Title 24 Energy Performance Report

639 South La Brea

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1. EXECUTIVE SUMMARY

The purpose of this analysis is to describe how the 639 South La Brea project (the "Project") will meet the Public Resources Code section 21155.1 Sustainable Communities Strategy CEQA exemption for transit priority project subsection (a) (8) requirement for energy and water efficiency.

Public Resources Code Sec. 21155.1 (a) (8) requires that:

The buildings in the transit priority project are 15 percent more energy efficient than required by Chapter 6 of Title 24 of the California Code of Regulations

The Project is a mixed-use development in the City of Los Angeles consisting of 121 residential units, 125-room hotel with 13,037 sf of commercial area, and below-grade vehicular and bicycle parking in one integrated building. The lot area is 51,866 sf.

This assessment followed the Title 24 Alternative Calculation Method (ACM) manual to compare the estimated energy usage of the proposed project against Title 24-2016 standards.

This Project complies with requirements, as follows:

Energy Use: **15.47%** less than allowed by Title 24, Part 6 2016

The energy compliance strategies are described below.

2. ENERGY MODELING PROCESS

2.1 Regulatory Framework

Public Resources Code Sec. 21155.1 (a)(8) requires that a Sustainable Communities Strategy project be 15 percent more energy efficient than required by Title 24, Part6, the California Energy Code.

Title 24 of the California Code of Regulations, known as the California Building Standards Code or just "Title 24," contains the regulations that govern the construction of buildings in California. Part 6 of the Title 24 of the California Code of Regulations deals with the California Energy Code.

Title 24, Part 6 provides two compliance paths:

1. The *Prescriptive Method*, under which projects must implement individual aspects of the building, one at a time, verifying that each aspect is not below the minimum or above the maximum level prescribed by the Title 24 code.
2. The *Performance Method*, under which projects use California Energy Commission approved energy modeling software to demonstrate that projects meet the required level of energy performance by calculating energy trade-offs. Under the Performance Method, the energy consumption of the entire building is calculated at once and uses this calculation to find the most cost-effective method of satisfying Title 24.

To enable the City of Los Angeles Department of Building and Safety to readily confirm compliance with the Subsection (a) (8) requirement of 15 percent more efficient than Title 24, Part 6, and the Project will use the *Performance Method*.

The following sections provide greater detail into the energy modeling process, the necessary design measures, and the resulting performance.

2.2 Energy Modeling

Preliminary whole building energy modeling was conducted to determine the anticipated Title 24 energy code performance. The energy modeling was done using Energypro which is a software tool approved by the California Energy Commission to generate a comparison of the Proposed Design to a Baseline Design compliant to Title 24 (2016). The DOE-2 based Savings by Design module has been used to simulate the energy performance of the proposed and baseline Buildings. Included in the following sections is a description of how this software was used to determine the building performance and the documentation of all energy modeling inputs and assumptions.

<u>Baseline Design</u>

The software program automatically generates a Baseline Design that is compliant to Title-24. It includes the following parameters:

- The same physical size and shape as the Proposed Design
- The same occupancy schedules and zoning as the Proposed Design
- The prescriptive assembly and glazing U-Factors, and solar heat gain coefficients, based on climate zone
- Baseline Building was modeled with a 40% window to wall ratio, per the Title 24 ACM
- The prescriptive lighting allotment based on occupancy or task
- The mandatory ventilation rates by occupancy
- The appropriate mechanical system
- A mechanical system size appropriate for heating and cooling loads

The results are measured as Time Dependent Valuation (TDV) Energy, which accounts for the energy used at the building site, consumed in producing, and in delivering energy to a site. TDV is calculated by multiplying the site energy use for each energy type times the applicable TDV multiplier. TDV multipliers vary for each hour of the year and by energy type, by climate zone and by building type

2.3 Energy Model Input

The energy model considers the following characteristics of the Project:

<u>Site and Climate</u>

A building location and climate play an important role in determining the energy usage of the building. The project is located on 639 South La Brea in Los Angeles, California. In accordance With Title 24, the following design weather conditions were used.

- Latitude / Longitude: 34° N / 118.23° W
- Climate Zone: Title 24 –CA Zone 9
- Weather File: CA_LOS-ANGELES-DOWNTOWN_722874.binm
- Summer Design DB/WB: 92/68°F (0.5%)
- Winter Median of Extremes: 38°F

Architecture and Form

The building consists of 8 floors above ground and 2 levels of underground parking. The ground floor part of the building is for retail/restaurant space with approximately 16,416 sf. The residential and hotel floors from level 2 to 8 are approximately 133,307 sf and 56, 956 sf gross area respectively.

Table 1: Space Programming & Occupancy Density

ESTIMATED OCCUPANCY		
	GROSS AREA	ESTIMATED OCCUPANTS
RESIDENTIAL	133,307	876
HOTEL	56,956	629
RETAIL/RESTAURANT	16,416	872

Opaque Assemblies

The opaque assemblies are the roof, wall and floor assemblies that enclose the conditioned spaces in the Project, protecting them from the outdoor environment. The assemblies used in the simulation model of the Proposed Design are described in Table 2 below. Also, the assemblies used in the simulation model of the proposed designed are described in Figure 1 below. For the Title 24 Baseline Design, the opaque assemblies follow the prescriptive envelope thermal performance requirements.

