Chapter 4

Guidelines for Accessibility, Systems, and Sustainability

Chapter Overview

This chapter provides design guidelines for a variety of modern needs that can pose challenges for owners of historic properties: accessibility (ADA compliance); updated mechanical and utility equipment; security systems; and environmental sustainability (like energy efficiency, water conservation, and green energy technology). It also provides guidelines for the treatment of structural systems in historic buildings, including seismic upgrades.

Use This Chapter If...

- You own a historic building that needs to be upgraded to meet accessibility requirements.
- You are undertaking mechanical improvements, utility upgrades, or security upgrades that may be visible at the exterior of your historic building.
- You are interested in enhancing your historic building's energy efficiency or are pursuing other improvements related to environmental sustainability.

What's Inside...

Accessibility

Guidelines for Accessibility

In 1990, the Americans with Disabilities Act (ADA) was passed, mandating that all public buildings be accessible to everyone, including those with disabilities. The ADA applies to historic buildings that are used for commercial, multi-family, rental, and public purposes. However, the law also allows for alternative measures to be considered when the integrity of a historic building may be threatened by standard accessibility upgrades. Redlands' owners of public historic properties should comply with accessibility requirements while still preserving the character and integrity of their historic buildings. As these Historic Design Guidelines are intended to direct the exterior treatment of historic buildings, treatment options related to making interior historic spaces accessible are not provided.

For more information regarding the ADA and historic buildings, refer to the 2016 California Historical Building Code, California Code of Regulation, Title 24, Part 8.

The accessibility ramp at the side of this building is painted and retains a simple design that is compatible with the historic building.

Site and Entrances

- Provide barrier-free access that promotes independence for those with disabilities, while preserving the significant historic features of the building and its site.
- Install accessibility ramps, railings, and lifts in such a way that their impact on the historic building is minimized. Accessibility features should be reversible so that if removed in the future, the integrity of the historic building should not be compromised.
- Integrate ramps, railings, and lifts with the building's architecture and historic setting. Use materials that are compatible with the original building materials and design. Avoid the use of pre-manufactured metal ramps or wheelchair lifts at the primary façade of the building.
- Retain historic doors when possible. Retrofit historic doors for accessibility by adding lever-handle devices to existing hardware and/or installing power assisted door openers.
- If the primary entrance to the building is too narrow for accessibility requirements, establish an entrance doorway that meets requirements at a secondary façade. The doorway should be no further than 200 feet from the primary entrance, per the State Historical Building Code.

RELEVANT SOURCES

NPS Preservation Brief 32: Making Historic Properties Accessible

Mechanical, Utility, & Security Equipment

Guidelines for Systems

New technologies in building operations and contemporary security requirements have introduced various types of equipment into (and onto) historic buildings where they were not present historically. The physical and visual impacts of such equipment should be minimized in order to preserve the character and integrity of Redlands' historic resources.

Mechanical Equipment

- Install mechanical equipment in areas and spaces that require the least amount of alteration to the historic features and fabric of the building. Avoid cutting holes in important architectural features, such as cornices, decorative ceilings, and wall paneling.
- Locate heating, ventilating, and air conditioning (HVAC) equipment, such as air handling units and heat pumps, at the rear roof or yard of the building to minimize its visibility from the public right-of-way. Avoid installing mechanical equipment at the primary façade of the building.
- If visibility from the public right-of-way is unavoidable, incorporate equipment with matte finishes and colors compatible with the historic building fabric.
- Place ground-mounted equipment in inconspicuous locations and consider installing a modest screen around the equipment.
- When feasible, install ductless air conditioning units or mini-duct systems so that ducts are not visible from the exterior.

For more information regarding mechanical, electrical, and plumbing requirements in historic buildings, refer to the 2016 California Historical Building Code, California Code of Regulation, Title 24, Part 8.

This mechanical equipment is located below the parapet of the building so that it is not visible from the public right-of-way.

