

An Introduction to ASHRAE Guideline 34-2019

Energy Guideline for Historic Buildings

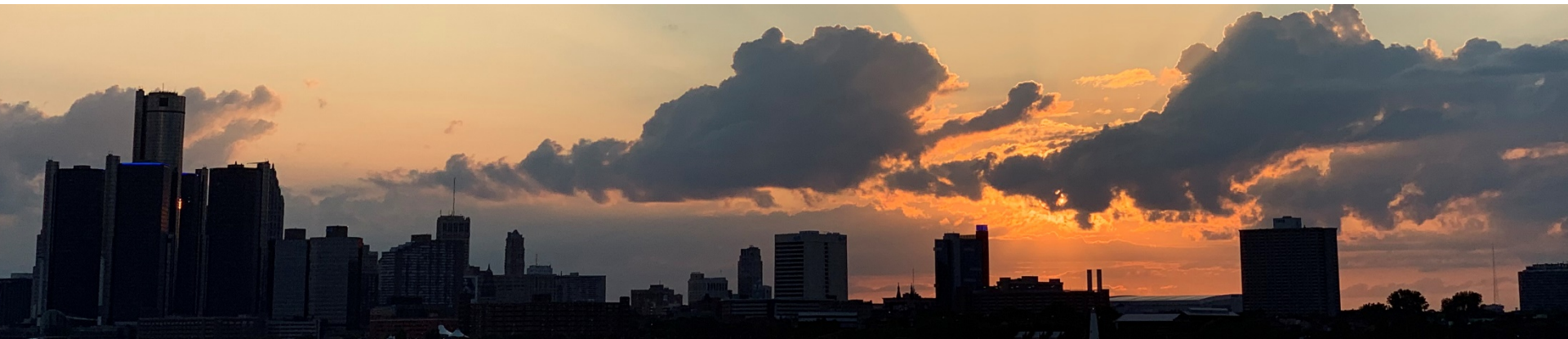
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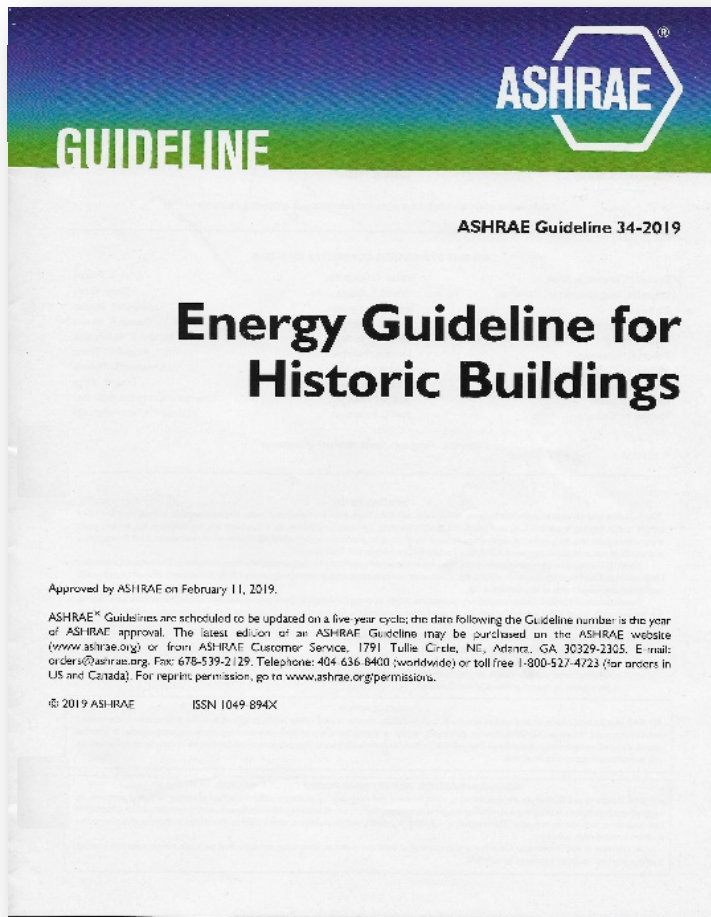
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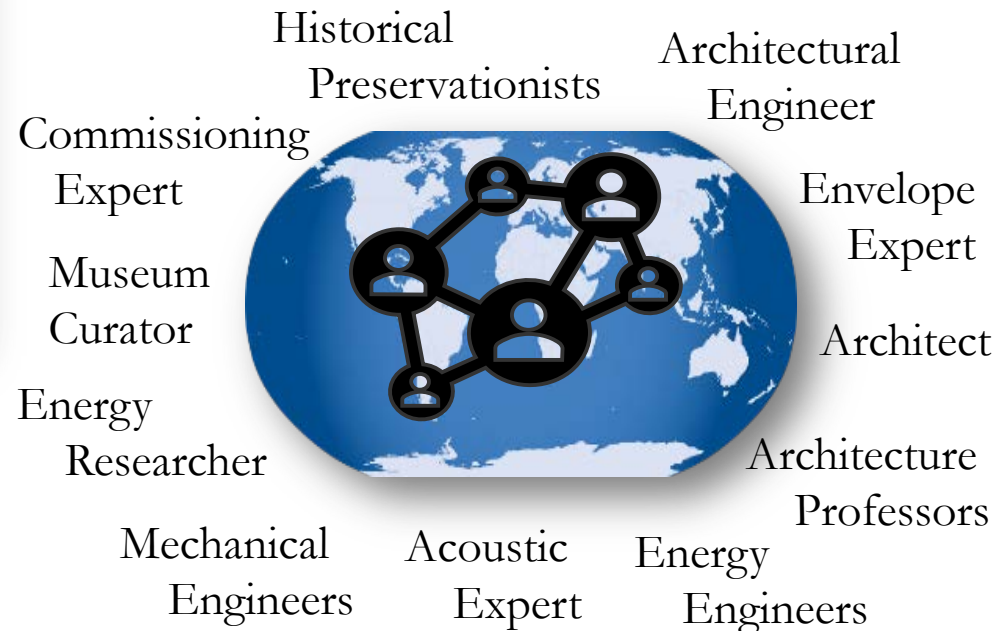
Shaping Tomorrow's
Built Environment Today

