SAN FRANCISCO
PLANNING DEPARTMENT

1650 Mission St.
Suite 400
San Francisco,
CA 94103-2479

Reception:
415.558.6378

Fax:
415.558.6409

Planning
Information:
415.558.6377

DATE:	**March 26, 2014**
TO:	**Historic Preservation Commission**
FROM:	**Timothy Frye, Preservation Coordinator, (415) 575-6822**
RE:	**City Hall Fellows Project**

I'm happy to share the results of several months of hard work from our City Hall Fellows on the attached public outreach document regarding passive energy systems in historic light industrial buildings. City Hall Fellows is a one-year fellowship that engages diverse, recent college graduates in local government. The Fellowship empowers them to be effective local change agents. In addition to fulltime work in a variety of City Departments, Fellows select a City project proposal as part of a Small Team Project.

The goal of the project was not to add process or time to our current review procedures, but to provide a tool to initiate conversations on the relationship between historic preservation and sustainability. The peer review period ends on April 2, 2014 and the Fellows will address those comments prior to making it available to the public on the Planning Department website. As part of the peer review process, the Fellows will present the document to the Historic Preservation Commission at its April 2, 2014 hearing to review the overall content, case studies, and usability.

MARCH 2014

PASSIVE ENERGY SYSTEMS IN HISTORIC BUILDINGS

The San Francisco Planning Department, under the direction of the Planning Commission, shapes the future of San Francisco and the region by: generating an extraordinary vision for the General Plan and in neighborhood plans; fostering exemplary design through planning controls; improving our surroundings through environmental analysis; preserving our unique heritage; encouraging a broad range of housing and a diverse job base; and enforcing the Planning Code.

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San Francisco Planning Department

Tim Frye, Preservation Coordinator
Kelly Wong, Preservation Planner

City Hall Fellows

Pai Ferreira, San Francisco Public Utilities Commission
Richa Goyal, San Francisco Public Utilities Commission
David Papas, Municipal Transportation Authority
Faran Sikandar, Controller's Office

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Introduction

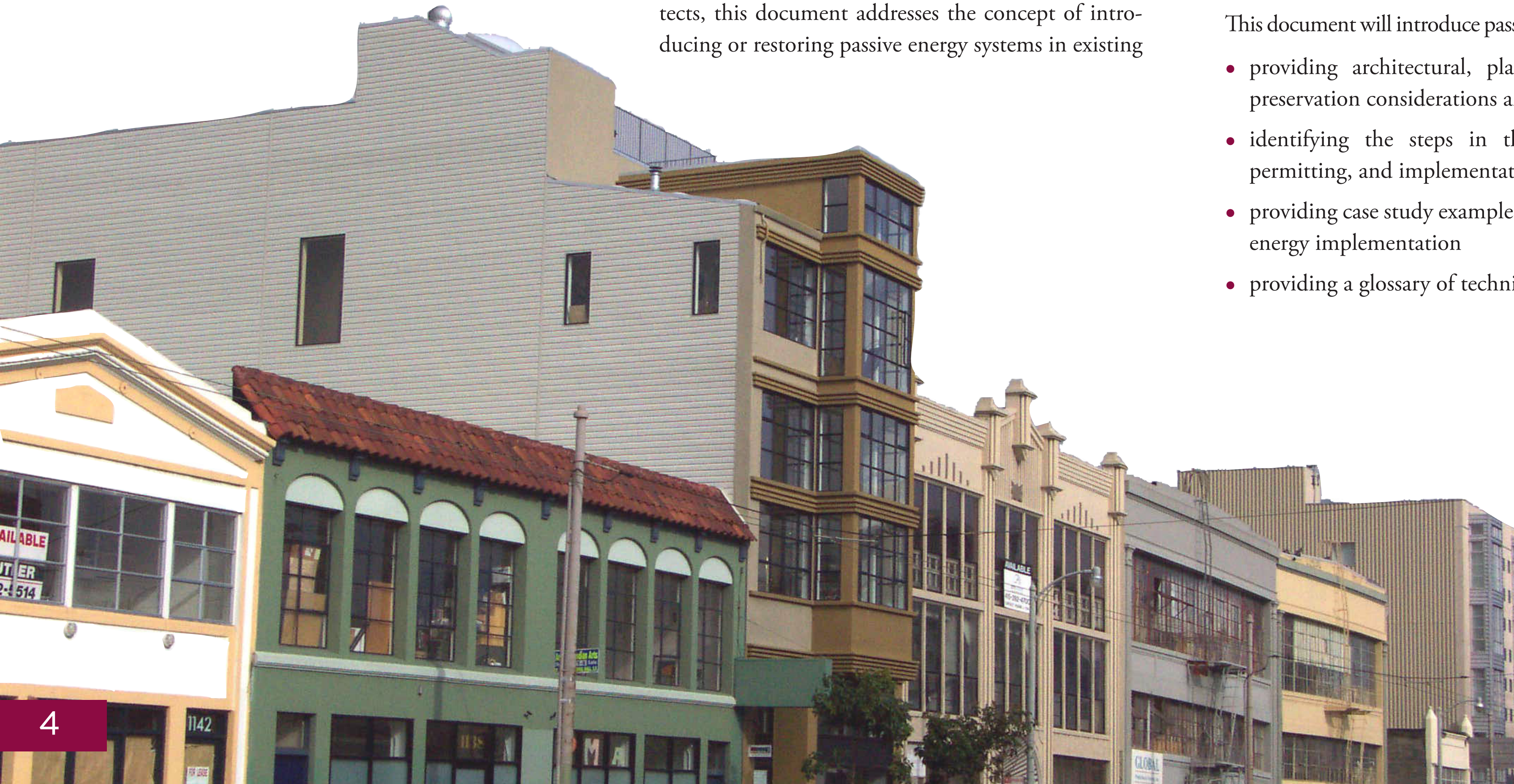
Through the Central South of Market (SoMa) Eco-District Program, the San Francisco Planning Department supports environmentally sound development projects in the Central SoMa area. This strategic planning vision, encapsulated in the Central SoMa Plan, relies heavily on community input, an analysis of past and current land use efforts, and long-range regional, citywide, and neighborhood needs. The Plan incorporates the inherently sustainable practice of historic preservation as a fundamental strategy. The Plan recognizes that historic buildings as community assets serve as anchors to educate the public on sustainability goals, projects and activities related to energy efficiency, community identity, adaptive reuse, and materials management.

