

Vermont Energy Efficiency Guidance: Contractor's Guide to Working on Historic Buildings

Introduction:

Historic buildings should be seen as records of the past. What is original, what has been altered, what was removed, every change to a historic building helps tell the story of the building and the people that called it home.

The often-quoted architect, Carl Elefante once said “The greenest building is the one that is already built.” This is based on the belief that historic buildings were constructed with inherently green or renewable materials. Preserving buildings will limit the amount of waste sent to landfills and will reduce the amount of energy needed for deconstruction and new construction. Together, trades people, building owners, and preservationists can work to reduce our energy usage, increase comfort, and preserve what makes our communities special, ensuring that these buildings will last another 100 years.



Embodied Energy is the amount of energy consumed in the process of making building products. This includes the harvesting, manufacturing, transport, and installation. Measured in Megajoules per Kilogram, the more processed a material is, the higher amount of energy needed to produce it. For example; plywood is 10.4 MJ/kg, cement is 5.6 MJ/kg, PVC is 80 MJ/kg, and hardwood is 2 MJ/kg. This energy usage can be converted to BTUs to show the energy equivalent, such as one gallon of gasoline is equivalent to the average production, transportation, and installation of eight bricks.

Except for a few significant buildings, most residences and buildings should be updated and operated to provide comfort, usability, and aesthetic appeal to the building owner. It is our collective job to ensure that those changes do not cause unintentional or undue harm or irreparable damage to the building or the occupants. While all efforts could be done in good faith, something as simple as blocking a gable vent could lead to serious rot and mold issues within a residence.

When working on historic or older buildings we should think about how the proposed work will impact the building – both in the short and long term. Some questions to ask are:

- What is the story of this building and what are the significant features?
- Are there any restrictions on working with this building?

- How will the proposed work impact the building?
- Are there alternative materials or methods I could be using?
- Do your employees or subcontractors understand the historic significance of the building and the plan to protect them?

When considering what character defining features or materials are past their useful life, we need to go through a rehabilitation order: repair before replace, replace in kind, replace with compatible materials, remove only if required. If there is a question, contact the Division for Historic Preservation.

Buildings That Tell a Story:

Every building has a story to tell. The materials used, the architectural style, the location, the alterations, all contribute to the building's history. We want to make sure that the proposed project does not alter or diminish this story—while also allowing for change and upgrades. The best way to reduce our impact on the building is to recognize what features make the building significant or help tell the story. This work should begin with a little research.

- When was the building built?
 - The town clerk or historical society can help answer these questions if the owner does not know. This information will tell us how the building was built and the methods and materials used during construction.
- What is the architectural style?
 - Each style has **characteristic features** that help place the building within a certain time and trend. These are the features that we do not want to alter.
 - Online overview of the more popular American architectural styles: <https://www.thisoldhouse.com/21018307/american-house-styles>
 - <https://www.historicnewengland.org/preservation/for-homeowners-communities/your-old-or-historic-home/architectural-style-guide/>
 - The book for identifying historic buildings: A Field Guide to American Houses by Virginia Savage McAlester (Knopf, 2015)
 - The Vermont Division for Historic Preservation can help you identify if your building is historic: <https://acd.vermont.gov/historic-preservation/identifying-resources>
 - The Preservation Trust of Vermont is a non-profit that helps building owners and communities preserve their buildings: <https://ptvermont.org>

- **Materials and integrity.** The materials used in the building are integral to telling the building's history. Learning about the materials and which may be original or later additions and how they have lasted over time will be key when choosing a repair treatment, replacement in kind, or complementary materials.
- **The building tells a story.** Simply because some materials may not be original,



does not mean that they are not important. Changes over time are part of the building's story and often are worth preserving.

