

Preservation League of New York State

New York State Energy Conservation Code Compliance Training for Historic Properties

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Executive Summary

In August, 2012, EYP/Architecture & Engineering, Inc. completed a study to identify insulation strategies appropriate to historic buildings that adhere to the Secretary of the Interior's Standards for Rehabilitation, minimize the impact on the historic character of the subject buildings, and address the issue of condensation. This study was funded by the National Center for Preservation Technology and Training, New York State Energy Research and Development Authority (NYSERDA) and guided by a committee including architects, engineers, scientists, and code officials from NYSEDA, NYS Department of State, and NYS Department of Health.

Prior to the technical report, the Preservation League of New York State delivered 11 training programs on historic preservation and the Energy Conservation Construction Code of NYS – 2010. Our workshop program included both lecture presentations and field sessions that provide hands-on demonstrations and the opportunity for program participants to see implemented energy retrofits of varying degrees of success in historic buildings. Leading up to the training delivery, the Preservation League of New York State (the League) convened a steering committee comprised of architects, engineers, material scientists, NYS agency technical staff, and property stewards. Through a series of over fifteen interviews and with the help of the steering committee, the League developed the core curriculum for the Energy Conservation in Historic Buildings training sessions.

Over 333 participants in workshops held in every region of New York State learned about holistic approaches to energy conservation, the energy code and historic preservation, HVAC and energy conservation, window efficiency, insulation, sealants, and participated in field sessions.

Throughout the Preservation League's Energy Conservation in Historic Buildings workshop series, questions on appropriate insulation for historic buildings regularly outnumbered those on any other topic. Architects, preservation professionals, and historic property owners had particular concerns about the impact of insulation on condensation and the reversibility of certain types of insulation. Condensation becomes a greater consideration with an increase in R-value, which is a measure of the material's thermal resistance.

EYP used two buildings as subject properties for this report, the Cambridge Co-op in Cambridge (Washington County) and the Zadock Pratt Museum in Prattsville (Greene County). The Preservation League chose these buildings, both built in the 19th century, as representative of two historic building types common to New York State. The Cambridge Co-op is a three-story brick mixed-use Main Street building and the Zadock Pratt Museum is a two-story wood-frame residence.

The Energy Conservation Construction Code of New York State – 2010 sets a minimum R-value for insulation, as well as other building components. The insulation study looked at four levels of compliance with the energy code standard for insulation – 50%, 75%, 100%, and 125%. The EYP project team used WUFI Pro software to analyze the heat and moisture transport through the building assemblies. They ran this software through a typical one-year cycle for each building and each of the four insulation levels.

Introduction

The Preservation League developed and implemented a training program for building professionals who wished to rehabilitate/retrofit historic buildings in compliance with the New York State Energy Conservation Code – 2010. We developed the program, identified and recruited experienced instructors, and delivered the program in a series of 11 workshops. Ten of the programs had a similar curriculum and were delivered in different regions throughout New York State. We held our 11th workshop in Albany with a one-day format and focused on Insulation in Historic Buildings, which had arisen through over a year of training delivery as the issue with the most controversy and divergence of professional opinion.

Our technical report, begun at the conclusion of the initial workshop series, was informed by the principal question among energy conservation and preservation professionals. How should one insulate a historic building? What harm, if any, does varying levels of insulation cause both historic brick and wood-frame buildings? Our selected consultant, EYP Architecture and Engineering, used initial field investigations and modeling software to evaluate various degrees of insulation for condensation or moisture-related problems, potential energy savings, and how well the changes would respect the existing historic fabric.

Methods and Materials

The following describe the methods used to develop our training program, as well as the materials used for the technical report.

Leading up to the training delivery, the Preservation League of New York State (the League) convened a steering committee comprised of architects, engineers, material scientists, NYS agency technical staff, and property stewards. Through a series of over fifteen interviews and with the help of the steering committee, the League developed the core curriculum for the ten Energy Conservation in Historic Buildings training sessions.

