White Paper
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Analysis and Optimization of the High Point Museum's Preservation Environment

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Background

The High Point Museum is located in the Piedmont region of North Carolina, an area known for mild, dry winters peppered with snowstorms and ice storms and for hot, humid summers. This type of climate, classified as humid subtropical, makes maintaining an appropriate preservation environment quite difficult. Environmental systems must be able to humidify and dehumidify at different times of the year, while sticking to temperature set points.

The Museum’s exhibits and collections storage space are located in a 20,000 square foot building constructed in two phases opened in 1971 and 2000, respectively. The front or southern half of the building is the older portion and includes the collections storage room downstairs and the Core Gallery upstairs, as well as bathrooms, offices, the museum store, kitchen, and conference room. The back or northern half is an addition that opened in 2000 and includes the High Point’s Furniture Heritage gallery and Education Classroom downstairs and the Changing Gallery, Meredith’s Miniatures gallery, and Lecture Hall upstairs. The north-facing wall of the lower floor is built into the ground, providing some buffer from outside conditions for the collections storage space.

During construction of the addition, some environmental recommendations from a 1995 Conservation Assessment Project (CAP) grant were implemented, including the addition of dehumidification controls for the collections storage space. However, many elements of the older HVAC systems were left in place, rather than being replaced at that time. The building’s HVAC systems need frequent fine-tuning and maintenance and, thanks to regular environmental monitoring by staff, it has been noted that systems throughout the building have trouble producing appropriate environmental conditions.

After a system failure in summer 2018 that affected the collections storage space, staff decided it was necessary to pursue outside expertise and funding for improvements.

Project Activities

The High Point Museum and the City of High Point received $21,694 in grant funding from the National Endowment for the Humanities’ Sustaining Cultural Heritage Collections program with a match of $5,424 for a total project cost of $27,118. The project team consisted of Museum staff members Edith Brady, museum director, Marian Inabinett, curator of collections, and Corinne Midgett, registrar and project director; City staff Tim McKinney, director of facility services, and Lorrie Russell, public library assistant director; HVAC contractor John Kennedy of Johnson Controls; and consultants Christopher Cameron, Kelly Krish, and Jae Gutierrez from the Image Permanence Institute.

Work began in November 2019 with a three-day site visit by Chris Cameron and Jae Gutierrez. Chris and Jae met with team members to review historic environmental data, walk through the building and discuss known issues, and place additional dataloggers in the exhibit and storage spaces and in their respective duct systems and air handlers.

Some new information came to light as a result of reviewing the building as a team. In Collections Storage, beneath the mobile shelving units, cracks were noted in the decking.
Monitoring since the site visit has not shown that moisture is entering through the cracks. Staff continue to monitor the cracks for expansion and movement, although none has been noted thus far.

Museum staff learned more about the HVAC systems during the site visit. Collections Storage has an open plenum system and the returns and supplies are in the light fixtures and alternate in a checkerboard pattern. While walking around the exterior of the building, Chris noticed vents for energy recovery ventilators (ERVs) on the west wall. They were not in operation, but they could provide enough humidification in winter to mitigate the low humidity in the spaces they service – Collections Storage and the furniture gallery. It was agreed that the ERVs would be serviced and made operational to test their efficacy.

On the second day of the site visit, staff from the City’s Facility Services department provided access to the air handlers on the roof of the building and in the ceilings of the exhibit spaces. Chris and Jae took notes on the equipment and placed PEM2 dataloggers to monitor supply and return air for each of the units. Loggers were also placed in several locations within exhibits and Collections Storage, including inside drawers and on top and bottom shelves of mobile shelving units. Chris and Jae then showed Corinne and Marian how to use the dataloggers and how to upload data to IPI’s PEM2-compatible, web-based program eClimateNotebook. They reviewed some of the museum’s historic data to show how eCNB can be used to analyze environmental conditions.

In the couple of years before this project started, Museum and City staff had discussed potential improvements to the HVAC systems. During the site visit, these were further discussed. One suggestion was the addition of two split systems in Collections Storage. Chris explained that such systems are designed to provide comfort, not moisture removal. If the main air handler for Collections Storage goes out and the splits take over, and the outside dew point is high, the splits will bring the inside temperature down, but will also have the effect of increasing the relative humidity.

Toward the end of the site visit, Chris and Jae reviewed environmental recommendations for preservation. The Museum should aim for 30-55% relative humidity. Rust is more likely above 55% and mold above 65%. The Museum is close to this in the summer and conditions sometimes drop below 30% in the winter. IPI’s Time Weighted Preservation Index (TWPI) considers the cumulative effect of high temperature and high humidity. A higher number indicates slower deterioration and a longer lifespan for a collection. The Museum’s storage and exhibit spaces currently measure in the 35-55 range; given the local climate, Chris and Jae believe a TWPI of 100-125 is achievable with improved environmental equipment and controls.

After the site visit, Chris created schematics for all the air handlers showing the locations of the loggers. Every four to six weeks, a Facilities Services staff member downloaded data from the loggers, which Corinne then uploaded to eClimateNotebook. Several team meetings were held virtually to review the data and discuss adjustments, including use of the ERVs and increasing temperatures to lower relative humidity and dew point.
For about four months, the project went as planned. In March 2020, the COVID-19 pandemic caused nationwide shutdowns and restrictions on travel. Thankfully, the loggers continued collecting data until downloads could resume. With most of the team working fully or partially remotely, virtual meetings were easy to schedule and the main project work of data collection and analysis continued.

