UPTOWN PARKING GARAGE

SCHEMATIC DESIGN

30 July 2021

A new parking structure to serve the Uptown Sedona community

Contents

Schematic Design

TABLE OF CONTENTS

Section

1

Architectural Narrative

Schematic Design

The Uptown Parking Garage consists of a single parking garage of approximately 117,780 SF. The project is located on a site of about 1.24 acres. The Structure is located along along Forest Road and creates a complimentary addition to one of Sedona's main streets. The facility will accommodate approximately 270+ vehicles. The visual scale of the garage is reduced by placing one parking level below grade. The resulting one-story height preserves the red-rock views of the neighboring residences.

"Our vision for the parking structure is to employ natural earth-centered materials to develop a sophisticated contemporary design in harmony with Sedona's unique character."

The Schematic Design draws inspiration from Sedona's native forms and materials. The envisioned structure offers simple modern lines using natural earth-centered materials. Color selections will conform to Sedona's development standards, blending with the natural environment.

The structure of the facilities will comprise a cast-in-place concrete frame system. The wall construction will be cast-in-place concrete with a waterproof membrane system applied below grade. Visible concrete wall structures will comprise a warm integral color. Architectural finishes will include a Corten steel panel system and stone screening elements constructed from stone excavated from the site.

The following pages include a detailed mechanical, electrical and plumbing engineering analysis. In a separate document you will also find a complete set of Schematic Design Drawings that accompany this narrative document.

CITY OF SEDONA

gla

2

Outline Specifications

Schematic Design

SCHEMATIC DESIGN - OUTLINE SPECIFICATIONS

CITY OF SEDONA
SEDONA UPTOWN PARKING GARAGE

04 05 26	CMU Integral Water Repellent
04 22 00	Concrete Unit Masonry

DIVISION 05 - METALS

05 10 00	Structural Metal Framing
05 50 00	Metal Fabrications
05 70 00	Ornamental Metals
05 75 10	Perforated Metal Panels.

DIVISION 06 – WOOD, PLASTICS AND COMPOSITES

06 10 53	Miscellaneous Carpentry

DIVISION 07 - THERMAL & MOISTURE PROTECTION

07 13 13	Bituminous Sheet Membrane Waterproofing
07 19 00	Water Repellents
07 21 00	Building Insulation
07 21 40	Foamed Masonry Wall Insulation
07 25 00	Weather Resistive Barriers
07 26 53	Vapor Reduction Floor Coatings
07 54 00.1	Thermoplastic Membrane Roofing (1)
07 60 00	Flashing and Sheet Metal
07 72 00	Roof Accessories
07 84 00	Firestopping
07 92 00	Joint Sealers

DIVISION 08 – OPENINGS

08 11 10	Steel Doors and Frames
08 71 00	Door Hardware

DIVISION 09 - FINISHES

08 22 16	Non-Structural Metal Framing
09 29 00	Gypsum Board
09 31 00	Tile
09 65 13	Resilient Base and Accessories
09 81 00	Acoustical Insulation
09 90 00	Interior, Exterior, and Industrial Paints and Coatings
09 96 00	High Performance Coatings

DIVISION 10 - SPECIALTIES

10 14 00	Signage
10 28 13	Toilet Accessories
10 44 00	Fire Protection Specialties

DIVISION 11 - EQUIPMENT

11 52 00	Audio Visual Equipment

DIVISION 14 – CONVEYING EQUIPMENT

END OF TABLE OF CONTENS

3

Schematic Narratives - Mechanical, Plumbing, and Electrical

Schematic Design

MECHANICAL, PLUMBING, ELECTRICAL – Guiding Principles

This parking structure will be carefully engineered per the **Parksmart** energy program to perform to the highest levels achievable and will be a cutting-edge technology parking facility demonstrating City of Sedona's commitment to sustainability, green design and respect for its visitors and its surrounding community health and welfare.

Mechanical: Systems will be designed to remove carbon emissions from vehicle tailpipes using active and passive high-efficiency technologies. Energy usage will be reduced using sensors and active fan controls yet will still achieve excellent ventilation. Careful engineering of all fans and devices will reduce noise emissions to lowest levels possible.