Holistic Approach to Energy Conservation

Two different presenters gave the opening presentation on a holistic approach to energy conservation, depending on the workshop location. Walter Sedovic and his colleague, Jill Gotthelf, presented on the inherent energy savings features within historic buildings. Their presentation was very popular among the training session audiences, yet relatively light on technical detail. John Cluver of Voith and Mactavish Architects gave this opening presentation at three of our training sessions. Mr. Cluver's presentation was more technically focused and included more code-relevant information. Both lectures received positive reviews from program participants. The League would like to see more integration with the NYS Energy and Existing Building Codes as part of this lecture in future programs.

Historic Renovation and the Energy Conservation Construction Code of NYS – 2010

This lecture was given primarily by John Barrows, a builder who gives frequent training lectures on the NYS Energy Code. Because the NYS Energy Code exempts buildings on the New York State and National Registers of Historic Places, often there is an initial belief that historic buildings do not need to consider the NYS Energy Code. Given the high number of historic buildings not designated on either of these registers, training on the code is very important for extensive rehabilitation projects in undesignated or locally-designated historic buildings. The most popular component of this lecture was the question and answer session, when contractors and architects in the audience could engage with Mr. Barrows on specific questions, which often crossed over into situations encountered by other program attendees.

HVAC

Mechanical systems are an integral part of achieving energy efficiency and conservation in a historic building. This lecture was often augmented by the lively personality of the presenters, either Bob Kennedy or Peter Ottavio of EYP Architecture and Engineering.

Saving Windows with Energy Efficiency

The League had two different instructors for this presentation, Jack Alvarez in eastern New York and Steve Jordan in western New York. Both presenters engaged the audience with information on how to increase energy efficiency through existing wood window restoration and weatherization, as well as the appropriate use of storm and screen windows. This presentation included important information on the NYS Energy Code requirements for windows and details on maintaining existing wooden windows while bringing windows up to code.

Field Sessions – Tools of Analysis and Whole House Analysis

Seven of our training programs included field sessions. The League did not include field sessions in the three 2012 Energy Conservation in Historic Buildings programs, nor in the Insulation Strategies for Historic Buildings program. Evaluations for each of our 11 training programs reinforced the popularity of the field sessions. The League would incorporate field sessions in future training delivery programs. These sessions gave participants an opportunity to see the tools used to analyze a building's energy loss, as well as field demonstrations of those tools. Leaders of these sessions also called attention to building features incorporated in the original construction that increased the building's heat retention in winter and air flow in summer.

Insulation

The initial steering committee meetings and subsequent participant discussion during training sessions demonstrated that considerations relating to insulating historic buildings were among the top concerns for historic preservation professionals. These concerns remained a consistent thread through our ten standard Energy Conservation in Historic Buildings training deliveries across New York State. Whether to insulate, where to insulate, and with what material to insulate, sparked long conversations at every single training program run by the League. Because of this intense level of interest, as well as an understanding that even building scientists had unanswered questions relating to insulating historic buildings, the League focused on historic building insulation for both our final follow-up training session (Insulation Strategies for Historic Buildings, held April 17, 2012 in Albany) and for our Technical Report.

Sealants

Following the first workshop, the League developed a new presentation on sealants. Because air infiltration is a top cause of heat loss (or gain) in buildings, we felt a presentation detailing sealant material, application, and location was an important addition to our program. This lecture topic was one of our most challenging, not only in development, but also in finding speakers to deliver an engaging lecture without going beyond the technical level of the audience. We would like to further explore this topic and add new faculty in future programs.

The League also found that there was extensive information on sealants in new or 20th century construction, but not a lot written on sealant application in historic houses or smaller historic commercial buildings. Thorough sealant application in a historic building is extremely labor-intensive, which can lead to poor and/or spotty application. A question raised in our final Insulation Strategies for Historic Buildings, regarding how to seal the bottom of a house, at the sill plate, and with what materials, highlighted the need for additional guidance on the topic.

Develop and Deliver Curriculum Focusing on Residential and Commercial Historic Buildings

The Preservation League developed workshop curriculum, content and training material on energy code compliance for Residential and Commercial Historic Buildings. The trainings focused on opportunities to develop appropriate means to improve energy performance in compliance with the principles of the New York State Energy Conservation Construction Code – 2010 (the Code). The courses covered the following:

- 1) Overview of the Code and applicability to historic buildings.
- 2) Inherent energy saving characteristics of historic buildings.
- 3) Technical obstacles to energy efficiency and code compliance.
- 4) Above-code and alternate methods for maximizing energy efficiency.
- 5) Quantification of energy savings.

