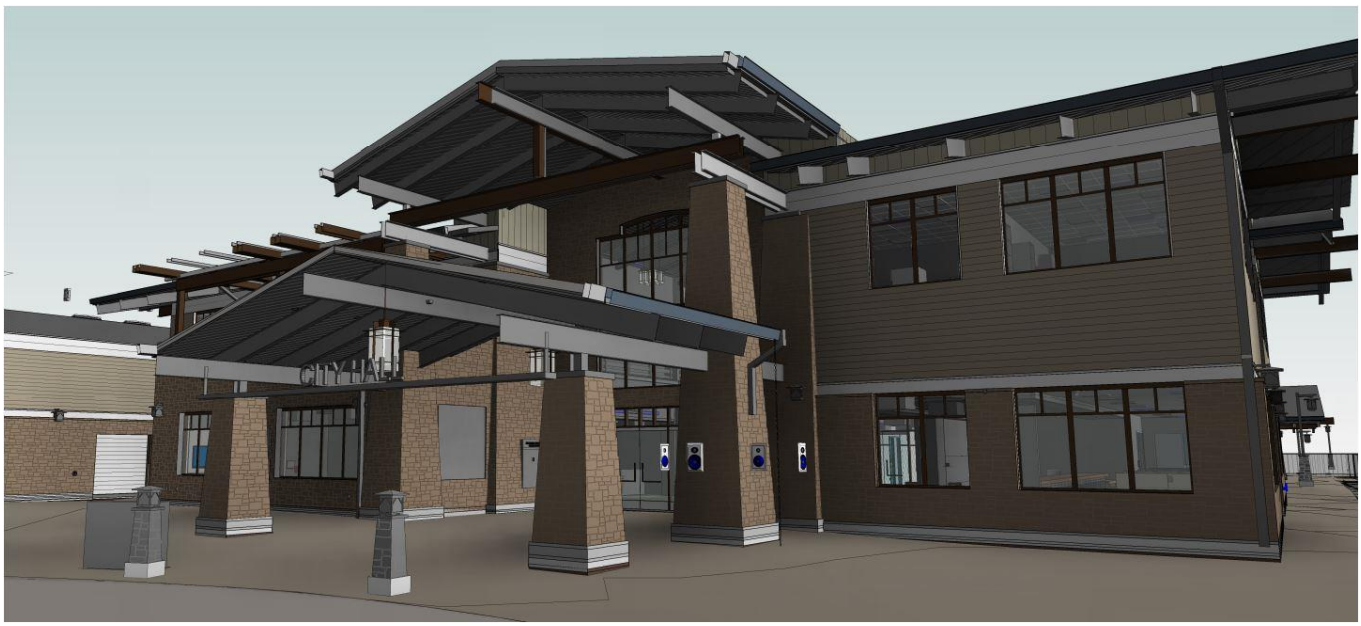
City of Lake Forest City Hall Administration Building

Leadership in Energy and Environmental Design (LEED)

Innovation in Design

Green Education



Introduction

The new City Hall Administration building is in suburban Southern California adjacent to hiking and bike trails. The site is designed to support and enhance outdoor activities, as well as serve as the City's 100-year home with facilities that address the community's needs under the LEED certification system.

LEED, or Leadership in Energy and Environmental Design, is the most widely used green building rating system in the world. Available for virtually all building, community and home project types, LEED provides a framework to create healthy, highly efficient and cost-saving green buildings. LEED certification is a globally recognized symbol of sustainability achievement.

Projects pursuing LEED certification earn points across several categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, Innovation and more. Based on the number of points achieved, a project then earns one of four LEED rating levels: Certified, Silver, Gold or Platinum.

Client:	**City of Lake Forest**
LEED Consultant:	**Verdical Group**
General Contractor:	**Bernards**
Architect:	**Carrier Johnson +Culture**
Mechanical, Electrical, Plumbing Engineers:	**Tk1sc**
Location:	**Lake Forest, CA**
Space Type:	**Municipal Office**
Gross floor area:	**53,265 sq ft**
LEED rating system:	**LEED v2009 (v3) NC**
Target Certification:	**Silver**
Total points achieved:	**54**

Aim

The project's target was to achieve a high level of sustainability performance measures for the well-being of the occupants of the building.

LEED categories targeted

Credits achieved

Sustainable site	**14 of 26 points**

Construction Activity Pollution Prevention **Prereq.**

The team created and implemented an erosion and sedimentation control plan for the site. The plan was structured as per the 2003 EPA Construction General Permit. The ultimate goal of this activity was to prevent loss of soil due to strong winds or stormwater and thereby also reducing the pollution caused by dust particles.

Site Selection **1/1**

The selected site helps reduce the environmental impact through the location of the buildings. It does not include construction on any of the restricted areas such as:

- sensitive land such as prime farmland
- undeveloped land that has elevation lower than 5ft.
- within 100 feet of any wetland
- A site that was underdeveloped land within 50 ft of a water body
- A land which prior to acquisition for the project was public parkland.
- Specified areas for habitat species that are threatened or endangered.

Development Density & Community Connectivity **5/5**

The project site is located at a previously developed area thereby saving land, energy, and resources to prepare a new site. It is within ½ mile of a residential zone or neighborhood with development density of 10 units/acre. As a matter of convenience for the occupants, a lot of basic services such as Schools, Medical facility, Bank, Restaurants etc. are within a radius of ½ mile and is accessible by pedestrians. The picture below shows some more facilities that are accessible from the site.

FIGURE 1: SITE NEIGHBORING FACILITIES

Alternative Transportation – Bicycle storage & Changing Rooms 1/1

The building has 20 exterior bicycle storage rack facilities to encourage more and more people to opt for a healthier and eco-friendly option to commute to work. Opting to commute by bicycle can help people improve their health as it also is a source for recreational physical activity. Currently peak building users (FTE + peak transients) for this building are 214. At present, the building provides secure bicycle racks/storage to 9.35% of users. To support this, the building also provides about 2.5% FTE the facility of 4 changing rooms and 10 showers at both level 1 and 2 of the building. The plans below indicate the location of bicycle storage racks and changing rooms.

