Bioengineering Building
Detailed Project Program Addendum

VERIFICATION/RECONCILIATION PROCESS | VIVARIUM

UNIVERSITY OF CALIFORNIA, SANTA BARBARA AUGUST 4, 2009

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ACKNOWLEDGEMENTS

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We wish to thank and recognize the contributions of the following individuals in the development of the Amendments to the Detailed Project Program, dated October 17, 2008, Part I of this document, and the creation of the Detailed Project Program for a Vivarium to be integrated into the Bioengineering Building, found in Part II of this document. Contributions to one or both of the efforts is noted below.

(DPP for the Amendment Committee, V for the Vivarium committee.)

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INTRODUCTION

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EXECUTIVE SUMMARY 2.1.0

SECTION 2.1.0 **EXECUTIVE SUMMARY**

The development of the Bioengineering Building on the University of California, Santa Barbara campus represents the highest of aspirations for the research community. Ranked with Caltech, MIT and other outstanding universities, UCSB has risen to be one of the premier research institutions in the nation. Championed by Chancellor Yang and the University's leadership, scientific pursuit at UCSB is characterized by shared goals and a collaborative approach. The new Bioengineering Building, chosen to anchor an important site within the heart of the campus, is intended to provide a home to collaborative research groups from the College of Engineering and the Departments of Biological Sciences, Chemistry and Physics, as well as a gathering forum for interaction within the greater scientific community.

Purpose of this Document

The information contained within this Detailed Project Program Addendum document represents the culmination of a planning process, initiated in the spring of 2007. The document is intended to be used in conjunction with the initial Detailed Project Program, prepared and issued by RBB Architects on October 17, 2008. This Addendum includes both amendments and extensions to the original DPP, along with minor modifications to specific technical proposals. The document also includes the addition of a Detailed Project Program for a vivarium intended to support both the campus and building's research needs.

The primary focus of the information contained in this document is to describe a project that maintains the University's aspirations for the proposed project which is reconciled with the project's specified construction budget. Specifically, the information within this document examines the size and quantity of the proposed spaces, the effectiveness of the building's systems, the efficiency of the proposed planning concept, as well as the University's sustainability goals, reinforced by a detailed analysis of the anticipated cost of construction.

For additional detail concerning the project's justification and description, see the excerpt from a memorandum to the Committee on Buildings and Grounds, dated November 18, 2008 in Section 2.3.0 beginning on page 21.

Project Overview

The proposed project will provide a new, high performance laboratory facility supporting the University's research and academic programs. The 78,250 square foot, three-story project will support the University's sustainability goals by seeking a LEED Silver Certification. The primary spaces include:

- office and conference space for a new academic Bioengineering Program
- office and conference space for the Institute for Collaborative Biotechnologies
- a new 100 seat Auditorium
- flexible research laboratory and laboratory support spaces
- faculty and student offices
- a Vivarium for small rodents
- an Animal Bio-Safety Level 3 laboratory (ABSL-3)

These facilities will be built within a planned construction budget of $50,375,000, including:

- $35,100,000 for construction of the Base Building
- $11,775,000 for construction of the Vivarium
- $3,500,000 for site work and landscape

Funding Sources and Options
For funding purposes, the project is divided into three primary components: the base building, the vivarium, and the project site. Program elements and construction costs associated with these components are being tracked separately in order to facilitate flexibility with any potential, future changes to project funding. The primary funding mechanism for the base building and the project site work is currently anticipated to be funds allocated through the use of the Garamendi mechanism.

The construction cost of the new vivarium is anticipated to be funded through an NIH grant that was submitted as part of the process of developing the vivarium's programmatic requirements. Pending approval of the NIH grant application, the vivarium would be designed as an integral part of the Bioengineering Building. If the NIH funding is not approved, the University will have the option of constructing the ABSL-3 suite and shell space within the basement of the proposed building in order to accommodate a future vivarium. However, alternate funding sources would be required.

Scope and Cost Strategies
A number of cost reduction strategies have been employed during the development of the proposed project program. The proposed program specifies a three-story structure with a full basement, rather than the original DPP's four-story structure. This strategy effectively decreases the overall area of the proposed scheme by reducing the number of spaces that would typically be required on every floor. With the inclusion of the vivarium, the originally proposed Bio-Safety Level 3 laboratory (BSL-3) can be combined with a similar space within the vivarium, reducing the base building laboratory area. Additionally, through careful analysis of the proposed project's shared spaces, the overall size of the project is able to be further reduced.

While shelling laboratory space would be an effective cost saving strategy, the desire to have the maximum number of occupiable labs reduces the desirability of this strategy. Instead, additional cost savings have been achieved by providing a partial, yet functional level of laboratory fit out as illustrated in the Room Data Sheet on page 104 in Section 8.2.0.

Different strategies were required to provide an on-budget program for the vivarium component. The infrastructure and servicing requirements of the vivarium, combined with the current animal housing needs and anticipated future growth of the facility, suggest a vivarium of approximately 16,000 gross square feet. At the currently anticipated construction cost, a facility of this size, with all desired equipment, would not be possible within the allocated construction budget. In order to complete the vivarium within budget, it is currently anticipated that not all of the animal procedure and holding spaces will be constructed. Instead shell space will be provided that can be completed at a later date. Additionally, the cost of the animal cage racks and cages will not be purchased as part of the project's construction budget. Separate funding sources will be identified to cover the cost of animal cages and racks.

Through the approaches described above, as well as the other specific information contained within this document, the probable cost of the project is expected to be within the construction budget established by the University.

reference	DPP CLARIFICATIONS AND AMENDMENTS
page 2.1.3	second paragraph: LEED Certification: The term used in the DPP "equivalent" is amended to state that UCSB seeks full LEED Silver Certification.

INTRODUCTION

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PROJECT PROCESS 2.2.0

SECTION 2.2.0 **PROJECT PROCESS**

The project development process started in spring 2007 with the Office of the President's support for the campus' strategy to finance a new research facility using the Garamendi mechanism. This approval allows the campus to undertake debt that will be repaid through research funding and establishes opportunities for additional financial support through gifts and other sources.

Undertaken within the following year, the University developed a Detailed Project Program that was issued on October 17, 2008. This document, prepared by RBB Architects, Inc. and its consultants, gathered a significant amount of information concerning both the campus' planning requirements and the research facilities needed. The process included the development of a series of blocking-and-stacking diagrams that attempted to illustrate the program's areas and functional relationships, as well as, a description of the probable cost for the facilities. Although steps had been undertaken to bring program and cost into alignment, further reconciliation was required at the time of the DPP's issue.

Process – DPP Verification / Reconciliation

A thorough review of the original DPP and an analysis of the program and blocking-and-stacking diagram, Scheme B, formed the basis for this study. The amount and distribution of the program was coordinated with spaces described in the room data sheets. From this effort revised programs and their associated blocking-and-stacking diagrams were developed to assist a dialog with the Building Committee.

New approaches were initially developed that reduced the height of the building, deleted gross and redundant net areas, as well as, removed the area devoted to the BSL-3 suite. The area for the BSL-3 suite was transferred to the Vivarium program.
Principal topics of discussion concerned –

- Guiding Principles for the design of the facility (Goals and Priorities)
- Siting strategies and parameters – the importance of the chosen site at the intersection of Pardall Mall and Science Walk and the potential of the building to convey a strong identity for sciences and the campus
- Relationships between the Vivarium and the Bioengineering Building above
- Review of the presented blocking-and-stacking diagrams – pros and cons and their associated costs

The process generated confirmation of the spatial and programmatic must-haves as well as established a list of fundamental goals and priorities. Further studies and refinements led to the proposed blocking-and-stacking diagram and its associated area summary, which provided the basis for a reconciled program and budget presented in this document (see Part III).

Bioengineeing - Goals and Priorities

The University's administration and Building Committee expressed the need to establish a set of clear and straightforward goals for the project. These will be the standard to guide the project through the design process and to judge its success upon completion and occupancy. Initial ideas intended to guide the building's design include –

- Designing an efficient structure that meets programmatic and budgetary requirements.
- Developing Laboratory space is of prime importance – Rather than shelling laboratory space to meet budget constraints, all labs should be built to a partial level of fit-out, with the ability to add benches and equipment as needed.

- Establishing spaces that are flexible – both within the laboratories and throughout the building's supporting areas.
- Understanding the facility's need to have a "loose fit" – given the changing nature of the science programs envisioned in the building – molecular biology, engineering, computational biology, etc. developed through the programs of Bioengineering, the Institute for Collaborative Biotechnologies (ICB) and the Center for Stem Cell Biology and Engineering.
- Creating a dynamic home for the programs being included. The building is seen as a "collision" space bringing a wide variety of research disciplines together.
- Fostering interaction and a multi-disciplinary research approach supporting the notion of the facility as a crossroads of the UCSB scientific community.
- Celebrating its important site at the intersection of Pardall Mall and Science Walk and using the new work to support overall goals established in the Campus Master Plan.
- Addressing sustainability goals by meeting a minimum of LEED Silver Certification.

These goals were further honed into an ordered rank of spatial requirements –

1. Research laboratories
2. Collision space for interdisciplinary collaborators
3. Administration (ICB headquarters, Bioengineering departmental home)
4. Education (Auditorium)
5. ABSL-3/Vivarium space

VIVARIUM – A Major Programmatic Addition
Reviews of the original DPP for the Bioengineering Building teamed with new opportunities for funding, led to the proposed inclusion of a vivarium as a part of the facility. The Vivarium is conceived as a critical support component for research both within the building and the campus as a whole. Initial assumptions place the Vivarium in the basement level space beneath the proposed Bioengineering Building. The lower level space is to be developed to accommodate a vivarium use and is not dependent upon the actual fit-out at this time.

Process – Vivarium DPP
Concurrent to the verification and reconciliation process for the Bioengineering Building DPP, the development of the Vivarium DPP involved a number of the same committee members and others within the University of California system with extensive experience with this facility type (see Acknowledgements).

Understanding the animal populations to be used and cage count capacities underlie the development of the full program requirements. From these needs, space types, quantities and sizes have formed both area summaries and the room descriptions found in the room data sheets. An idealized layout, generated from these components, provides an illustration of desired functional relationships.

Site Requirements
Although the Vivarium is to be consolidated into the overall planning of the Bioengineering Building, it has special needs that may influence its placement relative to other programmatic requirements. Optional approaches to the Vivarium's vertical location require exploration of each of the following issues –

- Security – both physical and visual
- Service
- Expansion – potential connections to Phase II to the north

Optional approaches that may be explored further during the Schematic Design Phase and their defining features include –

- Basement –
  - – Fully recessed below grade, “out-of-sight / out-of-mind”
  - – Service access via elevator due to depth of floor below grade
  - – Expansion to future phases through tunnels to north

- Partially recessed –
  - – Amount of recess below grade depends on various site and building circulation explorations
  - – Exposed walls seen as backdrops to grade level planting
  - – Service requires an elevator
  - – Expansion through tunnels to the north
  - – Provides greater potential for natural light into inhabited spaces

- Ground floor –
  - – Although the facility would most likely be behind solid walls, concern exists that it would still be a known entity on campus posing security risks
  - – Service provided on the same floor as the Vivarium
  - – Expansion to the north becomes limited or would require the development of a raised plinth / garden between Phases I and II.
  - – Provides easiest situation to include natural light into inhabited spaces.

The DPP provides a consistent and thorough description of the functional requirements of a modern animal facility. This document provides the framework from which to integrate the facility into the overall Bioengineering Building project.

INTRODUCTION

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MEMORANDUM TO THE COMMITTEE ON BUILDINGS AND GROUNDS 2.3.0

SECTION 2.3.0 **Office of the President**
TO MEMBERS OF THE COMMITTEE ON GROUNDS AND BUILDINGS:

For Meeting of November 18, 2008

AMENDMENT OF THE BUDGET FOR CAPITAL IMPROVEMENTS AND THE CAPITAL IMPROVEMENT PROGRAM, BIOENGINEERING BUILDING, SANTA BARBARA CAMPUS

Excerpt –

Description
This proposed action would authorize UC Santa Barbara to expend $1.6 million of campus funds for the preliminary plans phase of the Bioengineering Building project. The project would construct a 35,000 – 45,000 asf building to house academic research in the field of bioengineering. Occupants include the Institute for Collaborative Biotechnologies (ICB), a new academic program in bioengineering, and a unit of the Center for Stem Cell Biology and Engineering. Additional program components that are complementary to bioengineering will be considered during preliminary plans. Approval of this action item would allow the campus to establish the base year for Garamendi funding. The campus will present a full financial plan to fund the project at the time of project approval.

Background
The Bioengineering Building represents a new and exciting opportunity to pursue novel research that resides at the intersection between medicine and engineering. Although UC Santa Barbara is without a medical center or medical program, it has developed topnotch programs in biology, physics, chemistry, and multiple fields of engineering. Since 1997, sponsored research at Santa Barbara has more than doubled, rising to over $194 million as of June of 2008. Growth in bioengineering research over the past ten years has been exponential, with the number of faculty increasing from 10 to 40 and generating over $26 million in annual research expenditures. Federal funding for bioengineering and stem cell research is expected to increase substantially over the coming decade. The ICB and affiliated partners are primed to respond to the critical problems and questions pertaining to stem cells, regenerative medicine, diabetes, viral and bacterial infections, and neurodegenerative diseases – all of which could be transformational in health science.
The proposed new academic Ph.D. program in bioengineering will also help fuel California's bourgeoning biomedical and bioengineering industries, training and producing new scientists, professionals, and entrepreneurs.

Project Description
Current program plans for the Bioengineering Building provide a highly flexible facility that will be responsive to long-term changes in research. Program areas were devised using a conceptual building module that responded to multiple objectives: (1) limit the variability of spaces; (2) enhance the flexibility of the laboratories; and (3) accommodate sufficient infrastructure capacity to incorporate future changes in research. This approach has served to inform the facilities' functional requirements, including the need for vibration isolation of laboratories, efficient HVAC and energy systems, and security.

In light of local construction market volatility, Santa Barbara developed a preferred program scope and a reduced program scope for project consideration. Programmatically, the Bioengineering Building would accommodate between 11 and 16 faculty, scientists, and researchers; approximately 75 to 120 graduate students and post-doctoral researchers; and 25 to 30 staff, which include engineering and computer technicians and administrative support.

Conceptually, the building is envisioned as a simple and efficient four-story research building. Laboratories would be stacked floor-to-floor to minimize ducting and building systems infrastructure runs and office space would be aligned on a ringed-corridor, separated from the laboratories by laboratory support facilities. Building massing concepts will consider schemes seeking sustainable design benefits, such as orientation to solar paths, interior stairs. and an atrium to provide improved day-lighting, enhanced natural ventilation, and spaces to facilitate interaction. A partial basement and dedicated elevator is also programmed in anticipation of a subterranean connection to future academic buildings that will share support facilities.

Policy on Sustainable Practices

This project will comply with the *University of California Policy on Sustainable Practices* as well as UC Santa Barbara's policy that calls for all new buildings to achieve a LEED Silver rating or equivalency.

PART I

DETAILED PROJECT PROGRAM VERIFICIATION / RECONCILIATION

SPACE PROGRAM

4.0.0

SPACE PROGRAM

4.0.0

PROGRAM SUMMARY 4.1.0

SECTION 4.1.0 **SPACE PROGRAM**

Program Scheme B was used as the most current information from which to analyze the Bioengineering Building's initial programming and concept development effort. Programmed space types, areas, and quantities have been reviewed and reconfigured to ensure that functional requirements will be met in the new facility while adhering to given cost constraints.

The initial analysis of the Program focused on confirming areas and amounts. See the clarification items noted below that form the basis for the revised Space Program and Area Comparison Summary included in this study. The effort also included analyzing the Program area requirements and the graphic representations illustrated in Scheme B.

reference DPP CLARIFICATIONS AND AMENDMENTS

page 4.3.4 Program Summary, dated October 17, 2008:

PI Offices – math error corrected – 10 offices at 140sf ea. totaled as 980sf – correct total is 1,400 sf (see Program/Area Comparison, page 34).

P.D./G.S. Office – math error corrected – 44 offices at 140sf ea. totaled as 6,578sf - correct total is 6,160 sf (see Program/Area Comparison, page 34).

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Program amendments have been developed through a review and analysis of Program Scheme B and subsequent discussions with the Project Building Committee. All have worked to balance functional needs and budgetary requirements. These requirements have been used to form the basis for developing a consolidated Blocking-and-Stacking Diagram (see Section 6).

Gross Building Area	**62,300 gsf**	**(gross square feet)**
assumes average asf/gross ratio of ~.55 gross area includes corridors, restrooms, stairways, elevator shafts, main mechanical and electrical rooms, mechanical shafts, and other non-assigned spaces.		
Net Building Area	**34,258 asf**	**(assignable square feet)**
Research Labs- 100% exhaust	**13,514 asf**	
Shared Lab Support- 100% exhaust	**4,317 asf**	
Offices & Office Support- recirculated air	**16,428 asf**	
Other Non-assignable Spaces	**3,362 gsf**	
included in gross area above- not considered part of assignable square feet		

Research Labs- 100% exhaust 13,514 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Bioengineering Research Laboratory multi-function basic research laboratory for biology, engineering, & stem cell Modules include dedicated lab support rooms (1) 6' fume hood per 2 lab modules One lab prototype to be used for Bioengineering, ICB, and Stem Cell; Lab assignment to Bioeng, ICB, and Stem Cell to be made later during building occupancy	11' x 46'	11' x 45.5'	**27**	x	501	=	13,514

Shared Lab Support- 100% exhaust 4,317 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Procedure/Equipment Room (1) per floor shared for various procedure work	22' x 22'	21.5' x 21.5'	**3**	x	462	=	1,387
Freezer Room (1) per floor shared, storage of -80 deg. C freezers	11'x22'	10.5' x 21.5'	**3**	x	226	=	677
Cold Room- 4 deg. C (1) per floor shared, procedure cold room	11'x22'	10.5' x 21.5'	**3**	x	226	=	677
Warm Room- 25-45 deg. C (2) per building shared, procedure warm room	11'x16'	10.5' x 15.5'	**2**	x	163	=	326
Autoclave Room (1) per floor shared, sterilization work	11' x 22'	10.5' x 21.5'	**3**	x	226	=	677
Media Prep (1) per building shared, preparation of media	22' x 22'	21.5' x 21.5'	**1**	x	462	=	462
Bio/Chem Waste (1) per building shared, short term storage of biological and chemical waste	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110

Offices & Office Support- Recirculated air 16,428 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
P.I. Office private office for principal investigator	11' x 14.5'	10.5' x 13.33	**10**	x	140	=	1,400
Visiting Faculty Office shared office for two visiting faculty	11' x 14.5'	10.5' x 13.33	**2**	x	140	=	280
P.D./G.S. Office shared office for post docs / grad students	11' x 14.5'	10.5' x 13.33	**44**	x	140	=	6,160
Bioengineering Admin "home" for Bioengineering							
Chair's Office	11' x 18'	10.5' x 17.15	**1**	x	180	=	180
Staff Office	11' x 14.5'	10.5' x 13.33	**4**	x	140	=	560
Reception Office	11' x 14.5'	10.5' x 13.33	**1**	x	140	=	140
Storage Room	22' x 11'	21.5'x10.5'	**1**	x	226	=	226
Small Meeting 10 people / adj to Chair's Office	17' x 13'	16.5'x12.5'	**1**	x	206	=	206
Copy/Mail Room	11' x 14.5'	10.5' x 13.33	**1**	x	140	=	140
ICB Admin "home" for Institute for Collaborative Biotechnologies							
Director's Office	11' x 18'	10.5' x 17.15	**1**	x	180	=	180
Staff Office	11' x 14.5'	10.5' x 13.33	**19**	x	140	=	2,659
Reception Office	33' x 14.5'	32.5' x 13.33	**1**	x	433	=	433
Storage Room	22' x 11'	21.5'x10.5'	**1**	x	226	=	226
Small Meeting 10 people / adj to Director's Office	17' x 13'	16.5'x12.5'	**1**	x	206	=	206
Copy/Mail Room	11' x 14.5'	10.5' x 13.33	**1**	x	140	=	140

Offices & Office Support- Recirculated air continued

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Kitchen/Coffee Bar (1) per floor	11' x 11'	10.5'x10.5'	**3**	x	110	=	331
Conference Room 30 people	22' x 24'	21.5' x 23.5'	**1**	x	505	=	505
Auditorium 100 seats	33' x 65'	32.5' x 64.5'	**1**	x	2096	=	2,096
Interaction Space			**2**	x	180	=	360

Other Non-assignable Spaces 3,362 gsf

subtotal is not considered part of net area

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Technology Closet 1 per floor	11' x 11'	10.5' x 10.5'	**3**	x	110	=	331
Janitor Closet 1 per floor	11' x 8.5'	10.5' x 7.5'	**3**	x	79	=	236
Recycle Space 1 per floor	2' x 5.5'	2' x 5.0'	**3**	x	10	=	30
Custodial Supply	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110
Building Recycle Room	11' x 11'	10.5' x 10.5'	**1**	x	110	=	110
Receiving Area ground floor, exterior access	11' x 22'	10.5' x 21.5'	**1**	x	226	=	226
Vending	11' x 6.5'	10.5' x 6'	**1**	x	63	=	63
Lobby	33' x 33'	32.5' x 32.5'	**1**	x	1056	=	1,056
Shower/Locker unisex	11'x11'	10.5'x10.5'	**1**	x	110	=	110
Covered Bicycle Storage	33' x 33'	n.a.	**1**	x	1089	=	1,089

The matrix below highlights the differences between the original Scheme B Program and the Concept 3B Program.