Develop Training Delivery Plan

The training delivery plan included the following:

- 1) Locations and dates for the trainings, including the facilities where trainings were held at each location.

- 2) Marketing strategy, which included:
 - a) Direct contact with membership and affiliates of the Preservation League
 - b) Direct email to membership of the Preservation League and of various professional organizations such as the American Institute of Architects (AIA), Association for Preservation Technology Northeast Chapter, and others.
 - c) Internet advertising through search engines such as Google.
 - d) Announcements on the websites of related professional organizations.
 - e) Registration for continuing education credits (“CEC”) for architects through the AIA and other professional organizations.
- 3) Proposed registration fee structure. The Preservation League charged a nominal fee to course participants to offset costs for room, food, and material charges.
- 4) The Preservation League was responsible for course registration and documentation of attendance.
 - a) This included all marketing.

Training Delivery

The Preservation League organized, marketed and delivered the trainings, including all logistics, room rentals, food and beverage, course materials, evaluation, award of CEC, and recordkeeping.

The trainings included five two-day training sessions, five one-day training sessions, and one single-day follow-up training session. The Preservation League maintained the list of attendees, accreditations received, and the results of attendee satisfaction surveys.

Technical Report

The Preservation League established the basis for installation and moisture monitoring to inform insulation decisions and for possible use as a future demonstration project. The establishment of insulation recommendations based on computer analysis shall inform decision-making regarding insulation. The consultant built upon the computer-generated data on potential condensation locations to pinpoint the most important monitoring locations for future research and produced a final narrative to synthesize the work and provide future research recommendations.

Results and Discussion

Workshop Series

Number of Workshops: 11 programs in 11 counties

Attendance: 333 plus speakers and staff

Average Rating: 4.64

SCHENECTADY – May 16-17, 2011

Attendance: 25 plus speakers and staff

Average Rating: 4.42

We held our initial training on May 16-17 at the Schenectady County Community College, followed by a field session at the Schenectady County Historical Society. Our list of attendees included architects, contractors, NYS employees, and facilities managers. This initial program received excellent reviews from our attendees, who rated all of the lectures at or above average.

SYRACUSE – June 16-17, 2011

Attendance: 24 plus speakers and staff

Average Rating: 4.74

We held our second CODE GREEN: Making Older Buildings Energy Efficient program on June 16-17 in Syracuse. Onondaga Community College was the site of our 1.5 days of lectures. The George & Rebecca Barnes Foundation hosted our field session in their circa 1853 historic mansion. We researched and developed another lecture from scratch for this and future workshops – “Sealants: An Insider’s Guide.”

BUFFALO – July 14-15, 2011

Attendance: 41 plus speakers and staff

Average Rating: 4.67

We held our third CODE GREEN: Making Older Buildings Energy Efficient program on July 14-15 in Buffalo. The Theodore Roosevelt Inaugural National Historic Site was the site of our 1.5 days of lectures. Currently owned by Child and Family Services, the circa 1888 Tudor Revival, Richmond Lockwood Mansion was the location for our field session on the second day. A historian who attended the workshop said that he “picked up a lot of good information, as well

as some interesting ideas to present to the Historical Society board.” He went on to say that he felt the workshop reinvigorated some architectural colleagues to think twice when it came to preservation. We had strong presentations from both returning and new speakers. Returning from previous workshops were John Barrows, Jill Gotthelf, Steve Jordan, Walter Sedovic, and Mark Thaler. New additions included Kyle Normandin of WJE and Peter Ottavio of EYP presenting on Sealants and HVAC, respectively.