Electrical: Solar photovoltaic renewable power production, efficient LED lighting and active lighting controls, as well as electric vehicle charging stations shall all be provided.

Plumbing: Low water usage durable fixtures will be utilized. Rainwater harvesting tanks will be provided.

2 MECHANICAL SYSTEM DESCRIPTIONS

2.1 Parking Garage Ventilation:

The top level of the parking structure will be naturally ventilated which will gain substantial points in the **Parksmart** program criteria. The (2) lower levels will have mechanical ventilation congruent with **Parksmart** guidelines such as using energy efficient mechanical systems with Demand Control Ventilation, programmable thermostats, Carbon Monoxide (CO) sensors, and occupancy controls. Table 01 of section 2.1A of Mechanical System Descriptions in this report explicitly depict how Sedona Parking Structure mechanical design will meets the required **Parksmart** parameters.

2.1A Parksmart Energy Program - Mechanical:

Table 01: **Parksmart** Planning Worksheet – Mechanical Design

Parksmart Planning Worksheet					
Project Name:	Sedona Parking Structure				
Parksmart Certification Measure	**Options**	**Max Points**	**Yes**	**Maybe**	**No**
C6 - HVAC Systems - Occupied Spaces	Energy Efficient System	2	✓		
	CO Sensors	1	✓		
	Programmable Thermostats	2	✓		
	Environmentally Safer Coolants	1	✓		
C7 - Ventilation Systems - Parking Decks	Demand Controlled Ventilation	3	✓		
	Variable Air Flow System	2	✓		
	Schedule or Occupancy Controls	1	✓		
	Calibration and Maintenance	1	✓		
	Design for Natural Ventilation	6	✓		

2.1B Parksmart Energy Program - Mechanical:

Fresh outside air ventilation will be provided by sidewall intake fans, and exhaust will be provided with garage exhaust fans in accordance with code and best practice to keep areas freshly ventilated with well above average indoor air quality. Sidewall fans, as depicted in Figure 1, will be installed on the perimeter walls and/or within the central open light wells where mechanical shafts are provided. Planning and design of fan locations and air movement patterns will be deliberate.

Figure 1: Sidewall Exhaust Fan

A metal mesh (as shown in Figure 1) or other similar physical barriers will be provided all around the interior side of the fan inside the building envelope as safety measure. Special high efficiency **Parksmart** rated sidewall fans will be selected specifically for exhausting high volumes of air at low static pressure loss. A significant design parameter is noise criteria, for which a custom fan will be selected with a carefully designed airfoil pattern ideal for quiet applications. The large diameter and low speed of the fan will assist in moving high volumes of air at relatively low speeds to reduces the fan noise significantly below that of parking garages in typical garages. The top end of the shaft will also be covered with metal louvers or grates to ensure no trespassing.

Figure 2: Exterior Mechanical Shaft Metal Louver

2.2 Computational Fluid Dynamics (CFD) Design:

Computational Fluid Dynamics (CFD) analysis will be conducted to optimize the effectiveness of mechanical ventilation system. The purpose is to minimize and maintain safe levels of toxic gases such as Carbon Monoxide (CO) and Nitrogen Dioxide (N2O), and combustible gases such as Ethanol, Propane, Refrigerants, and Ozone. Figure 3 depicts the concentrated Carbon Monoxide gas which exceeds the safe level.