	October 17, 2008				August 4, 2009				
ASSIGNABLE SPACE (ASF)	**SCHEME B DPP PROGRAM**				**CONCEPT 3B - PROGRAM AREAS**				Items revised from Scheme B - DPP
	NUMBER	**EACH**	**AREA**	**TOTAL SF**	**NUMBER**	**EACH**	**AREA**	**TOTAL SF**	**NOTES**
RESEARCH LABS				15,223				13,527	Does not include BSL-3 Suite (see Vivarium)
Bio Research Lab Modules	7	1,979	13,853		27	501	13,527		asf of an 11' x 46' modules - approx = 495sf
BSL3 Lab Modules	1	1,370	1,370						moved to basement area (Vivarium area)
SHARED LAB SUPPORT				5,458				4,318	
Procedure/Equip. Room	4	462	1,848		3	462	1,386		
Freezer Room	4	226	904		3	226	678		
Cold Room	4	226	904		3	226	678		
Warm Room	2	163	326		2	163	326		
Autoclave Room	4	226	904		3	226	678		
Media Prep	1	462	462		1	462	462		
Bio/Chem Waste	1	110	110		1	110	110		
OFFICES				17,045				16,423	
PI Office	10	140	1,400		10	140	1,400		
Visiting Faculty Office	2	140	280		2	140	280		
PD/GS Office	44	140	6,160		44	140	6,160		2 Post-Doc or 3 Grad students per office
				7,840				7,840	
BioEnginering Admin Offices									
Chair Office	1	180	180		1	180	180		
Staff Office	4	140	560		4	140	560		
Small Reception Office	1	140	140		1	140	140		
Storage Room	1	226	226		1	226	226		
Small Conference Room (10 seats)					1	206	206		reduce to 200sf / place with BioE Suite
Copy/Mail Room					1	140	140		placed with BioE Suilte
				1,106				1,452	
ICB Admin Offices									
Director Office	1	180	180		1	180	180		
Staff Office	19	140	2,660		19	140	2,660		
Large Reception Office	1	433	433		1	433	433		
Storage Room	1	226	226		1	226	226		
Small Conference Room (10 seats)					1	206	206		reduce to 200sf / placed with ICB Suite
Copy/Mail Room					1	140	140		placed with ICB Suite
				3,499				3,845	
General Areas									
Auditorium (100 seating capacity)	1	2,096	2,096		1	2,096	2,096		
Small Conference Room (10 seats)	2	301	602						moved
Large Conference Room (30 seats)	2	591	1,182		1	500	500		Reduce from 2 to 1 @ 500sf - 30+ capacity
Copy / Mail Room	2	140	280						moved
Kitchen	4	110	440		3	110	330		1 per floor
Interaction Space					2	180	360		
				4,600				3,286	
BASE BUILDING ASF				**37,726**				**34,268**	

NON-ASSIGNABLE SPACE	SCHEME B DPP PROGRAM				CONCEPT 3B - PROGRAM AREAS				
	NUMBER	EACH	AREA	TOTAL SF	NUMBER	EACH	AREA	TOTAL SF	NOTES
BUILDING SUPPORT				4,941				4,042	
Janitor Closet	4	79	316		3	79	237		1 per floor, orig program lists 4
Recycling Space	4	10	40		3	10	30		
Custodial Supply	1	110	110		1	110	110		at loading
Building Recycling Room	1	110	110		1	110	110		at loading
Receiving Area	1	226	226		1	226	226		at loading
Vending	1	63	63		1	63	63		
Lobby	1	1,056	1,056		1	1,056	1,056		
Shower/Locker	2	110	220		1	110	110		unisex, locate on first floor
Restrooms	8	350	2,800		6	350	2,100		2 (men + women) per floor
MECHANICAL SPACES				2,905				4,925	
A/V Telecom Closet	4	110	440		3	110	330		1 per floor
Electrical Closet	4	110	440		3	110	330		
Main Electrical	1	400	400		1	500	500		first floor or basement
Boiler Room			0		1	750	750		
Chiller Room			0		1	690	690		previously located on roof
Vacuum Pump Room	1	525	525		1	525	525		first floor or basement
Pure Water / R.O. Generation	1	1,100	1,100		1	1,100	1,100		
Wet Mechanical			0		1	700	700		locate in basement
MISC GSF (per efficiency % req'd)				23,438				19,065	
Circulation, Interaction Areas,			23,438				19,065		confirm per bldg. layout
Walls, etc.									
NON-ASSIGNABLE SPACE				**31,284**				**28,032**	
BASE BUILDING AREA (GSF)				**69,010**				**62,300**	Includes Basement MEP spaces not
ASF/GSF				55%				55%	accounted for in DPP.
BASEMENT AREA (SHELLED for FUTURE VIVARIUM)									
Open basement area					1	15,960	15,960		(not programmed above)
ROOFTOP MECHANICAL									
Boiler Room	1	750	750						located in Basement
Chiller Room	1	690	690						located in Basement
Building AHUs	1		0		1	3,500	3,500		
OUTDOOR AREAS									
Covered Bicycle Storage	1	1,089	1,089		1	1,089	1,089		
Loading Area	1	250	250		1	250	250		
Electrical Service Yard	1		0		1	1,300	1,300		co-locate near Loading Area

SPACE PROGRAM

4.0.0

PROGRAM ANALYSIS 4.2.0

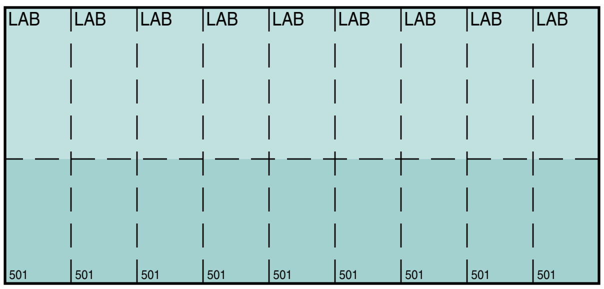
The following is a graphic analysis of the program areas listed in Section 4.1.0. The first analysis reviews how each program type is located throughout the entire building based on the Blocking and Stacking diagrams in Section 6.2.0. This information will show, for example, that while there are Staff Offices located on each level, the Bioengineering Offices are located on Level 1 and the ICB Offices are located on Levels 2-3.

The second series of diagrams illustrate each room to be included on every level. These diagrams quantify the different program areas and compare them against each other. On Level 1, for example, there are 9 Laboratory modules and 16 Student Office modules.

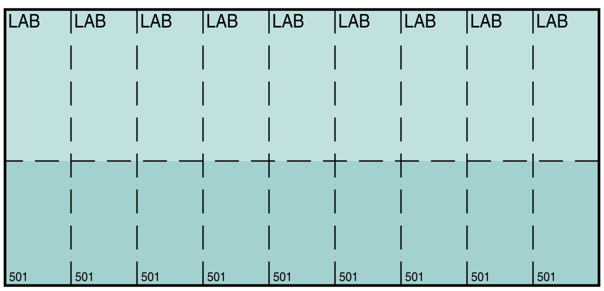
Together, these diagrams provide a visual evaluation of the program areas and their relationships to each other.

