



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: Creating a Suitable and Energy-Efficient Lighting Environment for the Preventive Conservation of the Permanent Collection

Institution: Indianapolis Museum of Art, Inc.

Project Director: Kathryn Haigh

Grant Program: Sustaining Cultural Heritage Collections

Creating a Suitable and Energy-Efficient Lighting Environment for the Preventive Conservation of the Permanent Collection

An Implementation Project

1. Project Description and Significance

The Indianapolis Museum of Art (IMA) seeks a Sustaining Cultural Heritage Collections Implementation Grant of \$211,847 as part of a \$423,694 project to enhance the preservation of the collection and reduce collection-related energy use and costs by converting to LED lamps for lighting the permanent collection in the galleries and in collection storage. The IMA maintains an encyclopedic collection of more than 54,000 works spanning 5,000 years, with significant holdings of African, American, Asian, European, and Contemporary Art and Design. The collections comprise paintings, sculpture, decorative and industrial design, prints, drawings, photographs, and textiles and fashion arts. Research of the collection, by both IMA staff and scholars around the world, is imperative to the Museum's mission to provide exceptional experiences to enrich lives through engagement with art and nature.

United States Lighting Energy Policy is moving towards increased efficiency in order to lower greenhouse gas emissions and energy use. The Energy Independence and Security Act of 2007 requires increased lighting efficiency and phases out incandescent lighting in order to require the use of more efficient fluorescent lighting. Due to this policy, a majority of the incandescent lamps that the IMA has traditionally used are no longer being manufactured. Conversion to LED lamps for lighting the permanent collection is increasingly critical.

The IMA began researching the use of light-emitting diode (LED) lamps for illuminating works of art in 2009, but rejected implementation at that time due to inadequate color rendering and high cost. Over the last six years, the quality of LED lamps has dramatically improved while the cost of individual lamps has consistently decreased. Though LED lamps currently cost approximately three times incandescent lamps, the lifespan of LED lamps is approximately five times that of incandescent lamps. Further, current LED lamps use approximately 20% the amount of energy of incandescent lamps.

The conversion to LED lamps for lighting the permanent collection in the galleries and in collection storage is timely and addresses key components of the IMA's recently adopted 10-year Strategic Plan, including the objective to enhance the Museum's permanent collection in order to provide exceptional experiences that leverage the IMA's strengths. LED conversion has been identified as a main capital priority for the next two fiscal years by the IMA Board of Governors and the Buildings and Grounds Standing Committee. The conversion is also cited in the IMA's Long-Range Conservation Plan under "Goal 1: Excellence in Collections Care":

Preventive conservation care: Collaborate with cross-departmental team to install LED retrofit lighting in galleries and storage areas to improve visual acuity with potentially lower light levels, eliminate UV, and reduce energy and labor costs.

The Museum-wide conversion of all existing incandescent and fluorescent lamps to LED lamps will safeguard the collection, eliminating ultraviolet emissions from lamps and improving color perception and clarity to potentially allow for lower light levels in the galleries. The conversion will also realize a return on investment reflected in reduced electricity utilities costs, a reduced number of lamps purchased per year, and reduced labor costs due to less frequent replacement of the LED lamps. This expected reduction in operating costs further enhances sustainability by making more funds available for exhibition and education programming and collections-based research and activities that deliver exceptional experiences with art to IMA guests and further drive earned revenue.

Creating a Suitable and Energy-Efficient Lighting Environment for the Preventive Conservation of the Permanent Collection

An Implementation Project

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3. Project Narrative

Creating a Suitable and Energy-Efficient Lighting Environment for the Preventive Conservation of the Permanent Collection

An Implementation Project

I. INTRODUCTION

Overview

The Indianapolis Museum of Art (IMA) maintains an encyclopedic collection of more than 54,000 works spanning 5,000 years, with significant holdings of African, American, Asian, European, and Contemporary Art and Design. The collections comprise paintings, sculpture, decorative and industrial design, prints, drawings, photographs, and textiles and fashion arts. Research of the collection, by both IMA staff and scholars around the world, is imperative to the Museum's mission to provide exceptional experiences to enrich lives through engagement with art and nature.

The IMA began researching the use of light-emitting diode (LED) lamps for illuminating works of art in 2009, but rejected implementation at that time due to inadequate color rendering and high cost. Over the last six years, the quality of LED lamps has dramatically improved while the cost of individual lamps has consistently decreased. These changes have been documented by the U.S. Department of Energy and its partners, Pacific Northwest National Laboratory and the Getty Conservation Institute; they have issued guidelines for LED conversion specific to museums. Though LED lamps currently cost approximately three times incandescent lamps (~\$35.00/LED lamp versus ~\$11.50/incandescent lamp), the lifespan of LED lamps (rated at ~25,000 hours) is approximately five times that of incandescent lamps (rated at ~4,500 hours). Further, current LED lamps use approximately 20% the amount of energy of incandescent lamps.

The conversion to LED lamps for lighting the permanent collection in the galleries and in collection storage is timely and addresses key components of the IMA's recently adopted 10-year Strategic Plan (Appendix A), including the objective to enhance the Museum's permanent collection in order to provide exceptional experiences that leverage the IMA's strengths. The IMA's 10-year Capital Plan (Appendix B) currently identifies more than \$42 million in capital needs over the next ten years, less than 10% of which have current funding commitments. LED conversion has been identified as a main capital priority for the next two fiscal years by the IMA Board of Governors and the Buildings and Grounds Standing Committee. The conversion is also cited in the IMA's Long-Range Conservation Plan (Appendix C), under "Goal 1: Excellence in Collections Care":

Preventive conservation care: Collaborate with cross-departmental team to install LED retrofit lighting in galleries and storage areas to improve visual acuity with potentially lower light levels, eliminate UV, and reduce energy and labor costs. Apply for a NEH grant for funding assistance with this initiative.

The Museum-wide conversion of all existing incandescent and fluorescent lamps to LED lamps will safeguard the collection, eliminating ultraviolet emissions from lamps and improving color perception and clarity to potentially allow for lower light levels in the galleries. The conversion will also realize a return on investment reflected in reduced electricity utilities costs, a reduced number of lamps purchased per year, and reduced labor costs due to less frequent replacement of the LED lamps. This expected reduction in operating costs further enhances sustainability by making more funds available

for exhibition and education programming and collections-based research and activities that deliver exceptional experiences with art to IMA guests and further drive earned revenue.

Profile of Organization

Founded in 1883 as the Art Association of Indianapolis, the IMA is among the ten largest and oldest encyclopedic art museums in the United States, with a collecting history that spans more than a century. The IMA provides its diverse audiences with the highest quality artistic experiences through a variety of exhibitions that complement its encyclopedic collection; educational and public programming designed to engage students, teachers, and the public; and the care of the IMA's permanent collection of more than 54,000 objects. In fiscal year 2015 (July 1, 2014–June 30, 2015), the IMA served approximately 421,512 visitors onsite with the support of 192 full-time employees and 117 part-time employees. The Museum's current annual operating budget is \$22,040,000.