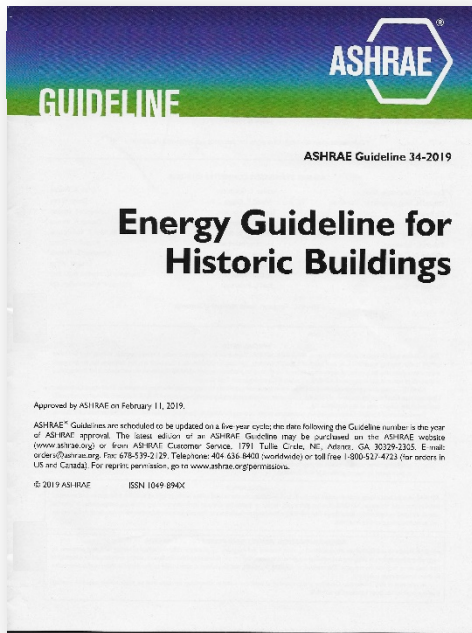


Swiss-U.S. Energy Innovation Days Austin, Texas October 7, 2019



I. Introduction





II. Guideline 34-2019 Contents

1. Purpose
2. Scope
3. Definitions & Acronyms

4. Background
5. Planning Phase
6. Building Envelopes
7. Environmental Control & Energy Systems
8. HVAC System Selection
9. Lighting