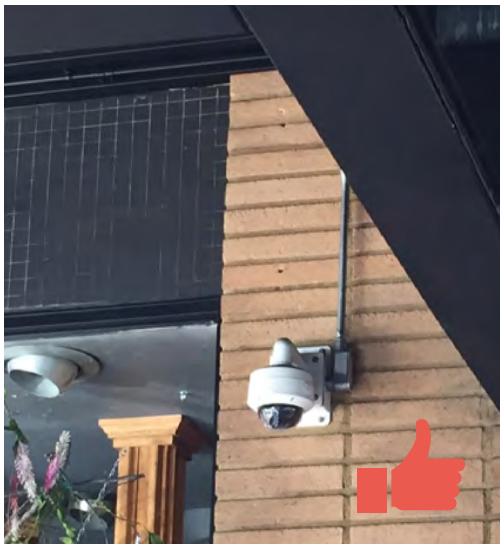
Utilities

- Install utilities in areas and spaces that require the least amount of alteration to the historic features and fabric of the building. Avoid cutting holes in solid walls to install conduit.
- When possible, group utility lines into one conduit to reduce the visual impact on the historic building.
- Do not use exposed conduit on the exterior of the historic building. If unavoidable, paint conduit to match the building's exterior.
- Antennas and satellite dishes should be located in places that are not readily visible from the public right-of-way (i.e. on the roof at the rear of the building).
- When possible, install automated teller machines (ATMs) on the interior of the building to avoid adverse impacts to the exterior. Avoid locating ATMs at the primary façade of the building.

Avoid installing utility features, such as this antenna, at the front of a building.

Mechanical, Utility, & Security Equipment

Guidelines for Systems



An example of a security camera installed at the upper storefront in an inconspicuous area, behind an awning.

Avoid the use of security bars and doors that obscure historic fenestration.

Security Equipment

- Install security equipment in such a way that it requires the least amount of alteration to the historic features and fabric of the building. The installation of security devices should be reversible so that if removed in the future, the integrity of historic materials would not be compromised.
- Security devices, such as cameras and lighting, should be small and located in inconspicuous areas (i.e. inside eaves or awnings) so that they do not detract from the historic character of the building.
- Security devices should not obscure significant architectural details or features.
- On commercial storefronts, use operable and transparent security screens, when necessary. Avoid using solid metal roll-up doors that hide historic storefronts when closed.
- Avoid the use of security bars and doors that obscure historic fenestration, particularly at the primary façade and those most visible from the public right-of-way. Security bars and doors may be acceptable for use on fenestration not visible from the public right-of-way (i.e. on the rear façade).

RELEVANT SOURCES

NPS Preservation Brief 24: Heating, Ventilating, and Cooling Historic Buildings -- Problems and Recommended Approaches

Energy Conservation and Environmental Sustainability

Guidelines for the Treatment of Inherently Sustainable Historic Building Components

In 2017, the City of Redlands adopted a Climate Action Plan (CAP) to demonstrate its commitment to reducing greenhouse gas (GHG) emissions and complying with the State of California's GHG emission reduction standards. The Redlands CAP sets forth the following goals related to energy reduction in existing buildings to more aggressively target GHG emissions:

- Encourage residential energy efficiency retrofits with the goal of a 50 percent energy reduction in 30 percent of the total homes citywide by 2035.
- Encourage commercial and industrial energy efficiency retrofits with the goal of a 25 percent energy reduction in 30 percent of the commercial and industrial square footage citywide by 2035.

Because older buildings are often less efficient than their newer counterparts, Redlands' substantial historic building stock presents a significant opportunity for reducing the city's GHG emissions. In order to preserve the character of Redlands' historic buildings, energy conservation measures should focus on retaining inherently sustainable, energy-saving historic features and implementing energy efficiency improvements that have minimal impact on historic integrity.

Prior to pursuing any energy efficiency upgrades in a historic building, the following treatment guidelines should be considered in order to optimize the energy-saving potential of the historic building's existing components and features.

Preserve

- Preserve the character and integrity of the historic building and its components during energy efficiency upgrades.
- Preserve inherent energy-saving features of the historic building. Energy-saving features include shutters, awnings, porches, skylights, vents, operable windows, and transoms, which together help to provide natural climate control.

Maintain

- Maintain the building's energy-saving features in operable condition. Regular, ongoing maintenance helps to preserve historic fabric and maximize operation efficiency.
- During regular maintenance, prioritize the use of sustainable products, such as non-toxic cleaning products that are compatible with historic finishes, and low volatile organic compound (VOC) paints when repainting.

In addition to preserving their historic character, the reuse and sensitive upgrading of historic buildings reduce the amount of energy needed to produce new building materials by preserving the energy already contained in existing buildings. The sum of all the energy consumed in the process of producing building materials is known as embodied energy.

