INDIANA HISTORICAL SOCIETY
COLLECTIONSADVISOR
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It’s Too Hot (or Cold)! How Temperature and Relative Humidity Affect Collections Objects

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Beach at Indiana Dunes State Park (Indiana Historical Society)

Many of the objects in museum collections are sensitive to the physical environments in which they are stored and exhibited. Areas such as attics, barns, and basements that don’t

have heating ventilation and air conditioning (HVAC) systems can be blistering hot part of the time and freezing cold at other times. In addition to unstable temperatures, collections are affected by changes in humidity. Changes in temperature and humidity levels can cause cracking, brittleness, and deterioration in collections objects. Paper items, photographic materials, textiles, and natural science specimens are especially susceptible to damage from temperature extremes and too much or too little humidity.

When we talk about humidity, we are often talking about weather. A muggy day is a day that is hot with a lot of moisture in the air. In colder months, the air can feel very dry. When we’re considering museum environments, we talk about temperature and relative humidity (RH). Relative humidity is the amount of water vapor in the air compared to the amount of moisture the air can hold at given temperatures. One way to think about it is that air can’t hold infinite amounts of moisture and eventually becomes saturated – the point at which it simply can’t absorb any more vapor. Warmer air holds more water creating that muggy feeling and colder air holds less water making the environment dryer.

Many of the objects in our collections are hygroscopic, meaning that they are made of materials that absorb and retain moisture. Organic objects made of wood, paper, wool, bone, etc. are best cared for in stable environments with a range of 40% to 60% RH. Dry air will cause them to lose moisture, and they will crack and split. Damp air will cause the objects to absorb moisture which can cause warping, swelling, and buckling. Damp, warm air can also cause mold to grow on objects and spread throughout the museum through HVAC systems and transfer from object to object through handling.

Inorganic materials can still be damaged by changes in temperature and corresponding fluctuations in RH. Metals may oxidize and corrode through a chemical process when the electrons in the metal come into contact with oxygen from the moisture in the air. Objects made of porous minerals and damaged glass or ceramics may show signs of efflorescence. When there is a great deal of moisture in the air, the porous material will absorb moisture. As the air dries, the naturally occurring salts in the object begin to come to the surface and crystallize into a white powdery or flaky looking substance on the surface of the object.

Many of our collections are a combination of organic and inorganic objects. For those collections, it’s best to maintain a stable relative humidity between 25% and 65%. A good middle ground keeps RH at 45% with temperatures of 65 and 68 degrees Fahrenheit.

Group Ice Skating (Indianapolis Recorder Collection, Indiana Historical Society)

Controlling the collections environment is the best way to provide the proper care for collections objects. Monitoring temperature and relative humidity is key. A first step is thinking about your building as your collections envelope. Learning about your HVAC systems and other building systems is important so that you can make adjustments as needed. For some museums, temperatures can be modified by opening and closing doors and transoms and adjusting the thermostat according to the season. It’s important to raise or lower temperatures gradually because rapid fluctuations in temperature can “shock” objects and cause damage.

Using equipment like **dataloggers** (an instrument that uses internal and/or external sensors to record data over time) and **hygrothermographs** (a specialized instrument that records temperature and relative humidity over time) can provide baseline information and **longitudinal data** (data collected over a period of time) so that you can develop and implement plans for environmental control.

Resources

FROM THE FIELD

Temperature and Humidity in Museums (Museum Galleries Scotland)

Temperature and Relative Humidity (American Museum of Natural History)

Conserve O Gram (National Park Service)

LOCAL HISTORY SERVICES

Collections Advisors (Indiana Historical Society)
Timely Tips (Indiana Historical Society)

Collection Trainings

NEW! COLLECTIONS CONUNDRUMS WORKSHOP SERIES IN INDIANA

Join IHS Local History Services for a Collections Conundrum workshop at one of three sites (same presentation at each site) around Indiana!

This full-day workshop will focus on the decisions we make about our collections. First, we'll address the decision-making and processes connected to incoming donations. Then, we'll turn our attention to the other side of collecting – how to legally and ethically remove objects from our permanent collections.

Cost: $35; $30 IHS members; $25 Local History Partner Members

Workshop Details:
Each workshop will be held from 9 a.m. to 4 p.m. local time.

> May 28: Evansville – REGISTER HERE
(Hosted by the Evansville Wartime Museum)

> June 11: Fort Wayne – REGISTER HERE
(Hosted by the History Center)

> Aug. 13: Franklin – REGISTER HERE
(Hosted by the Johnson County Museum of History)

VIRTUAL COLLECTIONS TRAININGS

Digital Preservation on a Shoestring
May 4 (Backlog)

Indigenous Collections Care: Use and Access of Collections
May 5 (Gilcrease Museum)

Monitoring What Matters Part 3: Making Sense of the Squiggly Lines
May 13 (Connecting to Collections Care)

Managing Moving Image Collections
May 14 (Northeast Document Conservation Center)

Digital Preservation Storage 101
May 21 (Northeast Document Conservation Center)

RECORDED WEBINARS

Connecting to Collections Care (FAIC)
Local History Services Webinars (Indiana Historical Society)
Museum Services Webinars (Texas Historical Commission)

This is a free publication. Anyone may subscribe.
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