This document will be one tool among many to work toward these goals to improve quality of life and environmental accountability in Central SoMa.

As a guide to developers, building owners, and architects, this document addresses the concept of introducing or restoring passive energy systems in existing light industrial buildings located within Central SoMa. Many of these buildings display a variety of architectural expressions and were constructed during the first quarter of the 20th century. These concrete, brick, and heavy timber structures also possess a high level of embodied energy. Adaptive reuse helps retain the fine grain scale and eclectic nature of the area, and capitalizing on the inherently sustainable attributes of these historic resources can bring about significant benefits for developers and buildings owners as they manage and invest in property.

This document will introduce passive energy systems by:

- providing architectural, planning, and historic preservation considerations and criteria
- identifying the steps in the energy auditing, permitting, and implementation processes;
- providing case study examples of successful passive energy implementation
- providing a glossary of technical terms



What is passive energy?

The industry definition of a passive energy system entails managing a building's cooling and heating needs without mechanical assistance such as air-conditioning or heating. A facility that employs passive energy uses its natural resources to capture solar energy and apply it for heating during cold months and minimizing cooling in warm months. Attention to air circulation and placement and structure of windows are key components to traditional passive systems.

This document expands on the definition to allow for the consideration of some mechanical technologies that are appropriate when coupled with traditional passive energy systems and that are feasible for light industrial buildings. Depending on a specific use or multiple uses in the building, there will be varied demand for energy consumption. Tailoring projected energy use to each space and incorporating some mechanical elements can be both energy-efficient and cost effective. Broadening the understanding of "passive energy" to provide a more comprehensive picture of how to reduce energy consumption.

"It's clear from the moment you enter the office that you've stepped into a truly modern building. It's bright, quiet, and full of fresh air."

Testimony from a Passive House office occupant in Portland, Oregon

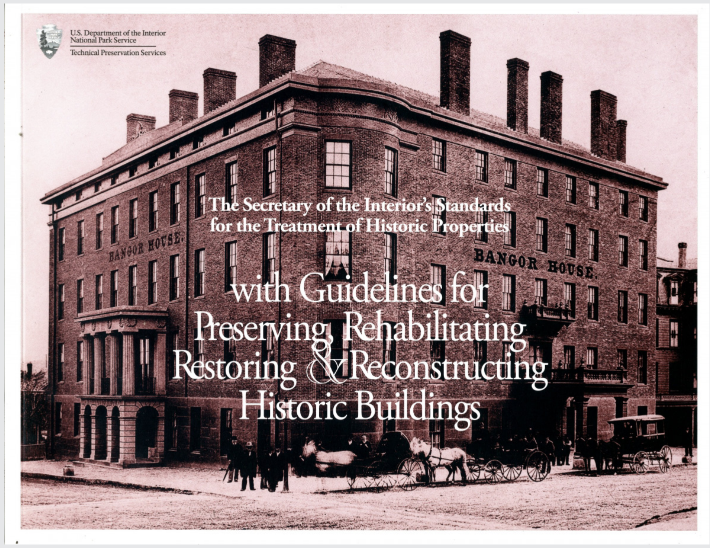
Leveraging
PASSIVE ENERGY

Implementing passive energy elements can provide numerous environmental, financial, and structural benefits that can make a building more attractive for both owners and tenants. Learn how to leverage passive energy systems to invigorate your organization and communities.

Incentive Area	Short Term	Long Term
Energy-Efficiency	Enables the natural ventilation, heating, and cooling of spaces using sustainable, time-tested technologies and materials	Reduces noise and air pollution and provides more thermal comfort at lower energy costs
Historic Preservation	Preserves neighborhood character and reduces waste from new construction	Anchors neighborhoods and creates tangible links to city culture and history
Smart "green" design to enhance quality of life	Increases marketing potential by providing amenities such as ample natural light and ventilation	Creates a desirable location for innovative businesses; provides a connection to neighborhood. Encourages productivity and a more positive work environment
Central neighborhood power plant or server farm	Captures locally-produced energy that would otherwise be wasted and funnels it back to the building and the neighborhood	Provides centralized energy resources enhancing neighborhood resiliency and efficiency and reducing depen-dence on outside providers
Collaborative design process with developers, owners, tenants, agencies	The planning process builds relationships that extend beyond energy savings. It brings various stakeholders together to work towards a common vision for the city	Promotes possibilities for integrating individual buildings to a neighborhood-scale infrastructure for sustainable community growth and achieving broader energy and quality-of-life goals

Preserving
HISTORIC CHARACTER

The National Park Service, through the U.S. Department of the Interior, set a series of advisory Standards intended to encourage "responsible preservation practices that help protect our Nation's irreplaceable cultural resources." The Standards are composed of four treatment approaches, which are Preservation, Rehabilitation, Restoration, and Reconstruction. Of the four treatments, only Rehabilitation includes an opportunity to alter or add to a building in order to make possible its efficient contemporary use. The Rehabilitation Standards support the efficient reuse of historic buildings and maximize the retention of significant historic material. Buildings are identified for their historic significance based on their importance to historic events, persons, architecture, engineering, or cultural values. Character-defining features are the elements of the building that reflect those associations.



THE SECRETARY OF THE INTERIOR'S STANDARDS FOR THE TREATMENT OF HISTORIC PROPERTIES	
Preservation	Preservation is defined as the process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. Limited and sensitive upgrading of mechanical, electrical, and plumbing systems to make properties functional is appropriate
Rehabilitation	Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.
Restoration	Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. Limited and sensitive upgrading of code-required work to make properties functional is appropriate.
Reconstruction	Reconstruction is defined as the act or process of depicting, by means of new construction, the form, features, and detailing of a non-surviving site, landscape, building, structure, or object for the purpose of replicating its appearance at a specific period of time and in its historic location.

Staying Up to Code

San Francisco's Green Building Ordinance (GBO) and California Historical Building Code (CHBC) are inherently sustainable design frameworks which focus on performance-based requirements to maximize material retention and energy efficiency, reducing waste and energy consumption.

