Sustaining Chinatown
Building System Upgrades: Mechanical Systems and Energy Conservation

Historic Preservation Summer Series 2016
Historic Hawaii Foundation for the Chinatown Improvement District
June 8, 2016

Presented by:
Joe Higgins, PE
Division Manager, Associate Principal
Allana Buick & Bers
Historic Hawai’i Foundation and the Chinatown Improvement District are pleased to announce the historic preservation summer series for 2016.

The 3-part series provides information about methods, techniques and resources to preserve historic commercial buildings. The seminars provide practical, specific information on maintaining and rehabilitating historic structures, helping them to continue to provide benefits to the owners, the historic district and the greater community.

The 2016 series will be held on the second Wednesday of the months of June, July and August from 12 – 1 p.m. at Lyon Associates, 45 No. King Street, 5th Floor. The one-hour classes are free and open to the public.

Wednesday, JUNE 8:
Building System Upgrades: Mechanical Systems and Energy Conservation
Presented by: Allana Buick & Bers Inc.

Wednesday, JULY 13:
Hazardous Materials Abatement: Lead Paint, Asbestos, Canec and Pesticides
Presented by: EMET

Wednesday, AUGUST 10:
Zoning and Special District Design Guidelines in Chinatown
Presented by: City & County of Honolulu Dept. of Planning & Permitting

Advance registration is recommended. Register online at www.HistoricHawaii.org
For more information, contact the Chinatown Improvement District at 589-9927, www.cidchinatownhawaii.org

June 8, 2016
Allana Buick & Bers, Inc.

• Architectural-Engineering Firm
• Established in 1987 – 29 Years
• Multi-Disciplined
  - Architects
  - Structural Engineers
  - Mechanical Engineers
  - Electrical Engineers
  - Civil Engineers
  - Building Envelope Experts
  - Solar Consultants
  - Construction Administrators
  - Project Managers
• 100 Employees
• 10 Offices
  - Honolulu, Palo Alto, Oakland, Sacramento, Los Angeles, Irvine, Las Vegas, Seattle, New York, Charlotte

Palo Alto

Honolulu in The Block – Richards Building
Learning Objectives

• What are typical Mechanical System projects that will need to be undertaken through the course of time?

• How does the Energy Code developments affect historical buildings?

• How does the evaluation process work? What can it cost?

• What incentives are available to defray these assessments or the implementation of these improvements?
ASHRAE and USGBC

- **ASHRAE** = (American Society of Heating, Refrigerating and Air-Conditioning Engineers) provides baseline standards and research.

- **USGBC** = United States Green Building Council which uses ASHRAE’s standards as part of their evaluation toolbox to quantify building performance and assign numeric quality thresholds (Platinum, Gold, Silver, etc...).
In July 2015, the Hawaii State Building Code Council unanimously approved the 2015 International Energy Conservation Code (IECC) with amendments. The code sets energy efficiency requirements for both residential and commercial buildings.

Until each county adopts the 2015 IECC, the counties of Hawaii, Maui and Honolulu enforce the 2006 IECC; Kauai, the 2009 IECC. However, the prevailing codes are a minimum, and designers and builders may follow the 2015 IECC.
State of Hawai`i Model Energy Code

What does the code say regards Historic Buildings?

101.4.2 Historic Buildings.

Any building or structure that is listed in the State or National Register of Historic Places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a National Register listed locally or designated historic district; or with an opinion or certification that the property is eligible to be listed on the National or State Registers of Historic Places either individually or as a contributing building to a historic district by the State Historic Preservation Officer or the Keeper of the National Register of Historic Places

ARE EXEMPT FROM THIS CODE
What About Energy Efficiency?
Appropriate Selection of AC Equipment
Appropriate Selection of AC Equipment
Possible Energy Conservation Measures (ECMs)

- **Air Conditioning Systems**
  - Programmable thermostats or BAS systems
  - Duct air leakage
  - Proper air supply temperature – 52 to 55 degrees
  - Improved mechanical cooling systems
    - Variable Refrigerant Flow (VRF)
    - Mini Splits
  - Proper air distribution through location of grilles

- **Proper integration into Building Envelope**
Possible Energy Conservation Measures (ECMs)

- Define chilled water operating set points which meet space needs while operating at higher efficiencies
- Define hot water set points which reduce source fuel consumption
- Define domestic water booster pump settings which meet occupant needs with lower operating costs
- Define space temperature set points which result in lower energy usage
- Define lighting schedules which reduce energy
ECMs in Historic Structures

- Most of these measures can be performed to mitigate visual impacts by mounting equipment away from Historical view planes.

- Minimize the amount of penetrations made through the structures roof by utilizing systems such as split type AC that mitigate those penetrations and can be mounted on the interior without obtrusive ductwork or dropped ceilings that compromise the original interior architecture.

