NATIONAL ENDOWMENT FOR THE HUMANITIES

DIVISION OF PRESERVATION AND ACCESS

Narrative Section of a Successful Application

The attached document contains the grant narrative of a previously funded grant application. It is not intended to serve as a model, but to give you a sense of how a successful application may be crafted. Every successful application is different, and each applicant is urged to prepare a proposal that reflects its unique project and aspirations. Prospective applicants should consult the NEH Division of Preservation and Access application guidelines at http://www.neh.gov/divisions/preservation for instructions. Applicants are also strongly encouraged to consult with the NEH Division of Preservation and Access staff well before a grant deadline.

Note: The attachment only contains the grant narrative, not the entire funded application. In addition, certain portions may have been redacted to protect the privacy interests of an individual and/or to protect confidential commercial and financial information and/or to protect copyrighted materials.

Project Title: Sustainable HVAC Stabilization Phase 1

Institution: Philbrook Museum of Art, Inc.

Project Director: Rachel Keith

Grant Program: Sustaining Cultural Heritage Collections

Project Description

Philbrook Museum of Art in Tulsa, Oklahoma requests an implementation grant in the amount of $350,000 from the National Endowment for the Humanities through the Sustaining Cultural Heritage Collections grant program to support a three-year project to replace outdated HVAC system components and establish a comprehensive monitoring system to enhance collections preservation and energy efficiency.

Philbrook's permanent collection contains approximately 16,000 objects that represent a period of over 5,000 years, making it the most comprehensive in Oklahoma. The Museum's diverse permanent collection provides opportunities to facilitate discussion and promote understanding about cultures, history, and social and aesthetic practices from around the world. Philbrook's vision is to be an institution central to the lives of the community as a place for learning, inspiration, and fun. Through bold action and strategic investment, the Museum creates a space for new ideas, diverse perspectives, and social connection. Vital to realizing this vision is the Museum's ability to safeguard the historic structure, ensure a healthy climate for the long-term stability of collections, and operate the building systems sustainably.

The largest current threat to the preservation of the historic property and permanent collection is the building's antiquated and unreliable HVAC system. Through an NEH Sustaining Cultural Heritage Collections Planning Grant, Philbrook staff and consultants have designed a two-phase project to (1) stabilize the system and gather more detailed climate readings and (2) refine the system and implement operational efficiencies.

Through the proposed grant project, Philbrook will address Phase One of this overall initiative, which involves replacing the major system components located in the boiler room. This project will (1) establish a reliable, simple, and clear method of monitoring environmental conditions throughout the building's collection areas, and (2) stabilize and restore full functioning to the system by replacing or rebuilding the major components that have exceeded their useful lifespan and are no longer functioning optimally. In addition to replacing these components, Museum staff will implement comprehensive monitoring throughout collection storage and display areas to build a more complete picture of microclimates within the building.

Based on conservative estimates, the new equipment alone will decrease gas and electricity usage by approximately 8%, saving the Museum $15,216 annually based on the three-year average utility bills ($190,205). In addition to energy savings, through the course of this project, Philbrook will:

- stabilize the system to prevent a catastrophic system failure,
- reduce the amount of staff time and repair costs required to keep the system operational,
- create a clear picture of microclimates within the building in order both to plan for future system improvements and to better match the needs of individual objects with their environments
- lay the ground work for improving overall storage conditions that will better prevent mechanical deterioration of the collection due to high temperatures over time, and
- better support the historic structure itself by shifting the climate setpoints slightly in order to reduce condensation forming within the building walls.

The results of this Implementation Grant would include a stable, operational HVAC system that is no longer at heightened risk of sudden catastrophic breakdown, improved care of collections, including the historic Villa, and improved energy efficiency. Improved climate conditions for the collection will help ensure the long-term sustainability and preservation of the Museum's diverse collection. Better balancing the collection and building's needs will support the long-term preservation of the historic Villa.

Philbrook

Attachment #2: Table of Contents

Introduction

Project Overview

Philbrook Museum of Art in Tulsa, Oklahoma requests support in the amount of $350,000 from the National Endowment for the Humanities toward a three-year project to replace outdated HVAC system components and establish a comprehensive monitoring system to enhance collections preservation and energy efficiency.

Philbrook Museum of art is a 30,000 square-foot Italianate Villa located on 25 acres of landscaped gardens. Designed by architect Edward Buehler Delk (1885-1956), the historic Villa was built in 1926 for petroleum businessman Waite Phillips and his family, then generously donated to the community in 1938 to become Tulsa's first art museum.

Philbrook's vision is to be an institution central to the lives of the community as a place for learning, inspiration, and fun. Through bold action and strategic investment, the Museum creates a space for new ideas, diverse perspectives, and social connection. Under the leadership of Executive Director Scott Stulen, who assumed the role in August 2016, Philbrook is currently in the final stages of developing a new, five-year Strategic Plan. The initiatives outlined in this new Strategic Plan (*see Appendix I: Strategic Plan*) advance critical, institution-wide goals intended to propel the Museum toward a sustainable future by increasing the community's engagement with art and gardens. Vital to realizing this vision is the Museum's ability to safeguard the historic structure, ensure a healthy climate for the long-term stability of collections, and operate the building systems sustainably.

The largest current threat to the preservation of the historic property and permanent collection is the building's antiquated and unreliable HVAC system. Philbrook recognized and acted upon the urgency of this threat and in 2017 was awarded a Sustaining Cultural Heritage Collections Planning Grant from NEH to research and plan for the replacement of the institution's HVAC system. Using the findings of the interdisciplinary team of experts, the proposed project will replace HVAC system components in greatest need and establish a comprehensive monitoring system to inform plans for needed refinements and increased efficiency in the future. This project is the first phase of the Museum's long-term initiative to improve HVAC system controls within the building to allow for greater efficiency and flexibility while balancing the needs of the collection and historic structure. The completion of this first phase will stabilize the Museum's HVAC system.

As the museum field strives for more sustainable approaches to preventative conservation—particularly with regard to seeking energy-efficient ways to provide appropriate climate conditions for collections—Philbrook seeks to improve its own ecological footprint. A key component of the NEH Planning Grant was the re-evaluation of current environmental setpoints vis-a-vis the needs of Philbrook's unique collection. To this end, Philbrook enlisted the help of Dianne Modestini, conservator for the Kress Foundation and expert in Renaissance panel paintings, and Rachael Arenstein, an objects conservator specializing in preventative conservation and ethnographic materials. Their recommendations, together with those from preservation architect Jeff Baker, formed the foundation for the HVAC requirements the interdisciplinary grant team developed through the course of the grant.

