CALIFORNIA AIR RESOURCES BOARD

PROGRAM UPDATE REPORT

January 7, 2015

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Executive Summary

The California Air Resources Board (CARB) is a part of the California Environmental Protection Agency (CalEPA). CalEPA reports directly to the Governor's Office in the Executive Branch of California State Government.

The Mission of the California Air Resources Board:

- To promote and protect public health, welfare and ecological resources through the effective and efficient reduction of air pollutants while recognizing and considering the effects on the economy of the state.

The Major Goals of the Board are to:

- Provide Safe, Clean Air to All Californians
- Protect the Public from Exposure to Toxic Air Contaminants
- Reduce California's Emission of Greenhouse Gases
- Provide Leadership in Implementing and Enforcing Air Pollution Control Rules and Regulations
- Provide Innovative Approaches for Complying with Air Pollution Rules and Regulations
- Base Decisions on Best Possible Scientific and Economic Information
- Provide Quality Customer Service to All CARB Clients

In 2006, a report was developed to outline the requirements for a new CARB emissions testing facility, including associated offices and ancillary spaces needed to support the emissions testing labs and analytical testing labs. The new CARB facility was assumed to be located at a yet to be determined site in southern California.

IBI Group has been tasked to review the 2006 Report, consider the current evolution of CARB, and update the 2006 Report.

The current existing total gross area occupied by CARB in Southern California is approximately 132,000 **gross square feet, excluding parking and outside facilities**. The existing space is deficient in many ways due to lack of space per the state space allowance standards, the lack of code compliant space (ADA accessibility, etc.), and the lack of program space for current CARB programs.

Based on current and future needs, the anticipated area requires to accommodate CARB's functional requirements is approximately **299,250 gross square feet**. The areas have been broken down and grouped into the following buildings.

Building 1	Light Vehicle Testing Building	91,171 SF
Building 2A	Heavy Duty Testing/OBD Building	62,316 SF
Building 2B	PEMS Building	6,683 SF
Building 3	Chemistry/Including Air Monitoring South Building	48,016 SF
Building 4	Office and Shared Facilities Building	72,702 SF
Building 5	ASD Building	18,365 SF
Building 6	Parking Structure	184,000 SF

Total building construction cost:	$169,694,298
Total building and site construction cost:	$189,190,882

This cost does not include design fees, permit fees, land acquisition costs, abnormal site improvement costs, no escalation due to inflation. This cost is for the building construction and normal site improvement cost only. Computers, IT, laboratory, and test cell equipment are also excluded.

The new facility will provide all necessary components for a fully operationally CARB program for at least the next 30 years.

Introduction

This report contains an update to the 2006 Preliminary Building Program Summary for the California Air Resources Board (CARB) in El Monte, California. The El Monte facility is primarily devoted to the control of emissions from motor vehicles and engines. The staff at this location conducts vehicle testing, chemical analysis, regulatory development, and enforcement activities. Six CARB divisions are represented in El Monte: ,the Mobile Source Control Division, the Emissions Compliance, Automotive Regulations and Science Division, the Monitoring and Laboratory Division, the Air Quality Planning and Science Division, the Enforcement Division, and the Administrative Services Division. CARB operations at the El Monte site have outgrown the existing original building. The El Monte operations consist of the original State-owned Haagen-Smit Laboratory (HSL) and office and miscellaneous space in five leased buildings adjacent to the HSL. These facilities are located on Telstar Avenue. Heavy Duty Testing is currently being conducted at the Metropolitan Transit Authority (MTA) Facilities in Los Angeles, California. The Facility includes one chassis dynamometer and one engine dynamometer. Chemical analysis for Heavy Duty Testing is performed at the HSL.

The current operations are disconnected and inadequate in size and have outdated and inadequate mechanical systems. In particular the laboratories are in disrepair and poorly designed for today's work and safety standards. The remote location of MTA is problematic due to the time sensitive nature of the tests. A new consolidated facility is need to meet CARB's mandated air quality and climate change requirements.

This report provides an outline of spaces, services, and costs associated with a concept planning layout that meets the needs of CARB.

The space planning information, requirements and proposal contained within this document represents the effort and results of an update to the programming efforts conducted in 2006. These updates were generated through site visits, questionnaires, interviews and conceptual layouts prepared as part of this report. The basic programming needs for the CARB were discussed with review of the planning options.

The program can be divided into roughly four components with each complimenting and supporting the other. The Office component provides office and meeting spaces for the program staff as well as administrative support. The vehicle testing and chemistry laboratory components are directly linked together as they rely on each other to serve the mission of the facility. The administrative services component provides the necessary overall shipping, receiving, storage, and support for the facility.

This updated report represents a complete effort on the program and concept design. The final program document will serve as a design and program guide for a hypothetical site. The concept design illustrated herein is just that, a concept. It is meant to serve as a general guide for any future design solution.

Evaluation of the Existing Facility

Through the course of the walk-through of the existing facility and the subsequent discussions of the problems and needs of the facility during the user committee work sessions, many problems were pointed out. The following outlines, in bullet form, the major issues facing the existing facility:

SITE LIMITATIONS:

- Insufficient area for all the CARB staff and functions
- Adjacent land and buildings and offices are leased to cover the short fall
- The hazardous materials associated with the facility pose a potential risk to the Rio Hondo River which abuts the back of the site
- Insufficient outdoor area for large vehicle circulation, shipping and receiving, and hazardous material storage
- Insufficient quantity of parking spaces for both secured vehicles and public/staff parking
- The facility is broken up into many disparate buildings and leased spaces around the site
- Facility lacks a large auditorium for the necessary public hearings

LABORATORIES:

- Insufficient laboratory space
- Each laboratory is divided into smaller rooms which hinder the optimal work process
- Interior finishes have degraded to the point of disrupting lab work
- Some finish materials contain asbestos
- More area is needed around the benches or in back of the instruments for access
- Air flow and pressurization within the laboratories does not function adequately and is unable to be upgraded to support operational needs
- Mobile laboratory vehicle needs to be parked in a garage and in proximity to the laboratories

VEHICLE TESTING:

- Insufficient area for testing, circulating, and parking the vehicles
- The relationship of the test cell with the control room is not optimal and not conducive to maximizing resources
- Some test cells are located at other sites and need to be consolidated
- Each test cell should be larger to accommodate various larger sized vehicles being tested
- Cylinder storage is decentralized and in some cases far away from in-use locations
- The testing of heavy duty vehicles cannot be accommodated in the El Monte facilities

- The MTA facilities are too small, cannot be expanded, and do not meet current ADA standards.

Programming and Concept Design Process

After an initial questionnaire was distributed to the user group, the design consultant team met with the user group committee over the course of a week to establish a program of spatial and technical requirements to meet the current CARB needs. Discussions about objectives, site requirements, spatial needs, quality of environment and functional requirements allowed the design team to establish criteria, priorities and ideas to generate a program of spaces and design solutions in line with the expressed goals and needs of CARB. After the large and complex program of spaces was identified, concept studies providing Room Data Sheets with operational layouts and sizes were presented and reviewed allowing for the conceptual space studies and programming to progress and become validated. The following section illustrates this process and progression of the concept design.

PROGRAM PLANNING STRATEGY

- Functional programmatic requirements to drive the building design
- To the extent possible, simplify and consolidate the wide variety of office space standards
- Cluster branch offices together with support office space to form mini units
- Where possible, plan for lab offices and vehicle testing staff offices to be in close proximity to their labs or test cells
- Direct natural daylight into each office and work area
- Use a lab module dimension that can repeat and accommodate the various lab functions
- Repetitive modules are planned to be more flexible and adaptable

Programming Questionnaire Summary

CARB strives to provide the highest quality measurements of air pollutants and their precursors to support California's air quality management program for the protection of public health and California's initiatives to reduce greenhouse gas (GHG) emissions.

The chemistry lab and the dynamometers are in close proximity to each other. This feature is necessary because many of the samples generated have very limited holding times and must be analyzed as quickly as possible.

Currently, office space is insufficient to locate all staff in the same building as the lab. A future facility would ideally consolidate office and laboratory space in one building or at least at no more than 2 or 3 tightly clustered buildings at the same location.

Laboratory Space:

- It would not have false ceilings as they only make it more difficult to work on building infrastructure and they are magnets for dust and fiber which then get deposited on instruments whenever there is a construction or repair project.
- It would be designed around the work flow of the lab. On the chemistry side of the lab, there should be a centralized area for receiving/logging-in samples, analysis of samples, and the safe storage of a wide variety of samples including flammable liquids.
- A permanent l00-amp 220-volt electrical hook up for the mobile lab would be located such that the lab could be parked securely behind a fence and in close proximity to the fixed lab.
- The vehicle testing side of the lab should also be designed around the flow of work. There should be "pre-check" garages for determining the initial operating condition of vehicles brought to the lab for testing, a vehicle "conditioning" area (cold-soak) for up to 30 vehicles, space for dynamometers, SHEDS, and an Environmental Chamber with versatile testing capabilities.
- There would be a centralized cylinder storage area in close proximity to the laboratory and a central shipping/receiving dock. There would be a bulk storage tank for liquid nitrogen plus a gas distribution system for gaseous nitrogen, helium, argon, zero air, and hydrogen generators.
- There would be an ample amount of storage to support varying program needs.
- The building would be wired for IT in every room and there would be dedicated space for the WAN/LAN/TELCO equipment and staff.
- The office space should be as close as possible to the lab space.

Natural Daylighting should be incorporated for the office space. For the majority of the lab space, it is not needed but would not hurt if provided. Limited portions of the lab would require the absence of daylight for analytical reasons.

Scientific equipment used in research:

- Dynamometers, dilution tunnels, mini-diluters
- Rack-mounted electronic sampling equipment, such as gas chromatographs
- High-performance liquid chromatographs, inductively coupled plasma mass spectrometer, Class 1000 clean room
- Microbalance
- Underground storage tanks for fuels

Specialized plumbing, mechanical and electrical needs:

- Ultra-pure gases will be needed for analysis [zero air, nitrogen, helium, hydrogen), safely distributed throughout the building by means of oxy-clean stainless steel pipe and controlled by pressure regulators and automated manifold systems for the compressed gas cylinders. Vacuum-jacketed plumbing for the distribution of liquid nitrogen from a 3000-gallon tank to various drops throughout the chemistry lab. A central vacuum system is needed in the chemistry lab for analytical reasons. Plumbing to deliver de-ionized water and natural gas to various locations in the lab.
- Specialized and/or extreme heating, cooling, and humidification requirements are called for in the test procedures and need to be met. In addition, the lab requires the operation of multiple fume hoods while the dynamometers have special exhaust requirements. The lab also operates a Class l000 clean room with additional stringent climate control requirements.
- Adequate capacity to provide the substantial electrical loads involved with operating multiple dynamometers and all the climate control equipment.

Hazardous materials [radioisotopes, biohazards, chemicals) used in scientific research:

- The laboratories use many chemicals and reagents as part of its operations and the safe storage of these materials and wastes is mandated by law. The fume hoods mentioned above provide for a safe method of working with these chemicals. Emergency eye-washes and showers are required throughout the laboratory.
- The vehicle refueling area must be designed properly and have an integrated fire safety/oxygen level alarm system vital to the safety of staff.

The facility should have a dedicated shipping and receiving dock capable of accommodating compressed gas cylinders with the capacity to store them safely in close proximity to the dock.

Secure parking for staff.

A visitor/reception area to greet and meet the needs of long-term foreign visitors, partners, and the public.

A sufficient number of conference rooms.

Flexible auditorium complete with the ability to support the latest multimedia equipment.

Provide adequate security and provide for tour access that does not interfere with testing and lab activities.

Meet ADA requirements (adjustable countertops and worktops where possible, aisle clearance, adjustable fume hoods, visual and auditory warnings, ADA cabinets, wheelchair accessible safety stations (shower/eyewash), etc.

A public announcement (PA) system to relay urgent information to staff.

Program Space Summary

This space summary program reflects the updated programmatic requirements for the new CARB building. This program serves as the basis of design. The actual program net and gross areas will vary depending upon the building schemes implemented for design as well as the site size, configuration, and building orientations. The total program area should be used as the basis of design for cost budgeting and planning purposes.

The program areas are defined in net square feet (nsf). The net square footage does not include corridors, shafts, elevators, mechanical rooms and other such non assignable spaces.

Update 2014 Program Space Summary

AREA	Size			Area	Quantity	Subtotal
El Monte Executive Offices						**2,778**
Chairman's Office	15	x	20	300	1	300
Visiting Board Member Office	12	x	17	204	1	204
Visiting Deputy's Office	10	x	15	150	1	150
Public Information Officer	10	x	12	120	1	120
Public Information Office - Publications includes:	20	x	22	440	1	440
2 (100sf) cubicles, 2 (80sf) cubicles						
Public Information Office - Phone Center, includes:	20	x	34	680	1	680
1 (100sf) cubicle, 4 (80sf) cubicles						
Office of the Ombudsman Small Business Ombudsperson						
Ombudsman Office, Small Bus (Ombudsperson)	12	x	17	204	1	204
Ombudsman Office, Small Bus (AP Spec)	8	x	10	80	1	80
Ombudsman Office, Small Bus (ART I LT/INT)	8	x	10	80	2	160
Ombudsman Office, Small Bus (ART II LT/INT)	8	x	10	80	1	80
Ombudsman Office, Small Bus (SSA LT/INT)	8	x	10	80	1	80
Office of Communications						
Communications (Info Officer 1)	10	x	10	100	2	200
Communications (AP Spec)	8	x	10	80	1	80

AREA	Size			Area	Quantity	Subtotal
Administrative Services Division						**624**
Visiting Division/Branch Chief	12	x	17	204	1	204
Business Management Branch						
El Monte Business Services Section						
SSMII	10	x	10	100	1	100
(ABMA, BSO II/SPEC, OT(T)	8	x	8	64	5	320
Dock Services	12	x	12	144	1	
Enforcement Division						**4,428**
Visiting Branch/Division Chief Office	12	x	17	204	1	204
Secretary	8	x	10	80	0	0
Legal Affairs Office	10	x	10	100	1	100
APS - Citations and Hotline Section	8	x	10	80	1	80
ART II - Citations and Hotline Section	8	x	10	80	1	80
APS - Statewide Truck and Bus Enforce (PY14-15)	8	x	10	80	1	80
ART I LT- Diesel Equip Enforce (becoming PI)	8	x	10	80	1	80
ART II - FOB:Fuel Enforcement Section	8	x	10	80	1	80
Fuels Staff Cubicle	10	x	10	100	1	100
Sacramento Visiting Staff	10	x	10	100	1	100
Enforcement Registration and Citations Branch						
Citations and Hotline Section						
ART II LT (becoming PI)	8	x	10	80	4	320
Diesel Programs Enforcement Branch						
Statewide Truck & Bus Enforcement Section						
(AR Sup 1)	10	x	10	100	1	100

AREA		Size			Area	Quantity	Subtotal
	(ART LT/INT)	8	x	10	80	1	80
Specialized Fleet Section							
	(AR Eng)	8	x	10	80	2	160
	(AP Spec)	8	x	10	80	1	80
	(ART II LT/INT)	8	x	10	80	1	80
Diesel Equipment Enforcement Section							
	(AR Sup 1)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	3	240
	(AP Spec)	8	x	10	80	1	80
Veh Pts & Consumer Products Enforce Branch							
	(AR Sup II)	10	x	10	100	1	100
	(OT (T))	8	x	8	64	1	64
Vehicle Enforcement Section							
	(AP Spec)	8	x	10	80	1	80
	(AR Field Rep III)	8	x	10	80	1	80
	(AR Field Rep II)	8	x	10	80	2	160
Consumer Products Enforcement Section							
	(ART I LT/INT)	8	x	10	80	1	80
Engine & Parts Enforcement Section							
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	0	0
	(AR Spec)	8	x	10	80	1	80
Field Operations Branch							
Fuel Enforcement Section							
	FOB: FES (AR Eng)	8	x	10	80	1	80
	FOB: FES (Staff APS)	8	x	10	80	1	80
	FOB: FES (AR Sup I)	10	x	10	100	1	100

AREA	Size			Area	Quantity	Subtotal
FOB: FES (AP Spec)	8	x	10	80	1	80
FOB: FES (AR Field III)	8	x	10	80	0	0
FOB: FES (AR Field II)	8	x	10	80	0	0
Railroad & Marine Enforcement Section						
FOB: Railroad& Marine (AP Spec)	8	x	10	80	2	160
Field Enforcement Center						
AR Field Rep III	8	x	10	80	2	160
AR Field Rep II	8	x	10	80	6	480
Enforcement Support Branch						
Training Section						
ESB: TS (ART I LT/INT)	8	x	10	80	1	80
Citation Registration & Hotline Section						
(AP Spec)	8	x	10	80	2	160
District Support Section						
(AP Spec)	8	x	10	80	1	80
Mobile Source Control Division						**5,368**
Division Chief & Asst Division Chief	12	x	17	204	2	408
Executive Assistant	8	x	10	80	1	80
Visiting Manager Office	10	x	10	100	1	100
(AR Sup II)	10	x	10	100	1	100
(OT (T))	8	x	8	64	1	64
Incentives& Technology Advancement Branch						
Alternative Strategies						
(AR Sup I)	10	x	10	100	1	100
(AR Eng)	8	x	10	80	1	80
(AP Spec)	8	x	10	80	1	80
(ART II LT/INT)	8	x	10	80	1	80

AREA		Size			Area	Quantity	Subtotal
	(ART I LT/INT)	8	x	10	80	0	0
Carl Moyer Off Road							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	2	160
	(AR Spec)	8	x	10	80	2	160
Incentives Oversight							
	(AP Spec)	8	x	8	64	2	128
New Section (2015)							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	3	240
	(AP Spec)	8	x	10	80	2	160
	(ART II LT/INT)	8	x	10	80	1	80
<u>Mobile Source Regulatory Dev Branch</u>							
	(AR Sup II)	10	x	10	100	1	100
	(OT (T)	8	x	8	64	1	64
Off-Road Control							
	(AR Sup I	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	1	80
	(AP Spec)	8	x	10	80	3	240
	(ART II LT/INT)	8	x	10	80	1	80
L-Emission Vehicle Strategies							
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	2	160
	AP Spec	8	x	10	80	1	80

AREA		Size			Area	Quantity	Subtotal
On-Road Heavy Duty Diesel Section							
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	4	320
	(AP Spec)	8	x	10	80	2	160
	(ART II LT/INT)	8	x	10	80	1	80
New Section (2015)							
	(AR Sup II)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	3	240
	(AP Spec)	8	x	10	80	2	160
Innovative Strategies Branch							
Planning & Regulatory Development Section							
	(AR Eng)	8	x	10	80	1	80
Off Road Advanced Strategies Branch NEW							
	AR Sup II	10	x	10	100	1	100
	(Office Tech)	8	x	8	64	1	64
	AR Sup I	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	3	240
	(AP Spec)	8	x	10	80	2	160
Monitoring and Laboratory Division							**3,248**
	Visiting Division/Branch Chief	12	x	17	204	1	204
	Visiting FEAT AR Sup II - Freight Em Test+Research	10	x	10	100	1	100
	Visiting FEAT AR Sup II - AQ Surveillance Br.	10	x	10	100	1	100
	Visiting ARE - MARS	8	x	10	80	1	80
	OT /LT - Administrative Section	8	x	8	64	1	64
	ART II LT/INT - FEAT Section	8	x	10	80	1	80

AREA	Size			Area	Quantity	Subtotal
ART II LT/INT - MTA Section	8	x	10	80	1	80
SA ENG/ARCH T/INT - PEMS Section	8	x	10	80	1	80
<u>Evaporative Controls & Cert Branch</u>						
Engineering Regulation Development Section						
(AR Eng)	8	x	10	80	1	80
<u>Freight Emissions Testing & Research Branch</u>						
FEAT Section						
(AP Spec)	8	x	10	80	1	80
(ARFR II)	8	x	10	80	1	80
MTA Section						
(AR Sup I)	10	x	10	100	1	100
(Staff APS)	8	x	10	80	1	80
(AR Eng)	8	x	10	80	2	160
(AP Spec)	8	x	10	80	2	160
PEMS Section						
(AR Sup I)	10	x	10	100	1	100
(ART II LT/INT)	8	x	10	80	6	480
(AR Eng)	8	x	10	80	3	240
(AP Spec)	8	x	10	80	3	240
(AETS III)	8	x	10	80	1	80
Air Quality Surveillance Branch						

AREA	Size			Area	Quantity	Subtotal
Air Monitoring South Section						
(AR Sup I)	10	x	10	100	1	100
(AR Eng)	8	x	10	80	2	160
(AP Spec)	8	x	10	80	2	160
(IT AO)	8	x	10	80	1	80
(ART I)	8	x	10	80	1	80
Office of Information Services						**368**
Tech Support	8	x	10	80	3	240
Asst ISA LT/INT Tech Support	8	x	8	64	2	128
Emissions Compliance, Automotive Regulations and Science Division						**18624**
Chief, CEA 3	12	x	17	204	1	204
VP Spec	8	x	8	64	1	64
AGPA	8	x	8	64	2	128
Staff APS (R/A)	8	x	10	80	1	80
SSA	8	x	8	64	1	64
ART II LT/INT	8	x	10	80	1	80
Asst Div Chief	10	x	15	150	2	300
Exec Secretary	8	x	10	80	1	80
Visiting Staff Office	8	x	10	80	1	80
Vehicle & Eng Testing Branch						
V&ETB: (AR Sup II)	10	x	10	100	1	100
(OT)	8	x	8	64		64
Engineering Testing Facilities Support Section						
(AR Sup I)	10	x	10	100	1	100
(Staff APS)	8	x	10	80	1	80
(AR Eng)	8	x	10	80	3	240

