INTRODUCTION

MAKING CULTURAL INSTITUTIONS SUSTAINABLE

An optimal preservation environment is one that achieves the best possible preservation of collections with the least possible consumption of energy, and is sustainable over time.

In 2009, the National Endowment for the Humanities (NEH) provided funding to the Image Permanence Institute (IPI) for an Education & Training series titled Sustainable Preservation Practices for Managing Storage Environments. This funding allowed IPI to present information about defining and achieving an optimal and sustainable preservation environment to hundreds of institutions around the country in 2010 and 2011 through a series of workshops and webinars. Our primary goal was to provide information, strategies, and tools that would enable staff in collecting institutions to make informed, strategic decisions regarding sustainability that would result in responsible collections care, energy cost savings, and carbon footprint reduction. The workbook created by IPI for the project has evolved into this publication.

During the same period, IPI received funding for two research projects related to sustainability. The NEH Research & Development Program funded Methodologies for Sustainable HVAC Operation in Collection Environments, an investigation designed to determine the best methods to ensure that library, archive, and museum collections are not harmed by short-term environmental fluctuations (temperature and relative humidity setbacks) made in the name of reducing energy costs. The Institute of Museum & Library Services (IMLS) granted IPI a Research & Demonstration National Leadership Grant titled Research on Energy Saving Opportunities in Libraries to investigate whether energy usage can be significantly reduced by carefully monitored and risk-managed shutdowns of air handling units (AHUs) during unoccupied hours in selected research library storage spaces.

These projects will produce two additional publications, one focused on the optimal management of temporary HVAC shutdowns, and another on the best methodology for temperature and humidity setbacks. The IMLS energy saving opportunities project publication and associated web-based resource will document the project's research methodology and results. This guide to shutdowns is expected to be available in the Fall/Winter of 2013. At the close of the NEH-funded sustainable HVAC operation project IPI will publish *Methodologies for Sustainable HVAC Operation in Collection Environments* which will include step-by-step guidance on HVAC setbacks for collecting institutions. This field guide will be available by the winter of 2013-14.

This Guide to Sustainable Preservation Practices and the two publications described above are designed to help institutions maintain the best climate for preservation with the least consumption of energy.

"IPI is the most innovative and leading organization addressing environmental needs for collections in the museum, library, and archival fields."

Lawrence L. Reger, President, Heritage Preservation

"IPI's research and contributions in the area of collections and archives care are well known throughout the preservation field. They have undertaken numerous solid and well thought out research programs, nationally and internationally, which have resulted in useful tools and data for those charged with conservation of cultural heritage."

Jerry Podany, Senior Conservator of Antiquities, J. Paul Getty Museum, and President of the International Institute for Conservation

Based on the success of the first program, NEH provided funding for Sustainable Preservation Practices for Managing Storage Environments—Series II. Four workshops will take place between August and November 2012, followed by nine topical webinars in the first half of 2013.

Years of research on climate and material decay changed the way we understand the effect of the environment on collection materials and opened up the range of acceptable temperature and relative humidity settings. Updated mechanical system operating standards and new methods of data analysis led the way to opportunities for reductions in energy use and related cost savings. IPI's initial series of Sustainable Preservation Practices workshops and webinars presented this information to several hundred individuals including collection care and preservation staff, facility managers, administrators, and students. Interest in the information, tools, and operational strategies presented in this series remains high and IPI is committed to the development and deployment of sustainable preservation practices and to the creation of useful tools and publications that serve the field of preservation.

Much of IPI's research on environmental management has been funded by the National Endowment for the Humanities (NEH). The development of IPI's Preservation Metrics™, algorithms that analyze temperature and RH over time and evaluate the impact of environmental conditions on collection materials, as well as IPI's hardware and software programs for environmental management were made possible by NEH support. IPI has also received major support for its research from the Institute for Museum and Library Services (IMLS) and the Andrew W. Mellon Foundation.

Making Cultural Institutions Sustainable

Collecting institutions face difficult choices as they respond to apparently conflicting mandates to lower operating costs, achieve sustainability goals, and preserve collections. The cost of energy used by cultural institutions to heat, cool, and dehumidify remains a formidable drain on institutional budgets. At the same time, collecting institutions have an obligation to provide the best stewardship possible to the object and information resources in their collections. Allowing collections to deteriorate in sub-optimal environmental conditions would be a significant loss to the humanities and to society in general.

