ET Summit 2019

Presented by

ET CC EMERGING TECHNOLOGIES COORDINATING COUNCIL

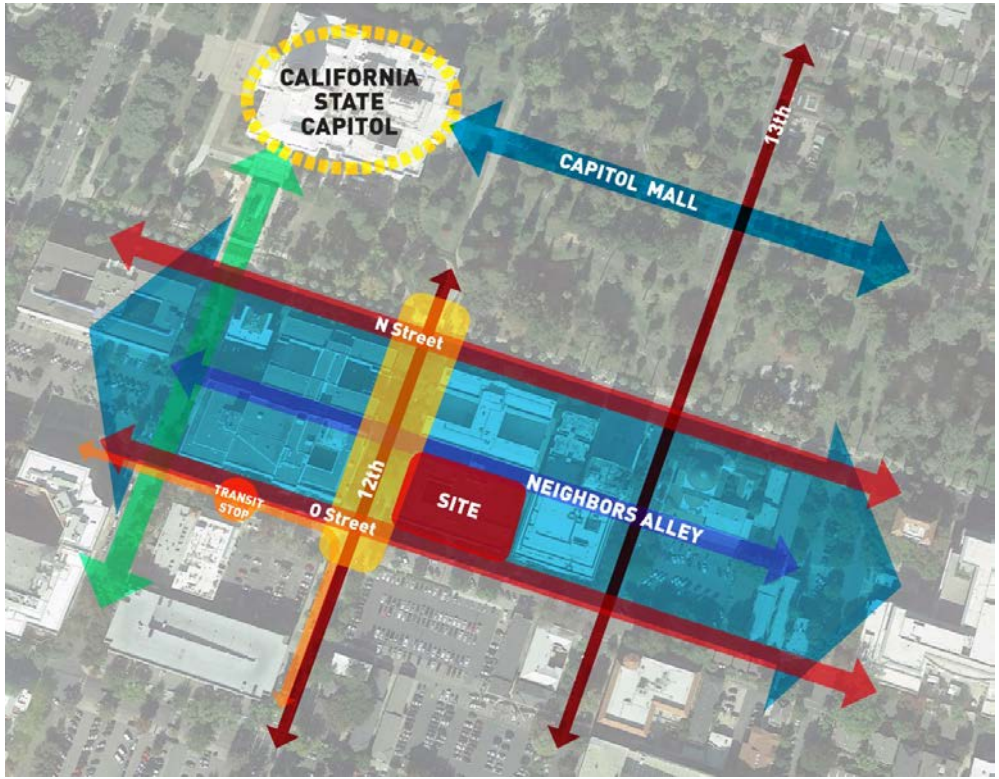
Designing for Technology & ZNE

Clifford L. Allenby Building
California Department of General Services

Nicholas Docous, AIA

Principal Architect, Lionakis

RUDOLPH AND SLETTEN GENERAL CONTRACTORS | ZGF | LIONAKIS


CALIFORNIA STATE CAPITOL
CAPITOL MALL
13th
N Street
12th
TRANSIT STOP
O Street
SITE
NEIGHBORS ALLEY

Zero Net Energy

DGS definition of ZNE

"ZNE Source – Energy Efficient building that produces as much clean renewable energy as it consumes over the course of a year, when accounted for at the energy generation source."

Our Approach

A high-performance building that meets contemporary standards for occupant comfort and building systems while providing a superlative and collaborative work environment enhanced by occupant education and feedback that addresses building features and functions, receptacle-level energy reporting, and whole building operation optimization.

Critical Success Factors

01 Create a **DISTINGUISHED AND INSPIRATIONAL** building design that fosters positive relationships with stakeholders, occupants, and the community.

02 Ensure **TRANSPARENCY OF DEMOCRACY**, building security and safety for occupants, including during construction.

03 Include **INNOVATION WITHOUT UNDUE RISK** utilizing proven technologies.

04 Provide **FLEXIBLE WORKSPACES** to accommodate modern movements in employee behavior and technology, and attract future generations of employees.

05 Create spaces that **ENCOURAGE COLLABORATION, WELLNESS AND SATISFACTION** of the occupants.

06 **ENGAGE** the **COMMUNITY** by providing a welcoming commercial space on the first floor.

07 Support sustainable, **ZERO NET ENERGY** strategies, including a maximum target Site Energy Use Intensity (EUI) of 30.