Encompassing 152 acres, the Museum campus features significant collections of African, American, Asian, European, Fashion, and Contemporary Art and Design; a state-of-the-art Conservation Science Laboratory; the 530-seat Tobias Theater (The Toby); and a 600-seat outdoor amphitheater. Art, design, and nature are featured in The Virginia B. Fairbanks Art & Nature Park: 100 Acres and Oldfields–Lilly House & Gardens, a 52-acre historic Country Place Era estate on the IMA grounds. Satellite properties include Miller House and Garden in Columbus, Indiana, one of the country's most highly regarded examples of mid-century Modernist residences, and Westerley, the former residence of Dr. George H.A. Clowes and Edith Whitehill Clowes, bequeathed to the IMA by Allen Clowes in 2001 for use as the Director's residence.

The IMA is more than a storehouse for the permanent collection. It is a place where people can see and learn about the best of the world's art. It is a community leader in cultural programming and a center of learning for both children and adults. Classes related to the permanent collections and special exhibitions are offered year-round, and lectures and symposia are presented throughout the year by distinguished guest speakers on topics as diverse as Japanese woodblock prints, contemporary glass, and England's greatest landscape painter, J.M.W. Turner.

Collections research is imperative in advancing the Museum's mission to provide exceptional experiences to enrich lives through engagement with art and nature. The IMA conducts research in the areas of art history, conservation and conservation science, WWII era provenance, audience engagement, visitor interpretation, and the environment. The Museum also makes collections resources available to researchers; recent inquiries include requests from a student of architecture, a doctoral candidate in design, a professor of anthropology, a curator of decorative art, and a design consultant. The development of the collection is guided by the IMA's 10-year Strategic Plan (Appendix A), the Collections Management Policy (Appendix D), and the advisement of the IMA Collections Committee, an advisory committee that encourages and pursues gifts and purchases that correspond to the collecting goals of the IMA and also oversees deaccessioning procedures. The Collecting Plan is currently undergoing revision to respond to the new 10-year Strategic Plan approved in May 2015. Collections care is directed by the IMA's Long-Range Conservation Plan (Appendix C) and the Policy and Procedures for the Rotation of Works of Art and Gallery Reinstallations (Appendix E).

II. SIGNIFICANCE OF COLLECTIONS

At the heart of an art museum are the constellations of objects that comprise its permanent collection. These works of art – and the spirit in which they are shared with others – give each museum its own personality. With over 54,000 works spanning over 5,000 years, the IMA has been described as a

“collection of collections.” Over the decades, important private collections formed in Indianapolis and in Indiana have found a permanent place in the Museum, each contributing to the distinctive character of the institution.

African Art

In 1989, a single gift of more than 1,200 works from Indianapolis industrialist Harrison Eiteljorg created the Eiteljorg Collection of African Art. The IMA’s African Art collection numbers more than 2,000 works, including masks, figures, textiles, and other objects that represent all major regions of the continent. The Eiteljorg Suite of African and Oceanic Art displays approximately 400 works connected by themes of power, the importance of ancestors, and life transitions. The majority of these objects were created and used in traditional practices during the middle decades of the 20th century, although some made of durable materials are hundreds of years old.

American Painting and Sculpture

Early American works in the IMA collection include portraits by artists such as Rembrandt Peale and Gilbert Stuart, as well as landscapes by Frederic Edwin Church, Asher B. Durand, and George Inness. Of particular strength is American Impressionism, representing artists such as Childe Hassam, John H. Twachtman, Frank Weston Benson, and William Merritt Chase. American Scene painting, also known as Regionalism, a style devoted to the realistic depiction of the varied aspects of American life, is represented by artists like Thomas Hart Benton and Edward Hopper. Works by members of the Stieglitz Group, including Georgia O’Keeffe, Marsden Hartley, and Arthur Dove, document the growth of American Modernism and the influence of avant-garde painting in Europe. The IMA’s long tradition of collecting works by Indiana artists has created extensive holdings of 19th-century painters such as Jacob Cox and George Winter, as well as the Museum’s special strength in the work of the state’s beloved “Hoosier Group,” which includes landscapes and figural subjects by T.C. Steele, J. Ottis Adams, William Forsyth, Otto Stark, and Richard B. Gruelle. Curatorial research in this area of the collection has been a focus in recent years in preparation for a series of four collections-based exhibitions that will be presented in 2016 in celebration of Indiana’s bicentennial, including *A Land Enchanted: The Golden Age of Indiana Art, 1877-1902*, *A Joy Forever: Marie Webster Quilts*, and the current *Gustave Baumann: German Craftsman - American Artist*.

Asian Art

The IMA has one of the nation’s largest and most significant Asian Art collections, with more than 5,000 works, including approximately 1,000 works on view in the Asian Art galleries. The Eli Lilly Collection of Chinese Art, assembled by the Indianapolis businessman and philanthropist Eli Lilly between 1930 and 1960, includes nearly 200 pieces of porcelain, ceramics, bronzes, paintings, and jades spanning four thousand years, from the Neolithic period to the Qing dynasty. In 2004, the IMA acquired 28 important Chinese paintings of the Ming and Qing Dynasties, establishing the Museum as the home of one of the nation’s best collections of Chinese art. These masterworks are by the most significant artists of their periods, including Shen Zhou, Wu Bin, Chen Hongshou, and Hongren. The R. Norris Shreve Collection of Chinese Jade holds personal ornaments, human and animal figures, and discs or vessels made of jades from the 18th through the 20th centuries. Japanese painting includes one of the finest collections of Edo-period paintings in the country, featuring landmark works by masters from the most important painting schools of the time – the Kano, Tosa, Rin, and Nanga schools – as well as excellent works by individual artists like Soga Shohaku. The Edo collection is supported by a handful of earlier masterpieces from the late 14th century through the 16th, while a growing number of later works illustrate the continuity of traditions through the Meiji period down to modern times. Two current exhibitions at the IMA present

new curatorial research of this collection: *Tradition Reborn: Contemporary Japanese Ceramics* and *Mastering Materials: Rare Objects from the IMA's Asian Collection*.

Contemporary Art After 1945

The IMA's collection of Contemporary Art encompasses over 900 works created since 1945 and includes outstanding examples of Abstract Expressionism, Color Field painting, Minimalism, Op and Pop Art, installation art, and video and light-based works. One highlight of the Contemporary collection is work by internationally recognized artists who are natives or residents of Indiana, ranging from David Smith and John Chamberlain to Bruce Nauman and Kay Rosen. Prints and photographs by artists such as Andy Warhol, Garo Antreasian, Vik Muniz, and James Casebere constitute another emphasis of the collection. A growing area is that of installation projects as exemplified by Kara Walker and Vito Acconci, as well as light-and-space works by Robert Irwin and James Turrell.

Contemporary Design

The IMA's Contemporary Design collection is international in scope and numbers more than 1,200 pieces. Focused on design after 1980, the collection includes designers from more than 20 countries in Europe, North America, South America, and Asia. Highlights include design pieces by Robert Venturi, Michael Graves, Philippe Starck, and Alessandro Mendini. With support from the Institute of Museum and Library Science, the IMA is currently developing a series of interpretive activities to enhance audience engagement with this collection.