- **False Narrative**

- In conducting research, photographs and written descriptions can be an excellent way to collect evidence on how buildings looked previously. It is important to not guess how historic buildings looked or make assumptions.
- Never add features or materials that look historic without evidence that they were used in the building. Adding brackets

to a soffit that never had brackets is an example of something that is not appropriate. The National Park Service has more information on this:

<https://www.nps.gov/tps/standards/applying-rehabilitation/its-bulletins/ITS56-Alterations-NoHistorical.pdf>

- Do not intentionally distress or weather materials to make them look old or antique. New materials should be appropriate but should not be confused for originals.

Building Codes or Restrictions:

Some older buildings are located in design review districts or have other protective restrictions on alterations or changes. Other state or municipal restrictions, such as energy codes, can apply when working on older buildings. Understanding what codes apply and how they can alter your project is important.

ACT 250 is Vermont's land use and development law. Projects that trigger Act 250 review must be assessed for their potential impact to cultural resources. For more information, visit the [Natural Resource Board Website](#)

- **Design Review or Protective Restrictions**

- Contacting the town clerk, zoning department, or regional planner should be the first step in determining what codes or rules apply to the building.
- Design review ordinances are commonly instituted to protect the historic character of neighborhoods. Some municipalities have guides to making changes to a building within the design review district.



- **Energy and Life Safety Codes**

- Many older buildings were built before energy or building codes and many codes were written without historic buildings in mind.

- Understanding what work can trigger code enforcement is important when developing a **scope of work**. Making even small repairs can sometimes spark into much larger projects because the disturbed area had to be brought up to code.

- Contact all pertinent code enforcement agencies *before* work begins and have a conversation about your proposed project.

- Fire Safety and Historic Buildings:

- <https://firesafety.vermont.gov/buildingcode/code/historic>

- VT Fire Safety Dept.: <https://firesafety.vermont.gov>

- VT Energy Code:

- https://publicservice.vermont.gov/energy_efficiency/rbes

- Burlington Zoning Office:

- <https://www.burlingtonvt.gov/DPI/Zoning-Permits>

If the implementation of Vermont's Energy Code could threaten, degrade, or destroy the historic form, fabric, or function of the building, there is an [exemption form](#) that can be signed by the Vermont Division for Historic Preservation.

Making your Project Work:

It is time to plan your project. You understand the **significant features** of the building and you have mapped out the specific areas you are working. Now it is a matter of making the *new* work with the *old*. It is important to remember that preservation is not about stopping change but ensuring a balance of old and new. The following approaches will help you find this balance when developing your plan:

- **Complement the old with the new.**

- New work should not overshadow, hide, or distract from the existing significant features.
- Think about the scale, size, and qualities of new materials or proposed work in relation to the existing.
- Take every step possible to reduce your impact on the historic features. Only remove materials that are past their functional lifespan or are direct impediments to needed alterations. Always document what is removed.
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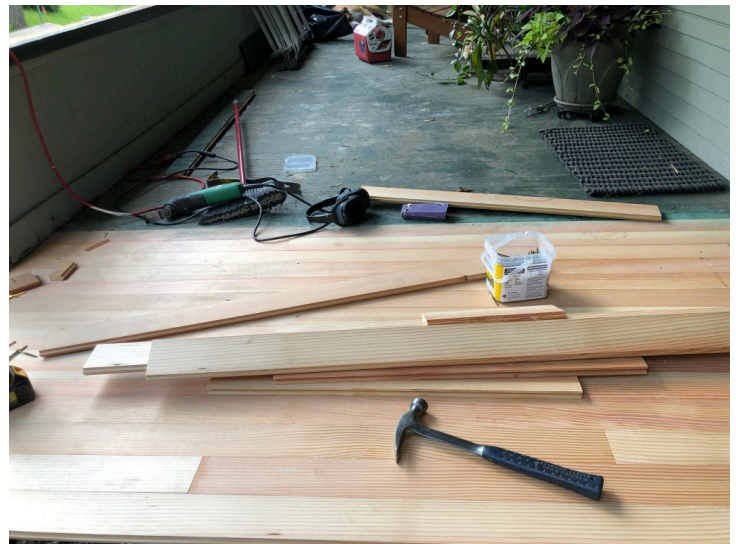