RESEARCH LABS

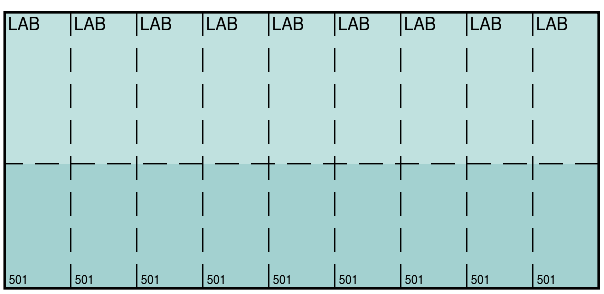
LEVEL 3



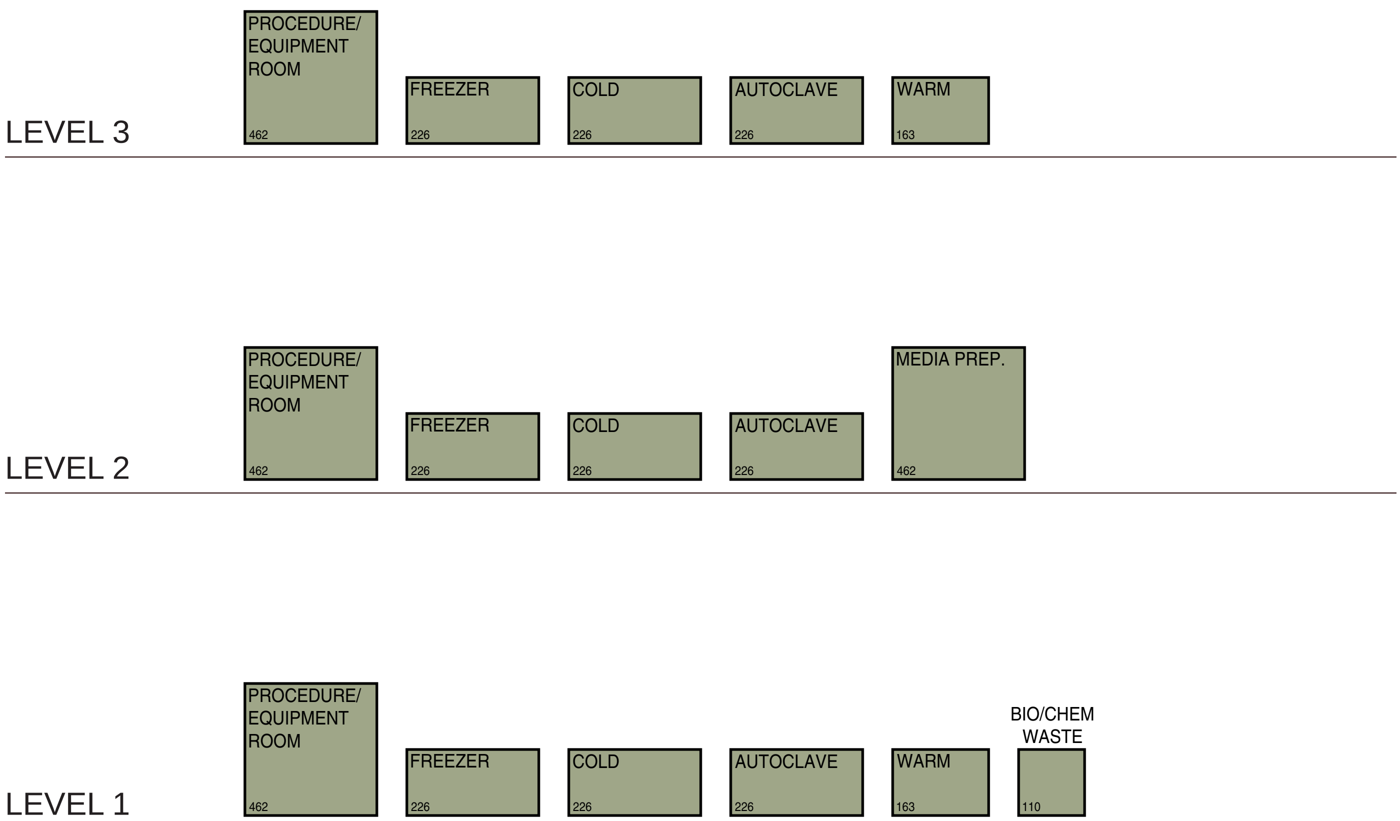
LEVEL 2



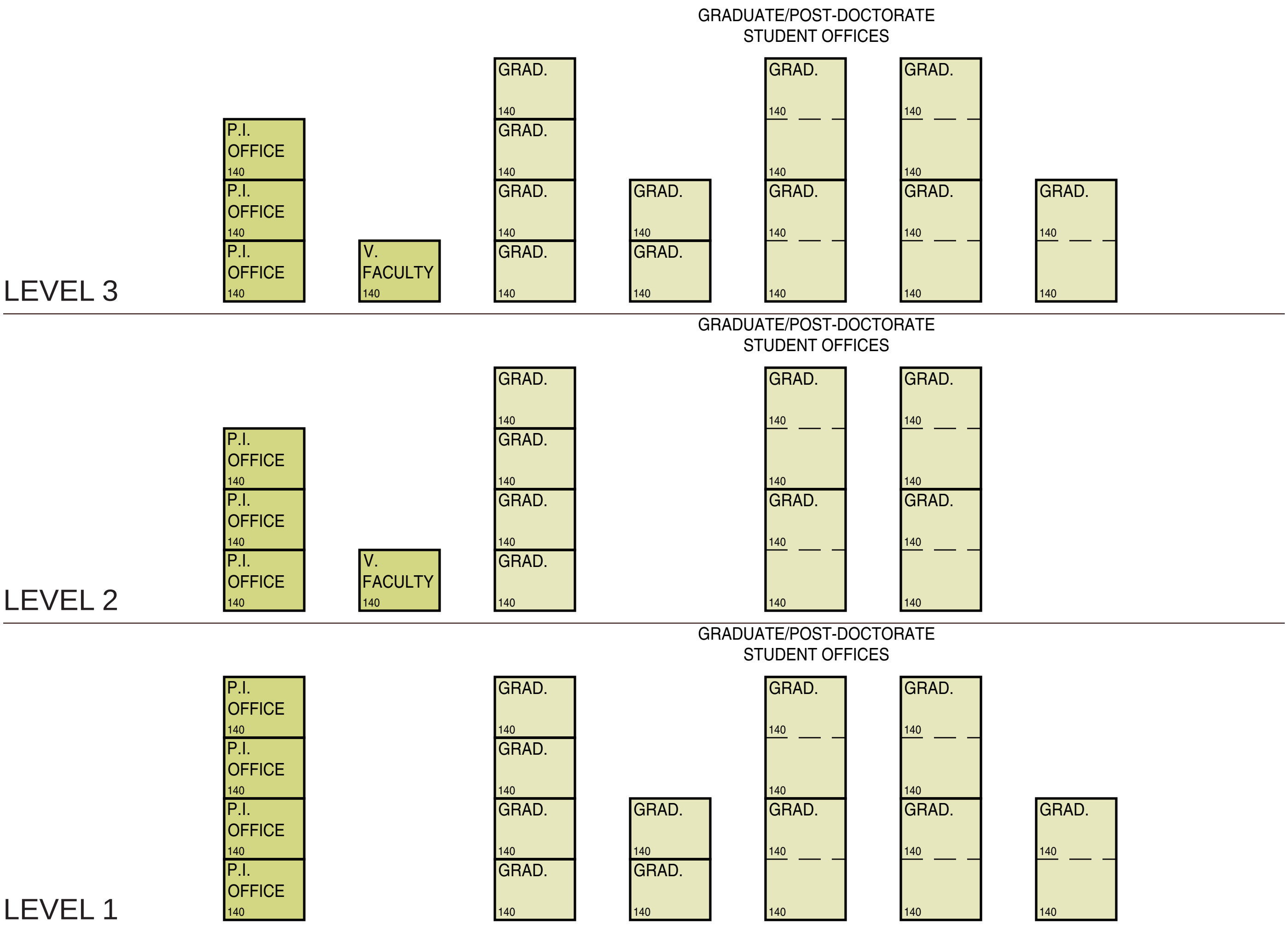
LEVEL 1



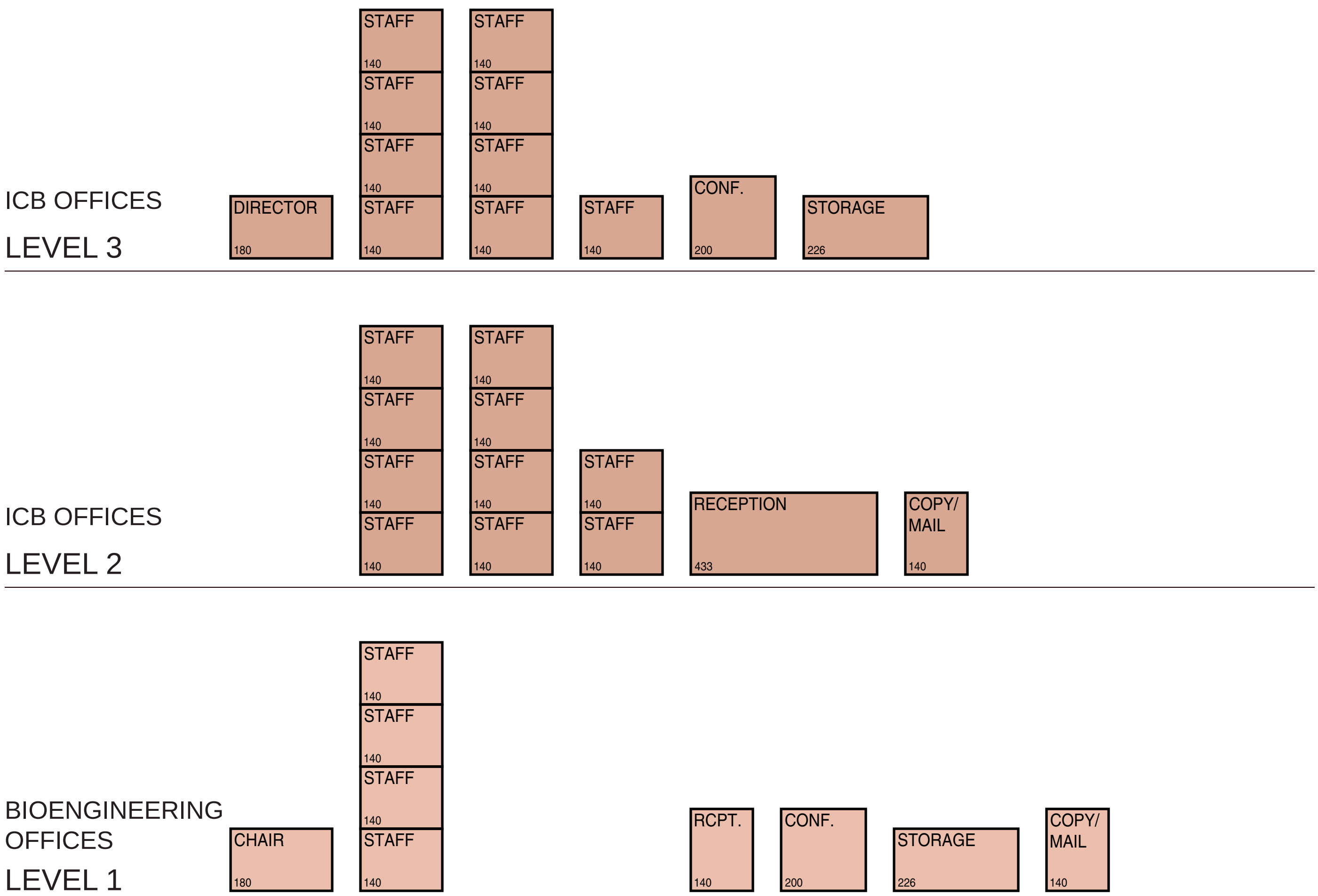
SHARED LAB SUPPORT SPACES



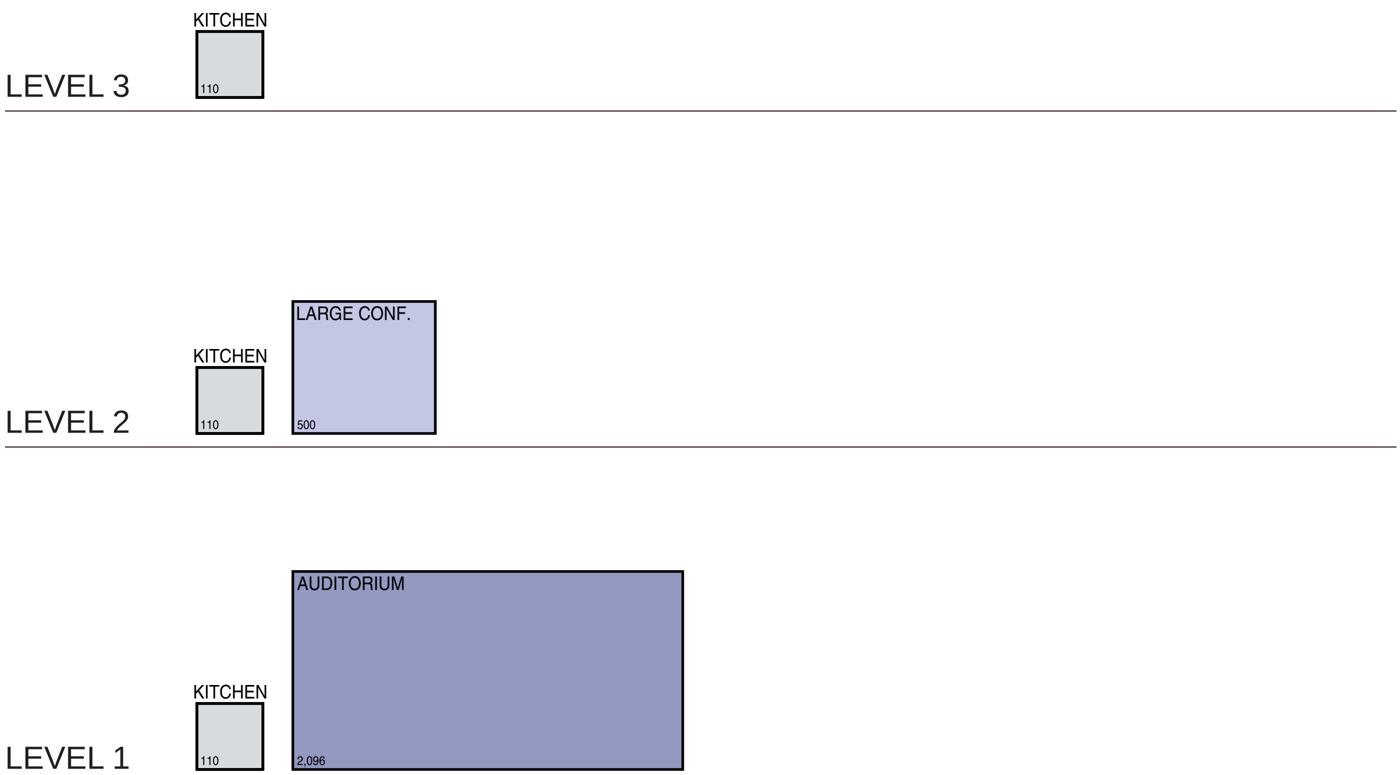
ACADEMIC OFFICES



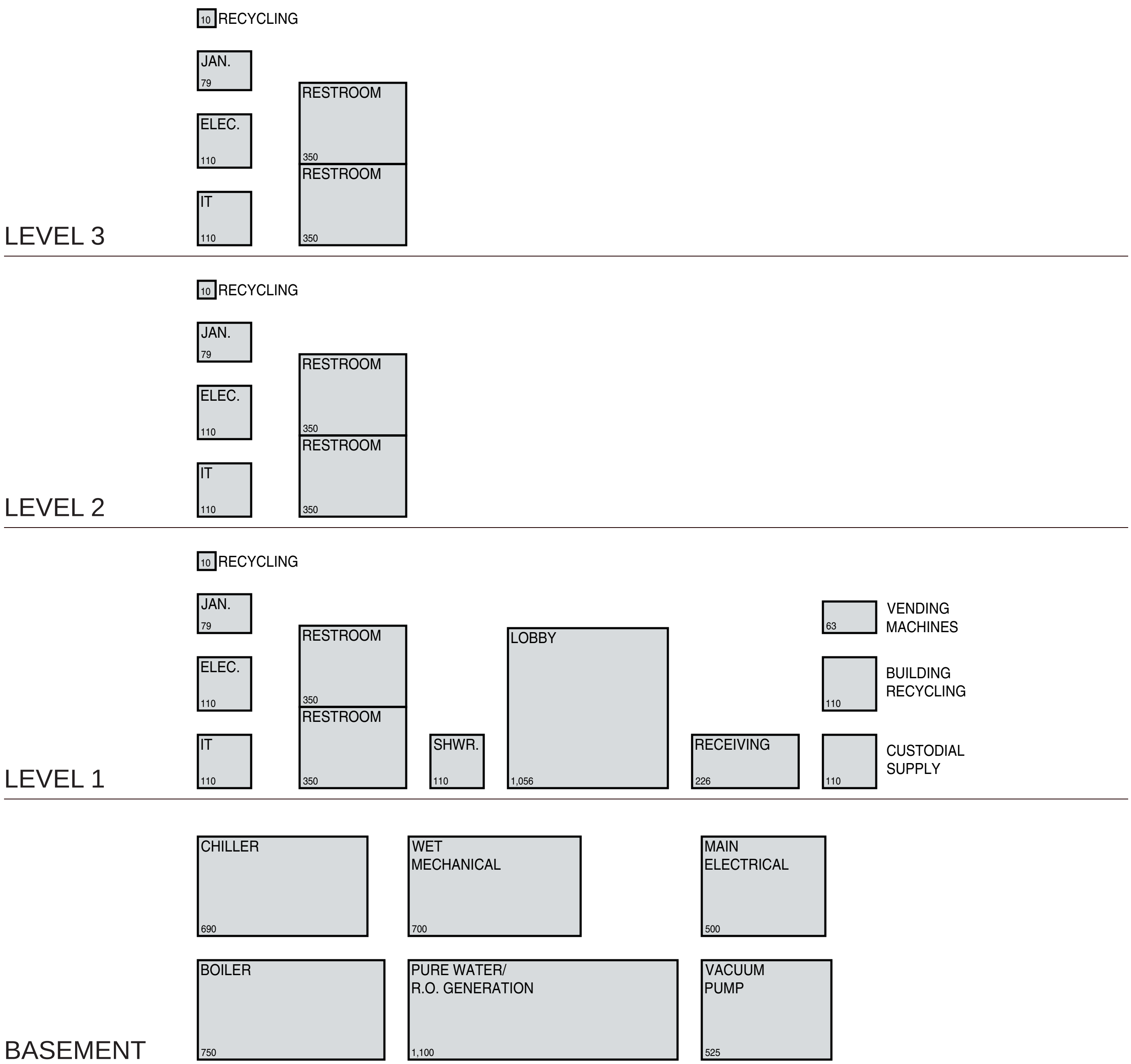
ADMINISTRATION OFFICES



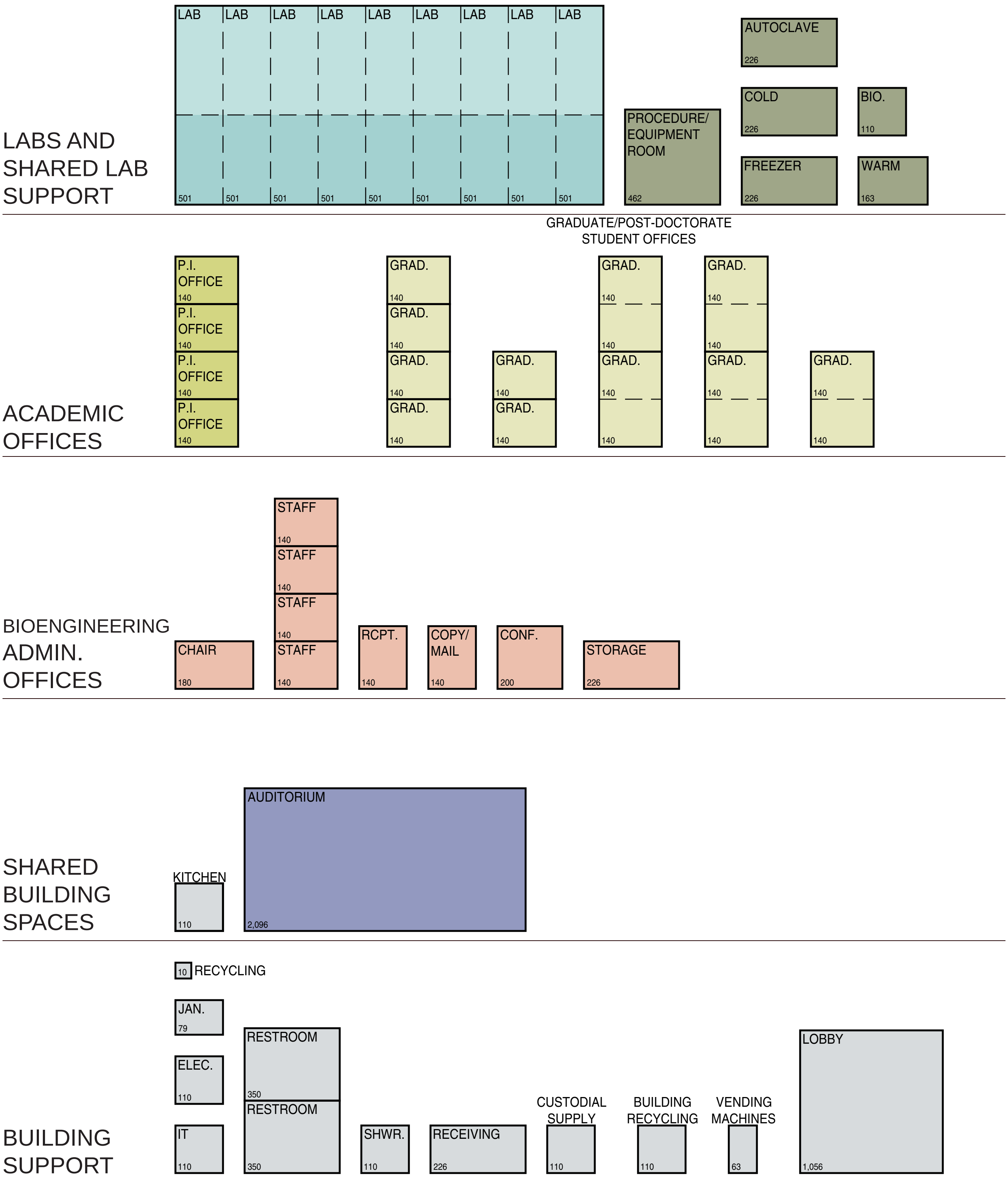
SHARED BUILDING SPACES



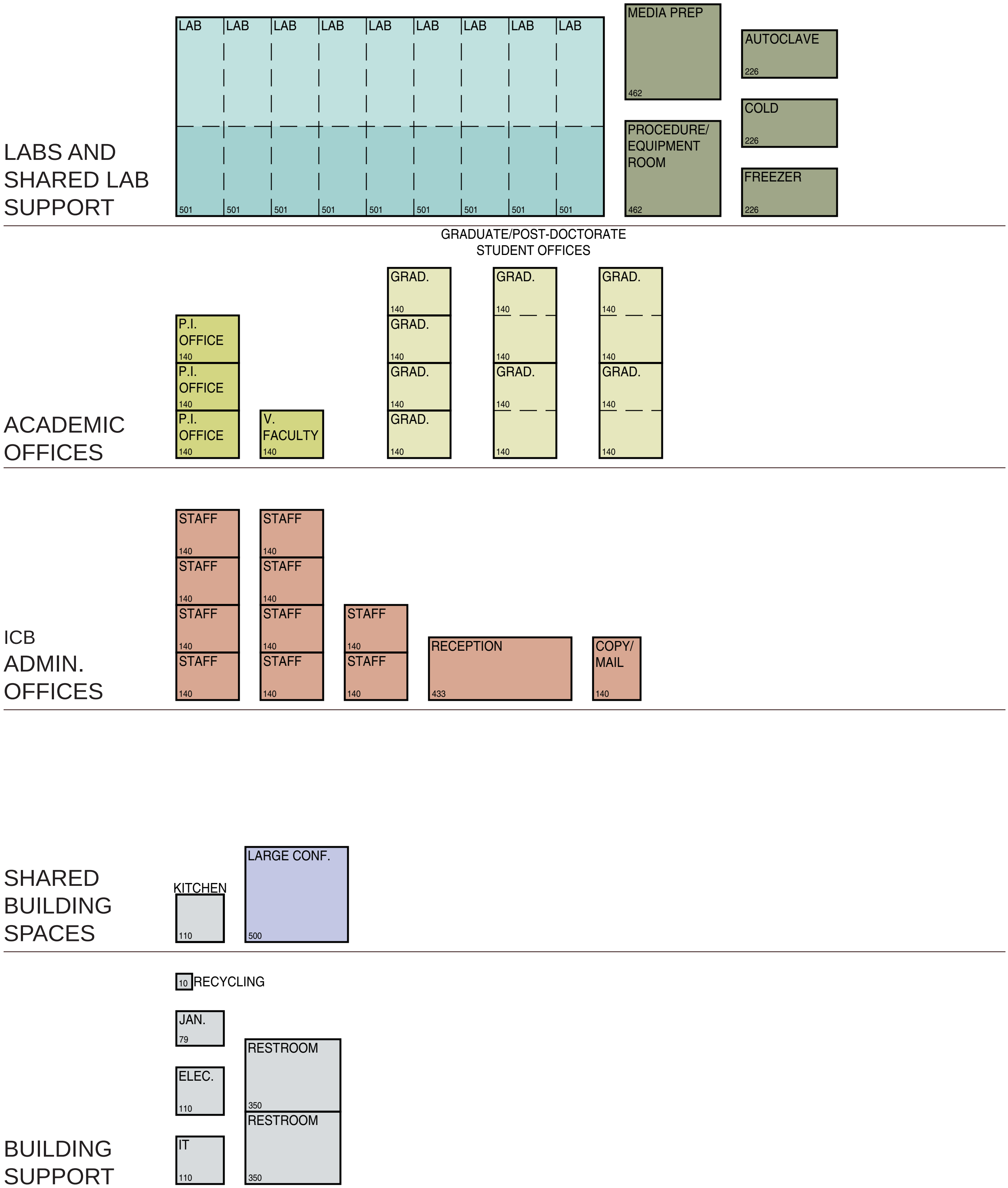
BUILDING SUPPORT SPACES



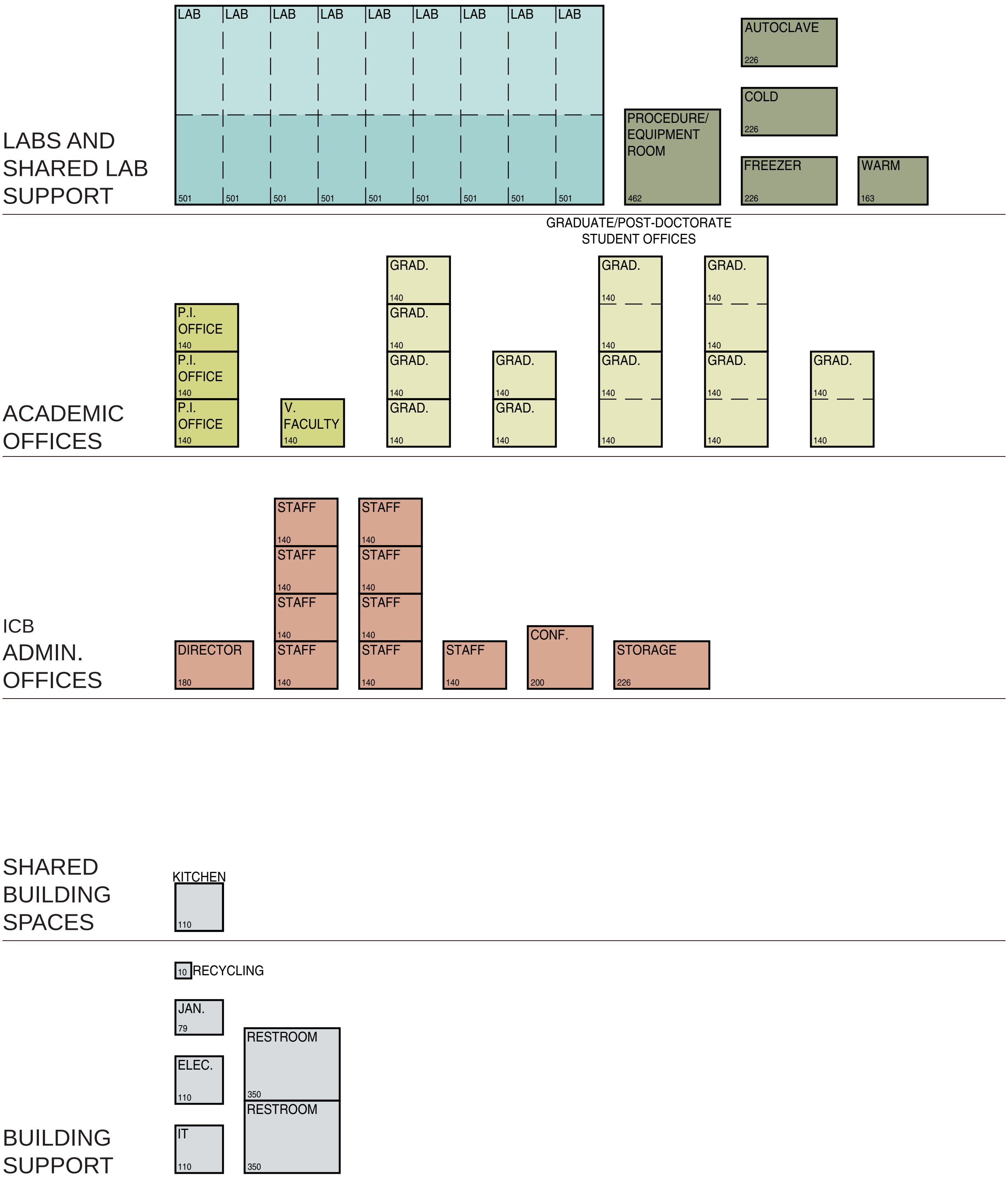
LEVEL 1


LABS AND SHARED LAB SUPPORT
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
PROCEDURE/ EQUIPMENT ROOM 462
AUTOCLAVE 226
COLD 226
BIO. 110
FREEZER 226
WARM 163
GRADUATE/POST-DOCTORATE STUDENT OFFICES
ACADEMIC OFFICES
P.I. OFFICE 140
P.I. OFFICE 140
P.I. OFFICE 140
P.I. OFFICE 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
BIOENGINEERING ADMIN. OFFICES
CHAIR 180
STAFF 140
STAFF 140
STAFF 140
STAFF 140
RCPT. 140
COPY/ MAIL 140
CONF. 200
STORAGE 226
SHARED BUILDING SPACES
KITCHEN 110
AUDITORIUM 2,096
BUILDING SUPPORT
10 RECYCLING
JAN. 79
ELEC. 110
IT 110
RESTROOM 350
RESTROOM 350
SHWR. 110
RECEIVING 226
CUSTODIAL SUPPLY 110
BUILDING RECYCLING 110
VENDING MACHINES 63
LOBBY 1,056

LEVEL 2


LABS AND SHARED LAB SUPPORT
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
MEDIA PREP 462
PROCEDURE/ EQUIPMENT ROOM 462
AUTOCLAVE 226
COLD 226
FREEZER 226
GRADUATE/POST-DOCTORATE STUDENT OFFICES
ACADEMIC OFFICES
P.I. OFFICE 140
P.I. OFFICE 140
P.I. OFFICE 140
V. FACULTY 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
140
GRAD. 140
140
GRAD. 140
140
GRAD. 140
140
ICB ADMIN. OFFICES
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
RECEPTION 433
COPY/ MAIL 140
SHARED BUILDING SPACES
KITCHEN 110
LARGE CONF. 500
BUILDING SUPPORT
10 RECYCLING
JAN. 79
ELEC. 110
IT 110
RESTROOM 350
RESTROOM 350

LEVEL 3


LABS AND SHARED LAB SUPPORT
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
LAB 501
PROCEDURE/ EQUIPMENT ROOM 462
AUTOCLAVE 226
COLD 226
FREEZER 226
WARM 163
ACADEMIC OFFICES
GRADUATE/POST-DOCTORATE STUDENT OFFICES
P.I. OFFICE 140
P.I. OFFICE 140
P.I. OFFICE 140
V. FACULTY 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
GRAD. 140
ICB ADMIN. OFFICES
DIRECTOR 180
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
STAFF 140
CONF. 200
STORAGE 226
SHARED BUILDING SPACES
KITCHEN 110
BUILDING SUPPORT
10 RECYCLING
JAN. 79
ELEC. 110
IT 110
RESTROOM 350
RESTROOM 350

SITE REQUIREMENTS

5.0.0

The Site Diagram in this section is intended to illustrate the conceptual relationships between the proposed Bioengineering Building and the adjacent buildings, as well as its relationships to the primary pedestrian and vehicular circulation routes around the site.

It is not indended to define a site design.

SECTION 5.0.0 **SITE REQUIREMENTS**

reference DPP CLARIFICATIONS AND AMENDMENTS

page 5.1.4 The DPP states the site was selected to "provide more privacy for researchers."

The intent of this description is to indicate that the building, while being in the core of campus, is to be more secure and discrete by being located at the southernmost portion site study area as compared with a placement at the northern edge of the site adjoining the Campus Green. This is an acknowledgment of the sensitive nature of the research to be conducted in the building.

page 5.1.4 Building 346, Love Lab, is to be relocated by the University prior to construction of the new Bioengineering Building. The University will undertake this effort directly. Cost associated with this relocation and demolition are not included in this project cost model.

page 5.1.7 Floor-to-floor heights are to be determined based on mechanical requirements, cost and façade design in a range from 15'-6" to 16'-0".

page 5.1.7
page 5.1.8 Updated Building Height Analysis and Stacking Diagram Sections have been relocated to Section 6.2.0, Building Concept on pages 71 and 72.

page 5.1.11 The Development Diagram describes a future Service Drive bordering the east edge of Davidson Library. This service zone includes the existing service area for the Library and potentially provides service access for the research facilities comprised of the Bioengineering Building and subsequent phases. This concept for service will require further study during the early design phases of the project.