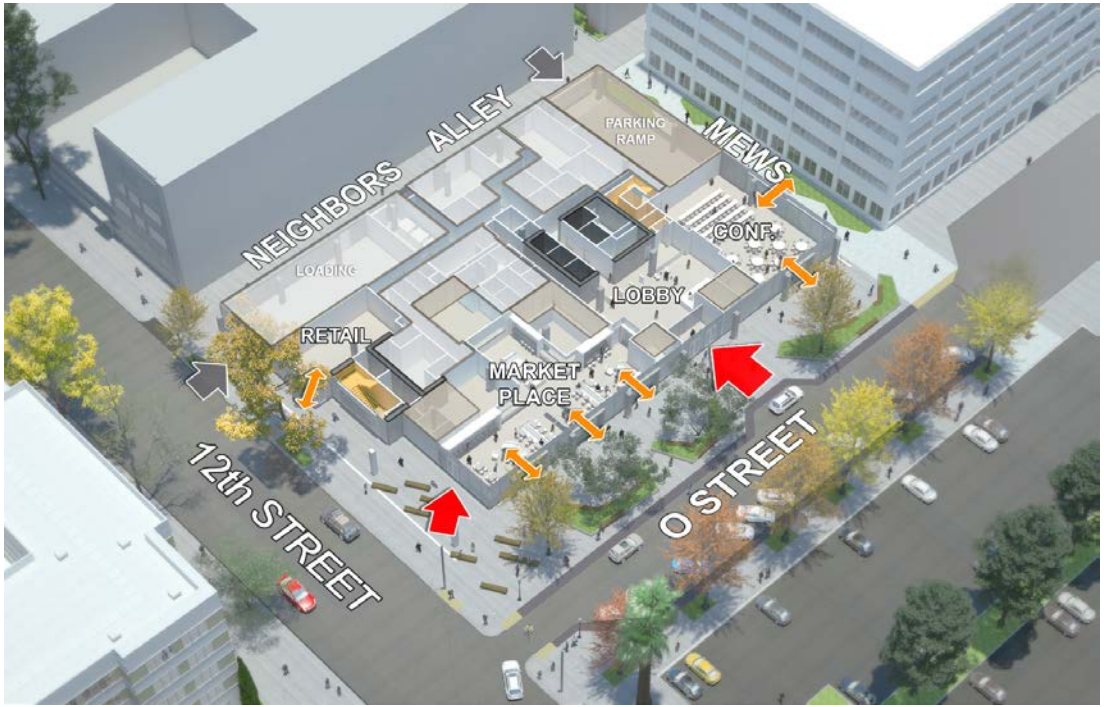
08 Include **WATER CONSERVATION** and reuse measures that exceed code requirements.

09 Provide a resilient, maintainable, durable, high-quality building designed and built to a **50-YEAR DESIGN STANDARD** with a 150 year life expectancy.

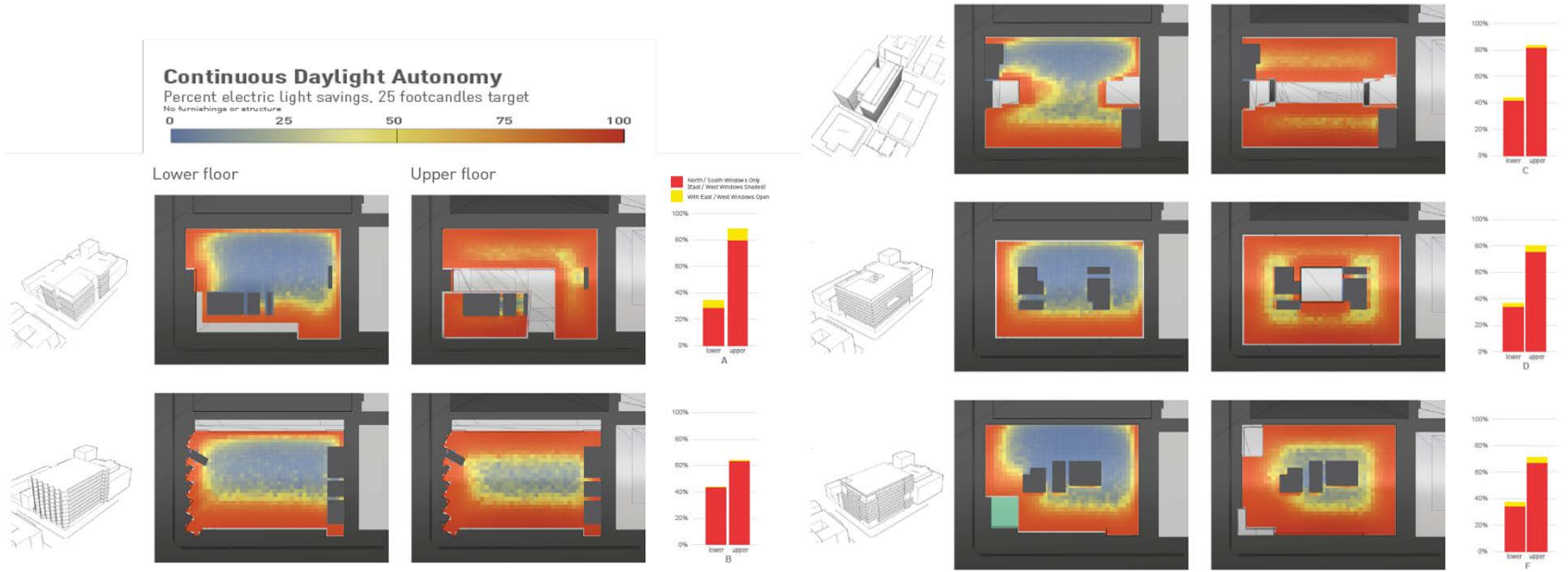
10 **FOSTER POSITIVE RELATIONSHIPS** with all stakeholders.