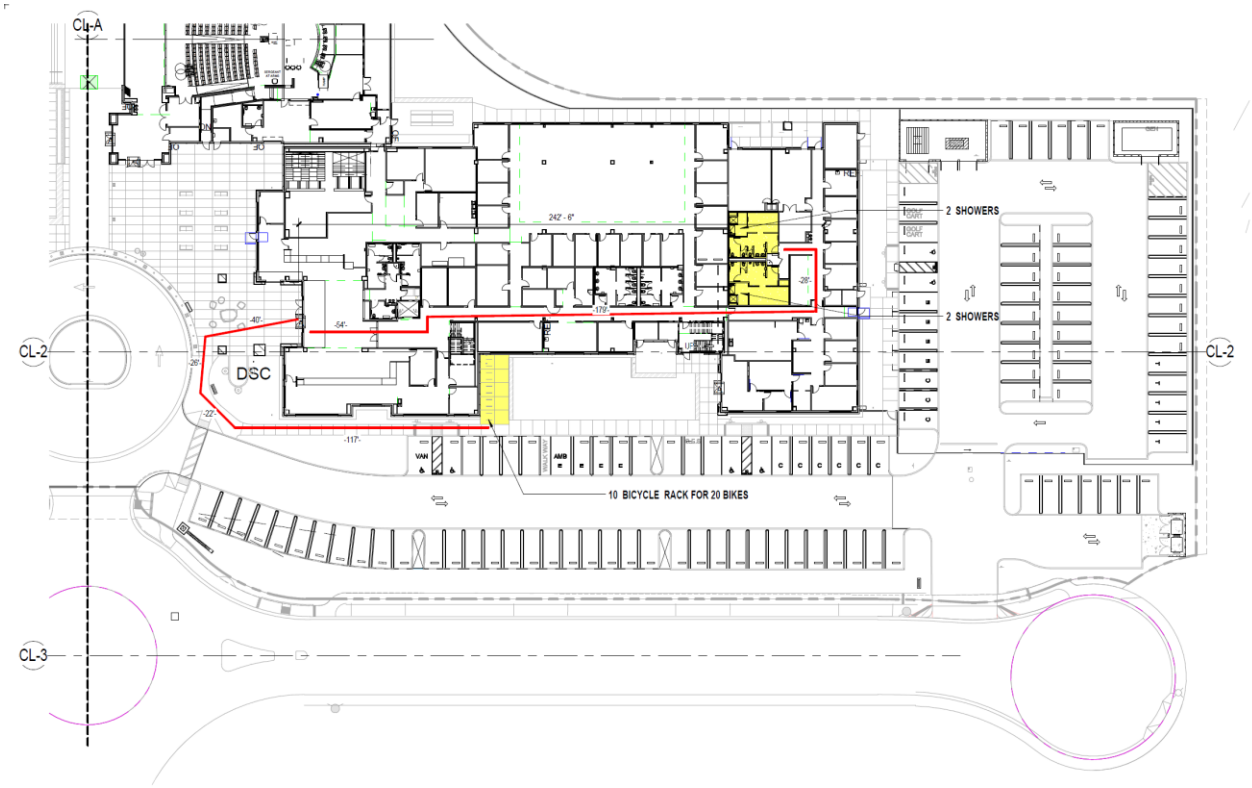


FIGURE 2 FIRST FLOOR PLAN WITH BICYCLE RACK AND SHOWER LOCATION

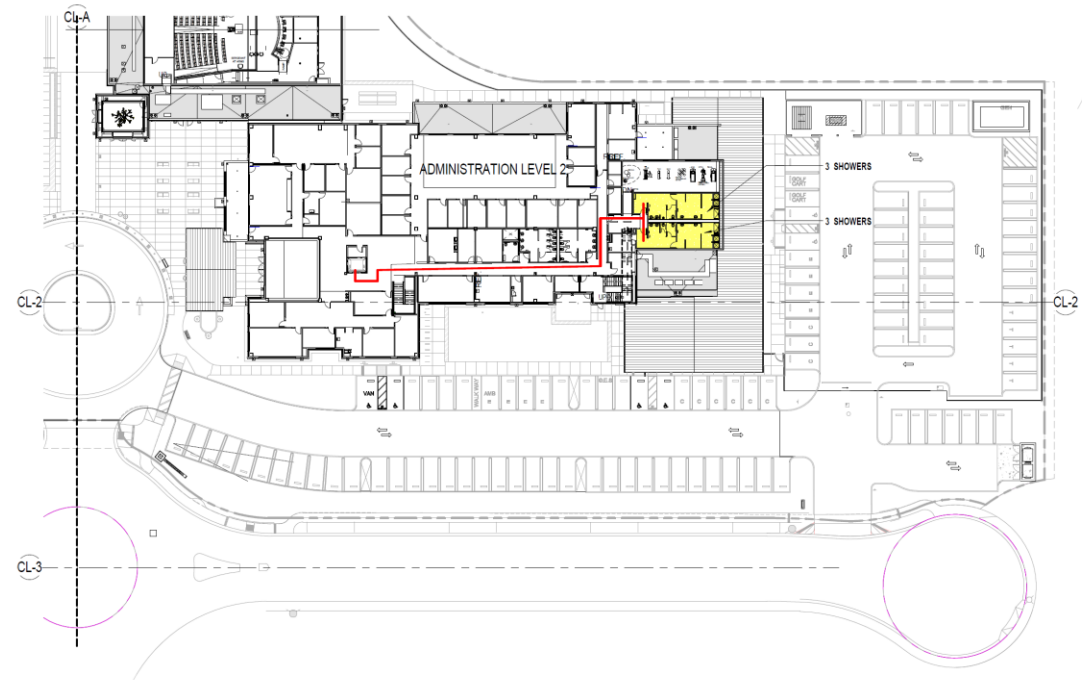


FIGURE 3 SECOND FLOOR PLAN WITH BICYCLE RACK AND SHOWER LOCATION

Alternative Transportation – Low emitting & Fuel-Efficient Vehicles 3/ 3

People who choose to commute with “Clean Air vehicle” i.e. low-emitting and fuel-efficient vehicles are provided with Specific parking spaces. A total of 8 of the 113 parking spaces i.e 7% of the total parking spaces are allotted for these vehicles. The plan below shows the designated parking for clean air vehicles.