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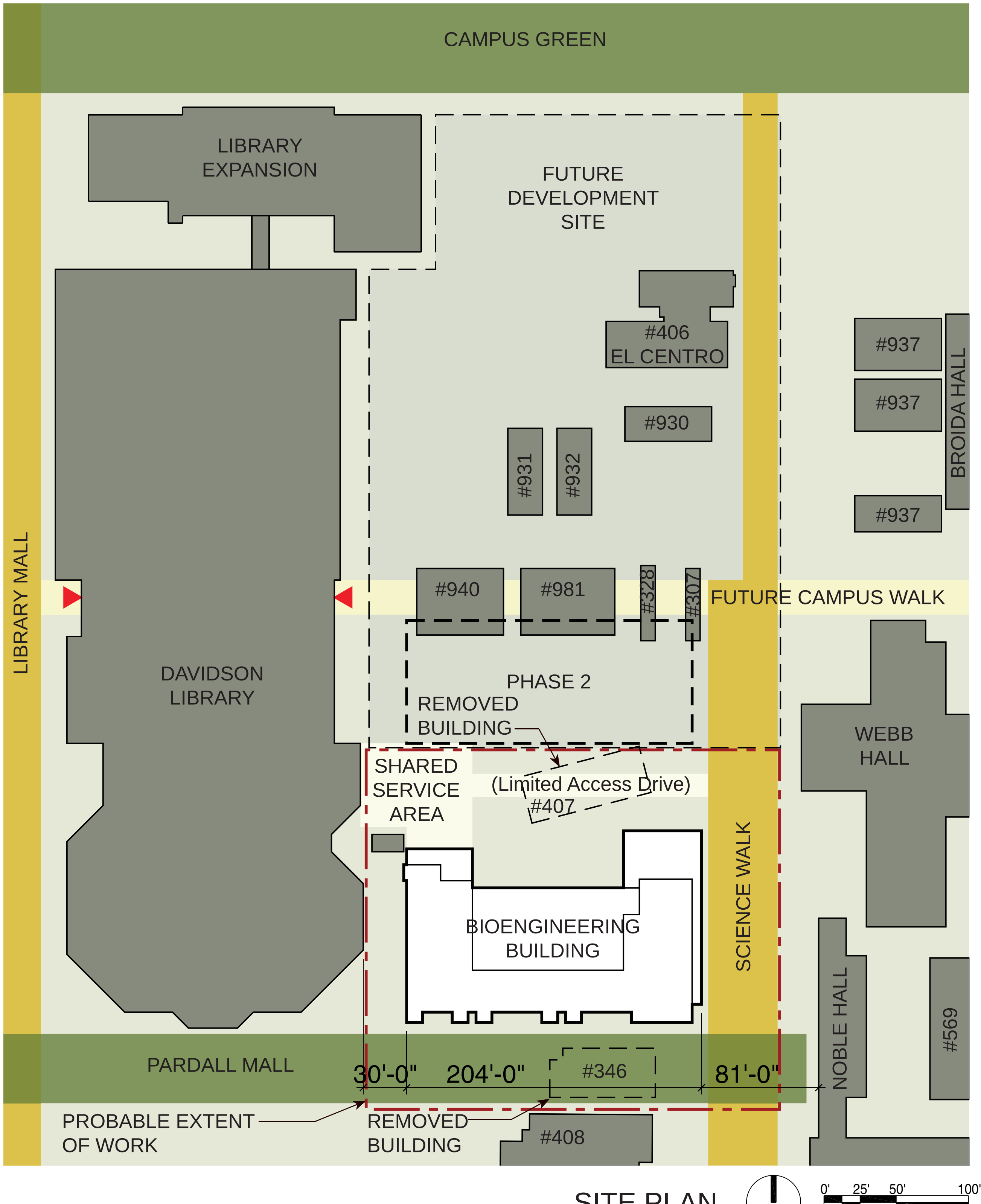

CAMPUS GREEN
LIBRARY EXPANSION
FUTURE DEVELOPMENT SITE
#406 EL CENTRO
#937
#937
#937
BROIDA HALL
#930
#931
#932
LIBRARY MALL
DAVIDSON LIBRARY
#940
#981
#328
#307
FUTURE CAMPUS WALK
PHASE 2
REMOVED BUILDING
WEBB HALL
SHARED SERVICE AREA
(Limited Access Drive)
#407
BIOENGINEERING BUILDING
SCIENCE WALK
NOBLE HALL
#569
PARDALL MALL
30'-0"
204'-0"
#346
81'-0"
PROBABLE EXTENT OF WORK
REMOVED BUILDING
#408
0'
25'
50'
100'

SITE PLAN

BUILDING CONCEPT

6.0.0

BUILDING CONCEPT

6.0.0

INTRODUCTION 6.1.0

SECTION 6.1.0 **BUILDING CONCEPT INTRODUCTION**

The development of a program that is consistent with the given budget was initiated through a thorough analysis of previously developed material documented within the Detailed Project Program, dated October 17, 2008. The analysis focused on the four-story Scheme B – both the blocking and stacking diagram and the related programmatic area summary. Although both the diagram and programmatic summary were based on the same amount of area, key differences were found in how this was distributed.

An understanding of these differences, combined with feedback provided by the University during the DPP review process, enabled redistributing the program configurations illustrated through the room data sheets, which led to the development of the proposed program. Key elements investigated included –

- The number of laboratory modules and the distribution of these per floor
- Graduate / post-doc office space configurations
- Location of the Auditorium and its relationship to the building and site
- Relationships and distribution of the Bioengineering Administration and ICB suites
- Mechanical space requirements and their appropriate locations within the structure

Proposed blocking and stacking Concept 3B is a three story approach that incorporates elements found with the original Scheme B as well as the six studies (see Part IV – Appendix) produced during the development of this DPP Addendum. Primary features include –

- Nine laboratory modules located on each of three floors
- Graduate / post-doc offices gathered around Primary Investigator offices
- Laboratory support located immediately adjacent to laboratory modules
- Vivarium space located in the basement
- Auditorium associated with main entry
- Bioengineering Administration located adjacent to, but separate from the building Lobby
- ICB suite placed on two interconnected floors
- Primary building entry at intersection of Pardall Mall and Science Walk

The blocking and stacking approach is designed to accommodate a full basement intended to house the Vivarium. Servicing, access and mechanical shaft requirements for the Vivarium will require integration into the design of the building above. For specific information related to the Vivarium, please see Part II of this document.

In addition to the overall Goals and Priorities described in the Project Process, on page 15, specific priorities for spaces and relationships expressed by the Building Committee have been incorporated into the proposed program and Concept 3B, including –

- Graduate Offices –
  - – Biology oriented laboratories to include some "office" space for the graduate students within the lab
  - – Graduate students to be located in offices outside of, but near the lab unit
  - – Graduate student offices spaces may be gathered into double-office modules, but should still include plentiful daylight, acoustic control and the ability for natural ventilation
  - – Graduate office module may be subdivided into standard offices for future flexibility

- Interaction Spaces –
  - Viable, flexible interaction space is programmatically included as a critical aspect of supporting a cohesive research community
  - Similar spaces associated with the graduate office areas will be further studied during design
  - The Auditorium is an important component in the development of community and education

- Laboratories / Lab Support –
  - Laboratory bench areas to have plentiful natural light and a sense of abundant space
  - Open lab areas allow greater flexibility to a wider range of research occupants
  - Laboratory space to be partially fit-out, saving initial cost and providing for changes in use during the development of the project and beyond

reference DPP CLARIFICATIONS AND AMENDMENTS

Pages 6.1.1-13 PROGRAM ANALYSIS DIAGRAMS:

These diagrams are updated to match the current Program and Blocking-and-Stacking Diagrams.

Building Concept Diagrams are revised as Concept 3B to match current Program. These include:

Site Analysis Diagram (updated Test to Fit Diagram)
Floor Planning Studies – Basement, Levels 1-3, Roof
Floor Stacking Diagram

Appendix

Area Tracking Summary – Concepts 1 & 2
Concept Diagram 1
Concept Diagram 2
Area Tracking Summary – Concept 3
Concept Diagram 3
Concept Diagram 3C
Concept Diagram 3D

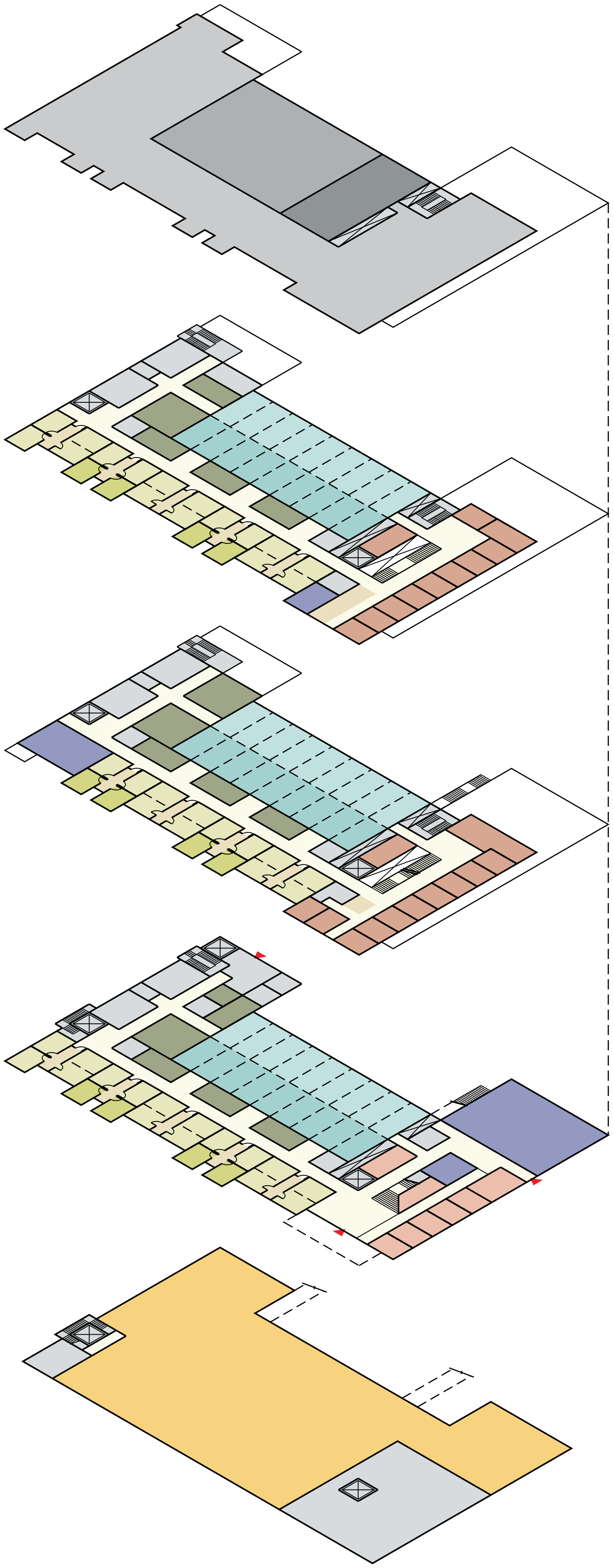
BUILDING CONCEPT

6.0.0

CONCEPT 3B 6.2.0

The Blocking & Stacking Diagrams on the following pages do not represent a building design. Rather, they begin to demonstrate a thoughtful organization of the Space Program based on adjacencies, user groups, building efficiency, site and cost.

FLOOR STACKING DIAGRAM



ROOF

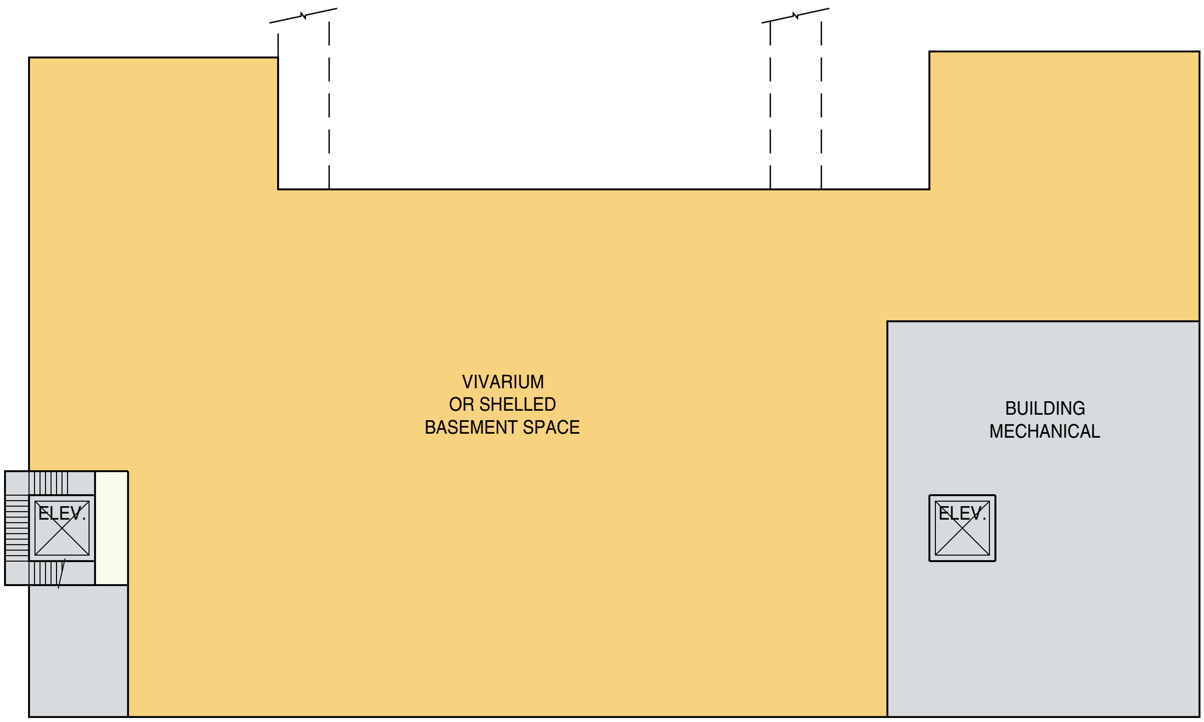
LEVEL 3
ICB

LEVEL 2
ICB

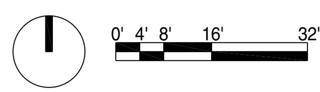
LEVEL 1
BIOENGINEERING

BASEMENT
VIVARIUM OR
SHELLED SPACE

BLOCKING & STACKING DIAGRAM



BASEMENT



LABORATORY

LABORATORY SUPPORT

ACADEMIC OFFICES

ADMINISTRATION OFFICES

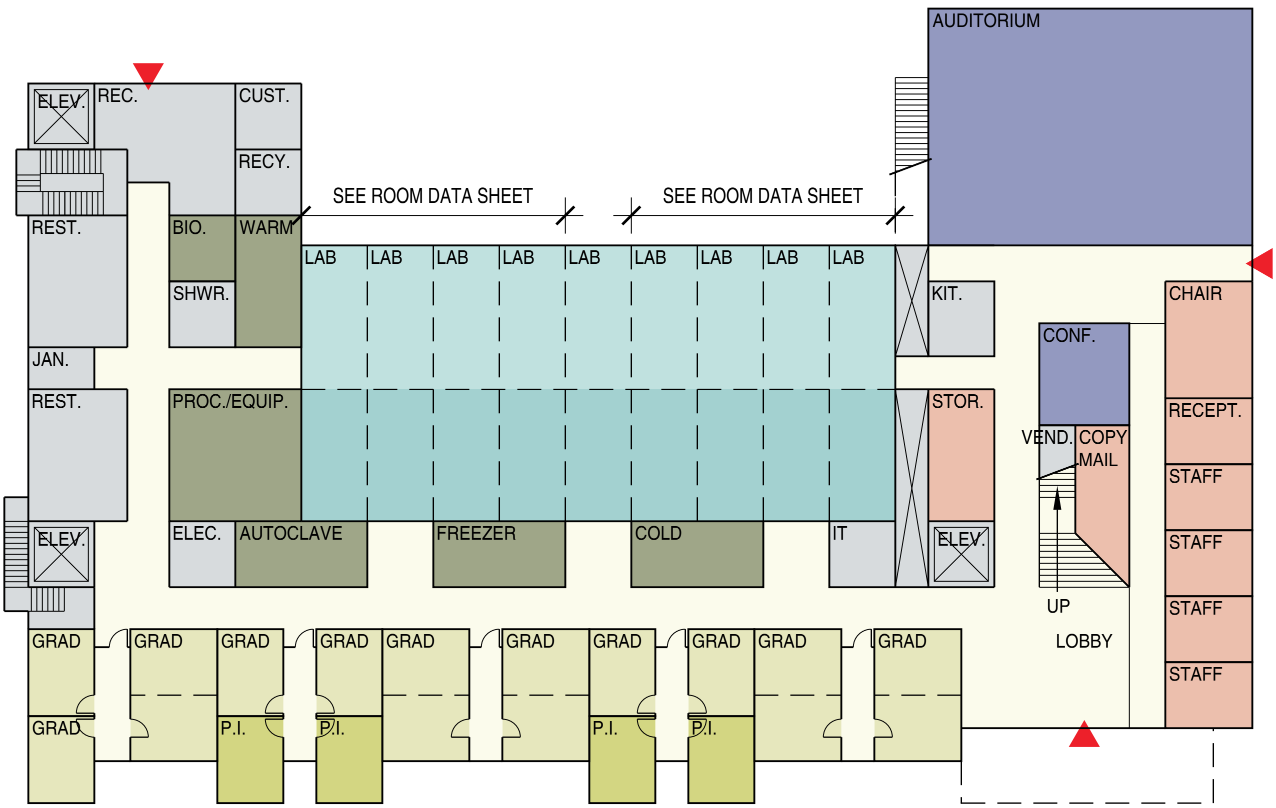
SHARED SPACES

BUILDING SUPPORT

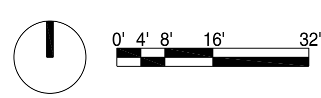
INTERACTION SPACES

VIVARIUM OR SHELLED SPACE

BLOCKING & STACKING DIAGRAM

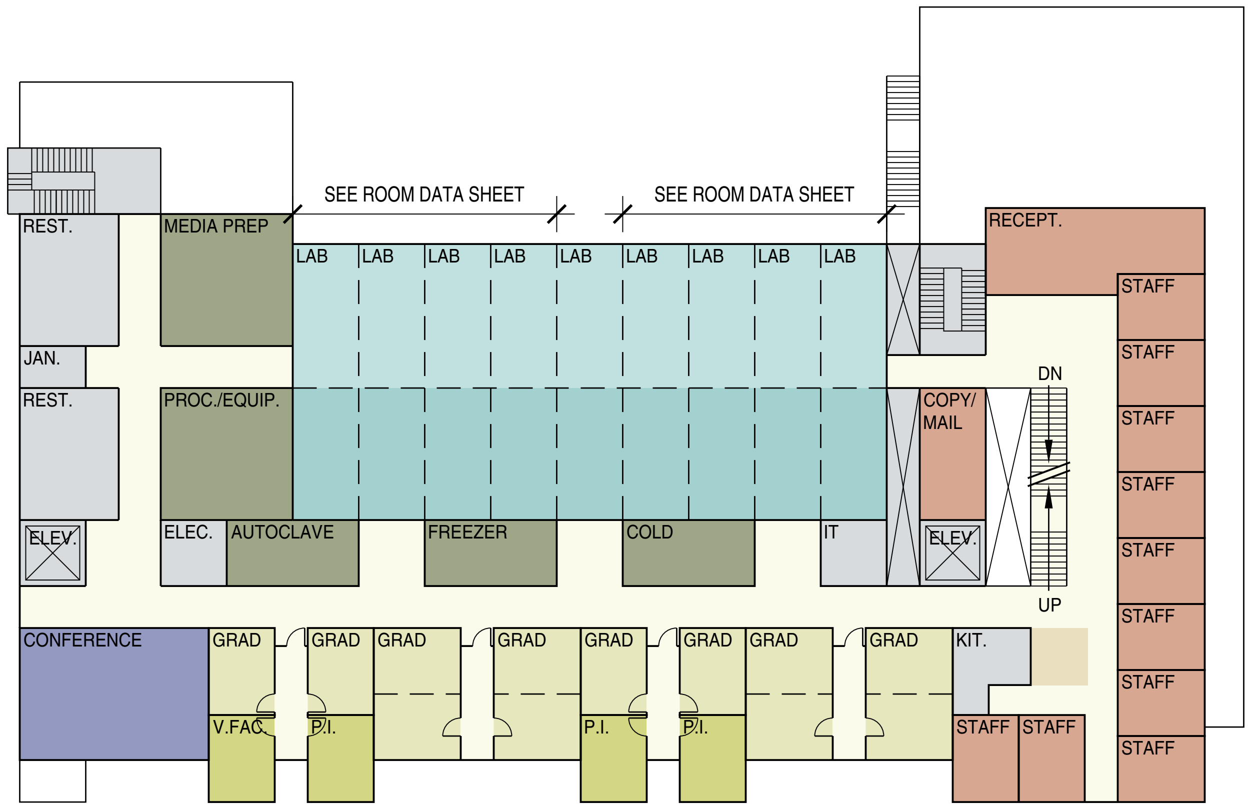


FIRST FLOOR
BIOENGINEERING
OFFICES

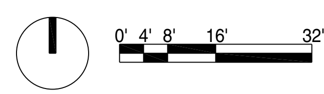


LABORATORY
LABORATORY SUPPORT
ACADEMIC OFFICES
ADMINISTRATION OFFICES
SHARED SPACES
BUILDING SUPPORT
INTERACTION SPACES
VIVARIUM OR SHELLED SPACE