Decorative Arts

The IMA collection of European and American Decorative Arts encompasses eras from the Renaissance to the present, with more than 200 works from the collection on display in the European and American galleries. The Museum has a fine selection of English and European porcelain of the 18th and 19th centuries from the leading manufacturers. The English holdings comprise objects from Worcester, Chelsea, Derby, Bow, and Wedgwood, while the French pieces feature significant works from Sèvres and Vincennes. Germany and Austria are exceptionally well represented by figures from Meissen, Ludwigsburg, Hochst, Frankenthal, and Vienna. A highlight of the collection is the stained glass window *Angel of the Resurrection* by Frederick Wilson, a designer for Tiffany Studios. This Tiffany window was first installed in 1905 at the First Presbyterian Church in Indianapolis before making its way to the IMA collection, where it became a focus of early research for the IMA's LED conversion methodology.

European Painting and Sculpture

IMA's European Art collection features works by Old Masters and Impressionists, as well as artists of the modern era. The Clowes Collection, formed by Dr. George H.A. Clowes and Edith Whitehill Clowes in the 1930s-1950s, is one of the most extensive collections of Old Master paintings ever assembled in the Midwest. The Collection includes masterworks by artists such as Rembrandt, Jusepe de Ribera, and Peter Paul Rubens. Conservation, Conservation Science, and Curatorial staff at the IMA have been actively researching and conserving these works, and a Clowes Collection serial catalogue project is currently underway, with the first publication date set for 2017. The Caroline Marmon Fesler Painting Collection features many of the IMA's masterpieces of landscape painting, including works by the 17th-century Dutch artists Meindert Hobbema, Aelbert Cuyp, and Jacob van Ruisdael; the Post-Impressionists Paul Cezanne, Georges Seurat, and Vincent van Gogh; and paintings by Pablo Picasso and Georges Braque. The most comprehensive collection of Neo-Impressionism in North America exists at the IMA. The collection documents the impact of the Neo-Impressionist movement throughout France, Belgium, and the Netherlands. The IMA possesses the entire collection of the Indianapolis industrialist W.J. Holliday, featuring paintings by Paul Signac, Maximilien Luce, Henry van de Velde, and Theo van

Rysselberghe. Through a landmark challenge grant from Lilly Endowment Inc., in 1998 the IMA acquired 17 paintings that formed the basis of The Josefowitz Collection of Gauguin and the School of Point Aven. Works by Paul Gauguin, Emile Bernard, Paul Serusier, and others illustrate the bold colors and patterns adopted by the progressive artists working in the Breton village of Pont-Aven during the 1880s and 1890s. Together with the 84 rare prints given by Mr. Josefowitz, they constitute the richest Pont-Aven School collection in America and combine with the Neo-Impressionist holdings to offer an unparalleled understanding of the beginning of modern painting. In the early history of the IMA, French modernism was considered too radical to purchase, but Indianapolis native Mary Quinn Sullivan organized a group of local supporters who dubbed themselves the “Gamboliers” and agreed to make annual contributions toward acquisitions of French and American modernist works. The Gifts of the Gamboliers included 167 works by artists such as Georges Braque, Henri Matisse, Amedeo Modigliani, Pablo Picasso, Maurice Prendergast, and Henri de Toulouse-Lautrec.

Prints, Drawings, and Photographs

With more than 26,000 works on paper – from medieval manuscripts to contemporary photographs – IMA’s collection of Prints, Drawings, and Photographs is integral to its permanent collection. Among the IMA’s most renowned holdings is the Pantzer Collection of Works by J.M. W. Turner. The collection includes 38 Turner drawings and watercolors, nearly 3,000 impressions of Turner’s prints, important watercolors by Turner’s major contemporaries, rare Turner letters, and even rarer portraits of the reclusive English master of landscape painting. The collection also includes a representative group of Old Master prints and drawings with works by Dürer, Rembrandt and Goya; prints by Paul Gauguin and the artists of his circle at Pont-Aven; photographs by William Henry Fox Talbot and Diane Arbus; and prints and drawings by American women artists of the 20th century.

Textiles and Fashion Arts

When the IMA purchased an Irish embroidery in 1888, it became one of the first American art museums to initiate a Textile Collection. Between 1916 and 1933, more than 3,000 pieces entered the Museum, thanks to the Indiana native Admiral Albert Niblack and his sisters Eliza and Sarah. These gifts form the nucleus of the IMA’s extensive holdings in Asian textiles and costumes from China, Japan, Southeast Asia, and Indonesia. A critical strength in western Asian weavings was established in 1996, when the IMA received 65 rare Baluchi rugs, constituting the largest collection of its kind in a public institution in the United States. African textiles are another highlight of the IMA collections. Exquisite embroideries and rugs from Morocco make this the most important collection of its kind in the U.S. The Fashion Arts Collection features rich holdings in women’s costumes and accessories of 19th- and 20th-century Europe and America. Creations by designers Norman Norell, Bill Blass, and Halston – all natives of Indiana – are an area of special emphasis.

Collections-Based Research and Programming

Collections-based research and programming is vital to advancing the mission of the IMA and is a focus across departments. The following projects are representative of the kind of research conducted at the IMA.

- The IMA presents **exhibitions** from the permanent collection that highlight art and cultures from around the world. Exhibitions representing recent curatorial research include:
 - *On the Flip Side: Secrets on the Backs of Paintings* (On view through October 30, 2016) – One in a series of NEA-funded exhibitions focused on provenance and conservation research, this exhibition allows guests the rare chance to view paintings from all sides, including the back, where interesting details about their history, composition, and condition reside.

- *Continuing the Work of the Monuments Men* (September 5, 2014 – November 22, 2015) – This exhibition told the story behind one of the IMA’s European paintings, *Interior of Antwerp Cathedral*, painted by Flemish artist Peeter Neeffs the Elder in 1651, and revealed the complexities of provenance research.
- *Coat of Many Colors* (August 22, 2014 – March 1, 2015) – A collaborative project from IMA Curators and Conservation Scientist, this exhibition used an Uzbek garment to illustrate how scientific imaging and dye analysis narrowed the possible creation date of the object and contributed to the understanding of the influx of modern European synthetic colorants into traditional Central Asian textile arts of the early 20th century.
- The IMA provides a range of collections-based **education and public programs** for all ages, including:
 - *St Mary’s Child Center at the IMA* – A unique preschool program offered to children ages 3-5, anchored in Reggio Emilia-inspired teaching, that provides children the chance to experience original works of art and create projects inspired by their environment.
 - *Viewfinders* – A school partnership program that trains elementary school teachers to utilize Visual Thinking Strategies (VTS) to discuss the collection in galleries with students.
 - *Scholar Program* – Graduate internship program offered to candidates in active pursuit of careers in the fields of curatorial research, historic preservation, or conservation.
 - *ARTxFIT* – An intensive three-week immersion course for adults that focuses on the IMA’s Contemporary Art Collection with dynamic discussion and making activities.
- The Museum conducts **research** in the areas of art history, conservation and conservation science, WWII era provenance, visitor studies, information science, and the environment. Recent projects include:
 - *Rapid Pollution Off-Gassing Assessments of Museum Construction Materials by Gas Chromatographic Techniques* (Current) – Development and optimization of a gas chromatography-mass spectrometry analysis protocol with a broadly applicable volatiles sampling strategy to provide rapid, quantitative, and molecularly specific assessments of the emissions from materials considered for use in museums.
 - *Documenting Modern Living* (Completed 2015) – NEH-funded project to research, organize, and digitize the Miller House and Garden archival collection, which documents the construction, history, and maintenance of one of the country’s most highly regarded examples of mid-century Modernist residences.
 - *The Viewing Project* (Completed 2013) – A series of 10 experimental installations devoted to activating the IMA’s encyclopedic permanent collection by investigating methods to encourage longer looking; funded by ART MENTOR FOUNDATION LUCERNE.
- IMA **publications** highlight featured exhibitions and collections research that expand scholarship, including:
 - *Rights & Reproductions: The Handbook for Cultural Institutions* (2015) – IMLS-funded publication that is the first comprehensive resource to focus solely on rights and reproductions guidelines, established standards, and emerging best practices at cultural institutions. Co-published by the IMA and American Alliance of Museums.
 - *The Neo-Impressionist Portrait, 1886 – 1904* (2014) – NEA-funded exhibition catalogue and the first book to examine the portraits produced by the most important figures of Neo-Impressionism, including Georges Seurat, Henri-Edmond Cross, Georges Lemmen, Maximilien Luce, Paul Signac, Henry van de Velde, Vincent van Gogh, and Théo van Rysselberghe. Co-authored by Ellen Lee, Wood-Pulliam Senior Curator at the IMA.