San Francisco established the ***Green Building Ordinance*** in 2008 for new and commercial buildings, as well as renovations to existing buildings. The GBO provides the legal requirements for any modifications and general building operation. The levels dictated by the ordinance are the minimum standards for energy targets with passive energy implementation. GBO as a law is designed so that different treatments are assigned different point allocations – if one achieves enough points, GBO is met and, inherently achieves a certain level of energy and cost savings.

In parallel, the ***California Historical Building Code*** provides alternate minimum acceptable standards in order to preserve the integrity of historic buildings. Use of the CHBC requires review and approval by the San Francisco Department of Building Inspection.

While the GBO and CHBC provide a legal framework through which developers and tenants can ensure compliance to technical standards that maximize energy savings hand-in-hand with preserving historic character, the ***Secretary of Interior's Standards*** provide general design and planning guidelines that help achieve compliance.

HISTORIC WINDOW REHABILITATION

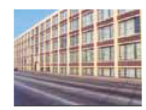
The following is an excerpt on window rehabilitation from the Secretary of the Interior's Standards for Rehabilitation & Illustrated Guidelines on Sustainability for Rehabilitating Historic Building.

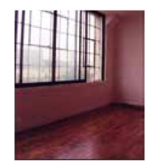
Since rehabilitating windows is a quick and effective way to reap many of the stated benefits of passive energy systems, this excerpt provides a useful example of the parameters of historic rehabilitation. Recent studies have shown that the rehabilitation of existing windows can come very close to the energy performance of high-performance replacement windows at a fraction of the cost. Often, simple repairs such as weather stripping and caulking to existing windows can yield significant energy savings. Steel sash industrial windows can also be easily restored back to operable condition by patching and/or doing Dutchman repairs, removing corrosion, replacing broken glazing, and painting.

Recommended: [33-35] Original metal windows were appropriately repaired as part of the rehabilitation of this historic industrial building.

WINDOWS

RECOMMENDED	NOT RECOMMENDED
Retrofitting historic steel windows and curtain-wall systems to improve thermal performance without compromising their character.	
Installing clear, low-emissivity (low-e) glass or film without noticeable color in historically-clear windows to reduce solar heat gain.	Retrofitting historically-clear windows with tinted glass or reflective coatings that will negatively impact the historic character of the building.
Installing film in a slightly lighter shade of the same color tint when replacing glazing panels on historically-dark-tinted windows to improve daylighting.	Introducing clear glazing or a significantly lighter colored film or tint than the original to improve daylighting when replacing historically dark-tinted windows.





Recommended: [36-38] Original metal windows were retained and made operable during the rehabilitation of this historic mill complex. Installing patio slider doors as interior storm windows was a creative and successful solution to improve the energy efficiency of the existing windows.

Prioritizing Steps for INTERVENTION

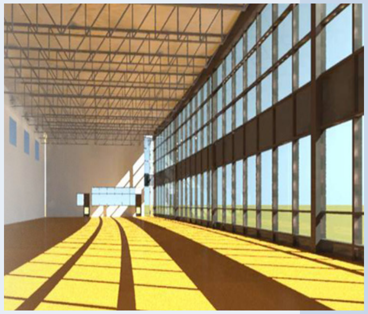
Rehabilitation is an effective approach when addressing historic preservation within the larger eco-district framework. Preservation is an inherently sustainable practice which retains embodied energy. The investment made in the labor and energy consumed during initial construction is conserved by rehabilitating and reusing historic buildings. Furthermore, passive energy systems are a low impact energy technology that can also contribute to substantially improving the efficiency of historic buildings by reducing operating energy costs.

In the case of Central SoMa, many of the historic buildings were constructed prior to the development and reliance on contemporary mechanical heating and cooling equipment. Passive energy design supports rehabilitation because it takes into account the energy performance of the building as it was originally designed. Rehabilitating or improving on pre-existing passive energy systems to allow historic buildings to perform as originally intended helps preserve its historic character and minimizes dependence on outside resources.

Passive systems benefit historic buildings by utilizing locally available (and free) energy sources, thus bolstering energy conservation. When considering passive systems, or any building upgrades for that matter, it is useful to prioritize plans for improvement in order of which intervention would make the largest impact through the least invasive approach. With this in mind, it is often useful to think of intervention options in the following order:

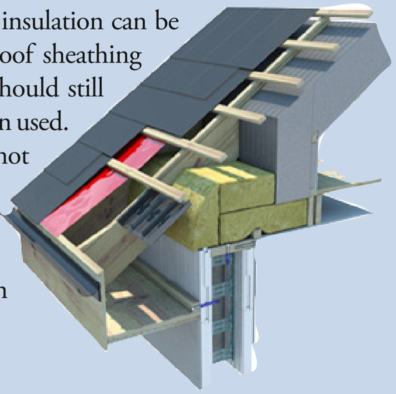
①

Daylighting and window rehabilitation are the quickest and most effective ways to have an impact on implement passive systems. Daylighting employs natural light from the sun to provide lighting and heat to the building, improve ambiance, and thereby offset using excess mechanical energy. Window rehabilitation goes hand-in-hand with daylighting, as wall or roof operable windows, clerestories and skylights play an integral role in letting in light, while controlling airflow and heat conservation. It is almost always more cost-effective, and desirable from a preservation perspective, to repair and rehabilitate historic windows than to replace them with new ones.



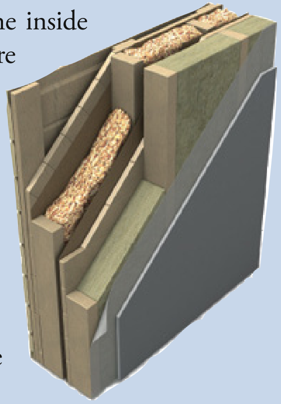
②

Roof insulation is optimal for historic buildings since it is typically out of sight and the insulation generally will not affect the historic character of the building. In most instances, insulation can be installed at the underside of roofs between rafters and other members without impacting its structure; there is often an interstitial space between the exposed roof structure and ceiling in which insulation material can be installed and hidden. If the undersides of roofs are exposed and considered a character-defining feature, then insulation can be installed between the existing roof sheathing and new roof. Consideration should still be taken on the types of insulation used. Spray foam insulation, which is not reversible, should be avoided. Because roof insulation requires minimal modification to the existing fabric, it is often time and cost-efficient.