Meeting the highest professional standards for collections care is also a top priority for Philbrook, and—despite not having a staff conservator—the collections care team follows a conscientious program of preventative conservation (see Current Conditions and Challenges). Several long-standing key collections policies (*see Appendix II: Collections Policies*) are in place as well, including a Collecting Plan (revised 2018), Collections Management Policy (revised 2018), Long-Range Conservation Plan (established 2006 / revision in progress), and Disaster Response Plan (revised 2007 / revision in progress).

Organizational Profile

Philbrook's mission is to make a more creative and connected community through art and gardens. The Museum is a home for art, learning, and creative engagement, and has been a cultural cornerstone of the Tulsa community for 80 years. Philbrook provides its audience with the highest quality artistic experiences through distinctive temporary exhibitions that complement its permanent art collection and living collection in the gardens; educational and public programming designed to engage students, teachers, and the public; and the display, interpretation, and stewardship of its permanent collection.

The Museum presents its permanent collection and an ambitious slate of exhibitions in the Villa, in a 1990 wing that includes a 5,000-square-foot exhibition space (as well as storage spaces, offices, and classrooms), and in a downtown satellite location opened in 2013. Philbrook owns the historic Villa and grounds; however, its downtown satellite location is currently under a long-term capital lease. The current project relates specifically to the Villa. Philbrook staff is comprised of 76 full-time employees, 16 regular part-time employees, and 59 variable part-time employees. Philbrook's annual operating budget is $7,379,266. In FY2018, the Museum welcomed approximately 162,000 visitors.

Philbrook's permanent collection is one of the most comprehensive in Oklahoma, including objects from Africa, the Americas, Asia, Europe, and Oceania. In alignment with mission, Philbrook continues to diversify the collection to include underrepresented voices and perspectives through strategic acquisitions, such as Kehinde Wiley's *Equestrian Portrait of King Philip IV* (2017) acquired in 2018. Philbrook is committed to honing the presentation of its permanent collection based on ongoing evaluation results, including re-envisioning the presentation of the collection. Regular revisions to the installation, including loans and new acquisitions, provide visitors with thought-provoking subject matter and ensure the Museum remains relevant to its key audiences while also attracting new audiences.

Significance of Collections

Philbrook Museum of Art's permanent collection contains approximately 16,000 objects from six continents that represent a period of over 5,000 years, making it the most comprehensive in Oklahoma. The greatest areas of strength include Native American works of the twentieth century, American art of the nineteenth and twentieth centuries, Italian Renaissance and French nineteenth-century paintings, and contemporary art by emerging and established American artists. The wide breadth of Philbrook's collection allows the Museum to represent a diverse range of cultures, time periods, and styles. The Museum's holdings of ancient art and antiquities (consisting of Egyptian, Etruscan, Greek, and Roman art and artifacts) are used to illustrate the development of art as well as the cultural and historical contexts in which these practices developed in the Classical world. The Kress Collection of Italian paintings and sculpture traces the development of art over 400 years, from the Medieval period through the Renaissance to the Baroque, connecting these artworks to broader cultural shifts taking place during this transformative era.

Philbrook also holds significant collections of African art (approximately 350 objects)—primarily wood sculpture from over 120 cultural and ethnic groups in Central and Western Africa—and Asian art (approximately 1,000 objects), with a particularly strong collection of Japanese paintings from the Edo Period (1603–1868). The display of art from around the world facilitates discussions about world history, as well as aesthetic value and meaning across cultures. At Philbrook, these discussions happen both implicitly (i.e. with the display of artwork from a range of cultures within the Museum) and explicitly through docent-led tours, curator presentations, and other educational programming.

In fall 2017, Philbrook launched a major initiative to reenvision the presentation of its permanent collection, which for decades has been segmented into galleries defined by culture groups. Through a

thematic, cross-cultural reinstallation centered on the concept of "Change," visitors will be invited to explore transformative elements of modern life—war, migration, and globalization, for example—and universal human experience, including birth, death, and spirituality. The new presentation will explore change within the field of art as well, considering adaptation, innovation, and modernism. This reinstallation marks the beginning of a ten-year strategy to reconsider Philbrook's collection and its—at times, unexpected—connections to contemporary life, the local community, and our shared histories.

The current outdated presentation of Philbrook's permanent collection reflects a highly traditional, Eurocentric approach to art history and museum installations that does not match the institution's mission or philosophy. This new presentation will challenge the systems of inequality implicit in the canonical tradition of art history and museum practice. Philbrook's planned thematic, cross-cultural, and inclusive approach to presentation will create opportunities to draw connections between cultures, highlight the broad range of cultures within the institution's collection, and embrace cultural equity in future narratives.

Native American Art Collection

Native American art has always been a cornerstone of the Museum's collection, and is now one of the Museum's largest holdings with approximately 4,000 objects. Philbrook boasts one of the finest surveys of twentieth-century Native art, with particular strengths in basketry, pottery, paintings, and jewelry. The collection features iconic works by influential artists from across Indian Country, including Datsolalee, Jeffrey Gibson, Maria Martinez, Fritz Scholder, and Pablita Velarde. Exhibitions of and public programs surrounding Native art highlight the cultural context of the works and often focus on themes such as aesthetic traditions, kinship, and cross-cultural exchange. Temporary exhibitions have investigated diverse religious traditions in Native communities (e.g. *Seeking the Sacred*, 2012) and Native historical perspectives (e.g. *First Person: Remembering Little Bighorn*, 2016). The Museum's Native American holdings are especially significant given the region's large Native American population.

American Art Collection

The Museum's collection of American art consists of nearly 6,500 works, including a recent accession of 4,000 photographs. The American art holdings include fine examples of eighteenth- to twenty-first-century painting and works on paper, including early colonial portraiture and romantic landscape painting, American Impressionism, and Regionalism. Recent exhibitions featuring American objects from the permanent collection have focused on photography as primary source material for historical events significant to Oklahoma and/or American history (e.g. *Making Modern America*, 2018) and re-examining traditional norms of western painting both from new perspectives and through art practices that cross cultural boundaries (e.g. *Black on Black & White: The Southwest of Laura Gilpin and Maria Martinez,* 2012).