BLOCKING & STACKING DIAGRAM

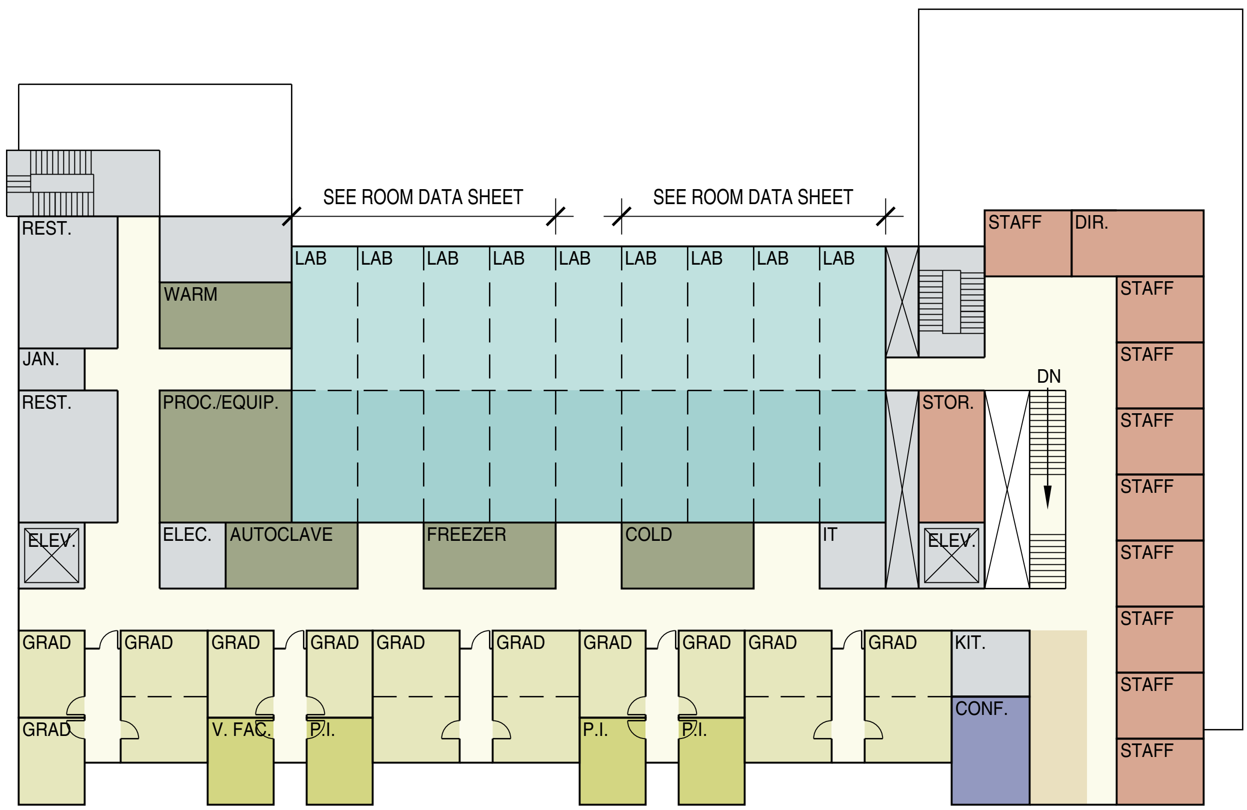


SECOND FLOOR
ICB OFFICES



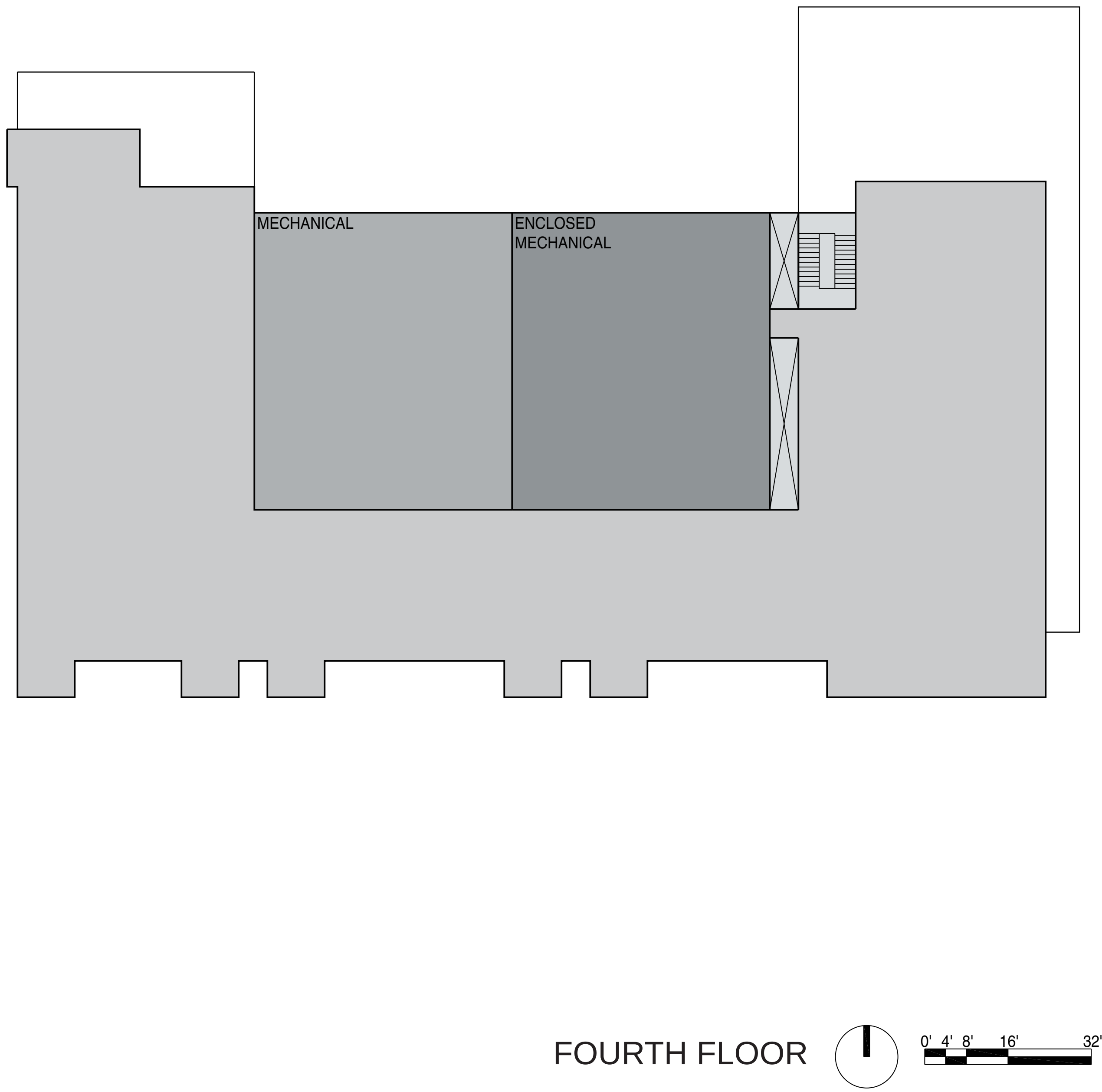
LABORATORY
LABORATORY SUPPORT
ACADEMIC OFFICES
ADMINISTRATION OFFICES
SHARED SPACES
BUILDING SUPPORT
INTERACTION SPACES
VIVARIUM OR SHELLED SPACE

BLOCKING & STACKING DIAGRAM



LABORATORY	ACADEMIC OFFICES	SHARED SPACES	INTERACTION SPACES
LABORATORY SUPPORT	ADMINISTRATION OFFICES	BUILDING SUPPORT	VIVARIUM OR SHELLED SPACE

BLOCKING & STACKING DIAGRAM



LABORATORY

LABORATORY SUPPORT

ACADEMIC OFFICES

ADMINISTRATION OFFICES

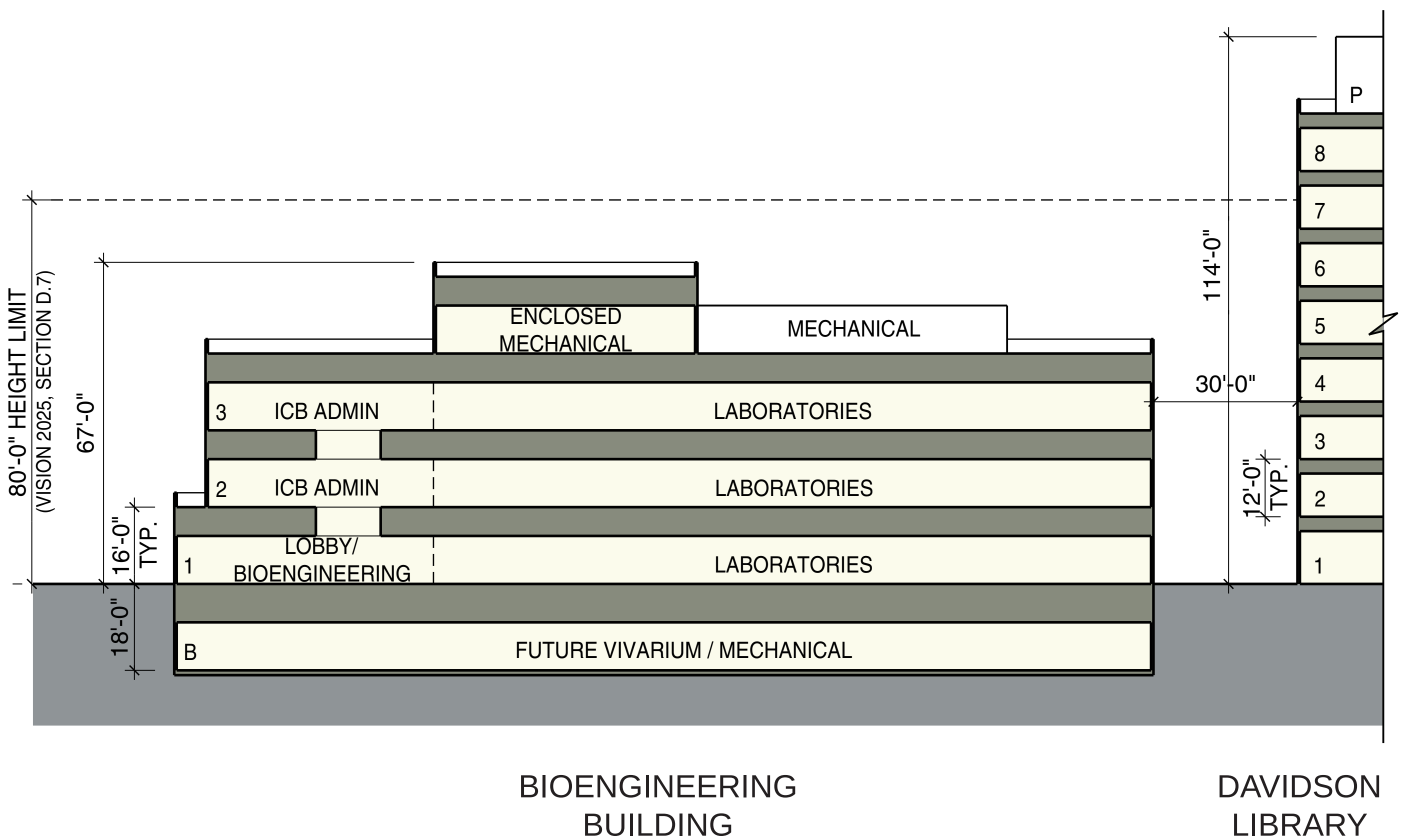
SHARED SPACES

BUILDING SUPPORT

INTERACTION SPACES

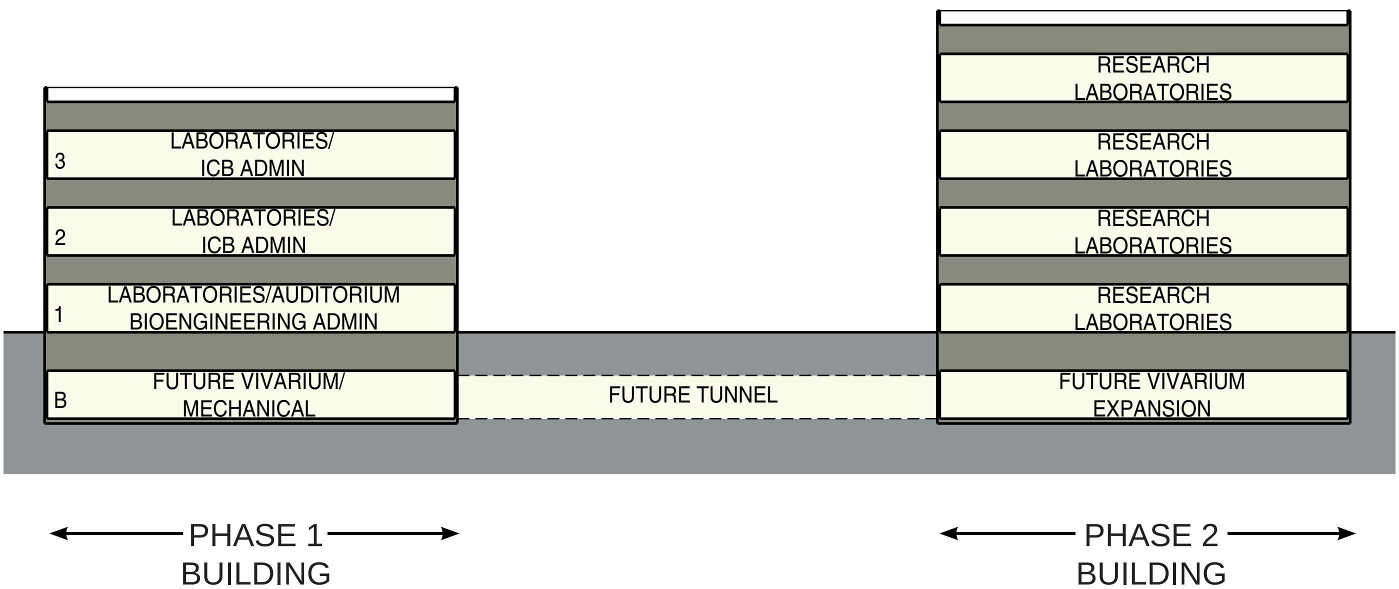
VIVARIUM OR SHELLED SPACE

BUILDING HEIGHT ANALYSIS



SECTION

STACKING DIAGRAM
PHASES 1 & 2



SECTION

BUILDING CODE ANALYSIS

7.0.0

SECTION 7.0.0 **BUILDING CODE ANALYSIS**

DPP CLARIFICATIONS AND AMENDMENTS

page 7.1.2

First sentence amended to:
The Bioengineering Building shall by Type I construction, up to five floors, and will have either a concrete or steel structural system.

page 7.1.2

BUILDING CODE ANALYSIS / Occupancy:
Regarding chemical usage quantities, the DPP states, "During the Design Phase the faculty will provide an itemized list of quantities to confirm the building occupancy. If quantities are exceeded, the building occupancy will be classified as an L."

This is amended to:
Before the end of Schematic Design, the faculty will provide an itemized list of quantities to confirm the building occupancy. If allowable quantities are exceeded, we recommend the use of specialized storage rooms (classified as H) in order to limit the quantity of chemicals stored within the laboratory spaces. The use of these specialized storage rooms can allow the building to remain B occupancy, without the additional cost associated with a change to an L or H occupancy.

page 7.1.5

LOCATION ON PROPERTY:
The location and openings allowed will require further study during the Schematic Design Phase of the project.

page 7.1.5

EXITING AND OCCUPANT LOAD:
A full accounting of space types and occupant loads, developed to confirm exiting requirements, will be required during the Schematic Design Phase.

LABORATORY DESIGN REQUIREMENTS

8.0.0

LABORATORY DESIGN REQUIREMENTS

SECTION 8.1.0 LABORATORY REQUIREMENTS

The verification process represented in this document has included a review of the basic laboratory design approach developed as a primary part of the original DPP. Included in the design is a multi-module, open bench area that is teamed with lab specific support rooms. Shared laboratory support including cold and warm rooms, freezer farms and prep labs are programmed to support primary laboratory functions on each floor. In keeping with current premier laboratory design, laboratory support space is equal to or greater than the area devoted to traditional laboratory benches. Items that will require further study during the early design phases include:

- Confirmation of actual bench amounts to be installed in the building
- Location and distribution of specific support facilities, such as microscopy rooms
- Location and number of lab sinks
- Number of entries into labs

reference	DPP CLARIFICATIONS AND AMENDMENTS
page 8.1.3	In order to help achieve sustainability goals, we recommend the chemical fume hood operational requirements include, for safety and efficient use, as noted variable air volumes (VAV), 100 ft/min air supply at an 18" sash opening. In addition, an occupancy sensor will be included to close the vertical sash. Horizontal sashes may be considered, based on research needs, to further enhance the energy savings of the building. Additional approaches, such as a standard VAV hood with a "setback" mode of 60ft/min tied to an occupancy sensor, will be evaluated by the design team and University staff and faculty. Any outstanding quesions and issues pertaining to the laboratories, including fume hoods, will be resolved during the design phase.
page 8.1.4	Washable (mylar) lay-in tile ceilings will be required in Autoclaves and Procedure Rooms only. All other spaces may use standard, acoustical tile where desired.
page 8.1.4	Although open ceilings in laboratories are an option, ceiling types and heights will be developed as an integrated solution balancing space conditioning volume, support of natural lighting, budget and acoustics.
page 8.1.5	In addition to DPP text describing exhaust and intake location requirements, actual placement will be guided by a Wind Analysis undertaken by a specialty consultant. This testing process will further study placement and exit velocity requirements not only for the Bioengineering Building but also surrounding campus facilities.
page 8.1.5	The DPP states, "exhaust air, in general, does not require filtration or scrubbing." This will require further verification based upon finalization of a chemical inventory and the wind study analysis.
page 8.1.7	The reference to an 11' x 22' "laboratory module" should be considered as a laboratory area and not be confused with a full 11' x 46' laboratory planning module. The area described provides for an average density of electrical circuiting for both bench and support areas.
page 8.1.7	Safety shower locations will be coordinated with lab entries while remaining less than 55 feet from any point within the laboratory. Actual location may be either within the lab or corridor.
page 8.1.7	Inert gas cylinder storage shall not only be secured vertically, out of the way of traffic, but should also be placed in dedicated storage closets or alcoves with manifolds to use areas.

LABORATORY DESIGN REQUIREMENTS

8.0.0

ROOM DATA SHEETS 8.2.0

SECTION 8.2.0 **ROOM DATA SHEETS**

Wireless technology, noted in the Room Data Sheets, will require further investigation during the design phases for the project. UCSB desires the potential for wireless internet service to be developed as part of an overall IT strategy.

reference	DPP CLARIFICATIONS AND AMENDMENTS
page 8.2	Note the following revisions to the design temperatures found in the Room Data Sheets: a. For naturally ventilated spaces (such as offices) the room temperatures will be 8 to 10 degrees F above ambient. b. For other spaces outlined in the Room Data Sheets, the design temperature will be 74 degrees F +/- 3 degrees, unless noted otherwise.
page 8.2.2 page 8.2.3	Bioengineering Chair Office and ICB Director Office Note revision to adjacency required. Rather than the access to the Small Conference Room, direct access should be to an Administrative Assistant office.
page 8.2.4 page 8.2.5	Bioengineering Staff Office and ICB Staff Office Staff offices will have one or two occupants depending upon duties and assignment prior to occupancy. Furnishing selections will require adjustment prior to purchase.
page 8.2.6	Bioengineering Reception Office The Bioengineering Reception Office is the main “entry” for the Department. The person occupying this office will greet and direct visitors, students, faculty and staff as well as accept deliveries for the unit.
page 8.2.7	ICB Reception Office The ICB Reception Office is the main “entry” for the Department. There will be three to four staff occupying this office. The staff will greet and direct visitors, students, faculty and staff as well as accept deliveries for the unit.
page 8.2.11	Auditorium The seating configuration and supporting teaching technologies are to be developed further during the Schematic Design Phase. Campus precedents, such as a similar space in the Marine Science Building, and the campus classroom planner, Art Battson, will provide design assistance for this space to the design team and building committee. The information included in Appendix F is provided by the campus instructional office to assist in this effort. Natural ventilation or displacement ventilation strategies shall be explored during the design phases.
page 8.2.12	Conference Rooms Group 1 equipment will include marker boards. The extent and placement will be determined during the design phases.