- **Building as a system.**
 - Different building systems from different time periods means different approaches. What may have worked on a masonry building will not work on a wood framed building, and the same goes for timber and balloon framed buildings. This is why investigation is key before developing a strategy.
 - Vents, weep holes, drains, or air pockets could all be integral features of how buildings breath or dry. You have to understand how these features work before altering.
 - While you may only be working in one specific area, remember that buildings work as a system. Your planning should consider how your work will affect the building as a whole. Some things to consider are:
 - **Air circulation and allowing the building to dry.** Are you restricting air movement in the wall cavities? The lack of air movement and trapped humidity can lead to **Sick House Syndrome**.
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2796751/>
 - **Structural and load capacity.** Are you removing structural materials or adding weight to certain framing members? Consider the intended use of materials and their integrity before making alterations.
 - **Drainage and weathering.** If you are diverting water, changing landscaping, or altering roof lines, think about where the water will go. Moisture is the biggest threat to historic buildings.
- **Protecting the building**
 - What steps are you taking to protect the significant features? Temporarily covering finished materials is a great way to ensure their protection.
 - **Fire safety** should be a major concern when working on older buildings. The dried wood, accumulated debris, and flammable insulation should be seriously considered.

- GSA Recommendations for fire safety during retrofitting historic buildings:
https://www.gsa.gov/cdnstatic/Fire_Safety_Retrofitting_in_Historic_Buildings.pdf
- **Working as a team**
 - Just because you understand the important features of the building does not mean that your sub-contractors or employees do. Be sure to explain the building's history and which features are important. Everyone has to take part in preserving the building.

Thinking About Materials

Buildings are a collection of materials. When too many of those materials are deteriorated, removed, or altered the historic integrity of the building is diminished and ultimately lost. We have to consider the existing materials and how new materials, or finishes will affect them and the building as a whole. We do not want to prematurely shorten the useful lifespan of materials, respect the materials and ensure that they can continue to be part of the building's history.



When working with historic building materials, think about the skill, time, and effort that went into producing them. Many of these materials were harvested locally, transported using teams of animals, and installed using nothing but brute strength, and preserved over generations. Just think of the craftsmanship that went into something as simple as a windows sash. An appreciation for the skill and labor of those that built and cared for these buildings is necessary. One day of using a crosscut saw or a hand drill should be enough to educate anyone.

- **Reversibility.** What might seem like a great solution now might be considered unsafe or inappropriate later; think of asbestos, lead-based paints, or VOCs. Other materials may be perfectly safe but permanently damage or adhere to historic materials, such as spray foam

insulation, epoxies, or applied finishes. New products should always be tested before applying them broadly.

- Make sure the building owners understands the potential effects and limitations of the products you are using. They are the ones that will have to live with and maintain the work that you are doing.
 - When repairing significant features, it can be appropriate to use non-reservable methods, such as epoxies.
- **Cleaning.** When cleaning or restoring materials, always start with the **gentlest means possible** and go from there. Always begin with a test patch on a discreet area of the material. National Park Service- Preservation Brief 6: The Dangers of Abrasive Cleaning to Historic Buildings. <https://www.nps.gov/tps/how-to-preserve/briefs/6-dangers-abrasive-cleaning.htm>
- **Replace in kind.** We want to use appropriate materials when replacing historic resources. Using the same or similar wood specie, replacing plaster with plaster, or matching historic mortar, will ensure that restoration efforts are fitting and maintain the integrity of the building.
 - Supportive resources when dealing with restoration or replacement materials:
 - National Park Service- Preservation Brief 16: The Use of Substitute Materials on Historic Building Exteriors. <https://www.nps.gov/tps/how-to-preserve/briefs/16-substitute-materials.htm>
 - Burlington's guide to replacing materials- https://www.burlingtonvt.gov/sites/default/files/ReplacementHXMaterials_Guidelines.Final_.0.pdf
 - National Park Service Preservation Brief on exterior replacement of materials- <https://www.nps.gov/tps/how-to-preserve/briefs/16-substitute-materials.htm>