Modern and Contemporary Art Collection

Philbrook's modern and contemporary collection is a growing area with approximately 700 works, and the Museum is particularly focused on acquiring art by women and people of color—groups of artists largely underrepresented in museum collections. The effort reflects both Philbrook's community-focused mission and contemporary art practices in the world today. After it closed, the Museum purchased two of the exhibited works to strengthen its own collection in this area. In 2017, Philbrook acquired Kehinde Wiley's *Equestrian Portrait of King Philip IV* (2017). This important and much-publicized acquisition expanded the scope and depth of Philbrook's permanent collection.

European Art

European art has long been an important part of the Museum's collection, with approximately 1,500 objects. The Museum's holdings of Italian Renaissance art of the fourteenth through sixteenth centuries are especially rich. The core of this collection came to Philbrook through one of the largest institutional

gifts ever made by Kress Foundation and and links Philbrook to other Kress-supported institutions across the country. Artworks such as Tanzio da Varallo's *John the Baptist in the Wilderness*—one of only a small number of works by the artist in American museums—and Biagio d'Antonio's *Adoration of the Child with Saints and Donors*—the largest work by the artist in the United States—help to make Philbrook's holdings exceptional and give the Museum a unique opportunity to contextualize art historical trends in European art.

African Art Collection

The African art collection at Philbrook provides a broad survey of west and central African masks and carvings. The collection numbers approximately 350 objects dating from the 19th to late 20th century and represents nearly 120 cultural groups from 25 countries.he collection highlights the carving traditions of many cultural groups throughout West Africa, particularly from the Ashanti, Baga, Bambara, Bembe, Benin, Dan, Dogon, Guro, Kran, Mossi, Senufo, and Yoruba peoples.

Antiquities

Philbrook's collections of antiquities represent Egyptian, Etruscan, Greek, Roman, Persian, and Syrian cultures. Objects range from figurative sculptures, vases, and other vessels, to jewelry, textiles, and coins, dating from approximately 2000 BCE to 1400 CE. Among the highlights of this group are an Egyptian mummiform coffin (1970.1); an Egyptian granite head of a king or god (1963.4.1); a "corn mummy"—an unusual type of Egyptian mummy that contains kernels of grain instead of animal remains (1969.17a, b)—and a bronze sculpture of the goddess Isis (1971.1.1); several Greek vessels, including a black-figure amphora attributed to the Euphiletos painter (1967.22) and a red-figure krater with a victorious athlete (1967.16.14); and a number of Greek and Roman heads and figures in marble and terracotta. This collection is significant as one of the only holdings of antiquities in Oklahoma, providing an opportunity to tell the story of western art starting with its roots in the Classical tradition.

American and European Decorative Arts and Design

Philbrook's American and European Decorative Arts and Design collection contains over 1,500 objects. The objects date from the 16th century through the early 21st century and include glassware, ceramics, textiles, furniture, and design objects. In addition to these items, a collection exists around the historic Villa Philbrook. Designed by Edward Buehler Delk and built in 1926–27, Villa Philbrook combines Italian Renaissance Revival, Beaux-Arts, Craftsman, and early Art Deco influences with cutting-edge 1926 construction techniques. The Phillips family also hired the Kansas City landscape architecture firm Hare & Hare (active 1910-1979) to design the a series of formal and informal gardens surrounding Villa Philbrook and New York-based interior designer Percy French (of French & Company art dealers) to work with Delk on the interior finishes of the Villa. French oversaw the interior detailing for the Villa, including contracting with painters Oscar Berninghaus and George Gibbs, sculptors Harriet Whitney Frishmuth and Jørgen Dreyer, stained glass artist Nicola D'Ascenzo and D'Ascenzo Studios, metal craftsmen Oscar Bach and Bertram Segar, muralists and decorative painters Cooper & Gentiluomo, and lighting company Edward F. Caldwell & Co. Villa Philbrook was listed on the National Register of Historic Places in 1978 as "Phillips, Waite, Mansion" (#78002274). While most of the upper and lower levels of the house have been transformed into traditional gallery spaces, a number of rooms on the main level retain their original features, character, and décor, with decorative arts playing a key role.

Asian Art Collections

Philbrook's collection of Asian art numbers nearly 1,140 objects from three main geographic areas: China, Japan, and Southeast Asia. Because there are few collections of Asian objects in Oklahoma institutions (only the Fred Jones Jr. Museum of Art at the University of Oklahoma has significant holdings), this is an important collection for the region. The Japanese collection is relatively small, but

high quality. The most significant objects, however, are thirty-three painted scrolls and seven painted screens from the Edo Period (1603–1868), including several by Ito Jakuchu, notably the exceptional *White Rooster* (1966.27.8). The paintings are important in their own right, and serve as interesting cross-cultural comparisons with works of art from other aesthetic traditions.

Collection Use

Philbrook reaches its large and diverse audience through exhibitions, catalogues, and public programs aimed at bringing specific themes, cultures, contexts, and artistic practices to light. Philbrook's upcoming exhibition *Making Modern America,* for example, is inspired by the Museum's permanent collection and examines the paradox of progress through modern images of industry, energy, and growth in American art in the first half of the 20th century. Through the lens of industry, this project explores varied social and environmental themes in American society during this period. Philbrook has also partnered with the Oklahoma Center for Humanities to host a panel discussion that uses exhibition themes as a lens to explore tensions that exist within cities, past and present.

Museum visitorship is primarily concentrated in the Tulsa Metropolitan Statistical Area; however, Philbrook engages audiences throughout the nation. Demographic data indicates that Philbrook's audience is primarily adults, those with at least some college education, and middle to upper class. The majority of these visitors are Caucasian; however recent survey data indicated that more than 16% of Philbrook visitors identified as minorities. Through frequently advertised accessibility programs, like children 17 and under free admission, Philbrook works to eradicate potential economic barriers to admission and grow diversity of audiences.

Current Conditions and Preservation Challenges

The historic structure, Villa Philbrook, where the permanent collection is displayed, is a 30,000-square foot stucco building with a clay tile roof (*see Appendix III: Villa Photos & Floor Plans*). Its construction methods were similar to those used in skyscrapers of the 1920s and relied on structural clay tiles, large amounts of concrete, and no wooden structural components. The circa 1990 wing is approximately 80,000 square feet. Housing the Museum's six storage areas, 5,000-square-foot temporary exhibition gallery, and boiler room (a vestige of an earlier wing incorporated into the expansion), it was built using construction methods typical of an office building, with an EIFS exterior and flat roof. The downtown satellite location has a separate geothermally powered HVAC system that is only seven years old and is not part of this project.