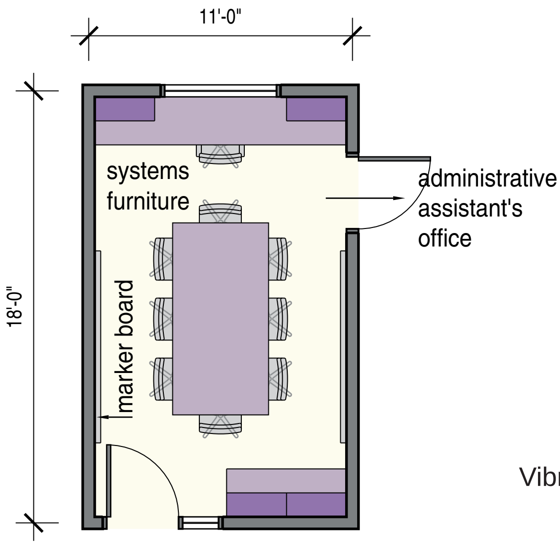
Page 8.2.25 Cold Room

The anteroom illustrated in the Room Data Sheet will require further study based on code requirements of adjoining corridors. If two sets of doors are not a code requirement, the space allocated will be distributed to other building needs.

Page 8.2.31 Bio/Chem Waste

Temporary storage requirements for biological and chemical waste will require further evaluation during the design phases.

CHAIR OFFICE
BIOENGINEERING
180 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: Near Bioeng. Staff offices
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

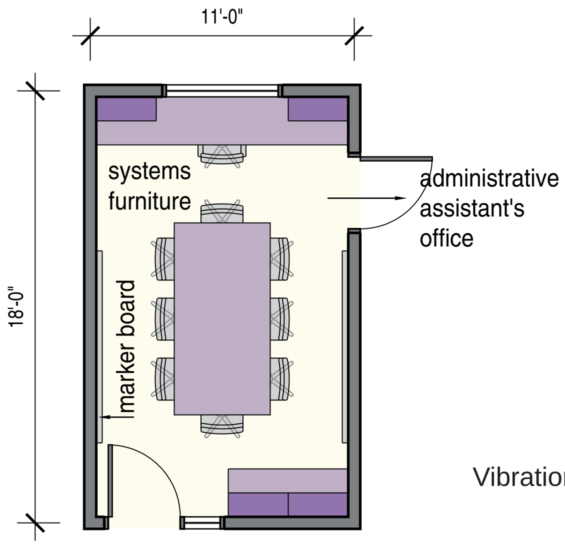
PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker board
Systems furniture
Chairs

DIRECTOR OFFICE
ICB
180 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: Near ICB staff offices
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

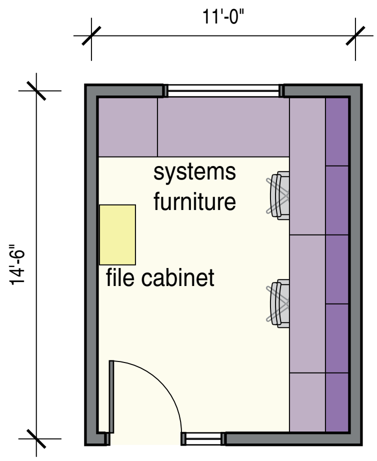
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker board
Systems furniture
Chairs

STAFF OFFICE
BIOENGINEERING

140 ASF

OCCUPANTS: 1 OR 2



ARCHITECTURAL
Occupancy: B
Adjacency: near Bioeng. Reception office
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

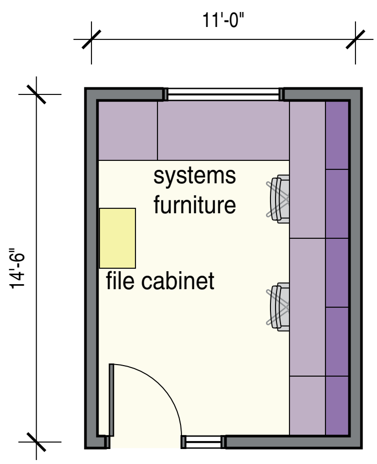
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker board
Systems furniture
Chairs

STAFF OFFICE
ICB

140 ASF

OCCUPANTS: 1 OR 2



ARCHITECTURAL
Occupancy: B
Adjacency: near ICB reception office
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10’ minimum
Door: 36” x 96”
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

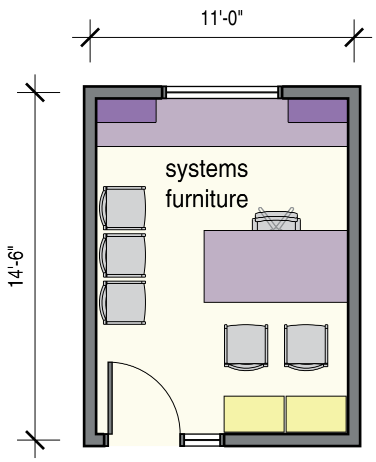
PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker board
Systems furniture
Chairs

RECEPTION OFFICE
BIOENGINEERING
140 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: near Bioeng. staff offices
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

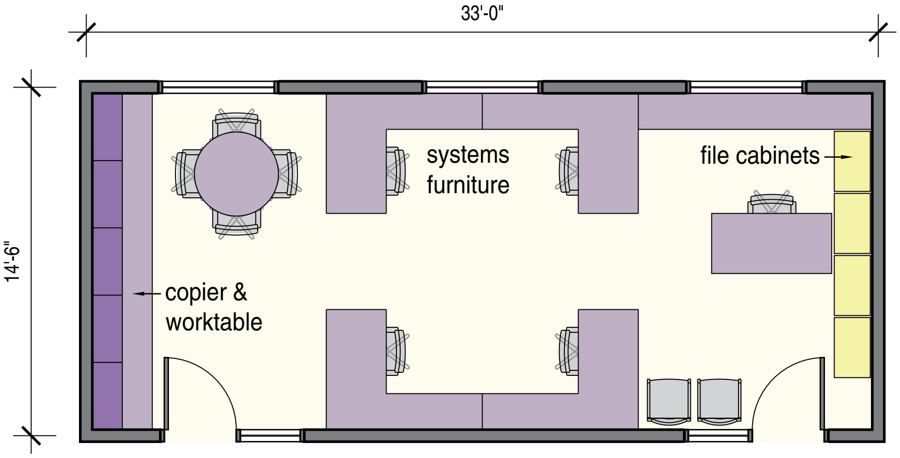
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker board
Systems furniture
Chairs

RECEPTION OFFICE
ICB

433 ASF

OCCUPANTS: 3-4



ARCHITECTURAL
Occupancy: B
Adjacency: near ICB staff offices
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

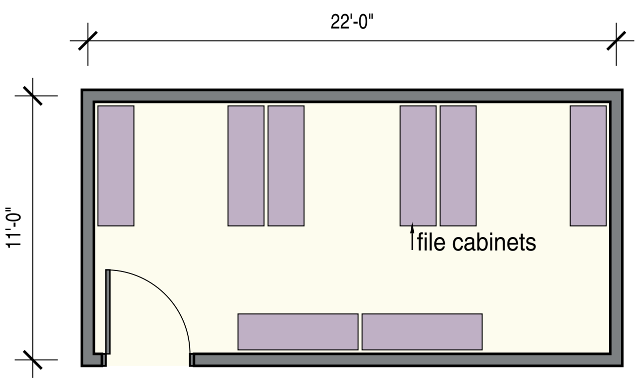
PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker boards
Systems furniture
Chairs

STORAGE ROOM
BIOENGINEERING
226 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: near Bioeng. Staff office
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 42" x 96"
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Mechanically ventilated
Humidity: ambient

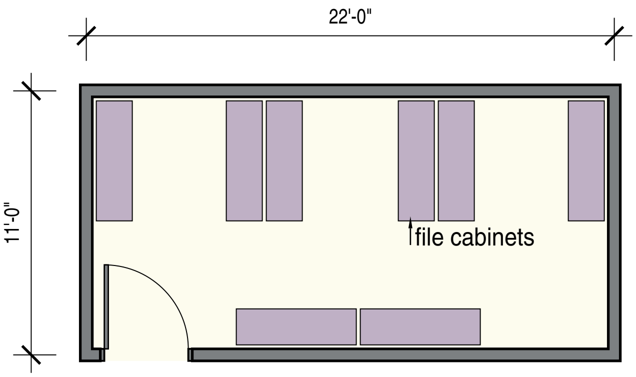
PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
File storage cabinets

STORAGE ROOM
ICB
226 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: near ICB staff office
Floor: sealed concrete
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 42" x 96"
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Mechanically ventilated
Humidity: ambient

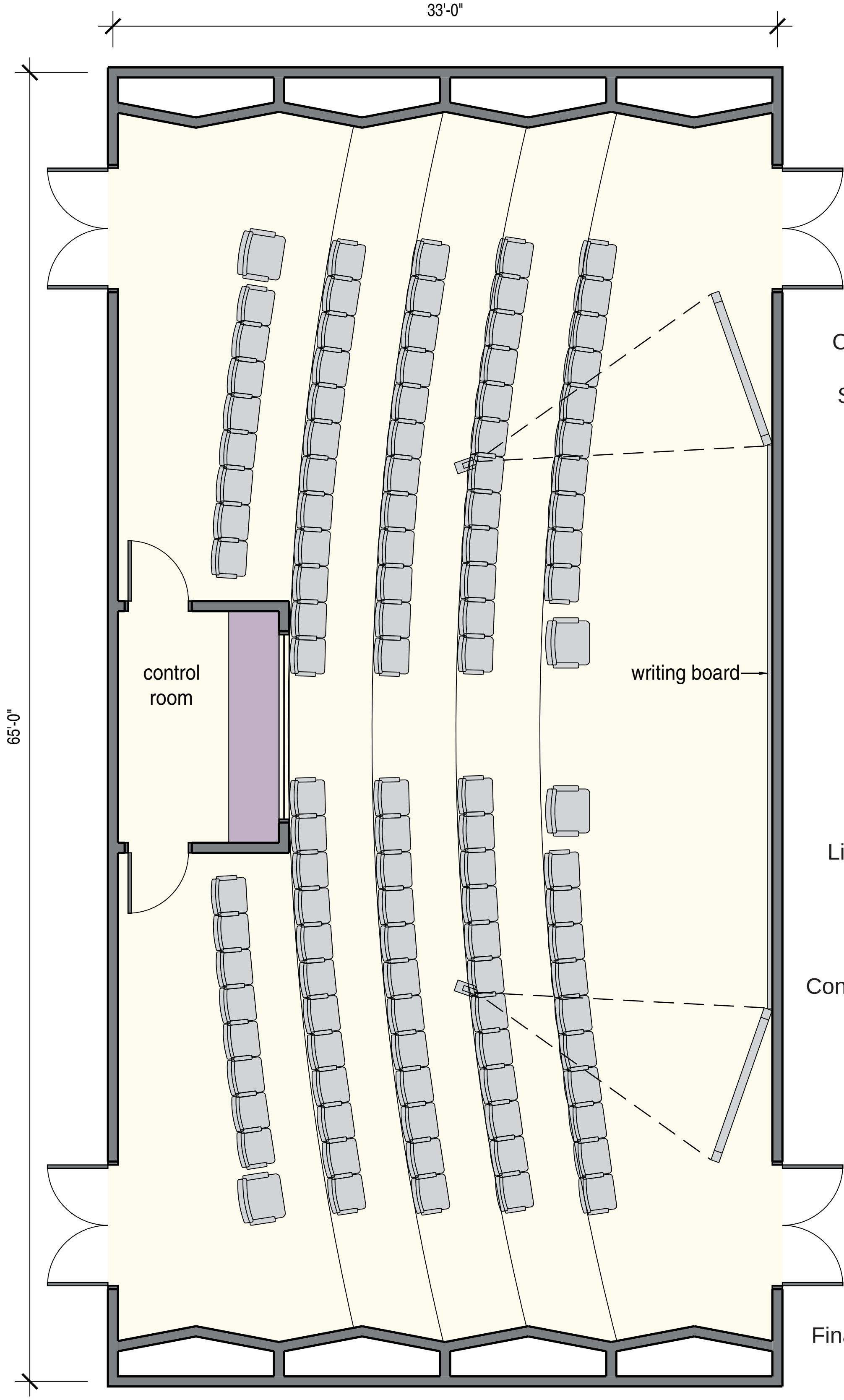
PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
File storage cabinets

AUDITORIUM



2,096 ASF
100 SEATS MIN.

ARCHITECTURAL
Occupancy: A-3
Adjacency: Ground floor
Floor: static dissipating carpet and/or VCT/sheet goods
Walls: acoustic panels, gypsum board, enamel paint
Ceiling: acoustic tile, 18' minimum
Door: 36/36"pair x96"
Sound Attenuation: NC 35 or less
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 3 deg. F
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Conduit, power for projection system
Screens
Fixed, tiered seating
Marker Boards

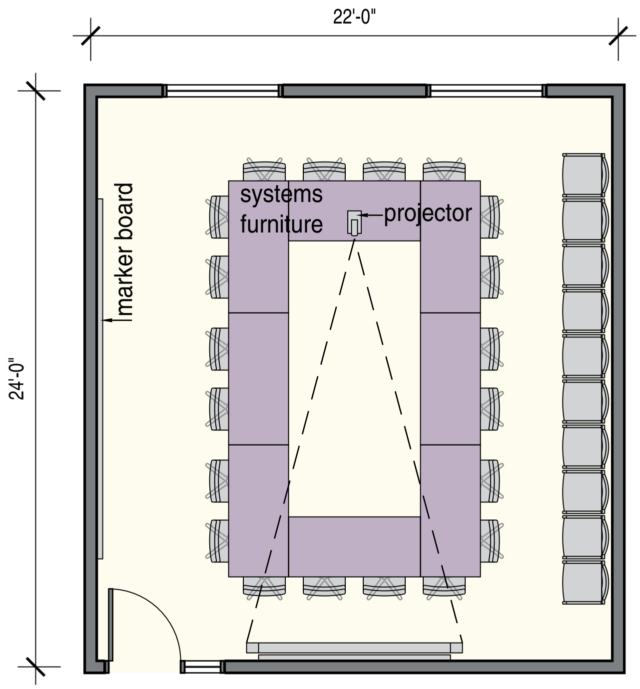
UNIVERSITY FURNISHED EQUIPMENT
Projection system

NOTE:
Consider flat floor with mobile seating as an option

Final configuration to be determined during design phase.
Diagram shows 112 seats.

LARGE CONFERENCE ROOM

500 ASF
30 SEATS



ARCHITECTURAL
Occupancy: B
Adjacency: None
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36"x96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 3 deg. F
Humidity: ambient

PLUMBING
None

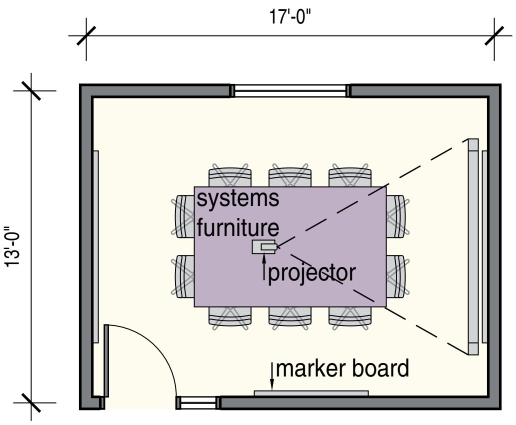
ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Projection system
Conduit, power for projection system
Screen
Marker boards

UNIVERSITY FURNISHED EQUIPMENT
Tables, chairs

SMALL CONFERENCE ROOM

200 ASF
10 SEATS



ARCHITECTURAL
Occupancy: B
Adjacency: Near administrative areas
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10’ minimum
Door: 36”x96”
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 3 deg. F
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

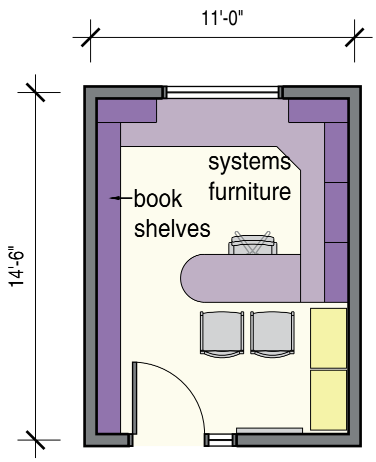
CONTRACTOR FURNISHED EQUIPMENT
Projection system
Conduit, power for projection system
Screen
Marker boards

UNIVERSITY FURNISHED EQUIPMENT
Tables, chairs

P.I. OFFICE

140 ASF

OCCUPANTS: 1



ARCHITECTURAL
Occupancy: B
Adjacency: near other faculty offices
On same floor as laboratory
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

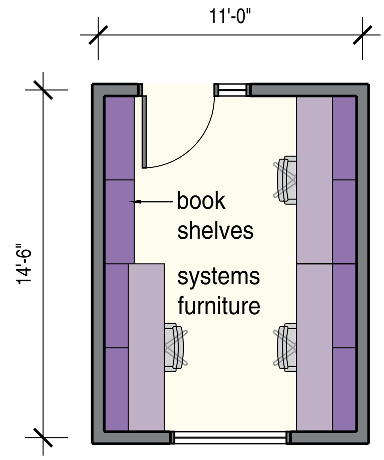
UNIVERSITY FURNISHED EQUIPMENT
Marker board
Systems furniture
Chairs

GRADUATE/POST-DOCTORATE STUDENT DESKS

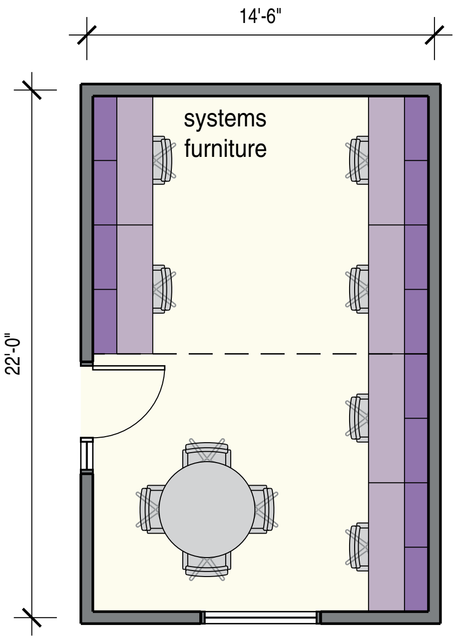
140 ASF OR 287 ASF

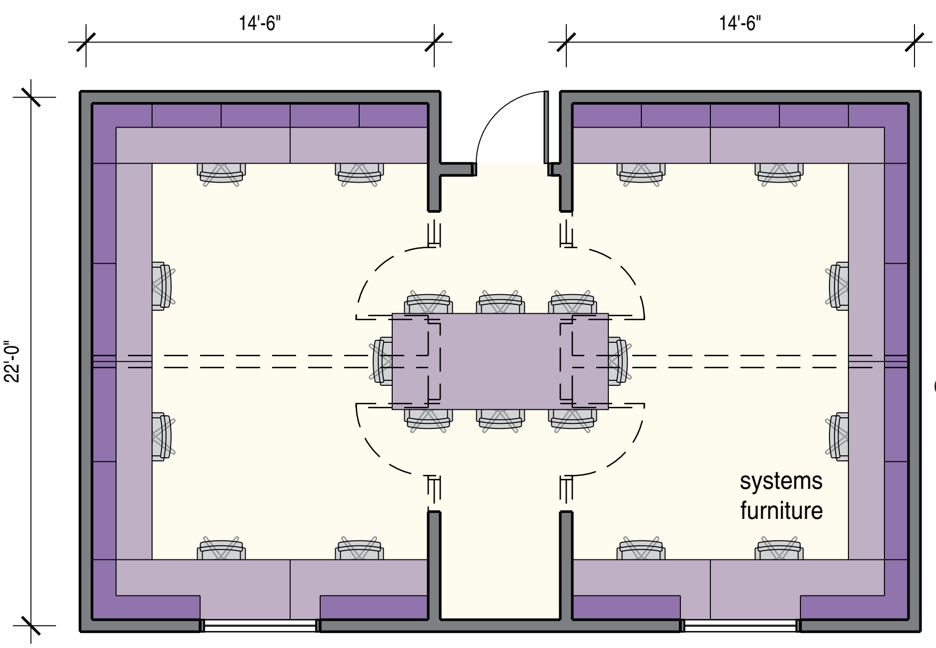
OCCUPANTS: 2-6

TYPICAL 140 ASF
STUDENT OFFICE



287 ASF
"DOUBLE" STUDENT
OFFICE





ARCHITECTURAL
Occupancy: B
Adjacency: near other P.D./G.S. offices and near labs
On same floor as laboratory
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/ sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
None

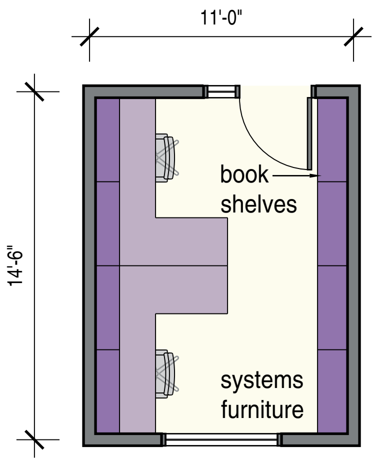
UNIVERSITY FURNISHED EQUIPMENT
Marker boards
Systems furniture
Chairs