3

Wall insulation is another effective way to deliver energy savings. However, great care should be taken when considering where to the apply insulation because installing it on the outside face of exterior walls can alter the building's overall character. Instead, in some cases insulation can be easily applied on the inside face of walls so long as it does not obscure any character-defining features of the building, such as exposed brick or timber framing. Like roof insulation, spray foam insulation that attaches permanently to character-defining features should be avoided. Additionally, it is important to remember to allow enough cross ventilation in your building's design in order to prevent deterioration of the building envelope through moisture retention and buildup.



4

Radiant heating, photovoltaics, or other more complex sustainable energy systems can augment those systems that rely on natural light, materials, and air flow. These treatments can add significantly to energy savings by helping you produce energy yourself using photovoltaics or using an energy efficient system such as radiant heating. Depending upon your goals, these measures produce a more eco-friendly building, a more comfortable space for building users, and provide long-term cost savings as well. For example, by using photovoltaics or other similar energy producing technology, you can produce more energy than your building requires and sell the energy back to a utilities company or putting energy back on the grid in the neighborhood. Hydronic radiant floor systems are cost-effective because they supply heat directly to the floor and thus minimize the amount of energy and cost required to heat the room.

5

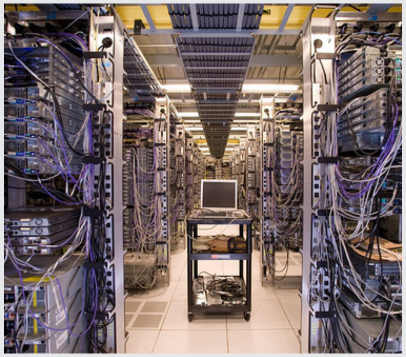
LED lighting or low-impact mechanical interventions may be appropriate to augment passive systems such as daylighting in a historic rehabilitation project.

For example, in the proposed rehabilitation of San Francisco's Old Mint, LED lighting will be installed in rooms where daylighting is insufficient. Due to its proposed conversion to a museum use, the building also requires different lighting schemes for each room depending on its use. An exhibit room might require the use of LED lighting for task lighting to illuminate items on display. A similar approach may be applicable to lighting office or retail spaces with special displays or storefronts. Another example is the easy installation of ceiling fans that can regulate cross-ventilation once windows are rehabilitated and made once again operable.

Passive Systems and YOUR BUILDING

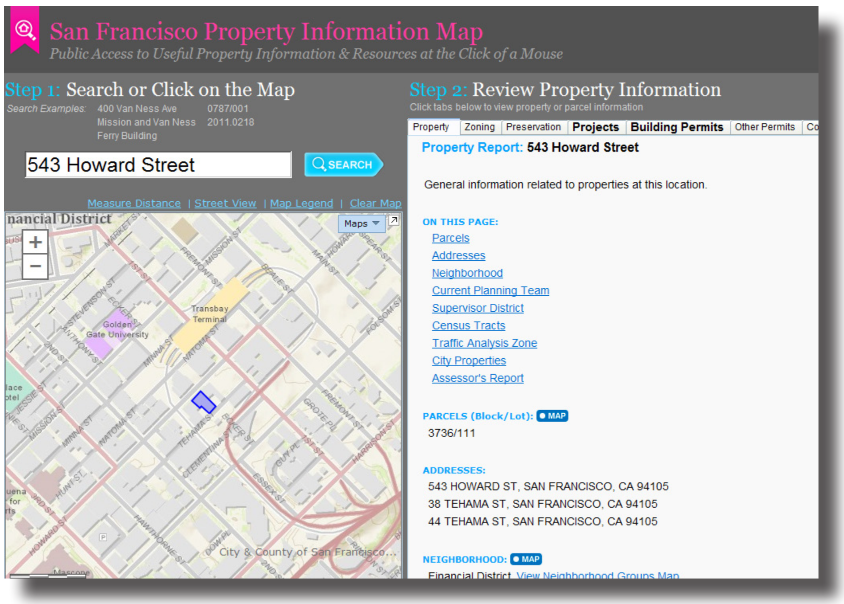
Planning for Use and Occupancy

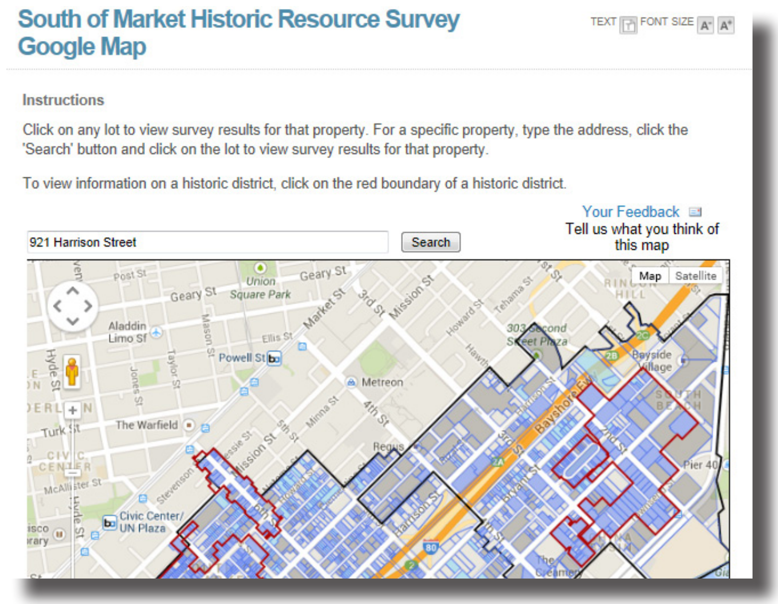
Before considering passive energy systems, it is crucial to be mindful of the building's current or future use and occupancy. Passive systems are best suited for environments where the acceptable temperature levels are variable and not restricted to a specific range. For example, passive systems might be appropriate in a casual work environment where one can add or remove a sweater as needed. Of course, a building can support multiple uses, separated by floors or be on the same floor and separated by interior walls. Based on the needs of building occupants, a combination of passive systems and active mechanical systems can be used conjointly throughout the space. If tenants require a server room that must be kept cool, it would be possible to mechanically cool that room while utilizing passive systems in other sections of the building. Since a building's energy use dictates the specific energy system required, designing for a particular kind of heating, cooling, and lighting need is essential.