- *The Essential Robert Indiana* (2013) – Exhibition catalogue that decodes Robert Indiana's visual language and reveals previously unknown autobiographical elements in the Pop artist's paintings and prints. Co-authored by Martin Krause, Curator at the IMA.

Interpretation of the IMA's encyclopedic collection benefits from its unique setting amid 152 acres, including historic gardens and the Virginia B. Fairbanks Art & Nature Park with commissioned site-specific works. The Museum has set itself apart as an authority on design in its commitment to building its Contemporary Design Collection and researching the collection and archive of the Miller House and Garden in Columbus, Indiana. The collection further benefits from in-house developers and digital strategists in the IMA Lab, a multi-disciplinary web design and development consultancy that serves the IMA's mission as well as the greater cultural sector through open-source software development. The IMA is known for its conservation and conservation science expertise, including a state-of-the-art Conservation Science Laboratory with a focus on researching the collection, and serves as a resource for colleagues in the Midwest and beyond.

III. CURRENT CONDITIONS AND PRESERVATION CHALLENGES

Preservation Challenges Addressed

In advancing its mission to share art with audiences, the IMA contends daily with the collection's exposure to light and currently employs a number of preventive conservation practices and policies to meet its commitment to mitigating those effects. The IMA is committed to both the preservation of the collection and its best, most accurate presentation. The use of LED lamps in the galleries will enhance visitor experience by improving the clarity and color rendition of the collection on view. Conversion to LED lamps will also eliminate the collection's exposure to ultraviolet light without the need for expensive, short-lived UV filtration and will preserve it longer for use and appreciation by future generations. The proposed project will result in a significant savings in utilities costs, because LED lamps are more energy-efficient and fewer LED lamps than incandescent lamps are required to create a similar lighting environment. Conversion will also significantly reduce the frequency with which lamps need to be changed as LED lamps have approximately five times the lifespan of incandescent lamps. LED technology has improved so significantly that the IMA is confident that LED lamps will perform to their manufacturer's specifications and will pose no harm to the collection.

Preventive Conservation Practices and Policies

The IMA follows a stringent Rotation Policy and Procedure for the Rotation of Works of Art and Gallery Reinstallations that dictates the duration and frequency with which light-sensitive works in the collection may be displayed (Appendix E). The Conservation Department is staffed by Conservators with specializations in paintings, works on paper, textiles, and objects; every gallery rotation and exhibition checklist is subject to review by the appropriate Conservator who verifies that each work of art may be exhibited as is or following required treatment, and determines display requirements, such as custom framing and mounts, light levels, and duration of exposure. Conservator recommendations are captured in the collections management system and the cross-departmental scheduling team follows those recommendations in determining the opening and closing dates of every rotation and exhibition, as well as rotations of light-sensitive material during exhibitions. Motion sensor lighting is used in galleries that regularly display works on paper and select cases that contain light-sensitive artworks; the lights remain off until a visitor crosses the threshold of the gallery and then remain on only as long as the sensors detect motion in the space.

The Museum's current Lutron lighting control system was recently upgraded to control cumulative light exposure more finely than in the past. By permitting tighter on/off schedules, the upgraded system limits daily illumination of the artworks, keeps an electronic record to automatically track light exposure to collections, and provides new dimming options to permit more finely-tuned light levels. The Lutron system will be further expanded to include all gallery areas before the close of the year and will enable staff to monitor and record accurate annual light exposure to all collections. Light barriers are occasionally used in the galleries and in storage to further minimize the collection's light exposure. Housekeeping and security use a separate lighting system throughout the Museum during non-public hours to reduce the number of hours artworks are directly lit.

During its 2005 renovation and expansion, the IMA added UV filters to all incandescent lamps to reduce UV output to zero; however, these filters are extremely expensive, become discolored over time, and create distracting patterns on the artwork as they degrade. Conversion to LED will eliminate UV without the need for additional filtration and its inherent problems, including the slow photodegradation of the collection.

Collections Storage and Movement

The proposed project includes LED conversion for both the galleries and collection storage areas. The high CRI (color rendering index) 4-foot fluorescent tubes in the Museum's primary storage area are no longer being manufactured nor are they available on secondary markets. Since the majority of the collection resides in storage, suitable and energy-efficient lighting in these areas is imperative to enable staff in Collections, Conservation, and Curatorial departments to access the collection daily. Replacing the outdated fluorescent tubes will improve illumination in the storage areas for visual acuity, ensure the safe handling and relocation of artworks, and eliminate the need to frequently change fluorescent tubes and UV filters in difficult to access areas. Lighting in collections storage is zoned in order to provide maximum protection to the collection from unnecessary light.

IMA collections are stored in state-of-the-art systems, with the exception of oversized sculpture and furniture currently stored on wooden cantilever shelving identified for replacement in the Museum's 10-year Capital Plan. The IMA has two staff members dedicated to the care of collection objects within storage; approximately 92.5% of the collection is in storage at any given time. Collection Support staff receives extensive art handling training upon hire and continues to be trained regularly in advance of exhibitions or projects that require specialized handling needs. IMA staff Electricians, trained to work in areas containing artwork, will complete rewiring in collection storage.

During the re-lamping of art storage areas, select artworks on cantilever shelving, in aisles, and on top of Delta storage cabinets will be relocated to permit safe access to the light fixtures. Many of these objects have already been boxed or palletized in order to minimize risk when handling. In the print storage room, the collection is stored on compact storage carriages that can be easily moved to provide access to light fixtures. The Collection Support department, which includes Installation and Preservation staff, will temporarily relocate artworks from one aisle to another available aisle temporarily blocked off for this purpose, then return the artworks to their home locations following re-lamping in that aisle. Artworks will be moved only as necessary and only within the same storage area. Re-lamping of collection storage will occur between scheduled exhibition and gallery rotations and will attempt to coordinate with other collections activities, such as gallery reinstalls or collection documentation projects, in order to minimize the handling of and risk to collection objects.