Energy Conservation and Environmental Sustainability

Guidelines for the Treatment of Inherently Sustainable Historic Building Components

Repair rather than replace building materials to reduce the amount of waste being sent to the landfill.

Retrofitting original windows with historically compatible, low-e glass is a way to achieve greater energy efficiency. (Photo, City of Phoenix Planning and Development Department, Historic Preservation Office, 2018.)

Repair

- Repair, rather than replace, deteriorated building materials and components, in order to reduce the amount of waste being sent to the landfill and the need to produce new materials.

Refer to Ch. 3 - Guidelines for the Preservation, Rehabilitation, and Restoration of Historic Exterior Building Materials for additional information on appropriate repair options.

- Repair inoperable windows and transoms that were historically operable to increase natural ventilation.

Replace

- If historic windows are missing or are deteriorated beyond repair, install energy-efficient windows that match the material, design, size, proportion, and overall appearance of the existing historic windows.
- Replacement windows may include new windows with clear, low-emissivity (low-e) glass or laminated glass that is not noticeably different in profile or reflectivity than existing historic glazing.
- In general, double-glazed windows are incompatible replacement windows in a historic building because most double glazing reflects differently than single glazing, altering the historic appearance of the building. Additionally, double glazing often requires thicker muntin profiles than exist in historic windows, which can alter the historic character of the building. However, recently some manufacturers have begun to make slim-profile, double-glazed windows, which may be appropriate for historic buildings. The City may determine whether double-glazed window panes are acceptable on a case-by-case basis.

Restore

- Restore inherently sustainable, energy-saving historic features that have been removed or altered. Restoration of these features should be based on existing historic documentation.

Energy Conservation and Environmental Sustainability

Historic Doors & Windows: Retrofitting vs. Replacement for Energy Efficiency

There is a common misperception that historic windows are drafty, difficult to maintain, and not energy efficient. Window manufacturers propagate this myth, often by comparing a new window with an unrestored, unmaintained historic window. The principal offender affecting a building's energy efficiency is actually the infiltration of air, rather than heat gain or loss through window glass. According to the Journal of Building Physics (January 2012), studies estimate that infiltration can account for as much as 50% of the heating load in a building. Thus, the addition of weatherstripping at windows and doors, as well as caulking cracks and sealing mechanical ducts and pipes, can have a major impact on reducing air infiltration and increasing energy efficiency.

Keeping and restoring historic wood windows instead of replacing them is important not just to a building's authenticity, but also to sustainability. The original wood materials and thin profiles found in historic windows are difficult to replicate with new windows. Traditional windows were made from quality materials and used individual parts fitted together (stiles, rails, muntins, etc.). They incorporate both hardwoods and softwoods, often from early growth lumber, which is more dense, dimensionally stable, and termite-resistant compared to contemporary lumber. And when the parts are damaged, they can be individually repaired or replaced in kind.

Modern windows are manufactured using contemporary lumber as complete units. When one part fails, the entirety must be replaced. They are also visually bulkier and less refined in detail than their historic counterparts, a result of their need to accommodate double-glazed panes.

Maintaining and repairing historic windows can be as simple as adding weatherstripping, keeping components clean and operable, insulating wall cavities (like sash pockets in double-hung windows), and maintaining paint to prevent sashes and frames from warping and deteriorating.

Appropriate Window Glazing Alternatives

Redlands' hot summers can add significant energy costs associated with cooling a building, putting more strain on mechanical systems. Low-emittance ("low-e") glass has been proven to improve thermal performance by eliminating infrared radiation through the window, and can be installed in historic windows. Another option is laminated glass, which has some insulating value and can be equipped with a low-e coating to help offset heat gain. Some manufacturers are also making slim-profile, double-glazed panes, which may be appropriate for retrofitting historic windows. However, the City should be consulted before deciding on an appropriate window glazing alternative.

Energy Conservation and Environmental Sustainability

Energy Efficiency Upgrades and Water Conservation Strategies

Consider hiring a professional to conduct an energy audit in order to identify energy efficiency upgrades that can be undertaken without compromising the historic character of the building.

Seek less invasive weatherizing solutions first, such as installing interior curtains or shades.

Awnings are a historically appropriate solution to keeping a building cool.

There are a number of energy improvements and water conservation strategies that may be appropriate to implement in a historic building. While the appropriateness of different strategies may be determined on a case-by-case basis, any improvements that are undertaken should not compromise the historic character and integrity of the building.