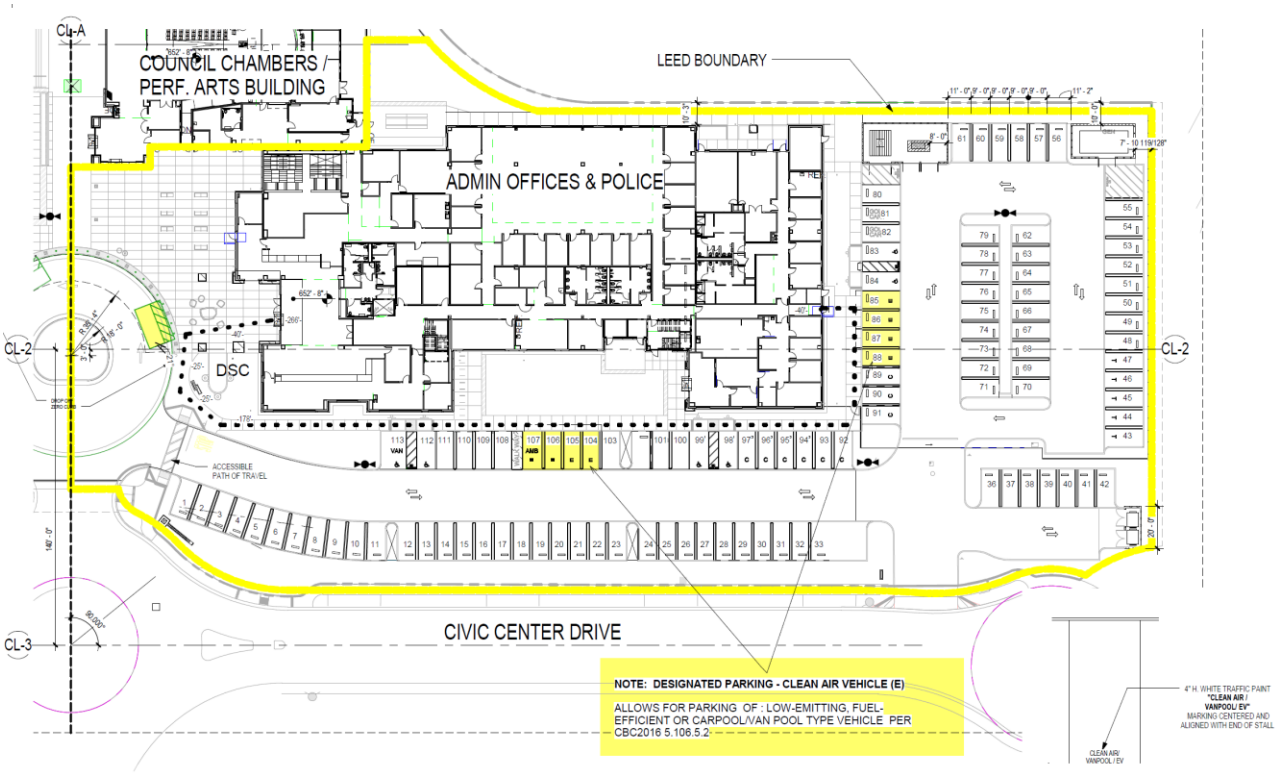


FIGURE 4 PARKING SPOT FOR CLEAN AIR VEHICLES

Alternative Transportation – Parking Capacity 2/ 2

People who opt to carpool to work are provided designated parking spots. The parking includes 113 total non-residential parking spaces, out of which 10 spots or 8% of parking spaces are for people who travel to work by car or van pool. The below plan below depicts the carpooling spaces.

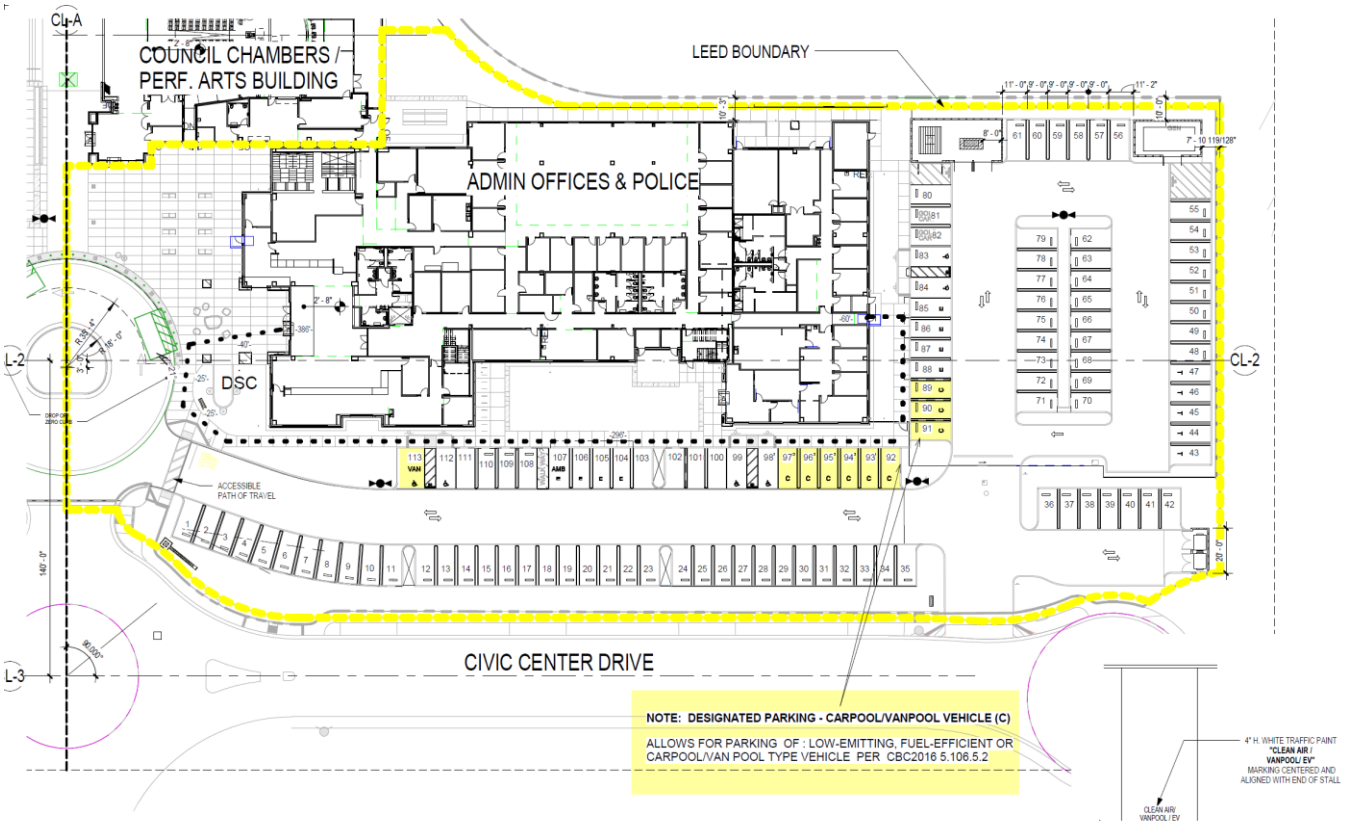


FIGURE 5 PARKING SPOTS FOR CAR/VAN POOL VEHICLES

Heat Island Effect, Roof **1 of 1 pt.**

The roof construction for this building includes two types of materials. The Single ply roof: Carlisle Sure-Flex PVC and Metal roof: Centria. The SRI values for these roofs are 69.22 and 37.69. The high-albedo roof accounts for 35,641 sq ft., which is about 90% of the roof. Choosing such high reflective roofing helped the building to achieve high reduction in heat gain through the roof.

Water efficiency	10 of 10 points

Water efficient landscaping **4 /4**

The landscaping and irrigation systems includes vegetated roofs and/or courtyard landscaping which uses captured rainwater, recycled wastewater/greywater or water treated specifically for non-potable uses. 100% of water used for landscaping is non-potable treated water from the municipality.

Innovative wastewater technology **2/2**

The municipal plant catering to the site location generates 155,727.25 gal of treated non-potable water which is equal to the captured site water. This water further helps fulfill the demand for the flush water. The flush water demand equals the water generated. Therefore, 100% of demand of flush fixtures is through municipal treated

wastewater. As the reduction is double the required percentage, an extra credit is earned for exemplary performance.

Water use reduction **4/4**

The project achieved 20% reduction in water use and then further achieved 39% reduction of non-potable water use by using efficient fixtures. All flush fixtures in the project (water closets and urinals) use municipal recycled water. This would mean that the municipal water source provides 100% of the water needed to operate the flush fixtures. Thus, the reuse of water led to the water use reduction of 64%, contributing it to achieving an extra credit for exemplary performance.

Energy and Atmosphere 7 of 35 points

Fundamental Commissioning of the Building Energy Systems/ Enhanced Commissioning **2/2**

The project has been assigned with a commissioning agent who reviewed the OPR and BOD to get a better sense of the project. He then incorporated the commissioning requirements to the construction documents and developed a commissioning plan. Prior to the construction phase the CxA reviewed the completion of commissioning activities. A similar design review was conducted prior to mid construction document phase to make sure that everything is as per schedule. During this process the CxA also reviewed the contractor's submittal applicable to systems that were to be commissioned. The commissioning systems included of energy related systems namely HVAC, DHW, Lighting and controls, Renewable energy systems have been assigned as per the OPR, BOD and the Construction Document.

Minimum/Optimize Energy Performance **4/19**

This project achieved a 21.45% energy cost savings to meet the requirements for this prerequisite and credits.