Overall, the building is in very good condition, but the HVAC system has far exceeded its expected lifespan and is currently one of the largest threats to the collection at Philbrook. The primary system components are approximately 40 years old, and while the heating and cooling systems are still operating near capacity, humidification is only at 50%. The Museum's current HVAC system has been patched together in a reactionary and opportunistic way to fit within available parameters of income or support. In 2007, the HVAC system servicing the Villa was partially renovated. During this renovation, the oldest air handlers—secondhand, non-commercial units from the 1970s—were replaced and the majority of the Villa system was moved to the attic. The original system had no make-up air unit with which to introduce outside air into the system to bring existing operations up to current building codes. The system used pneumatic controls, which required manual calibrating, an outdated practice (in fact, a number of air handlers in use today at Philbrook have pneumatic controls). There was no warning mechanism for equipment failure until it was indicated by changes in space temperature or water flowing down the wall.

During this renovation, new air handlers were placed in the attic, the oldest units were replaced, a make-up air unit was added, pneumatic controls were converted to direct digital control, and water sensors were

added beneath the units. The 2007 system, which serves the entire facility, allows for remote monitoring control. Fireproofing measures were also made during this renovation to seal holes in the attic's concrete floor.

After this renovation, the original capabilities for redundancy were lost, as retrofits and repairs have increased the demands for steam, requiring both units to work simultaneously in order to maintain established setpoints. Meanwhile, many important zones in the building have no humidity control, including temporary, oversize, and works on paper storage areas. Staff monitors the humidity in these spaces and attempts to control them with freestanding dehumidifiers when needed.

The building engineers keep the system stable as best they can, and the collection appears to be in good overall condition despite the modest regular fluctuations. Without redundancy, however, the risks associated with catastrophic failure are significant and would lead to more patches within the system. The Museum seeks to proactively plan for system replacement that is intentionally designed to balance the needs of the collection, the historic building, and environmental and financial sustainability.

The HVAC components in dire need of replacement include both centrifugal chillers, installed in 1979 & 1989; both hot water boilers, installed in 1979 & 1989; both steam boilers for humidification, installed in 1989; the heat exchanger; both chilled water pumps; both heating water pumps; and,numerous air handling units with steam humidification. (*see Appendix IV: Current Equipment Photos*)

The central plant at Philbrook consists of two centrifugal chillers for chilled water cooling and dehumidification. Chiller 1 is 250 ton and was installed in 1989 and Chiller 2 is 210 ton and was installed in 1979. Both chillers were installed as "used" equipment. The plant contains a free cooling plate for winter cooling when the wet bulb setpoint is reached. There are two hot water boilers in the plant, both are 70HP each for heating and re-heating on dehumidification. These were installed in 1979 and 1989. There are also two steam boilers at 15 HP each for humidification and both were installed in 1989. The 250-ton chiller is used in the summer and, despite repeated attempts at repairs, continues to have problems maintaining the chilled water setpoint, making dehumidification difficult to maintain. This chiller is not connected to the free cooling plate and therefore cannot be used during winter months. The 210-ton chiller is used in the winter because it is connected to the free cooling plate and cannot be used in the summer because it is too small to handle the extreme heat temperatures.

The system includes 26 air handler units, 21 of which serve gallery or collections storage areas. Of the 15 units, 7 are 40 years or older and 4 units are 30 years old. Each unit has individual control of temperature, humidity, and carbon dioxide, with the exception of 7 units that control carbon dioxide through use of a make-up air unit. Each unit uses hot water and cold water coils to control temperature and reduces relative humidity by condensing moisture on chilled water coil to pan and using hot water coil to control temperature. To raise relative humidity, the units have steam humidifiers. Only 6 units have efficient humidifiers to control relative humidity in the winter months. Other units need more efficient humidifiers, which in turn require larger capacity steam boilers to maintain proper pressure. This portion of the system will be addressed in a later Phase 2 effort and not in the current proposed project; the related issues are important to note as part of current conditions, however.

The cooling tower system consists of a pair of 400-ton Marley Towers, top-of-the line equipment built with extremely durable materials: ceramic tile fill enclosed within a cement structure with a vinyl canopy to keep out debris. Although 30 years old, the extremely high construction quality and fastidious maintenance has left the towers themselves in good condition. For these reasons, the Planning Team recommended the more sustainable option of rebuilding rather than replacing them. Rebuilding, which

involves replacing the ceramic fill, pumps, and direct drive fan motors, will not only prepare them to work for another thirty years, but will also increase their energy efficiency.

The HVAC controls provider is Automated Building Systems. While this system improved control capabilities from the former pneumatic-type control system, which had to be calibrated manually, the system is very slow to respond, which leads it to overcorrect. For example, when the spray bars are turned on to raise humidity levels and the level rises to the desired point, the system should shut off. Instead it cuts back gradually, often beyond where it should, creating a surplus of humidity and overall unstable relative humidity levels.

Despite these challenges, the Philbrook Facilities staff have been able to maintain a remarkably stable climate in most areas—the mean temperature in gallery spaces is between 68-71 degrees between 75 and 99% of the time (see *Appendix V: Arenstein Sustaining Collections Recommendations*). Nevertheless, certain adverse conditions have persisted for decades. For example, certain sections of walls are built over old metal-framed windows, and these wallcoverings—where many highly sensitive early Renaissance panel paintings are installed—sweat during several months of the year. This is not only evidence of a possible source of deterioration for the building and indicative of a point of heat loss for the system, but also, the condensation running down walls could elevate the humidity in certain key display zones, creating "microclimates" that slip past the regular environmental monitoring system. In other areas, walls built over old windows change temperature drastically on a daily and seasonal basis, and artworks hanging on these covered areas seem to exist within microclimates as well.

Preventative Conservation at Philbrook

The Philbrook collections staff works closely with the security and facilities departments to uphold appropriate security and building protocols and practices many preventative conservation measures such as:

- limiting light levels on artwork as appropriate to the materials and duration of display;
- reducing or limiting UV light in galleries and storage using UV filters on windows and fixtures;
- taking a proactive approach to pest control through an Integrated Pest Management Policy (implemented 2017) that includes limiting food sources, monitoring sticky traps for insect activity daily in storage, and limiting pesticide usage;
- maintaining an up-to-date Disaster Response Plan;
- storing like items with like;
- maintaining portable moisture alarms in storage and any leak-prone zones;
- twice-daily inventories of art in galleries;
- a rolling cycle of storage inventories that reaches each item at least every five years.

