CHAPTER 3

Keeping Your Cool

A Practical Guide to Climate Control

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It is sometimes hard to keep your cool! Theological librarians work in various contexts and positions and face many challenges, such as budget constraints, staffing limits, and lack of training opportunities. One of their most important challenges is to preserve physical collections, and one of the most important factors affecting the longevity of those materials is climate. Whether your library is small, medium, or large, maintaining appropriate and consistent temperature and humidity levels is critical to avoiding collection disasters, such as mold outbreaks, and to slowing the natural deterioration of the materials.

Despite the importance of climate control, many librarians lack the information they need to manage temperature and humidity effectively in the spaces where collections are stored. This chapter tries to close that knowledge gap so that you can keep your cool. It will help you become more familiar with the equipment that regulates

and monitors temperature and humidity levels, the standards that are recommended for those levels in libraries and archives, and the value of partnering with facilities personnel. The standards identified here are specific to the authors' situation in the United States. You should familiarize yourself with local standards if you live in a part of the world with very different climatic conditions.

The Importance of Climate Control

Preservation is the intentional act of ensuring that the "holdings of a library or archives remain in the best possible condition for as long as possible" (Balloffet, Hille, and Reed 2005, xvii). While this may sound like a straightforward task, preservation is certainly not simple. It includes multiple financial, managerial, and technical concerns (Walker 2003, 1). Recently, scholars have also addressed the impact of climate change on the preservation of cultural materials. According to a study in *Climate Risk Management*, in which investigators assessed 1,232 archival repositories, they concluded that "approximately 98.8% of [the repositories assessed] were likely to be affected by at least one climate risk factor" (Mazurczyk et al. 2018, 118). Given these and other complexities, the task of preservation must be a collaborative effort, requiring the participation not only of librarians but also of facility managers and others with special expertise.

A key component of preservation is identifying the causes and agents of deterioration. The Canadian Conservation Institute (2017) names 10 primary threats to heritage objects, and at least three of these have to do with controlling storage environments: light, temperature, and relative humidity. It is important to be aware of these factors in the deterioration of materials and to implement climate control measures to ensure their long-term preservation. Librarians have often experienced what can happen if such climate control measures are not implemented. For example, in an environment with too little humidity, the air will begin to take up moisture from physical materials like paper and cause irreversible damage. A high-humidity environment will cause those materials to absorb water from the air and swell. High humidity can also contribute to the potential onset of a mold outbreak (Balloffet, Hille, and Reed 2005, 3).

Implementing climate control measures gives librarians unique opportunities to collaborate with other members of their communities for the sake of a common good. Controlling factors like temperature and relative humidity are contingent on equipment, facilities, storage, and infrastructure. Maintaining channels of communication and identifying partners is crucial because this contributes to the mutual end of preservation. Implementing efficient climate control measures depends on these relationships and on how well librarians communicate these goals to administrators, who might not understand why expenditure on preservation is important. We cannot do preservation in isolation; we need the help of others. The importance of this kind of collaboration, especially for small libraries, is addressed further in Chapter 4 of this volume.

Knowing Your Equipment and Partners

Successful control of a library environment requires basic knowledge of the equipment used to regulate temperature and humidity and regular communication with those who install and maintain this equipment. Improvements to controlling indoor environments in a variety of locations and climates have expanded greatly since the introduction of centralized heating and cooling in the 19th century. Sophisticated integrated systems developed during and since the 20th century often combine "fire suppression, lighting, air filtration, temperature and humidity control, and security detection" (Park 1991, 3). While the equipment has modernized, current library buildings may be older, with limited capabilities to incorporate the newest technologies. Such building limitations can affect your ability to control indoor air temperatures and humidity levels, but there are often ways to work within and around those limitations.