Fundamental Refrigerant Management **Prereq.**

The building has been provided with all new latest equipments. The equipments have been placed within the project boundary. The equipment types used are VRF, Split AC or heat pump, while the refirigents used are R-407C and R-410A.

Measurement & Verification **1 of 3 pts.**

This project obtained a design score of 89 for Energy Star and registered with the Energy Star Portfolio.

Green Power **2 of 2 pts.**

The clients agreed on engaging into a 2-year program for renewable energy. This will help provide at least 35% of building electricity generated by PV's.

Materials and Resources 4 of 14 points

Storage & Collection of Recyclables **Prereq.**

Recyclable bins have been provided on both the levels of the building so that they are easily accessible by the occupants. Plans below show the location of the recyclable bins.

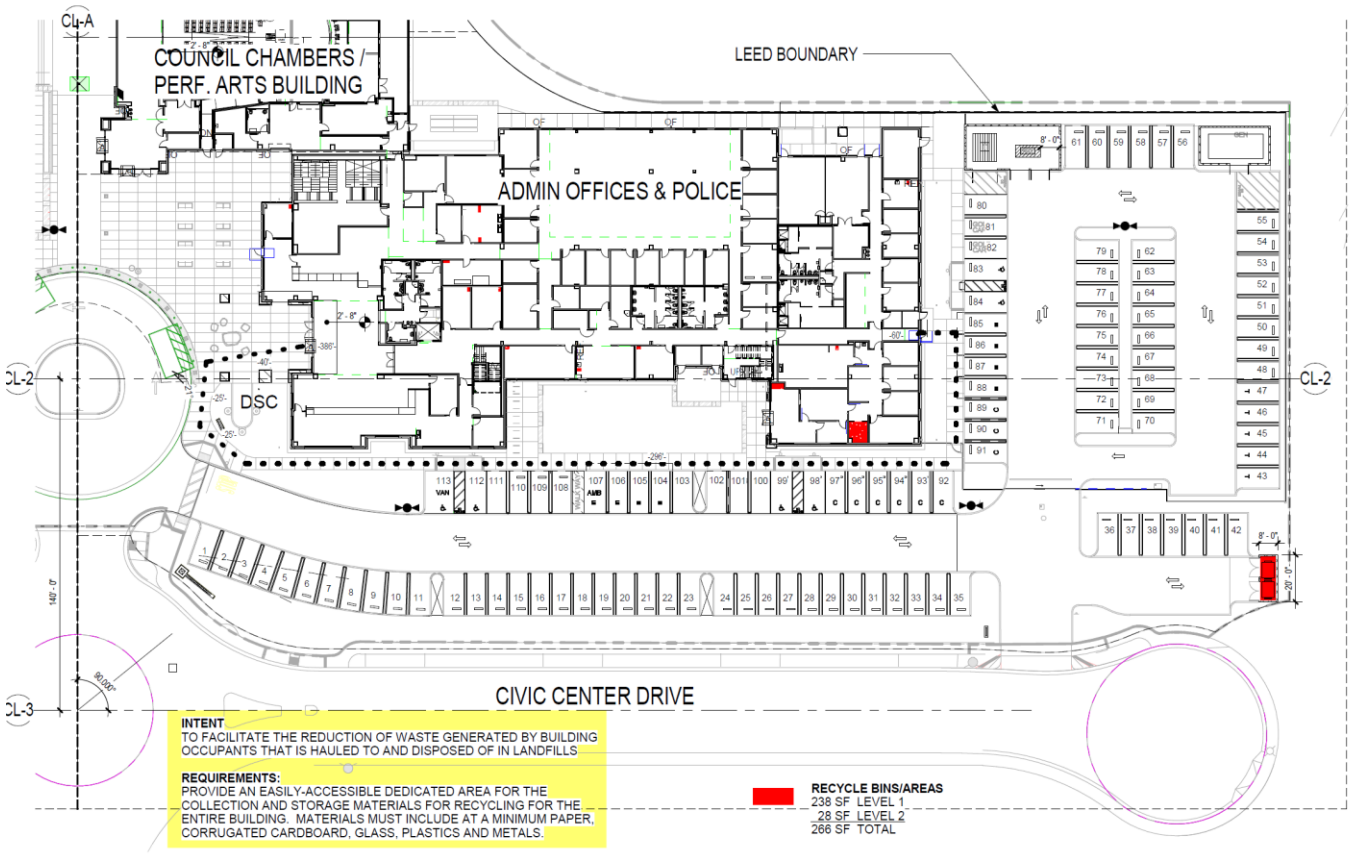


FIGURE 6 RECYCLABLE BINS ON LEVEL 1

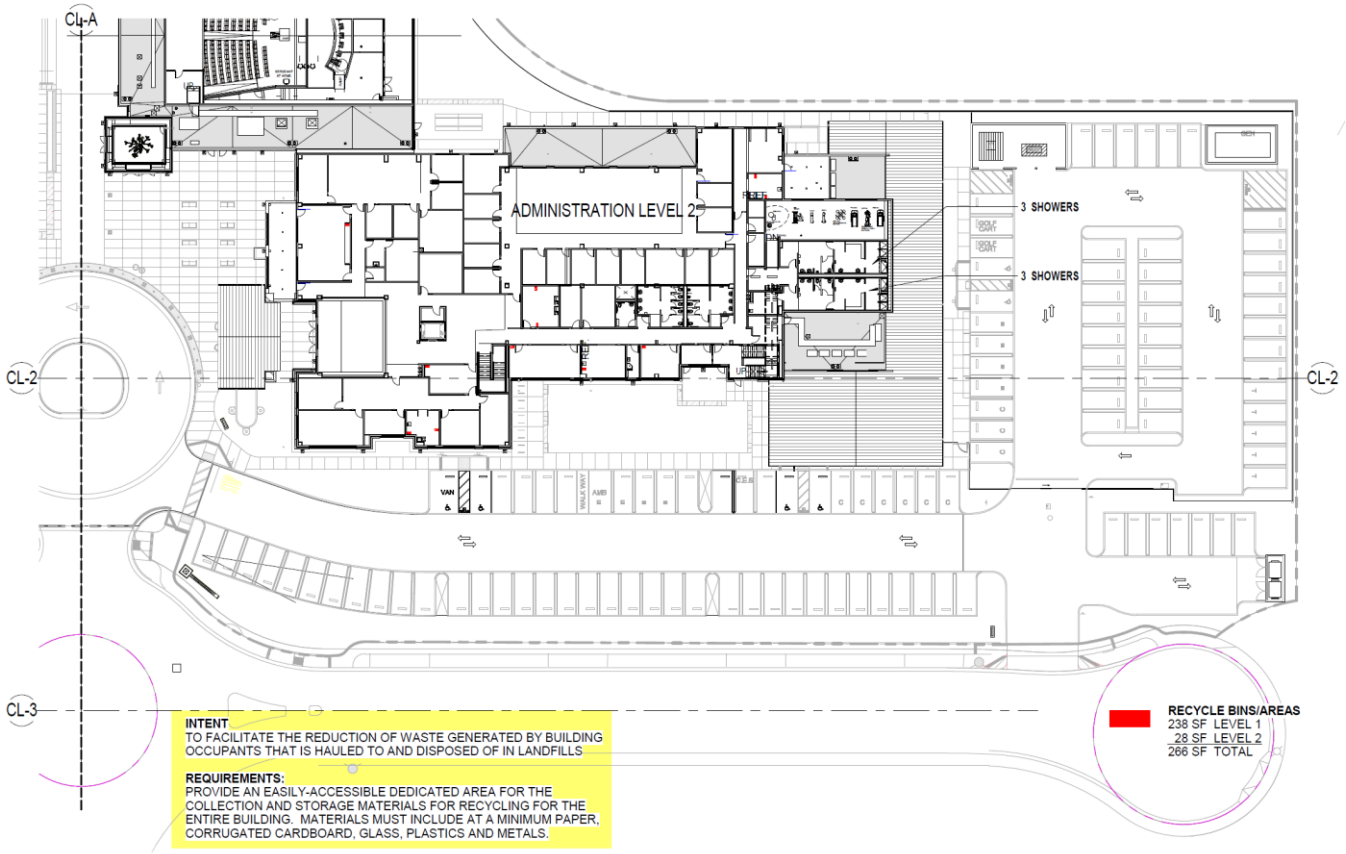


FIGURE 7 RECYCLABLE BINS ON LEVEL 2

Construction Waste Management **2/2**

As shown in the plans above, approximately 266 sqft of 53,265 sqft of the project is dedicated to collection and storage of recycling waste. Hence, an effort has been made to segregate the recycled waste on site.

Recycled Content **1/1**

The building's recycling program will consist predominantly of paper but will also have single-stream recycling that will accommodate all five waste streams: paper, cardboard, plastic, metal, and glass. The parking lot will accommodate recycle