AREA		Size			Area	Quantity	Subtotal
	(AP Spec)	8	x	10	80	6	480
	(Spec III)	8	x	10	80	2	160
Vehicle Emissions Testing Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	3	240
	V&ETB: VETS (AP Spec)	8	x	10	80	2	160
Laboratory Logistics & Testing Support Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	3	240
Testing Support Unit							
	(AET Sup)	10	x	10	100	1	100
	(AETS III)	8	x	10	80	5	400
	(AETS I)	8	x	10	80	2	160
Project Support Unit							
	(AET Sup)	10	x	10	100	1	100
	(AETS III)	8	x	10	80	4	320
Specialty Vehicle & Engine Testing Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	5	400
	(AP Spec)	8	x	10	80	1	80
<u>New Vehicle Programs Branch</u>							
NVEPB: (AP Sup II)		10	x	10	100	1	100
NVEPB: (OT (T))		8	x	8	64	1	64
On Road Light Duty Certification Section							
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	7	560

AREA	Size			Area	Quantity	Subtotal
(ART II LT/INT)	8	x	10	80	1	80
(SA Eng/Arch T/INT)	8	x	10	80	1	80
AP Spec	8	x	10	80	1	80
Vacant BCP #5	8		10	80	3	240
Compression Ignition & Heavy Duty Cert Section						
(AR Sup I)	10	x	10	100	1	100
(AR Eng)	8	x	10	80	6	480
(AP Spec)	8	x	10	80	1	80
(SA Eng/Arch T/INT)	8	x	10	80	1	80
Aftermarket Parts Section						
(AR Sup I)	10	x	10	100	1	100
(AR Eng)	8	x	10	80	8	640
(SA Eng/Arch T/INT)	8	x	10	80	2	160
Off-Road Spark-Ignited Engine Cert Section						
(AR Sup I)	10	x	10	100	1	100
(AR Eng)	8	x	10	80	7	560
(AP Spec)	8	x	10	80	3	240
SA/ENG/ARCH	8	x	10	80	1	80
In-Use Vehicle Programs Branch						
(AP Sup II)	10	x	10	100	1	100
(AP Spec)	8	x	10	80	0	0
(OT (T))	8	x	8	64	2	128
(ART I LT/INT)	8	x	10	80	0	0
(ART II LT/INT)	8	x	10	80	0	0
Field Operations Warranty Section						
(AR Sup I)	10	x	10	100	1	100
(Staff APS)	8	x	10	80	1	80

AREA		Size			Area	Quantity	Subtotal
	(AR Eng)	8	x	10	80	1	80
	(AR Spec)	8	x	10	80	1	80
	(ARFR III)	8	x	10	80	1	80
	(ARFR II)	8	x	10	80	5	400
Retrofit Assessment Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	2	160
	(AP Spec)	8	x	10	80	1	80
	(ART 1/II)	8	x	10	80	1	80
Evaporative Emissions Testing Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	2	160
	(AP Spec)	8	x	10	80	2	160
	(AETS III)	8	x	10	80	3	240
In-Use Compliance Section							
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	2	160
	(AP Spec)	8	x	10	80	3	240
In-Use Compliance and Evaluation Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	1	80
	(AR Spec)	8	x	10	80	1	80
	(ART II LT/INT)	8	x	10	80	2	160
	Vacant BCP #9	8	x	10	80	1	80

AREA		Size			Area	Quantity	Subtotal
	Laboratory Data Support Branch						
	LDSB: (AR Sup II)	10	x	10	100	1	100
	LDSB: (OA (T))	8	x	8	64	0	0
	Laboratory Testing Support Section						
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	3	240
	(AP Spec)	8	x	10	80	3	240
	Data Development Services Section						
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	1	80
	(AP Spec)	8	x	10	80	4	320
	(ART II LT/INT)	8	x	10	80	0	0
	Emissions Laboratory QA Section						
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	2	160
	(APS)	8	x	10	80	1	80
	(AETS)	8	x	10	80	2	160
	(SA Eng/Arch T/INT)	8	x	10	80	2	160
	Advanced Tech AMP						
	(AR Eng)	8	x	10	80	0	0
	On Board Diagnostic Branch						
	OBDB: (AR Sup II)	10	x	10	100	1	100
	OBDB: (OA (T))	8	x	8	64	1	64
	Gasoline On Board Diagnostic Section						
	(AR Sup I)	10	x	10	100	1	100
	(Staff APS)	8	x	10	80	2	160
	(AR Eng)	8	x	10	80	3	240
	Vacant BCP #2	8	x	10	80	2	160

AREA	Size			Area	Quantity	Subtotal
On Board Diagnostic Program Development Section						
(AR Sup I)	10	x	10	100	1	100
(Staff APS)	8	x	10	80	1	80
(AR Eng)	8	x	10	80	1	80
(AP Spec)	8	x	10	80	2	160
Vacant BCP #2	8	x	10	80	2	160
Diesel On-Board Diagnostic Section						
(AR Sup I)	10	x	10	100	1	100
(AR Eng)	8	x	10	80	7	560
Chemical Analysis & Emissions Research Branch						
CA&ERB: (AR Sup II)	10	x	10	100	1	100
CA&ERB: (OT (T))	8	x	8	64	1	64
Aerosol Analysis & Methods Evaluation Section						
(AR Sup I)	10	x	10	100	1	100
(Staff AP Spec)	8	x	10	80	1	80
(AR Eng)	8	x	10	80	4	320
(ARP Spec)	8	x	10	80	5	400
(ART II LT/INT)	8	x	10	80	1	80
(ART I LT/INT)	8	x	10	80	1	80
Organic Analysis Section						
(AR Sup I)	10	x	10	100	1	100
(Staff AP Spec)	8	x	10	80	1	80
(AP Spec)	8	x	10	80	7	560
(ART I LT/INT)	8	x	10	80	1	80
Fuel Analysis Methods Evaluation Section						
(AR Sup I)	10	x	10	100	1	100
(Staff AP Spec)	8	x	10	80	1	80
(AR Eng)	8	x	10	80	1	80
(AP Spec)	8	x	10	80	4	320

AREA		Size			Area	Quantity	Subtotal
Air Quality Planning & Science Division							**1944**
Modeling & Meteorology Branch							
Regional AO Modeling Section							
	(AR Eng)	8	x	10	80	1	80
Transportation Planning Branch							
Sustainable Com Policy & Plan Section							
	(AR Sup I)	10	x	10	100	1	100
	(AP Spec)	8	x	10	80	2	160
Transportation Analysis Section							
	(AR Eng)	8	x	10	80	1	80
Mobile Source Analysis Branch							
On-Road Light Duty Analysis Section							
	(AR Sup I)	10	x	10	100	1	100
	(AP Spec)	8	x	10	80	5	400
	(SA Eng/Arcvh T/Int)	8	x	10	80	1	80
Gasoline Off Road Inventory Section							
	(AR Sup I)	10	x	10	100	1	100
	(AR Eng)	8	x	10	80	2	160
	(AP Spec)	8	x	10	80	2	160
	(SA Eng/Arch T/Int)	8	x	10	80	1	80
Off Road Diesel Analysis Section							
	(AR Eng)	8	x	10	80	1	80
On Road Model Development Section							
	(Staff APS)	8	x	10	80	1	80
	(AR Eng)	8	x	10	80	1	80
Visiting Division/Branch Chief		12	x	17	204	1	204

AREA	Size			Area	Quantity	Subtotal
Shared Facilities						**27,572**
Reception	20	x	20	400	1	400
Exam Room	12	x	14	168	1	168
Copy/Printer Room	12	x	14	168	7	1176
Employee Lunch Room (80 pers)	50	x	45	2250	1	2250
Exercise Room	24	x	24	576	1	576
Locker Rooms w/ shower	16	x	24	384	2	768
Library	24	x	36	864	1	864
File Storage Room	10	x	12	120	9	1080
Small Conference Room (10 pers)	12	x	16	192	5	960
Medium Conference Room (20 pers)	16	x	24	384	4	1536
Large Conference Room (50-60 pers)	24	x	36	864	1	864
Auditorium (400 seat)						6000
AV Control Room	14	x	20	280	1	280
Network Room	20	x	30	600	2	1200
IT Storage Room	20	x	30	600	2	1200
Child Care Center						3300
Machine Shop	50		74	3700	1	3700
Electronic Fabrication	25		50	1250	1	1250
						0
Chemistry Laboratories						**24,270**
FAMES						
Fuel Analysis Laboratory						**4,176**
Fuel Analysis Open Laboratory	30	x	100	3000	1	3,000
Equipment/Entry Area	14	x	12	168	1	168
Fuel Vapor Pressure Room	14	x	12	168	1	168
Chemical Storage Room	14	x	12	168	1	168

AREA	Size			Area	Quantity	Subtotal
Sample Storage Cold Room	14	x	12	168	1	168
Sample Receiving Room	14	x	12	168	0	0
Sample Preparation Room	14	x	12	168	1	168
Cetane Number Analyzer Room	14	x	12	168	1	168
Radiation Instrument Room	14	x	12	168	1	168
OAS						
Exhaust GC Laboratory						**5,376**
GC/FID Exhaust Open Lab	98	x	36	3528	1	3,528
Equipment/Entry Area	14	x	12	168	1	168
Flexible Lab Space	84	x	12	1008	1	1,008
Equipment Room	14	x	24	336	1	336
Cold Room	14	x	12	168	1	168
Cylinder Room	14	x	12	168	1	168
Exhaust LC Laboratory						**1,344**
HPLC Lab	42	x	24	1008	1	1,008.00
Equipment/Entry Area	14	x	12	168	1	168.00
Chemical Storage	14	x	12	168	1	168.00
AAMES						
Metals Laboratory						**1,926**
ICP/MS Room	14	x	18	252	1	252
Digestion Room	14	x	18	252	1	252
Air Lock	14	x	7	98	1	98
XRF Room	22	x	20	440	1	440
Equipment/Entry Area	14	x	16	224	1	224
open clean area	30	x	22	660	1	660

AREA	Size			Area	Quantity	Subtotal
PM GC/MS Laboratory						**1,344**
GC/MS Open Lab	28	x	36	1008	1	1,008
Equipment/Entry Area	14	x	12	168	1	168
Chemical Storage	14	x	12	168	1	168
PM Extraction Laboratory						**1,848**
Equipment/Entry Area	14	x	12	168	1	168
Sample Storage Cold Room	14	x	12	168	1	168
Synthesis Room	0	x	0	0	0	-
Organic extraction open lab	14	x	36	504	1	504
AMS open lab	28	x	36	1008	1	1008
PM Sample Receiving/ Storage Suite						**2,688**
Receiving Rom	35	x	12	420	1	420
Equipment Area	35	x	12	420	1	420
Sample Storage Cold Room	14	x	24	336	1	336
Sample Prep Room	14	x	24	336	1	336
Balance Clean Room	14	x	24	336	2	672
Air Lock	21	x	12	252	2	504
Carbon & Ion Laboratory						**2,016**
Carbon & Ion Open Lab	42	x	36	1512	1	1,512
Flexible Area	28	x	12	336	1	336
Equipment/Entry	14	x	12	168	1	168
Carbon and Aerosol Physics Laboratory						**2,016**
Equipment/Entry	14	x	12	168	1	168
Carbon and aerosol physics open lab (1)	14	x	36	504	1	504.00
Carbon and aerosol physics open lab (2)	28	x	48	1344	1	1,344.00

AREA	Size			Area	Quantity	Subtotal
Semi-Volatile PM Laboratory						**672**
Semi-Volatile PM Open Lab	14	x	36	504	1	504
Equipment/Entry	14	x	12	168	1	168
Misc Lab Support						**864**
Glasswash Room	18	x	28	504	1	504
Glass Storage	18	x	20	360	1	360
Mobile Lab Parking - Inside (20' Ht)				0		-
Air Monitoring - South						**616**
Demo Room				0	0	-
Instrument Repair Area	14	x	12	168	1	168
Indoor Air Monitoring Room	14	x	12	168	1	168
Sample Storage Room	14	x	10	140	1	140
Equipment Storage Room	14	x	10	140	1	140
VEHICLE TESTING AREA						**107,906**
LIGHT DUTY						**55,956**
Vehicle Coordinator's Office - 3 staff	8	x	10	80	3	240
Small Common space	4		4	16	1	16
Breezeway	40	x	350	14000	1	14,000
Vehicle Parking in Cold Soak	10	x	20	200	30	6,000
SHED emissions test sites	24	x	30	720	3	2,160
SHED (Environmental)	24	x	50	1200	1	1,200
Fueling Room	30	x	44	1320	1	1,320
Fuel Drain Office (includes, 5 10x10 cubicles)	24	x	30	720	1	720
Pre-check Vehicle Diagnosis Rms	30	x	30	900	2	1,800

AREA	Size			Area	Quantity	Subtotal
Indoor Lift Area for Repairs	40	x	30	1200	1	1,200
Parts Storage/ Brake Shop	20	x	30	600	1	600
Vehicle Test Cell	35	x	55	1925	5	9,625
Prep Dyno Cell	35	x	55	1925	2	3,850
Vehicle Test Cell Control Room	15	x	55	825	5	4,125
Motorcycle Test Cell	35	x	40	1400	2	2,800
Small Engine Test Cell	35	x	40	1400	1	1,400
Testing Equipment Mezzanine	35	x	20	700	7	4,900
Test Cell Office Module, includes:	25	x	450	11250		
Included above						
printer station and file storage (see shared)						
Machine Shop (inc in Share 3700sf)					1	-
Equipment Storage	30	x	50	1500	1	1,500
VTS Electronics Work Area	15	x	15	225	0	-
QA Instrumentation Storage (secured)	15	x	15	225	0	-
HD PEMS						**4,950**
PEMS Demo Room	55	x	90	4950	1	4,950
Vehicle Parking (2 Large Vehicles), included in Demo Room						-
PEMS Office Module	50	x	90	4500	1	-
HEAVY DUTY						**42,100**
Heavy Duty Cold Soak	40	x	90	3600		-
HD Cold Soak 1	20	x	60	1200	1	1,200
HD Cold Soak 2 and 3	60	x	60	3600	1	3,600
Heavy Duty Test Cell	40	x	90	3600	3	10,800
HD Test Cell Control Room	15	x	90	1350	2	2,700
Pre-check Vehicle Diagnosis Rms	35	x	60	2100	1	2,100
Heavy Duty Engine Dyno Test Cell+Control Rm	40	x	90	3600	2	7,200

AREA		Size			Area	Quantity	Subtotal
	Testing Equipment Mezzanine	20	x	60	1200	4	4,800
	Heavy Duty SHED+Control Rm	55	x	60	3300	1	3,300
	HD Test Cell Office Module, includes:	50	x	130	6500	1	-
	Included above						
	printer station and file storage						
	Repair Shop	40	x	55	2200	1	2,200
	HD Storage & Equipment Room #1	10	x	45	450	1	450
	HD Storage & Equipment Room #2	30	x	20	600	1	600
	Cylinder Storage Room	55	x	30	1650	1	1,650
	Fueling Room	25	x	60	1500	1	1,500
	OBD (On Board Diagnostics)						**3,400**
	Light Duty OBD Test Vehicle area	10	x	20	200	2	400
	Heavy Duty OBD Test Vehicle area	40	x	75	3000	1	3,000
	Shop Storage						
	printer station and file storage		x		0	-	
ASD	**Administrative Services Division**						**14,068**
	Dock Clerk Office	12	x	12	144	1	144
	Shipping/Receiving Dock	24	x	36	864	1	864
	Central Cylinder Storage includes:	50	x	60	3000	1	3,000
	Calibration Gas Storage Room						
	Hydrogen & Helium Cylinder Room						
	NIST Gas Cylinder Storage Room						
	Records Storage	22	x	25	550	1	550
	Furniture Storage	22	x	25	550	1	550
	Supply Storage	22	x	25	550	1	550
	Mail Room	22	x	25	550	1	550
	Reproduction	20	x	30	600	1	600

AREA	Size			Area	Quantity	Subtotal
OIS (Offices included above)						
Burn In Room	20	x	18	360	1	360
Centralized Warehouse/Supplies						6,500
Cart and Forklift Parking	20	x	20	400	1	400
SUBTOTAL Indoor net assignable square feet						**211,814**
TOTAL PROGRAM building gross square feet	**211,814 nsf**		**/**	**~0.41**	**is**	**299,252**
The gross area includes: circulation corridors, stairs shaft spaces, restrooms, mechanical, plumbing, and electrical rooms, mechanical mezzanine above the test cells, and exterior cladding						
OUTDOOR SERVICES						**231,619**
Hazardous Waste Storage	22	x	22	484	1	484
Liquid Nitrogen Tank	20	x	20	400	1	400
Outdoor Fuel Pumps and Underground Tanks	24	x	44	1056	1	1,056
includes: Canopy, 5 fuel pumps,						
(4) 5,000 gal. gasoline tanks,						
(1) 5,000 gal. diesel tank						
Field Drum Storage - (**60**) 55 gal. Drums	22	x	22	484	1	484
Secured Parking						24,000
Light Duty Vehicle Testing	9	x	18	400	40	
8 spaces for Heavy Duty Test Vehicles	10	x	40	800	10	
Fleet Parking Reg 90 Cars	9	x	18	400	60	24,000
Fleet Parking 30 HD	10	x	40	800	25	20,000
Bicycle Lockers Area (12 lockers)	2.5	x	6.5	16.25	12	195
Staff/Visitor/Public Parking	9	x	18	400	400	160,000
Innovatively High Electric Vehicle Charging						
Level 2 ((11%)(of total, area included above))					44	
Level 1 (6%)(of total, area included above))					24	
Fuels Bus	20	x	50	1000	1	1,000

Program Design Concepts

Office Suite Design Concept

The office suite design concept is based upon the idea that each Branch and its associated office space would comprise a suite. This suite is made up of the following:

- Branch Chief office
- Secretary cubicle adjacent to the Branch Chief
- Section Manager and visiting staff offices
- Open Cubicles
- Enclosed File Storage Room
- Small Conference Room
- Copy/Supply Room or Alcove
- Open space for file storage
- Exterior window wall for natural light into office suite

Laboratory Design Concept

The laboratory design concept is based upon a laboratory suite for each major lab function. Each suite consists of an open main lab with smaller specialty rooms directly adjacent to the open lab. The main laboratory design has been developed upon a 14’ module for accommodating a split bench for access to the back of instruments and with enough aisle clearance for safe circulation and carts.

The basic features of the laboratory suite design are:

- 14’ wide lab module 36’ deep to accommodate a 20’ long island bench
- Exterior window wall for natural light into the labs
- Perimeter bench along the exterior wall for intern stations

- Chemical fume hoods stationed at the end walls of the lab
- Maximize mobile, adjustable lab casework
- Minimize fixed, built-in casework
- Power service at each lab and lab support room includes 110v and 208v, with refrigerators and freezers and instruments on stand-by power
- Plumbing service at each lab includes hot and cold water, purified water (1 megohm), natural gas, vacuum and compressed air. All other piped services such as C02, nitrogen gas, argon, etc., will be provided locally by use of cylinders in the labs.
- All labs and lab support rooms shall have a minimum of 6 air changes per hour, 100% exhaust, and negative pressure
- Locate in close proximity to the vehicle testing cells

Flexible Casework

The idea of flexibility is carried further to the design of the casework. Movable and adjustable tables, lab benches and shelves will allow for scientists to custom fit their environment with a minimum of disruption and difficulty. This flexibility will also support the continual rotation of various sizes of testing equipment that will change over time for varied operations and testing requirements.

Test Cell Design Concept

The design concept for the vehicle test cell is to provide a prototypical test cell that can meet the needs of testing all types of light duty vehicles regardless of length, height, front or rear wheel drive. Heavy duty vehicles will have separate prototypical test cells. Associated with these test cells is the control room used for monitoring the tests. This room, directly adjacent with a view window to the test cell, becomes an integral part of the design prototype. The prototype can be repeated in the layout as necessary and allow for a more flexible use and assigning of tests.

Two options for laying out the test cell and control room were developed. The merits of both options were discussed and the option with the control room in between two test cells was determined to be most beneficial.

Vehicle Test Area Design Concept

Each test cell/control room will be accessed from the cold soak controlled environment, which is essentially a large indoor vehicular circulation area with space for parking and accommodating the SHEDS.

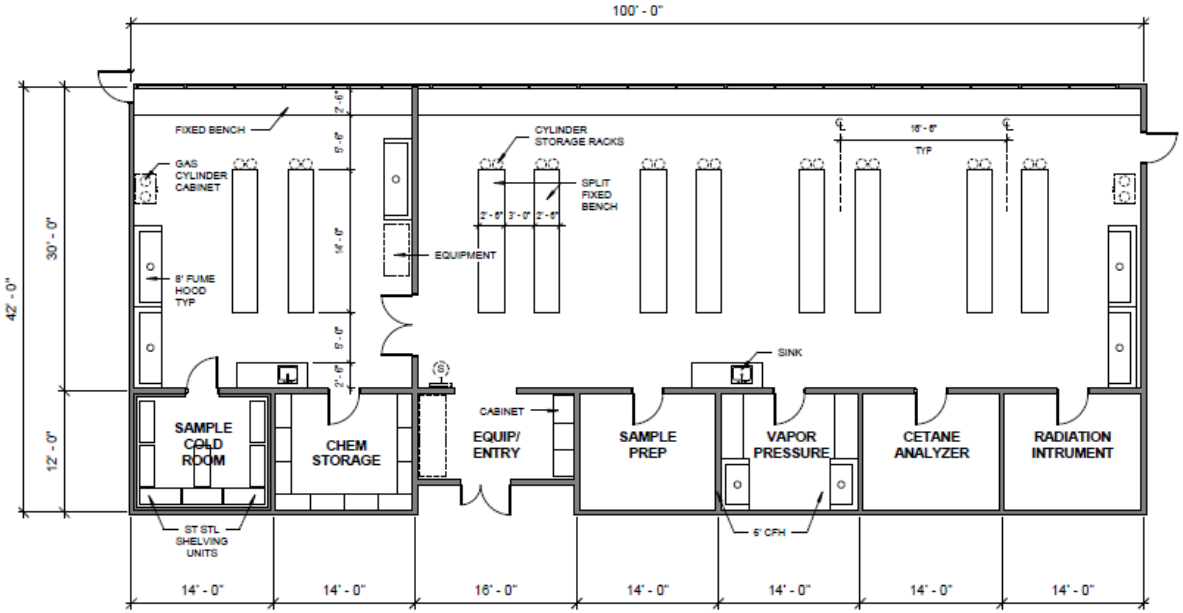
Layout Requirements:

- One way vehicle circulation through the cold soak area
- All vehicle testing program rooms in close proximity with one another and accessible through the cold soak area
- All vehicles to access the test cells through climate controlled cold soak area
- Cold soak area to contain 3 SHEDs, 1 Environmental Chamber, and parking for up to 30 vehicles

Room Data Sheets

The following room data sheets provide a plan view diagram of each different program space for the new CARB building. They are meant to serve as the basis of design for the subsequent design phases. They will require verification of layout and plan as part of the design phase work. The size of the rooms is based upon the function of the space and the equipment being used in the space.