11 Complete the Project on budget and **MEET OR EXCEED** the schedule.

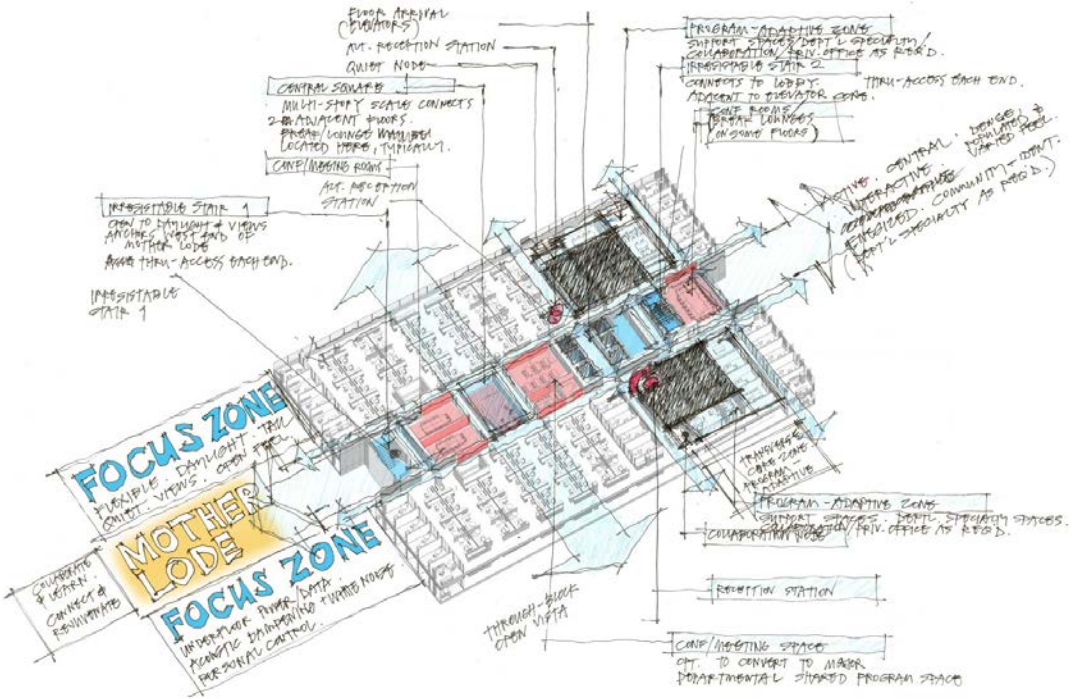
Design Approach



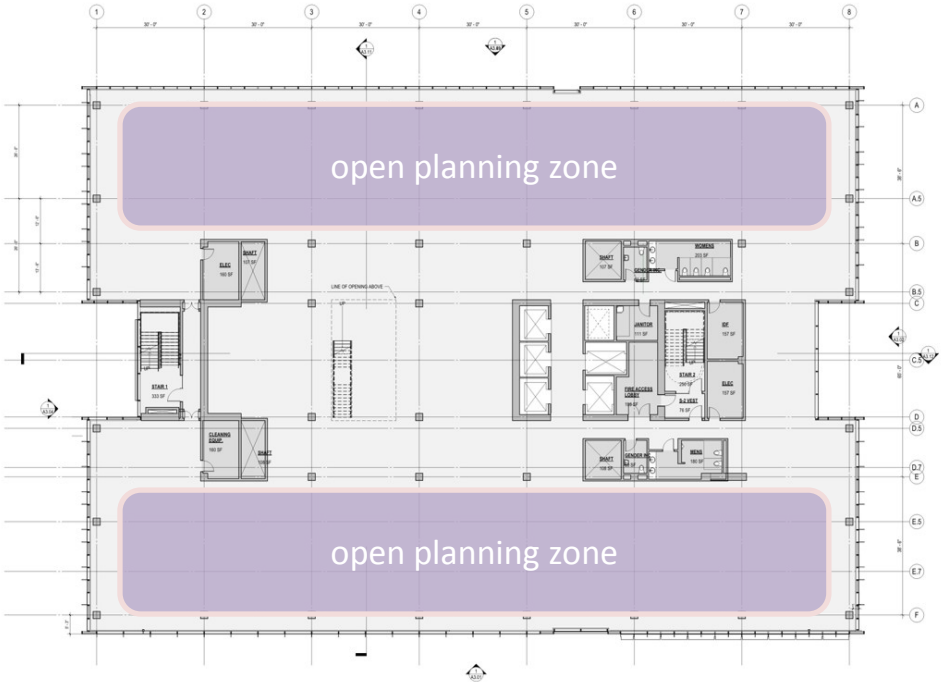
Massing Options



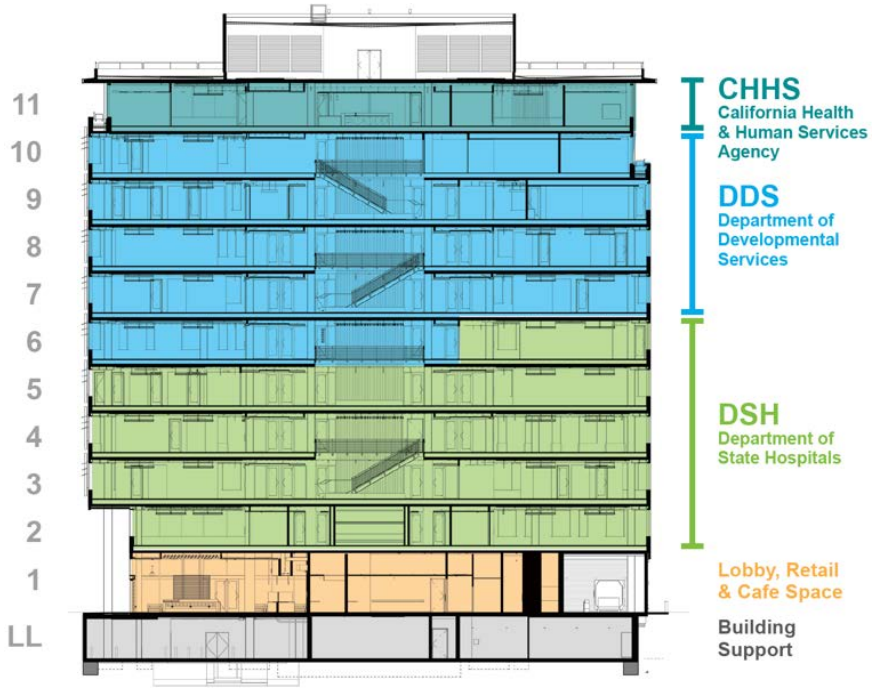
Mother Lode Concept



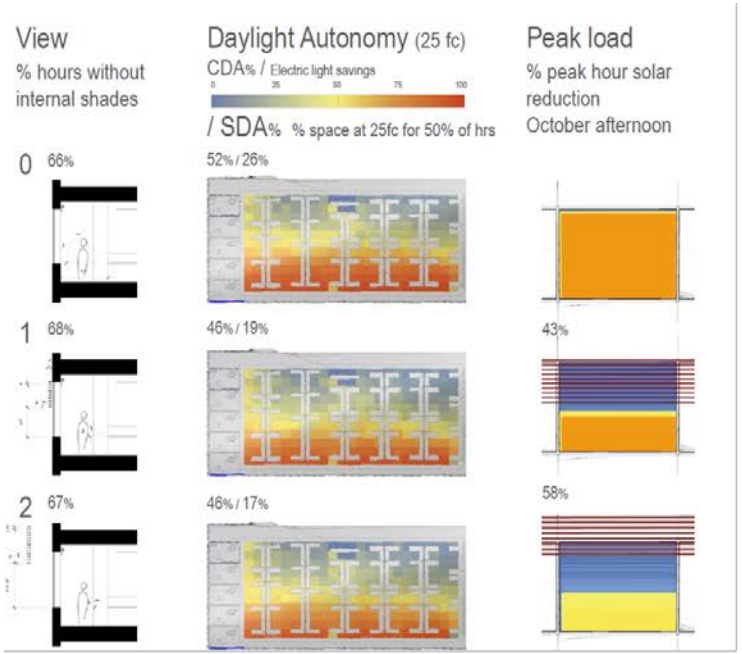
Typical Floor

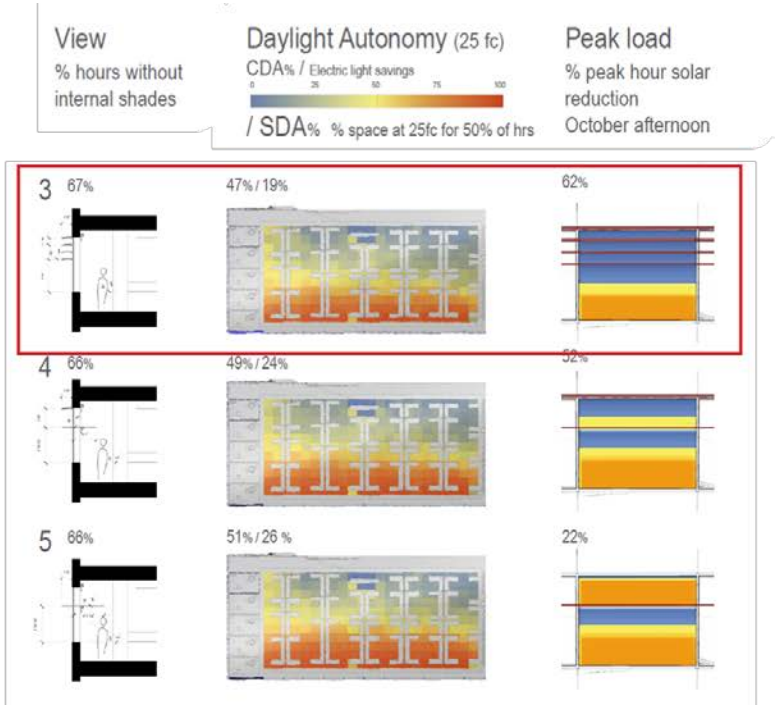


Departmental Stack

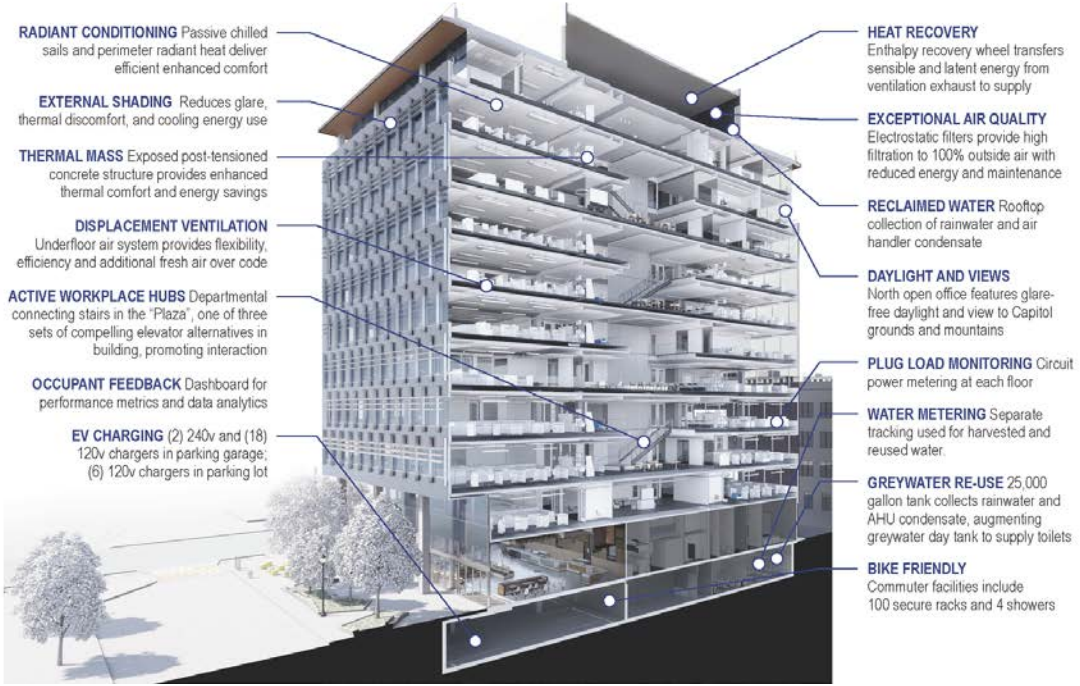


Shading Optimization

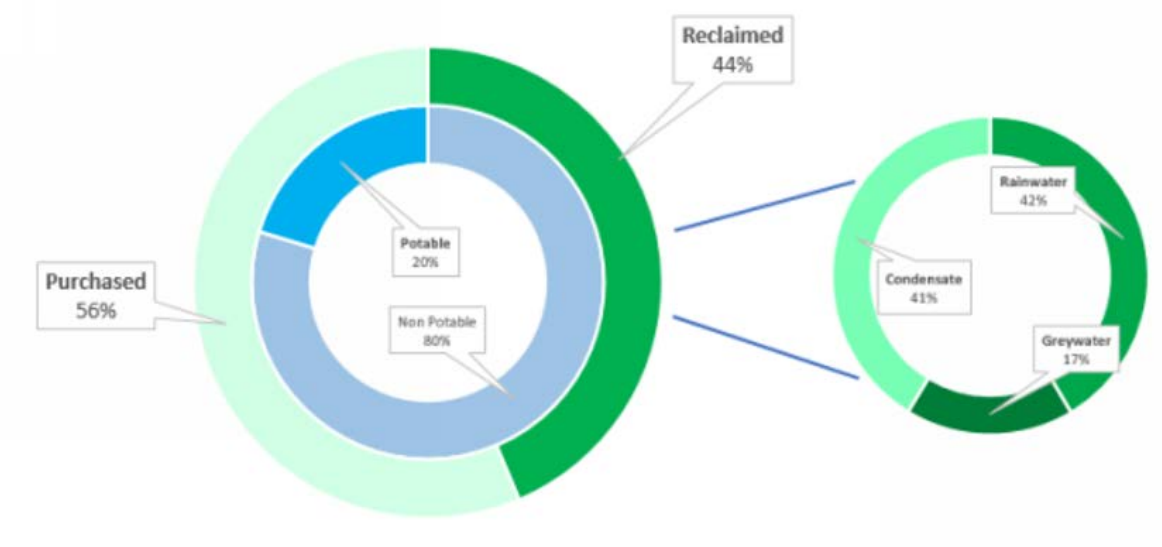




Systems


RADIANT CONDITIONING Passive chilled sails and perimeter radiant heat deliver efficient enhanced comfort
EXTERNAL SHADING Reduces glare, thermal discomfort, and cooling energy use