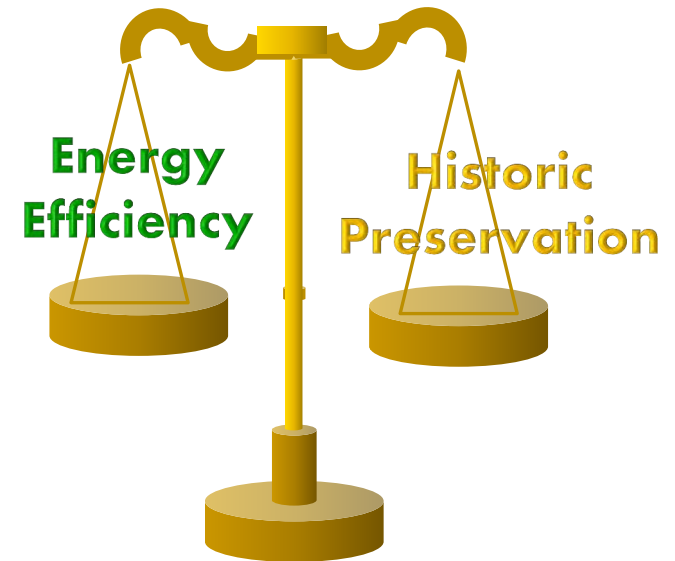
10. References
- Informative
Appendices A-E

1.0 Purpose & 2.0 Scope

To provide guidance for improving
ENERGY EFFICIENCY
in listed
HISTORIC BUILDINGS



III. Content Summaries



Valere Basilica
Sion, Switzerland
(Registered in the Swiss Inventory of
Cultural Property of National &
Regional Significance)

III. Content Summaries

3.0 Definitions & Acronyms

mechanical ventilation: the active process of supplying door air to (and removing stale air from) an indoor space by powered equipment such as motor-driven fans and blowers but not by devices such as wind-driven turbine ventilators and mechanically operated windows.

natural ventilation: ventilation occurring as a result of only natural forces, such as wind pressure or differences in air density, through intentional openings such as open windows and doors.

nogging: use of masonry, e.g., brickwork, between studs or other framing.

Owner's Project Requirements: details the functional requirements of a project, including goals, measurable performance criteria, and supporting information.

system: a system where natural forces are used for ventilation purposes in lieu of mechanical/electrical systems.

3.2 Abbreviations/Acronyms

AH

absolute humidity

AIC

American Institute for Conservation of Historic and Artistic Works

APT

Association for Preservation Technology

BAS

building automation system

BIM

building information modeling

BoD

Basis of Design

CBECS

Commercial Buildings Energy Consumption Survey

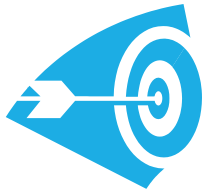
constant-air volume

Conformité Européenne

4.0 Background

III. Content Summaries

4.1 Goals of preservation



4.2 Related existing guidance



4.3 Historic buildings, their significance, & character defining features

Approach = f (significance)

PRESERVATION
REHABILITATION
RESTORATION
RECONSTRUCTION







Historic Orchard Lake School buildings **look like fortresses**, Orchard Lake, MI, USA