- Eliminate through wall or window-mounted air conditioners which compromise the façade aesthetics and historical integrity.
Possible Energy Conservation Measures (ECMs)

- Replacement of lighting (LED upgrades)
  - LED Lighting is not Plug n Play
  - Photometrics is key
  - Power over Ethernet (POE) is latest LED twist
  - Upgrade fixtures consistent with culture and age of the building
Possible Energy Conservation Measures (ECMs)

- Daylighting with Natural Light
  - Promote open space concepts
  - Use motion sensors on lights
Emerging Energy Strategies To Lower Demand Charges

Shift It

Shave It

Shed It
Shifting Technologies Require Time Of Use Pricing

Time of Use (TOU) pricing:

- **Priority Peak:** 5:00 p.m. - 9:00 p.m., Monday - Friday
- **Mid-Peak:** 7:00 a.m. - 5:00 p.m., Monday - Friday
  - 7:00 a.m. - 9:00 p.m., Saturday - Sunday
- **Off-Peak:** 9:00 p.m. - 7:00 a.m., Daily

TOU Rates available now for medium sized users

- Up to 300kW Demand (TOU J)

**DEMAND CHARGE** - (To be added to Customer and Energy Charge)

- **Priority Peak** - per kW of billing demand $18.69/kW
- **Mid-Peak** - per kW of billing demand $11.69/kW

Expect TOU rates for all HECO tariffs within 2 – 3 years
Store Energy When It’s Cheap, Use It When It’s Expensive

<table>
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Shift It - Weekday - HECO TOU-J

Off-Peak Store

Priority Peak Use
What Do Battery Storage Systems Look Like?

On-site behind-the-meter Battery Energy Storage

- 54kW / 108 kWh
- 30kW / 60 kWh
- 200kW / 400 kWh
What Do Shaving Systems Look Like?

Power Conditioning and Power Shaving
The Vast Ocean Of Vendors...

- Efficient Lighting
- Efficient HVAC Design
- Advanced Controls, Commissioned Properly/Regularly
- Smart/ Optimized
- Demand Response
- Energy Storage
- Solar PV

June 8, 2016
Energy Master Planning

- Comprehensive plan for managing energy and related expenses
- Roadmap for capital deployment, expense reduction and value creation
- Spans: procurement, use, measurement, management, finance & sponsorship
- Living Document
  - Communicate goals and plan to all stakeholders and incorporate feedback

Key Concept: “Conservation & Storage Before Generation”

- Optimize whole system, not each part in a vacuum
- Deployment order matters
  1. Energy Efficiency & Conservation
  2. Energy Storage
  3. Generation
The ASHRAE Level-1 audit is intended to help the energy team understand where the building performs relative to its peers; establish a baseline for measuring improvements; deciding whether further evaluation is warranted; and if so, where and how to focus that effort. The Level-1 audit also will outline the range of potential financial incentives available from Federal, State, Local, and Utility sources.
Energy Audits – ASHRAE Level-2

The Level-2 project starts with the findings of the Level-1 audit

- Evaluates the building energy systems in detail to define a variety of potential energy-efficiency improvements. (ECM’s)
- Can include the Building Envelope, Lighting, Heating, Ventilation, and Air Conditioning (HVAC), Domestic Hot Water (DHW), Plug Loads, and Compressed Air and Process Uses (for manufacturing, service, or processing facilities).
Some of the system upgrades or retrofits revealed by the Level-2 audit may require significant investments of capital, personnel, and other limited resources. Before making this level of investment, the Owner will want to have a much more thorough and detailed understanding of the benefits, costs, and performance expectations. This is the purpose of the “investment-grade” Level-3 ASHRAE audit.
Existing HVAC – Retro Commissioning

- Assessment of equipment
- Evaluation of facility needs
- Development of system operation plan to meet facility needs
- Execute the plan
Budget Costs

- ENERGY AUDITS
  - BETWEEN $0.50 AND $1.00 PER SQ FT

- COMMISSIONING
  - BETWEEN $1.00 AND $2.00 PER SQ FT
Hawai`i Energy Incentives

- Hawaii Energy offers incentive Incentives to conduct Level I and Level II Energy Audits.
  - A Level I Energy Audit identifies all of the electrical power consuming elements of the building.
  - A Level II Audit identifies Energy Conservation Measures which lower the use of electrical power consumption in the building

- Hawaii Energy offers incentives for
  - Lighting
  - Retro Commissioning
  - HVAC Improvements
  - Sub-Metering
  - Many others
Plumbing System Failures

- Supply Water, Waste and Vent Piping Replacement
Supply Water Pipe Issues Discovered

The green scale is a copper ‘precipitant’ which forms when there pinhole leaks or water drips from another pipe.

Asbestos?
Concealed Pipe Failures

Solder joints in 40 year old ½” copper pipe – fell apart at joints due to poor soldering. Pipe replacement costs most likely not in repair budgets.
In original construction, brass screws (code then, and now, requires a copper fastener) created a “galvanic reaction” which caused copper to corrode and fail.
Concealed Drain Pipe Failure

Hub Connectors
Clogged pipes retain water, accelerating corrosion. Soap and grease buildup has reduced pipe area by 90%. Drain lines should be “snaked” on a regular basis.
Plumbing Replacement Considerations

- Restoration of finishes
- Current codes require modifications
- Water conservation
- Hazardous Materials
- Original plumbing cleanouts do not facilitate proper maintenance of the drain and waste piping
- Original plumbing did not contain adequate service valves to facilitate repairs
- Repairs may mean complete shutdown of water at fixtures for extended periods of time
How is Your Roof Doing?
Other Mechanical System Upgrades

- Roof Drains and Integral Downspouts
Questions?