Fuel Analysis Laboratory



ARCHITECTURAL

Floor: vinyl quartz tile, rubber base
Walls: dens wallboard, enamel paint
Ceiling: acoustic tile, 10' minimum
Door sizes: 3'/2' x 8' pair at entry, 3'-6" all others
Vibration: 3,000 micro inches or less
Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Purified water
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL

11Ov20a1ph outlets in aluminum raceways
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 60 f.c.

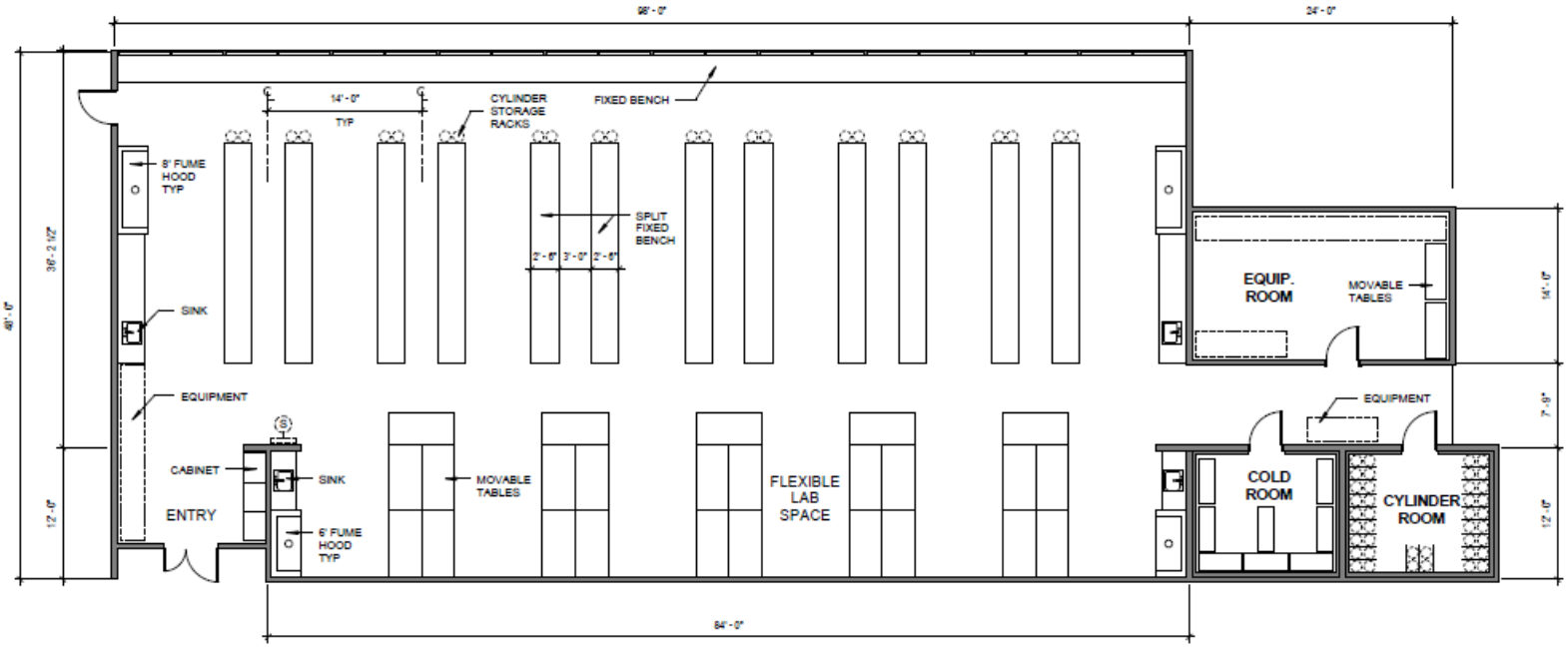
CONTRACTOR FURNISHED EQUIPMENT

Lab casework, tops, sinks
Movable tables
Marker boards
8' chemical fume hoods
6' chemical fume hoods
Gas cylinder cabinets

OWNER FURNISHED EQUIPMENT

Chairs
Refrigerators, scientific instruments

Exhaust Lab/Carbonyl Analysis



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Ambient Humidity
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100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Purified water
Liquid Nitrogen with vacuum gasketed jacket
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL

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Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 60 f.c.

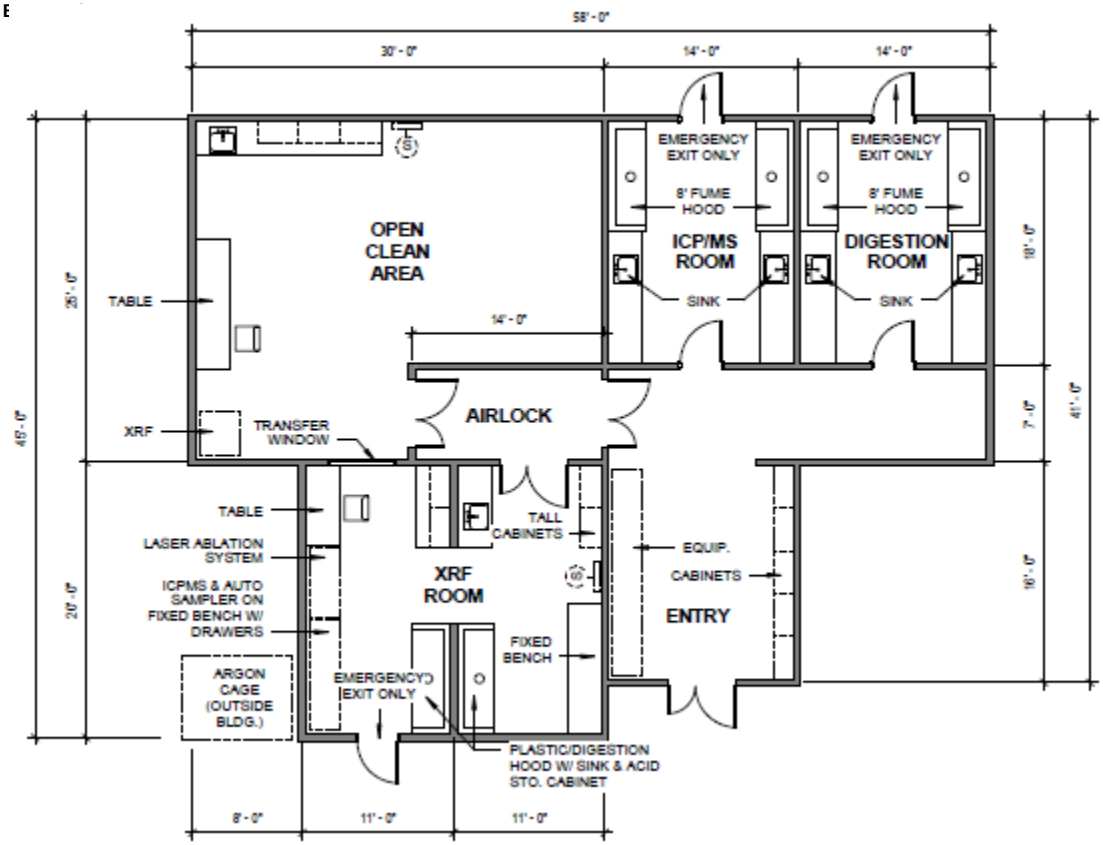
CONTRACTOR FURNISHED EQUIPMENT

Lab casework, tops, sinks
Movable tables
Marker boards
8' chemical fume hoods
6' chemical fume hoods

OWNER FURNISHED EQUIPMENT

Chairs
Refrigerators, scientific instruments

Metals Lab



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Door sizes: 3'/2' x 8' pair at entry, 3'-6" all others
Vibration: 3,000 micro inches or less
Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Purified water
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL

11Ov20a1ph outlets in aluminum raceways
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 60 f.c.

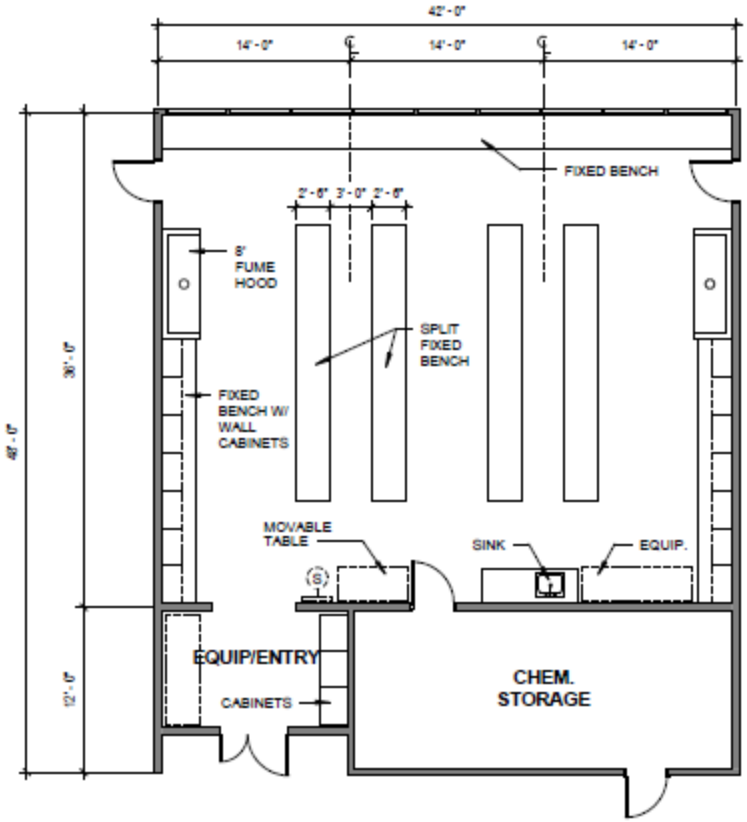
CONTRACTOR FURNISHED EQUIPMENT

Lab casework, tops, sinks
Movable tables
Marker boards
8' chemical fume hoods

OWNER FURNISHED EQUIPMENT

Chairs
Refrigerators, scientific instruments

PM GC/MS Lab



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Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

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Ambient Humidity
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100% exhaust
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Industrial Hot/cold water
Purified water
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Electrical panel: 225 amp 42 circuit
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Voice/data outlets in wall
Lighting: LED Lighting, 60 f.c.

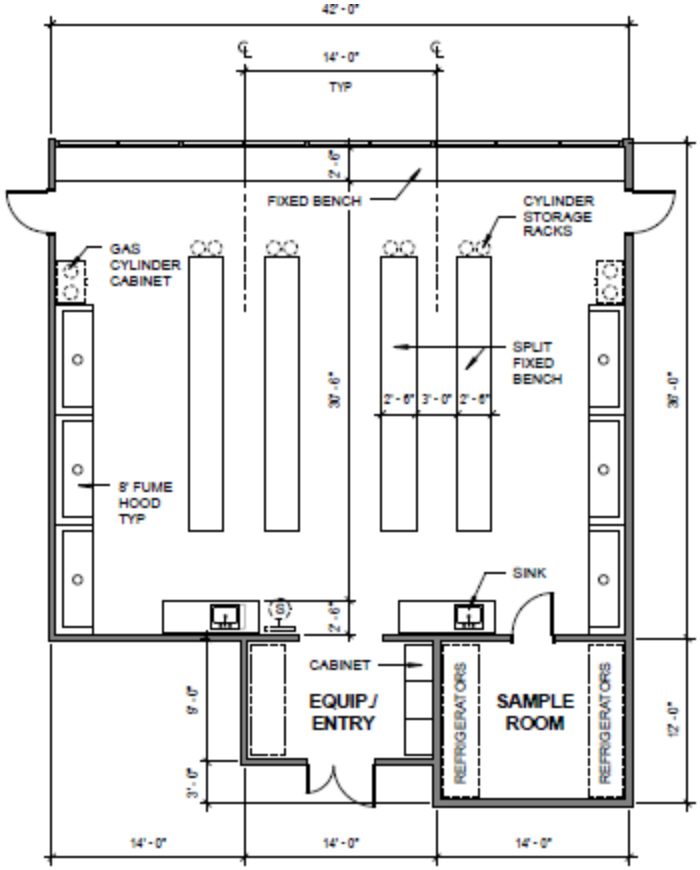
CONTRACTOR FURNISHED EQUIPMENT

Lab casework, tops, sinks
Movable tables
Marker boards
8' chemical fume hoods

OWNER FURNISHED EQUIPMENT

Chairs
Refrigerators, scientific instruments

PM Extraction Lab



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Ceiling: acoustic tile, 10' minimum
Door sizes: 3'/2' x 8' pair at entry, 3'-6" all others
Vibration: 3,000 micro inches or less
Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Purified water
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL

11Ov20a1ph outlets in aluminum raceways
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 75 f.c.

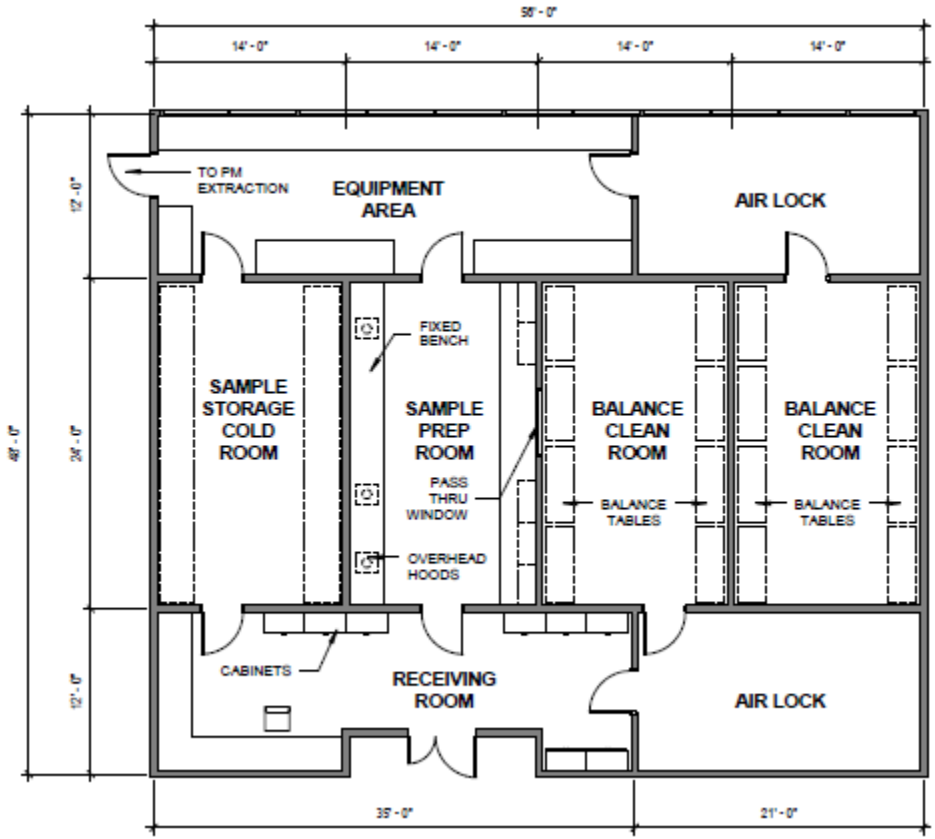
CONTRACTOR FURNISHED EQUIPMENT

Lab casework, tops, sinks
Movable tables
Marker boards
8' chemical fume hoods
6' chemical fume hoods

OWNER FURNISHED EQUIPMENT

Chairs
Refrigerators, scientific instruments

PM Sample Receiving/Storage



ARCHITECTURAL
Floor: vinyl quartz tile, rubber base
Walls: dens wallboard, enamel paint
Ceiling: acoustic tile, 10' minimum
Door sizes: 3'/2' x 8' pair at entry, 3'-6" all others
Vibration: 3,000 micro inches or less
Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

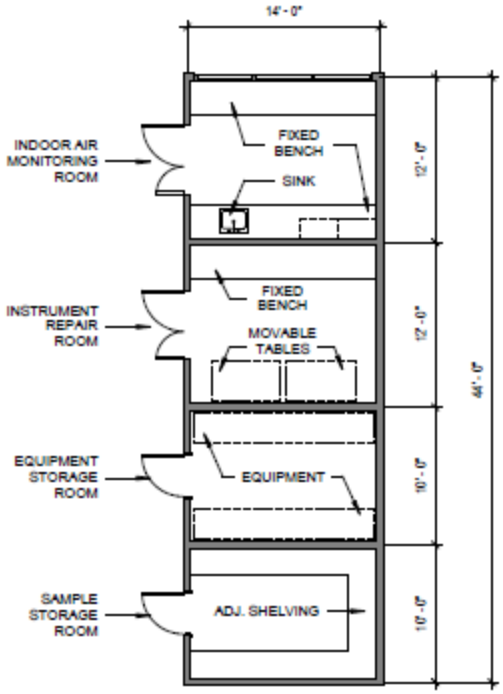
PLUMBING
Industrial Hot/cold water
Purified water
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally

ELECTRICAL
11Ov20a1ph outlets in aluminum raceways
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Lab casework, tops, sinks
Movable tables
Marker boards
Balance tables

OWNER FURNISHED EQUIPMENT
Chairs
Refrigerators, scientific instruments

Air Monitoring - South Lab Suite



ARCHITECTURAL
Floor: vinyl quartz tile, rubber base
Walls: dens wallboard, enamel paint
Ceiling: acoustic tile, 10' minimum
Door sizes: 3'/2' x 8' pair at entry, 3'-6" all others
Vibration: 3,000 micro inches or less
Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

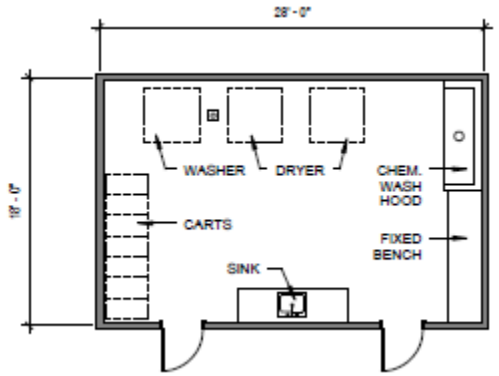
PLUMBING
Industrial Hot/cold water
Purified water
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally

ELECTRICAL
11Ov20a1ph outlets
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 60 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Lab casework, tops, sinks
Movable tables
Marker boards
Balance tables

OWNER FURNISHED EQUIPMENT
Chairs
Refrigerators, scientific instruments

Glassware Room



ARCHITECTURAL
Floor & base material: epoxy
Wall & paint material: dens wall board, epoxy paint
Ceiling material & height: fiberglass tile, 9' minimum
Door sizes: 3'-6" x 8'-0" high with vision panel
Vibration attenuation: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 75 btu/h per s.f.