THERMAL MASS Exposed post-tensioned concrete structure provides enhanced thermal comfort and energy savings
DISPLACEMENT VENTILATION Underfloor air system provides flexibility, efficiency and additional fresh air over code
ACTIVE WORKPLACE HUBS Departmental connecting stairs in the "Plaza", one of three sets of compelling elevator alternatives in building, promoting interaction
OCCUPANT FEEDBACK Dashboard for performance metrics and data analytics
EV CHARGING (2) 240v and (18) 120v chargers in parking garage; (6) 120v chargers in parking lot
HEAT RECOVERY Enthalpy recovery wheel transfers sensible and latent energy from ventilation exhaust to supply
EXCEPTIONAL AIR QUALITY Electrostatic filters provide high filtration to 100% outside air with reduced energy and maintenance
RECLAIMED WATER Rooftop collection of rainwater and air handler condensate
DAYLIGHT AND VIEWS North open office features glare-free daylight and view to Capitol grounds and mountains
PLUG LOAD MONITORING Circuit power metering at each floor
WATER METERING Separate tracking used for harvested and reused water.
GREYWATER RE-USE 25,000 gallon tank collects rainwater and AHU condensate, augmenting greywater day tank to supply toilets
BIKE FRIENDLY Commuter facilities include 100 secure racks and 4 showers