The heating, ventilating, and air-conditioning (HVAC) system comprises the primary equipment regulating the library's temperature and humidity. HVAC systems contain several components, including a thermostat, heat exchanger, evaporator coil, condenser coil, combustion motor, and blower motor. Typically, air is pulled from the inside of the building and routed to the HVAC unit for heating or cooling before recirculation. Newer equipment may have built-in dehumidifiers. Older units can be fitted with reheating coils to dry the air if needed. HVAC systems do not pull outside air directly

in through the system, but buildings usually have outdoor air intakes that pull in fresh air to circulate through the spaces (see Figure 3.1).

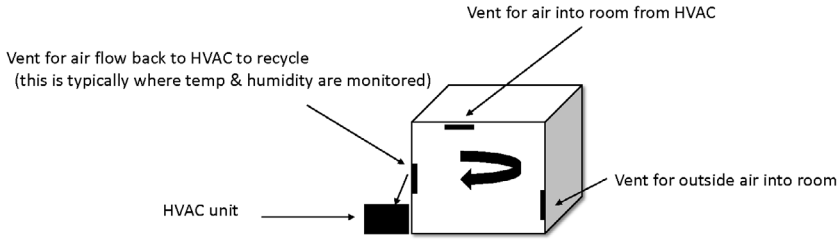

Figure 3.1: Basic air flow in a room with HVAC. This figure is licensed under the Creative Commons Attribution 4.0 International License.

Regular maintenance and monitoring of the system's performance are necessary to ensure its continued effectiveness and efficiency. According to a 2011 publication of the Occupational Safety and Health Administration (OSHA), many common indoor air quality problems "are associated with improperly operated and maintained heating, ventilating and air-conditioning (HVAC) systems…" (OSHA 2011, 3). Maintenance of this equipment is not typically performed by librarians. Establishing positive communication lines with those responsible for maintenance will increase librarians' basic knowledge of how the equipment works in their building. In addition, these partners can help assess existing climate conditions and, with shared information, can be well-prepared for any problems or concerns. In large institutions, there are entire facility maintenance crews with designated staff responsible for HVAC systems while, in smaller organizations, there may be only a single maintenance person who performs all duties, or you might have to rely on third-party installation and repair companies. Regardless of your organizational structure, it is important to know these potential partners. Set up a time to do a walk-through with them. Learn about their work and concerns and teach them about the materials you are responsible for. It is important to establish a relationship on which to base additional conversations about what work can be done to improve the systems. Here are some important initial questions to ask them:

- Where is the library HVAC unit located?
- Is the library a multi-zone system? If so, how are the zones designed?

- Where are the air ducts and vents located?
- How does outside air enter the building?

Have information ready also for your facility/HVAC partners to help them understand your concerns and the needs of your collections. Have there been preservation problems with the collection in the past, including mold outbreaks or water damage? Where are collections located, in separate rooms or in spaces shared with people? Where are rare or valuable collections housed, and what sorts of additional protection do they require? Facilities personnel work with standards established by the National Information Standards Organization (NISO), so sharing the standards specific to library collections is a place to start the conversation (Wilson 1995, 2).

Evaluating and Monitoring Your Environments

Understanding how the equipment works that cools, heats, and manages humidity is crucial to managing the overall stability of your collections, but monitoring the equipment to ensure that temperature and humidity levels are appropriate is also essential. If your equipment fails, and no one is regularly checking humidity levels, a mold outbreak can occur in only a few days, depending on your geographic location. Gathering information on your equipment and collection spaces, such as whether you have one zone to manage or multiple zones with several HVAC units, is helpful when analyzing the environments. General building maintenance should also be assessed, including whether there is adequate sealant around windows and doors and whether there are leaky pipes or roof leaks.

The Northeast Documentation Conservation Center (NEDCC) offers free preservation pamphlets to help you monitor collection environments. According to the author of one of these pamphlets:

> Maintaining stable conditions is crucial. An institution should choose a temperature and relative humidity within the recommended ranges that can be maintained twenty-four hours a day, 365 days a year. The climate-control system should never be turned off, and settings should not be lowered at night, on weekends, or at other times when the library or archives is closed. Additional costs incurred by keeping the system in constant operation will be far less than the cost of

future conservation treatment to repair damage caused by poor climate (Ogden 1999).