FARMINGDALE – August 4-5, 2011

Attendance: 27 plus speakers and staff

Average Rating: 4.83

We held our fourth Energy Conservation in Historic Buildings program on August 4-5 in Farmingdale. The Sustainability Institute at Molloy College was the site of our 1.5 days of lectures. The field session was held in two locations on Long Island. First participants toured and analyzed a National Register property at Sisters of St. Dominic’s Rosary Hall in Amityville, a 1870s brick Gothic Revival motherhouse complex. The second location was at the pre-Revolutionary War, Georgian-style home of Josiah Martin, currently called Rock Hall Museum in Lawrence. At this site, we discussed the possibility of the use of historic passive systems and radiant heating. A member of a local town historic preservation commission noted that knowledge he gained from attendance at the workshop has already started to be applied on his commission. We had strong presentations from both returning and new speakers. Workshop lecturers included: Jack Alvarez, John Barrows, John Cluver, Bob Kennedy, Kyle Normandin and Mark Thaler.

ELMIRA – August 18-19, 2011

Attendance: 30 plus speakers and staff

Average Rating: 4.56

We held our fifth Energy Conservation in Historic Buildings program on August 18-19 in Elmira. The Corning Community College Academic and Workforce Development Center hosted 1.5 days of lectures. Participants of the workshop got to experience a very unique field session when they toured through the vacant Gerard Building, currently owned by the Chemung County Historical Museum. Without much funding to pursue an extensive rehabilitation, workshop presenters spoke about approaches to take with the Gerard building to reusing initial energy conscious ideas already built into the structure’s design as well as other cost effective approaches to reducing energy expenditure. This workshop had great community support with

nine co-sponsors helping to promote the program (AIA Southern New York, Chemung County Historical Society, City of Elmira, Corning Community College, Historic Elmira, Historic Ithaca, Landmark Society of Western NY, Market Street Restoration Agency, and Southern Tier Economic Growth). Presenters included: John Barrows, Jill Gotthelf, Elise Johnson-Schmidt, Steve Jordan, Kyle Normandin, Peter Ottavio, Walter Sedovic and Mark Thaler.

HYDE PARK – September 30, 2011

Attendance: 36 plus speakers and staff

Average Rating: 4.57

We held our sixth Energy Conservation in Historic Buildings program on September 30 in Hyde Park. With ample space for presentations and wonderful proximity to significant historic structures, the Henry A. Wallace Visitor and Education Center at the FDR Presidential Library and Museum was a great setting for this one day workshop. Although turning the workshop from a two-day program into only one day reduced the time spent in the field, many enjoyed the analysis and tour through FDR's home at Springwood. Presenters from EYP Architecture and Engineering spoke about their plans for mechanical system interventions on the site. Thirty-eight building professionals participated in this program. Presenters included: Jack Alvarez, John Barrows, Jill Gotthelf, Marilyn Kaplan, Peter Ottavio, Walter Sedovic and Mark Thaler.

PLATTSBURGH – October 14, 2011

Attendance: 14 plus speakers and staff

Average Rating: 4.68

We held our seventh "Energy Conservation in Historic Buildings" program on October 14 in Plattsburgh. The Clinton County Historical Association hosted our event at their museum. The Four Chimneys building at the former Plattsburgh Air Force Base provided an intimate setting for this final workshop. Thirteen building professionals from the North Country and students from the University of Vermont participated in this program. Presenters included: Jack Alvarez, John Barrows, Bob Kennedy, Toby Nadel, Mark Thaler and Erin Tobin.

COLD SPRING HARBOR – March 19, 2012

Attendance: 16 plus speakers and staff

The Society for the Preservation of Long Island Antiquities hosted our March 19th program at their Cold Spring Harbor headquarters. Over 15 people attended this workshop, including architects, historic building managers, a SPLIA board member, and three regional staff from

NYS OPRHP's Long Island office. The sessions presented at this one-day workshop mirrored those from Farmingdale's two-day program in August, 2011, without the sealant lecture or field session. Presenters included John Cluver, John Barrows, Mark Thaler, Bob Kennedy, and Jack Alvarez.

NEW YORK CITY – March 20, 2012

Attendance: 21 plus speakers and staff

Our program on March 20th was held at the General Society of Mechanics and Tradesmen. Over 20 architects, preservation consultants, and NYS OPRHP staff attended this program, which focused on the Energy Conservation Construction Code of NYS – 2010 and its relevance to the NYC Energy Code. Attendee discussion and questions centered on issues regarding locally-designated buildings and compliance with the New York City Energy Conservation Code.