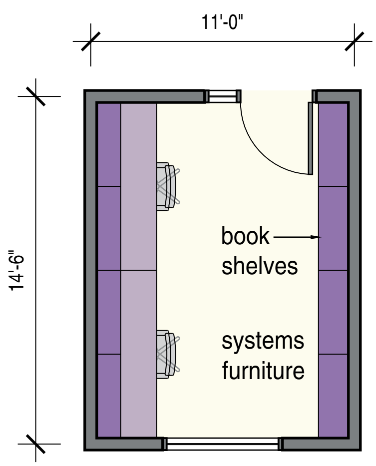
NOTE:
Alternate furnishing configurations dependent upon building design

VISITING FACULTY OFFICE

140 ASF

OCCUPANTS: 2





ARCHITECTURAL
Occupancy: B
Adjacency: near other faculty offices
On same floor as laboratory
Floor: static dissipating carpet
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10’ minimum
Door: 36” x 96”
Sound Attenuation: NC 35 or less
Light Attenuation: at exterior windows
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Natural ventilation
Humidity: ambient

PLUMBING
None

ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

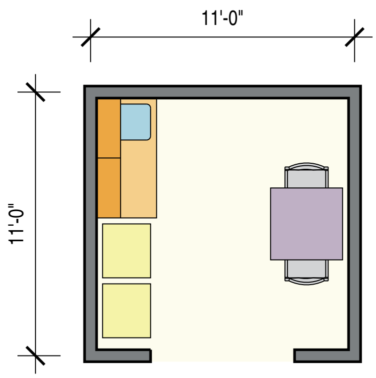
CONTRACTOR FURNISHED EQUIPMENT
None

UNIVERSITY FURNISHED EQUIPMENT
Marker boards
Systems furniture
Chairs

NOTE:
Alternate configurations
dependent upon building design

KITCHEN/COFFEE BAR

110 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: Near labs
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 10' minimum
Door: 36" x 96"
Sound Attenuation: NC 40 or less
Light Attenuation: at exterior windows

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Mechanically ventilated
Humidity: ambient

PLUMBING
Domestic hot/cold water

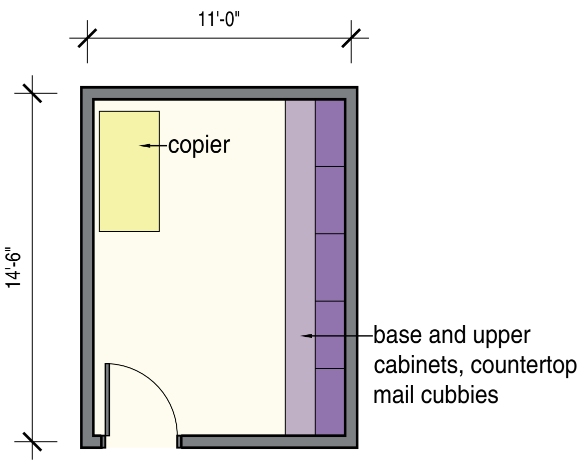
ELECTRICAL
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Wood casework
Sink, tops

UNIVERSITY FURNISHED EQUIPMENT
Table, chairs
Microwave
Undercounter refrigerator
Coffee machine

COPY/MAIL ROOM

140 ASF



ARCHITECTURAL
Occupancy: B
Adjacency: near departmental reception
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: acoustic tile, 9' minimum
Door: 42"x96"
Sound Attenuation: NC 45 or less
Security: Key access at door

STRUCTURAL
Vibration Attenuation: 8000 microinches/sec. or less

MECHANICAL
Temp: may vary 8-10 deg. above ambient
Mechanically ventilated
Humidity: ambient

PLUMBING
None

ELECTRICAL
208v30a1ph for copier
110v15a outlets
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Casework

UNIVERSITY FURNISHED EQUIPMENT
Copier
Mail slot cabinets
Recycling

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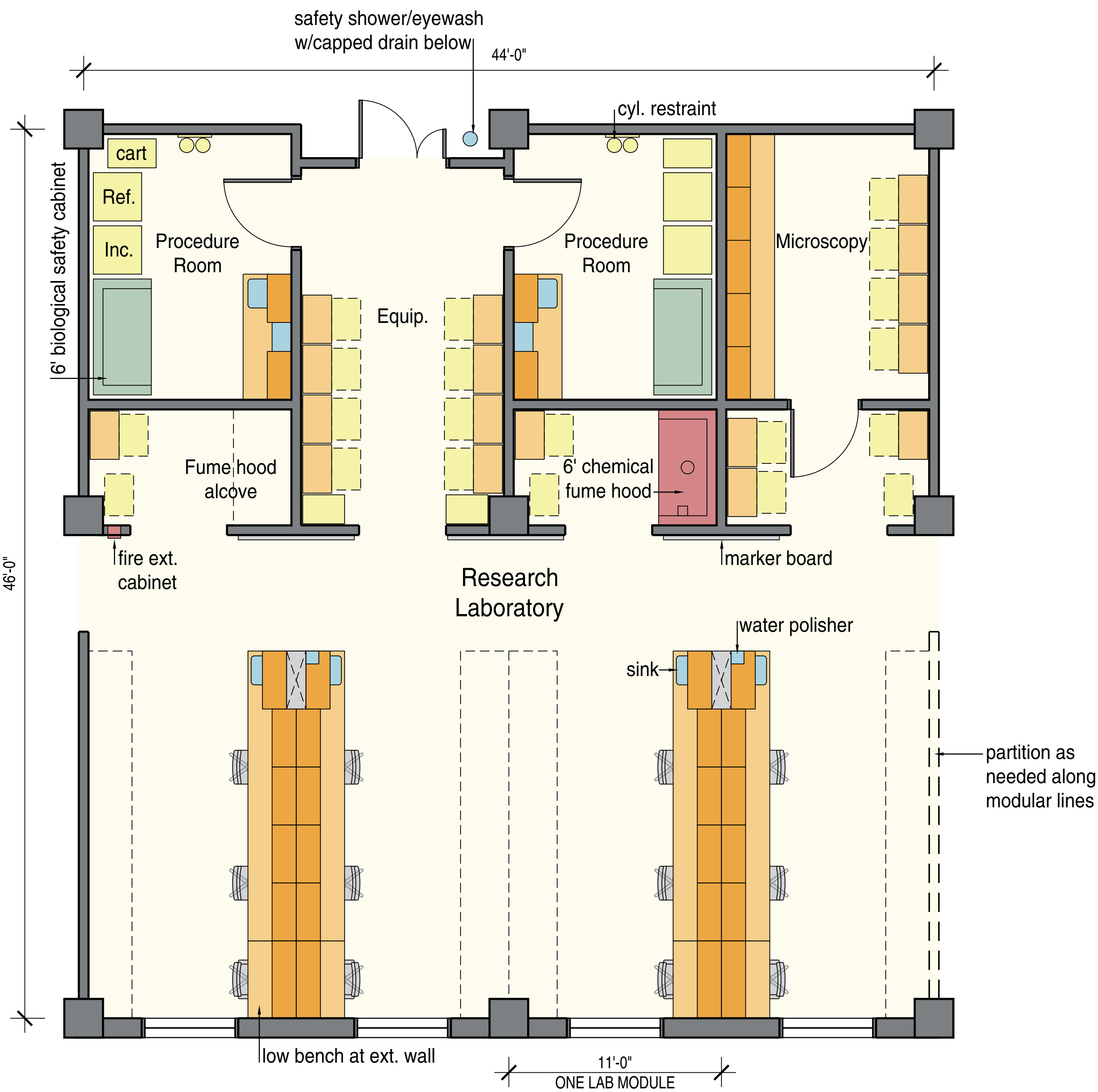
LABORATORY SPACES

1,979 ASF



LABORATORY SPACES

ARCHITECTURAL
Occupancy: B
Adjacency: Paired with other lab unit to form one PI Lab
Floor: rubber tile
Walls: gypsum board, enamel paint
Ceiling: open to structure in main lab, entry, and fume hood alcove
9' acoustic ceiling in procedure room (mylar tile)
9' acoustic ceiling in microscopy room
Doors: 36"/18" x 96" pair at lab entry
42" x 96" at Procedure Room and Microscopy Room
Sound Attenuation: NC 45 or less
Light Attenuation: at exterior windows
Security: Card reader access at lab entry

STRUCTURAL
Vibration Attenuation: 2000 microinches/sec. or less

MECHANICAL
Temp: 72 deg. F +/- 2 deg. F
100% exhaust: 1 c.f.m./s.f.
Air change rate may be higher due to equipment heat gain.
Humidity: 30-50%

PLUMBING
Industrial hot/cold water
RO/DI Pure water (Type II)
Domestic water at safety shower/eyewash
Capped drain at safety shower
Natural gas and vacuum
Compressed air- 30 p.s.i.
Specialty gases (inert)

ELECTRICAL
208v30a1ph; 110v20a
Standby power
Cable tray
Hardwire and wireless data
Lighting: indirect fluorescent at 60 f.c

CONTRACTOR FURNISHED EQUIPMENT
Chemical Fume Hoods
Wood casework: base cabinets, wall cabinets, Adjustable shelves, sinks, tops

UNIVERSITY FURNISHED EQUIPMENT
Scientific Equipment
Biological safety cabinets
Incubators, refrigerators, freezers
Analytical benchtop instruments
Marker Boards
Chairs

LANDSCAPE DESIGN

9.0.0

SECTION 9.0.0 **LANDSCAPE DESIGN**

reference DPP CLARIFICATIONS AND AMENDMENTS

page 9.1.1 Add to paragraph three:
Irrigation shall be provided by available recycled water.

page 9.1.1 Landscape Concept Description / Site Goals / Item Number 2:
The use, location and species of skyline trees will be evaluated during the early design phases in consultation with the campus.

CIVIL

10.0.0

SECTION 10.0.0 **CIVIL**

reference	DPP CLARIFICATIONS AND AMENDMENTS
page 10.1.1	Items noting specific design solutions based on Schemes developed in the original Detailed Project Program shall be amended and updated per information within other sections of this DPP Amendment.
page 10.1.1	Section A. SITE REQUIREMENTS / Item 3: Potentially contaminated soils will be evaluated through the undertaking of a Soils Report and evaluations during excavation. The University will develop mitigation and implementation plans prior to project bidding.
page 10.1.1	Section B. EXISTING SITE CONDITIONS – SITE ANALYSIS / Item 2: The need for over-excavation and recompaction with engineered soils will be superceded with the inclusion of a full basement as part of the project.
page 10.1.1	Section B. EXISTING SITE CONDITIONS – SITE ANALYSIS / item 3: Removed site materials shall be recycled as possible.

BUILDING SYSTEMS REQUIREMENTS

11.0.0

BUILDING SYSTEMS REQUIREMENTS

11.0.0

STRUCTURAL 11.1.0

SECTION 11.0.0 **BUILDING SYSTEM REQUIREMENTS**

SECTION 11.1.0 **STRUCTURAL SYSTEMS**

reference	DPP CLARIFICATIONS AND AMENDMENTS
page 11.1.1	Structural Systems / Overview: Items noting specific design solutions based on Schemes developed in the original Detailed Project Program shall be amended and updated per information within other sections of this DPP Amendment. This includes the number of stories, the inclusion of a basement and the requirement for LEED certification.
page 11.1.1	UCSB's requirement for 2,000 micro-inches per second vibration criteria noted for both wet and dry labs shall be evaluated further during the early design phases of the project. As this requirement carries considerable cost implications, the development of space to this criteria shall be carefully undertaken to ensure meeting the functional requirements of current and future research within a thoughtfully conceived physical environment.
page 11.1.1 page 11.1.2	Gravity Load Systems / paragraph three (continued onto next page): Statements defining the proposed structural system to be concrete are to be amended noting that both concrete and steel structural systems will be evaluated during Schematic Design based on a variety of reasons as part of an integrated design approach (including cost, availability, compatibility with other building systems, etc.). Structural steel and a variety of concrete frame approaches may all meet the building's technical requirements (such as vibration control) and are to be vetted during the Schematic Design Phase.

BUILDING SYSTEMS REQUIREMENTS

11.0.0

SECTION 11.2.0 **MECHANICAL SYSTEMS**

SECTION 11.3.0 **PLUMBING AND UTILITY PIPING**

SECTION 11.4.0 **ELECTRICAL SYSTEMS**

The following lists certain specific mechanical, electrical and plumbing items within the original DPP that need amendment or further verification. It is anticipated that the consulting engineers responsible for the design of the building's systems will re-evaluate all MEP proposals provided in the DPP as part of developing overall sustainability strategies for the facility. Approaches are to be considered within an integrated building design method that balances first and life-cycle costs while being constructible and providing functional maintainability for the University.

Note that all loads and requirements based on previously developed Schemes will be re-evaluated based on updated Concepts and further development during the design phases. It is anticipated that with a reduction in built areas shown in this Amendment Document, load requirements will be reduced.

reference	DPP CLARIFICATIONS AND AMENDMENTS
page 11.2.2	Section B. Energy Conservation / Item 1: The paragraph indicates that the systems "shall be designed to meet or exceed by 30% the energy performance requirements of California Title 24." UCSB clarified that the project is to exceed Title 24 by 20%. The systems listed in the mechanical DPP do not provide adequate energy efficiency reduction to support the 20% reduction statement. Additional energy saving approaches may include the use of a water cooled chiller plant with low part load Kw/ton performance (such as frictionless compressors or use of geothermal energy) and/or use of the sustainable air conditioning systems for the Lab spaces (such as chilled beam distribution system) and/or use of energy recovery systems, upsizing the air handling units to 400 FPM and main distribution ductwork to reduce internal system losses, therefore reducing energy consumption, would be more appropriate to complement this statement. All systems should be developed as part of an integrated design approach that includes a high performance building envelope, reduction of plug loads, use of natural ventilation as appropriate and use of natural daylighting as available.
page 11.2.2	Section C. Mechanical Loads / Item 1: Per the previous paragraph "the overall design envelope and systems shall be capable to meet or exceed the energy performance requirements of Title 24 by 40% which would qualify the building for LEED Silver Rating." In paragraph C.1, there is an indication that the wall insulation will be specified with R-19 insulation. To achieve the energy efficiency standards stated in this document, insulation values should be increased beyond the minimum Title 24 requirement.
page 11.2.4	Section D. HVAC Systems / Item 14: The paragraph states "laboratory noise, much of it generated by HVAC systems, shall be maintained at NC 40 – 45 dB." For the laboratory spaces with fume hoods and high air flow delivery the noise would be maintained at NC 45 – 50 dB.

page 11.2.6 Section E. BSL-3 Laboratories:
Reference to this laboratory type shall be deleted from this section of the DPP. Refer to Part II, Vivarium Detailed Project Program for requirements for this laboratory.

page 11.2.7 Section G. Fume Hood Controls:
In order to help achieve sustainability goals, we recommend using occupancy sensors that shall cause the sash to close when unoccupied. Equivalent approaches will be evaluated by the design team and University staff and faculty during the design phase.

page 11.2.8 Section L. Mechanical Equipment List / Items 5-10:
Based on an initial review of air flow amounts stated in the DPP, air flow amounts described may be too low to serve the laboratory environment. Supply and exhaust may need to be increased by a minimum of 20% with an increase of the chiller capacities from 100 to 150 tons each.

The proposed air handling units appear to be sized based on the 100% of the connected load without extra capacity built into the mechanical systems. This amendment recommends sizing the air handling units and laboratory exhaust fans based on 70% (each) of the connected load to deliver future flexibility to the laboratory space.

All loads, air handling capacities, and cooling requirements shall be re-evaluated during the early design phases.

SUSTAINABILITY

12.0.0

SECTION 12.0.0 **SUSTAINABILITY**

reference DPP CLARIFICATIONS AND AMENDMENTS

page 12.1.3 Achieving 6 points in the “Optimize Energy Performance” credit will require the development of additional energy reduction strategies within the mechanical system’s design.

PART II

VIVARIUM DETAILED PROJECT PROGRAM

PART II - VIVARIUM

INTRODUCTION

1.0.0

PART II - INTRODUCTION

The Bioengineering Building is currently planned to include a vivarium facility. As this program element was introduced after the development of the original DPP and is subject to funding pending approval of an NIH Grant, the Vivarium Program is included here. This section outlines the planning and design guidelines, programmatic requirements, as well as the functional and technical requirements for the Bioengineering Vivarium. The anticipated construction cost of the facility described in this section is included in the Opinion of Probable Cost, located in Part III, Section 2.0.0.

QUALITY OF LIFE

The Bioengineering Building Vivarium is a workplace for vivarium personnel and research personnel who work elsewhere in the Bioengineering Building. The Vivarium should be designed so that it is aesthetically pleasing to the staff and meets the needs of the investigators engaged in animal research. The Vivarium shall provide for the health and safety of the staff and provide an environment for highly sensitive animal subjects, compatible with the requirements and protocol of research. The Vivarium shall be designed to be efficient, secure, and easy to maintain and perform animal caretaking services. Sufficient air supply, filtration, and exhaust shall be provided to minimize unpleasant animal odors and animal allergens. Provision of natural light, if feasible, adequate work space, color, and ergonomic furniture systems are integral to a pleasing, functional, and effective work environment that will enhance productivity and aid in the recruitment and retention of quality personnel.

The Bioengineering Building Vivarium is designed to accommodate rodents. Other non-human primates, pigs, and dogs will not be housed in this Vivarium. Animal housing shall be designed to ensure animal well-being, to meet research requirements, to be cleanable and easily maintained, and to minimize experimental variables (maximize predictability). The Bioengineering Building Vivarium shall provide a healthy social environment for the animals. Windows or skylights in housing areas are inappropriate. Natural light may be provided in administrative areas if feasible. Illumination in occupied animal holding spaces is generally 35 to 85 foot candles. Fluorescent lighting is recommended because it generates less heat. Acoustical control is an important consideration and should be evaluated carefully in the design phase. Most animals are stimulated by noise. Noise can cause stress in animals, and induce unwanted variables into research studies. Without views to the outside or significant landmarks with the facility, orientation for vivarium staff and research personnel becomes a significant planning issue in vivarium design. A map of the corridor system should be provided in the hallway. Each room should have a number clearly displayed at its entry. Color or other wayfinding methods should be considered and evaluated.

SECURITY

The Bioengineering Building Vivarium is designed to address the critical security features that are appropriate for a university vivarium facility. Card reader access to the Vivarium, with multiple layers of access and control shall be part of the security system. The loading dock and delivery areas shall have controlled access. A camera monitoring system shall be used to monitor movement of personnel in and out of the Vivarium facility. The Vivarium shall be situated within the Bioengineering Building such that it is not obvious to people that a vivarium is located in the building proper.

BARRIER DESIGN

The Bioengineering Building Vivarium is designed as a barrier facility. A full barrier is provided around the animal holding rooms and support areas by means of double door control exit points in the barrier corridor. Access in and out of the barrier is through the barrier locker/shower rooms. A secondary barrier is around the Vivarium proper and has controlled access and security.

FLEXIBILITY AND ADAPTABILITY

The spaces should be able to accommodate changes in function without having to make major changes to the facility. Custom designed spaces should be avoided where possible. The Vivarium and its accompanying utility services should be planned and designed to be adaptable to changes in animal species and research protocol. Care should be given to plan and design the building systems to permit ease of accessibility for routine inspection, maintenance, and repair without entering the animal holding rooms. All systems should be planned to be accessible to all spaces which require them and be configured so they can be extended, added, or deleted in an unobtrusive manner.

PLANNING MODULE

The Bioengineering Building Vivarium is based upon a modular planning scheme which follows that of the laboratory spaces on the levels above. Where possible, rooms shall be clustered to provide separate zones for animal holding, taking into account the difference in rack dimensions, waste disposal requirements, caretaking requirements, investigators, protocols, disease status, and airflow requirements.

Utility systems within the Vivarium shall be capable of providing all the services necessary for scientists to conduct their research and the animal husbandry staff to properly care for the animals. Provisions should be made for future utility services to accommodate unanticipated demands brought about by new technologies or changes in research protocol. A certain amount of reserve capacity shall be designed into the primary building systems to accommodate increased animal densities and potential future expansion of the Vivarium.

The most common unit of space is the animal holding room. The width of the room is determined by the number and types of animals, the way in which they are housed, and the cleaning methodology which will be employed. Room length is determined based on housing/caging options, and must accommodate service space for sinks, cleaning equipment, etc. The height of the holding room is primarily a function of the maximum rack height anticipated. There must also be enough space above the rack to provide a uniform airflow distribution in the room. The planning module for the Vivarium is 11' x 22'. Holding rooms and procedure rooms follow this modular pattern as much as possible, as well as other vivarium support functions. The floor-to-floor height of the Vivarium from the floor to the first floor above will be 18'. This will allow for adequate service access of HVAC and plumbing equipment above the ceiling plane. Valves will be located such that they are accessible outside of the footprint of the holding rooms.

