This paper demonstrates that the implementation of geothermal heating and cooling systems offers a favorable solution to the conservation of historic structures by encompassing mindful historic preservation while still meeting ambitious sustainability and energy efficiency goals.

I. Introduction
   a. Métissage - This is an exciting time to be involved in historic preservation as we watch the convergence of our cultural heritage and modern technology. This step towards eco-effectiveness values balance of economy, ecology, and equity.
   b. Review Objectives: We will discuss...
      i. Authentic sustainability
      ii. Planning for geothermal/renewable energy adaptations for historic building use
      iii. Examine two case studies exhibiting varying problem-solving options when converting HVAC systems of historic buildings to renewable alternatives.

II. Analyze the Green Building Movement and Sustainability in Preservation
   a. Motivations
      i. Buildings account for an estimated 38 percent of all greenhouse gases (AIA National Government Advocacy Team)
      ii. Review primary energy consuming components in the home
   b. Thorough consideration and planning
      i. First steps to transitioning to a greener historic building
         a. Securing fenestrations efficiency
         b. Improve weatherization
         c. Reduce heat gain/loss with solar shading devices
         d. Convert existing heating and cooling systems to a renewable resourced based system

III. Geothermal Adaptations for Historic Building Use
   a. Planning
      i. Access archeological significance of environs before breaking ground to determine best well placement; study soil composition, ground water, water flow rate, and water delivery for site planning.
ii. Outlying buildings present on site can offer space to store associated mechanical equipment.

iii. Openings present within the structure should be utilized; no additional cuts into the building should be made. Ducting should be used if existing from an earlier renovation.

iv. No ducting (forced air system) alternatives.

IV. Small Residential Case Study
   a. E.L. and Ruth Fogleman House; Raleigh, NC

V. High Profile
   a. Poplar Forest; Forest, Virginia

VI. Overall Benefits & Disadvantages
   a. Disadvantages
      i. Less competitive in market
      ii. Public is less familiar and therefore, therefore less interested in investing
      iii. Difficult to source qualified contractors and tradesman to integrate these systems for historic building use
      iv. Higher upfront cost
      v. Horizontal wells require large open space for wells
      vi. Open loop systems may cause water contamination
   b. Advantages
      i. Lower operating costs post installation
      ii. Quiet operation, minimal vibrations
      iii. Reliable due to limited wear from elements
      iv. Less environmental impact, no carbon dioxide, carbon monoxide, of other greenhouse gas (GHGs) emissions.
      v. Doesn’t burn fossil fuels
      vi. Low electricity demands
      vii. Higher indoor air quality, more balanced interior environment
      viii. Long life expectancy
      ix. 3-8 year payback
      x. Mitigates unsightly unit from compromising experience with the cultural resource.

VII. Conclusion
   a. Tie advantages into triple bottom line= sustainability
   b. Margaret Mead introduction and quote:
      i. “A small group of thoughtful people could change the world. Indeed, it’s the only thing that ever has.”
   c. Questions

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Introduction to Corrosion and Cathodic Protection

1. Corrosion (1 minute)
   a. What is corrosion
   b. How corrosion cells behave
2. Corrosion’s impact on historic masonry (2 minutes)
3. What is Cathodic Protection (5 minutes)
   a. Brief history of its development from 1824 to its use on steel frame construction
   b. How the systems came to be used in Heritage buildings
   c. Examples of ICCP in heritage buildings
4. Why are feasibility studies necessary? (2 Minutes)
   a. Construction Type
   b. Understanding Construction Details
   c. Understanding as-built conditions are suitable for an ICCP system
   d. Understanding the impact of
      i. Too much current
      ii. Discontinuous steel
   e. Understanding client requirements
5. What does the feasibility study entail (10 minutes)
   a. Site Investigation
   b. Visual Survey
   c. Semi-Destructive Testing
   d. Trial cell
   e. Results analysis
6. Conclusions What is the final product? (2 minutes)(interspersed with Case Studies)
   a. Understanding of the structure
   b. Understanding the long term behavior of the structure
   c. Predicting performance of the steel
   d. Understanding if the building is capable of having an ICCP system
   e. Ensuring anode type is suitable
   f. Understanding current requirements
   g. Ensuring that there will be no negative impact
CS18c: Sibley Hall Dome: Integrating Investigative Techniques to Diagnose and Preserve an Iconic Steel Roof

Presented by: Janet Null & Evan Kopelson

I. Introduction

By its nature, a dome is both a roofing system and a preeminent, even dominant, feature of a building’s architectural design. The three-story center section of Sibley Hall at Cornell University was built in 1902 to connect West Sibley (1871) and East Sibley (1894) Halls. Constructed of heavy gauge galvanized steel directly attached to a structure of steel trusses, the Sibley Hall dome covers the entire center section of the building, which, consequently, has the official name of its roof - Sibley Hall Dome. The 68-foot diameter dome, with its elliptical profile surmounted by a circular lantern, is a landmark feature of the original campus Quad, but currently presents material deterioration, building environment issues and a significant maintenance challenge.

In 2012, Cornell undertook a design study for roof repairs and replacement for nine core campus buildings, including Sibley Hall Dome. The central question was if, when, and how, these roofing systems needed to be replaced. This presentation discusses appropriate investigation techniques, the value of high-tech and low-tech methods in concert, and a collaboration between disciplines in data collection, analysis and perspectives as we tried to answer that question.

II. Construction & history of Sibley Hall Dome

A. Original design, profile, structure and sheet metal construction

B. History of alterations & maintenance from physical evidence, historic research, maintenance records, including

1. Significant alterations

2. Paint/color history

C. Current issues presented by the University. Apparent or reported problems included: condensation within the dome; roof leaks; falling plaster; deformation; deterioration of the sheet metal; and deterioration of coatings on the dome.