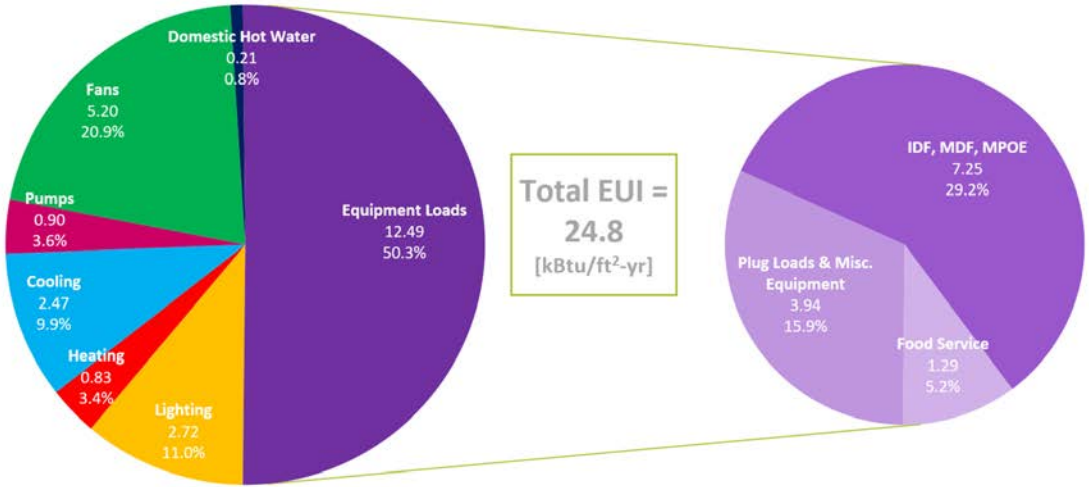
Water Optimization



Energy: Roles & Responsibilities

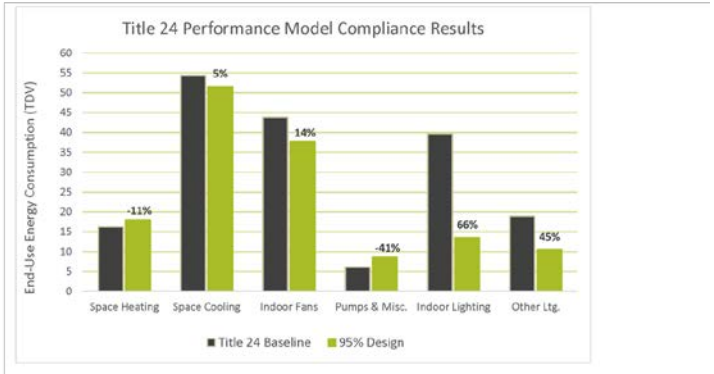
Phase	Task	Responsible Party	Role
Design	Create Energy Model	Glumac	Energy Modeler
	Generate M&V Plan	Glumac	MEP Engineer
Construction	Implement M&V Infrastructure	Schetter, Airco	Elec, Mech/Plumb Contractors
	Implement M&V Software	L&H Airco	Controls Contractor
	Commission M&V System	Enovity	Commissioning Authority
Post-Construction	Data Collection	L&H Airco	Controls Contractor
	Implement M&V Plan	Glumac, DGS, Airco, Schetter	MEP Engineer, Owner, Mech/Plumb, Elec Contractors
	Model Calibration	Glumac	Energy Modeler
	Building Calibration	R&S, L&H Airco, Airco, Schetter, Glumac, DGS	GC, Controls, Mech/Plumb, Elec Contractors, MEP Engineer, Owner
	Data Analysis	Glumac	MEP Engineer
	Confirmation of ZNE	DGS	Deputy Director - Sustainability

