- Camera
- Management Team
- Dew Point Calculator @ DPcalc.org
- Questions
Data Analysis Tips

Using data to make decisions.
What a novel idea.
Analysis of Environmental Data

Use data to assess collection storage conditions:
- Analyze preservation quality of each location
- Compare suitability of space conditions
- Document improvements
- Heat loads and sources of moisture
Analysis of Environmental Data

Use data graphs to understand the performance of your climate control system:

• Which systems serves the space
• Periods of humidification and dehumidification
• Night time setbacks and lighting schedules
• Identify seasonal trends
• Identify malfunctions
Data Analysis Tip

• Identify which system serves the space

Compare dew point – if the annual dew point graphs from different spaces overlay nearly exactly, they are likely served by the same AHU. The third (gold line) space is probably served by another AHU.
Data Analysis Tip

- Does the system humidify or dehumidify the air?

Compare graphs of indoor and outdoor dew point – if the lines follow each other with minimal buffering there is no indication of moisture control.
Overlay indoor & outdoor dew point graphs

• Trends (dips and rises) are echoed
• A cap below high summer dew point temps indicates dehumidification
• A floor above low winter dew point temps indicates humidification
Data Analysis Tip

The indoor dew point from this storage space shows seasonal humidification and dehumidification. The “floor” between January and April and late October through December shows humidification. The “ceiling” between late May and mid-September indicates dehumidification.
Indoor and outdoor dew point graphs for this location show that between periods of moisture control, the outdoor dew point does influence indoor conditions.
Data Analysis Tip

Use months or years of dew point data to track changes in humidification and dehumidification over time. This graph indicates humidification in the winter of 2009 and no humidification in the same period in 2010.
Data Analysis Tip

Flat line dew point indicates the presence of both dehumidification and humidification.

Dew point in the low 20s indicates the probable use of a desiccant dehumidifier.
This graph illustrates regular daily fluctuations in temperature. A sawtooth pattern is typical of night time setbacks and lighting schedules. The fluctuations fall within a 4° range.
Data Analysis Tip

Equipment malfunction can be reflected in the temperature graph.
Data Analysis Tip

Set point changes are visible in “flat-line” situations as a “step” that then plateaus.
Data Analysis Tip

Identify heat loads and sources of moisture

These three locations are in one room, all served by the same AHU. The RH of the Mammals Case (in green) is constant but very high – mold has been an issue. The cause – water running beneath that section of the building.
Data Analysis

- The more data you have, the more opportunity you have to learn from it.
A Few More Thoughts:

• Data collection is the first step toward improving the environment for collection preservation:
  – You cannot manage what you do not measure
  – One logger arbitrarily placed is not a monitoring program
  – You need at least one year's worth of data
  – Pull data from your loggers at least once a month
  – Logger accuracy and battery life are very important
  – No finger pointing
Our Philosophy: Data Driven Decision Making

• Measure and compare quality of the environment over time
Long-term View

The preservation environment benefits from the availability of long term comparative data

• Improves quality of environment over time
• Improves quality of operation
• Establishes collection history
• Facilitates communication and starts decision making
Upcoming Webinars

• May 6: Dealing with Temperature & Moisture Extremes
• June 10: Equilibration & Enclosures
• July 8: Building Envelopes & Moisture Control
• Aug. 12: Understanding Mechanical Systems
• Sept. 9: Diagnosing & Addressing Inefficient HVAC Operations
• Oct. 14: Becoming Sustainable: Real-World Approaches
The Next Webinar will Explore:

Dealing with Temperature & Moisture Extremes in Your Environment
- How temperature, relative humidity and dew point interact
- How to deal with temperature extremes
- How building envelopes deal with moisture
- Temperature and moisture control in historic buildings
- Energy costs of dealing with excessive moisture via HVAC systems
Sustainable Preservation Practices for Managing Storage Environments

Project website

- www.IPISustainability.org
- Includes archived workshop and webinar presentations, reference material, videos, etc.
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