**APTI Conference 2015 - Kansas City, Missouri**
**Track: Sustainable Preservation: Preservation Technology and Climate Change**
**CS11: Sustainable Conservation Guidelines**

***BUILDING RESILIENCE: Practical Guidelines & Technologies for Sustainable Rehabilitation***
*Presenter: Mark Thompson Brandt*

**Abstract**

Historic place conservation is a growing factor on the broader green building and community resilience agendas throughout North America. There is increasing recognition of the strong interconnection between heritage preservation and sustainability (the nexus of natural and cultural conservation) and there is simultaneously an increasing need for all existing buildings to accelerate and lead the movement to sustainability and resilience - in turn providing the need for more technical assistance in this area.

*"BUILDING RESILIENCE: Practical Guidelines for Sustainable Rehabilitation of Buildings in Canada"* is a new on-line document for those involved in interventions to existing buildings, particularly historic properties, co-authored by the presenter. This "green building tool" assists the practitioner to make wise choices in developing rehabilitation projects with maximized sustainability improvements, while protecting heritage value of the asset. This session is essentially a "user's manual" for this new document.

This decision-making tool counsels an integrated approach to achieving sustainability enhancements in traditional construction, and provides specific guidance for sustainably renewing, upgrading and adapting historic and existing buildings. It demonstrates the leveraging of often-forgotten resilience and durability inherent in traditional building construction & design, and helps to facilitate retention and continued use of historic places as models of stewardship for the existing built environment.

We will hear how *Building Resilience* incorporates concepts that improve understandings such as the:

• Various ways of how traditional building systems, envelopes and design can be inherently sustainable and what you need to know about that before making intervention decisions;

• Buildings of the modern era - how they present different sustainability challenges as their unique materials, systems and assemblies age;

• Impact of interior space arrangements in traditional construction and their important relationship to exterior form and building performance;

• Various ways structural and mechanical systems can be re-used or leveraged to accommodate new use and occupancy requirements.

Starting with background comprehension to sustainable rehabilitation of historic structures, this session will then demonstrate uses of building component guideline chapters, and how they systematically describe the sustainable elements and challenges, define the issues, explain interrelationships with other building elements and functions, and provide strategies for sustainable intervention and technologies worthy of consideration.

The session will show how the document illustrates preferred methods and approaches for "greening" heritage buildings, and that these provide best practices for sustainably rehabilitating all existing buildings, regardless of where their value lies.

Related illustrated case studies will provide real-life examples drawn from multiple climate zones across Canada. One case study of particular significance will provide info on how the architects (including the presenter) collaborated with other industry professionals, lessons learned, and other interesting aspects of the sustainable rehab work.

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**Outline**

- I. Introduction and Context
  - a. Defining Resilience
  - b. Global Impact: Environment/Economic/Social
- II. Understanding your Building
  - a. Heritage Value & Physical Properties
  - b. Evaluation Tools
  - c. Identify Inherently Sustainable Elements
  - d. Other Issues
- III. Building Component Guidelines
  - a. Common Considerations and Core Guidelines
  - b. Components Addressed
  - c. Component Guideline Structure
  - d. Component Examples
    - i. Exterior Walls
    - ii. Materials
    - iii. Mechanical & Electrical Systems
    - iv. Operations & Maintenance
- IV. Further Information
  - a. Case Studies
  - b. Next Edition Upgrades

**Learning Objectives:**

Participants will be able to:

1. describe the interconnection between heritage preservation and environmental resilience and the need for more technical assistance in improving the performance of existing buildings;
2. utilize the new "green building tool", *Building Resilience: Practical Guidelines for the Sustainable Rehabilitation of Buildings in Canada,* created in a collaboration between Parks Canada's Federal, Provincial and Territorial Collaboration on Historic Places and the British Columbia Heritage;
3. follow a systematic approach to the evaluation of existing buildings to identify inherent sustainability and new whole-system solutions;
4. and apply practical strategies, informed by a series of illustrated Case Studies, for improving the sustainability and resilience of heritage buildings.

**Mark Thompson Brandt** is Senior Conservation Architect & Urbanist with MTBA Associates Inc., an Architecture, Urbanism and Conservation consultancy in Ottawa, ON. He has over 30 years of practice in these fields and currently is working on several projects on Parliament Hill in Canada's Capital.

**ASHRAE's New Guide: "Energy Guideline for Historical Buildings and Structures"**
*Presenter: William B. Rose*


**Abstract**

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) has recently released Standard 100-2015 "Energy Efficiency in Existing Buildings" which sets energy targets by building size, use and climate. The Standard contains an exemption for historic buildings. A new Guide, not yet released, addresses this. "Energy Guideline for Historical Buildings and Structures" discusses matters of energy conservation from a preservation perspective. While much of the material is not controversial, some subjects do merit attention from all in the preservation community. Use of spray foam polyurethane foam is recommended as a means of airtightening of buildings for point and line applications, not for whole surface applications. The concept that the preservation of exterior materials requires constant heating of those materials during cold weather is challenged as a general approach. Concern for diffusion analysis of buildings is shifted to a concern for managing airflows and, in particular, water deposit on the building.