Know your SoMa Building

Whenever planning a project involving a historic building, it is important to be well-versed in its history and its significance. Two resources available to assist in gathering information for projects within the South of Market area are the San Francisco Property Information Map and the South of Market Historic Resources Survey. Both interactive websites are sponsored by the San Francisco Planning Department and will provide vital information about underlying zoning requirements and historic status.





San Francisco Property Information Map

In addition to the basic details about the building, the site's Zoning tab provides detailed information on the types of uses the property is suited for. Before putting pencil to paper, it is crucial to know what ultimate uses the property can allow to properly assess its energy needs.

South of Market Historic Resource Survey

The SoMa Historic Resource Survey provides information on a building's eligibility for historic registers. Here, you can locate the building's classification as a historic resource, a potential historic resource, part of a historic district, or none of the above. Inquire with a Planning Department Preservation Planner if more information is needed on a building's character-defining features.

Building Inspection and Analysis

Inspection of your building will provide insight into the design and condition of the existing architectural and structural systems, which together lay the groundwork for possible alterations that support passive energy systems. Existing energy-efficient characteristics of the building should also be evaluated prior to determining the use of any new energy system. Features to take note of include:

- the building envelope assembly
- wall thickness
- construction materials
- location of window and door openings
- building orientation

If there were signs of previous passive systems such as lightwells (open shafts within a building allowing natural air and light to reach and flow out of unventilated interior spaces), look to determine if there is any potential to restore that system's infrastructure. Furthermore, if there are passive systems in place, such operable skylights, clerestories or windows, consider how you might further their energy performance by making simple changes such as restoring frames or by coupling them with an appropriate technology such as adding ceiling fans to provide more efficient air flow. If there are no previous passive systems, identify areas that present the opportunity to implement a new passive system, i.e. the introduction of ***thermal towers*** to allow for natural ventilation. Additionally, observe how the structure interfaces with its surrounding environment, including:

- orientation of the building toward the sun
- prevailing wind direction
- proximity of other buildings

250 Valencia Street is the oldest surviving Levi Strauss & Co. factory and the only one located within the company's home city of San Francisco. The building was the site of clothing manufacturing from 1906 to 2002. In 2008, the building was adapted for the K-8 San Francisco Friends School. Of the many sustainable features included in the project, one notable component was the introduction of four thermal towers which naturally circulates air and are not visible from the public right-of-way. The use of this natural ventilation system improved interior air quality, reduced energy consumption, harmful emissions, and noise levels, and also minimized the need for ductwork, respecting the interior historic fabric.

Assess what can change

Rehabilitating historic buildings requires extra care and consideration. As outlined in this document, The Secretary of the Interior's Standards provide a guide for "making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values." Key in this definition, and continuous throughout the Standards, are:

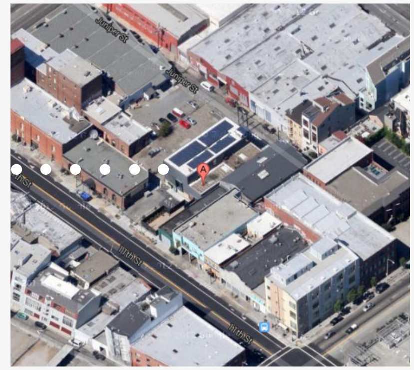
- Being selective in the number or scale of alterations in parts of the building that are visible to the public, whether from the public right-of-way or from within the building; and
- Only using active systems where absolutely necessary and especially not in areas that alter or obscure character-defining features.

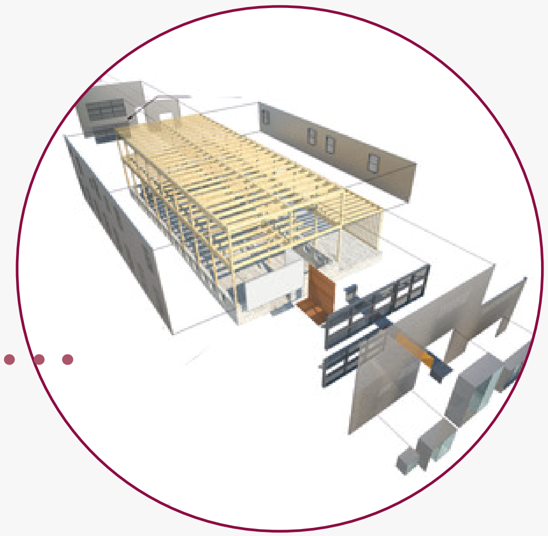
Both ideas underscore an approach of minimizing change in historic buildings while still making them compatible with a functional modern use. While minimizing interventions is an important guiding principle, it does not mean that alterations are not possible or cannot significantly add to the functionality of the building.

The Standards emphasize minimizing change because historic buildings act as community anchors. They connect the public to their past and provide unique character to the neighborhoods they belong to. In order to retain the benefits of historic buildings, any alteration

1 355 11th St. San Francisco

Year Built: 1912
Renovated: 2010
4,000 square feet





Constructed of concrete, heavy timber and clad in corrugated metal siding, this 1912 bottling warehouse for the Jackson Brewing Company complex, a National Register Historic District, was adaptively reused to house professional office space and a new restaurant in 2010. As a contributor to the district, the heavy timber structure was retained, historic wood windows were repaired or replaced in-kind where beyond repair, and the damaged historic corrugated metal panels were replaced with new metal cladding matching the pitch and depth of the historic material in keeping with the utilitarian character of the building and in conformance with the Secretary of the Interior's Standards for Rehabilitation.

In select areas the metal panels are perforated to allow for additional light and ventilation. The building remains naturally ventilated, while solar panels provide the majority of the electrical power. New interior elements consist of sustainable materials such as repurposed wood, low-flow fixtures, low-VOC materials, and recycled content concrete. The rehabilitation project received LEED Gold certification for the building and LEED Platinum for the commercial interior.

The rehabilitation of this 1920s light-industrial building retained much of the building's historic fabric including its reinforced-concrete structure and heavy-timber framing. Operable skylights and an open floor plan allow for natural light and ventilation throughout the mixed-use building. The project utilized non-toxic interior finishes and high recycled content materials in concert with the architectural character of the building. Energy-efficient features, such as passive solar design, sun shading, and clean energy emergency generators were also incorporated. A contemporary two-story addition is slightly out of scale with the historic building and closely references the historic building with very little differentiation. As a result this project does not meet all historic preservation standards, although it retains most of the character-defining features of the building.

