DRAFT- The Lancaster Resolution: On the Introduction of Modern Mechanical Systems Into Historic Buildings

Background – Observations from the Lancaster Roundtable Discussion of December 4, 2009

A. Since the mid-20th century modern mechanical systems have been inserted into historic structures to improve environmental conditions, according to published standards, and to increase safety and utility.
B. Although much research on the management of relative humidity and temperature has been carried out, much remains to be understood about historic building materials, assemblages, and cultural objects and their responses to climatic conditions in general, especially when influenced by HVAC systems.
C. Partly due to unknown variables and the often-unique and complex nature of historic buildings, numerous HVAC projects have been effectively experimental. Many have been surprisingly expensive and overly complex and have been unable to reliably create the desired environments while requiring excessive resources and staff time for operation, maintenance, modifications, or even for replacement over disappointingly-short service life spans. HVAC systems can be too complicated for non-specialist staff to operate and, ultimately, may be too expensive to be sustainable.
D. New research is leading to the revision of traditional environmental standards for preservation to be more flexible, with set points adjustable seasonally and environmental target bands broadened based on local environments and the capacities and the needs of the heritage.
E. Historic buildings generally do not conform to modern construction standards on which access guidelines, fire safety codes, and fire protection systems are based. Using sanctioned performance standards, rather than rigid, specification-based codes, may encourage better, more flexible, creative solutions that protect the integrity and authenticity of historic buildings while achieving acceptable levels of access and safety.
F. Proactive prevention of damage and loss is the preferred strategy for preservation and fire protection. Historic structures and their contents are irreplaceable artifacts whose value cannot be recovered by insurance payments and whose original authenticity may not be restorable by conservators.
G. As with most conservation interventions, new mechanical systems should be as simple and minimal as possible to conserve resources, reduce visual and physical impacts, lower initial and long-term costs, and reduce risks to the heritage while successfully accomplishing the intended goals.
H. Preservation is the mechanism by which the rate of decay is reduced, but not stopped; risks may be managed but cannot be eliminated, and compromises are often needed.
I. Preservation approaches, knowledge, and technologies are constantly changing and evolving.
J. It is important to build on the experience of others and to embrace the spirit and the philosophical principles of historic preservation charters, conventions, and standards that have been developed over time, notably the ***New Orleans Charter for Joint Preservation of Historic Structures and Artifacts***.

It is time to re-examine the use of HVAC and fire protection systems in historic buildings and the best ways to achieve desired environmental and safety goals while preserving the buildings, the artifacts in them, the associated intangible cultural heritage, the historic and modern functions of the structures, and the human inhabitants and visitors. Based on the Lancaster Roundtable discussions, stakeholders are recommended to consider the following points before proceeding with the design and installation of new systems.

I. LONG-TERM PLANNING AND ASSESSMENTS:

1. Re-examine current practices, resource allocations, and long-term institutional mission goals, planning and space use priorities, and operational and fund-raising strategies.
2. Assess the absolute and relative values of the cultural heritage and its condition, vulnerabilities and environmental needs in order to allocate resources and prioritize care. For many organizations, buildings are the primary artifacts. Fully catalogue the collections and store digital copies off site for safety.
3. Professionally assess the existing health, safety, security and other risk factors, including fire safety, for the building and collections. Fire risk indexing, including susceptibility to heat effects, fire byproducts, water damage, and other parameters, can help estimate fire safety for strategic planning purposes.
4. In consultation with local emergency responders, create and implement an Emergency Disaster Plan for the building and site that includes a section on Fire Protection and Safety with fire prevention, fire sensing and alarm, and fire suppression strategies and staff training and procedures that prioritize human safety while preserving the physical heritage. If fire suppression equipment is considered, ensure that all risks are evaluated and a cost benefit analysis is performed. Prioritize the protection or removal of collections.
5. Create and implement a comprehensive Maintenance Plan with safe housekeeping and maintenance practices for the building and site.