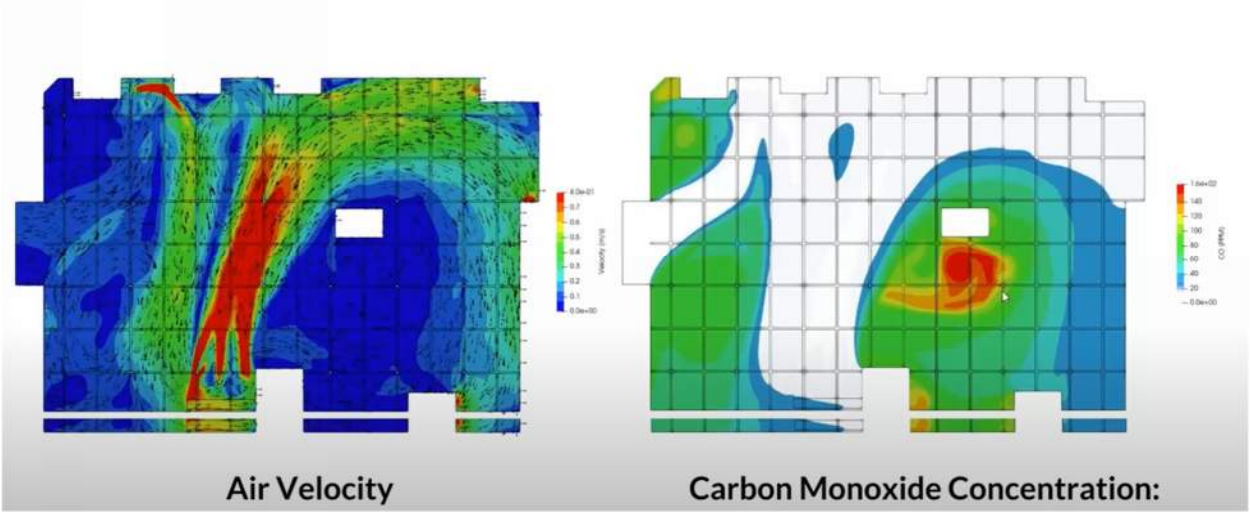

Figure 3: Concentrated Carbon Monoxide (CO) in red to be avoided

Concentrated Carbon Monoxide is caused by air stagnation due to low air velocity. CFD analysis accurately shows the presence of such problems. Solutions include placement of transfer fans having and potentially ducted air transfer systems within the parking garage.

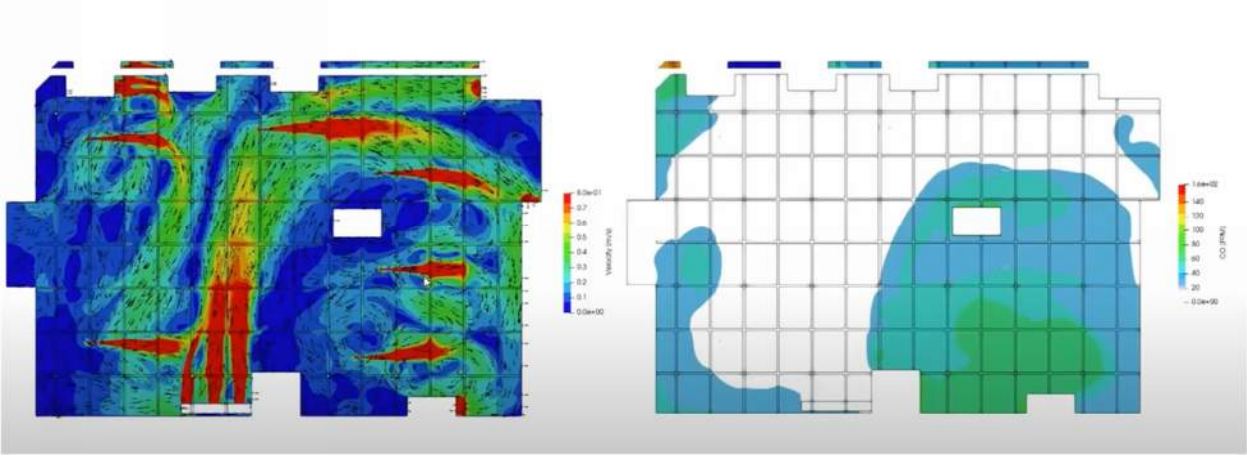

Figure 4: Carbon Monoxide (CO) Concentration After Transfer Fans

It is observed that implementing transfer fans in the design reduces Carbon Monoxide concentration level due to increasing the air velocity fields. Comparison will be conducted between several design configurations until the optimal system producing the best ventilation is determined.