② 543 Howard Street San Francisco

Year Built: 1923
Renovated: 2003 – 2004
72,103 square feet

Understanding
BUILDING ASSESSMENTS AND AUDITS

The ultimate goal in implementing a passive energy system is bringing about a net reduction in the building's energy use and costs. Before making any changes to your building, it can be useful to conduct a Building Energy Assessment. An assessment of the building's materials, thermal mass and envelope, and air flows provides information on the building's strengths and weaknesses in terms of energy use. An assessment is a good first step because it will help guide your plan of action for rehabilitation.

A Building Energy or Performance Audit is recommended after the building is occupied. An audit, a real-time rating of the building's energy performance, is distinct from an assessment since building energy performance will differ based on how the building space is used. For example, a building that features a restaurant on one floor and an architectural firm on another will see a wide variance in the energy profiles of each space. An audit helps you understand which energy targets are being met, areas of weakness, and potential areas for improvement.

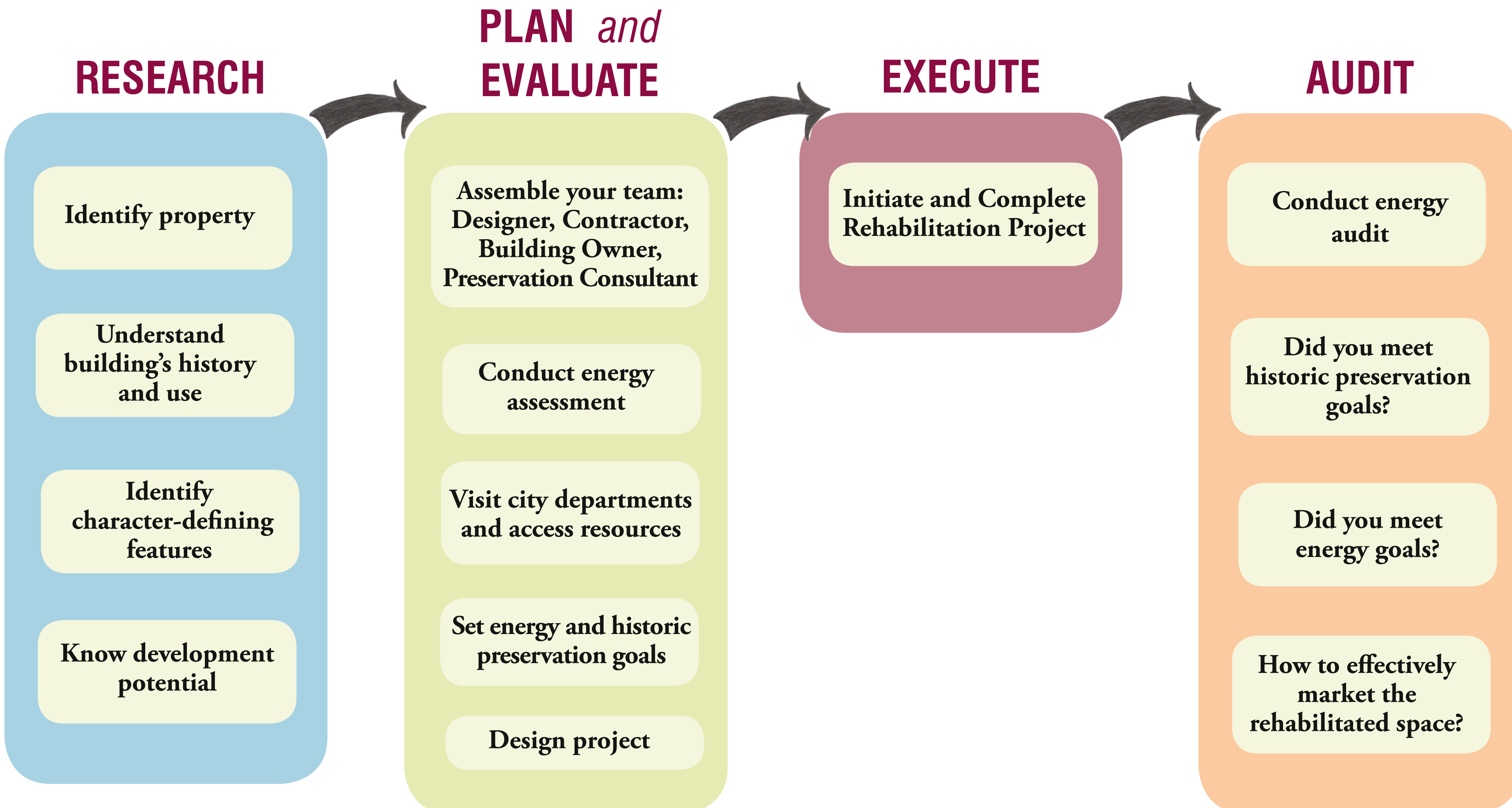
Professional consultants and software are available for both building assessments and audits. Performing an assessment and audit allows a way to differentiate your building from the market, attract tenants, and formally quantify the energy savings you are providing through your rehabilitation.

Energy Targets

While passive energy systems have been implemented in some modern buildings to attain near zero energy principles, it is important to remember that historic buildings operate differently and tolerate less aggressive retrofitting. After meeting the Green Building Ordinance and California Historical Building Code, any additional personal energy goals for historic buildings in the Central SoMa should reflect their unique capacity, with appropriately tailored benchmarks and targets.

A Guide to Successful
REHABILITATION

This schematic offers step-by-step planning as you take your rehabilitation project from start to finish.



This document serves as an introductory guide to rehabilitating historic buildings with passive energy systems. When executed responsibly, the rehabilitated property will enhance the culture of the community, improve the quality of life for both building occupants and passersby on the street, and save energy costs.

Although the document highlights industrial buildings, passive systems of energy are suitable for many building types, from residential to mixed-use buildings. To make passive systems a reality in your future rehabilitation project, take a look at the resources in the Appendix, which include a list of contacts, financial incentives, and a glossary of terms.