While experts do not all agree on specific standards for all materials and geographic locations, the NISO standards on storage parameters (Wilson 1995, 2) will help you assess whether appropriate conditions are being consistently maintained in your library. Many collections are in spaces shared with users and so will require a different range than materials that are in a non-public area or vault. Wilson's Table 1 provides a helpful overview of recommendations (see Figure 3.2).

STORAGE PARAMETERS **NISO TR01-1995**

Table 1: Suggested values for temperature and relative humidity

	Temperature (°F)	Relative Humidity (%)
Combined stack and user areas	70 (maximum)[a]	30-50 [b]
Stack areas where people are excluded except for access and retrieval	65 (maximum)[a]	30-50 [b]
Optimum preservation stacks	35-65 [c]	30-50 [b]
Maximum daily fluctuation	+/- 2	+/- 3
Maximum monthly drift	3	3

[a] These values assume that 70 °F is about the minimum comfort temperature for reading, and 65 °F the minimum for light physical activity. Each institution can make its own choice.

[b] A *specific value* of relative humidity within this range should be maintained +/- 3%, depending on the climatic conditions in the local geographic area, or facility limitations.

[c] A *specific temperature* within this range should be maintained +/- 2 °F. The specific temperature chosen depends on how much an organization is willing to invest in order to achieve a given life expectancy for its records.

Figure 3.2: Suggested values for temperature and relative humidity

Facilities staff should be able to help you track the temperatures and humidity. If not, there are tools to help you monitor trends over time. A *psychrometer* is a hand-held instrument that measures relative humidity and records the information. *Data loggers* can be used to log the information you gather. Another NEDCC preservation pamphlet covers various types of equipment and how they are used (Willer 2022). Based on a 2000-2002 field trial with 180 cultural organizations, a high percentage of the participants recommended using the *preservation environment monitor* developed by the Image Permanence Institute (Turpening 2003). The National Park Service

published the 2011 report "Comparing Temperature and Relative Humidity Dataloggers for Museum Monitoring," which reviews a considerable number of options, covering the hardware specifications of various data loggers and their relative capacities for data retrieval, viewing, and analysis (Arenstein and Alderson 2011).

Setting Realistic Guidelines

The reality is that it is difficult to meet NISO standards. Even in a newly constructed library with the latest equipment, it is not easy to create distinctive spaces with optimal conditions both for people and for each type of material your collection includes: paper, photographs, microfilm, etc. The best recommendation is to determine what your equipment can do and work toward consistent temperature and humidity levels. Consistency in the environment is the most critical factor for material stability.

Stability requires regular maintenance of the HVAC system and maintaining consistent environmental conditions, allowing for seasonal shifts. A good relationship with your facility personnel is important to ensure that this is accomplished. Either you or they will need to monitor conditions. If your facilities staff does this, explain why you need to see the data over extended periods. It is good to test in a variety of seasonal environments so that you can factor in the variants based on outside environmental conditions. Collaborating with your partners in facilities, assess the results, and set a range that the equipment will consistently support. It is acceptable to have a temperature that might be a little higher than NISO standards recommend if you are able to maintain that temperature consistently with only a little seasonal shift. If the equipment is not able to support a reasonable range, and you have evidence of preservation issues, then you will have the data needed to support a request for new equipment or significant adjustments.

Conclusion

Despite the various challenges and difficulties librarians may face in implementing successful climate control measures, they can initiate

tasks that will significantly contribute to overall preservation efforts. Understanding and monitoring the equipment involved in maintaining climate control and building good rapport with partners will go a long way toward achieving the desired results. Evaluating your environment will help you make informed decisions, such as replacing older measuring equipment with data loggers, and can help you shape realistic guidelines that work for your institution.

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