
# REDWOOD CITY VETERANS MEMORIAL SENIOR CENTER

LOCATION
Redwood City

EXPECTED COMPLETION
2023

SIZE
43,768 sf

OVERALL COST
$66 million

ANNUAL OPERATING COSTS $66,038

GROSS SITE EUI
26 KBTU/SF/YR

ENERGY USE
1,209,504 KBTU

ELECTRIC/TOTAL ENERGY
100%

TITLE 24 ENERGY DESIGN RATING
58

AWARDS AND CERTIFICATIONS
The project is LEED registered and targeting LEED Platinum certification to be awarded at end of construction.

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## Project description

In Redwood City, the new Veterans Memorial Senior Center replaces aging facilities at Red Morton Park. It is targeted for LEED Platinum and ZNE certification. In addition to an all-electric commercial kitchen supporting a dining room, the complex provides meeting spaces, a state-of-the art 270 seat theater and a gym, office spaces for local non-profits, and an elevated outdoor deck with community gardens and an exercise track.

Intended to complement the programming of an adjacent YMCA to be built in a future second phase, both buildings are simple, wood-clad forms designed in a modernist take on the Bay Region Style. Environmentally conscious features include innovative “solar chimneys,” which are exposed above the roof line to inspire curiosity about how these passively cooled and ventilated buildings operate.

This project’s characteristics were developed after an extensive public process. More than twenty public meetings were held to gather input on recreation, wellness and aquatics programming from multi-generational stakeholder groups from families with daycare requirements up to seniors.

Early in community meetings, the team introduced concepts of cross ventilation, solar gain, daylighting and solar power, all of which were fully realized in the design. An initial charrette included the client and the entire design team; as the project progressed, multiple presentations to the client group enabled the team to fine-tune the structure’s energy strategy.

One of the City's primary goals was for the building to be used, when necessary, as an emergency shelter, which required a strong design focus on resilience. To that end, Veteran's Memorial Building will be able to house and feed up to 125 people during major power outages lasting multiple days. A micro-grid stores emergency (and non-emergency) power and is supported by on-site water storage, for use throughout the building. To develop the back-up power strategy, the design and energy modeling teams worked with the clients to determine which loads were critical to building operations; this understanding helped them size the battery back-up and PV systems appropriately.

A second important program element was the commercial kitchen. The Redwood City Parks Department, which offers meals to seniors on a regular basis, needed this site to facilitate up to 400 meals per day. Since commercial cooking equipment is typically fueled by natural gas, going to an all-electric kitchen required a design that reflected an unconventional approach to food preparation. The clients, design team, and food preparation staff visited PG&E's all-electric demonstration kitchen and were able to see first-hand how induction cooking could be designed and operated in the new facility.

## Building planning process

Following community presentations and input, ELS worked closely with Integral Group to develop and refine strategies for passive cooling by means of natural ventilation, solar chimneys, thermal mass, and shading.

Passive cooling measures require close collaboration between the design and the energy modeling teams throughout a project's design and construction document phases. Each solar chimney was sized to meet ventilation requirements based on the energy models' dictates, but they also had to blend with the building's architecture.

As the project developed, a defining issue turned out to be thermal mass, especially in the floors, where greater thermal mass had the benefit of reducing and delaying peak cooling loads. Thermal mass was desirable from an energy standpoint, but the floors' considerable weight resulted in added costs and higher structural loads at the upper floor and roof.

Following extensive collaboration between the design and energy modeling teams, the resulting design balances energy performance of added thermal mass against cost and other architectural impacts.

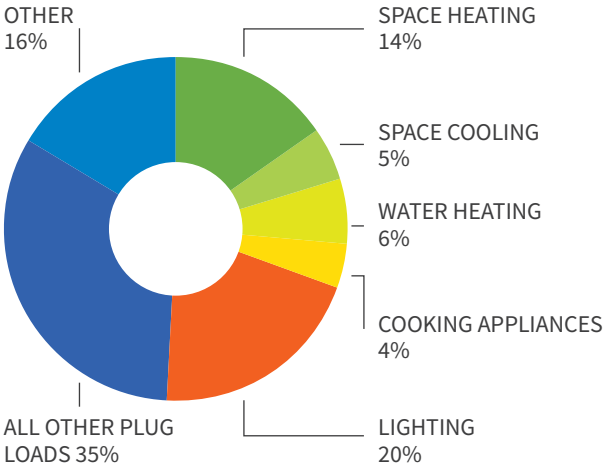
### PASSIVE DESIGN

Landscape
Shading
Daylighting
Thermal mass
Envelope insulation
Air-tightness insulated glazing
Natural ventilation & solar chimneys

### ACTIVE DESIGN

On-site renewable energy
Solar photovoltaics
On-site energy storage
Heat pump water heater
Air source heat pump
Induction cooktop
Energy Star appliances
Demand response capabilities

### ENERGY USE BY CATEGORY



Natural ventilation is deployed throughout the building (above) and the design balances daylighting and solar gain.