III. Investigation of the Dome

Following, and concurrent with, historic and maintenance research, the study team – Argus, Vertical Access and Ernie Conrad of LFG – undertook the hands-on investigation. Team defined partly by the questions being investigated and partly by the physical difficulties of access.
A. Architect’s interior and exterior visual survey, with aerial platforms and within the Dome’s “cavity”

B. Thermal investigations
   1. Infrared thermal imaging
   2. Temperature and humidity monitoring

C. Industrial rope access investigations, including
   1. Exterior hands-on investigation
   2. Live-feed video discussion during inspection
   3. Documentation using TPAS during survey to create annotated drawings with hyperlinked photographs
   4. Ultrasonic thickness gauge measurements

IV. Investigation results & design concept
   A. Structural and material integrity; thickness, stiffening, patching and replacement material
   B. Corrosion; patterns, joint design, coatings and sealants
   C. Thermal profile and air infiltration
   D. Design concept for repair

   Accurate data and analysis enabled the team to develop a concept design for the repair of Sibley Hall Dome that is economical and conservative, requiring very minimal replacement or alteration of the historic fabric. Also, the data and analysis supported a traditional approach to environmental control as part of the preservation strategy for the dome.

V. Conclusions
   A. Critical factors in longevity & preservation of galvanized roofing
   B. Data are only data until put into (holistic) context
   C. Are we asking, and answering, the right questions?
“Who Picked That Color?!”: Understanding Color in Modern Architecture

Presenter: Kayla Loveman, Architectural Conservator, Jablonski Building Conservation, Inc.

Introduction:
- Association of “Modernism” with white
- Although there were changes in the way color was used as Modernism matured, its importance was not diminished.
- Focus on four New York City landmarks completed between 1930 and 1931
- Art Deco
  - Chrysler Building
  - Chanin Building
- International Style
  - Starrett-Lehigh Building
  - McGraw-Hill Building

Art Deco
- Historical Context: The Roaring 20’s. – Opulence and ambition expressed in architectural design through extraordinary height and lavish materials.
- Color obtained primarily through use of these materials.
- Chrysler Building
  - Stainless steel
  - Brick
  - Marble
- Chanin Building
  - Sculpted bronze
  - Sculpted terracotta
  - Brick
  - Marble

International Style
- Historical Context: Onset of the Great Depression. International Style was a more inexpensive style to execute and the logical next step in the progression of architectural taste during this period.
- Applied finishes become more prominent sources of color than they had been for Art Deco. Vast selection of paints and glazes meant that color was very deliberately chosen.
- Starrett-Lehigh Building
  - Red brick and buff cast concrete spandrels
  - Yellowish green painted window bands
- McGraw-Hill Building
  - Terracotta glazes: bluish green field; orange and white lettering; bluish green, yellow, beige parapet
  - Paints: Apple green windows; vermillion lintel bands, dark turquoise column covers
  - Enamels: Turquoise, black, and gold banding on first floor
  - Mortar: Green, orange, white
  - Anodized finishes

Conclusion
Looking ahead
Post Modern Architecture: Are you prepared to protect it?

Peter Meijer, Peter Meijer Architect PC, Portland, OR

Outline
Background
  Beginnings
    Academic movement
    Reactionary
    Design innovation
  Practitioners
    Johnson
    Graves
    Beeby
  Popular response
    Favorable
    Critical
    Parallel movements
      Deconstructivism

Built Work
  Early ideas
    Lovejoy Pavilion
    New York 5
  Seminal work
    Portland Building
    Piazza d'Italia
  Mature style

Materials
  Components
    Thin skin

Innovation
Permanence

Popular response
  Cultural Resource vs. Architecture
The public debate on the merits of Post Modernism has arrived sooner than expected. The impermanence of the materials and the construction systems are not yet fully understood. Are material conservators and preservation technologists ready (and willing) to contribute to a controversial debate over a design style?

There is no middle ground. People either love or hate the Post Modern icon Portland Building. Whether or not Michael Graves’ Portland Service Building is considered a master work is greatly debated. The debate focuses on the distinction between design and architecture.

Very recently, the national press published a series of editorial comments asking the question whether or not the Portland Building should be torn down. The articles have been prompted by a misleading representation that $95 million dollars is required to repair a building just 30 years old. There is no debating the facts that the building leaks at specific locations and the tenants do not like working in the building because of its small windows with limited daylight. But should these subjective opinions drive the decision to preserve or demolish a building internationally recognized as the defining moment of Post Modern design.

At its very core, the current discussion is identical to the heated, and often acrimonious, debate during the original selection process. The arguments on both sides are nearly identical: the building is a design masterpiece, boldly experimental and places Portland, Oregon on the architectural map vs. a failed piece of architecture, abhorably and functionally obsolete and lacking street vitality, an attribute germain to Portland’s urban fabric.

Does the inherent impermanence of the original materials justify an approach of non-preservation as preservation? The façade of the Portland Building incorporates building systems or individual components that are neither produced nor assembled currently in similar manners due to improvements in technology and building envelope science. Therefore, the process and method of building envelope repair could dramatically or minimally impact the exterior character.

Is the proper approach to retain the essence of criticism towards Post Modernism by preserving the appearance of insubstantial material installed incorrectly? Proposals to improve envelope performance of both the individual components and building systems are challenged in finding products that will both improve performance and retain the aesthetics of a Post Modern building. Windows have always been a source of controversy in preservation and the undersized windows of the Portland Building are defining elements of the Post Modern design. The preservation community should be prepared to participate in discussing the merits of Post Modernism. The conversation has begun.