- Prioritize energy upgrades and water conservation methods that are less invasive and thus less likely to damage historic building material. Less invasive improvements include:
    - The addition of weatherstripping at windows and doors
    - The installation of operable systems at historic fenestration (i.e. storm windows/doors, curtains, and awnings)
    - The application of clear window films to block ultraviolet (UV) rays
    - Sealing and insulating air ducts and water pipes
    - The installation of energy- and water-efficient systems (i.e. high efficiency air conditioning units, LED light bulbs, low-flow sprinkler heads, and timed sprinkler systems).
- Install insulation at the interior of the building so that the exterior historic appearance of the building is not impacted. Insulation should only be installed after other less invasive energy-efficient upgrades are implemented and air infiltration has been reduced.

Prior to insulating a historic building, consult with a professional to ensure the insulation can be installed safely without affecting the durability and lifespan of historic building material.

Energy Conservation and Environmental Sustainability

Energy Efficiency Upgrades and Water Conservation Strategies

- If the building's landscaping is not historically significant, consider planting drought tolerant, water conserving vegetation.
- Consider installing a graywater system, per City of Redlands Ordinance No. 2842 and the California Plumbing Code (Title 24, Part 5, and Chapter 16).
- Incorporate rainwater harvesting systems, such as rain barrels. Install barrels where they will have a minimal impact on the historic character of the building (i.e. at the rear or side of the building).
- When installing new paving (i.e. a walkway or driveway), consider using pervious concrete, a porous material that allows water to infiltrate, helping to manage runoff and recharge groundwater supplies. New concrete should match the tint, scouring pattern, and dimensions of existing historic concrete.

Refer to Ch. 9 - Guidelines for Site and Landscape Design for additional information regarding appropriate historic hardscaping treatments

Refer to the City of Redlands' website for more information about its free water use analysis by Water Conservation staff and its Water Rebate Program: https://www.cityofredlands.org/post/conservation-programs

Consider installing drought tolerant landscaping to conserve water.

Porous driveways help with water runoff.

Energy Conservation and Environmental Sustainability

Energy-Generating Technologies

Avoid installing solar panels at the front of a roof.

Solar Technology

- When installing solar technology, minimize potential adverse effects on the character and integrity of the historic building and, if applicable, the surrounding historic district.
- When possible, use ground-mounted solar technology. Site the equipment in an inconspicuous location, such as a rear or side yard.
- Locate solar equipment on new construction, additions, or on ancillary buildings, such as garages, in order to minimize any direct impacts to the historic building.
- If located on the roof of a historic building, solar equipment should be installed in such a way that its visibility is minimized from the public right-of-way. Solar equipment should not alter the historic roofline or roof profile. The size of the equipment should be subordinate to the overall size of the historic roof.
- Attach solar equipment using the least invasive methods possible so that it may be easily removed without adversely affecting historic building fabric.
- Ensure solar panels, framing, and conduits are compatible with the color of the surrounding historic fabric to minimize their visibility.
- As solar technology continues to advance, solar roof shingles may be acceptable for use on historic buildings, provided that the shingles are compatible with the historic appearance of the original roofing. Appropriateness may be determined by the City on a case-by-case basis.
- If installing solar equipment will negatively impact the historic character of the building or site, consider off-site renewable energy options.

RELEVANT SOURCES

NPS Preservation Brief 3: Improving Energy Efficiency in Historic Buildings

Energy Conservation and Environmental Sustainability

Energy-Generating Technologies

Wind Power

- When installing wind-powered technology, minimize the potential adverse effects on the character and integrity of the historic building and, if applicable, the surrounding historic district.
- When possible, use ground-mounted wind-powered equipment. Site the equipment in an inconspicuous location, such as a rear or side yard.
- Locate equipment on new construction, additions, or ancillary buildings to minimize any direct impacts to the historic building.
- Only in rare instances may wind-powered equipment be acceptable on a historic building since in most instances, the equipment would be highly visible, impacting the historic character of the building.
- If installing wind-powered equipment will negatively impact the historic character of the building or site, consider off-site renewable energy options.

An example of wind-powered equipment located in a remote land location. (Photo, National Park Service, Illustrated Guidelines on Sustainability for Rehabilitating Historic Buildings, 2018)

Cool Roof vs. Green Roof

Cool Roof: a roof made of highly reflective paint, sheet coverings, tiles, or shingles. Cool roofs are designed to reflect more sunlight and absorb less heat than a standard roof. In turn, they lower roof temperatures during hot, sunny weather, keeping buildings cooler inside and increasing energy savings for cooling.