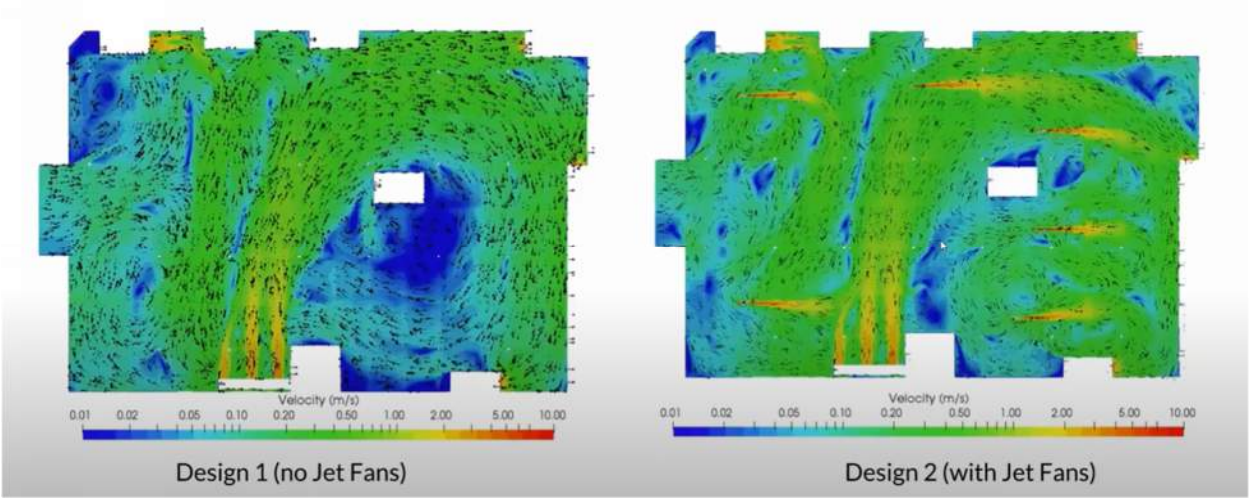

Figure 5: Air Velocity Comparison

Figure 5 shows the increase in air velocity after implementation of transfer fans.

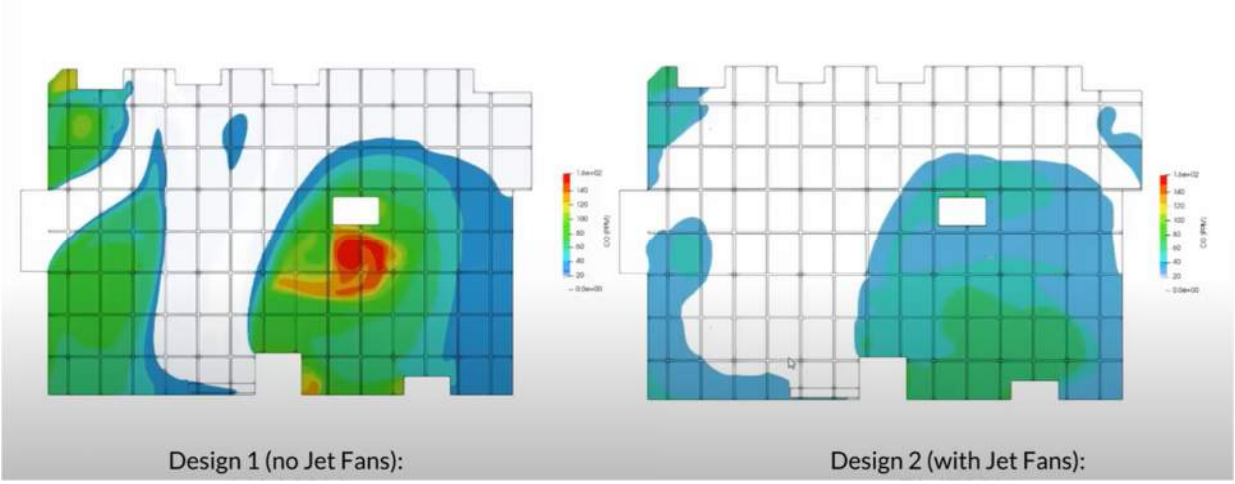

Figure 6: Carbon Monoxide (CO) Concentration Comparison

Figure 6 accurately measures the effectiveness of mechanical ventilation design.