Site Energy

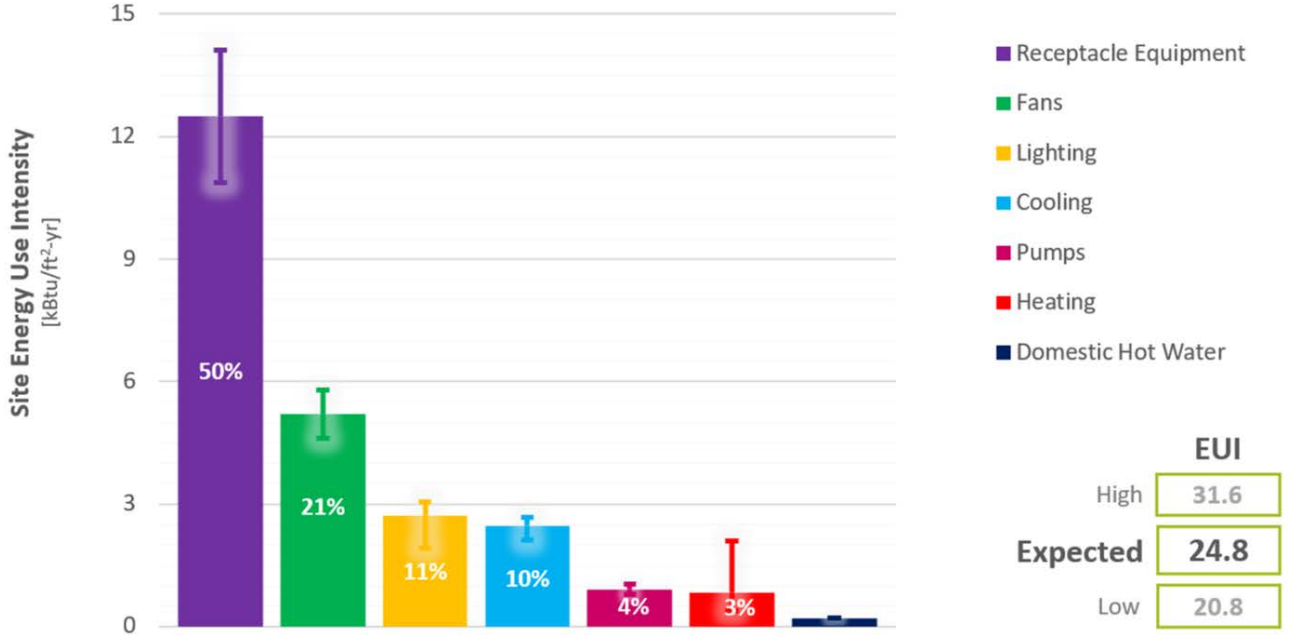

Domestic Hot Water
0.21
0.8%
Fans
5.20
20.9%
Pumps
0.90
3.6%
Cooling
2.47
9.9%
Heating
0.83
3.4%
Lighting
2.72
11.0%
Equipment Loads
12.49
50.3%
Total EUI =
24.8
[kBtu/ft²-yr]
IDF, MDF, MPOE
7.25
29.2%
Plug Loads & Misc. Equipment
3.94
15.9%
Food Service
1.29
5.2%

LEED & Title 24 Compliance

Parameter	Unit	LEED Baseline	95% Design
Natural Gas Consumption	kBtu	5,972,362	460,873
Electricity Consumption	kWh	3,481,636	2,564,750
Total Energy Consumption	kBtu	17,851,196	9,212,162
On-Site Solar PV Energy Generation	kWh	0	0
SMUD SolarShares Purchased Electricity	kWh	0	2,700,000
SMUD SolarShares Purchased Electricity	%	0.0%	105.3%
Electricity Consumption with Renewables	kWh	3,481,636	(135,250)
Total Energy Consumption with Renewables	**kBtu**	**17,851,196**	**(620)**
Building Area	ft²	171,209	
Site EUI	kBtu/ft²-yr	68.39	24.62
Site Energy Savings	%	48.4%	
Site EUI with Renewables	kBtu/ft²-yr	68.39	0.00
Site Energy Savings with Renewables	**%**	**100.0%**	