Areas dedicated to collection storage typically receive conditioned air twenty-four hours a day, seven days a week, and are

"For more than 50 years conservators around the world have sought to prevent damage to the varied objects in their collections by observing a uniform climate-control mantra: Keep everything in the museum at approximately 70 degrees Fahrenheit and 55 percent relative humidity. Since the 1970s that goal has increasingly been achieved with the help of mechanical HVAC systems, which typically cope with unforeseen events by working overtime. But as museum budgets shrink, energy costs spiral, and gradual climate changes make the traditional HVAC system more costly to maintain, conservators and other museum experts are rethinking this model."

Carol Kino, "Keeping Art, and Climate, Under Control," http://www.nytimes.com/2009/04/05/

maintained at more stringent temperature and humidity conditions than other spaces. As a result, these spaces consume more energy than other areas. Performance measurements by the energy consulting firm Herzog/Wheeler & Associates (the Image Permanence Institute's partner in several research and consulting projects) indicate that a 10,000 square foot collection storage area costs between $20,000 and $50,000 per year to condition. As a result, cultural institution facility managers and administrators are asking collection care staff to consider energy-saving alterations to the operation of storage area HVAC systems.

Determining if proposed energy-saving strategies are viable requires thoughtful consideration of building design, mechanical systems, and collection vulnerabilities. While some options are not viable, others could reduce energy consumption by 10% to 30%, without posing significant risk to collection preservation.

Beyond the strain on budgets from energy costs, concern has grown over the burning of fossil fuels to power HVAC systems, which adds significantly to the production of atmospheric carbon dioxide. Many institutions are committed to integrating sustainable energy use practices into all major operations. However, these goals need to be balanced with the responsibility for long-term care and preservation of collections. Unfortunately, in many cases neither the facilities staff nor the collection care staff feels they have the expertise or tools to properly evaluate the impact on long-term preservation of energy reduction strategies such as night and weekend setbacks, AHU shutdowns, or significant changes in temperature and relative humidity settings. Collection care staff fear that arbitrary changes in climate settings will undo years of hard-won gains, and they are very anxious to avoid the perception that controlled conditions are frivolous and unnecessary. Facilities staff are convinced that cost savings are possible if collection staff would ease their requirements. The lack of specific guidelines and methods to avoid risks to collections while taking advantage of opportunities for cost reductions and sustainability gains defined the need for IPI's initial Sustainable Preservation Practices series of workshops and webinars.

It is very important that collections care and facilities staff work together to manage the environment to reach both preservation and energy saving goals. A joint learning experience, ideally with administrative support, is the best way to build a shared sense of direction and purpose. To truly achieve an optimal and sustainable environment these individuals need to communicate effectively, work cooperatively, and become partners in environmental management.

How to Use This Guidebook

This guidebook is divided into four primary sections:

- **Section One** focuses on what you need to know about the environment, its effect on material decay and the primary factors that shape the storage environment. Use this section as an introduction or a refresher course depending on your background.
- **Section Two** details what you need to do to accurately document both the storage environment and associated climate control systems and how to use this knowledge to effectively analyze risk and improve preservation quality.
- **Section Three** was designed to guide and focus environmental management activities and highlight opportunities for energy savings and sustainable practices.
- **Section Four** includes additional guidance and information for your use.

The goal is an optimal preservation environment—one that achieves the best possible preservation of collections with the least possible consumption of energy, and is sustainable over time.

If your institution has taken steps to reduce energy costs by making changes that effect the storage environment, we would like to know about it. Please tell us what steps were taken, how those decisions were made, and what the impact has been. Email Patricia Ford at pafpph@rit.edu.

FOREWORD

DEVELOPMENT OF NEW ENVIRONMENTAL STANDARDS

A great deal has been learned in recent years about managing the storage environment in collecting institutions. The accepted norm—that temperatures should be steady and unwavering at human comfort levels, and that short-term fluctuations in relative humidity matter more than long-term trends—is now regarded by preservation scientists as outmoded and counter-productive. Environments are complicated. The simple notion of setting targets for an 'ideal' environment and watching for daily or weekly excursions is the wrong approach. Even the greenest of buildings can't make flat lining at 70°F and 50% RH sustainable. As the current economic situation and related budgetary problems force cost reductions, collecting institutions need a new management approach in order to navigate between fiscal realities and effective preservation strategies.