IV. HISTORY OF THE PROJECT

Previous Preservation Actions

The IMA has been committed to the preservation of the collection throughout its history. An in-house Conservation department was established in 1970, and now features conservation specialties in paintings, works on paper, textiles, and objects, all housed in spacious, well-equipped laboratories. The addition of a Senior Conservation Scientist in 2009 and the opening of a state-of-the-art Conservation Science Laboratory in 2010 greatly enhanced IMA's preservation efforts. The Conservation department has continually met or exceeded best practices, receiving the 2013 Ross Merrill Award for Outstanding Commitment to the Preservation and Care of Collections, awarded jointly by the American Institute for Conservation of Historic and Artistic Works (AIC) and Heritage Preservation.

The 2005 renovation and expansion of the Museum is a testament to the IMA's commitment to preservation. Only the best materials and methods of the time were used for gallery lighting, environmental monitoring, HVAC systems, casing and mounting, and fire suppression. FM200 fire suppression systems were installed in sensitive areas, including the print storage room, which houses approximately 50% of the total collection. Pre-action fire suppression systems were installed in the renovated galleries to mitigate damage in the event of a fire. The IMA continues to upgrade these buildings systems on a consistent basis, including converting all remaining Johnson Controls for the HVAC system to Andover digital controls in order to better control the Museum environment. As previously noted, the Lutron lighting control system was recently upgraded and later this year will be expanded into all remaining gallery areas to better control cumulative light exposure.

Preventive conservation is a team effort at the IMA. The Collections, Exhibitions, and Facilities Management Division was formed two and a half years ago to foster communication between departments directly involved in the preservation of collections. The results have been extremely positive as Facilities, Conservation, Security, Registration, Storage, and Installation staff regularly participate in cross-departmental teams to manage different aspects of the preservation of the collection, including the proposed project.

While the Conservation department is responsible for the day-to-day care and maintenance of the collection – such as managing the integrated pest management program, dusting objects on view in the galleries, and consulting with Storage and Installation staff on mounts for display and in storage, including consideration of earthquake mitigation – there are many more departments involved in preservation. Current preventive conservation practice includes environmental monitoring primarily performed by Facilities Maintenance staff and 24-hour Security staff that monitor the control room. Dataloggers and hygrothermographs placed in exhibition galleries and storage areas are further monitored by the Conservation department.

The Museum has committed to state-of-the-art storage cabinetry, such as steel cabinets with gaskets and charcoal filters from Delta and Viking, as well as compact storage for textile and works on paper collections. Scavengers are regularly used in storage and in display cases to control corrosion. As needed, the IMA uses humidity control in display cases and creates microclimates for fragile panel paintings. The Conservation Science Laboratory is currently developing a new process to test display and storage materials in a more efficient way than the traditional Oddy test method, and the IMA is also assessing air quality in the Museum environment and investigating additional filtration. All of these efforts are in line with best practices in the field of collections management and conservation.

Sustainability

Following the Museum's expansion in 2005, it consumed 73,000 decatherms in natural gas and over 15,000,000 kwh of electricity. It was determined that a much closer look was needed to reduce total energy cost. In 2006, the IMA Facilities department began a re-commissioning initiative that lasted through 2009. The net result was a reduction of electricity by 35% and a reduction of natural gas usage by nearly 75%. The IMA paid \$1,100,000 for electrical usage in 2005 and over \$800,000 for natural gas. Today, the IMA's annual budget for electricity is \$850,000, and \$250,000 for natural gas. (Note that today's numbers also represent an increase in utilities costs since the initiative was completed in 2009.) The IMA purchases 5.3% of its total electrical use from the Green Power program through Indianapolis Power and Light. This energy is generated from wind farms in the plains states and methane fields produced from the landfills in northern Indiana.

Unfortunately, utilities costs continue to rise and are projected to increase by 9% this year alone according to Mark Wetzel, the IMA's Indianapolis Power and Light account representative (Appendix F). The implementation of LED lamps should realize a significant return on investment in terms of reduction in electricity usage. Conversion to LED will reduce the number of new lamps purchased per year since the average lifespan of a LED lamp is five times that of an incandescent lamp. The IMA currently spends approximately \$14,000 annually on replacement lamps, but the annual cost of purchasing new lamps is expected to decrease dramatically following LED conversion.

The IMA has one Lighting Designer dedicated to lamping the galleries (4,129 gallery lamps) and it is difficult for a single employee to maintain replacement of burnt out lamps. There are also several areas with extremely high ceilings that may only be reached by renting a specialized lift. This expense necessitates that the Museum typically wait until several lamps have burnt out before renting the lift, which results in these galleries occasionally having less than adequate lighting. The implementation of LED lighting campus-wide will reduce the frequency with which lamps must be changed, maintain more consistent lighting in the galleries, and result in a better visitor experience.

Previous LED Implementation and Study

Previous implementation of new lighting systems kept preservation and efficiency as the foremost considerations. Several galleries now have fiber optics inside display cases rather than traditional incandescent illumination. The control boxes are housed in a remote location, eliminating heat build-up and UV in the cases. In 2012, the redesign and reinstallation of the African Art galleries incorporated LED case lighting, specified by the Chief Designer and the Guest Curator in consultation with the Conservation department. Before gallery use, the selected MR-16 type lamp (GE 4 watt, 15° spot; LED4MR16S839/15) in a Lazer track system by Halo was tested in a mock-up environment and approved for UV and lumen output by the Conservation department. Thoughtful object groupings, plus carefully directed and controlled illumination on light-sensitive objects in concert with regular rotation schedules per collection management policies, met IMA's preservation goals for the reinstallation. Halogen ceiling track lighting is still used in the African Art galleries to illuminate platforms and pedestals and requires LED conversion. (See Appendix G for large format images)



Image 1. African art galleries with current LED case lighting.

In 2013, LED accent lighting was incorporated into custom modular wall cases in the new Contemporary Design galleries. This LED strip lighting by California Accent Lighting was used outside the display cases to add indirect light as needed to eliminate shadows from halogen track lighting in the ceiling. The amount of light emitted is controlled and directed with theatrical masking materials to prevent over-illumination of light-sensitive objects. This system was tested in mock-ups and approved by a cross-departmental team of Conservators, Designers, and Curators. Additionally, LED 2' x 2' ceiling fixtures were installed for housekeeping and security purposes when gallery lighting is off. These fixtures do not directly illuminate artworks and are dimmed to a low level, appropriate for these functions. These fixtures were tested and approved for UV and lumen output by the Conservation department.

In preparation for campus-wide LED conversion, the IMA undertook an inventory of the number and type of lamps in all existing gallery and public spaces (Appendix H). During this process, it was discovered that lighting of the Tiffany stained glass window, *Angel of the Resurrection*, needed to be upgraded immediately. Behind the window, large ballasts supported dozens of fluorescent lamps to make the glass appear as if it were illuminated by daylight. A cross-departmental team of Electricians, Conservators, Designers, and Curators assessed various brands of LED 4000°K tube lights for color, lumen output, UV output, and heat generation, and performed blind tests to guide selection. Rewiring and installation of the new LED lighting system for the stained glass window was completed in February 2015. This system uses 18 fewer lamps, uses 40.5 amps less energy, and yields superior color rendering and visual discrimination at lower light levels than the previous system. The goal of the project was to present the artwork with the best possible light while maintaining an appropriate context as if it were still in the church for which it was originally designed. The result was dramatically-improved clarity of the different colors of glass as well as an enhanced presence of the work of art in the gallery. Further,

the need for large ballasts was completely eliminated since each individual LED lamp contains its own ballast. The project reduced the risk of fire as the wires inside the framework had deteriorated significantly, leaving exposed copper in a wooden frame. This single LED conversion project will reduce the cost of illuminating the artwork and preserve it more effectively by eliminating UV light without the need to periodically replace UV filters on high UV-output fluorescent tubes.