**Outline**

I. Intro
   a. Inherent efficiencies
   b. Historic buildings exclusion in codes and standards
   c. Role of ASHRAE. Appearance of GPC-34

II. Starting points
   a. ASHRAE Standard 100 "Energy Efficiency in Existing Buildings"
      i. Uses RECS, CBECS databases
      ii. Sets pass at 25th percentile of 2010 estimates based on databases
   b. No database of energy use in historic buildings
   c. What is a historic building? Include Main Street buildings, "historic-eligible".
   d. "Not with my building you don't": Preservation mandates and energy mandates

III. Background

IV. Planning
   a. Setting desired indoor conditions
   b. Hygrothermal analysis desired? Needed? (Possible?)

V. Building envelope
   a. Airtightness and spray-applied urethane (reversibility)
   b. Insulating masonry
      i. Joist pockets, floor and partition edges
   c. Justification for expending energy for durability purposes only?
      i. Perhaps, in exceptional cases

VI. Equipment - Eliminating or reducing ductwork

VII. Wrapup


**William B. Rose** is a licensed architect and ASHRAE Fellow. He is the author of *Water in Buildings,* published by Wiley & Sons and for 12 years he was the Handbook Chair for the ASHRAE Handbook (Fundamentals and Applications) chapters on building envelopes.

**Prioritization of Energy Retrofits for Historic Homes**
*Presenter: William A. Dupont*


**Abstract Summary**

Seeking to enhance the social justice of energy retrofits for owners of small, historic homes in hot-humid climates, a team of researchers studied four typical homes in climate zone 2A. Research findings support financial rationale and practical guidelines for appropriate retrofits to similar homes, prioritized by investment value.

**Abstract**

The technology of sustainable preservation offers meaningful knowledge on energy retrofits achievable by owners of historic homes in financially attractive phases. Cost-effective strategies appropriate for older, wood-frame structures in hot-humid climates are not well known to homeowners. Available advice concerns non-historic homes, northern climate zones, and large construction budgets. Few reliable sources of information are available to guide regionally appropriate improvements, and none offer prioritization. Consequently, some work being done today does has negative impacts and does not achieve good effectiveness for dollars invested.

Climate change is occurring and human activity is contributing to the change. Within the project's study area, climate zone 2A, coal is a primary energy source, and the process produces carbon emissions that are a major contributing factor in all climate change models. Energy retrofits of older buildings can reduce the pace of climate change because the improvements will reduce consumption of fossil fuels. Additionally, many retrofits are a smart financial investment for the average homeowner.

The study involved multiple researchers from the University of Texas at San Antonio. The team looked at four homes typical of pre-WWII construction in the southern U.S. – single story, detached, wood-frame, and averaging 1,700 square feet. Project findings summarize energy retrofits prioritized by cost-benefit analysis. Some popular options do not make the list of recommend retrofits, such as wall insulation. Findings describe energy efficient products and practices that respect the historical integrity of the architecture, and are intended to help homeowners prioritize improvements that will lower energy use and increase occupant comfort without diminishing cultural heritage identity.

The four homes in the study are located in climate zone 2A, within a designated historic district. Estimates of probable construction costs and projected energy savings were calculated for typical improvements/ renovations to the housing type. Fieldwork at the selected homes included detailed measurements, assessment of physical conditions, and infrared photography. Architectural drawings were produced for the software modeling. A simple test of the air tightness of the house (known as a "blower door test") was performed for baseline analysis, as well as a "duct-blaster" test for the HVAC ducts. Study participants provided past bills of energy use. Energy use monitors were installed to understand current usage. Analysis of the energy consumption allowed better understanding of the energy use at each home and formed the basis for recommended energy efficiency improvements. The energy bills were a source of financial data and served as a basis for projected savings. Also, the team researched construction costs to generate probable budgets for suggested improvements.

Ongoing research is now focused on radiant barriers with funding from National Center for Preservation Technology and Training, U.S. National Park Service. An update on this research will be provided.

**Prioritization of Energy Retrofits for Historic Homes**
*Presenter: William A. Dupont*

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**Outline**

I. Introduction
    a. Team members
    b. Project funding, scope and intentions
    c. APTI presentation learning objectives
        i. Identify the primary concerns for increasing the energy performance of historic, wood-frame homes in hot-humid climates.
        ii. Understand the best practices and priorities for specific energy retrofits in hot-humid climates.
II. Research Methodology
    a. Addressing gaps in energy retrofit knowledge:
        i. data from field analysis of actual homes
        ii. hot-humid climate zones
        iii. practical information for small homes
    b. Field data collection
    c. Energy efficiency tests and electricity use monitors
    d. Performance simulation modeling software
    e. Product research library
    f. Construction cost estimating
III. Financial analysis
    a. Investment
    b. Pay-back
IV. Data assessment outcomes
    a. Primary retrofits – attic insulation, HVAC ducts, radiant barrier
    b. Secondary retrofits – crawlspace insulation, air infiltration
    c. Less effective – window replacement
    d. Not recommended – wall insulation, vapor retarders.
V. Conclusions
    a. Need for better data
    b. Massive potential for savings by retrofit improvements
    c. Dissemination to consumers: How can the profession better communicate technical knowledge to property owners and home improvement contractors?
VI. Conclusions
    a. Need for better data
    b. Massive potential for savings by retrofit improvements
    c. Dissemination to consumers: How can the profession better communicate technical knowledge to property owners and home improvement contractors?

**William A. Dupont** is Director of the Center for Cultural Sustainability and the San Antonio Conservation Society Endowed Professor at the College of Architecture within the University of Texas at San Antonio (UTSA). A Fellow of the American Institute of Architects, his current research, scholarship and training efforts in San Antonio, New Orleans, Havana, and Erbil are focused on cultural heritage conservation. He is a past 2-term Board member of US/ ICOMOS (International Council of Monuments and Sites) and expert member of the ICOMOS International Scientific Committee on the Analysis and Restoration of Structures of Architectural Heritage.