containers that will provide 8 cubic yard of storage space for recycling. These bins are accessible by both the janitorial service that will be collecting recycling from all floors of the building daily and the recycling hauler that has pick-up services scheduled weekly.

Regional Material **1/1**

10% of the materials installed on the project have been extracted from within 500-mile radius of the site.

Certified Wood **1/1**

Wood that has been certified by FSC has been used for the permanently installed materials/objects in the project. The structural framing, flooring, sub-flooring, wood doors and finishes included are the minimum components that have been included.

Minimum IAQ Performance **Prereq.**

The project is mechanically ventilated and has VRF system as part of HVAC. It's a single zone system and no critical zone is required for this system.

Environmental Tobacco Smoke (ETS) control **Prereq.**

No smoking signs within 25' of the entrance and inside the building have been installed at various entrance and exits of the building to alert tenants and visitors.

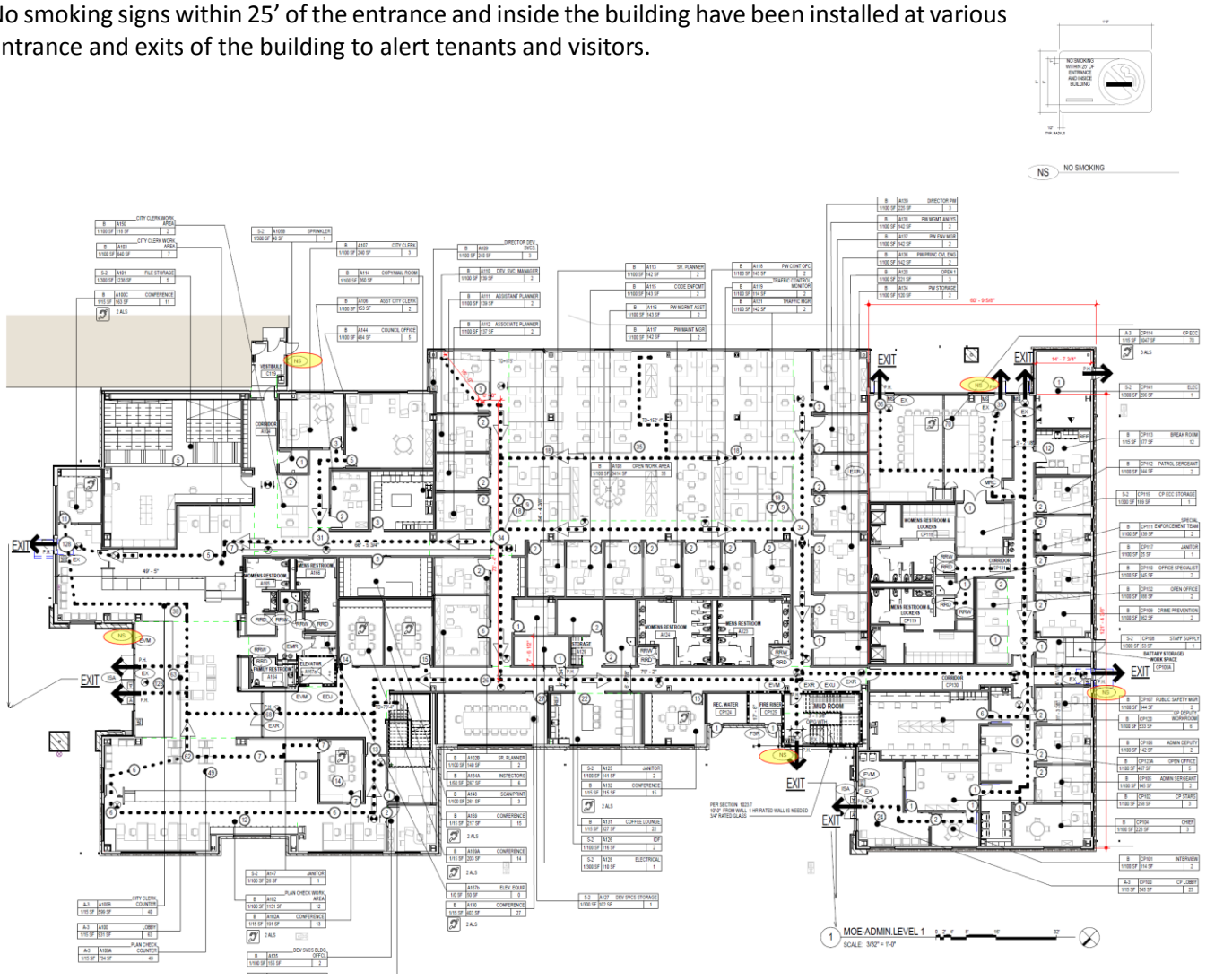


FIGURE 8 NO SMOKING SIGNAGE PLAN

Outdoor Air Delivery Monitoring **1/1**

The project contains both densely and non-densely occupied spaces. The building has been provided with monitoring systems to ensure the minimum ventilation standards. The plans below show the densely occupied rooms on both the floors that have been provided by the CO_2 monitors. The monitors have been installed at 4' height and is designed as 900ppm.