Image 2. Tiffany window illuminated by fluorescent lamps (left) and by LED lamps (right).

V. METHODS AND STANDARDS

LED Conversion Task Force

The museum community has been exploring the use of LED lighting for nearly a decade; significant papers and case studies have been presented at conferences and made available through various museum networks. The IMA began researching LEDs for illuminating works of art in 2008. In 2009, several LED vendors were invited by the IMA's Chief Operating Officer to demonstrate their products with an emphasis on reduction of electrical consumption. Cross-departmental assessments rejected these products due to poor color rendition and high initial cost. At that time, Jim Druzik at the Getty Conservation Institute agreed that LEDs were not yet capable of museum-quality color rendering.

As it became evident that all museums would eventually be required to make this shift, IMA's Kress Fellow in Paintings Conservation Sarah Gowan attended the 2013 Lunder Center Conference and reported back on the latest research and trends in LED lighting for museums. Over the past three years, the IMA has reached out to colleagues at The Getty, The Smithsonian, The Toledo Art Museum, The Frist Center for Visual Arts, The Cleveland Museum of Art, The Minneapolis Museum of Art, The Cincinnati Art Museum, and The National Gallery (UK) to research their approach to lighting and LED testing and implementation and has also reviewed numerous articles and papers on the topic. In November 2014, IMA's Chief Conservator participated in the questionnaire response to *SSL Adoption by Museums: Survey Results, Analysis, and Recommendations* (see Appendix I for description). All relevant research documents were uploaded to a shared space on the Museum's project management site, Basecamp, and made accessible to staff investigating the topic.

In 2014, a cross-departmental LED Conversion Task Force was designated and assigned to define the scope of the proposed LED conversion project. This Task Force included: Deputy Director for Collections, Exhibitions, and Facilities Management; Deputy Director for Audience Engagement and

Public Programs; Curator of European Painting and Sculpture; Curator of Contemporary Art; Chief Designer; Chief Conservator; Director of Collection Support; Associate Director of Facilities; Lighting Designer; Manager of Preservation Initiatives; and Purchasing Manager. The Task Force determined that LED conversion in the galleries and collection storage would only require re-lamping and some rewiring, and not the replacement of fixtures or existing light tracks.

The Task Force then began to research lamps using the *Listing of Lamps Qualified for Consideration in Typical Museum Display Environments* (see Appendix I for description). The database was used by the Lighting Designer and the Chief Conservator to narrow down a selection of lamps for initial testing in IMA galleries. The objective was to identify lamps from both large and small manufacturers that were comparable to those the IMA currently uses and compatible with the Museum's current Edison-Price and LSI tracks and fixtures.

LED Test Environments

The Task Force next created a test environment patterned after one developed at the Jordan Schnitzer Museum of Art in Eugene, Oregon for the U.S. Department of Energy GATEWAY Demonstration Program in 2011 (see Appendix I for description).



Image 3. Test environment patterned after the Schnitzer Museum model.

An exhibition gallery with neutral walls was hung with six groupings of test materials (“artworks”), each illuminated by a different LED lamp. Each grouping included a matted and framed black and white photographic print by the Museum staff photographer, a vivid color poster of IMA’s Robert Indiana *LOVE* painting, and a standard photographic color checker by X-Rite (3/2015).

Five LED lamps, each by a different manufacturer, were selected for testing based on a relatively narrow range of color temperature, lumen output, beam spread, high CRI, efficacy, warranty, and availability.

The main factors assessed by the Task Force during testing were perception of color rendering, visual discrimination of contrast and detail, and beam appearance and patterning.

The five selected LED lamps, plus one of the IMA’s standard halogen lamps (*Sylvania Double Life Halogen*, 60 watt, 10 degree spot/PAR30), were installed and adjusted with metal scrims to achieve as similar a light level and beam spread as possible to permit test observers to make appropriate comparisons. This was a blind test, with only the Lighting Designer knowing the placement of the tested lamps. The lamps selected for testing were: *Philips LED*, 10.5 watt indoor spot /PAR30L/flood, 3000K, 750 lumens; *G.E. LED*, 12 watt, 15 degree spot/PAR30, 2700K, 820 lumens; *Sylvania Ultra High Definition LED*, 11 watt, 15 degree wide spot/PAR 30, 3000K, 650 lumens; *Cree LED*, 12 watt, 20 degree/PAR 38, 2700K; and *Soraa LED*, 18.5 watt, 9 degree spot/PAR30, 2850K, 1100 lumens.

	Type of lamp	Description	Wattage/ K	Lumens	Life (at 9 hours per day)	Yearly energy cost at 3 hours (at 9 hours per day)
A	<i>Philips LED</i>	Indoor spot/PAR30L/flood	10.5/ 3000K	750	25,000 hours/ 7.6 years	\$1.26 yearly (\$3.79 yearly)
B	<i>G.E. LED</i>	15 degree spot/PAR30	12/ 2700K	820	25,000 hours/ 7.6 years	\$1.45 yearly (\$4.34 yearly)
C	<i>Sylvania Ultra High Definition LED</i>	15 degree spot/PAR30	11/ 3000K	650	25,000 hours/ 7.6 years	\$1.32 yearly (\$3.97 yearly)
D	<i>Cree LED</i>	20 degree/PAR38	12/ 2700K	600	50,000 hours/ 15.2 years	\$1.45 yearly (\$4.34 yearly)
E	<i>Sylvania Double Life Halogen</i>	10 degree spot/PAR30	60/ 2850K	1100	2.7 years/ .91 of a year	\$7.23 yearly (\$21.68 yearly)
F	<i>Soraa LED</i>	9 degree spot/PAR30	18.5/ 2700K	1190	32 years	\$2.23 yearly (\$6.68 yearly)

Table 1. Specifications of the six lamps compared in the test environment.

The lamps were initially measured for color temperature (using a Sekonic Model C-500 color meter), heat output at the center of the framed photograph (using a Fisher Scientific IR Thermometer, Model 15-077-968 with traceable calibration), and foot-candles and UV radiation of light falling on the “artworks” (using an Elsec 764 UV + Monitor, Littlemore Scientific). The lamps were kept continuously illuminated to test for changes over time.

All of the LED lamps measured zero UV. Initial average color temperature readings did not always match the lamp specifications: *Phillips LED* 3380K (3000K specification), *G.E. LED* 2830K (2700K specification), *Sylvania Ultra High Definition LED* 2815K (3000K specification), *Cree LED* 2700K (2700K specification), and *Soraa LED* 2800K (2850K specification). Foot-candle readings varied from 24 to 30; each lamp required different screening to reduce light levels due to different lumen output and beam spread.