4.0 Background (cont.)

III. Content Summaries

4.4 Understanding
past use
(envelope,
systems,
occupancy,
environmental
management,
energy cost)

4.5 Impacts of Energy Efficiency
Measures (**EEMs**) on historic
buildings

TABLE 4.1	
 BENEFICIAL	 DETRIMENTAL
 BENIGN	 STUDY NEEDED

5.0 Planning Phase

III. Content Summaries

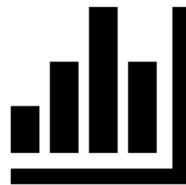


5.1 Project team

5.2 Building investigation
& documentation

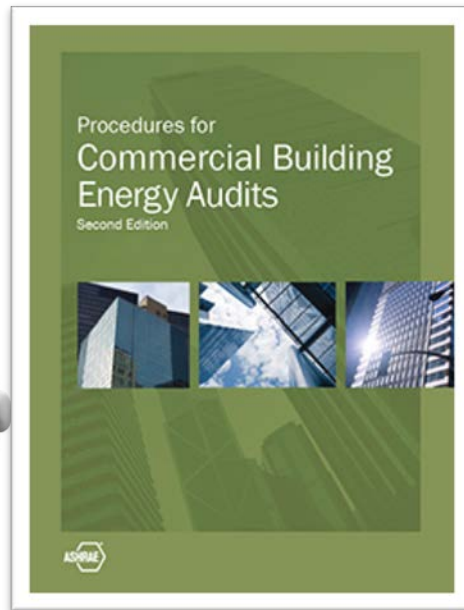


5.3 Energy use analysis,
benchmarking &
target setting

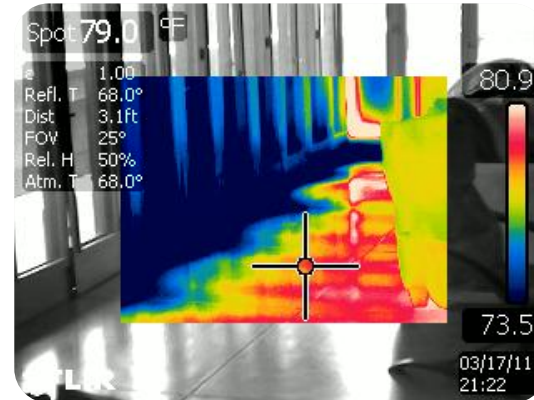


5.0 Planning Phase (cont.)

5.4 Field investigation & condition assessment



III. Content Summaries

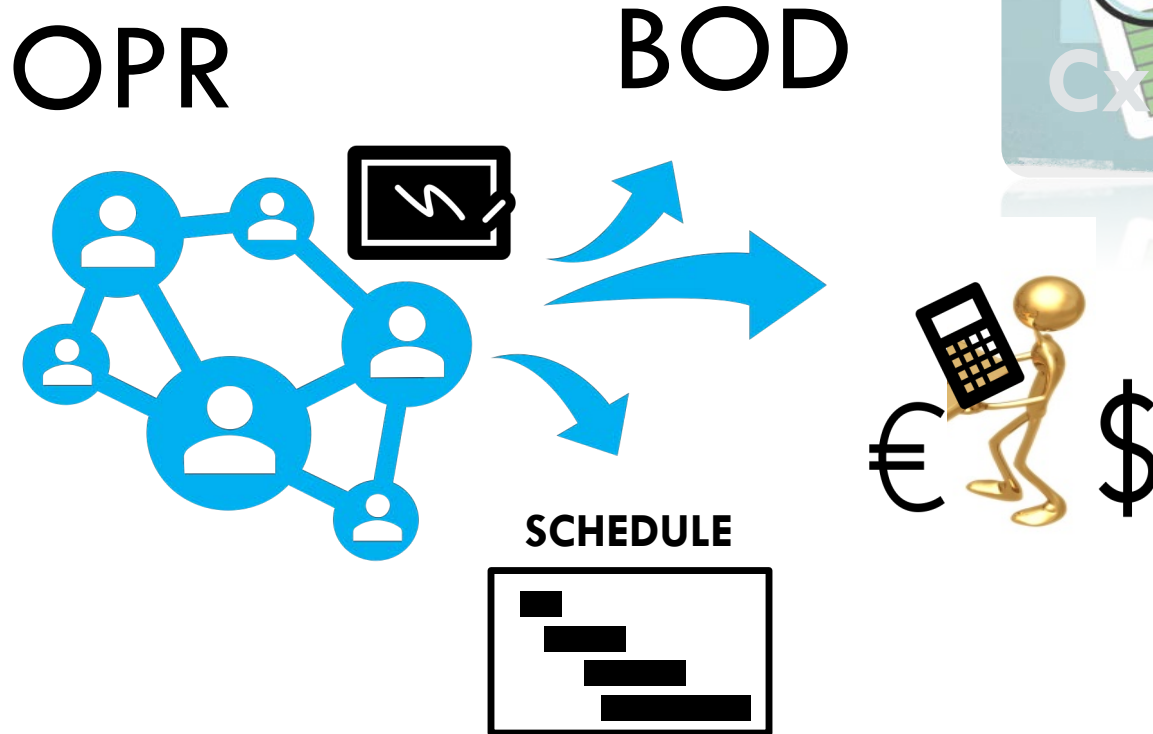


Glass doors & radiant-heated floor in Frank Lloyd Wright's Affeck House, Bloomfield Hills, Michigan, USA (Registered National Historic Building)

