Project 01_Case Study

Climate Classification: Csb (San Francisco)
Sustainable Design Project: Rene Cazenave Apartments
San Francisco, CA, USA
San Francisco

City Data: Timeline

1700s: Spanish influence – arrival in 1796. Original name: Yerba Buena (an herb that grew throughout the area).

1800s: Under Mexican control in 1821. Then in 1848, the United States claims California in the Mexican-America War. The Gold Rush in 1849, transforming the city nearly overnight.

1900s: Reconstruction after the 1906 earthquake. Rebuilt with greater organization and infrastructure. Flourishing as northern California’s financial, commercial, and cultural center.

Present: Growing population, marked historical landmarks, socially progressive and diverse.
San Francisco

City Data: Overview
- Incorporated in 1850
- Last estimated population: = 884,000
- The tip of a peninsula on the coast of Northern California.

Map of San Francisco’s neighborhoods.

(Above) Cable cars to handle the steep hills. (Below) Union Square – a place of public gathering since the 19th century.

(Above) Victorian Painted Ladies with rising modern buildings behind. (Below) 1-2 Unit homes / apartment buildings to house the increasing population.
San Francisco

Climate Data: Overview

- Climate Zone = Csb

- Mediterranean/ dry-summer subtropical climate

- Moderate seasonality: mild, dry summers, and most rainfall occurring during winter months.

- Compared to typical Mediterranean climates, San Francisco experiences a more oceanic climate where conditions are typically cloudier and damper

- Average Temperature = 57.2 °F

- Average annual precipitation = 19.7 inches
San Francisco

Climate Data: Overview

- Sunny vs cloudy during daylight hours = approx. 70% vs 30%

- A wet and dry season - 80% of annual rainfall occurring between November and March.

- Known for its intense fog rolling off the ocean and rapidly moving through the city/between hills and valleys

- The Pacific Ocean air acts as an air conditioner over the city, keeping temperature moderate
San Francisco

Geography & Climate:

- A gridded layout of infrastructure over many rising hills.
- The hills throughout the city lend to varying temperatures and conditions
- The city falls in a seismic zone (Earthquake of 1906)
Diagram illustrating the forces of fog for coastal San Francisco.

1. Winds circling clockwise around the Pacific High, a semi-permanent area of high pressure, push ocean surface waters south and away from the coast.
2. The resulting current causes an upwelling of cold water.
3. The cold water cools the air above it, causing its moisture to condense into fog.
4. Warm air in the sun-heated Central Valley rises and is gradually replaced by cool ocean air, drawing fog inland.

Sources: Chronicle research, Bay Area Air Quality Management District
San Francisco

Typical Solutions:

- As a dense, compact city, public transportation is crucial.

- Bay Area Rapid Transportation (BART) train system provides access throughout and beyond San Francisco.

- Ferry services to nearby cities like Berkley and Oakland.

- Cable cars, first introduced in the 1880s, still remain a form of transportation.

BART is environmentally conscious. All electric trains. Hydroelectric and solar sources provide two-thirds of the power needed to run the trains.
Historic records of past earthquakes and analysis for future seismic activity.

- Seismic activity: in 1906 an earthquake with the magnitude of 7.8 struck.
- Following 1906’ earthquake, fires broke out. The map outlines the extent of the destruction.
San Francisco
City Data: Typical Solutions

- Building construction takes great consideration for seismic activity to prevent catastrophic damage.

- Retrofitting highway overpasses.

- The lateral motion of earthquakes pose a danger to the foundation of homes and buildings.

Transamerica Tower – implemented seismic instruments to analyze the building’s motion during an earthquake.

Map illustrating the liquefaction, landslides, and seismic zones.

A typical soft-story

During an earthquake

Possible solutions

Wood column

Open walls

Soft story

Heavier top floor puts disproportionate lateral stress to the soft-story causing a possible collapse.

Columns can be replaced or retrofitted with steel frames.