A questionnaire based on the Schnitzer Museum model was developed and distributed to Conservation, Curatorial, Design, and Installation staff, as well as to the Museum Director and Deputy Directors, to assess their response visually to each of the lamps (Appendix J). Responses to the questionnaire

demonstrated that the *G.E. LED* and *Sylvania Ultra High Definition LED* lamps were perceived more favorably than the other lamps. These lamps were then tested in the IMA's Conservation Science Laboratory for spectral output analysis to assess whether the lamps' output in the blue/violet region was potentially harmful to works of art. Radiometry analysis confirmed that these two LED lamp options contribute less UV-A wavelengths to the gallery lighting environment and produce less ambient heating in the form of infrared radiation than the standard halogen lamp (Appendix K). Additionally, using fewer LED lamps to illuminate galleries for acceptable visual acuity would provide a preservation advantage due to lower lumens and overall irradiance in the blue/violet region hitting the artworks.

After a period of over three months of continuous operation (equivalent to over 9 months of typical 8 hours per day of illumination), output of these two LED lamps was re-measured to determine if it had changed dramatically. The *G.E. LED* lamp increased slightly in color temperature to an average of 2865K (from 2830K) and the *Sylvania Ultra High Definition LED* lamp increased even less in color temperature to 2820K (from 2815k); both are satisfactory. There was no significant change in foot-candle readings.

Sylvania Ultra High Definition LED lamps were selected for a "live" test and installed in the American Modernist gallery to see if they performed uniformly with both two-dimensional and three-dimensional works of art when integrated into the galleries. Lighting in this test gallery was inspected by the same IMA staffers who surveyed the original selection of LED lamps to reaffirm the consensus. Foot-candle, UV, color temperature, and heat measurements were taken and the results were a range of 25-30 foot-candles on paintings and sculptures and 5-10 foot-candles on works on paper (consistent with adjacent halogen-lit galleries), zero UV output, and color temperatures varying from 2970-3100K. Temperature readings between 74-76°F taken on the light fixture exteriors suggest that the *Sylvania Ultra High Definition LED* lamps operate well within the manufacturer's stated range of -4° to 104°F, giving confidence that the lamps will not overheat and, therefore, should reach their anticipated lifespan and achieve the desired return on investment. The live test gallery was documented before and after the LED lamps were installed for comparison purposes.



Image 4. American Modernist gallery lit by halogen lamps (above) and lit by *Sylvania Ultra High Definition LED* lamps during the live test (below).

VI. WORK PLAN

Purchasing and Training

The IMA has allocated capital funds to stockpile existing incandescent lamps for the next two years to maintain current gallery and collection storage lighting as needed prior to and during LED conversion. Upon implementation of the LED conversion project, new LED lamps will be ordered in bulk to maximize

purchasing power and will be anticipated to be onsite within six weeks; a storage space for the lamps has been designated by IMA Facilities staff. The IMA will also purchase a Genie lift to supplement the rental lift and provide the Lighting Designer and Lighting Technicians with access to light fixtures and tracks in high-ceilinged galleries.

The IMA will hire two temporary Lighting Technicians (one senior) for the grant period to complete re-lamping (Appendix L). Temporary Lighting Technicians are necessary to implementation as the Museum's exhibition and gallery rotation program will not be suspended during LED conversion and will require a majority of the permanent Lighting Designer's time. These positions will be posted on the Museum's website and advertised through appropriate channels, with the interview and selection process expected to take 4-12 weeks. The IMA Lighting Designer will train the hired Lighting Technicians to measure existing light levels of each lamp before replacement; light various types of artwork, using scrims, dimming, and other strategies as necessary; provide fill lighting for visitor comfort and safety and label legibility; and re-measure lamp output to confirm light levels are appropriate for each work of art as specified by the Conservation department.

Re-lamping

Under the direction of the Lighting Designer, Lighting Technicians will begin re-lamping on the fourth floor of the IMA in the Contemporary Art collection galleries and continue the process systematically, gallery by gallery, throughout the Museum. One Lighting Technician will take light readings and prepare the lamps, screens, and other supplies for the other Lighting Technician, who will be on the lift exchanging the lamps. This method has been recommended by Clint Paugh, Lighting Designer at The Nelson-Atkins Museum of Art, who recently headed that museum's conversion to LED lighting. With two Lighting Technicians on the project, physical fatigue is reduced by allowing the staffers to alternate daily between re-lamping on the lift or preparing the lamps. Hiring two Lighting Technicians also allows the project to move forward according to schedule on those days when only one technician is available.

Based on re-lamping of the American Modernism gallery for the live test, the LED Conversion Task Force estimates that it will require approximately one day to re-lamp each 20' x 20' area of gallery space. According to this calculation, the schedule for re-lamping all galleries and collection storage is as follows (see Appendix M and N for floor plans and work plan):

- **Floor Four:** Contemporary Art and galleries for temporary exhibitions
 - 25,511 square feet – 64 workdays
- **Floor Three:** African Art, Asian Art, Ancient Art of the Mediterranean, Textile and Fashion Arts, Contemporary Design, and Works on Paper
 - 41,438 square feet – 104 workdays
- **Floor Two:** American Art, European Art, Native American Art, Glick Glass Collection, Decorative Arts, Pulliam Family Great Hall, and galleries for temporary exhibitions
 - 64,978 square feet – 163 workdays
- **Internal Case Lighting:** For Asian Art and Decorative Arts collections in cases; will require rewiring of the fixtures inside the cases
 - 53 cases – 20 workdays
- **Corridor:** Kay Rosen Mural
 - 1,200 square feet – 3 workdays
- **Oldfields-Lilly House:** Temporary exhibition galleries
 - 2,821 square feet – 7 workdays
- **Collection Storage:** Seven collection storage rooms

- 22,789 square feet – 25 workdays

Re-lamping in collection storage areas will require less time as objects in storage do not need to be lit to the same aesthetic specifications as in the galleries. Re-lamping collection storage requires the participation of Collections Support staff to relocate artwork and IMA Electricians to rewire light fixtures. This portion of the work plan is scheduled to occur when Collections Support staff is not expected to be involved with planned exhibitions and gallery rotations.

Recycling

Fluorescent and incandescent lamps replaced during LED conversion will be recycled and rehoused. The fluorescent bulbs currently used in collection storage areas and the CFLs currently used to light the Kay Rosen mural in the corridor to the parking garage will be recycled through an Indianapolis-based company called Liquid Waste Removal. Existing incandescent lamps will be offered to other local and regional museums through Listservs and other working groups in which IMA staff participate. Many smaller museums in the region have not yet begun the conversion to LED and will be looking to stockpile existing incandescent lamps, since fewer are being manufactured.