Table 2: Opaque Construction Properties

<table>
<tr><th colspan="5">Opaque Construction Properties</th></tr>
<tr><th rowspan="2"></th><th colspan="2">Proposed Design</th><th colspan="2">Title 24 Baseline</th></tr>
<tr><th>Description</th><th>U-Factor</th><th>Description</th><th>U-Factor</th></tr>
<tr><td>Roof</td><td>6”Concrete Deck Roof With R-32.5 Rigid Insulation</td><td>0.028</td><td>6”Concrete Deck Roof With R-32.5 Rigid Insulation</td><td>0.028</td></tr>
<tr><td>External Wall – 1st Floor (Retail Level)</td><td>Insulated Spandrel. Thermally broken aluminum framing, Low-e glass, R-20 insulation</td><td>0.153</td><td rowspan="2">R-19 Wall Metal Stud with R-9 Rigid insulation</td><td rowspan="2">0.069</td></tr>
<tr><td>External Wall – All other levels</td><td>R-19 Wall Metal Stud with R-10 Rigid insulation</td><td>0.065</td></tr>
</table>

Fenestration System

All vertical glazing for the building is a part of the fenestrate system. This includes all windows on the building. The following performance values were used for the fenestration system in the baseline and proposed models are described in Table 3 below. Also, the assemblies used in the simulation model of the proposed designed are described in Figure 1 below.

Table 3: Fenestration Properties

Glazing System Properties			
Building Location	**-**	**Proposed Design**	**Title 24 Baseline**
1st floor Retail/Restaurant Storefront	Assembly U-Factor*	0.41	0.41
	Glazing SHGC**	0.26	0.26
	Visible Light Transmittance	60%	46%
Hotel + Residence Operable Windows	Assembly U-Factor*	0.46	0.41
	Glazing SHGC**	0.42	0.22
	Visible Light Transmittance	60%	32%

*U-factor: a measure of the heat transmission through a building part

**Solar Heat Gain Coefficient (SHGC): fraction of incident solar radiation admitted through a window

Figure 1: Proposed Design

Characteristics of the HVAC

For the Project to be more energy efficient than Title 24 standards, the Proposed Design's total Time Dependent Valuation (TDV) energy use must be equal to or less than the Baseline Design's Total TDV energy budget. The following are the categories of TDV energy end use considered in the energy model:

- **Heating**: Annual TDV energy used for space heating
- **Cooling**: Annual TDV energy used for space cooling
- **Lighting**: Annual TDV energy used for electric lights
- **Receptacle**: Annual TDV energy used to meet equipment (receptacle) load. This value is fixed for compliance by occupancy
- **Fans**: Annual TDV energy used for fans moving conditioned air
- **Heat Rejection**: Annual TDV energy used for cooling tower operation
- **Pumps**: Annual TDV energy used pumps for hot water, chilled water, and condenser water piping systems
- **Process**: Annual TDV energy used in process loads input within the program
- **Service Water Heating (DHW)**: Annual TDV energy used for domestic (service) hot water

Mechanical System

The mechanical systems in the building provide the heating, ventilation, and air conditioning for the project. A variety of different systems can be used depending on the project requirements. This building will be served by High efficiency VRF (variable refrigerant flow) systems ranging from 10.2 to 12.10 Energy Efficiency Rating (EER) & 19.5 to 23.0 Integrated Energy Efficiency Ratio (IEER). The table below outlines the HVAC systems general parameters for the proposed Design and Title 24 baseline.

Table 4: HVAC System

HVAC System Type			
	Space Type	**Proposed Design**	**Title 24 Baseline**
Primary HVAC Type	Retail/Restaurant(1st floor) & Corridor	VRF Heat pump with Heat recovery	Packaged VAV
	Hotel + Residence	VRF Heat pump with Heat recovery	Four-Pipe Fan Coil
Average unitary Cooling Efficiency	Retail/Restaurant(1st floor) & Corridor	EER=12.10/10.7/10.2 IEER=23.0/22.40/19.5	EER=10/11.2
	Hotel + Residence	EER=12.10/10.7/10.2 IEER=23.0/22.40/19.5	Chiller per T24 Table 110.2-D
Average Unitary Heating Efficiency	Retail/Restaurant(1st floor) & Corridor	COP=3.52/3.20/3.23	Hot Water Loop (80% Efficient Boiler)
	Hotel + Residence	COP=3.52/3.20/3.23	Hot Water Loop (80% Efficient Boiler)
Fan System Operation	Retail/Restaurant(1st floor) & Corridor	Operates Continuously to provide ventilation air	
	Hotel + Residence	Cycles on based on Heating/Cooling Demand, Natural Ventilation through operable windows for Hotel Area & Mechanical Ventilation for Residential Area	

Lighting

Interior Lighting was modeled identical for both the Title 24 baseline and the proposed design energy models. Lighting power densities were modeled per the baseline Title 24 energy code requirements. Exterior lighting energy was not included in the proposed or baseline energy models per the Title 24 Energy code Alternative Compliance Manual (ACM). All exterior lighting and signage lighting will be designed to meet the prescriptive Title 24 requirements.