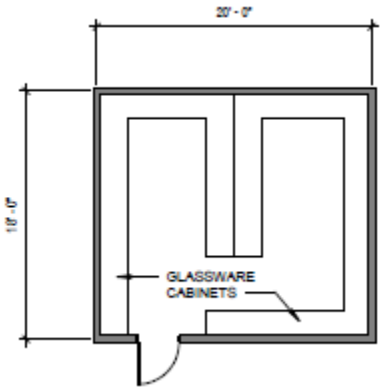
PLUMBING
Industrial Hot/cold water
Purified water

ELECTRICAL
110v20a1ph outlets
208v30a1ph outlets
Voice/data outlets in wall
Lighting: LED Lighting, 75 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Washer/Dryer, Ovens
Fixed bench with sinks (stainless steel)

OWNER FURNISHED EQUIPMENT
Glassware Carts

Glassware Storage



ARCHITECTURAL
Floor & base material: epoxy
Wall & paint material: dens wall board, epoxy paint
Ceiling: acoustic tile, 9' minimum
Door sizes: 3'-6" x 8'-0" high with vision panel
Vibration attenuation: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

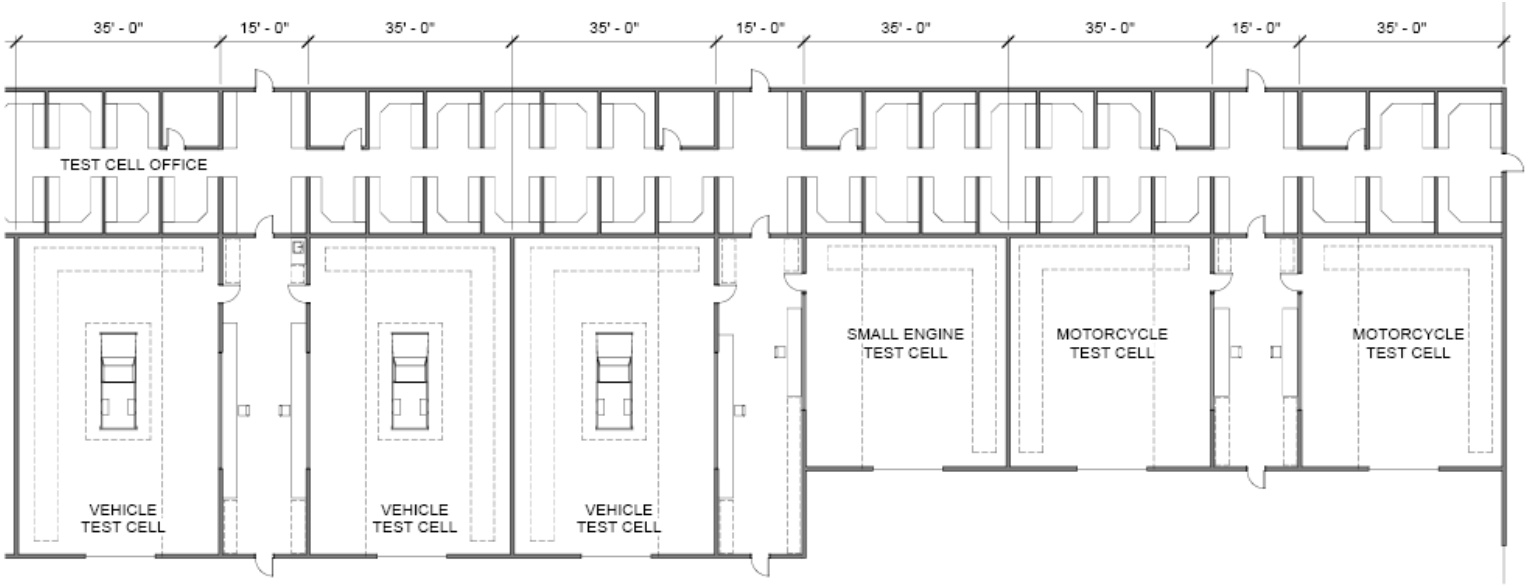
PLUMBING
None required

ELECTRICAL
110v20a1ph outlets
208v30a1ph outlets
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Fixed glassware cabinets

OWNER FURNISHED EQUIPMENT
None identified

Vehicle Test Cell, Control Room & Office Module



ARCHITECTURAL

Floor: sealed concrete, rubber base in test cells
Vinyl quartz tile in control room and entry area to office cubicles
Carpet in office cubicles
Walls: dens wallboard, enamel paint
Ceiling: acoustic tile, 10' minimum open to structure, 20' in test cells
Door sizes: 3'-6" x 8-0"
12' clear height at roll up door
Sound attenuation: NC 40 or less
Natural daylight to office cubicles

MECHANICAL

Temperature: 72F +/- 2F
Dry fire suppression system for test cells and control room
Visible alarm with strobe inside test cells
Ambient Humidity
4 air changes per hour minimum
Recirculated air
Dedicated exhaust for test cells
Negative Pressure at test cells
Positive pressure at office cubicles
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Hand wash sink in control room
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL

480v400a3ph with disconnect in test cells
110v20a1ph outlets, 208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 50 f.c.

CONTRACTOR FURNISHED EQUIPMENT

Casework
Marker boards

OWNER FURNISHED EQUIPMENT

Dynamometer
Computers, analytical instruments, scientific instruments

Heavy Duty Vehicle Test Cell

ARCHITECTURAL

Floor: sealed concrete, rubber base
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 20' minimum
Door sizes: 3'-6" x 8'-0"
16' clear height at roll up door
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
4 air changes per hour minimum
100% fresh air supply
Dedicated exhaust for vehicles
Negative pressure
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Specialty gases piped locally

ELECTRICAL

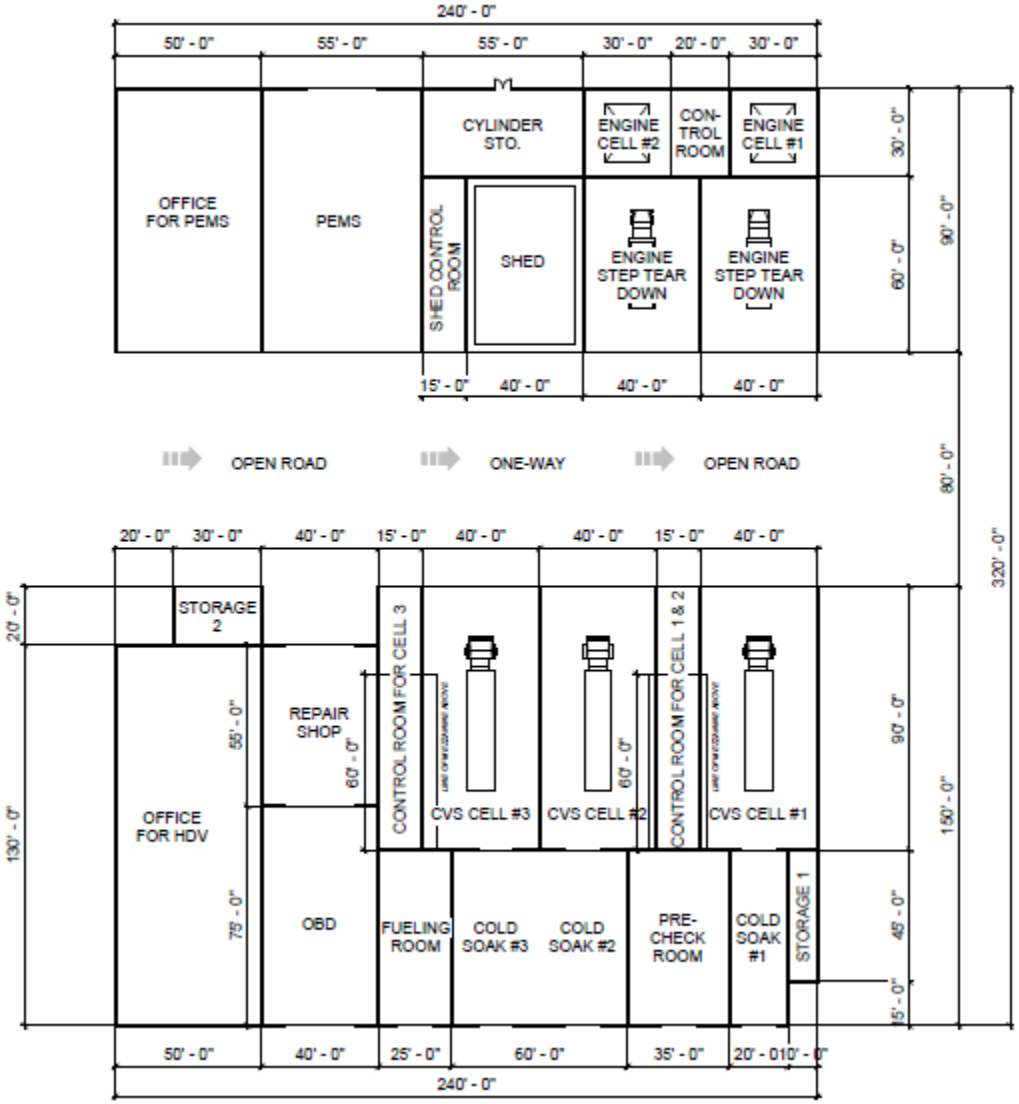
480v800a3ph with disconnect
110v20a1ph outlets in aluminum raceways
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 75 f.c.

CONTRACTOR FURNISHED EQUIPMENT

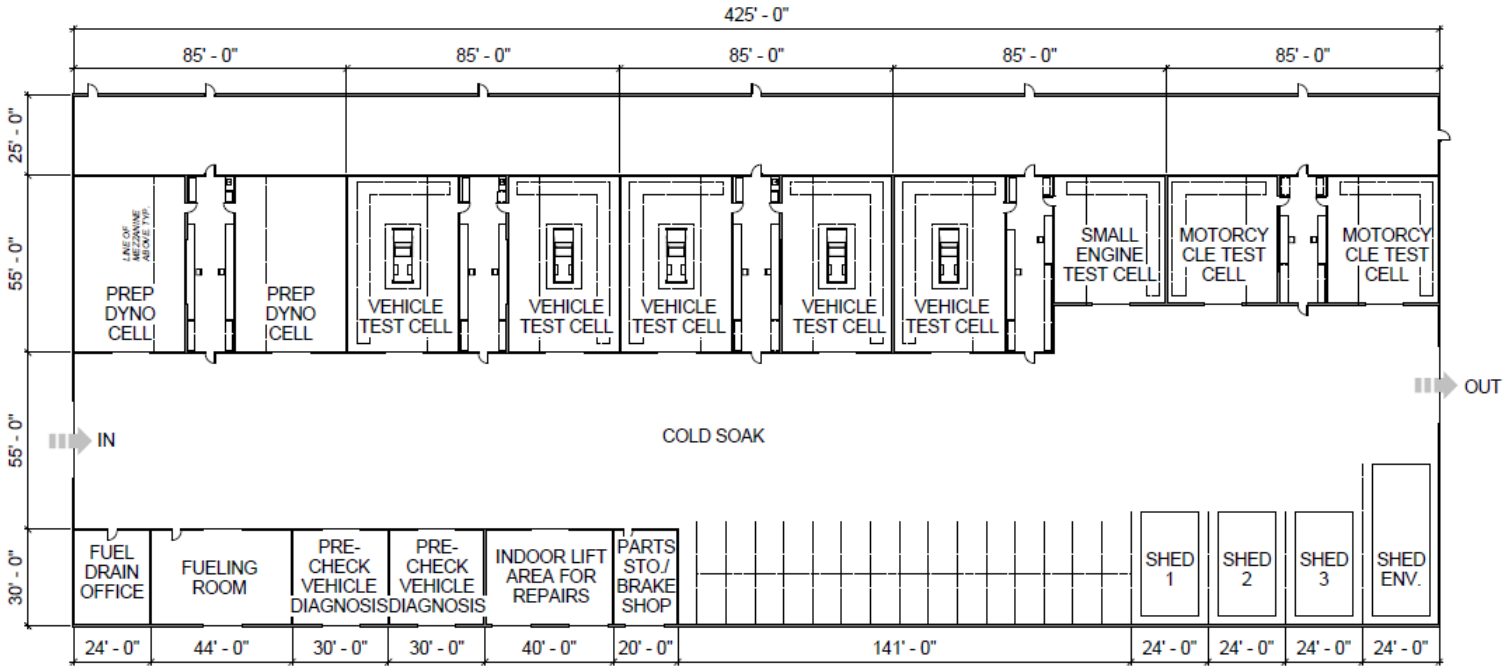
Casework
Marker boards

OWNER FURNISHED EQUIPMENT

Dynamometer
Computers, analytical instruments, scientific instruments



Light Vehicle Test Cell



ARCHITECTURAL

Floor: sealed concrete, rubber base
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 20' minimum
Door sizes: 3'-6" x 8'-0"
16' clear height at roll up door
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
4 air changes per hour minimum
Recirculated air

PLUMBING

Industrial Hot/cold water
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL

110v20a1ph outlets
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 75 f.c.

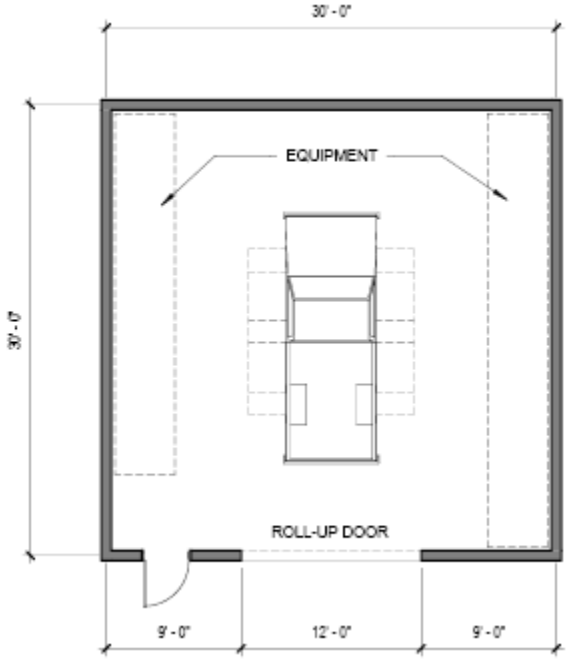
CONTRACTOR FURNISHED EQUIPMENT

None

OWNER FURNISHED EQUIPMENT

Dynamometer
Testing SHEDs
Computers, analytical instruments, scientific instruments

Pre-check Vehicle Diagnosis



ARCHITECTURAL
Floor: sealed concrete, rubber base
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 20' minimum
Door sizes: 3'-6" x 8'-0"
16' clear height at roll up door
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
4 air changes per hour minimum
Recirculated air
Negative Pressure
Heat gain: 25 btu/h per s.f.

PLUMBING
Industrial Hot/cold water
Specialty gases piped locally
Eyewash/safety shower

ELECTRICAL
110v20a1ph outlets
208v30a1ph outlets
Electrical panel: 225 amp 42 circuit
Emergency standby, UPS
Voice/data outlets in wall
Lighting: LED Lighting, 75 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Casework
Marker boards

OWNER FURNISHED EQUIPMENT
Computers, analytical instruments, scientific instruments

Parts Storage/Brake Shop

ARCHITECTURAL

Floor: sealed concrete, rubber base
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 20' minimum
Door sizes: 3'-6" x 8'-0"
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
4 air changes per hour minimum
Recirculated air
Negative Pressure
Heat gain: 25 btu/h per s.f.

PLUMBING

Industrial Hot/cold water
Specialty gases piped locally

ELECTRICAL

110v20a 1 ph outlets in aluminum raceways
208v30a1ph outlets
Emergency standby
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

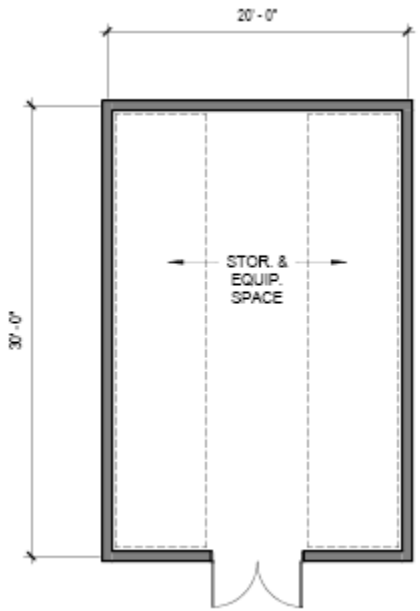
CONTRACTOR FURNISHED EQUIPMENT

Casework

OWNER FURNISHED EQUIPMENT

Computers, analytical instruments, scientific instruments

HD Storage & Equipment Room



ARCHITECTURAL
Floor: sealed concrete, rubber base
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 12' minimum
Door sizes: 3'-6" x 8'-0"
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
4 air changes per hour minimum
Recirculated air

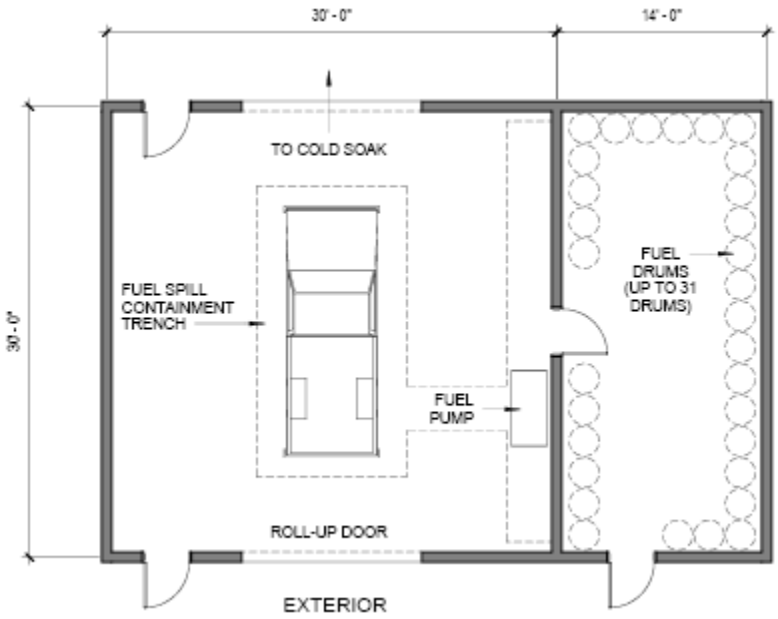
PLUMBING
Industrial Hot/cold water

ELECTRICAL
110v20a1ph outlets
208v30a1ph outlets
Emergency standby
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Storage cabinets

OWNER FURNISHED EQUIPMENT
Equipment

Fueling Room



ARCHITECTURAL
Occupancy: H2
Provide explosion wall or ceiling
Floor: sealed concrete, rubber base
Provide spill containment
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 12' minimum
Door sizes: 3'-6" x 8-0 '
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Provide dry fire suppression system
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure

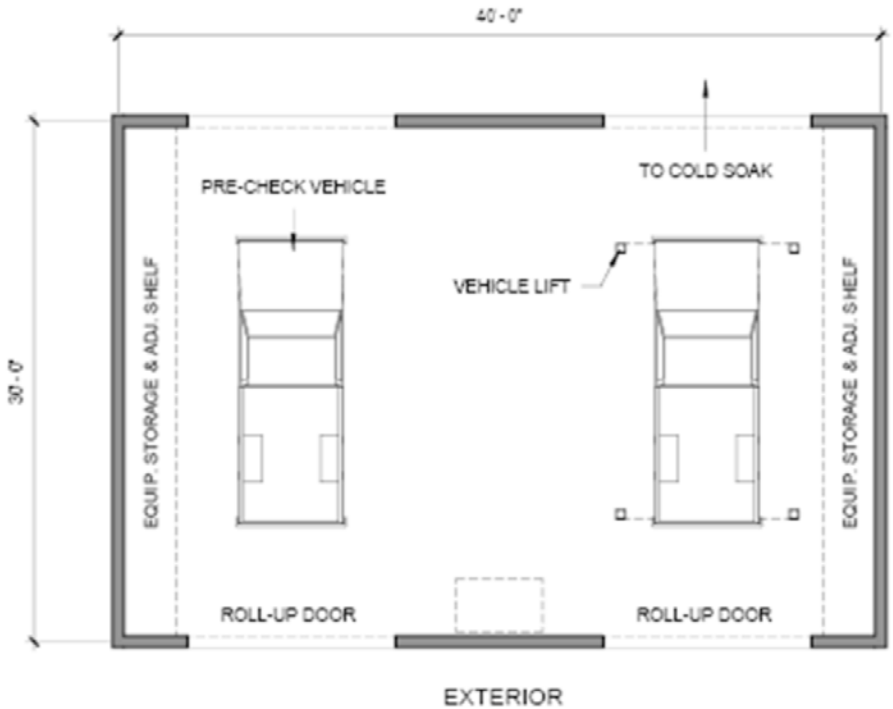
PLUMBING
Piping for gas distribution
Provide explosion proof fittings

ELECTRICAL
Provide grounding system
Provide explosion proof outlets
110v20a1ph outlets
Emergency standby
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
None identified

OWNER FURNISHED EQUIPMENT
Fueling equipment

Indoor Lift Area for Repairs



ARCHITECTURAL
Floor: sealed concrete, rubber base
Walls: dens wallboard, enamel paint
Ceiling: open to structure, 20' minimum
Door sizes: 3'-6" x 8'-0"
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less
Natural daylight; attenuation at windows

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

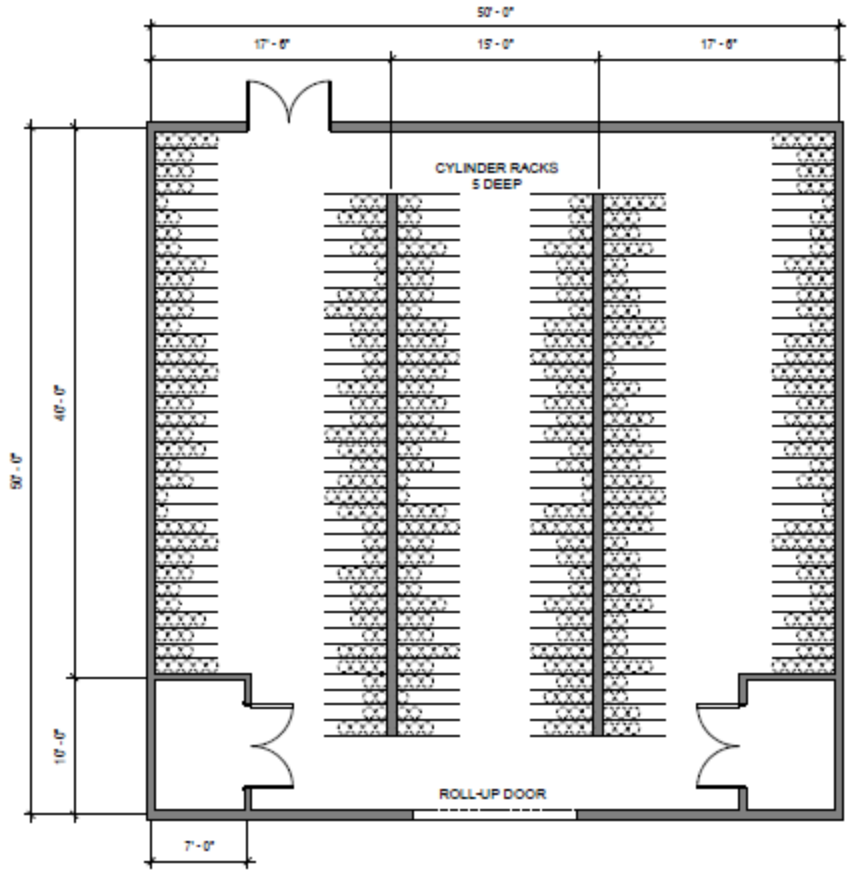
PLUMBING
Industrial Hot/cold water

ELECTRICAL
110v20a1ph outlets
208v30a1ph outlets
Emergency standby
Voice/data outlets in wall

CONTRACTOR FURNISHED EQUIPMENT
Dynamometer
Casework
Movable tables
Marker boards

OWNER FURNISHED EQUIPMENT
Computers, analytical instruments, scientific instruments

Central Cylinder Storage Room



ARCHITECTURAL

Floor: sealed concrete, rubber base
Walls: dens wallboard, epoxy paint
Ceiling: open to structure, 10' minimum
Door sizes: 3'-6" x 8'-0"
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less
No windows

MECHANICAL

Temperature: no control
24/7 natural ventilation
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure

PLUMBING

None indicated

ELECTRICAL

110v20a1ph outlets
Lighting: LED Lighting, 30 f.c.