VII. PROJECT TEAM

Grant Contract Staff

Temporary Lighting Technician I. Under the oversight of IMA Lighting Designer, the Temporary Lighting Technician I will work under the Temporary Lighting Technician II to replace existing lamps with LED lamps in galleries and collections storage. In collaboration with Exhibition Designers, Curators, and Conservators, this position will appropriately light works of art in the galleries. This staffer will spend 100% of their time on this project during the grant period. (See Appendix L for job description)

Temporary Lighting Technician II. Under the oversight of IMA Lighting Designer, the Temporary Lighting Technician II will work with the Temporary Lighting Technician I to replace existing lamps with LED lamps in galleries and collections storage. In collaboration with Exhibition Designers, Curators, and Conservators, this position will appropriately light works of art in the galleries. This position will also manage day-to-day tasks related to the LED conversion. This staffer will spend 100% of their time on this project during the grant period. (See Appendix L for job description)

IMA Staff

Carol Cody, Lighting Designer, has worked in lighting design at the IMA for 15 years. Cody is responsible for lighting all works of art in the permanent and temporary exhibition galleries. On the LED Conversion Task Force, she assisted in the selection of LED lamps for final testing, installed the test environment, and advised on the style of lamps required for each gallery space. Cody will be involved in the hiring of the temporary Lighting Technicians and responsible for their training. She will also oversee their project activities and consult with them on appropriate lighting for various works of art. She will devote 25% of her time to this project during the grant period. (See Appendix O for resume)

Phil Day, Associate Director of Facilities and Licensed Electrician, has worked at the IMA for five years. As a member of the LED Conversion Task Force, he helped select LED lamps for final testing. He will be responsible for physically wiring lighting fixtures in gallery cases and in collection storage. He will devote approximately 8% of his time to this project during the grant period. (See Appendix O for resume)

Mike Bir, Director of Collection Support and Special Projects, oversees the Installation, Storage, and Packing staff in Collection Support. With 25 years at the IMA, Bir is responsible for all collections-related special projects. He is a member of the LED Conversion Task Force and helped assess existing lighting tracks and fixtures. He will provide and oversee Collections Support staff to temporarily relocate objects in collection storage for re-lamping. He will devote approximately 4% of his time to this project during the grant period. (See Appendix O for resume)

David Miller, Chief Conservator and Senior Conservator of Paintings, has spearheaded the research and testing phases of the LED conversion project, including consulting with colleagues, gathering and reviewing reports, and defining the methodology and standards for implementation. He will participate as an advisor, grounding implementation in best practices and good collection stewardship. Miller holds a Master's degree and Certificate of Advanced Study in Art Conservation and has 37 years of materials suitability testing and environmental monitoring as a Conservator at the IMA. He will devote approximately 1% of his time to this project during the grant period. (See Appendix O for resume)

Kathryn Haigh, Deputy Director for Collections, Exhibitions and Facilities Management, has managed collections and facilities at major encyclopedic museums for more than 20 years, with 8 years at the IMA. Haigh is a member of the IMA's capital budget team, which determines capital priorities for the institution, and initiated the LED Conversion Task Force. Her responsibilities at the IMA include oversight of Registration, Exhibitions Administration, Rights and Reproductions, Facilities, Security, Conservation, Conservation Science, and Collection Support, which includes Storage, Packing and Installation. She will serve as Project Director and supervise the implementation and schedule of LED conversion. She will devote approximately 1% of her time to this project during the grant period. (See Appendix O for resume)

Internal and External Advisers

Jim Druzik, Senior Scientist at the Getty Conservation Institute, has worked in preventive conservation research since the 1970s and has served in a variety of advisory capacities for the National Archives and Records Administration, the Library of Congress, and the Smithsonian Institution. He will serve as an adviser to the IMA as an expert in creating safe museum environments.

Preston Bautista, Deputy Director for Audience Engagement and Public Programs, has been at the IMA for four years and oversees all Curatorial departments as well as Audience Engagement, Design, Interpretation, Evaluation, and Public Programs. He represents IMA Curators as part of the LED Conversion Task Force and participated in both the blind test for LED lamp selection and the live test.

Ellen Lee, Distinguished Senior Curator of European Painting and Sculpture after 1800 and American Art, has worked at the IMA for 42 years. She is a member of the LED Conversion Task Force and participated in the blind test for LED lamp selection and provided feedback on the live test. She oversees the majority of the second floor galleries and is invested in the preservation of the collection as well as the overall aesthetic experience of the galleries.

Tricia Paik, Curator of Contemporary Art, has been at the IMA for one year and, prior to that, oversaw the Modern and Contemporary Art reinstallation as Curator at the Saint Louis Art Museum. She is a member of the LED Conversion Task Force and participated in the blind test for LED lamp selection and provided feedback on the live test. She oversees the majority of the fourth floor galleries and is invested in the preservation of the collection as well as the overall aesthetic experience of the galleries.

Phil Lynam, Chief Designer, has been with the IMA for 12 years. He is a member of the LED Conversion Task Force and supervises Lighting Designer Carol Cody. His feedback is valued in achieving a consistent aesthetic throughout all IMA galleries.

Kelly Griffith-Daniel, Manager of Preservation Initiatives, has been with the IMA for 11 years and oversees collection storage areas and the physical inventory of the collection. Her participation in this project will include advising on appropriate times to access collection storage for re-lamping.

VIII. PROJECT RESULTS AND DISSEMINATION

Expected Outcomes

The proposed LED conversion project will contribute to the longevity of the permanent collection at the Indianapolis Museum of Art. Preventive conservation undertaken by converting existing incandescent and fluorescent lamps to LED lamps will eliminate ultraviolet exposure without the need for expensive, short-lived UV filters. It will potentially allow for lower light levels for light-sensitive artworks while retaining or even improving clarity and visual acuity for IMA audiences, especially those of advanced age. LED conversion will realize a return on investment reflected in reduced electricity utilities costs, a reduced number of lamps purchased per year, and reduced labor costs due to less frequent replacement of the LED lamps. This expected reduction in operating costs enhances sustainability by making more funds available for exhibition and education programming and collections-based research and activities that deliver exceptional experiences with art to IMA guests and further drive earned revenue. Vastly improved energy efficiency following conversion to LED lamps will also greatly reduce the Museum's carbon footprint. These expected outcomes are in alignment with the 2014 *SSL Adoption by Museums: Survey Results, Analysis, and Recommendations* from the Pacific Northwest National Laboratory.

Dissemination

The methodology and results generated by the IMA's LED conversion project will have universal applicability to those charged with the protection of our cultural heritage. Though not the first to implement LED conversion, the IMA has already gained and expects to gain further knowledge related to LED lamp testing and re-lamping implementation that may be of value to other institutions in the museum or preservation fields. To that end, IMA staff involved in LED conversion will discuss the project methodology, implementation, and results with colleagues at national and international collections- and facilities-related conferences; IMA staff plans to pursue opportunities to present the project through formal lectures, presentations, panel discussions, or poster sessions. Conferences currently in consideration include: the International Association of Museum Facility Administrators Annual Conference, the American Alliance of Museums Annual Meeting and MuseumExpo, and the Association of Registrars and Collections Specialists Annual Conference. The IMA will also draft a white paper documenting lessons learned about sustainable preventive conservation strategies that would be posted on the NEH website.

The IMA's LED conversion project will be shared broadly with local and regional audiences through various methods. As galleries are temporarily closed for re-lamping, gallery signage will describe the reason galleries are temporarily closed and provide a brief overview of the project and its expected benefits. The project will also be featured on the IMA's blog in a short series of entries. The IMA is currently constructing a page on its website dedicated to sustainability initiatives, on which the LED conversion project will be featured. *IMA Magazine*, a triannual print publication distributed to the Museum's more than 15,000 members, will also feature an article about the project, its timeliness, and its expected outcomes.