Green Roof: a roof that is partially or fully covered with vegetation and a growing medium, planted over a waterproof membrane. Green roofs provide increased thermal insulation, helping to further energy savings for heating

Cool Roofs and Green Roofs

- When installing a cool or green roof, minimize potential adverse effects on the character and integrity of the historic building.
- When possible, install a cool or green roof on the flat-roof portion of a building to minimize its visibility from the public right-of-way.
- If the cool roof is visible from street level, ensure the color and roofing material is compatible with the historic building fabric.
- Vegetation on a green roof should be appropriately scaled so that it does not extend above the roof parapet.
- Prior to installing a green roof, ensure the roof is water tight and that roof drains, gutters, and downspouts function properly. Include a moisture-monitoring system to protect the historic building from added moisture and unintended leakage.

An example of a green roof with appropriately scaled vegetation that does not extend above the parapet.

Structural Systems

Treatment Guidelines

A building's structural capacity is crucial to its long-term preservation. In the State of California, where buildings are likely to experience seismic activity, structural stability is imperative to ensuring a historic building's future existence and the safety of those who use it. Moreover, current seismic code requirements specify that historic buildings must meet a minimum level of structural capacity. Historic building owners should comply with seismic code requirements while retaining a building's historic character and integrity to the greatest extent feasible.

Prior to pursuing any additional seismic reinforcement, historic building owners should consider the following treatment options regarding the enhancement of a historic building's existing structural system.

In some cases, a historic building's structural system, such as an exposed interior roof truss, may be a character-defining feature in its own right and should be preserved.

Inspect seismically vulnerable historic components, such as chimneys, to ensure they are structurally sound.

Weakened or sagging features, such as this porch roof, suggest the need for structural repair.

Preserve

- Preserve the design, scale, massing, form, proportions, materials, and details of a historic building and its components during seismic reinforcement.
- Avoid removing seismically vulnerable components, such as chimneys, parapets, cornices, or turrets that are considered character-defining features of a historic building.

Maintain

- Maintain a historic building in good condition to ensure the building is not debilitated by rot, rust, decay, or other moisture problems. Well-maintained buildings, even those that have not been seismically retrofitted, are more likely to survive a seismic episode compared to similar buildings that have not been maintained.
- Routine maintenance may include keeping gutters and downspouts clear and the roof and foundation in good repair; alleviating any signs of corrosion of metal ties at parapets and chimneys; regularly inspecting and safeguarding wood structural members from insect infestation; repointing deteriorated mortar joints; and ensuring exit steps are securely connected to the building so that they do not collapse during an emergency exit.

Repair

- Repair a historic building's structural components to enhance its capacity to withstand a seismic event.
- Repair work may include augmenting existing structural components, such as weakened structural members, by pairing or sistering with a new member and bracing (or reinforcing in some other manner).

Structural Systems

Treatment Guidelines

Replace

- Restore historic features and details, such as cornices, parapets, chimneys, and balconies that may have been removed due to their seismic vulnerability. Restoration of these features should be based on existing historic documentation.

Seismic Upgrades

Often, additional structural reinforcement is necessary for the preservation of a historic building and the safety of its occupants. Seismic upgrades should be carried out sensitively, while still complying with code requirements.

- Prioritize seismic improvements that have a minimal visual impact on the historic exterior of a building. Such improvements may include interior diagonal bracing, moment frames, diaphragms, and shear walls that are set back (or otherwise not visible) from windows or storefronts, and hidden or grouted bolts and rods used to tie foundation, floors, and walls together.
- If visible from the right-of-way, reinforcement features such as anchor plates and washers should be designed to blend with the exterior of the building.
- Install exterior bracing at projecting elements, such as parapets, chimneys, and balconies, in such a way that the bracing is not visible from the public right-of-way and does not damage the decorative details of these elements.

For more information regarding structural requirements in historic buildings, refer to the 2016 California Historical Building Code, California Code of Regulation, Title 24, Part 8.

An example of seismic anchor plates that blend in with the surrounding brick.

An example of parapet reinforcement not visible from the public right-of-way.

RELEVANT SOURCES

NPS Preservation Brief 41: The Seismic Rehabilitation of Historic Buildings