Receptacle Loads

The receptacle loads for the proposed building match with the Title 24 code baseline values, as required by California Energy code. The equipment power densities are modeled identical in the baseline and basis of design energy models.

Domestic Hot Water

The table provided below outlines domestic hot water heating parameters in both the baseline and proposed energy models. Proposed system for this project utilize 85% efficient boiler. Additionally, 10% of the hot-water heating system will be provided from the solar collectors.

Table 5: Domestic Hot Water System

Domestic Hot Water Equipment		
	Proposed Design	**Title 24 Baseline**
DHW Equipment Type	GAS	GAS
Equipment Efficiency	85%	80%
Solar Hot Water	10%	Not required

3. Energy Efficiency Measures

There are key performance measures and features of the Proposed Design that increase the building energy efficiency. These include:

Building Envelope

- **High-performance window system:** The Project would use a thermally broken, double glazed window system with low-emissivity coatings and insulated spandrel panels for first floor. The Project would use a double glazed window system with low-emissivity coatings for rest of floor. These combined effects reduce cooling energy during the summer and heating during the winter.
- **Efficient Exterior Walls:** For level 2 thru Level 8, The Project would use a 6" Metal stud wall with R-19 batt insulation plus R-10 rigid insulation for exterior walls. This will also reduce cooling energy during the summer and heating during the winter.

HVAC System

- This building will be served by High efficiency VRF (variable refrigerant flow) systems ranging from 10.2 to 12.10 Energy Efficiency Rating (EER) & 19.5 to 23.0 Integrated Energy Efficiency Ratio (IEER).
- VRF technology brings an array of advantages over conventional systems. It saves energy by variable-speed compressors in outdoor units & provides extremely high part-load efficiency (IEER) which helps to reduce overall energy consumption during part load condition. Also, Increase energy efficiency during heat recovery mode.
- By eliminating the need for large distribution fans and water pumps, VRF unit provides energy saving for fan and pumping energy.
- Users can set individual temperature set points for multiple zones. Variable-speed compressors with wide capacity and precise modulation help maintain each zone's temperature within a narrow range.

<u>Domestic Water Heating</u>

- Centralized hot water system: Large centralized hot water systems use more efficient equipment than individual heating systems within the units. The Project would use a centralized hot water system that is 85% efficient. The water heating system has recirculation controls to keep water in the lines hot, reducing hot water wait time and water waste. This hot water system also makes it easier to integrate renewable energy systems like solar hot water.
- Solar Collectors: The Project would use a solar hot water factor of 0.1, in that 10% of the hot water heating system will be provided from the solar collectors. Energy usage is reduced in the centralized hot water system.
- High-efficiency water fixtures: By specifying fixture flow rates per the more stringent City of Los Angeles Green Building Code versus the standard CalGreen Code, the Project will inherently use less hot water. As a result, there is lower energy consumption.

4. Energy Model Results and Conclusion

Based on the values in the model, the Energy Use Intensity (EUI) of the Proposed Design is calculated and compared to the Baseline in Table 6 below. The results show that the Project has an estimated EUI of 146.68 TDV, compared to the Baseline of 173.53 TDV of conditioned floor Area.

With the incorporation of these performance measures, the Project exceeds Title 24 standards by 15.40%.

These performance estimates are intended to be used for relative comparisons between the Proposed Design and the Title 24 baseline model. There are a range of energy efficiency measures and systems that can achieve the required 15% greater energy efficiency as required by Public Resources Code Sec. 21155.1 (a) (8).

The final combination of energy efficiency measures is best selected during the final design of the project, when other options may be considered.

Table 6. Energy Use Intensity (EUI) for Each Model by End-Use

Energy End-Use	**Notes**	**Proposed (TDV)**	**Baseline (TDV)**	**Margin (TDV)**
Interior Lighting		41.94	41.94	0.0
Space Heating	1	3.19	1.46	-1.73
Space Cooling	1	41.01	20.37	-20.64
Fans - Interior	1	36.54	63.71	27.17
Heat Rejection	2	0	6.42	6.42
Pumps	2	0.02	1.49	1.47
Domestic Hot Water	3	23.98	38.14	14.16
Total	-	146.68	173.53	26.85
Savings	**4**	**15.47%**		

Notes:

1. Corresponds to "building envelope" and "HVAC system" energy categories.
2. Does not correspond with any EEM as it is unregulated energy category.
3. Corresponds to "domestic water heating" energy category.
4. Percent savings determined by dividing total margin by total baseline energy.

Figure 2: Proposed Energy Savings Over title 24