Administrative and Intellectual Control of Collections

The Museum has intellectual control of approximately 99% of its collections, with at least basic cataloguing and photographs for each object stored in its electronic database, The Museum System (TMS). The Museum has been using TMS, a robust collections database software that supports all aspects of collections care, since 2013. In 2017, the Museum contracted with an independent TMS consultant to support ongoing database administration with additional training and support, as staff training and data cleanup and standardization are ongoing efforts in TMS. In 2018, Philbrook launched eMuseum, the institution's first-ever collections access tool available to the public. While only about 250 records are currently available through this portal, curatorial and collections staff are continuing to add new records according to a prioritized list of objects and collections.

History of the Project

In 1987, Philbrook completed a survey of environmental conditions in storage spaces and galleries. The results of this report informed the design and implementation of a partial HVAC system installed in 1988—the same system remains largely in use today. Many key functions of the system, however, such as redundancy of the humidification system, have either failed or been altered as the larger system has changed, and are now inoperable. Since the 1987 grant that enabled a survey of environmental conditions in the building, the Museum has received NEH funding to support the creation of a Long-Range Conservation Plan (2006).

In 2009, a comprehensive Historic Structure Report was conducted by Mesick Cohen Wilson Baker Architects in Albany, New York (*see Appendix VI: Historic Structure & CAP Report*). The Historic Structure Report found that the Museum's "reasonably strict temperature and humidity curatorial goals are having a negative impact on the building fabric," and raised questions about the severity of this effect. The report recommended probing the building to determine whether condensation caused by the differential of interior to exterior air is causing rusting of steel structural elements of the building. If rusting is occurring, the report recommended increasing the allowable seasonal variations to reduce interior condensation—not to eliminate it, but to minimize it in order to extend the life of the building envelope. Philbrook does allow seasonal flow of its setpoints, but the local climate is extremely variable, with both temperatures and humidity shifting by 30-40 degrees / percent on a regular basis during many months of the year. In response, the building engineer adjusts the setpoints on an almost daily basis during the long spring and fall seasons in Tulsa.

Following this report, a preliminary HVAC assessment was conducted in 2013. The recommendations at that time were that the Museum replace existing chillers and boilers and remove existing hot water and steam boilers in order to replace them with new steam boilers with two steam-to-hot-water heat exchangers, boiler feed, and blow down systems.

In 2017, Philbrook was awarded a planning grant through the NEH Sustaining Cultural Heritage Collections program. Through this grant, the Museum completed an intensive cross-disciplinary study of the complex, interconnected museum ecosystem modeled after recommendations from the Image Permanence Institute (IPI), Rochester, New York, an organization that has devoted many years of research to issues of sustainable practices in museum climates. Our interdisciplinary team involved staff from facilities, collections, archives, curatorial, and administration as well as a broad array of consultants in museum sustainability, conservation, architecture, and engineering. This team analyzed the existing conditions through eight years of temperature and relative humidity charts, seven years of archived utility statements, various structural and collection-focused reports, including a 2002 CAP report, a 2009 Historic Structure Report, artwork examinations and conservation histories, and on-site inspections. The opportunity to focus on specific problem areas was crucial as well: understanding the limits of the building and its systems and the specific needs of our collection guided us towards ways of working with our building and its climates—a much more sustainable approach than working against it.

Maximizing energy reduction while supporting an appropriate climate for Philbrook's collections will require more than just replacing the building's HVAC system. Working together, the team identified:

- opportunities to reduce the load on the HVAC system, including better sealing the building envelope, completing the transition to LED bulbs in galleries, and using carbon dioxide from building inhabitants rather than outside air as a source for make-up air;
- ways to incorporate passive approaches to environmental controls;
- appropriate steps to care for the building fabric, such as eliminating opportunities for condensation—steps that will also help preserve the building itself (as Jeff Baker pointed out the in Historic Structure Report, adjusting Philbrook's climate setpoints and reinforcing the building

envelope both would reduce the frequency and duration of condensation and thus dramatically extend the life of the building itself).

The team also identified key locations where over decades, Museum staff has asked the building to function in ways it was not intended and as a result, the building has suffered, with mold growing around poorly sealed windows, and leaks persisting undetected beneath drywall covering original windows. The most extreme example of this is the Kress Galleries, a series of rooms originally built as a sunroom and open-air porches, enclosed in the 1950s to create a home for the Museum's new Kress Collection. Metal-framed windows were installed between limestone columns and then drywalled over from the inside. Although a minimal layer of insulation was installed, there is no vapor barrier or thermal break, so as the porous columns wick moisture from the outside of the building into the inside and as condensation from the warm gallery spaces collects on the interior of the cold metal window frames, the drywall is frequently wet, causing mold growth and material degradation.

The findings of the 2017-18 planning grant were instrumental in guiding decisions regarding these Kress Galleries. Confirmation of these issues from project consultants has influenced Philbrook's decision to revert this area closer to its original use, which in turn means that the Museum must determine new gallery space for this collection. After closely studying the present conditions and through consultations with the director, curators, Board of Trustees, and other key stakeholders, the Museum has decided to return the Kress Galleries to a state closer to their original design. Although the details will be determined during the design development phase of planning for an upcoming capital campaign, the Museum intends to uncover the French doors currently covered, replace the 1950s-era metal-framed windows with historically appropriate wood-framed, double- or triple-glazed windows, and relocate the highly sensitive panel paintings currently installed there to areas within the building, where the climate can be stabilized more consistently and efficiently.

Throughout the building, a number of windows currently covered with drywall or other materials will be uncovered during a future renovation to better connect the galleries with the gardens, create a clearer sense of place within the galleries, and promote better care of the building by allowing access for regular inspection, maintenance, and repairs as needed. During the same renovation, all windows will be fitted with interior ventilated wooden storm windows with UV protection. [N.B. Although increased light levels in certain galleries will limit the works that can be displayed there, the improved care of the building and visitor experience will more than compensate for this new challenge, and several areas within the building will still offer very low light levels for light-sensitive artworks]. A summary of recommendations resulting from the Planning Grant is available in *Appendix VII*.