Speakers at this program included Marilyn Kaplan (NYSERDA), John Lee (NYS Department of Buildings), Richard Leigh (Urban Green Council), and Cory Herrala (NYC Landmarks Preservation Commission). Marilyn Kaplan explained and analyzed the provisions of the revised Energy Conservation Construction Code of NYS – 2010, including information on that code's intersection with the New York State Existing Building Code. John Lee, NYC Department of Buildings (DOB), explained how the city interprets the energy codes and what DOB examiners look to see in plans for new projects. He also explained the process of obtaining exemptions and exceptions based on National Register listing. Richard Leigh, Director of Research at Urban Green Council, spoke about the science behind energy conservation and spoke about controversial amendments to the NYC Zoning Resolution, such as the Zone Green initiative, currently pending adoption by the City. Most preservationists oppose some of the provisions of the proposed amendments as they appear to encourage the defacement of older buildings. Cory Herrala, from the NYC Landmarks Preservation Commission, spoke about the Commission's policies regarding such things as energy efficient windows, solar panels, and the "super insulation" of brownstones. He explained what type of project could be approved at the staff level and those that require a public hearing.

ROCHESTER – April 11, 2012

Attendance: 30 plus speakers and staff

Average rating: 4.29

The Preservation League held the final workshop in our standard “Energy Conservation in Historic Buildings” series in Rochester, co-sponsored by the Landmark Society of Western New York and the Genesee Finger Lakes Regional Planning Council. Thirty people from five NYS counties and Maryland attended the program, with especially strong participation from one of the sponsoring groups, the Landmark Society of Western New York. As a result, Landmark’s technical staff (which serves nine counties) will be better equipped to advise their constituents on the proper ways to insulate attics, repair wood windows and other energy conservation issues. The practical advice and display of window parts and materials from Rochester-based speaker Steve Jordan was especially well received. Speakers included Walter Sedovic and Jill Gotthelf, Vincent Calvosa, Toby Nadal, Mark Thaler, Peter Ottavio, and Steve Jordan.

Single Day Workshop

ALBANY – April 17, 2012

Attendance: 70 plus speakers and staff

Average rating: 4.29

The College of Nanoscale Science Engineering and Technology at the University at Albany hosted our one-day follow-up training session titled, Insulation Strategies for Historic Buildings. The Preservation League developed this program in response to the issue of greatest concern and conversation throughout our prior ten training sessions – insulating historic buildings. This program was our best attended workshop, with a strong showing from the Capital Region, yet over half of the attendees came from outside the region, including Rochester, Buffalo, Syracuse, and Long Island.

The Preservation League created a new curriculum for this program, focusing on the energy code requirements for insulation, factors in determining which insulation is appropriate for a historic building, lessons learned on what not to do when insulating an existing building, and estimating the effect of insulation on indoor temperature and humidity. Speakers included Marilyn Kaplan (NYSERDA), Joseph Hill (NYS Department of State), Mark Thaler (Mark Thaler, Architect), John Rahill (Black River Design), and Todd Crawford (NYS Department of Health). A common thread through all of the presentations was that insulating an existing building falls towards the bottom of the energy conservation priority list. As part of that discussion, the presenters underscored the importance of air sealing. Several presenters noted the inherent hygroscopic properties of plaster, as an interior wall surface, and that insulating plaster walls could lead to building damage with limited energy conservation payback. Presenters and some

audience members also noted the irreversibility and unknown durability of some popular insulation materials currently on the market. This led to a vigorous discussion about best practices for insulating historic buildings and what building owners and stewards should do in order to lower their energy bills and save fuel consumption.

Technical Report

In August, 2012, EYP/Architecture & Engineering, Inc. completed a study to identify insulation strategies appropriate to historic buildings that adhere to the Secretary of the Interior's Standards for Rehabilitation, minimize the impact on the historic character of the subject buildings, and address the issue of condensation. This study was funded by the National Center for Preservation Technology and Training, as well as the New York State Energy Research and Development Authority (NYSERDA). A committee including architects, engineers, scientists, and code officials from NYSEDA, NYS Department of State, and NYS Department of Health guided the project and provided peer review.