Ducted air transfer may be utilized along with transfer fans for noise reduction purposes.

Carbon Monoxide sensors and Nitrogen Dioxide detectors will be implemented using the latest electrochemical technology, and they will be interlocked with exhaust fan system. When internal combustible vehicles are present and emitting fumes, the gas detectors activate the exhaust system across the building envelope within that specific garage level. Thus, significant energy saving will be obtained. Gas detectors will be meticulously designed and placed on structural columns to cover the entire subterranean levels, and will be installed in breathing zone heights, ranging 4-6ft. This will result in even more accurate readings. The same CO sensors will also detect combustible gases, creating a very safe environment for the public. All combustible and toxic gas detectors will be connected to a controller that monitors these levels 24/7/365.

Figure 7: Toxic and Combustible Gas Detector

Electrochemical sensors work by ionization of Volatile Organic Compound (VOC) molecules inside the sensor by ultraviolet light. The ionized molecules are then collected on a plate within the sensing element. That results in an offset of very small amount of electronic resistance within the sensing device causing more electric current to flow. Concentration of toxic gases is determined by measuring the amount of change in current. This entire process takes place in milliseconds, making the toxic gas detection extremely fast, accurate, and effective.

2.3 Restroom Ventilation:

Restrooms will be naturally tempered using louvers and screened areas. Exhaust fans will be provided in accordance with code. Restrooms will be maintained at negative pressure.

2.4 IT/Communication Room Ventilation:

IT/Communication room will be conditioned using an adequately sized climate-correct split system heat pump.

2.5 Elevator Ventilation:

High efficiency ducted split system heat pump equipped with fire dampers will be provided for the hoistway and controls room of the elevator.

3 PLUMBING SYSTEM DESCRIPTIONS

3.1 Domestic Water Systems:

All valves, piping, and equipment used in the domestic water system will be certified Lead Free and ANSI/NSF 61 & 372 approved per the 2018 IPC.

3.1A Parksmart Energy Program - Plumbing:

Table 02: Parksmart Planning Worksheet – Plumbing Design

Parksmart Planning Worksheet					
Project Name:	Sedona Parking Structure				
Parksmart Certification Measure	**Options**	**Max Points**	**Yes**	**Maybe**	**No**
C13 - Indoor Water Efficiency	Efficient Fixtures	2	✓		
C17 - Design for Durability	Design for Durability	6	✓		

3.2 Water Supply:

The water supply for the building will be City water. Domestic water system will be served with (1) water meter and (1) backflow preventer. All piping will be Type L Copper.

3.3 Waste and Vent:

4” main sanitary waste will exit the building underground. All exposed piping will be cast iron.

3.4 Plumbing Fixtures:

All restrooms will have the following extreme heavy-duty stainless steel vandal resistant fixtures**:**

Figure 9: Drinking Fountains

Plumbing isolation valves will be provided at all plumbing fixtures. Isolation valves will be located over hallways or in accessible plumbing chases for ease of access for the maintenance crew.

Figure 10: Latest “Low Flow” Urinals

Figure 11: Prison Grade Bullet-Proof Stainless-Steel Water Closets

Water closets will be the latest “low flow” 1.28 GPF flush valve water closets. Water closets to be wall mounted units. Heavy use of stainless steel for water closet fit out will help reduce corrosion.

All water closet and urinal flush valves and faucets will be “no touch” sanitary battery operated, Sloan Optima and shall be compatible with the installed fixture.