The hard surfaces required for effective thermal mass posed challenges for other areas of the design. Hard surface floors with exposed concrete structure above let structures act as a heat sink, but they do not necessarily result in comfortable, user-friendly spaces, especially for seniors. To address the aesthetic challenges of an exposed concrete structure, the design team called for slatted-wood ceilings as a visual barrier that permits air to flow freely throughout the room.

The use of hard surfaces can also result in a noisy environment, a particular issue for hearing-impaired seniors. Working with our acoustical engineers and modeling team, we developed a system of suspended baffles and acoustical panels above the slatted ceilings that would expose the spaces to the thermal mass above while also dampening the acoustic effect of the hard surfaces.

The photovoltaic system used solid panels for most of the building and transparent panels at trellis locations. Sizing of the photovoltaic system evolved alongside the building's passive systems and mechanical design; as building systems became more efficient, the scale of solar panels required to achieve Net Zero was reduced. In addition to its use for emergency power, the microgrid is also used for routine energy, storage, and powering the building on solar energy during peak demand hours and in the evenings when the sun is not shining.

## Building and site description

Located in the mild climate of Redwood City (city slogan: "Climate Best by Government Test"), the Veteran's Memorial Senior Center presented an ideal opportunity to design an energy efficient, passively cooled building that takes full advantage of the mild climate and prevailing breezes.

Sited in Red Morton Park in a residential neighborhood, the project replaces existing, energy-inefficient buildings. Along with climate and wind considerations, the shape and orientation of the building were dictated by the property's site constraints, which include a residential street to the north, a soccer field to the east and a parking access drive to the west. The wide setback at the northern edge maintains the existing building line, preserves existing trees and provides a continuous parklike streetscape, allowing for generous green space between the new building and the residences across the street.

The building orientation takes advantage of natural breezes coming from the northwest and southeast, and large windows provide abundant natural light. On the southwest and northwest facades, sunshades form a key aspect of the energy efficient strategy. Size and spacing of sunshade elements were determined with input from the energy model to minimize heat gain during critical peak times. Interior shades in critical locations act as a so-called "second skin," trapping heat near the glass where it can be ventilated through automatically operated windows and louvers that open and close according to outdoor conditions and interior air temperature.

The increase in wildfires and associated poor air quality during hot summer days raised the project team's awareness of the need for an alternative to natural ventilation. With construction documents nearly complete, the owner and design team made the decision to quickly add systems, initially planned for a later addition, that could provide full air conditioning throughout the building and allow windows to be closed when exterior conditions are unhealthy.

The building was designed in conjunction with an adjacent YMCA, to be built in a second phase. A new pedestrian promenade, located in the right-of-way where the parking access road had been, will link the two buildings and provide access to the park beyond.

## Project lessons learned

ELS Architecture and Urban Design summarize their lessons learned as follows:

*We want others to know that passive cooling and Net Zero are achievable goals, not science fiction. The key is to aim high and set ambitious goals at the very beginning for energy performance, resilience, and green building features, and to recognize that this work is likely not achievable by the design team alone. It is essential to have a receptive client that is open to learning more about the health, environmental, and cost benefits of innovative design.*

*We also learned to be prepared for an iterative process reflecting close collaboration between the energy modeling teams, mechanical and electrical engineers, and the architectural design team. This kind of work will not succeed if engineers are designing their systems to accommodate a building that was fixed in concept design. We recommend holding discussions as early as possible among the design team about the cost and design impacts of characteristics like thermal mass, sun shading, and solar chimneys, that affect the structural design and architectural finishes. For our team, the ability to flexibly adjust to new and changing conditions led to a successful design.*

PROJECT TEAM

City of Redwood City

ELS Architecture and Urban Design, architecture

Integral Group, mechanical, electrical, plumbing, energy modeling

Müller Design, food service design

Forell/Elsesser Engineers, structural

SWA Group, landscape architecture

Sandis, civil engineering