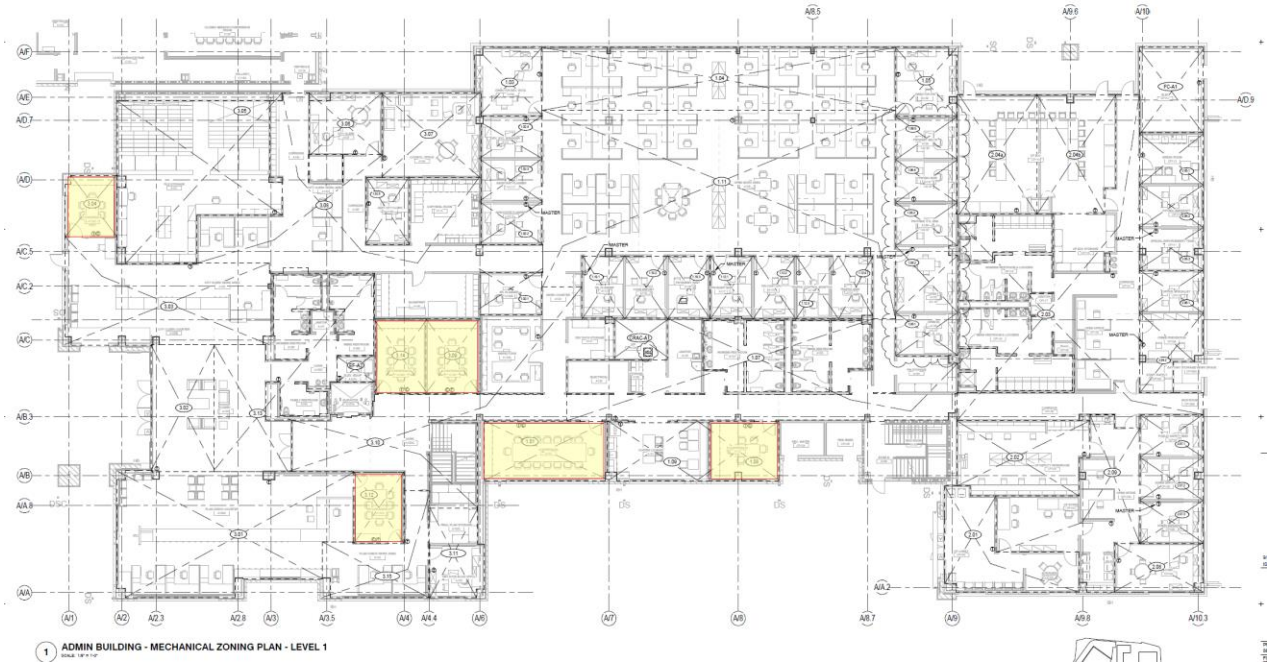


FIGURE 9 CO2 SENSOR PLACEMENT ON LEVEL 1

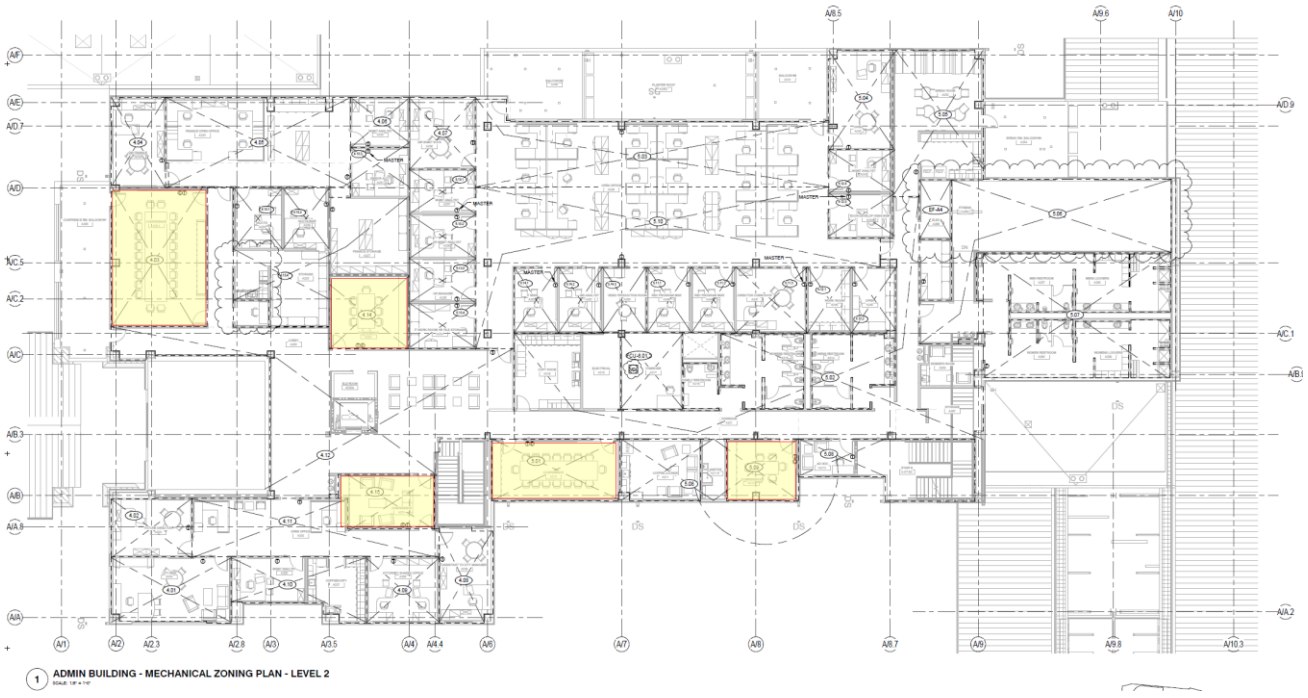


FIGURE 10 CO2 SENSOR PLACEMENT ON LEVEL 12

Increased Ventilation **1/1**

All the ventilation AHUs for the project are at least 30% above the minimum ASHRAE 62.1 standards.

Construction IAQ Management Plan, During Construction/Before Occupancy **1/1**

The project meets the control measures as per SMACNA Guidelines for Occupied buildings under construction. The materials have been protected from moisture damage by storing them in dry areas. The air filters installed have a minimum efficiency (MERV) of 8 as per ASHRAE 52.2 standards. After all the finishes were installed onsite a flush-out of the building air supply was performed to promote the comfort and well being of the building occupants.

Low-Emitting Materials:

Adhesives & Sealants, Paintings & Coatings, Flooring System, Composite wood & Agri fiber products 4/4

In an effort to reduce the quantity of indoor air contaminants that are odorous, irritating and/or harmful to the comfort and well-being of installers and occupants, materials were carefully selected to comply with VOC limits and product type specific testing requirements.

Indoor Chemical & Pollutant Source Control **1/1**

Efforts to reduce the outdoor hazardous particulates and chemical pollutants have been taken by installation of permanent entryway systems such as grilles, mats etc. at the entrances of the building and by providing exhaust in the rooms such as copying room, janitor room etc. that may be exposed to hazardous chemicals. For occupied spaces that are mechanically ventilated, the filtration (MERV) rating of 13 or higher has been used.