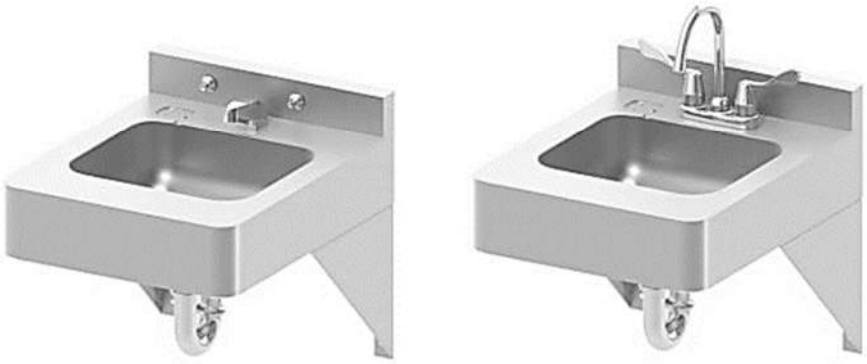

Figure 12: Latest “Low Flow” .5 GPM Lavatories

3.5 Water Heating:

High efficiency instantaneous electric water heaters will be provided.

Figure 13: Latest High Efficiency Stainless Steel Instantaneous Electric Water Heater

3.6 Roof Drainage:

6” roof drains will be designed and provided to divert water and debris off the roof.

3.7 Storm Drainage:

6”- 8” storm drains will be provided with floor drain areas. All piping will be cast iron.

3.8 Trench Drainage:

Trench drainage will be provided under each ramp using cast iron piping. For example, see Figure 14 below.

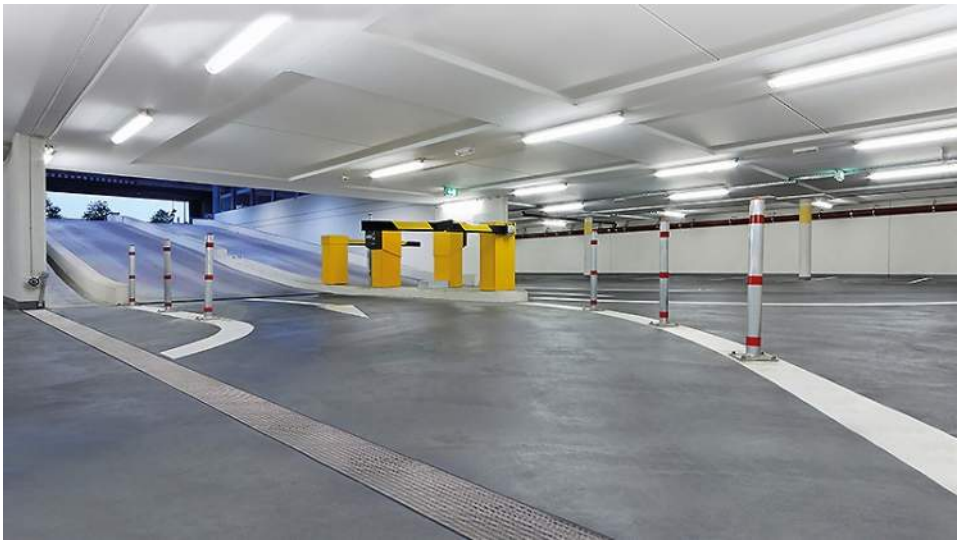

Figure 14: Parking Garage Trench Drain

3.9 Sump Pump:

Sump pump(s) will be provided to drain rain water accumulated at lower levels.

4 ELECTRICAL SYSTEM DESCRIPTIONS

4.1A Parksmart Energy Program - Electrical:

Table 03: Parksmart Planning Worksheet – Electrical Design

Parksmart Planning Worksheet					
Project Name:	Sedona Parking Structure				
Parksmart Certification Measure	**Options**	**Max Points**	**Yes**	**Maybe**	**No**
C9 - Energy Efficient Lighting System	Lighting Power Density (LPD)	7	✓		
	Average Rated Lamp Life	1	✓		
C8 - Lighting Controls	At least 75% of lighting fixtures controlled by occupancy sensors	6	TBD		
	At least 50% of lighting fixtures controlled by occupancy sensors	4	TBD		
	At least 50% of lighting fixtures controlled by advanced programmable system	3	TBD		
	At least 50% of lighting fixtures controlled by simple timer	2	TBD		
	At least 25% of lighting fixtures on lighting controls	1	TBD		
	At least 60% of (exterior) lighting fixtures controlled by photocells or occupancy sensors	2	TBD		
	At least 60% of (exterior) lighting fixtures controlled by programmable timer	1	TBD		
C5 - EV Charging Stations	Two or more DC Fast Chargers	5	TBD		
	One DC Fast Charger	4	TBD		
	Two or more AC Level II EV Chargers, equaling at least 1% of all parking spaces	5	TBD		
	Two or more AC Level II EV Chargers, equaling at least 0.5% but less than 1% of all parking spaces	4	TBD		
	At least one AC Level II EV Charger, equaling less than 0.5% of all parking spaces	2	TBD		
	Level I equipped spaces equaling at least 0.5% of all parking spaces	1	TBD		

	No additional payment is required to charge vehicles	1	TBD		
C16 - Renewable Energy Generation	At least 75% of energy is on-site renewable energy	12	TBD		
	At least 50% and less than 75% of energy is on-site renewable energy	10	TBD		
	At least 25% and less than 50% of energy is on-site renewable energy	8	TBD		
	At least 5% and less than 25% of energy is on-site renewable energy	6	TBD		
	At least 75% of energy is offset by RECs	4	TBD		
	At least 50% and less than 75% of energy is offset by RECs	3	TBD		
	At least 25% and less than 50% of energy is offset by RECs	2	TBD		
	At least 5% and less than 25% of energy is offset by RECs	1	TBD		

4.1 Utility Service and Service Entrance Section:

The existing utility service is anticipated to be supplied from the nearest APS point of connection, potentially via overhead primary on Forest Road. The facility service will include underground primary, APS pad mounted transformer, and 480/277V service entrance section (SES). Existing overhead utilities requiring conversion to underground will be coordinated with APS. The estimated service rating to serve the proposed facility lighting, mechanical, elevator, technology, and up to 20% EV charging spaces is approximately 800 amps at 480/277V, 3 phase. Providing future flexibility may produce a service rating of 1200 amps or more. The service entrance section shall accommodate multiple PV system connection types including both line side and load side tap for maximum flexibility. Other service entrance section features shall include an owner power meter, surge protection device, and provision for future physical expansion. The SES shall be located within an interior electrical room provided that APS access can be achieved. Exterior services may be concealed by way of structure or screening.

Figure 15: APS Transformer

4.2 Power Distribution:

A main electrical room will house the electrical equipment including 480V switchboard, panelboards, and low voltage transformers. Other equipment to be located in the main electrical room will include a central inverter for emergency power, lighting control panel, fire alarm control panel, ground bus, and other building electrical hardware. Strategically placed electrical chases will allow for vertical power distribution. Spare conduits or sleeves will provide future access between levels for flexibility in power and low voltage system distribution. Surge protective devices (SPDs) shall be located at service entrance and panelboards to protect personnel and equipment from voltage surges.

Figure 16: Switchboards, Panelboards, and Low-Voltage Transformers

4.3 Emergency Power:

A three-phase central inverter shall provide emergency power to lighting and life safety systems and will be located in the main electrical room out of view.

Figure 17: Three-Phase Emergency Power Central Inverter

4.4 Telephone / Data Systems:

Telephone/data systems shall enter the building at the dedicated IT / MDF room. Conduits and secure pull boxes shall be installed to create pathways throughout the facility for low voltage systems such as video surveillance, access controls, and communication. The MDF shall have fire treated plywood mounted on all sides, ladder rack mounted around perimeter and over center racks, ground bus, receptacles each wall and a dedicated sub panel for server rack power.

Figure 18: Telephone/Data Systems

4.5 Site and Garage Lighting:

Site and garage lighting shall be environmentally sensitive, full cutoff, to minimize light pollution and light spill at property lines. Total area fixture wattage, in addition to complying with energy codes in force, shall pursue low lighting power densities and average lamp life to support **Parksmart** credits C9.