6. If modern HVAC equipment is considered, realistically consider the pros and cons of proposed actions and their possible future impacts before undertaking significant interventions. Because of the potential, long-term financial and preservation risks involved, many questions should be resolved before actions take place. How long are the historical resources realistically expected to last and what are the planning, stewardship, preservation, and functional implications of this? Can institutional resources be permanently allocated to pay for the proposed HVAC system's future operation, energy consumption, maintenance and replacement costs? How can costs and risks be reduced?
7. Commit to sharing the information and experience gained in the planning and implementation process through publications, meetings, electronic forums, and the like.

II. REVITALIZATION OF THE EXISTING BUILDING:

8. Perform all necessary, cyclical maintenance and preventative conservation on the historic building, especially its weather envelope, to return it to its traditional condition and proper function and to control agents of deterioration.
9. Consider renovating the traditional performance and function of the building, including historic forms of heating and ventilation, as stewardship and caretaking permit.
10. Evaluate existing mechanical systems and utilities, including historic plumbing, heating, and electrical, equipment, and renovate or replace them to conform to current health and safety regulations. In many cases, historic or obsolete plumbing, wiring, and other equipment, which may appear safe, should be preemptively replaced, removed, or relocated to reduce risks after appropriate inspection and documentation. It is recommended that decommissioned samples of such systems be left in place as historical records.
11. If lacking, add appropriate modern security, environmental, and fire sensing and alarm systems in a manner to minimize their visual and physical impacts. Before adding fire suppression equipment, consider the limits of their performance, the costs, benefits and risks of their installation and operation, including their durability and dependability, and the potential role and capabilities of emergency responders from external agencies.
12. Consider making minor, visually unobtrusive architectural changes that do not compromise architectural character and authenticity in order to improve a structure's environmental performance and fire safety. Examples include upgrading the drainage systems, adding ultra violet light-blocking films or interior storm panels to windows, adding insulation, and sealing air leaks after careful study and testing. All interventions should be appropriately documented, identified, and monitored and should be as reversible as possible.
13. Use buffering materials and passive means to simply and automatically moderate and minimize swings in relative humidity and temperature as much as possible.
14. Consider modifications to the local exterior microenvironment to improve the building's performance. This could include modifying the existing site vegetation or re-establishing historic planting schemes to control local ventilation and seasonal winds, moisture levels, sunlight intensity, etc. Surface and subsurface water control may also be beneficial.

III. DEVELOPMENT OF USE STRATEGIES TO IMPROVE BUILDING AND SITE ENVIRONMENTAL PERFORMANCE AND HERITAGE PRESERVATION WITHOUT MAJOR NEW SYSTEMS:

15. Recognize that historic buildings generally make poor museums or heritage object storage facilities.
16. Consider the basic environmental capabilities of existing structures, finishes, and components and try to use them accordingly. This includes selecting storage and display strategies appropriate for the existing environmental conditions. Do not expect historic buildings to perform to unreasonable, modern standards.
17. Evaluate, quantify, prioritize and balance the environmental needs of the cultural heritage and those of the human inhabitants and visitors for planning, preservation, and design purposes.
18. Develop simple, non-mechanical and passive techniques for maximizing the local internal environment to minimize the need for mechanical climate control equipment. This could include such manual activities as daily opening and closing of existing shutters and windows to adjust ventilation, temperature and humidity, etc. This does require appropriate planning and monitoring as well as staff training and cooperation.
19. Seek ways of addressing human comfort and health by re-zoning the building based on usage and occupancy. Human comfort may differ from, conflict with, and be less important than the environmental needs of the heritage. Get offices out of historic buildings so that heat can be decreased or eliminated in the winter since low temperatures can extend the life of artifacts and buildings.
20. Examine alternative use patterns to minimize or eliminate future HVAC needs, such as maximum occupancies, maximum environmental loadings, and seasonal closings.
21. Consider storage and display strategies for objects and collections that group materials with similar climatic needs, rather than conditioning everything to accommodate the most fragile materials.

22. Consider creating climate controlled display cases or layered micro-environments within historic structures for more sensitive objects or relocating especially fragile objects or collections to purpose-built, modern buildings or spaces where superior environmental conditions can be maintained more easily and efficiently.