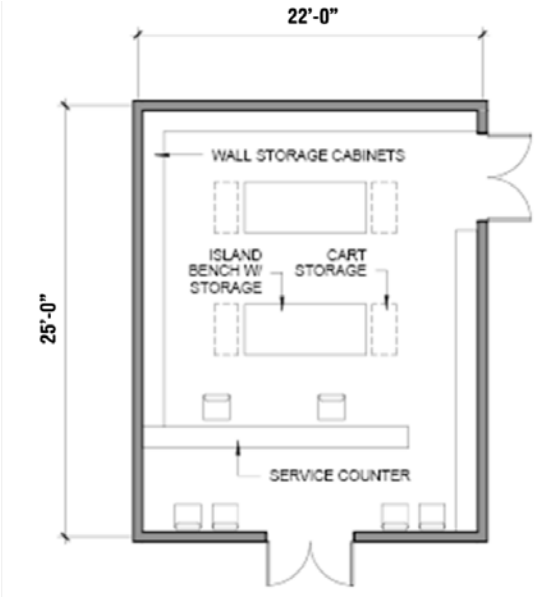
CONTRACTOR FURNISHED EQUIPMENT

Cylinder storage racks

OWNER FURNISHED EQUIPMENT

None identified

Mail Room



ARCHITECTURAL
Floor: vinyl quartz tile, rubber base
Walls: dens wallboard, epoxy point
Ceiling: acoustic tile, 10' minimum
Door sizes: 3'-6" x 8-0"
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
Recirculated air

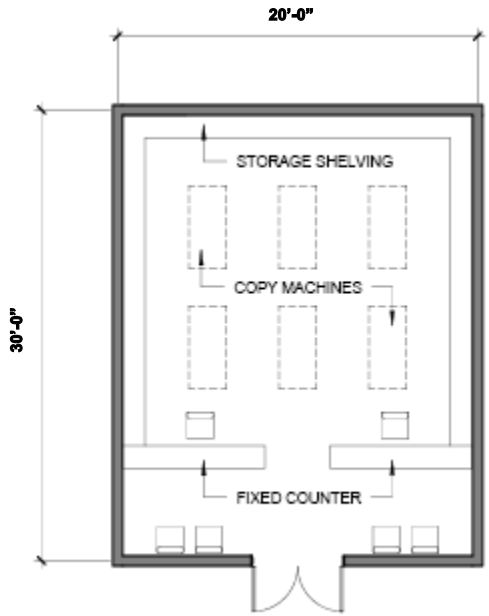
PLUMBING
None indicated

ELECTRICAL
110v20a1ph outlets
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Shelving

OWNER FURNISHED EQUIPMENT
None identified

Reproduction Room



ARCHITECTURAL
Floor: vinyl quartz tile, rubber base
Walls: dens wallboard, epoxy point
Ceiling: acoustic tile, 10' minimum
Door sizes: 3'-6" x 8'-0"
Vibration: 3,000 micro inches or less
Sound attenuation: NC 45 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure
Heat gain: 25 btu/h per s.f.

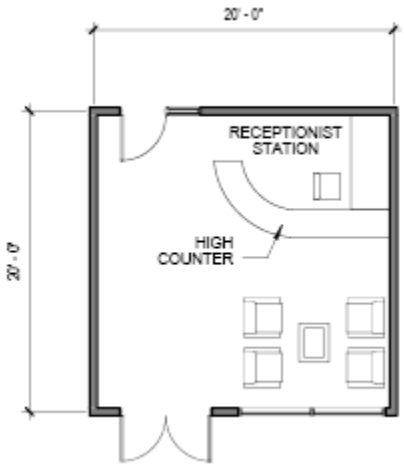
PLUMBING
None indicated

ELECTRICAL
110v20a1ph outlets
208v30a1ph outlets
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Shelving, ventilated cabinets, flammable storage cabinets

OWNER FURNISHED EQUIPMENT
None identified

Reception



ARCHITECTURAL
Floor & base material: carpet, rubber base
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 12' minimum
Door sizes: 3'-0"x 8'-0"
Sound attenuation: NC 40 or less
Natural daylight: attenuation at windows

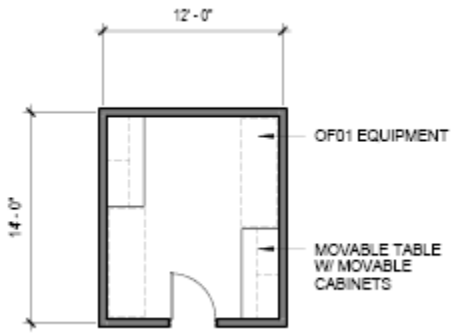
MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
Re-circulated air
Neutral Pressure

ELECTRICAL
110v20a1ph outlets
Voice/data outlets in wall and floor (recessed)
Lighting: LED Lighting, 50 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Marker Board, Counter
Pass-thru window, Signage

OWNER FURNISHED EQUIPMENT
Chairs, Systems office furniture

Copy/Printer Room



ARCHITECTURAL

Floor & base material: carpet, rubber base
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 9' minimum
Door sizes: 3'-0"x 8'-0"
Sound attenuation: NC 45 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
20 cfm/person ventilation, recirculated air
Neutral Pressure
Heat gain: 50 btu/h per s.f.

ELECTRICAL

110v20a1ph outlets
208v30a1ph outlet for copier
Voice/data outlets in wall
Lighting: LED Lighting, 50 f.c.

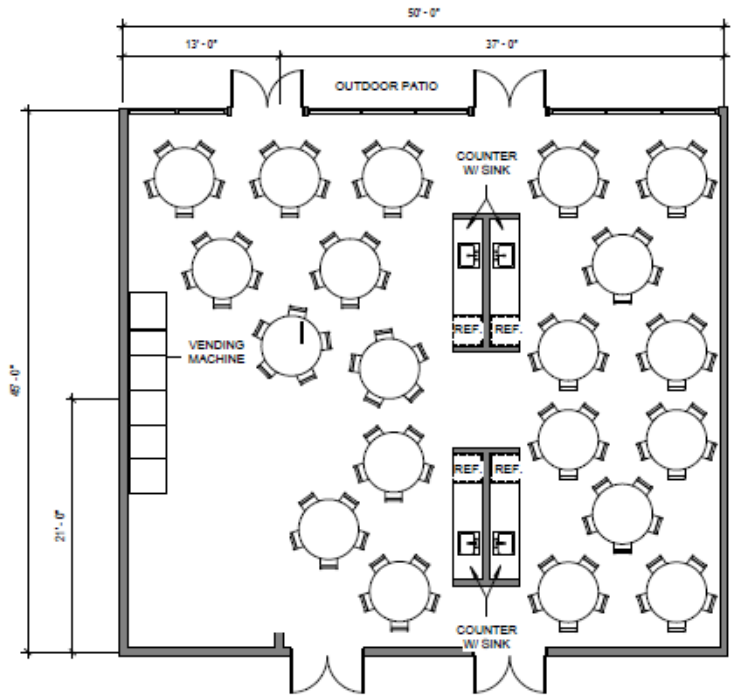
CONTRACTOR FURNISHED EQUIPMENT

Casework, movable tables, cabinets
Signage

OWNER FURNISHED EQUIPMENT

Copy machine, Fax machine

Employee Lunch Room



ARCHITECTURAL

Function: Break, lunch room
Floor & base material: vinyl quartz tile, rubber base
Wall & point material: dens wall board, epoxy point
Ceiling material & height: acoustic tile, 12' minimum
Door sizes: 3'-6" x 8'-0" with vision panel
Sound attenuation: NC 40 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
4 air changes per hour minimum
Re-circulated air
Neutral Pressure

PLUMBING

Potable hot/cold water at sink

ELECTRICAL

110v20a1ph outlets
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

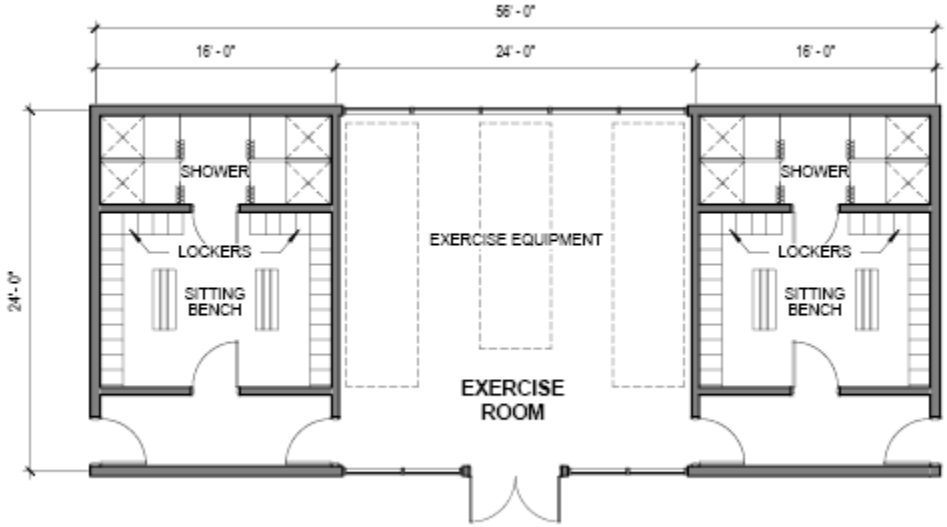
CONTRACTOR FURNISHED EQUIPMENT

Fixed bench with sink
Wall cabinets
Marker/tack board

OWNER FURNISHED EQUIPMENT

Tables, chairs, refrigerator

Exercise & Locker/Shower Room



ARCHITECTURAL

Floor & base material: epoxy
Wall & paint material: dens wall board, epoxy paint
Ceiling material & height: fiberglass tile, 10' minimum
Door sizes: 3'-0" x 8'-0" pair
Single doors at 3'-6"x8'-0"
Sound attenuation: NC 45 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
6 air changes per hour minimum
100% exhaust
Negative Pressure

PLUMBING

Potable Hot/cold water

ELECTRICAL

110v20a1ph outlets
Lighting: LED Lighting, 30 f.c.

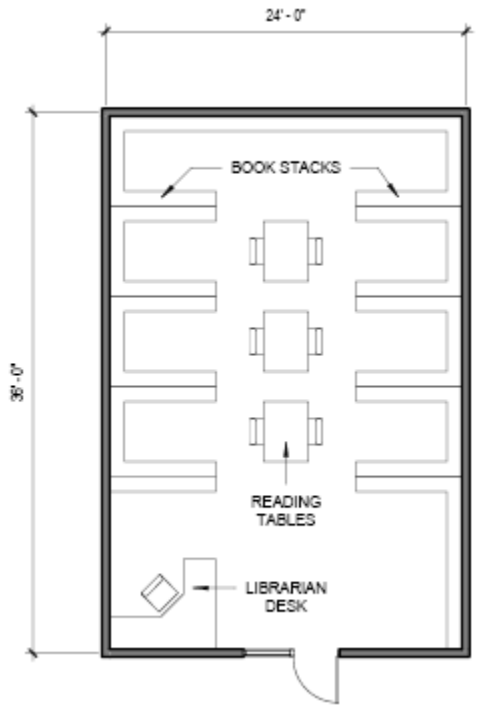
CONTRACTOR FURNISHED EQUIPMENT

Showers, Lockers, Seating bench

OWNER FURNISHED EQUIPMENT

None identified

Library



ARCHITECTURAL

Floor & base material: carpet, rubber base
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 12' minimum
Door sizes: 3'-0"x 8'-0"
Sound attenuation: NC 35 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
20 cfm/person ventilation, recirculated air
Neutral Pressure

ELECTRICAL

110v20a1ph outlets
Voice/data outlets in wall
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT

Library shelving
Marker Board
Signage

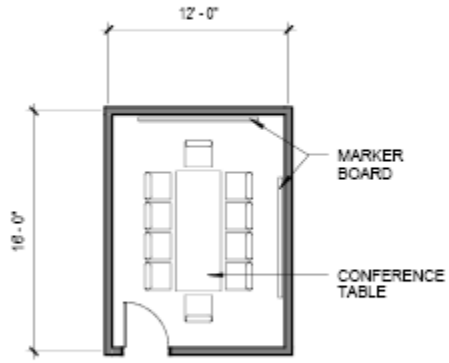
OWNER FURNISHED EQUIPMENT

Chairs, Modular conference table

Small & Medium Conference Rooms

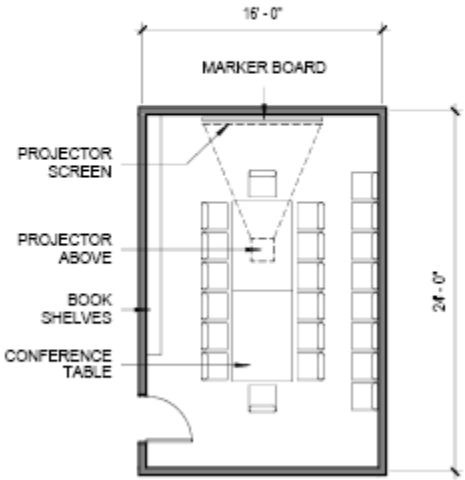
SMALL CONFERENCE ROOM

192 SF



MEDIUM CONFERENCE ROOM

384 SF



ARCHITECTURAL

Floor & base material: carpet, rubber base
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 9' minimum
Door sizes: 3'-0"x 8'-0"
Sound attenuation: NC 35 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
20 cfm/person ventilation, recirculated air
Neutral Pressure

PLUMBING

Industrial Hot/cold water
Purified water
Piped (house) gases: Gas, Vacuum
Specialty gases piped locally

ELECTRICAL

110v20a 1 ph outlets
Voice/data outlets in wall and floor (recessed)
Lighting: LED Lighting, 50 f.c.
dimmable to 5 f.c.

AV: Projection Screen, Ceiling mount and wiring for data projector

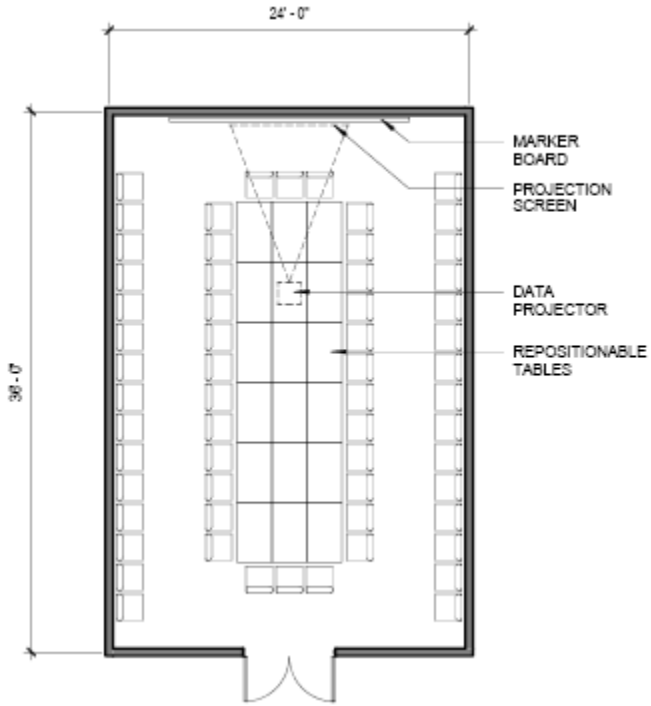
CONTRACTOR FURNISHED EQUIPMENT

AV Monitor, projection screen
Marker Board
Signage

OWNER FURNISHED EQUIPMENT

Chairs, Modular conference table
Data projector

Large Conference Room



ARCHITECTURAL

Floor & base material: carpet, rubber base
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 10' minimum
Door sizes: 3'-0"x 8'-0"
Sound attenuation: NC 35 or less

MECHANICAL

Temperature: 72F +/- 2F
Ambient Humidity
20 cfm/person ventilation, recirculated air
Neutral Pressure

ELECTRICAL

110v20a 1 ph outlets
Voice/data outlets in wall and floor (recessed)
Lighting: LED Lighting, 50 f.c. at work plane dimmable to 5 f.c.
AV: Projection Screen, Ceiling mount and wiring for data projector

CONTRACTOR FURNISHED EQUIPMENT

AV Monitor, projection screen
Marker Board
Signage

OWNER FURNISHED EQUIPMENT

Chairs, Modular conference table
Data projector

Auditorium

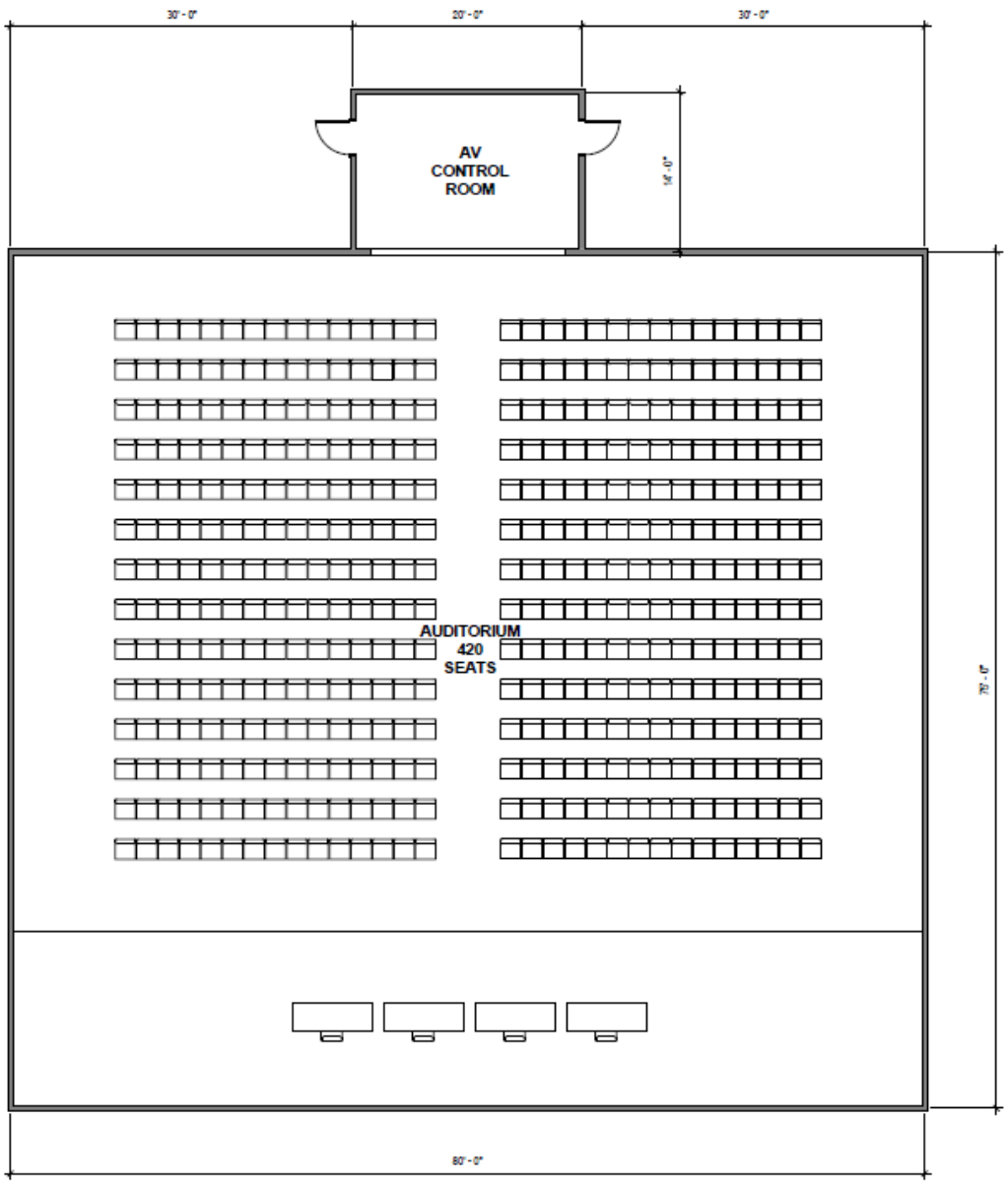
ARCHITECTURAL
Floor & base material: carpet, rubber base
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 20’ minimum
Door sizes: 3’-0”x 8’-0”
Sound attenuation: NC 35 or less

MECHANICAL
Temperature: 72F +/- 2F
Ambient Humidity
20 cfm/person ventilation, recirculated air
Neutral Pressure
Heat gain: 10 btu/h per s.f.