Rooftop level parking shall utilize pedestrian scale (12’ high) pole mounted luminaires within center areas which will be supported by lower level fixtures around the perimeter. The lighting fixture style, location, and mounting shall be coordinated closely with the PV structure. Garage parking levels will utilize ceiling mounted luminaires. Exterior area lighting may be supported with wall mounted luminaires and landscape lighting. Lamp temperature throughout shall be warm Kelvin, wildlife friendly, to coordinate with local codes and to minimize ambient lighting impact to the surroundings.

Emergency lighting shall be supplied from a central inverter, providing emergency illumination throughout the garage and pathways during power outages.

Area lighting will be controlled via programmable lighting controller with photocell and astronomical timeclock programming. Garage lighting shall be high efficiency with integral occupancy sensing controls to further reduce light levels during non-occupied times which will support **Parksmart** credit C8.

Figure 19: Energy Efficient Lighting System

4.6 Solar Photovoltaic (PV) System:

Provisions for large scale solar photovoltaic (PV) system shall be provided in support of **Parksmart** renewable energy credit C16. Total output and percentage of on-site energy will be determined by the rating and coverage of PV modules on the upper level. Connection to the utility shall occur by way of line or load side connections at the service entrance section. Conduit infrastructure including spare conduits shall connect the electrical room to the roof level and other strategic points. Inverters will be located out of view as much as is possible. Exterior conduit shall be coordinated with the PV structure to minimize visibility and promote concealment.

Figure 20: Solar Photovoltaic (PV) System

4.7 Electric Vehicle (EV) Charging Station:

From 5-20% (14-54) of parking stalls shall contain EV charging stations. Additional EV charging station provisions shall be provided during base build by way of electrical capacity and raceways installed to the future charging areas, making future installations clean and efficient for installers. The final EV charging hardware specifications and any metering will be selected as coordinated with owner's specific preferences.

Figure 21: Electric Vehicle (EV) Charging Station

4.8 Fire Alarm:

A fire alarm system shall be installed with the main fire alarm control panel located in the electrical room and the remote annunciator located in a common area if applicable. All wires will be installed in conduit. The fire alarm panel shall be connected to a central station. Fire alarm system shall be specified for compatibility with the Owner's preferred suppliers. Heat detectors shall be included in electrical, IT, and mechanical rooms. The elevators shall have the required protective devices per code. Notification devices (horn/strobes) shall be located throughout the facility and spaced per NFPA 72. Fire alarm conduit shall be concealed and coordinated with structure design to minimize the amount of exposed conduit within the facility.

Figure 22: Fire Alarm System

4.9 Grounding:

A new ground electrode system shall be installed at the new service and extended to building electrical room with a #3/0 bare copper conductor and connected to ground buss within the electrical room. The ground bus shall serve as the intersystem bonding connection and grounding electrode connection for a PV system.

Figure 23: Ground Electrode System

4.10 Control System:

Interior and exterior card readers, associated devices, wiring, and equipment shall be located as coordinated with owner's IT representative(s) and users. 120V power, junction boxes, and rough in shall be installed at all primary exits, powered doors, and secure area doorways and gates. Rough-in shall be coordinated with garage construction to minimize the amount of exposed conduit.

4.11 Video Surveillance System:

Interior and exterior cameras, associated devices, wiring, and equipment shall be located as coordinated with owner's IT representative(s) and users. Rough in for cameras shall be provided. Rough-in shall be coordinated with garage construction to minimize the amount of exposed conduit.

5.0 Mechanical, Plumbing, Electrical Codes Standards

The following codes, guidelines, regulations, and other references serve as standards and guidelines for design and City of Sedona amendments will be followed:

2018 International Building Code (IBC)

2018 International Mechanical Code (IMC)

2018 International Plumbing Code (IPC)

2018 International Fuel Gas Code (IFGC)

2018 International Energy Conservation Code (IECC)

2017 National Electric Code (NEC)

American Society of Heating and Refrigeration and Air Conditioning Engineers (ASHRAE) 55-2004, 62.1-2007 & 90.1-2007

Mechanical Plumbing Section by: Gregory Piraino PE, Principal, Applied Engineering

Electrical Section by: William Bethurum PE, Principal, Volta US