5.0 Planning Phase (cont.)

III. Content Summaries

5.5 Predesign planning



5.0 Planning Phase (cont.)

5.6 Considerations for envelope improvements & energy systems design



DETERMINE
ROOM
CLIMATE
CONTROL
SET POINTS



ARTIFACT
CLIMATE CONTROL



III. Content Summaries



HISTORICAL CLIMATE CONTROL

Cool air from under house rises & exits via clerestory windows around the corner in the kitchen. Frank Lloyd Wright Affeck House Bloomfield Hills, Michigan, USA (Registered National Historic Building)



Da Vinci's Madonna & Child in conditioned glass container for close monitoring of temperature & humidity at Hermitage Museum, St. Petersburg, Russia (UNESCO World Heritage Site)

5.0 Planning Phase (cont.)

III. Content Summaries

5.7 Occupancy &
operations phase



Energy
Management
Plan

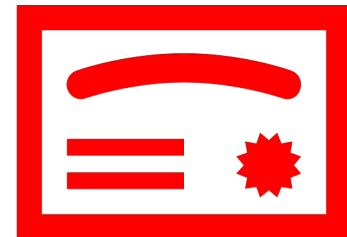


Systems
Manual



Training

Warranty
Review



6.0 Building Envelopes

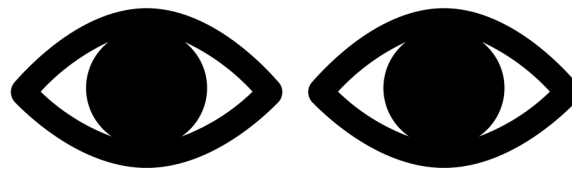
III. Content Summaries

6.1 Roof Assemblies

6.2 Wall Assemblies

6.3 Foundations

6.4 Glazing (windows & doors)



Insulate attics with replaceable insulation.

It may be impossible or **detrimental** to insulate some walls.



Reinstall original assemblies, i.e.,

Built-in shutters

Williamsburg
Virginia, USA

7.0 Environmental Control & Energy Systems

III. Content Summaries

7.1 Introduction

7.2 Environmental
systems in historic
buildings background

7.3 Field investigation



**18th Century
Fireplace/
Stove**
Seurasaari
Open Air
Museum in
Helsinki,
Finland
Europe

7.0 Environmental Control & Energy Systems (cont.)

III. Content Summaries

7.4 Extent of intervention

7.5 Retrofitting existing systems

ENHANCE
or
REPLACE?



Original vertical terminal unit left in place & cloth ducts added close to ceiling for hot air distribution.

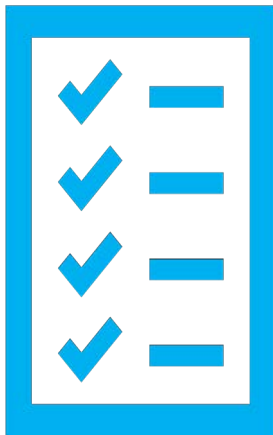


The Henry Ford, Dearboorn, Michigan, USA (Registered National Historic Building)

8.0 HVAC System Selection

III. Content Summaries

8.1 Introduction



Design criteria (temperatures, humidity levels)?

Add cooling equipment?

Retrofit old equipment?

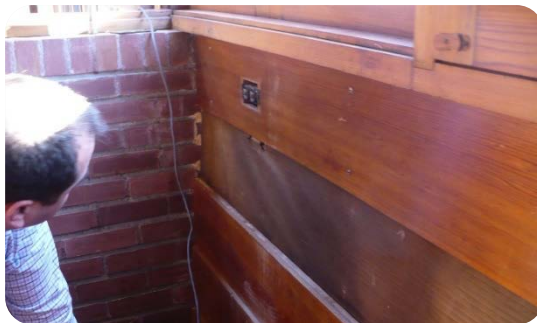
Type of systems?

Add duct work?

How can newer HVAC systems be accommodated?

Potential equipment noise? +++

8.2 Electrical considerations



Original wiring without grounding mounted within a routed groove in wood within the walls.