This new direction reflects a philosophical shift in the way the institution views the Villa itself: as the most important single artwork in the collection. As such, the Museum accessioned the Villa in 2018; in 2017, it created a new position, Associate Curator for Research, Archives, and Special Collections, which oversees the study and interpretation of the Villa; and it plans to invest heavily in efforts to restore many areas that were post-modernized in a 1989-90 renovation.

Philbrook's staff is also committed to sustainable practices and applies them whenever practicable:

- Storing and retrofitting artwork crates for reuse whenever possible;
- Storing and reusing pedestals and other exhibition furniture; when no longer needed, offering these items to smaller local organizations;
- Disassembling exhibition structures and storing the materials for reuse when the structures cannot be reused;
- Using geothermal energy in the HVAC system at Philbrook Downtown;
- Implementing LED bulbs in public areas at both Philbrook locations;

- Transitioning all gallery fixtures from halogen to LED as funds allow, and retrofitting all fixtures with T-12 bulbs to hold the more efficient T-8 bulbs;
- Applying seasonal temperature and relative humidity setpoints;
- Using "green" cleaning products at both locations;
- Recycling institution-wide and composting in the gardens;
- Using art shuttles rather than exclusive shipments whenever possible.

As Philbrook prepares for the launch of a capital campaign in 2020, it is in the final stages of approving its 2019-2023 Strategic Plan (pending full board approval March 2019). This Strategic Plan focuses on four strategic initiatives: (1) Become Tulsa's most welcoming and engaging cultural institution; (2) Increase the community's engagement with the Museum; (3) Deepen the Museum's engagement in the community; and (4) Grow organizational capacity and ensure long-term sustainability. Integrating sustainable preservation practices is central to each of these initiatives. In particular, Philbrook's focus on ensuring long-term sustainability includes maintaining best practices in collections management and conservation to preserve the permanent collection and historic property. By replacing portions of the HVAC system and integrating updated system controls, the proposed project is key to Philbrook's long-term sustainability initiatives.

Expected Project Outcomes

Based on the recommendations of the Planning Team, Philbrook staff and consultants have designed a two-phase project to (1) stabilize the system and gather more detailed climate readings and (2) refine the system and implement operational efficiencies. Phase One, the project here proposed, will involve replacing the major system components located in the boiler room (two steam boilers, two hot water boilers, two chillers, one heat exchanger, two chilled water pumps, and two heating water pumps). In addition to replacing these components, Museum staff will implement comprehensive monitoring throughout collection storage and display areas to build a more complete picture of microclimates within the building. At the end of Phase One, the primary components of the HVAC system will be operational, with redundancy restored, and more than one year of climate data will be available to guide planning for Phase Two, which would involve any needed changes to ductwork, airflow, air handling units, additional humidification, and a new building automation system that would support increased flexibility and operational efficiency.

Based on conservative estimates, the new equipment alone will decrease gas and electricity usage by approximately 8%, saving the Museum $15,216 annually based on the three-year average utility bills ($190,205). By expanding the environmental setpoints, incorporating opportunities for operational efficiencies such as night-time setbacks in certain areas and turning portions of the system off entirely during periods when outdoor temperature and dew point are at established levels, better sealing the building envelope, and improving efficiency of other system components in later project phases, we anticipate total savings over the life of the system to be higher. Further adjustments to the BAS and operating protocols to be established in the next phase would also create additional energy savings.

In addition to energy savings, through the course of this project, Philbrook will:

- stabilize the system to prevent a catastrophic system failure,
- reduce the amount of staff time and repair costs required to keep the system operational,
- create a clear picture of microclimates within the building in order both to plan for future system improvements and to better match the needs of individual objects with their environments
- lay the ground work for improving overall storage conditions that will better prevent mechanical deterioration of the collection due to high temperatures over time, and

- better support the historic structure itself by shifting the climate setpoints slightly in order to reduce condensation forming within the building walls.

Methods and Standards

The long-term goal is to create an optimal storage environment—one that balances the needs of the collection as well as the historic structure—that supports the long-term preservation while minimizing the environmental impact. In recognizing the many constraints of the existing system, Museum staff has realized that the chasm between current conditions—a system that is antiquated and not fully operable—and desired conditions—an efficient, sophisticated system that supports an optimal storage environment—is too great to meet in one great leap. Phase One of work, the subject of this current grant, comprises two parts: (1) establish a reliable, simple, and clear method of monitoring environmental conditions throughout the building's collection areas, and (2) stabilize and restore full functioning to the system by replacing or rebuilding the major components that have exceeded their useful lifespan and are no longer functioning optimally.

Phase Two of the project (beyond the scope of the current proposal) will update the Building Automation System, air handlers, and any changes to ductwork or ventilation that may prove necessary. Improving system controls within the building will allow greater efficiency and flexibility while supporting the varied needs of the Museum's diverse collection. Given the level of current performance of the system and the relatively stable climate Museum staff have been able to achieve, the team believes that overall the basic bones of the system—ductwork, zoning, etc.—are sufficient.

By first stabilizing the core system to restore full operation and prevent a catastrophic failure, and using energy-efficient equipment such as a high-efficiency boiler, the Museum can begin to collect valid data about how the system behaves as a whole and can then reassess the needs and opportunities to increase efficiency further. The Museum can then also plan for the system as a whole, which supports designing an intentional and healthy system, rather than reacting to emergency situations one piece at a time.

Comprehensive datalogging is also a key component of this strategy. For the past several years, Museum staff has relied on climate data coming from within the air handlers rather than external dataloggers. Although several years of these readings are available, they have been measuring the air coming into the galleries, not the actual temperature and relative humidity of the galleries themselves. Fifty new dataloggers, PEM2s from the Image Permanence Institute, will be deployed throughout the galleries and storage areas to identify microclimates and better understand the behavior of the overall system. The Museum will also implement a system of regular calibrations between the PEM2s and the Building Automation System.

More Sustainable Setpoints

Philbrook Museum of Art has been AAM-accredited since 1986, with the most recent renewal in 2007, and adheres to the highest professional standards of collections care at all times. The staff is well aware of the mandate in the field—both nationally and globally—to improve energy efficiency in maintaining appropriate environments for collections. In the past several years, new environmental guidelines statements have been issued by the IIC and ICOM-CC, AICCM, the Bizot group, and the AIC with support from the AAMD endorsing broader ranges of acceptable climate settings.