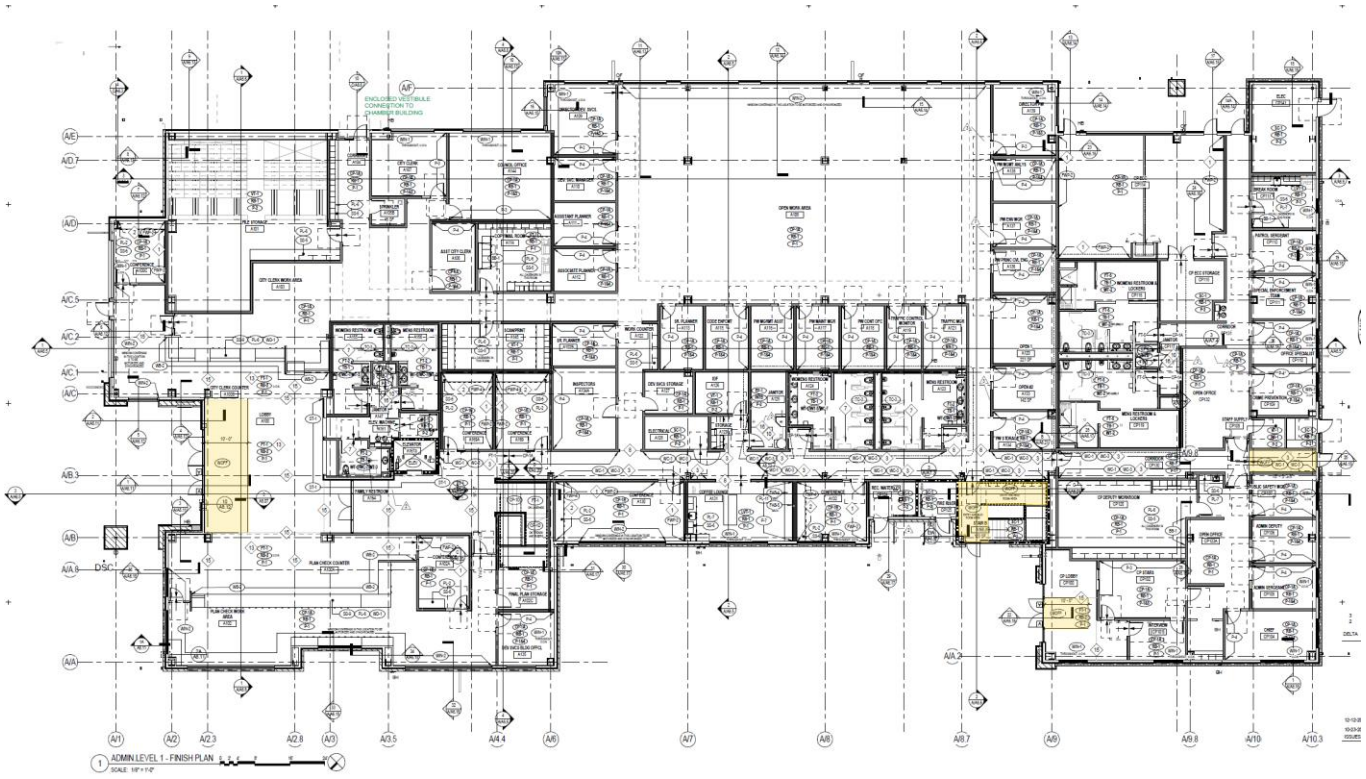


FIGURE 11 ENTRYWAY SYSTEM PLAN

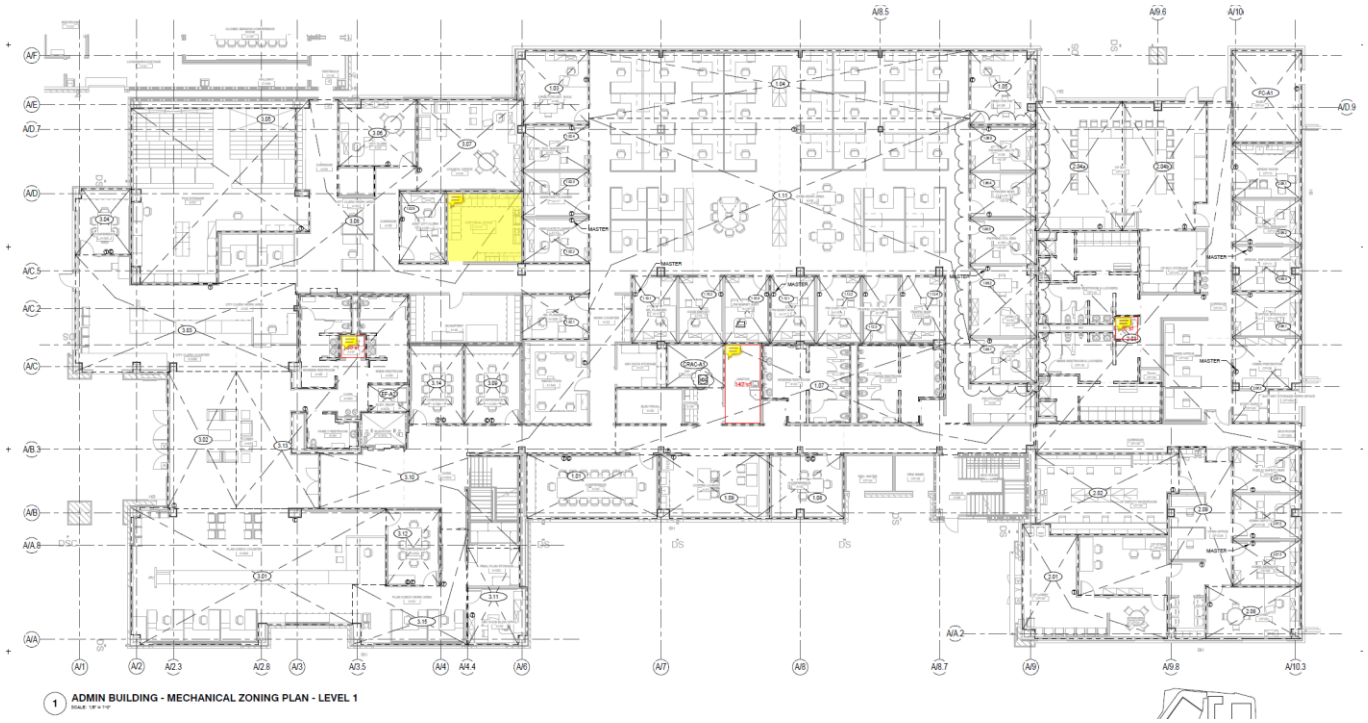


FIGURE 12 ROOMS WITH EXHAUST FANS

Controllability of Systems, Lighting 1/1

The building consists of both individual occupant spaces and multi-occupant spaces. 41% i.e. 62 of 148 individual occupied spaces are provided with lighting controls whereas 100% lighting control is provided for shared multi-occupied spaces. Also, every workstation in the open offices have been provided by LED task light to promote the productivity, comfort and well-being. Below are the plans showing the lighting controls for both the plans.