Frank Lloyd Wright's Affleck House, Bloomfield Hills, MI USA (Registered National Historic Building)

9.0 Lighting

9.1 General considerations in historic buildings

9.2 Site survey

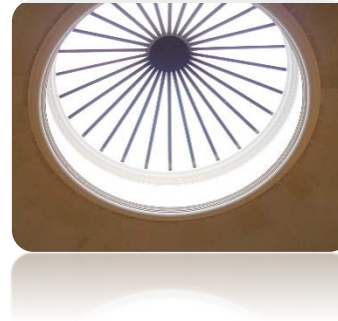
ORIGINAL LIGHT SOURCES & HISTORICAL RETROFITS

9.3 Design approach

PRESERVE/RESTORE
or **REPLICATE**
or **REHABILITATE**

9.4 Exterior lighting

III. Content Summaries



Sunlight provided by oculus in Thomas Jefferson's Rotunda, University of Virginia, Virginia, USA (UNESCO World Heritage Site & a Registered National Historic Building)



Exterior Lighting of Historic Building in Antalya, Turkey

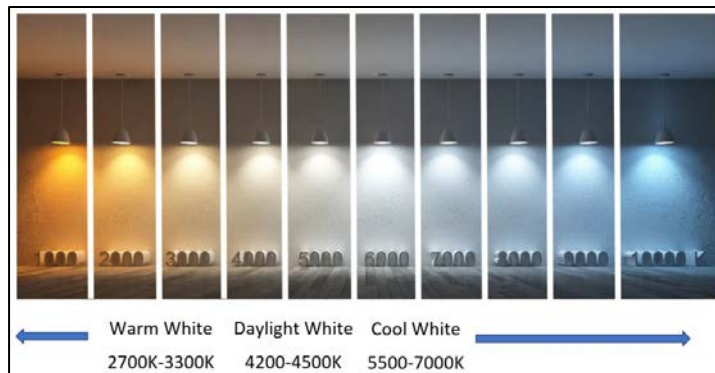
9.0 Lighting (cont.)

9.5 Light source selection

↑ EFFICACY = ↑ ENERGY SAVINGS

9.6 Color temperature & color rendering

Match 'new' lamp color rendering to historical lighting



III. Content Summaries

9.7 Dimming & lighting controls

ADVANCED LIGHTING CONTROLS = ↑ ENERGY SAVINGS

https://www.homeelectrical.com/sites/default/files/styles/original_image/public/images/product/blg/blg-colortemperature.jpg
accessed 09/21/19

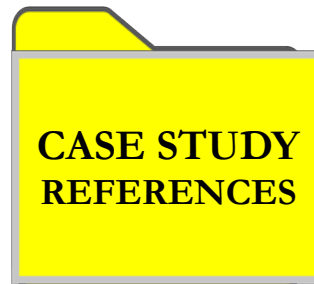
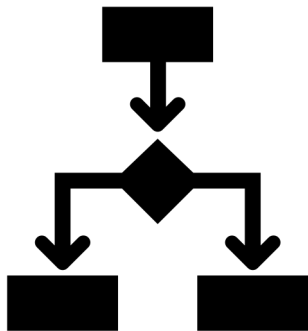
References & Appendices

III. Content Summaries

References



Appendices



ASHRAE Guideline 34-2019

Energy Guideline for Historic Buildings

IV. Concluding Remarks

- Issued Spring 2019
- Applicable worldwide
- Sensitive to balancing historic preservation with energy efficiency goals
- Useful to ALL players (architects, engineers, museum curators, & others) planning to preserve, reconstruct, rehabilitate or restore a historic building

www.ashrae.org/bookstore (Enter “Energy Guideline for Historic Buildings” in search box.)

Acknowledgments

ASHRAE, founded in 1894, is a global society advancing human well-being through sustainable technology for the built environment. The society and its members focus on building systems, energy efficiency, indoor air quality, refrigeration, and sustainability. Through research, Standards writing, publishing, certification and continuing education, ASHRAE shapes tomorrow's built environment today.

Presenter was an active and voting member of the committee which wrote Guideline 34-2019.

All photos were taken by the presenter.

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