In order to increase system efficiency by loosening system setpoints, the Museum staff needed first to better understand the needs of the collection. To do this, they enlisted two conservators on the Planning Team, both deeply connected to current research in the field. Rachael Arenstein is e-Editor for the American Institute for Conservation and Dianne Modestini is the Kress Conservator at NYU. During the NEH SCHP Planning Grant, they reviewed the condition and condition histories of some of the

Museum's most sensitive items, several previous years of Museum climate data, and completed a survey of both published and soon-to-be-published museum climate recommendations including the Image Permanence Institute's *Guide to Sustainable Preservation Practices for Managing Storage Environments* (v.2.0, 2012), BSI (British Standards Institute) document PAS 198:2012: *Specification for Managing Environmental Conditions for Cultural Collections*, and Chapter 23 of the *ASHRAE (American Society of Heating Refrigerating and Air-Conditioning Engineers) Handbook—Heating, Ventilating, and Air-Conditioning Applications*, among others.

The conservators identified target relative humidity setpoints as 45% in the winter and 50% in the summer, with an absolute minimum of 30% and maximum of 60%. Keeping the relative humidity as stable as possible and allowing the temperature to fluctuate somewhat in order to support stable humidity is also now a priority for the system. Temperature setpoints will be set as low as possible while maintaining human comfort, around 68-70 degrees Fahrenheit in galleries, with lower temperatures maintained in storage areas as practicable. The lowest level storage areas are ideally situated to efficiently support a cool (around 54 degrees Fahrenheit) storage environment. They have excellent buffering capacity, as they are situated completely underground, with thick concrete walls and tightly sealed access points. During previous periods of equipment malfunction, the climate has not changed significantly.

Other storage rooms on the ground level will be kept somewhat higher, around 64-68 degrees Fahrenheit. (Renovations to storage rooms are planned as a capital project, and subsequently the collection would be rearranged to take advantage of cooler storage for the highest-risk materials, including photographs, works on paper, and organic and inorganic 3-d objects). These setpoints have been identified not only to better support the collection, but also to mitigate potential damage to the historic building fabric caused by condensation from unnecessarily high humidity inside the building during cold weather.

Minimizing Impact on the Collections

The Villa itself also has demonstrated good buffering capacity. It benefits from tremendous mass, extremely sturdy construction methods, including 3' thick exterior concrete walls, concrete floors on each level, and several layers of finishes on top of these concrete layers. The Villa, too, has experienced periods of power loss or equipment outage when the systems were off line and has been able to maintain its climate within about 10 degrees of normal for as long as eight days in the winter and four in the summer. Once the building envelope is further improved (chimneys appropriately capped, doors weatherstripped, and interior storm windows installed), its buffering capacity is expected to improve further.

Based on these experiences, staff expects minimal disruptions to the climates of galleries and storage systems during the equipment replacement period. While the exact measures to be taken will vary depending on outside weather conditions each day or week, Museum staff will work closely together to strategize how best to maintain a stable climate during this period. Solutions will include limiting access to storage areas, keeping doors into galleries and storage areas closed, running portable chillers and boilers, and if necessary, delaying work until favorable weather conditions are possible. The timing of the equipment replacement was selected specifically for the promise of mild weather.

Team Development

Following the Planning Grant, the Museum established an Environmental Monitoring Team (see Project Team below) to continue the work begun during the Planning Grant and to support the ongoing maintenance of an energy efficient museum climate. The Environmental Monitoring Team includes many of the team members from the original interdisciplinary team—Director of Collections and Exhibitions, Collections Manager, Curator, Facility Manager, Lead Engineer—as well as the Chief Operating Officer, who oversees the Museum's Facility and Finance Departments. Key members of the Planning Team

including architect Jeff Baker and conservators Rachael Arenstein and Dianne Modestini will continue to support the project as advisors on an as-needed basis.

Through the course of the Planning Grant, the team recognized the need for support of experts more specialized in managing museum climates than the current project team included. After speaking with project advisors, colleagues at Winterthur, and the Image Permanence Institute (IPI) staff, the Museum enlisted IPI conservator Kelly Krish and facilities specialist Chris Campbell to consult on the phase of the project at hand. They will review the detailed plans to ensure the specified equipment will deliver the desired functionality, facilitate interpretation of the new data charts, work with the Environmental Monitoring Team to explore operational strategies to increase system efficiency, such as nighttime setbacks, and make recommendations for optimal system operation.

In addition to the IPI consultants, the Museum has also contracted with mechanical engineer and certified Building Commissioning Professional Jeff Ferguson of Cyntergy, a local engineering firm, to confirm all equipment installations are completed according to the highest standards.

Work Plan

Pre-Submission
Project staff have met with the design engineer and commissioning agents to review the recommendations of the Planning Team, scope of work for Phase One (as well as the complete, multi-phased project), and project schedule. The project director has had two phone meetings with Kelly Krish and Chris Campbell of the Institute for Image Permanence to discuss the results of the planning phase, plans for moving forward with comprehensive datalogging, and the Museum's needs during Phase One. The Museum has begun work on a Master Site Plan, and has completed a building imaging project to create AutoCAD renderings and complete three-dimensional renderings of the historic Villa. The team has also had several conversations about timeline, roles, and process with the individual consultants to plan the project details. The Museum staff identified a set of 20 artworks to serve as "canary" objects (*see Appendix VIII: Canary Objects*) that will receive additional monitoring during the multi-year process of renovating the HVAC system to act as early indicators of environmental distress within the collection.

Pre-Grant
The Museum will continue work on many of the smaller projects related to or stemming from the Planning Grant, including transitioning to all LED-bulbs in the galleries, further sealing the building envelope by installing or maintaining seals on doorways, and further investigating the state of the stucco walls using probes. Design engineer Greg Sutcliff—in consultation with the larger planning team as needed—will complete a full set of construction documents and procure bids for the work, and staff will secure funding for this work. Cyntergy and IPI will review the penultimate set of construction drawings to ensure the system as designed in the final drawings will deliver the intended results for the collection.

Phase 1: Preparation
Upon notification of award, the fundraising team will begin securing match funds toward the project. This work will be ongoing through the project timeline until all funds are secured. The facilities manager and chief operating officer will finalize all contracts with subcontractors for equipment procurement and installation, and will arrange for backup boilers, chillers, or other equipment to be brought in as needed during equipment replacements to ensure continuity of service during each transition (*See Appendix IX: Contractor & Equipment Quotes*).