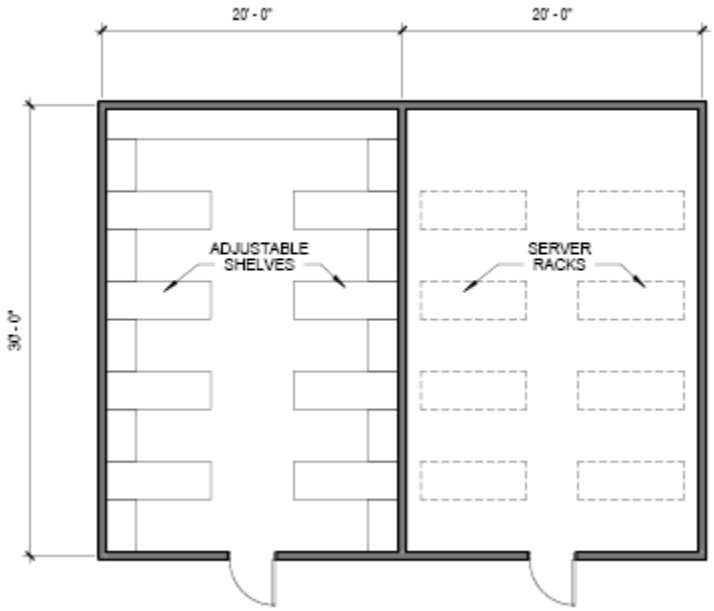
ELECTRICAL
110v20a1ph outlets
Voice/data outlets in wall and floor (recessed)
Lighting: LED Lighting, 50 f.c. at work plane dimmable to 5 f.c.
AV: Projection Screen, Ceiling mount and wiring for data projector

CONTRACTOR FURNISHED EQUIPMENT
AV Monitor, projection screen
Marker Board
Signage

OWNER FURNISHED EQUIPMENT
Chairs, Modular conference table
Data projector



Network Room & IT Storage



ARCHITECTURAL
Floor & base material: raised/access floor
Wall & paint material: dens wall board, painted
Ceiling material & height: acoustic tile, 10' minimum
Door sizes: 3'-0"x 8'-0" pair
Sound attenuation: NC 35 or less

MECHANICAL
Temperature: 68F +/- 2F
Ambient Humidity
50 btu/h per sf recirculated air
Neutral Pressure

ELECTRICAL
110v20a1ph outlets
208v30a1ph circuits
UPS, Data
Lighting: LED Lighting, 30 f.c.

CONTRACTOR FURNISHED EQUIPMENT
Marker Board
Signage

OWNER FURNISHED EQUIPMENT
Computer servers, Racks

Laboratory Design Criteria

QUALITY ENVIRONMENT

Laboratories shall be designed for people and provide them with a safe and pleasant work environment, which promotes increased productivity. Direct, natural daylight (where appropriate), adequate work space, color, a well-organized and logical layout, and functional and durable casework, all will enhance the quality of the laboratory environment.

Laboratories and offices shall be provided with natural daylight and views to the outside environment, so long as the daylight does not conflict with functional requirements. Natural light is not required in laboratory support rooms.

Laboratory artificial lighting shall provide shadow-free illumination of the laboratory work surface. The ability to control lighting in specialized laboratories or in spaces that use computers must be considered.

Effective operation for the agency is fostered by communication and collaboration among the scientific staff. Equally important to this is the smooth daily analysis and preparation of samples. Laboratory planning concepts should facilitate an ease of operation and interaction through the strategic location of key programmatic spaces and their relationship to each other.

Graphics and signage will help staff and visitors find their way through the building. Directional graphics/signage shall be functional and in harmony with the architecture of the building. Artwork may be considered for shared use, common support, and some circulation spaces.

DENSITY OF LABORATORY SPACE

The new building should provide scientists with adequate laboratory space, lab technicians with adequate laboratory preparation space, and other supportive type space in order to create a safe and functional environment. Adequate laboratory workspace shall be provided to meet the needs for lab components such as chemical fume hoods, biological safety cabinets, laboratory benches, equipment space, storage space, and desk space. The space must be adequate to provide a safe working area and access to and around equipment, containment devices, and bench top areas. Visual access to all parts of the lab is also a key criteria for the safety and success of a laboratory.

The ratio of laboratory support space to analytical laboratories shall be adequate to eliminate the need to locate equipment in non-laboratory functional areas (such as corridors). Consideration shall be given to locating noise, heat, and vibration producing equipment in laboratory support areas adjacent to the analytical laboratories. These may be dedicated or shared spaces, open alcoves, or securable rooms as required. They may also be on the same planning module as the laboratory.

FLEXIBILITY AND ADAPTABILITY

Laboratories where it makes sense should be adaptable. This requirement encourages flexible spaces with the ability to readily accommodate changes in function without requiring significant physical or infrastructure changes to the space itself and with little or no cost.

Services must be uniformly and repetitively distributed to each laboratory and designed to provide simple extension into the laboratory without disruption to adjacent rooms or laboratory modules. Services may be run overhead or in interstitial space to permit changes without requiring an upgrade to the building infrastructure, capacity, or major distribution systems. All building system components that require routine maintenance and repair shall be accessible without interrupting the day-to-day activities of the laboratory environment.

Utilities and services shall be organized into specific zones, both horizontally and vertically, to provide uniform distribution of systems and services to each lab module. A three dimensional planning approach will allow ease of maintenance and access of services and provide maximum operational flexibility.

PLANNING MODULE

The purpose of establishing a planning module is to form a common denominator, which will meet a variety of scientific needs while allowing mechanical systems, partitions, and laboratory casework to be provided as required. The laboratory module is the basic conceptual building block, which provides uniformity and repetitiveness to the areas and services of the building. Generally, vertical elements such as stairs, elevators, chases, shafts, and shear walls should be located at the outer perimeter of the laboratory block of space, thereby creating a large, open, unobstructed laboratory environment, in which changes can be accommodated. This permits the rational creation of space and allows the standardization of mechanical, electrical, and plumbing systems. The systems are accessible to each laboratory module.

The laboratory building is based on a planning module that is 14’ in width, and 36’ in depth. This allows the rational formation of spaces that can accommodate a wide variety of laboratory and laboratory support functions. The 14’ laboratory module width will accommodate a split bench for ease of access to the back of instruments, equipment, and aisle widths needed for research. The depth for support areas is 14’.

Floor to floor heights will be driven by the utilities distribution scheme selected for the building.

The building’s structural system and pattern shall relate to the planning module. The recommended structural grid for the building is 14’x36’. This bay size provides the most efficient balance between column locations, beam spans, and vibrations attenuation.

CIRCULATION/FLOW

Circulation throughout the laboratory building shall be efficient and direct. Clearly defined horizontal and vertical circulation routes for people, equipment, supplies, waste disposal, and maintenance and repair activities are needed. Primary and secondary circulation between laboratories, lab support shall be clearly addressed early in the design process. Minimum public corridor widths shall be 8’ clear.

LABORATORY FURNITURE AND EQUIPMENT

Fixed, built-in casework should be minimized in order to provide a flexible laboratory environment. Moveable lab tables and moveable casework cabinets will be provided for added flexibility.

Countertops will be resin, either epoxy resin or phenolic resin. Chemical resistant plastic laminate may be used in areas where durability is not such a great concern. Stainless steel tops and sinks will be used in glass wash areas. Laboratory sinks will be epoxy resin, mounted flush with the bench top.

Chemical fume hoods will be constant volume. They are to be located in the laboratory so as to avoid entrapment, blocking of egress, or otherwise creating a hazard in the laboratory. Chemical fume hoods will operate continuously and provide a face velocity of 100 feet per minute. All fume hoods anticipated for the building are standard chemical fume hoods. There is no requirement for special purpose hoods such as radioisotope, perchloric acid, or heavy acid digestion type hoods.

Biological safety cabinets will be Class IL Type A, and are owner furnished, owner installed. These cabinets do not require exhaust connection to the building exhaust system.

FINISHES AND MATERIALS

Materials selected for the construction of laboratories must be durable and cleanable, and contribute to the creation of a comfortable, productive, and safe work environment. Design features shall promote cleaning, maintenance, and better storage while minimizing pest access.

Floor materials must be nonabsorbent, skid proof, resistant to wear and resistant to the adverse effects of acids, solvents, and detergents. Materials may be monolithic (sheet flooring) of have a minimal number joints such as vinyl quartz tile (VQT) or rubber tile. The base may be vinyl or rubber, or an integral cove base when sheet vinyl flooring is used. Special use areas such as glass wash/autoclave rooms and greenhouse rooms will have epoxy resin floors.

Wall surfaces shall be free from cracks, unsealed penetrations, and imperfect junctions with ceiling and floors. Materials must be capable of withstanding washing with strong detergents and disinfectants and be capable of withstanding the impact of normal traffic. Comer guards and bumper rails shall be provided to protect wall surfaces in high traffic/impact areas.

Ceilings such as washable lay-in acoustical tiles shall be provided in most laboratory areas. Ceiling height shall be a minimum of 9’ in laboratory support areas, and 10’ in teaching laboratories.

Windows in laboratories shall be non-operable and must be sealed and caulked. Light-tight treatments will be provided in laboratories and conference rooms that need to be darkened. Window systems shall use energy efficient gloss.

Doors into laboratories along a corridor shall consist of a 36” active leaf and on 18” inactive leaf, with a vision panel in the active leaf. All doors to laboratories or support rooms with only one door shall hove a minimum width of 42”. In special cases a pair of 36” doors or a 36”/24” pair may be

used. Doors shall be a minimum of 84” high, although 96” is preferred for laboratory and laboratory support areas. Laboratory doors opening onto a corridor shall be recessed, and open in the direction of egress.

HVAC

HVAC systems must be responsive to laboratory demands. Temperature must be carefully controlled. Systems must have adequate ventilation capacity to control fumes, odors, and airborne contaminants, permit safe operation of fume hoods, and cool the significant heat loads which can be generated in the laboratory. HVAC systems must be both reliable and redundant and operate without interruption. HVAC systems must be designed to maintain relative pressure differentials between spaces and must be efficient to operate, both in terms of energy consumption and maintenance. Laboratory noise, much of it generated by HVAC systems, shall be maintained at NC 40-45 dB.

Adequate access shall be provided for periodic maintenance and cleaning of coils, filters, and drain pans.

Outdoor air intakes shall be located as far as practical (on directionally different exposures) but not less than 40’ from exhaust outlets of combustion equipment stocks, cooling towers, ventilation exhaust outlets from the building or adjoining buildings, vacuum systems, plumbing vent stacks, or from areas that may collect vehicular exhaust and other noxious fumes. The bottom of outdoor air intakes serving central systems shall be located as high as practical but not less than 6’ above ground level, or if installed above the roof, 3’ above the roof level.

Exhaust outlets shall be located a minimum of 10’ above ground, away from occupied areas or from doors and operable windows. The preferred location for exhaust discharge is above the roof level. Prevailing winds, adjacent buildings, and discharge velocities must be taken into account to insure that discharge in not entrained within an outdoor air stream.

Laboratories containing harmful substances shall be designed and field balanced so that air flows into the laboratory from adjacent spaces, offices and corridors. The requirement for directional airflow into the laboratory is to contain odors and toxic chemicals. Air supplied to the corridor and adjacent clean spaces must be exhausted through the laboratory to achieve effective negative pressurization. Laboratory HVAC systems shall utilize 1003 outdoor air, conditioned by central station air-handling systems to offset exhaust air requirements. Laboratory supply air shall not be re-circulated or reused for other ventilation needs.

The building HVAC system shall be designed to provide a purge cycle during the building start-up and when future renovations occur. The purge cycle employs 100% outdoor air to ventilate away fumes and odors generated by construction materials, furnishing, and finishes.

The supply air for oil laboratory systems shall be filtered on the upstream side of fans with 30% prefilters and 95% efficient after filters. Exhaust air, in general, does not require filtration or scrubbing.

Air supplied to a laboratory space must keep temperature gradients and air turbulence to a minimum, especially near the face of laboratory fume hoods and biological safety cabinets. Air outlets must not discharge into the face of chemical fume hoods. Large quantities of supply air are best provided through perforated plate air outlets or linear diffusers designed for large air volumes. The air supply must not discharge on a smoke detector.

Laboratories using chemicals must remain at a negative air pressure in relation to corridors and other non-laboratory spaces. Laboratory air shall flow from low hazard to high hazard use areas. Office and administrative areas must always be positive with respect to corridors and laboratories. Corridor supply air distribution shall be sized to offset transfer air to laboratories while maintaining an overall positive building pressure. Loading and receiving docks must be maintained as positive to prevent the entrance of vehicle fumes.

Control of airflow direction in research laboratories controls the spread of airborne contaminants, protects personnel from toxic and hazardous substances, and protects the integrity of experiments. The once-through principle of airflow is applied based on exhausting 100% of the supplied air; maintaining the required airflow with all exhaust units operating at capacity; and providing directional flow of air from areas of least contamination to areas of greatest contamination.

The ventilation rate for laboratory HVAC systems is driven by three factors: fume hood demand, cooling loads, and removal of fumes and odors from the general laboratory work area. The minimum air-change rate for laboratory space is six air changes per hour regardless of cooling load. Some laboratories may require significantly higher rates to support fume hood demand or to cool high instrument heat loads in equipment laboratories.

Implementation of a re-circulating HVAC system for office and administrative areas may be utilized for energy conservation. Re- circulating air systems shall provide ventilation conforming to ASHRAE standards and must not affect the pressurization and balance between laboratory and administrative zones. Re-circulating air systems shall be completely separate from 100% outdoor air laboratory systems.

PLUMBING

The plumbing systems shall be coordinated with the laboratory planning module. A piping distribution method, including mains, risers, and branch lines, shall be designed to accommodate easy service isolation and system maintenance while minimizing disruption to laboratory functions. Emergency isolation valves must be conveniently located on branch lines so that segments can be taken off line quickly in the event of failures.

Piping systems shall be designed for flexibility and have redundant components to provide reliable and continuous operation. Adequate fluid temperature, pressure, and volume must be delivered to required laboratory functions through conservatively sized pipe mains. Future capacity allowances need to be considered in the building design.

All required penetrations shall use raised sleeved openings sealed and caulked to prevent leakage and maintain the fire rating of the slab.

ELECTRICAL

Laboratories shall have surface mounted aluminum raceways mounted above all benches and at equipment areas. The power duct shall have a continuous 120/208V60A30 4 wire plus ground circuit installed. Twenty ampere taps as needed shall serve receptacles via 20A single pole circuit breakers mounted in the raceway. Receptacles shall be mounted at 24” on center. Receptacles mounted within 36” of water dispensing shall be

ground fault interrupter type. A minimum of one 60A30 4 wire circuit shall serve a 14'x36' laboratory module. In addition, a minimum of five 20A circuits per 14'x36' lab module with three duplex receptacles each will be provided.

The following are to be connected to standby power.

- Fume hood exhaust fans
- Incubators, refrigerators, freezers, cold rooms, warm rooms
- Biological safety cabinets

Voice and data outlets shall be pre-wired using accessible coble trays and conduit as required. The location and number of voice/data outlets must be carefully evaluated in the design phase.

HEALTH AND SAFETY

Fume hoods shall be tested in accordance with ANSI/ASHRAE Standard 110-1985, after installation but before acceptance by the construction project manager. In general, the fume hoods shall be tied into the laboratory area exhaust system, with no separate exhaust stock.

Vacuum pump systems will have hydrophobic (water-resistant) filters on the suction side, with the exhaust to the outside of the building and not into mechanical spaces. The filter housing shall be designed for easy replacement of the filter, with maximum protection of maintenance employee from possible contamination.

A safety shower/emergency eyewash will be provided at each laboratory space containing a chemical fume hood. Safety showers shall be no more than 75 feet from any point in the laboratory. Casework and tops shall be designed to be as vertically flush as possible. Kneehole space shall be provided for waste containers.

Flammable storage cabinets will be incorporated into the design of laboratories. Flammable storage cabinets are to be located as remote as possible from the exit doors of the laboratory. Flammable storage cabinets shall not be installed below fume hoods, or in corridors or exit pathways within the laboratory. Flammable storage cabinets shall not be vented.

Inert gas cylinders will be secured to a vertical surface out of the way of traffic.

Space for waste boxes will be provided in the laboratories.

Mechanical Engineering Design Criteria

APPLICABLE CODES

California Building Code (Title 24, Part 2), 2013

California Mechanical Code (Title 24, Part 4), 2013

California Energy Code (Title 24, Part 6), 20013

California Referenced Standards Code (Title 24, Part 12), 2013

REFERENCE STANDARDS AND GUIDELINES

American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)

American Society of Mechanical Engineers (ASME)

Underwriters Laboratories, Inc. (UL)

American Standards of Testing Materials (ASTM)

National Fire Protection Association (NFPA)

ANSI/AIHA Z9.5 American National Standard for Laboratory Ventilation, 2012

DESIGN CRITERIA

Project Location: To be determined Latitude: To be determined

OUTSIDE DESIGN CONDITIONS

Heat gains and losses to the exterior will be allocated using ASHRAE outdoor design conditions at frequency levels of 1% for summer dry-bulb and mean coincident wet-bulb temperature and 99% for winter dry-bulb temperature.

Note: The operating and comfort conditions and ventilation rates required for each laboratory space and room function will be reviewed on a case by case basis. Other spaces, such as offices, conference rooms, and administrative areas, shall be maintained at 74 F indoor temperature during the summer and 70 F during the winter.

AIR CONDITIONING SYSTEM

The major equipment and systems that will serve the Air Resources Board Building shall include the following:

Central Plant Equipment

Heating hot water will be generated on site via hot water boilers located in a central plant enclosure to generate 180 degree space heating hot water, 140 degree domestic hot water. Two storage tanks will be provided one for industrial and one for domestic hot water. The domestic hot water will be stored at 140°F to prevent Legionnaire's Disease. The space heating hot water system will be designed to operate at a 40- degree temperature differential between supply and return water temperatures to maximize energy efficiency.

Chilled water will be generated using multiple centrifugal chillers. Variable speed drives will be installed on the chillers to minimize energy consumption during part load conditions. Chillers with magnetic bearings will be considered for increased energy efficiency. The chillers will be sized based on the facility load profile and pony chillers will be provided for periods of low demand. The chillers will be designed to deliver 42 degree Fahrenheit chilled water to the air handling units with a design temperature differential of 24± degrees to optimize flow energy.

Chilled water and heating hot water will be delivered to air handlers installed on the roof of the building via piping distribution and pumps. Multiple variable speed pumps will be provided for energy efficiency and redundancy. An energy management system will be provided to maximize efficiencies and m1inim1ize energy consumption at the site. Chilled water and heating hot water piping materials will be schedule 40 black steel for pipe sizes 4" and larger and copper for smaller pipe sizes.

Offices

A single tunnel, variable volume, roof mounted air-handling unit, composed of plug fans for supply and return air, chilled water coils and filter sections will serve the office areas. The office air handler will be provided with a full economizer cycle to minimize energy consumption during favorable outdoor conditions. Variable speed drives will be provided on supply and return air fans to minimize energy consumption and maximize system efficiency.

The office air conditioning system will deliver conditioned supply air, and return air back to the unit to minimize outside air loads during summer months. Air distribution throughout the office will be delivered through ductwork and VAV boxes with reheat coils. Supply and return air ductwork will be constructed of galvanized sheet metal materials.

Variable refrigerant flow systems with dedicated outdoor air units that has integral energy recovery devices and variable speed fans controlled through space Carbon Dioxide sensors and space pressure sensors will be studied through energy usage simulation life cycle analysis and should be selected if energy efficiency, reliability, safety, cost, space temperature control, indoor environmental conditions and maintenance are found to be better than the conventional variable air volume system with reheat.

Laboratories

A 100% outside-air, dual tunnel, air-handling unit composed of plug fans for supply air, chilled water coils pre-filter and final-filter sections will serve laboratory spaces and support areas. Each tunnel of the dual tunnel air handler will be sized to provide 75% of the building load capacity to provide limited redundancy in the event of a unit failure or periodic maintenance. Variable speed drives will be provided on supply air fans to minimize energy consumption and maximize system efficiency.

Energy recovery from room exhaust and direct indirect evaporative cooling should be studied through energy usage simulation life cycle analysis and incorporated if the payback is satisfactory.

The laboratory exhaust system will consists of two exhaust fans manifolded together, each having a capacity of 100%. With the second fan being redundant. One possible configuration being evaluated consists of a pair of exhaust fans serving each floor or each building segment with a common operating schedule. A separate exhaust system will be provided for the laboratory fume hoods that can be combined. The laboratory spaces and general exhaust requirements will be provided by a separate system for which heat recovery will be considered. Individual exhaust fans will be required for any specialty hoods. All exhaust ductwork associated with laboratory fume hood exhaust fans will be constructed of fully welded 316 stainless steel.

The fume exhaust stacks must be above the highest point of the building, including mechanical penthouses and roof parapets, to facilitate the removal of hazardous materials and ensure safe dilution levels. The height of the fume exhaust stacks will be carefully determined in conjunction with local codes and regulations. The height of the stacks and their location on the roof are critical to safe building operation and the safety of neighboring sites. Fume exhaust stacks must be minimum ten feet above the adjacent roofline to avoid exposing the maintenance personnel to the direct upward blast of the fume exhaust.

The discharge velocity from exhaust stacks should be maintained at a minimum of 3,000 feet per minute (or higher depending on building wind air flow analysis) to counteract any re-entrainment due to varying wind direction or area environmental features. Exhaust stacks should not be located within enclosures or architectural screens. Architectural masking structures may be used as long as the requirements of this section are met and the stack extends at least one diameter above the masking structure. Recirculation of hazardous fumes from exhaust stacks on the roof to the outside air intakes of building systems shall be prevented.

Depending on the location of the unknown site, it possible that a wind tunnel model test or a Computational Fluid Dynamics test may need to be performed to determine the best location and height of the exhaust discharge. Of concern is the effect of the wind conditions, which may introduce exhaust air into this or adjacent buildings.

