Understanding The Role of Temperature, Relative Humidity and Dew Point in Creating a Sustainable Preservation Environment

Sustainable Preservation Practices for Managing Storage Environments

Webinar: March 6, 2013
Introduction

• Presenter
  – Jeremy Linden, Preservation Environment Specialist
  Image Permanence Institute, RIT
Technical Support and Questions

• Shae Trewin – IPI Preservation Environment Specialist

• Lauren Parish – IPI Web Designer
Technical Information

• Cable internet preferred rather than wireless or dial-up
• Participants can use their computer’s speakers (VoIP) or telephone.
• United States
  Toll: +1 (909) 259-0026
  Access Code: 630-859-458
  Audio PIN: Shown after joining the webinar
• Need Help? Contact Lauren Parish at lmppph@rit.edu or (585) 475-7175
Sustainable Preservation Practices for Managing Storage Environments

About this project

• An Education and Training Grant from the National Endowment for the Humanities, Division of Preservation and Access
Outline of Webinar

- Why does dew point matter?
- Defining dew point
- The relationship between dew point, temperature, and relative humidity
- Controlling dew point
- Dew point and preservation
- Application in real-life
Questions?
Submit questions using the Question Box located in the Go To Webinar control panel
Defining Dew Point
What is Dew Point?

• The temperature at which air containing a specific amount of water becomes saturated – manifested as condensation
  – We use this as a representation of the actual amount of water in the air (absolute humidity)
Point to Remember:

- Given a constant moisture content (dew point) in the air:
  - As Temperature Rises, RH Falls
  - As Temperature Falls, RH Rises
Temperature, Relative Humidity, and Dew Point are Interrelated
Why is it important?

• Determines the preservation environment we can achieve
• Concerning preservation, typically the limiting factor of a mechanical system’s capability
Throw on the headbands!

Right side! One two, one two, one two.
Left side! One two, one two, one two, one two.
C'mon! Keep those cerebells up!...
one two, one two...
Concept A
The capacity of air to hold water increases as air is warmed, and decreases as air is cooled.
Concept B
The actual amount of water in the air does not change with changes in air temperature.
Fundamentals of Air Temperature, Relative Humidity and Absolute Humidity

Concept of Relative Humidity

Air Temperature

55°  60°  65°  70°  75°  80°

Relative Humidity

100%  84%  70%  59%  50%  42%

Capacity to hold water

Actual water present

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Dew Point

Temperature and RH at a range of dewpoint temperatures

Air Temperature

- 45° 50° 55° 60° 65° 70° 75° 80°
- Capacity to hold water
- Actual water present

100% 84% 70% 59% 50% 42%

100% 84% 69% 58% 50% 42% 35%

100% 84% 68% 58% 48% 41% 34% 29%

Absolute Humidity (.0092 lbs/lb)

Absolute Humidity (.0076 lbs/lb)

Absolute Humidity (.0062 lbs/lb)
Controlling Interior Dew Points
Managing our Dew Points

• Majority of indoor moisture comes from outside – often requires adjustment

• Three options:
  – “Let it Ride”
  – Add moisture (humidify)
  – Remove moisture (dehumidify)
Local Climate

DP °F of ROCHESTER, NY
2012-01-01 - 2012-12-31

ROCHESTER, NY DP °F

2011-Dec

www.eclimateno...
Set Points – Moisture Control

- 70F, 50% RH = 50F Dew Point
- 62F, 50% RH = 44F Dew Point

What do we need for moisture control in Rochester?
Fundamentals of Air Temperature, Relative Humidity and Absolute Humidity

Dehumidification by sub-cooling and reheating

70°  
59% RH  
55° DP

Cooling Coil

45°  
100% RH  
45° DP

Heating Coil

65°  
48% RH  
45° DP
Cooling Coil Dehumidification
No HVAC/Dehumidification system?

Just be careful…
No HVAC humidification?

- Can use space humidifiers
  - Difficult to control
  - Can create microclimates
- Better option:
  - Control temperature
Dew Point and Preservation
What do humans like?

<table>
<thead>
<tr>
<th>Dew Points</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 55</td>
<td>Pleasant</td>
</tr>
<tr>
<td>56-60</td>
<td>Comfortable</td>
</tr>
<tr>
<td>61-65</td>
<td>Getting Sticky</td>
</tr>
<tr>
<td>66-70</td>
<td>Uncomfortable</td>
</tr>
<tr>
<td>71-75</td>
<td>Oppressive</td>
</tr>
<tr>
<td>76+</td>
<td>Miserable</td>
</tr>
</tbody>
</table>

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But what do collections like?

- Cool temperatures, moderate relative humidity
- Requires a lower dew point
Dew Point in Real Life?
Dew Point Calculator

- http://www.dpcalc.org
Project Web Site

- Visit www.ipisustainability.org
  - Information on upcoming webinars
  - Recordings of past webinars
  - Webinar and Workshop power point presentations
Reference Guidebook

- Project publication
- Has bibliography of relevant articles, guidelines and standards
- $25 – available from www.imagepermanence.org
Upcoming Webinars

• **April 3**: Fundamentals of HVAC – What Shapes Optimal Preservation Environments
• **May 1**: Best Practices for Collecting and Analyzing Environmental Data
• **June 5**: Dealing with Summer Heat & Humidity
• **August 7**: Practical Approaches to Environmental Control for Small Institutions – Guest speaker Richard Kerschner, Director of Preservation and Conservation, Shelburne Museum, Shelburne, Vermont
• **September 4**: Sustainable Preservation Practices

Webinars from Jan-March are available for viewing on ipisustainability.org
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