Natural Gas Cost	$/therm	1.0172	
Electricity Cost	$/kWh	0.1171	
Total Energy Cost	$	$468,448	$305,020
Energy Cost Savings	**%**	**34.9%**	
Natural Gas Source Energy Multiplier	-	1.09	
Electricity Source Energy Multiplier	-	3.15	
Total Source Energy	kBtu	41,929,799	28,067,768
Source Energy Savings	**%**	**36.1%**	
Natural Gas GHG Emission Factor	metric ton CO_2/MMBtu	0.053020	
Electricity GHG Emission Factor	metric ton CO_2/kWh	0.000703	
Total GHG Emissions	metric ton CO_2	2,794	(71)
GHG Emissions Saving	**%**	**102.6%**	
Improvement Over LEED Baseline:		**69.3%**	
LEED Points:		**18**	



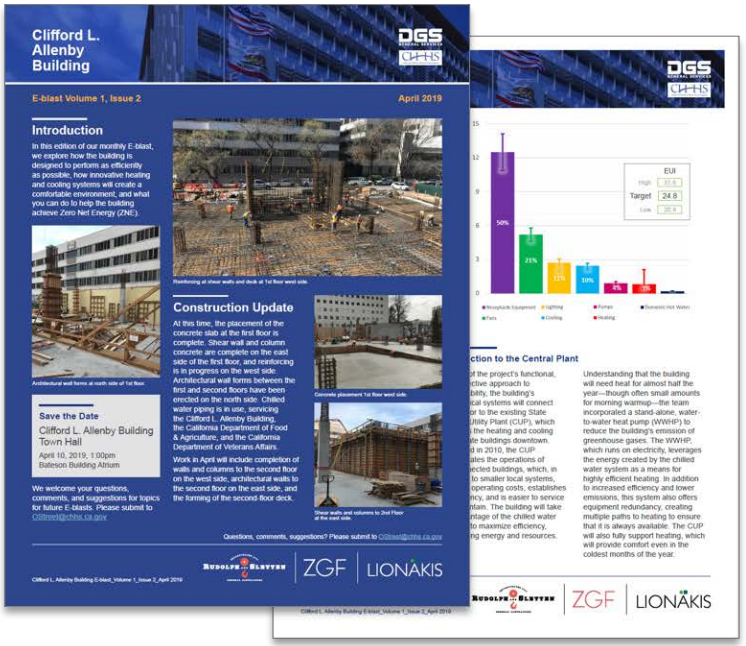
Design End-Use Energy



Change Management

- Tenant engagement and user education
- Managing and optimizing building performance
- Measuring success

E-Blast Newsletter



Ongoing Measurement

Workplace Environment


CALIFORNIA
CLIFF L ALLENBY BUILDING


BIG Salad Shop
fire & grill

Relationships

Performance

Design

Nicholas Docous, AIA
Principal Architect
Lionakis
nick.docous@lionakis.com
www.Lionakis.com