Throughout the Preservation League's Energy Conservation in Historic Buildings workshop series, questions on appropriate insulation for historic buildings regularly outnumbered those on any other topic. Architects, preservation professionals, and historic property owners had particular concerns about the impact of insulation on condensation and the reversibility of certain types of insulation. Condensation becomes a greater consideration with an increase in R-value, which is a measure of the material's thermal resistance.

EYP used two buildings as subject properties for this report, the Cambridge Co-op in Cambridge (Washington County) and the Zadock Pratt Museum in Prattsville (Greene County). The Preservation League chose these buildings, both built in the 19th century, as representative of two historic building types common to New York State. The Cambridge Co-op is a three-story brick mixed-use Main Street building and the Zadock Pratt Museum is a two-story wood-frame residence.

The Energy Conservation Construction Code of New York State – 2010 sets a minimum R-value for insulation, as well as other building components. The insulation study looked at four levels of compliance with the energy code standard for insulation – 50%, 75%, 100%, and 125%. The EYP project team used WUFI Pro software to analyze the heat and moisture

transport through the building assemblies. They ran this software through a typical one-year cycle for each building and each of the four insulation levels.

For the Zadock Pratt Museum, the project team found that an insulated wall with a vapor retardant paint on the interior did not lead to moisture accumulation within the wall and lengthened the drying cycle of the wall. Without the vapor retarder, however, the wall had excess moisture accumulation on the interior face of the clapboards.

At the Cambridge Co-op, the WUFI analysis demonstrated excess moisture within the masonry, yet the lack of insulation warmed the masonry and reduced the potential for damage due to freeze/thaw cycles. Adding insulation did not reduce the moisture accumulation, but did make the masonry colder. Again, the insulation without a vapor retarder led to moisture accumulation within the plaster wall, as well as on the face of the plaster. This accumulation was reduced with the addition of a vapor retarder.

Because this report focused solely on insulation levels and condensation potential, the project team did not consider important energy saving measures, such as air infiltration reduction.

Conclusions

The Energy Conservation in Historic Buildings workshop series, technical report, and website presence contributed to the discussion on whether historic buildings could be made energy efficient and comply with the NYS Energy Conservation Construction Code – 2010. The workshop series training almost 350 building professionals and established a curriculum for continued and future use. Indeed, the Preservation League was able to continue the training program through 2012 with additional funding from the NYS Energy Research and Development Authority. The website presence of the workshop curriculum and technical report established the Preservation League as a resource for historic property owners, developers, and building professionals.

As League staff learned more about energy modeling and computer programs that help determine energy conservation protocol and moisture retention in buildings, it appeared that properties of historic building materials were not readily available in commonly used software such as WUFI. Historic building materials such as old-growth wood, historic brick, lime-based plaster, slate, and even historic “wavy” glass have different properties than new or replacement materials manufactured today. These property differences could mean different heat transmission properties. For example, gypsum board and a plaster wall set on wood lath have significant differences when analyzing heat and moisture transmission in a wall.

Unfortunately, funding limitations meant that the Preservation League could not sponsor an insulation demonstration project with year-long monitoring. This would be an important follow-up to the WUFI modeling completed by EYP Architecture and Engineering. Questions regarding insulation impacts on historic buildings persist as property owners and architects seek to make their buildings as energy efficient as possible while taking advantage of preservation incentives that necessitate adherence to the Secretary of the Interior’s Standards for Historic Buildings and often located in local historic districts subject to municipal preservation ordinances.

The technical report noted that adding insulation to a building envelope has the potential to dramatically shift the thermal profile of the assembly. When evaluating energy conservation measures in an older or historic building, it is critical to understand the dynamics of the envelope. Typically, an older structure is already compromised to some degree and has

undergone significant changes over its lifespan so that it has either reached the state of equilibrium that allows its survival, or it is in need of immediate attention. When considering the introduction of thermal insulation, it is important to analyze plans for the overall rehabilitation or restoration process within the context of these issues.

Since publication of the technical report, architects have used it and other course materials as a resource in planning their Federal Rehabilitation Tax Credit projects where they wish to achieve maximum energy efficiency.

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Mark Thaler, Bob Kennedy, and Steven Reilly of EYP Architecture and Engineering authored the report, "Investigations for Insulation Strategies."

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