Several resources are available to help research and plan the implementation of passive energy systems into historic buildings. Creating a design by utilizing the following information and expertise will ensure the maximum gains from your rehabilitation project. Accessing these resources in any order will be useful for your planning purposes.

RESOURCE	DESCRIPTION	HOW THEY CAN HELP
Preservation Green Lab 1429 12th Ave, #D Seattle, WA 98122	Preservation Green Lab is a department of the National Trust for Historic Preservation that advances research that explores the value old buildings can bring to their communities and works to make building reuse and retrofit easier.	Visit their website for an overview of current trends and research on energy efficiency in old buildings. Reports like "Saving Windows, Saving Money: Evaluating the Energy Performance of Window Retrofit and Replacement" and "Realizing the Energy Efficiency Potential of Small Buildings" will be particularly useful.
SF Environment 1455 Market St, #1200 San Francisco, CA 94103	The department's website details procedures to obtain an appropriate energy audit for existing non-residential buildings. Regardless of historic status, every existing non-residential building must obtain a comprehensive energy efficiency audit from a qualified auditor every five years.	As the next step to learning more about passive energy systems in your building, SF Environment offers numerous webpages regarding energy efficiency in non-residential buildings. You can specifically learn about energy audits when renovating existing buildings, including information on when to obtain an audit, how to find a qualified auditor, and how to make use of what your audit reveals.
Pacific Energy Center (PEC) 851 Howard St, San Francisco, CA 94103	As PG&E's workshop, PEC offers classes, building performance measurement equipment, design advice, and research assistance to California commercial building professionals working on energy efficiency projects.	A personal meeting with a member of the PEC's technical staff will allow a deep dive into passive energy design. Additionally, testing out their design software and learning about programs like the Daylighting Initiative will build up your understanding of the constraints and allowances of passive energy systems.
Planning Information Center (PIC) 1660 Mission Street San Francisco, CA 94103	Preservation Planners from the SF Planning Department are available to discuss historic status and character-defining features of a property, the process and permits required for a proposed project, answer zoning or land use questions, and provide more information about a particular area plan.	Once you have done the background research on passive energy systems and their possible use in your historic building, these preservation planners can provide consultation on whether or not your proposed implementation is appropriate.
Department of Building Inspection (DBI) 1660 Mission St San Francisco, CA 94103	DBI oversees the enforcement of San Francisco's Building, Housing, Plumbing, Electrical, and Mechanical Codes, along with the Disability Access Regulations.	DBI can conduct a preliminary assessment of your building plan and perform a formal Project Review. This can provide guidance on how to achieve the city's mandatory energy compliance standards.

FINANCIAL INCENTIVES

How to Make Passive Energy Actively Save You Money

	DESCRIPTION	INCENTIVE TYPE	ELIGIBLE SECTORS & STAKEHOLDERS	ELIGIBLE TECHNOLOGIES	REQUIREMENTS
1	Federal 20% Income Tax Credit for Rehabilitation of Historic, Income-Producing Buildings	Federal tax credit	Income-producing buildings that are certified historic structures	Rehabilitation work that complies with Secretary of Interior's Standards for Rehabilitation	A 20% income tax credit is available for the rehabilitation of historic, income-producing buildings that are determined by the Secretary of the Interior, through the National Park Service, to be "certified historic structures."
2	Federal 10% Income Tax Credit for Rehabilitation of Non-Historic Buildings Placed in Service Before 1936	Federal tax credit	Non-historic buildings placed in service before 1936; Must be rehabilitated for non-residential use	Varies	The 10% tax credit is available for the rehabilitation of non-historic non-residential buildings placed in service before 1936. In order to qualify for the tax credit, the rehabilitation must meet three criteria: at least 50% of the existing external walls must remain in place as external walls, at least 75% of the existing external walls must remain in place as either external or internal walls, and at least 75% of the internal structural framework must remain in place.
3	U.S. Department of Energy - Loan Guarantee Program	Federal Loan Program	Commercial, Industrial, Nonprofit, Schools, Local Government, State Government, Agricultural, Institutional, Any non-federal entity, Manufacturing Facilities	Each year, Technical Preservation Services approves approximately 1000 projects, leveraging nearly $4 billion annually in private investment in the rehabilitation of historic buildings across the country. Learn more about this credit in Historic Preservation Tax Incentives.	Section 1703 of Title XVII of the federal Energy Policy Act of 2005 (EPAct 2005) authorized the U.S. Department of Energy (DOE) to issue loan guarantees for projects that "avoid, reduce or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued."

More detailed information for most of these financial incentives can be retrieved from:

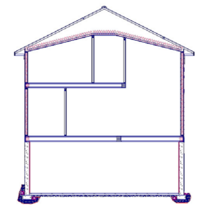
	DESCRIPTION	INCENTIVE TYPE	ELIGIBLE SECTORS & STAKEHOLDERS	ELIGIBLE TECHNOLOGIES	REQUIREMENTS
4	Qualified Energy Conservation Bonds (QECBs)	Federal Loan Program	Local Government, State Government, Tribal Government	Unspecified Efficiency Technologies Renewable Technologies: Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Municipal Solid Waste, Hydrokinetic Power, Anaerobic Digestion, Tidal Energy, Wave Energy, Ocean Thermal	The Energy Improvement and Extension Act of 2008, enacted in October 2008, authorized the issuance of Qualified Energy Conservation Bonds (QECBs) that may be used by state, local and tribal governments to finance certain types of energy projects. QECBs are qualified tax credit bonds, and in this respect are similar to new Clean Renewable Energy Bonds or CREBs.
5	City of San Francisco - Commercial Efficiency Rebates	Local rebate program	Commercial, Multi-Family Residential	Efficiency Technologies: Equipment Insulation, Water Heaters, Lighting, Lighting Controls/Sensors, Furnaces , Boilers, Heat recovery, Steam-system upgrades, Compressed air, Programmable Thermostats, Motors, Motor VFDs, Custom/Others pending approval, Food Service Equipment	Businesses in San Francisco's PG&E territory can receive equipment rebates, a detailed energy analysis, and the discounted installation of a variety of energy efficiency technologies through San Francisco's Energy Watch Program. A range of incentives are available for lighting, HVAC, food service equipment and network power management systems. See web site above for more information.
6	Energy-Efficient Commercial Buildings Tax Deduction	Corporate tax deduction	Commercial, Construction, State Government, Fed. Government: • Owners • Tenants	Efficiency Technologies: Equipment Insulation, Water Heaters, Lighting, Lighting Controls/Sensors, Chillers, Furnaces , Boilers, Heat pumps, Central Air conditioners, Caulking/ Weather-stripping, Duct/Air sealing, Building Insulation, Windows, Siding, Roofs, Comprehensive Measures/Whole Building, Tankless Water Heaters, Heat Pump Water Heaters	Install (1) interior lighting; (2) building envelope, or (3) heating, cooling, ventilation, or hot water systems that reduce or reasonably contribute to the reduction of the building's total energy and power cost by 50% or more in comparison to a building meeting minimum requirements set by ASHRAE Standard 90.1-2001.