IV. DESIGN AND INSTALLATION OF NEW HVAC SYSTEMS:

23. Consider modern HVAC systems only after all reasonable, non-mechanical methods to improve the building's environmental performance have been enacted, after environmentally sensitive storage, display and use strategies have been carried out, and after the long term financial, staffing, and risk implications have been fully evaluated. The climatic contribution from the operation of existing, traditional heating and ventilating systems, if demonstrably safe and practical, may be considered in new HVAC designs.
24. Recognize the need to establish permanent, annual budgets for the future costs of proposed HVAC systems.
25. Collect at least 12 months of interior and exterior environmental data before starting the design process.
26. As needed, convene an experienced, interdisciplinary team to holistically consider goals and develop the intended project, to help select experienced system designers and installation contractors, and to provide management, advice, supervision, review and approval during the work. Consulting experts, such as architects, architectural and object conservators, mechanical engineers, curators, cultural heritage managers, financial advisors and other stakeholders should participate as needed depending on the project.
27. Design a simple, minimal HVAC system to accomplish reasonable tasks, utilizing low and proven, non-experimental technology when possible, to minimize initial and future energy and operational costs and to reduce failure rates and possible risks to the heritage and to the staff and visitors.
28. Design a robust HVAC system, utilizing decentralized, independent zones, if appropriate, to increase system redundancy and to reduce failure risks by compartmentalizing the system into autonomous, modular units.
29. Design a flexible HVAC system that can be easily upgraded, replaced, or removed as warranted.
30. Utilize off-the-shelf HVAC hardware and software, with digital controls, monitors and sensors, to reduce costs and ease operation, data transmission, maintenance, and upgrades.
31. Design the system to allow equipment to run at the most efficient levels. This may result in a slightly undersized system that runs more continuously compared with conventional designs.
32. Coordinate HVAC equipment installation with scheduled structural, architectural, conservation or other work.
33. Phase in the installation, as possible, over time in order to reduce the initial costs, to allow for performance reviews, testing, and subsequent design modifications based on lessons learned.
34. Supervise and document the HVAC installation and appropriately protect the site, the building, the collections, and staff and visitors during the work.
35. Commission the installation professionally and independently verify that the system consistently functions appropriately and according to design specifications from the beginning.
36. Document the system's design, operation and maintenance with a clearly written instruction manual and train multiple members of the local staff in its correct use. Make sure this institutional memory, including the project's drawings and specifications, is durable and accessible.
37. Implement regular professional monitoring, servicing and review of the system's operation, and maintenance, Conservators and other trained staff should also independently monitor and record environmental conditions. Adjust or modify the HVAC system and its operation and maintenance to meet its intended performance standards and re-commission as appropriate.
38. Prepare for and include the malfunction and failure of the HVAC system and other modern equipment, and the impact of this on the historic buildings and collections, in the Emergency Disaster Plan for the building and site.

Authored by William C. S. Remsen (wremsen@gmail.com), with contributions from David Bittermann, Barbara A. Campagna, John D. Childs, Curt Genga, Patrick Guthrie, Benjamin Haavik, Richard Kershner, Philip C. Marshall, C. Jeffers Moore, W. Brown Morton III, Henry Moss, Tom Nutt-Powell, Lynn Smiledge, Lynne Spencer, James M. Younger, William J. Waldyka, and Josh Wright.

The Lancaster Resolution: On the Introduction of Modern Mechanical Systems Into Historic Buildings is the product of the Round Table Discussion: The Introduction of Modern Mechanical Systems Into Historic Buildings In New England, held on December 4, 2009 in Lancaster, Massachusetts, USA. This meeting was carried out as part of an Architectural Conservation Grant from the Getty Conservation Institute and sponsored by the First Church of Christ and the Bulfinch Fund. The projects architects, Menders, Torrey, and Menders, Inc. of Boston, Massachusetts, and the sponsors worked with William Remsen to organize this meeting.