General utility set type building exhaust fans will be provided for restrooms and utility rooms to minimize sizes and capacities of the laboratory exhaust fans. General duty exhaust ductwork will be constructed of galvanized sheet materials.

A laboratory control system will provide the laboratories with a variable air volume system designed to provide the required number of air changes, maintain room pressure I temperature setpoint and vary the fume hood air flow depending on sash position of fume hoods. All of these functions serve to provide a safe environment for the building occupants.

The design of the building controls and energy management system will be fully modular, permitting future expansion capability in both, the number of control I monitor points and the control functions.

Phoenix valves or similar pressure independent venturi valve terminals will be used in all laboratory spaces on both supply and exhaust air systems to maintain required air changes and temperature control.

Specialty spaces within the lob areas will be treated on a case-by-case basis depending on program requirements and space function. These include but are not limited to radio-isotope spaces, chemical storage rooms or other critical function spaces.

Vehicle Testing Area

The roof mounted air handling system serving the vehicle testing area shall be designed to allow for l00% outside air operation. However, under normal operation return air shall be delivered back to the air handler. A carbon monoxide sensing system and a nitrous oxide sensing system shall be provided to control the outside air quantity delivered to the occupied spaces.

Upon detection of CO levels at 15 PPM the outside air damper at the air handler shall deliver a minimum of 50% outside air to the occupied space. The carbon monoxide monitoring system shall allow for a maximum CO level of 25 PPM upon which time the air handler shall operate at 100% OSA and return air shall be shut off.

The roof mounted exhaust system serving the vehicle testing area shall be designed to provide a minimum of 4 air changes per hour in conjunction with the return air at the air handler during normal operation. Upon detection of higher CO levels, the exhaust air will increase to match the amount of outside air being delivered to the space. This fan will be controlled by an adjustable frequency drive through input from a space pressure sensor.

A similar sequence of operation will occur based on NOx levels. Upon detection of NOx levels of 2 PPM the outside air damper at the air handler shall deliver a minimum of 503 of outside air to the occupied space. Upon detection of NOx levels at 5 PPM or higher the air handler shall deliver 100% OSA and the exhaust system shall exhaust 100% of the air being delivered into the occupied areas.

A manual push button emergency purge function may also be provided to allow for user interface upon feelings of nausea, dizziness, or concern by occupants that nitrous oxide or carbon monoxide levels may be elevated.

Supply air, exhaust air, and return air ductwork serving the vehicle testing area shall be constructed of galvanized sheet metal materials.

HVAC CONTROLS

All DDC panels and Application Specific Controllers (ASC) shall be stand-alone in memory, networking, and control operations. The design of the controls will be in a modular format, permitting future expansion capabilities. The system shall monitor and control equipment according to the

sequence of operation, as well as additional Input I Output points. The building control system will operate to ensure operational safety, regulatory compliance and satisfy process constraints as well as occupant comfort. This system will be designed to provide flexibility and minimize the operational cost of the building.

In addition to the main building control system, the laboratories will have a fully integrated control system to control temperature, ventilation rate, room pressurization, fume hood capture velocities, and provide for a variable air volume operation. The laboratories will have room occupancy sensors, increasing the number of air changes to 10 or more, as required, and in accordance with the latest version of the standards on laboratory ventilation.

A controller will sense the total exhaust volume of each two-fan laboratory exhaust system. The system will automatically maintain the fan motor speed arrangement in order to meet the fan motor speed requirements in the laboratory and the fan discharge. In the event of fan failure, the system will automatically operate the second fan at 100% and alarm the primary fan failure.

The laboratory controls will maintain a differential pressure in the laboratories with respect to the adjacent area. The laboratory controller will sequence the exhaust air valve and supply air valves to maintain pressure differential, regardless of fume hood exhaust flow. The system will also measure the air flow volume to maintain minimum specified air changes per hour. The system will measure the room's space temperature and control the supply air damper position and reheat coil valve actuator to maintain the room temperature setpoint. The reheat coil valve will be controlled based on the supply duct discharge temperature utilizing a thermal anticipatory scheme in conjunction with the current supply air volume and the measured space temperature. This control sequence will prevent space temperature swings during large volume changes as required to maintain make-up air requirements for the fume hoods. The system will override the temperature control of the supply damper to maintain the proper pressure constraints.

Face and bypass control of coil leaving temperature will be considered to avoid reheating of the coil leaving air to maintain higher space air flow rates.

ENERGY CONSERVATION SYSTEMS

Several energy conversation measures will be incorporated as part of the mechanical systems. Variable frequency drives (VFD) will be incorporated in the design of the air distribution systems. The air handlers and exhaust fans will operate in variable air volume system (VAV) mode, which will make use of VA V air terminals to properly zone the building.

Variable frequency drives will also be used to operate the chilled water and heating hot water pumps. This will save pumping energy and reduce the demand from the central plant utilities. Two-way valves will be used to optimize the use of the variable water flow system.

All major equipment will be required to have premium efficiency type motors.

Electrical Engineering Design Criteria

APPLICABLE CODES

California Building Standards Administrative Code (Title 24, Part 1)

California Building Code (Title 24, Part 2)

California Electrical Code (Title 24, Part 3)

California Mechanical Code (Title 24, Part 4)

California Energy Code (Title 24, Part 6)

California Elevator Safety Construction Code (Title 24, Part 7)

California Fire Code (Title 24, Part 9)

REFERENCE STANDARDS AND GUIDELINES

NFPA 30 Flammable and Combustible Liquids Code.

NFPA 45 Fire Protection for Laboratories Using Chemicals.

NFPA 101 Safety to Life from Fire in Buildings and Structures.

CFR 1910.1450 Occupational exposures to hazardous chemicals in laboratories (OSHA Standard 29).

ANSI/AIHA Z9.5 American National Standard for Laboratory Ventilation, 1992.

Illuminating Engineering Society of North America (IES).

Equipment and materials would comply with the following standards:

UL	Underwriters Laboratories.
ASTM	ASTM International.
CBM	Certified Ballast Manufacturers.
NEMA	National Electrical Manufacturer's Association.
ANSI	American National Standards Institute.

SITE UTILITY

This building will be served by the serving utility with an electrical system consists of a 1200 Amp, 4160V electrical service.

The site telephone/data system will consist of 2-4" conduit from serving utility to main telecom room in the building.

The design of the building electrical system will include a 750 KW (937 KVA) 480/277V diesel engine driven emergency generator.

ELECTRICAL POWER DISTRIBUTION SYSTEMS

Electrical Engineering Design Criteria

Electrical Service and Power Distribution. The proposed facility building area is approximately 300,000 gross square feet including Heavy Duty Testing. Electrical loads for vehicle testing equipment are very high, for example a dyno system can require a 480-volt, 1200 amp connection. The total electrical connected load for the facility is high. A 1200 amp, 4160-volt electrical service will be provided.

Proposed Distribution

4160-volt to 277/480-volt Substations will be installed at the high load locations of the facility. Each substation will include a primary air load interrupter switch, a dry type 4160-volt to 480/277-volt transformer and 480/277-volt secondary distribution switchboard. 480-volt to 120/208-volt dry type step down transformers will be located throughout the facility to serve 120 and 208-volt loads. Lighting will be connected at 277-volt. Air conditioning will be connected 480-volt.

Laboratory panels will be mounted outside individual laboratories, with a minimum of one 60 A, 3-phase, 4-wire panel board serving an 11'X22' laboratory module. Each laboratory panel will have a main circuit breaker.

Transient voltage surge protection will be provided at the 208-120 volt transformer secondary switchboards, serving panels in laboratories.

Motor control centers will be provided to serve mechanical motor loads.

Proposed Distribution Voltages

480V, 3 phase 3 wire for all motor loads 1 horsepower and larger

277V for lighting 120V for receptacles

120/208V, single and three phase for equipment

POWER

Laboratories shall have surface mounted aluminum raceways mounted above all benches and at equipment areas with receptacles mounted 24" on center. Receptacles mounted within 6'-0" of water dispensing shall be ground fault interrupter type.

Power wiring to all motors, fans and pumps, will be provided as part of the electrical construction. All wiring below 120V will be considered as part of other trade such as mechanical systems. All low voltage devices, where required for other trade, will be provided with raceway only. 20 ampere circuits will be provided for convenience outlets. Outlets serving computers and specialty systems will be on dedicated circuits. Separate neutral will be provided for circuits serving computers, copy machines and laser printers. Motors rated 30 horsepower and above will have reduced voltage starters.

LIGHTING

The building will have an energy efficient lighting system throughout the offices, laboratories, toilets, janitor and utility rooms. The lighting system will comply with CCR-Title 24 standards. The interior lighting will be an energy conserving LED Lighting fixture high coefficients of utilization. Dimmable lighting will be provided in conference rooms and multi-purpose rooms.

The illumination levels will be based on Illuminating Engineering Society (IES) guidelines.

LIGHTING CONTROL SYSTEM

Occupancy sensors and override switches will be provided in offices and conference rooms. Switches will be provided in laboratories, service areas and utility rooms. Lighting control will comply with CCR-Title 24 Standards. Exterior lighting will have photo-cell control.

Emergency lighting (light fixture with on emergency generator) and night lighting will be provided in labs, pathways, corridors and public access areas and minimum illumination will exceed one foot candle level.

EMERGENCY AND DISTRIBUTION STANDBY SERVICE

Emergency power is provided for systems legally required by the Authority Having Jurisdiction to automatically supply in the event of failure of normal power or in the event of accident to elements of a system intended to supply, distribute, or control power and illumination essential for safety to human life. Standby power is intended to protect facilities or property where life safety does not depend on the performance of the system. Sources for both types of power will be from the same generator.

Proposed Distribution Voltages

480Y/277V, 3 phase, 4 wire:

Motors 1 hp and larger, fluorescent lighting, large laboratory equipment cold rooms.

208Y/120V, 3 phase, 4 wire:

Receptacles, motors 3/4 hp and smaller, small power requirements and local laboratory equipment needs.

The building electrical systems will be provided with a 750 KW diesel-fueled generator backup. The generator will be interconnected to the building electrical system via automatic transfer and bypass switches. The transfer switches will be 4 pole (3 phases plus neutral). One switch will be dedicated for life safety loads (e.g. egress lighting, exit signs, data & alarm circuits, etc. and the second switch will be provided for equipment load. Generator voltage will be 480Y/277 Volt, 3-phase, 4 wire.

The Emergency generator is sized to provide for the following:

Emergency System:

- EMS and fire alarm panels
- Telephone equipment and associated air conditioning
- Emergency egress and exit lighting throughout the facility at the locations and egress paths required by Code, including exterior stairs

Standby System:

- Required HVAC/mechanical equipment, including supply and exhaust fans, fume hoods and smoke purge fans where required by Code, mechanical room lights and receptacles, sump pumps, elevators (only as required by code),etc.
- Data/Server room equipment, laboratories refrigerators and other, selected convenience receptacles in laboratories, equipment rooms and one receptacle in one cold room on each floor.
- Special equipment power, as defined under individual divisions of the work (i.e. mechanical, laboratory furnishings and equipment, etc.)
- Approximately one receptacle per research laboratory module and one per support space. Some receptacles will be 120V and some will be 208V.
- Capacity to accommodate simultaneous motor starting loads for all life safety required motor loads, plus motor starting loads of individual motors on a time-delay basis for non- life safety related equipment.
- Twenty percent (20%) minimum spare capacity after all other loads are accommodated.

Power connections from the emergency generator to the main switchboard will be via conduit and wire.

The emergency generator will consist of engine generator and controls, UL listed fuel tank, exhaust system, radiator, batteries, starting system and generator output circuit breaker located outdoors in a common sound attenuated weatherproof enclosure. Generator fuel supply will have a capacity to operate the generator at its full load rating for a period of 24 hours.

Emergency Distribution System:

Emergency and standby power will be distributed in conduit and boxes, separate from all other conduit and raceway systems.

Harmonic Distortion/Transient Voltages:

Areas used to support relatively large amounts of computers and microprocessor-based equipment will be provided with separate neutral conductors for each circuit. This includes all laboratories and instrumentation of spaces.

GROUNDING

A central grounding system will be provided from the building service substation to panels, metallic conduit and raceways. A separate ground conductor will be provided for maximum of three circuits in the same conduit unless otherwise noted.

TELEPHONE/DATA

The telephone/data system will consist of wall or raceway-mounted outlets in all occupied spaces, such as offices, laboratories, and laboratory support rooms. These outlets will then be connected to distribution blocks, in communications rooms via conduit, and cable tray system in accessible ceiling spaces. Conduits running to cable trays will take the most direct route to minimize cable length.

A single 1 ¼" conduit will be run from each wall outlet box to cable tray or telephone/data room. Where conduits are run back to telephone closets, cabinets, or backboards, one homerun conduit will serve a maximum of two wall outlet boxes.

All conduits and telecom/data wiring passing through fire rated partitions will be installed to maintain the rating of the partition. All cable will be plenum-approved.

Offices will be provided with dual telephone/data receptacles, mounted above desk height.

All jacks will be wired to the EIA/TIA 568 and 569 standards.

EQUIPMENT ROOMS

A main distribution frame (MDF) room will be provided near the main electrical service room. The room will be in a dry location. The MDF will be a minimum of 10 feet by 8 feet and will have 3/4inch sheet of fire-resistant plywood on all walls. Four l20V/20A emergency power duplex receptacles will be mounted below the plywood at 18 inches above finished floor.

Smaller intermediate distribution frame (IDF) rooms (8 feet wide by 4 feet depth) with similar requirements are required on each floor. Rooms should be vertically aligned and connected with two 4 inch conduits. Equipment rooms will be provided with a #2 copper ground connected to the main building service grounding electrode. Equipment rooms will be provided with emergency lighting and two dedicated 120V/20A duplex emergency electrical receptacles, mounted at 18 inches above finished floor. All walls will be provided with at 3/4inch fire-retardant treated plywood.

SUPPORTING EQUIPMENT

Cable tray: 12 inches wide x 4 inches high, center hung ladder-type, with rungs at 9 inches on center, minimum with divider; 4 foot minimum turning radius. Provide 12 inch clearance above tray.

Conduit: 1 ¼ inch EMT

Back Boxes: 4 11/16 inch x 4 11/16 inch x 2 1/8 inch with 1 ¼" inch knockout and double-gang plaster ring

Outlet Device: Voice and data outlet shall be pre-wired using accessible cable trays and conduit. The location and number of voice/data outlets must be carefully evaluated in the design phase.

DESIGN CRITERIA

Load Calculation Criteria

Design Voltages

Secondary Voltage, Emergency/Standby:

- 480Y/277V, 3 phase, 4 wire
- 208Y/120V, 3 phase, 4 wire

Secondary Voltage, Normal:

- 480Y/277V, 3 phase, 4 wire
- 208Y/l 20V, 3 phase, 4 wire

Preliminary Design Loads

Overall connected Volt-Ampere per Square Foot

Office:

- Lighting 2.0
- Receptacle 2.0

Laboratory, Support and Technical Areas:

- Lighting 3.5
- Receptacle – Labs 35
- Laboratory support 35

Storage:

- Lighting 0.50

Corridor:

- Lighting 0.50
- Receptacle 0.50

Mechanical Areas:

- Lighting 1.5
- Power Actual Motor H.P.

Equipment Sizing Criteria

Branch Circuit Load Calculations

- Lighting 125% of Actual installed wattage
- Receptacles 180 VA per outlet
- Surface wireway 180 VA per outlet
- Special outlets Actual installed wattage of equipment served
- Motors 125% of motor wattage

Demand Factors

- Lighting 125% of total wattage
- Receptacles 100% of first 10 kVA plus 50% of all over 10 kVA
- Motors 125% of wattage of largest motor plus 100% of wattage of all other motors

Minimum Bus Sizes

- 277V Lighting panels 100A
- 480V Lab Equipment Panels 100A
- 120V Lab Equipment Panels 225A
- 120V General Receptacle Panels 225A
- 480V Motor Control Center 600A

Feeder Size

Feeders from substation to distribution panels will be sized the same as the distribution panel bus size. Distribution panels will be sized for 20% extra future capacity and space.

Feeders from distribution boards to panel boards will be sized the same as the panel bus size.

Lighting Criteria

Design Lighting Levels, Maintained Foot-candles

- Office: 30-50 at desk level
- Laboratory: 60-100 at 36” above the floor
- Conference: 30-50at desk
- Corridor: 10-30 at floor
- Storage: 20-30 at floor
- Mechanical: 20-30 at floor
- Stairs: 10 at floor

INTRUSION SYSTEM

Systems will be provided if requested by owner.

Control access will be provided at main entrances and at special interior areas requiring controlled access to be determined during detailed design. Eight (8) readers are typically planned per control panel.

Other security features:

- Electric mortises and electrified panic hardware.
- Egress will be shunted via motion detectors.
- Door alarm contacts will be flush mounted on the door header.
- Local, audible alarms will occur for door breeches and excessive door-ajar time periods.
- Cabling for electric mortise hardware will be wired through the hinge-side of door.
- Security components and panels will not be located in mechanical rooms or electrical rooms. Security and Fire Alarm Systems can however be located in the same rooms.

FIRE ALARM

The fire alarm system will be addressable automatic detection with style 7 wiring.

Fire alarm devices shall be by the following manufacture: Notifier, Simplex or FCI.

The system will utilize individual addressable smoke detectors, heat detectors, pull stations, signal modules and control modules. Water flow detection devices will also be installed to report when the sprinkler system has been activated.

The system will report the date, time, device type, device ID, location and type of alarms that are received. Fire alarm graphic enunciator panels will be located in the building adjacent to the fire department entrance. Each panel will include remote status zone alarm indication and trouble signals.

Audio and visual alarm devices will be installed throughout the building.

Smoke detectors will be provided where required by NFPA guidelines, i.e. air handling units, elevator lobbies and machine rooms, at doors in fire rated areas where doors are electrically held open.

All fire alarm wiring will be installed in conduit.

ZERO NET ENERGY

If the ARB pursues zero net energy for the building, a full analysis would need to be conducted. IBI has a work order to investigate this option, with results expected in the Spring of 2015. Some considerations of zero net energy are:

- Photovoltaic system on roof and shaded parking car ports.
- LED Lighting with daylight harvesting.
- Plug load receptacle controls.
- Demand response lighting controls.
- Energy efficient transformers.
- Cogeneration.

Plumbing Engineering Design Criteria

The codes and standards listed below are minimum requirements. Nothing is to prevent the architect, engineer, or consultant from exceeding the applicable requirements.

APPLICABLE CODES

California Building Code (Title 24, Part 2), 2013

California Plumbing Code (Title 24, Part 5), 2013

California Energy Code (Title 24, Part 6), 2013

California Referenced Standards Code (Title 24, Part 12), 2013

REFERENCE STANDARDS AND GUIDELINES

UL: Underwriters Laboratories, Inc.

FM: Factory Mutual System - Approval Guide

ASTM: ASTM International

ASME: American Society of Mechanical Engineers

WATER SUPPLY

Building domestic water will be supplied via a new lateral line, and associated systems such as industrial and purified water will be supplied from the domestic water lateral line, approximately sized 4”.

DOMESTIC HOT AND COLD WATER (HW, CW)

The building will be fed from below grade with new water line. Point of connection will be indicated on plumbing and civil plans. Service meter(s) and associated backflow prevention device(s) will be indicated on civil site plans, location to be determined. Backflow prevention device(s) will be provided on main cold water supply to protect site mains from backflow from the building. Domestic cold water will be distributed to plumbing fixtures throughout the building via distribution lines. Domestic hot water will be distributed via a looped distribution system. Hot water will be generated by means of a centrally located gas fired building domestic hot water heater. Water temperature within the hot water distribution system

will be maintained by means of a hot water return (HWR) system. The temperature for domestic HW will be 110°F, and will maintain a 5°F. temperature differential between hot water supply and return piping connections at storage tanks. The storage tanks will be maintained at 140°F to prevent Legionnaire's disease. Mixing valves will be provided to adjust the supply water temperature lower. Variable circulation pumps with integral time clocks and temperature and pressure sensors will be provided. These pumps will be provided for each loop between service shutoff valves and the supply to the individual faucets will be minimized to ensure hot water delivery and cold water loss. Groups of fixtures will be provided with isolation valves for ease of maintenance and isolation valves at various locations. Each fixture will also be provided with angle stop valves. Potable water will be supplied at drench hoses and safety shower/emergency eyewash fixtures.

NATURAL GAS (G)

The natural gas system will supply the Laboratory Gas (LG) system(s). Isolation valves will be provided throughout the system for maintenance and an emergency gas shut-off valve will be provided at laboratory spaces. Seismic shut-off valve(s) will be provided at all building natural gas piping points of entry.

Building natural gas and associated systems such as laboratory gas will be supplied via a new lateral medium pressure gas (MPG) to exterior of building, Pressure to be determined. Gas service into the building will be reduced to approximately 7"-8" W.C. at point of entry to building by means of a gas regulator. Groups of equipment will be provided with isolation valves for ease of maintenance.

Building sanitary soil/waste p1p1ng will be drained via new site sewer lateral(s) to various points of connections.

HVAC CONDENSATE DRAINAGE (CD)

HVAC condensate drainage piping will be provided to each HVAC unit. Such piping will drain to an indirect waste connection to the sanitary soil/waste system via either tailpiece connection at the nearest lavatory or sink, floor sink, or a fixed air gap mounted within a stainless steel panel in wall.

ROOF/OVERFLOW DRAINAGE (RD, OD)

Roof and overflow drain systems will be provided to serve roof and overflow drains as required by architectural design. Sizing of drains and drainage piping will be based on rainfall figures commonly used for the area.

Building roof drain system will discharge to site storm drain system and overflow drain system will spill to grade at various locations.

CD: Type "M" copper, insulated, minimum 1/4" per foot slope.

RD, OD: Heavy duty cast iron. No hub, minimum 1/4" per foot slope.