However, when it came time to schedule the second site visit in fall 2020, travel restrictions had still not been lifted. The project team decided on a new course of action: a six-month extension was requested from the NEH, along with revisions to the budget. The extension and budget revisions were approved. The consultant time that was intended to be spent during the two-day site visit was redirected toward additional data analysis during the extension and toward a complete rewrite of the museum’s disaster response plan, which was outdated and in need of replacement. Funds that were originally budgeted for travel were reallocated toward project-related supplies: replacement ERV cassettes, gauges to measure cracks under the mobile shelving units, and wireless dataloggers. Since Chris and Kelly would have picked up the IPI-supplied dataloggers during the second site visit, a small amount was spent to mail the loggers to IPI.

At the end of the six-month extension in July 2021, the museum had 18 months of detailed data showing environmental conditions in exhibit and storage spaces within the museum, as well as a report that analyzed the data and provided data-driven recommendations for short-, mid-, and long-term improvements. Despite the challenges caused by the COVID-19 pandemic, we were able to complete the project with the unexpected benefits of a rewritten disaster response plan and new ERV and monitoring equipment.

Accomplishments

As described above, all aspects of the project goals were completed, with the exception of a second site visit by consultants Chris Cameron and Kelly Krish. The site visit was canceled due to travel restrictions and public health guidelines. Thanks to the flexibility of Chris, Kelly, the NEH, and other team members, a modified workplan and budget were adopted that allowed the project to be completed.

The project’s main objective was to produce a report outlining recommendations for improvement or upgrade of the existing HVAC systems serving the museum’s storage and exhibit spaces. The report was completed and included recommendations to adjust temperature set points, address building envelope issues that were discovered during the project, improve dehumidification capacity, replace the gallery air handlers, and add a Building Automated Control System (BACS).

Though the second site visit would have been valuable, the team was able to review the report and hold a final project meeting virtually. The additional consultant time and funding that was budgeted for the second site visit were reallocated toward emergency planning, building environment improvements, and monitoring equipment. Kelly and Corinne spent several months writing a new disaster response plan for the museum. The existing plan was more than 15 years old and did not adequately address collections-related emergencies like HVAC outages. The new plan...
plan incorporates staff knowledge of the collection and site to outline preparation for different types of emergencies and provides resources and guidelines for recovery of different object types. A contact list, institutional and building information, and inventories of disaster kits are included. The plan was made to be useable, practical, and manageable – comprehensive, but not overwhelming. It can be updated and revised very easily.

The ERVs that were brought back into service after the first site visit were in need of new cassettes for longevity and efficiency, so those were purchased and installed. Monitors to alert staff of changes in the cracks under the mobile shelving units were purchased and installed. These will stay in place for at least two years per Chris’ recommendation. Lastly, additional dataloggers with remote monitoring capacity were purchased so that staff can better monitor storage and exhibit spaces, particularly hard-to-access and out-of-sight areas that experience reduced airflow and are more susceptible to humidity extremes and mold germination.

Continuation of the Project

Museum staff plans to pursue the recommendations in Chris and Kelly’s report. Additional funding will be likely be needed, so staff is investigating grants and other sources. The Museum is a facility of the City of High Point and a division of the High Point Public Library and the report will be provided to City Council and the Library Board of Trustees. The Museum’s support group, the High Point Historical Society, owns the Museum’s collection and is an important advocate for the collection; the report will be made available to the HPHS Board of Trustees as well.

Since major improvements will take time to implement, staff will continue to collect and monitor environmental data throughout the Museum building. A process is already in place that allows quick response to HVAC issues through the City’s HVAC contractor. Short-term recommendations, such as adjustments to temperature set points, will be tested and implemented if they are found to be beneficial.

Setbacks and Lessons Learned

No project ever goes entirely as planned and the project team certainly didn’t foresee a global pandemic happening within months of the start date. When it became clear that a second site visit wasn’t possible, the entire team showed a great deal of thoughtfulness and flexibility in creating a revised workplan and budget. Museum staff benefited from Chris and Kelly’s experience with other NEH-funded projects. Additionally, the NEH staff made the process of requesting revisions very simple. What initially seemed onerous and frustrating worked out so well in the end. The virtual meetings to review the disaster plan and report were easy to schedule, since no one needed to travel across states or even across the city. Technology made it simple to share and edit documents during meetings.

Museum staff came to the project with some assumptions about the recommendations and improvements that would be suggested. In some cases, those assumptions were correct, but there were surprises along the way. One of the reviewers of our application questioned why the Museum was applying for a planning grant when staff already knew the building and HVAC
systems had issues. In fact, staff knew there were problems, but weren’t entirely clear about the best way to mitigate those problems. The Museum has a small budget and will likely have to find outside funding for HVAC improvements. If substantial funds are going to be spent, the Museum needs to spend it on the most appropriate solution and that requires robust planning.

Bringing in an outside expert, especially in such specialized fields as building environments and preservation, is always valuable. Chris, Kelly and Jae have experience at many institutions in a variety of climates and they were able to bring lessons from those experiences to this project. As they viewed the building that Museum staff see every day, they saw things that had escaped staff’s notice, such as the ERV vents and the cracks under the mobile shelving units. Asking outsiders to review and find faults in your institution can be challenging, but the end result will be a stronger, more resilient organization.

**Publicizing the Project and Disseminating Results**

Upon notification of the award, the Museum issued a press release. Another press release will be issued upon completion of the project. Acknowledgement of NEH funding is included in press releases and in the report and the disaster plan. In October 2020, Corinne organized a virtual session through the Southeastern Museums Council in which Chris participated; the session, titled “Understanding Building Environments and Operations,” built on the project and Chris’ expertise to help museum professionals learn the language of HVAC systems and effective methods of communicating with building maintenance professionals. Museum staff will continue to seek out opportunities to share their experiences with this project.