Database of Energy Efficiency, Renewable Energy Solar Incentives, Rebates, Programs Policy (DSIRE) www.dsireusa.org

National Parks Service Technical Preservation Services www.nps.gov

GLOSSARY

As you navigate passive energy implementation, certain technical terms will arise again and again. This glossary aims to explain some of these terms.



TERM	EXPLANATION
Air infiltration	The unintended introduction of outside air into a building, typically through cracks in the building envelope and through use of doors for passage. Infiltration is caused by wind, negative pressurization of the building, and by air buoyancy forces known commonly as the stack effect. The leakage of room air out of a building, intentionally or not, is called exfiltration.
Assessment	The collection of baseline building information that identifies the physical breakdown of the structure. Information collected in the field supplied background for the Scope and design phase.
Audits	The inspection or examination of a building or other facility to evaluate or improve its appropriateness, safety, efficiency.
British Thermal Unit (BTU)	Traditional unit of energy equal to about 1055 joules. It is the amount of energy needed to cool or heat one pound of water by one degree Fahrenheit. In science, the joule, the SI unit of energy, has largely replaced the BTU. The BTU unit is most often used as a measure of power (as BTU/h) in the power, steam generation, heating, and air conditioning industries, and also as a measure of agricultural energy production (BTU/kg).
Building Envelope	Also known as building enclosure; is the physical separator between the interior and the exterior environments of a building. It serves as the outer shell to help maintain the indoor environment (together with the mechanical conditioning systems) and facilitate its climate control.
Character-defining features	A physical feature or element that represents the building's historical significance.
Clerestory	The upper portion of a wall containing windows for supplying natural light to a building.
Cool Roof / Green Roof	Artificially-altered surfaces that can deliver high solar reflectance (the ability to reflect the visible, infrared and ultraviolet wavelengths of the sun, reducing heat transfer to the surface) and high thermal emittance (the ability to radiate absorbed, or non-reflected solar energy).
Cross-ventilation	Technique of using natural air movement from the outside and drawing it inside (without the aid of ventilation systems) to cool buildings.
Daylighting	Buildings with daylighting are designed to optimize the use of sunlight to illuminate rooms and reduce the amount of electrical lighting.

TERM	EXPLANATION
Embodied Energy	The amount of labor, and energy consumed to extract resources and process, manufacture, transport, and install materials needed to construct a building.
Films or Coatings	A retrofit upgrade installed to flat glass that aids in retaining the collected solar heat.
Geothermal System	A central heating and/or cooling system that pumps heat to or from the ground. It uses the earth as a heat source or a heat sink.
Heating, Ventilation, and Air Conditioning (HVAC)	The technology of indoor and vehicular environmental comfort. Typically through the use of mechanical equipment used to provide clean, comfortable air conditions for humans and for maintaining required air conditions for various uses in buildings.
Insulated glass	A type of glazing consisting of two or three glass panes separated by a hermetically sealed air space to reduce heat transfer.
Insulation	A material or substance used in insulating a layer that reduces unwanted heat loss or gain and can decrease the energy demands
Integrity	The ability of a property to convey its significance. The evaluation of integrity of a historic building is grounded in an understanding of a property's physical features and how they relate to its significance.
Laminated glass	A type of glazing consisting of two or more sheets of glass with plastic sheeting in between. Laminated glass is highly effective in reducing noise.
Light Shelf	An architectural element that allows daylight to penetrate deep into a building. This horizontal light-reflecting overhang is placed above eye-level and has a high-reflectance upper surface. This surface is then used to reflect daylight onto the ceiling and deeper into a space.
Operating energy	The energy consumed for HVAC, lighting, equipment, and operation of the building.
Period of Significance	Refers to the span of time during which significant events and activities occurred. Events and associations with historic properties are finite; most properties have a clearly definable period of significance.
Radiant heat (hydronic or electric)	Heating a building by radiation from panels containing hot water or electrical heaters.
Rehabilitation	The process of making possible a compatible use for a property through repair, alterations and additions, while preserving those portions or features that convey what have been determined to be important cultural or architectural values.

TERM	EXPLANATION
R-value	A measure of resistance to heat flow (commonly used for walls and ceilings). The higher the value, the better the building insulation's effectiveness. The reciprocal of u-value.
Significance	The importance of a property to the history, architecture, archeology, engineering, or culture of a community, a State, or the nation. Significance may be based on association with historical events; association with a significant person; distinctive physical characteristics of design, construction, or form; and potential to yield important information.
Thermal mass	A concept that describes how the mass of the building provides stability against temperature fluctuations. Materials with thermal mass have the density and levels of conductivity to absorb, store, and release solar energy.
Transom	A window set above the top of a door or larger window; a fanlight.
U-value	A measure of the rate of heat transfer (commonly used for windows). The higher the value, the worse the thermal performance of the building envelope. The reciprocal of r- value.
Vent stack (stack effect)	A vertical opening that provides ventilation to a building.
Weatherstripping / weatherization	The process of sealing the leaks or cracks in a building envelope with plastic, rubber, felt, or metal to protect an interior from external extremes in temperature.

REFERENCES

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FOR MORE INFORMATION:
Call or visit the San Francisco Planning Department

Central Reception
1650 Mission Street, Suite 400
San Francisco CA 94103-2479

TEL: **415.558.6378**
FAX: **415 558-6409**
WEB: **http://www.sfplanning.org**

Planning Information Center (PIC)
1660 Mission Street, First Floor
San Francisco CA 94103-2479

TEL: **415.558.6377**

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