The codes and standards listed below are minimum requirements. Nothing is to prevent the architect, engineer, or consultant from exceeding the applicable requirements.

APPLICABLE CODES

California Building Code (Title 24, Part 2), 2013

California Plumbing Code (Title 24, Part 5), 2013

California Energy Code (Title 24, Part 6), 2013

California Fire Code (Title 24, Part 9), 2013

California Referenced Standards Code (Title 24, Part 12), 2013

DRAINAGE, WASTE, AND VENT (DWV)

Soil/waste drainage piping will be provided to each domestic plumbing fixture. Such piping will also receive condensate discharge from HVAC equipment via indirect waste connections. Sanitary drainage vent piping will be provided to each domestic plumbing fixture or trap and will terminate at various locations of the roof.

DOMESTIC PLUMBING PIPING MATERIALS

HW, CW:	Copper tube, Type L with wrought copper fittings and brazed or soldered joints.
G:	Schedule 40 black steel with threaded galvanized malleable iron fittings as required.
DWV:	Heavy duty cast iron. No hub, minimum 1/4” per foot slope.

REFERENCE STANDARDS AND GUIDELINES

ANSI Z358.1:	Emergency Eyewash and Shower Equipment, 2009
UL:	Underwriters Laboratories, Inc.
FM:	Factory Mutual System Approval Guide
ASTM:	ASTM International
ASME:	American Society of Mechanical Engineers

DISTRIBUTION

Laboratory piped services will be distributed throughout the facility, as required. Each group of laboratories will be provided with a main shut-off valve for each type of service, such that they may be isolated without affecting services to other areas served by the distribution service. A complete set of laboratory piped services will be stubbed out for each group of laboratories even though all services may not be initially required. This will increase flexibility and minimize remodel and retrofit costs as laboratory uses change. Each group of laboratories will have separate shut-off valves located in a consistent, accessible manner for emergency shutoff. The criteria for each service listed below should be considered for these systems:

PURIFIED WATER (PW)

A central purified water system that will supply CAP Type II reagent water will be provided to satisfy the use of the laboratory requirements. More stringent water purity requirements, such as CAP Type I will supplied by owner-furnished points of use polishers fed from the central system.

Purified water will be generated utilizing equipment centrally located within the mechanical room. Equipment to be provided will include: Twin water softener, reverse osmosis system, two 650 gal. capacity tanks cone bottom, distribution duplex pump skid system, deionization mix bed tanks, UV sterilizer, and final post filter. Sizing of equipment will be determined based on laboratory PW outlets and equipment demand (such as glasswashers, etc.) as well as distribution/recirculation pipe routing and configuration. Supply and recirculation distribution loop will be routed throughout the building in a serpentine configuration to serve each laboratory PW outlet.

LABORATORY VACUUM (LV)

Laboratory Vacuum system will include duplex vacuum pumps, storage tank(s), controls, and distribution piping providing minimum 23 inch Hg negative pressure at the point of use. Vacuum equipment will be centrally located in mechanical room. The distribution piping will be routed throughout the building to serve each laboratory space with LV requirements. Vacuum pumps will utilize an air purge feature to protect internal items from possible chemical corrosion. Control will be “lead/lag” type operation.

Vacuum distribution p1p1ng system will be routed to each laboratory space that requires (LV). Isolation valves will be provided throughout the system for maintenance.

LABORATORY GAS (LG)

Natural gas will be supplied at 7”-8”W.C. pressure. Laboratory gas distribution piping system will be supplied from the building’s natural gas (G) distribution system, and will be routed throughout the building to serve each laboratory space with LG requirements.

ANALYTICAL/SPECIALTY GASES

Analytical/Specialty Gases will be used at various locations throughout the facility. Such systems will be provided by the users.

INDUSTRIAL HOT AND COLD WATER (IHW, ICW)

Industrial hot and cold water systems will be supplied from the building’s domestic cold water (CW) and hot water (HW) systems. A central backflow prevention device will be provided to isolate each industrial water system from potable water systems, and protect potable water from possible cross contamination. Industrial grade water will be routed throughout the building to serve each laboratory space with IHW and ICW requirements. All fixtures serviced with industrial water will have a sign stating “Non-Potable Water”. Industrial Hot water will be generated by means of a centrally located heat exchanger utilizing high temperature water (HTHW) to heat building industrial hot water. Industrial hot water will be stored in insulated storage tanks, size to be determined. Water temperature within the industrial hot water distribution system will be maintained by a means of an industrial hot water return (IHWR) system. The temperature for IHW will be 120°F and will maintain a 5°F. temperature differential between hot water supply and return piping connections at storage tanks.

LABORATORY WASTE AND VENT SYSTEM (LW, LV)

Laboratory sinks, floor drains, fume hood cup sinks, and other fixtures that will discharge laboratory waste will be provided with a corrosion-resistant drainage system connected to the sanitary sewer outside the building perimeter after dilution levels are achieved.

An acid neutralization tank system and sampling station will be provided to dilute such lab waste before discharging to sanitary sewer.

A best management practice system should be established and lab waste that cannot be treated or removed with a conventional PH control system such as petroleum products, toxic materials can be discarded into a safe storage tank for proper final disposal by a hazardous waste specialist contractor.

LABORATORY UTILITY DISTRIBUTION PIPING MATERIALS

VAC: Cleaned and capped Type L, with wrought copper fittings and brazed joints. Vacuum piping larger than 3 inches in diameter will be Schedule 40 PVC with solvent joints.

PW: PVDF pipe, valves and fittings with electro fusion joints.

LG: Schedule 40 black steel with threaded galvanized malleable iron fittings as required.

LW, LV: Electro fusion PVDF above and below grade.

IHW, ICW: Copper tube. Type L, with wrought copper fittings and brazed or soldered joints.

All piping components subject to sweating or heat loss will be insulated with appropriate thickness of insulation and fire-retardant jacket.

AUTOMATIC FIRE SPRINKLER SYSTEMS

The codes and standards listed below are minimum requirements. Nothing is to prevent the architect, engineer, or consultant from exceeding the applicable requirements.

APPLICABLE CODES

California Building Code (Title 24, Part 2), 2013

California Fire Code (Title 24, Part 9), 2013

California Referenced Standards Code (Title 24, Part 12), 1999

REFERENCE STANDARDS AND GUIDELINES

NFPA 13: Installation of Sprinkler Systems, 2001

NFPA 24: Installation of private fire service mains and their appurtenances, 2001

UL: Underwriters Laboratories, Inc.

FM: Factory Mutual System - Approval Guide

AUTOMATIC FIRE SPRINKLER SYSTEM(S)

Automatic fire sprinkler system will be provided as a deferred item by a qualified design/build fire protection contractor. This contractor's design will be based on a performance specification (provided by mechanical engineer) and instructions on plumbing plans. The majority of the system will be Wet Pipe, based on Light or Ordinary Hazard occupancy as defined by the space. Areas where the laboratory or test equipment can be damaged by water will be provided with water mist systems that use Nitrogen and water vapor as the extinguishing agent combined with a preaction system as the last resort protection. Installation will include automatic fire sprinkler riser, flow alarms, valves, and associated items, as well as main and branch piping with sprinkler coverage of area(s) indicated on plans.

Building Automatic Fire Sprinkler systems will be supplied via a new lateral line, approximately sized 6".

FIRE PROTECTION PIPING MATERIALS

Riser or cross mains will be ASTM A 795 Steel Piping schedule 40 black steel pipe. All other sprinkler piping will be either ASTM A 795 schedule 40 black steel pipe, or ASTM B 88 Type K copper tube installed in an approved manner. Connections or fittings shall be threaded, flanged, grooved or welded.

LEED Certification

LEED v4 for BD+C: New Construction and Major Renovation

The goal of Platinum LEED (Leadership in Energy and Environmental Design) compliance is recommended for this project. The LEED requirements are consistent with the CARB overall environmental conservation mission. A preliminary LEED evaluation indicates that a Platinum rating may be realistic. The following items have been determined as appropriate for the building, without adding unnecessary cost. The formal LEED certification process may represent an added cost.

Y	?	N			
			Credit	Integrative Process	1

25	5	0		Location and Transportation	16
16			Credit	LEED for Neighborhood Development Location	16
1			Credit	Sensitive Land Protection	1
1	1		Credit	High Priority Site	2
2	1		Credit	Surrounding Density and Diverse Uses	5
2	3		Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1

8	2	0		Sustainable Sites	10
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
2			Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
1	2		Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1

5	6	0		Water Efficiency	11
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
1	1		Credit	Outdoor Water Use Reduction	2
2	4		Credit	Indoor Water Use Reduction	6
1	1		Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1

19	12	0		Energy and Atmosphere	33
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
4	2		Credit	Enhanced Commissioning	6
9	9		Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
1	1		Credit	Demand Response	2
3			Credit	Renewable Energy Production	3
1			Credit	Enhanced Refrigerant Management	1
			Credit	Green Power and Carbon Offsets	2

7	4	0		Materials and Resources	13
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3	2		Credit	Building Life-Cycle Impact Reduction	5
1	1		Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
1			Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1			Credit	Building Product Disclosure and Optimization - Material Ingredients	2
1	1		Credit	Construction and Demolition Waste Management	2

13	2	0		Indoor Environmental Quality	16
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1			Credit	Enhanced Indoor Air Quality Strategies	2
1	2		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
2			Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
2			Credit	Interior Lighting	2
3			Credit	Daylight	3
1			Credit	Quality Views	1
1			Credit	Acoustic Performance	1

6	0	0		Innovation	6
5			Credit	Innovation	5
1			Credit	LEED Accredited Professional	1

4	0	0		Regional Priority	4
1			Credit	Regional Priority: Specific Credit	1
1			Credit	Regional Priority: Specific Credit	1
1			Credit	Regional Priority: Specific Credit	1
1			Credit	Regional Priority: Specific Credit	1

87	31	0	TOTALS	Possible Points:	110

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

NOTE: Renewable Energy Production will be from solar generation.

Conceptual Site & Building Massing

Courtyard Scheme:

Hypothetical Site Plan

This site plan represents the recommended site design accommodating the building and site requirements of the program for a hypothetical green field site

Courtyard Scheme

- Building design concept w/ exterior courtyard
- Office and Shared Facilities Building (3 Story) (yellow): 48,468 nsf; 72,702 gsf
- Chemistry Building, Inc Air Mon South (1 Story) (blue): 30,010 nsf; 48,016 gsf
- Light Vehicle test net area (1 Story) (green): 67,534 nsf; 91,171 gsf
- Heavy Duty Testing and OBD Building (1 Story) (red): 46,160 nsf; 62,316 gsf
- PEMS Building (1 Story) (red): 4,950 nsf; 6,683 gsf
- Admin. Services (ASD) Building (1 Story) (orange): 14,692 nsf; 18,365 gsf
- **Total program area:** 211,814 nsf; 299,252 gsf

(The net area only includes assignable spaces; it does not include corridors, shafts, elevators, stairs, mechanical rooms, mechanical mezzanine above the test cells, electrical rooms, plumbing rooms, telecom/data rooms, and restrooms).

- Approximate site dimensions required: 730 ft. wide by 835 ft. deep.
- Approximate site area: 14 acres (609,840 sq.ft.)
- Building foot print area: 299,252 gsf.
- Mezzanine mechanical space above the test cells: 17,550 gsf.
- Total building area: 299,253 gsf.
- Net program area: 211,994 nsf.

(The net area only includes assignable spaces; it does not include corridors, shafts, elevators, stairs, mechanical rooms, 2nd floor mechanical mezzanine above the test cells, electrical rooms, plumbing rooms, telecom/data rooms, and restrooms).

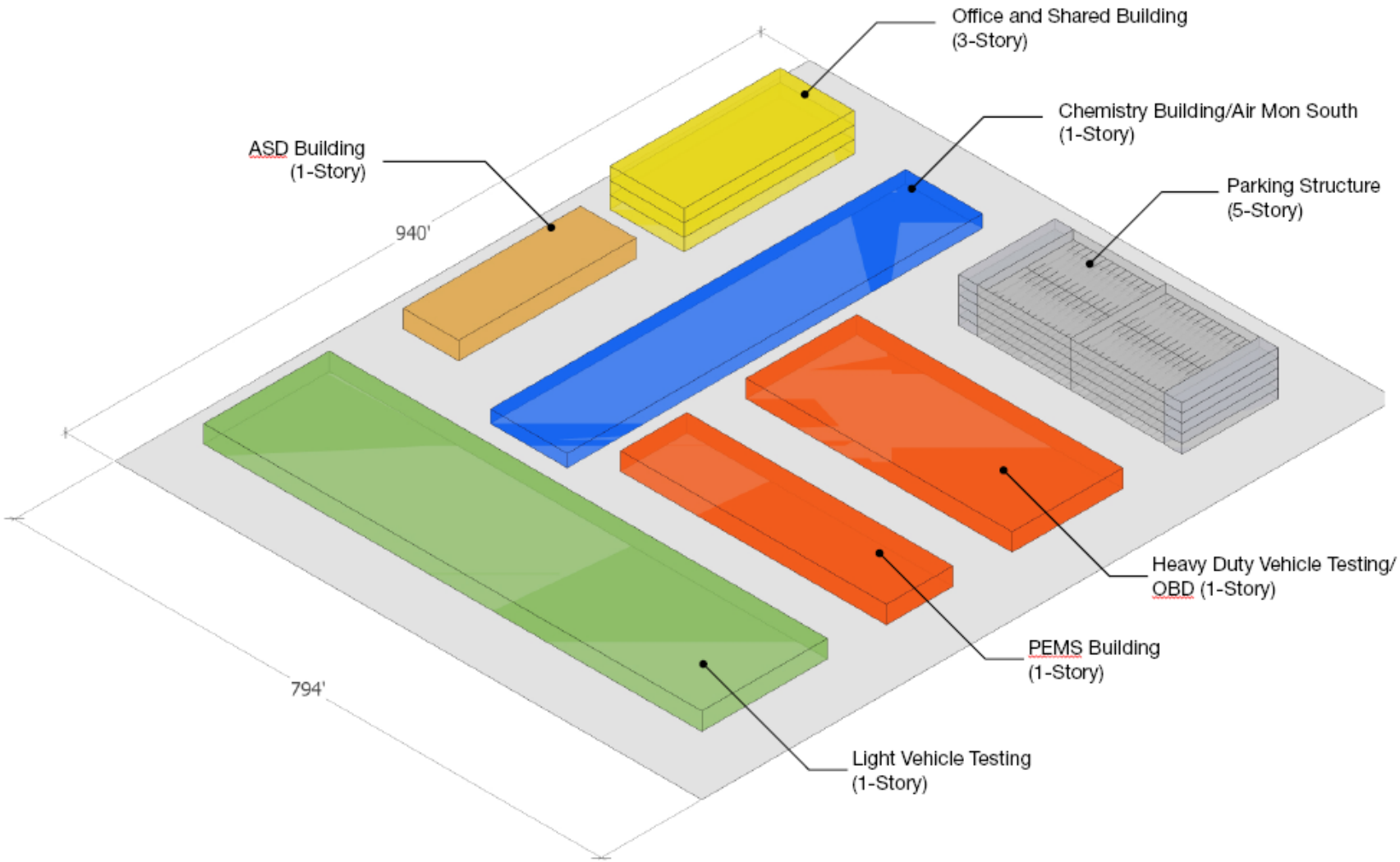
- Secured outdoor area of site includes: Fuel pumps, Underground fuel tanks, Haz-Mat storage

SHED, Fuel drum storage shed, HD vehicle test parking (6), Vehicle test and state vehicle parking (100), Loading dock, Liquid Nitrogen tank.

- Staff and Public parking for 400 vehicles
- Outdoor courtyard
- Multi-Level Parking Structure (gray): 160,000 nsf, 184,000 gsf.

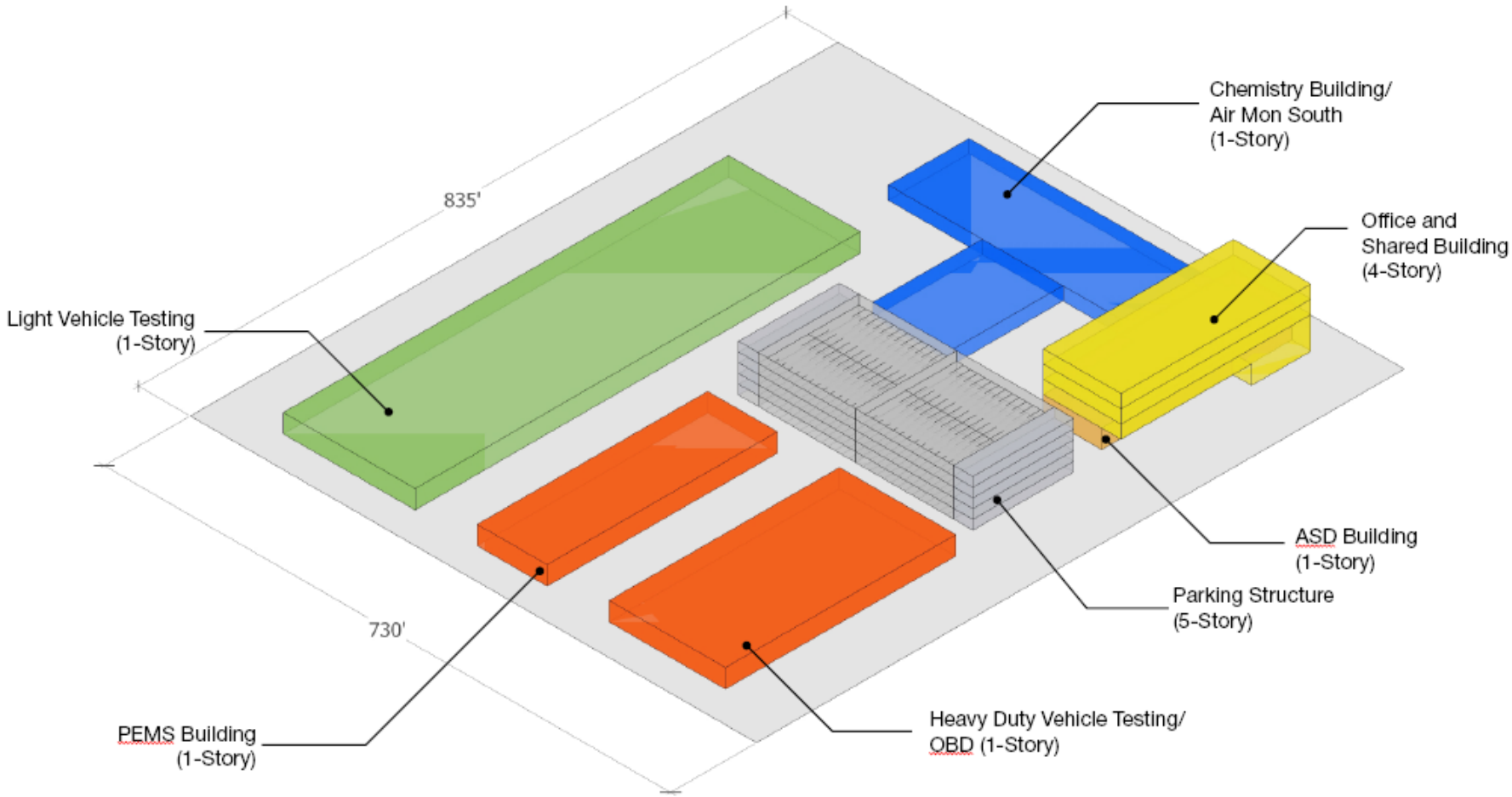
Hypothetical Site

Site Concept Options 1



Hypothetical Site

Site Concept Options 2
<u>Preferred Option</u>



Cost Analysis

Emissions Testing Facility
California Air Resources Board
Rough Order of Magnitude Estimate - Revised 1/7/15

BUILDING & SITE COST SUMMARY

Element	Area (SF)	Cost/SF	Total
1 Building 1 - Light Vehicle Testing	91,171	$487.05	$44,404,787
2 Building 2A - Heavy Duty Testing/OBD Building	62,316	$650.75	$40,552,137
3 Building 2B - PEMS Building	6,683	$382.17	$2,553,851
4 Building 3 - Chemistry/Including Air Monitoring South Building	48,016	$694.63	$33,353,354
5 Building 4 - Office and Shared Facilities Building	72,702	$407.82	$29,649,330
6 Building 5 - ASD Building	18,365	$259.23	$4,760,759
7 Building 6 - Parking Structure	184,000	$78.37	$14,420,080
8 Sitework			$19,496,585
TOTAL ESTIMATED CONSTRUCTION COST	483,252	$370.00	**$189,190,882**

NOTE:
The cost estimates are based on the Clarke Project Solutions, Inc. Rough Order of Magnitude Estimate – 3rd Revised, Dated November 12, 2014. However, the final square footages for each building in this Program Summary were slightly revised subsequent to the completion of the Clarke Project Solutions report. Therefore, the final costs in this report are slightly different than the final cost estimates in the Clarke Project Solutions report. However, the dollar per square footage for each individual building is identical between the two reports.

Exclusions

- All professional fees.
- Construction phase contingency.
- Inflation adjustment is not included
- All owner supplied furniture, fixtures, and equipment.
- Dynamometers to Vehicle Testing Area.
- Land acquisition costs.
- Hazardous material abatement.
- Any costs associated in dealing with soil contamination.
- Any building/structure demolition costs.
- Any site utilities cost beyond the allowance contained in the Elemental Summary.
- Any site costs associated with a site larger than 18 acres.
- Any costs associated with abnormal soil conditions.
- This cost model is based upon a single-story building with a 22,000 SF mechanical mezzanine.
- All building permit and development fees.
- All owner administration and soft costs.
- Legal costs.
- Financing costs.
- Cost associated with LEED certification.
- Laboratory Equipment excluded.