Reinforced shear walls with seismic plywood

Extra bolts and braces drilled into foundation

VS.
Case Study: Rene Cazenave Apartments

Koppen-Geiger Climate Classification
Climate Zone: Csb
Case Study_Rene Cazenave Apartments

San Francisco

Rene Cazenave Apartments

Architects:
Leddy Maytum Stacy Architects and Saida + Sullivan Design Partners,

Project Size:
74,723 square feet

Project Cost:
$31.7 million

Completion Date:
December 1, 2013

With the goal to provide housing for the formerly “chronically homeless” in San Francisco’s Transbay Redevelopment Area, the Community Housing Partnership and BRIDGE Housing collaborated with Leddy Maytum Stacy Architects. This was a great social project that also made sustainable strides. Energy use and costs are kept low with a number of sustainable systems, living conditions are healthy and encouraging, and seismic resiliency is maximized.
San Francisco

Rene Cazenave Apartments

- Close proximity to BART, a ferry port, Transbay Terminal, and bus stops to encourage use of public transportation.

- Network of corridors for bicycle transit directly accessed from RCA. No car parking available on site; however, secure bike parking is provided.

- Public spaces like Yerba Buena Gardens and Rincon Park offer relief from the otherwise dense urban environment.
San Francisco

Rene Cazenave Apartments

- Developed within a dense, urban area – RCA is sure to transform the surrounding site and inspire further sustainable consciousness.

- Designing and building in at this site was made possible by first redirecting the freeway off ramp.

- Now, the RCA and future park designs work to improve the ecosystem where impervious surfaces used to dominate.

Seismic Resiliency:
- The concrete structure features post-tension shear wall system. As seismic drift decelerated, the post-tensioning reinforcing with re-center the building.

- Mechanical spaces, plumbing, and means of egress are designed to allow for lateral movement in the event of an earthquake.
Concept diagrams capture the program of the building to establish a preliminary layout of the design. On the ground floor, a wide corridor termed the “Main Street” encourages socialization and a sense of community. The upper floors are programmed with a compact, efficient layout of apartment, ensuring each unit has sufficient glazing for natural daylight and view to the outdoors.
Level 1:
Mixed-use program featuring retail, public space (courtyard, bike parking, lounge), mechanical rooms, and a large space for counseling.

Level 2:
Compact layout of studio apartment units, organized by a simple corridor axis. Access to green roof/community garden.

Typical Upper Floor: Continued compact & efficient layout of studio units as well as 1-bedroom units.

Roof Plan:
Network of solar panels.
Key Strategies for Sustainability:

- Ventilation thoughtfully designed to bring fresh air down into the building, then stored as thermal mass.

- Natural daylight for each apartment unit, but in a control fashion.

- Solar canopy to help keep energy costs low.

- The green roof is aesthetic and functional. It acts as a noise barrier and collects stormwater.
Ventilation and Daylight:

- Fresh air is continuously provided, start from its filtration at roof level.
- With operable windows and ceiling fans, on top of San Francisco's temperate climate, the RCA does not need air conditioning to make for a comfortable, healthy living environment.
- The design lends to natural daylight, allowing artificial lights to remain off during daytime hours.
- 96% of the livable areas are day lit.
- 68% of the livable areas are naturally ventilated.
Water Activity on Site:

- Because the building consumes the whole site, storm water is managed through detention tanks.

- Low-flow fixtures and drip irrigation work to reduce water use.

- The plumbing has been designed and integrated to be able to connect to a future municipal reclaimed water system.

- % of rainwater from a max. anticipated 24-hour, 2-year storm event that can be managed on site: = 25%
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Unit Breakdown:

- A simple modular unit design – yet, no load-bearing walls allowing for future modifications.

- 84% of construction waste was diverted from the landfill by conscientious monitoring.

- Selective materials used – screened for are durability, easy maintenance, and low-emitting properties.
The Rene Cezanave Apartments have provided an invaluable opportunity for a healthy, comfortable living situation for a vulnerable clientele of formerly homeless – most of which suffer from mental and physical disabilities.

This design and its many sustainable features will continue to inspire and bring people closer together with each other and the city of San Francisco.
Work Cited:

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