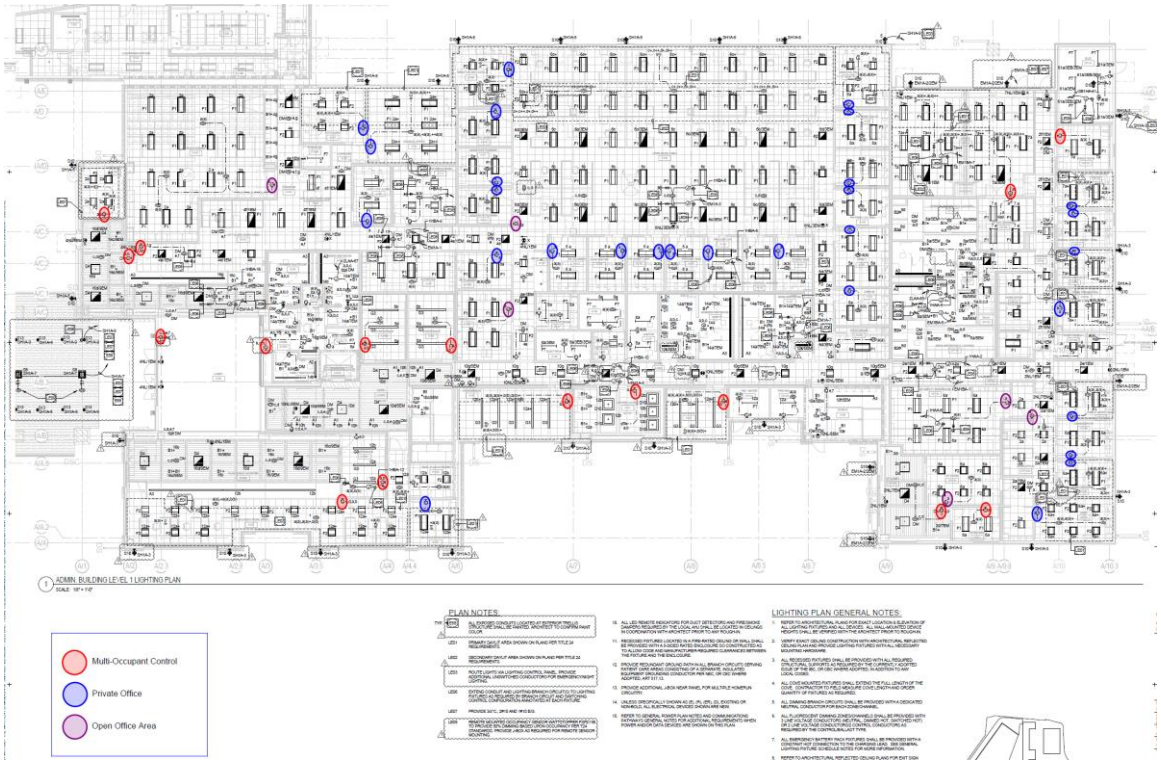


FIGURE 13LIGHTING CONTROLS AT LEVEL 1

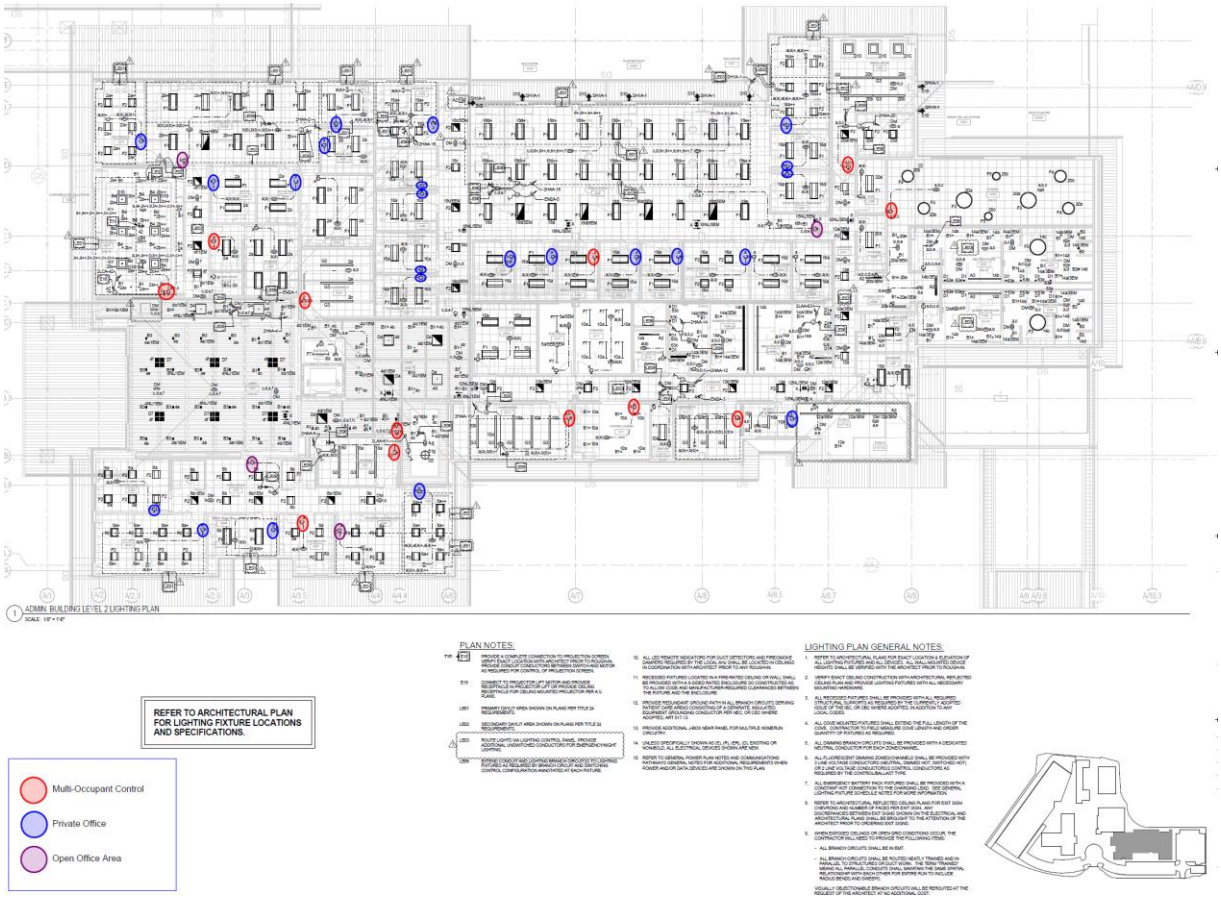


FIGURE 14LIGHTING CONTROLS AT LEVEL 2

Thermal Comfort, Design **1/1**

The project's HVAC system meets the space design parameter for both part and full load conditions. The spaces are grouped for efficiency based on the activity level, the operative temperature and humidity range based on ASHRAE 55 standards. The climatic design condition used for peak cooling load calculation is 88 deg F and for peak heating load calculation is 39 deg F.

Thermal Comfort, Verification **1/1**

The project is well ventilated by mechanical systems. CO_2 sensors have been placed at heavily occupied regions and the devices are programmed to generate alarms when the conditions vary by 10% or more from the input. Smoking is prohibited within the building. Lighting controls are provided are enabled with automatic adjustments to meet the needs and preferences of the occupants. Around 6-8 months post occupancy stage, survey forms will be sent out to the occupants to track the thermal comfort in the building.

Innovation 4 of 6 points

Exemplary Performance: Water Use Reduction **2/2**

The projects achieved an exemplary performance credit for Innovative wastewater technology as it uses municipal treated wastewater to supply 100% of demand from flush fixtures. Thereby saving 79% indoor water use saving, which exceeds the exemplary performance threshold.

Exemplary Performance: Reduced Mercury **1/1**

The project proposed the use of low mercury fixtures. The purpose was to reduce toxic materials used and installed on site by installing no mercury containing lights. Hence, high efficiency LED lighting are used as an alternative.

Innovation in Design: IPM **1/1**

The project team created an Integrated Pest Management (IPM) plan to be incorporated in operations and maintenance to minimize pest problems and exposure to pesticides.

Innovation in Design: Green Education **1/1**

The current document provides the case study of this building to be able to achieve this point.

LEED AP **1/1**

The project includes a LEED Accredited Professional working on the documentation and recommended best practices to achieve points under each credit.

Regional Priority 2 of 4 points

The project gains 2 points under this category for the Innovative wastewater technology that helped supply 100% of demand as it uses municipal treated wastewater to supply 100% of demand from flush fixtures.