A close reading of the literature of conservation will reveal that the creators of the unwavering 70°F/50% RH recommendations regarded their suggestions as provisional pending closer study. The evolution away from such simple ideas and toward a more modern view incorporates research undertaken over the last twenty-five years. Modern thinking holds that all environments are compromises among various agencies of decay. Thanks to this research, we know more about the specifics of these agencies.

The Smithsonian's Museum Conservation Institute has done a great deal to clarify how moisture content affects the mechanical properties of cultural heritage objects. Their work shows that extremes of dryness and dampness pose the greatest risk of physical damage. And that statement contains one of the most significant differences between old thinking and new thinking. We're now concerned much more with what poses the greatest threat (that is, in identifying the circumstances we need to avoid) than we are with articulating an ideal.

Through years of massive accelerated aging projects, including research at the Library of Congress and at the Image Permanence Institute (IPI), preservation science laboratories have explored and clarified how materials such as plastics, dyes, paper, leather, and textiles are at risk due to spontaneous chemical change—decay that we might call 'natural aging.' This kind of deterioration is long-term and depends on the integral over time of temperature (thermal energy) and RH (moisture content of the objects).

The current understanding about environment standards is that there is no such thing as a "one size fits all" standard that is possible and that each institution must figure out what is best for each storage location

based on a holistic approach that includes the most significant vulnerabilities of the stored materials, the capabilities of the HVAC system, the external environment, and the limitations imposed by the building construction.

The Museum Microclimates conference held in Denmark in 2007 included many papers addressing the validity of strict environmental standards and the move toward a more holistic view of risk analysis. The development of new standards for storage and exhibition environments is reflected in guidelines recently developed and published by the Canadian Conservation Institute. On their website, the introduction to their Environmental Guidelines for Museums describes their approach as "a departure from earlier more traditional thinking about museum environments, which called for stringent control of RH and temperature." CCI also notes that "it is neither economical nor environmentally acceptable to have very tightly controlled conditions if they are not necessary." The Getty Conservation Institute recently referenced a "new interdisciplinary initiative that will focus on the research and development of sustainable environmental control and management strategies for collections in museums, libraries, archives, and other repositories."

IPI has been active in the development of new environmental standards for over fifteen years. Working in partnership with the energy management consulting firm Herzog/Wheeler & Associates, IPI has taken its experience with material preservation research and environmental assessment into the field to explore and develop a cross-disciplinary approach between building engineers, facility managers, collection staff, and preservation specialist.

IPI and Herzog/Wheeler call this process 'optimization'—meaning that human comfort, energy and fossil fuel consumption, and preservation quality are all measured, brokered and discussed, and ultimately, an optimal combination of each is achieved. This vision can work, but it cannot be fully realized without a clear and accurate understanding of material decay, the realities of the storage environment, the role of local climate, the building envelope, and the basic functions of the mechanical system. No one is a master of every aspect, but a team of shareholders including collection care staff, facility managers and administrators, sharing their particular knowledge, can implement changes that both save energy and protect collections.

An examination of the history and development of recommendations for the climate in museums reveals that there was minimal scientific support for the values and ranges that were selected. The small basis of research that existed was often extended to materials or objects to which it did not apply; decisions that were merely best guesses based on minimal evidence became set in stone; and the rationale for many decisions seems to have been forgotten or twisted around. It is only relatively recently that research has provided a general scientific basis for determining appropriate values for the museum climate, especially the range in which temperature and relative humidity can be safely allowed to vary. Because the results of this research differed from what had become climatic dogma, it was criticized by some in the field. However, the results have stood up, with no substantive challenge to the data or conclusions, and are increasingly widely accepted.

David Erhardt, Charles S. Tumosa and Marion F. Mecklenburg, "Applying Science to the Question of Museum Climate," Proceedings from Museum Microclimates, T. Padfield & K. Borchersen (eds.) National Museum of Denmark, 2007 ISBN 978-87-7602-080-4