Prior to the start of work in the building, the full project team will meet to review the project goals, contractor responsibilities, schedule, and requirements and procedures for working in the building.

Kelly Krish and Chris Cameron of the Image Permanence Institute (IPI) will travel to Tulsa to work with the collections manager to place, install, and trouble-shoot dataloggers throughout collection display and storage areas. Since eClimateNotebook is already in use, the additional monitors will be connected to the existing system.

Phase 2: Equipment Replacement
The HVAC contractor will rebuild the cooling towers during cool weather (planned for February) and then perform the replacement of preselected equipment, timing all replacements according to exhibition requirements as well as anticipated and actual climate conditions (the equipment replacement is planned for March, when the Museum's exhibitions calendar could support a system disruption, but would also be predicated on typical weather conditions; if unseasonable weather prevented the installation in spring, it could be rescheduled for the fall without a change or disruption to the exhibition schedule). The equipment replacement is expected to take approximately three weeks. (*see Appendix X: Equipment Specifications*)

Environmental monitoring throughout collection areas will continue.

Phase 3: Commissioning
Jeff Ferguson of Cyntergy will review the installation to ensure all specifications have been met. The building engineer and Cyntergy will work with the HVAC contractor to commission the system. Environmental monitoring throughout collection display and storage areas will continue. The team will convene (out-of-town consultants will join by videoconference) to review the functioning of the system, identify needs for additional monitoring, opportunities to further improve function or efficiency, and trouble-shoot as needed.

Phase 4: Reporting
The commissioning agent and IPI prepare final reports. The Environmental Management Team reviews the reports, plans next steps, and prepares final grant report. Environmental monitoring continues into the post-grant period.

Project Team

1. Rachael Perkins Arenstein is currently an Objects Conservator in Private Practice in New York. Rachael has extensive past experience in preventative conservation, including environmental monitoring and control. Rachael will serve as a project advisor.
2. Jeff Baker is an Architect for Mesick-Cohen-Wilson-Baker Architects in New York. Jeff completed a comprehensive Historic Structures Report for Philbrook in 2009, which is referenced throughout the grant application. Having already taken an in-depth look into the historic structure and all building systems of Philbrook, Jeff will act as an advisor on the project.
3. Charisse Cooper is the current Facility Manager at Philbrook. Charisse will act as the primary communication manager between local contractors and the Philbrook facility staff.
4. John Gwin, Philbrook Building Engineer, has 25 years in facility management, 15 caring for Philbrook facilities. John is certified with the Oklahoma Corporation for Underground Fuel Tank Commission as a First Class Engineer and has experience with many different types of HVAC systems including pneumatic and digital. He will serve as primary manager of project logistics and hands-on work.
5. Project Director Rachel Keith joined Philbrook as Director of Collections and Exhibitions in 2016 and served as project director for the 2017-18 NEH Planning Grant. She came to Philbrook after eleven years at the Kemper Art Museum at Washington University in St. Louis, where she oversaw the departments of exhibitions, registration, facilities, and security. During her tenure there, she led the move of the collections to a new building, worked with an interdisciplinary team to redesign the

new museum's humidification system, and established several new policies, including a Long-Range Conservation Plan and a Disaster Response Plan. She is responsible for overseeing the care of all historic elements of the Villa. She will lead the project team, overseeing the reporting and schedule.

6. Paul Nelson, Philbrook Chief Operating Officer, will oversee project finances and the Museum's facilities department during the project.
7. Susan Green is Philbrook's Curator of Archives, Special Collections, and Research is will manage the care of all historic elements of the Villa and Permanent Collection.
8. Jaye McCaghren is currently Collections Manager at Philbrook Museum of Art, where she has worked for over eleven years, overseeing the design and construction of storage fixtures, facilities, and the move of over 5,000 collection items and objects to Philbrook's satellite facility. Jaye will manage the installation and maintenance of the PEM2s and eClimateNotebook.
9. Greg Sutcliffe is a Principal Engineer for Phillips & Gomez Engineering in Tulsa, Oklahoma. Greg was part of the NEH SCHC Planning Grant team and has recently completed several museum projects in the region. Greg will act as the Design Engineer for the project.
10. Jeff Ferguson is a mechanical engineer with Cyntergy, a certified Building Commissioning Professional, and past President of the Tulsa NEOK ASHRAE chapter. Jeff will serve as the commissioning agent for the project.
11. Kelly Krish, conservator, and Chris Cameron, preservation consultant, both at the Image Permanence Institute, will develop recommendations for mechanical system operation to optimize preservation while improving sustainability and efficiency.

Project Results and Dissemination

The results of this Implementation Grant would include a stable, operational HVAC system that is no longer at heightened risk of sudden catastrophic breakdown, improved care of collections, including the historic Villa, and improved energy efficiency. After the grant period, the Museum will be poised to implement a new building control system using recommendations from IPI to further increase the efficiency of the system. Improved climate conditions for the collection will help ensure the long-term sustainability and preservation of the Museum's diverse collection. Better balancing the collection and building's needs will support the long-term preservation of the historic Villa.

Philbrook anticipates meaningful results and lessons would come from several phases of this project. Quantifiable data could be released following completion of the implementation phase, when Philbrook staff would compare data from the old system to data on the new system in order to show the improvement in energy efficiency. Philbrook staff will prepare a white paper for the NEH and will highlight the work through a series of posts on the Museum's website or social media outlets. The project director, sustainability consultants, and other relevant key team members will propose conference presentations to the American Alliance of Museums, Registrars' Committee of AAM, Association of Registrars and Collection Specialists, and the Oklahoma Museum Association, among others, on topics such as interdisciplinary collaboration in integrating sustainable approaches to preventative conservation and collections care, balancing collection needs in the context of historic structures, or other topics that come to light through the course of the implementation of this grant.

Working with local contractors for a project such as this one benefits the entire community as engineers, installation crews, inspectors, and local audiences all become more familiar and comfortable with sustainable practices in terms of both system design and operation. The project director and team members would also propose conference sessions or lectures for local historic preservation and architecture groups, such as the Tulsa Foundation for Architecture, Tulsa Historical Society & Museum, the Eastern Oklahoma Chapter of the American Institute of Architects, and the Oklahoma State Historic Preservation Office.