CIRCULATION

Vivarium corridors shall be a minimum of seven feet clear width, which allows the simultaneous passage of two animal cage racks. A unidirectional single corridor system provides efficient circulation and maintains separation between clean and dirty zones. Contact between clean and dirty materials shall be minimized by scheduling pickups and deliveries and covering cages during transport. Service to and from the Vivarium is provided by means of a dedicated and screened loading dock at the ground level, and a dedicated vivarium elevator. These features will enhance the security and maintenance of the Vivarium.

ZONING

The zoning of a vivarium facility consists of three major components. First, an administrative and management support zone, which includes offices, break rooms, etc.; second a transitional zone which includes gowning areas, lockers, toilets; and third, an animal housing, procedure, and support zone. The facility layout has been planned in order to minimize the personnel traffic in the holding areas.

Within the Vivarium, the flow of materials, cages, animals, and personnel must be accommodated in an efficient and economical manner. Adjacencies are planned to maximize operational affinities and minimize travel distances. Relationships between deliveries, quarantine, housing, procedure rooms, cage wash, staff locker rooms, and administration spaces are designed to provide maximum efficiency.

Circulation space is a critical factor in controlling contaminants within the Vivarium. Planning of circulation focuses on the movement of cages and racks in the facility, since this is the most intensive use of the space. The objective of security is to ensure the safety of animals, staff, equipment, and data. Vivarium users shall take into account security at the site, building, vivarium, and room levels. Air intakes and any central utilities must be safeguarded from intruders.

The location of the loading dock area is based on the operational concept for the Vivarium facility. The quantity and types of materials that will be received and discharged, the need for security, quality control functions, accessibility for vehicles of multiple sizes, temporary storage and staging, recycling, pest management, waste disposal, materials storage, and staff marshaling are key issues to confirm in the detailed planning and design of the Vivarium and the associated dock area. A dedicated dock receiving area that is visually screened shall be provided. The office and break room have been located at an exterior wall in order to provide natural light by use of a secure light well.

HOUSING/HOLDING AREAS
The Bioengineering Building Vivarium is designed to accommodate mice and rodents. The housing or caging system is one of the most important considerations in the design of the Vivarium facility. It should be carefully planned and designed to facilitate animal well being; meet research requirements; minimize experimental variables; and be isolated from heat, vibration, and noise sources. The caging system should provide adequate space to permit freedom of movement and normal postural adjustments; a comfortable environment; and an escape-proof enclosure that confines animals safely with easy access to food, water, and ventilation. The caging system must meet the biological needs of animals. All holding rooms shall be designed to be easily cleanable and minimize pest harborage. Consideration should also be given to the accommodation of records and supplies.

FURNITURE AND EQUIPMENT
Cantilevered benchtops with rolling metal cabinets are proposed because of the ease of cleaning. Countertop materials may be epoxy or phenolic resin where corrosive chemicals are used, or stainless steel for washing areas. A variety of equipment will be used in the Bioengineering Building Vivarium. The equipment will include caging systems, sterilizers, tunnel washers, cage rack washers, freezers, tables in procedure rooms, surgery and necropsy tables and other related equipment. The cage and cage rack washing equipment will consist of a large capacity cage and rack washer, pit mounted. It will provide washing capacity of the ~9,000 cages anticipated for use in the first phase of the Vivarium. Future connections to holding areas of future adjacent buildings will increase the cage count and require additional washing capacity. Space for a future tunnel washer has been provided in the cage wash area in order to address the additional washing requirements as future buildings come on line. A bulk autoclave will be provided in the cage wash area for sterilization of cages, cage racks, and feed and bedding.

FINISHES AND MATERIALS
The finishes of the Bioengineering Vivarium shall be strong and durable enough to meet the demands of cart traffic, frequent cleaning, and the use of high-pressure, high-temperature water, abrasives, and caustic cleaners. All joints between dissimilar materials shall be accessible, easily cleanable, and caulked.

Floors shall be smooth, durable, moisture-proof, nonabsorbent, skidproof, and resistant to the adverse effects of disinfectants, high-temperature water, and detergent cleaning, as well as chemicals used in holding and procedure rooms and continuous movement of cages and equipment. Resinous epoxy flooring, troweled on, is recommended, and offers the best protection. Floor covering should be carried up the walls, at least six inches, to provide an integral flooring base for ease of cleaning. If thresholds are used, they must be of the type to permit the easy wheeling of cages or other equipment through the Vivarium.

Walls must be free from cracks, unsealed penetrations, or imperfect junctions with ceilings and floors. They should be constructed of materials capable of withstanding scrubbing with detergents and disinfectants and high-pressure water, and be capable of withstanding the impact of cages, carts, and racks. Walls must also provide sound isolation. Ceramic tile and glazed block, though nonporous materials, are not recommended. The number of exposed joints increases the possibility of failure and the opportunity for dirt to collect. Concrete masonry units are effective if they are coated, and the joints are tooled flush. The block may be plastered, or a block filler may be used. Fiberglass wall systems are also appropriate, and provide a durable, cleanable partition system. Bumper guards on walls in corridors and holding rooms will prevent cages, racks, and handcarts from colliding with and damaging walls.

Ceilings must be smooth, moisture-proof, free from imperfect junctions with the wall, and capable of withstanding scrubbing with detergents, disinfectants, and water under pressure. Most ceilings may be constructed of moisture resistant gypsum board with epoxy paint, or a fiberglass panel system. Surface mounted lights and exposed piping is not permitted. Windows, if any, shall be limited to the offices and break room, and are to be nonoperable, sealed and caulked.

Doors should be sized to easily accommodate passage of cages, racks, and other equipment. Doors shall have a minimum width of 42” and a height of 96”. Heavy (16 gauge) stainless steel doors in stainless steel frames or fiberglass doors in fiberglass frames are recommended. Door frames should be completely sealed to prevent the harboring of vermin and other pests. Doors shall be sealed top and bottom and be provided with vision panels with light-tight covers, locks, kick plates, fixed bristle sweeps, and closers. Doors shall be equipped with bumper rails.

VIBRATION ATTENUATION
Consideration must be given to vibration of floor framing systems caused by mechanical and electrical equipment such as pumps, chillers, fans, emergency generators, and transformers and other sources such as foot traffic, and movement of heavy equipment. Many animals are extremely sensitive to vibration, and it can produce detrimental effects on research. Every effort must be taken to control vibration and to locate vibration sources away from animals and activities sensitive to vibration. The following considerations should be made during the design phase:

- Vivarium spaces should be located away from sources of vibration.
- Vivarium spaces should be located on grade-supported slabs. This not only helps with vibration attenuation, but also pits required for cage and rack washing equipment are more easily accommodated and the risk of water leakage to lower levels is eliminated.

HVAC
The Bioengineering Building Vivarium HVAC systems shall be designed to the requirements published in *The Guide for the Care and Use of Laboratory Animals*. Temperature, humidity, and air-change rate shall be carefully controlled and monitored on a continuous basis. Systems shall have adequate ventilation capacity to control fumes, odors, and airborne contaminants and offset the heat load of lab animals. The HVAC system must be 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.

The HVAC systems for the Vivarium shall be independent from other Bioengineering Building HVAC systems. These systems must maintain a safe and comfortable environment for animals, be adaptable, and be capable of maintaining environmental conditions in any of the holding rooms for any of the species anticipated to be housed in the facility. The HVAC system shall be designed to provide backup in the event of component failure. The central HVAC systems shall be provided with multiple chillers, pumps, cooling towers, etc., to improve reliability. Recirculation of air in the Vivarium is prohibited.

The Vivarium will require special attention to air quality, acoustics, airflow quantities, diffusion characteristics, means of delivery, delivery temperature, air velocity, and air distribution. Distribution should prevent cross contamination between individual spaces; air shall flow from areas of least to areas of higher contamination potential, i.e., from “clean” to “dirty” areas. Air supply terminals may be located at the ceiling level or close to ceiling level if located on sidewalls. Exhaust should be located near the floor level. It is preferable to have several exhaust points in animal rooms. Air distribution and diffusion devices shall be selected to minimize temperature differentials in the space.

The Vivarium must be protected against contamination from outside sources, including particulates brought in from the outside in the HVAC airstream. Generally, the Vivarium must remain at a negative air pressure relative to the clean corridors and other nonvivarium spaces, but positive with respect to the outside environment. Relative pressure inside the Vivarium is a series of complex relationships. Some of these relationships may change as research and animal populations change. The HVAC system must be capable of maintaining these relationships, and capable of adapting as needs change.

Clean areas, including the clean side of the cage and rack wash, the clean corridor, and bedding dispensing, diet, and preparation areas must be positive relative to animal holding areas or soiled areas. Animal housing areas are generally negative to clean areas and positive relative to service corridors and soiled areas. The HVAC system must be adaptable so that pressure relationships can be modified as required over the life of the building.

PLUMBING

The plumbing systems in the Vivarium include wash systems, waste drainage systems, and animal drinking water systems. The design of these plumbing systems shall minimize the potential for accumulating dirt and providing pest harborage and access to animal care areas. All pipes, mounting brackets, and supports shall be caulked and sealed during installation. The following criteria should be considered in the plumbing system design:

- Minimize exposed piping inside animal rooms
- Install piping with standoff support to aid in proper cleaning
- Avoid insulation of pipes
- Minimize pipe penetrations, with any penetrations carefully sealed
- Use piping materials that do not use toxic releasing compounds during manufacturing
- Carefully evaluate drainage design so as to prevent clogged drains

Large quantities of liquid waste leave the Vivarium through the sewer systems. The system must be adequately sized, particularly if it is mixed with feces and bedding. Although there will be a waste disposal system that will remove bedding and waste separate from the plumbing drain system, there will still be residual bedding waste introduced into the building waste stream. A six inch waste line is recommended for drains located in washing areas.

ELECTRICAL

The conduits in the Vivarium shall be concealed. Surface mounted conduits in wash down areas shall be Intermediate Metallic Conduit (IMC) or rigid galvanized steel with threaded couplings. Conduits shall be sealed with conduit sealer such as Duxseal at each device/junction box. Surface metal boxes shall be cast metal. Conduits entering or leaving device boxes, junction boxes, pull boxes, etc., shall be sealed at each box with a nonhardening sealant such as Duxseal. Surface metal raceway with snap-on covers shall not be used in the Vivarium due to the requirements for wash down cleaning.

The following loads are required to have stand-by power:

- Animal ventilation fans
- Ventilated cage racks
- CCTV cameras and equipment
- Security system
- Switch controlled minimal lighting in animal holding rooms

ABSL3- ANIMAL BIOSAFETY LEVEL 3

The Bioengineering Building Vivarium includes an Animal Biosafety Level 3 suite that will provide containment of airborne pathogens. Earlier design schemes of the Bioengineering Building included a BSL3 suite on one of the upper research lab floors. This suite has now been relocated to be included as part of the Vivarium proper, and is now an Animal Biosafety Level 3 suite. The term “containment” is used to describe the methods for managing biological agents in the laboratory. Containment is intended to reduce or eliminate exposure to laboratory workers, individuals not in the immediate work area, and the surrounding environment. Each vivarium workspace must conduct a risk assessment of the work to be done to determine the appropriate level of containment. Primary Containment is the protection of personnel and the immediate laboratory environment from exposure to biological agents. It will contain the agent at the source. It is provided by the use of:

- standard microbiological practices/techniques
- appropriate safety equipment

Secondary Containment is the protection of the environment external to the laboratory from exposures to biological agents. It is achieved through a combination of:

- standard microbiological practices/techniques
- facility design

Biosafety Levels 1-4 were developed by the CDC and NIH and are intended to help control infectious agents that may cause disease in healthy human adults. They are not usually appropriate for the control of other hazards. Each level specifies a combination of facilities, equipment, and microbiological practices to use in handling etiologic agents. The combination of elements is based upon the operations performed:

- documented or suspected routes of transmission of the agent
- laboratory function or activity

The Bioengineering Building Vivarium biosafety suite is programmed and shall be designed to the requirements of an ABSL3 laboratory (as described in the CDC/NIH Biosafety in Microbiological and Biomedical Laboratories, 5th edition) and are used for labs requiring a higher level of containment. The critical features of the ABSL3 design are:

- Lab is separated from areas that are open to unrestricted traffic flow within the building.
- Access to lab is through two sets of lockable doors from corridors and other contiguous areas.
- Interior surfaces of walls, floors, and ceilings are water-resistant so they may be easily cleaned. Penetrations in these surfaces are sealed or capable of being sealed to facilitate decontamination. Floors should be monolithic and slip-resistant.
- Bench tops are impervious to water and resistant to acids, alkalis, organic solvents, and moderate heat.
- Laboratory furniture is sturdy, and spaces between benches, cabinets, and equipment are accessible for cleaning.
- Chairs and other furniture should be covered with a non-fabric material that can be easily decontaminated.
- A foot, elbow, or automatically operated sink for hand washing is contained in the lab.
- An autoclave for decontaminating waste is available, preferably within the lab.
- A ducted exhaust air ventilation system is provided which creates directional airflow. Exhaust air is not recirculated to any other area, is discharged to the outside, and is dispersed away from occupied areas and air intakes.
- Exhaust air can be discharged to the outside without being filtered or treated.
- Biological safety cabinets are required and are located away from doors, from room supply louvers, and from heavily-traveled lab areas.
- HEPA-filtered exhaust air from BSCs is discharged directly to the outside or through the building exhaust system.
- HEPA-filtered exhaust air from Class I or Class II BSCs is connected and discharged as not to cause any interference with the air balance of the cabinets or exhaust system. Vacuum lines are protected with liquid disinfectant traps and HEPA filters. Continuous-flow centrifuges or other equipment that may produce aerosols are contained in devices that exhaust air through HEPA filters before it is discharged into the lab.
- An eyewash facility is readily available inside the lab.
- Illumination is adequate for all activities, avoiding reflections and glare that could impede vision.

Additional components which were discussed but are not currently included in the proposed program, include:

- A clothes change room
- A personnel shower
- Windows are not desirable. If provided, windows would be closed and sealed.

HEALTH AND SAFETY

The animal holding areas have been designed with employee movement requirements in mind. Specifications for vivarium equipment should include a requirement that sharp edges and other protuberances that may cause injury to either personnel or animals should be avoided.

Due to the frequent washing down of surfaces, floor areas shall be slightly sloped in the immediate area around the floor drains to reduce pooling of water and the probability of slips and falls.

All electrical systems and apparatus shall be connected to a ground fault circuit interrupter (GFCI) to prevent electrical shock.

Eyewash and safety showers will be provided in areas of the Vivarium where hazardous chemicals and cleaners are used, eyewash stations should be available within 55 feet of the location of chemical use.

Waste storage shall be located on the “dirty” side of the facility. This area must be sufficiently large for the storage of waste materials generated in the facility. This location should be near exit doors and should provide sufficient room to facilitate movement of waste containers/carts in a sage manner, with minimal ergonomic stress.

SUSTAINABILITY DESIGN PRINCIPLES

The University of California, Santa Barbara and the University of California have a campus and system wide commitment to sustainable design that can be found at the following address: http://sustainability.ucsb.edu/plan/.

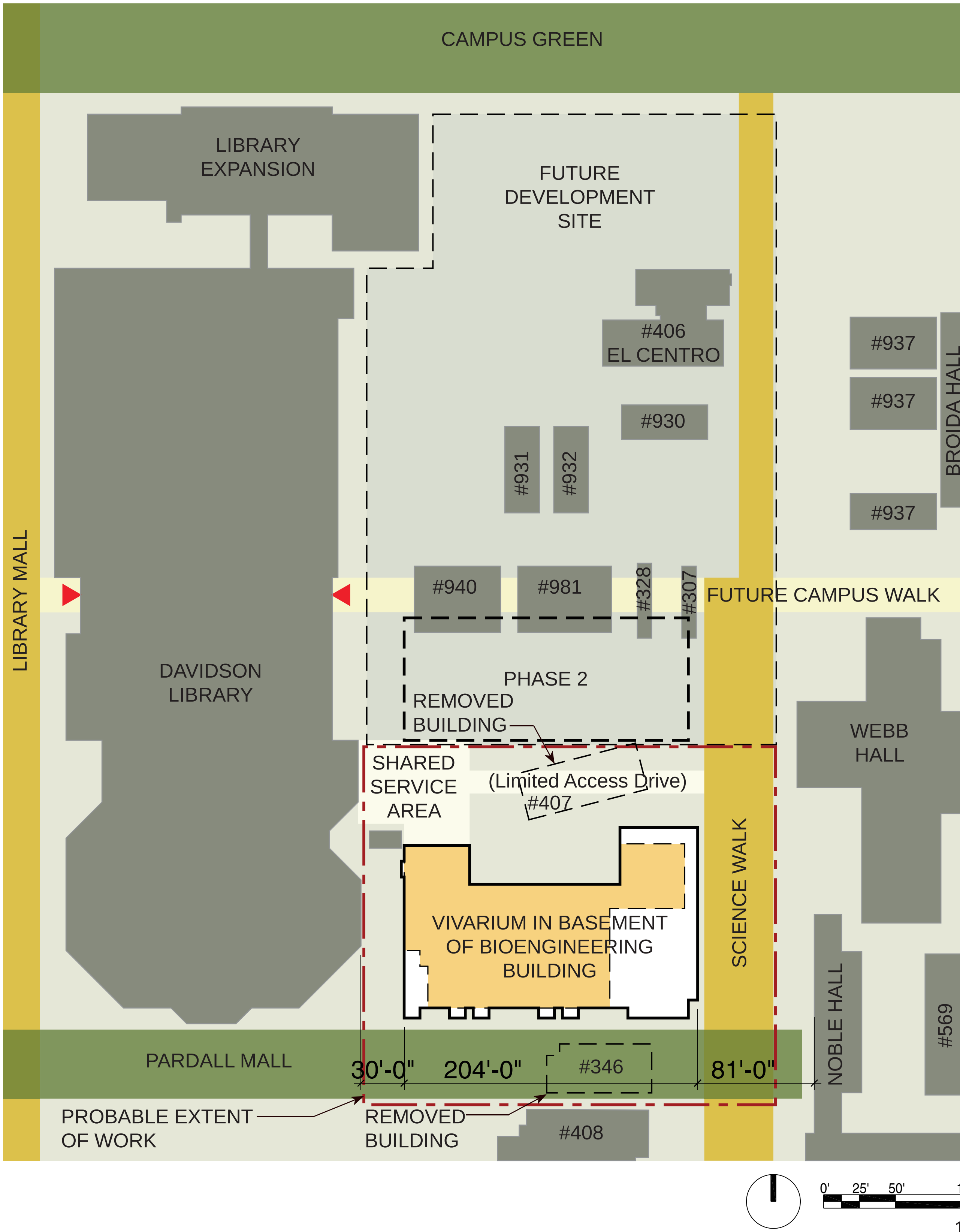
The proposed vivarium facility, developed as a portion of the new Bioengineering Building, is to achieve a minimum of a LEED (Leadership in Environmental and Energy Design) Silver Certification. Overall strategies include the reduction of energy use, the wise use of water resources and the use of local, recycled or recyclable materials wherever possible. Specific strategies and approaches being developed include but are not limited to:

- Use of energy efficient equipment
- Use of run-around heat extraction coil on vivarium exhaust – used to pre-heat outside air intake
- Use of frictionless water cooled chiller with variable frequency drives (energy reduction equipment)
- Increased size of air handling units and ductwork dimensions to reduce initial and delivery pressure drops (energy reduction strategy)
- Water efficient cage washer
- Water-less urinals

PART II - VIVARIUM
SITE DESCRIPTION
2.0.0

The Site Diagram on the following page is intended to illustrate the location of the Vivarium with respect to the Bioengineering Building, as well as the Vivarium's relationship to the adjacent service access.

SITE PLAN


CAMPUS GREEN
LIBRARY EXPANSION
FUTURE DEVELOPMENT SITE
#406 EL CENTRO
#937
#937
#937
BROIDA HALL
#930
#931
#932
LIBRARY MALL
#940
#981
#328
#307
FUTURE CAMPUS WALK
DAVIDSON LIBRARY
PHASE 2
REMOVED BUILDING
WEBB HALL
SHARED SERVICE AREA
(Limited Access Drive)
#407
VIVARIUM IN BASEMENT OF BIOENGINEERING BUILDING
SCIENCE WALK
NOBLE HALL
#569
PARDALL MALL
30'-0"
204'-0"
#346
81'-0"
PROBABLE EXTENT OF WORK
REMOVED BUILDING
#408
0'
25'
50'
100'

PART II - VIVARIUM

SPACE SUMMARY

3.0.0

Gross Vivarium Area 15,960 gsf (gross square feet)

assumes 55% efficiency

gross area includes corridors, stairways, elevator shafts, main mechanical and electrical rooms, mechanical shafts, and other non-assigned spaces.

bedding disposal equipment room

steam generator room

dedicated vivarium dumpster

dedicated loading dock area

Net Vivarium Area 8,778 asf (assignable square feet)

Animal Holding Rooms	**4630 asf**
Vivarium Support	**3622 asf**
Vivarium offices	**527 asf**

Cage Capacity at Full Build-Out: **8,960**

Cage Capacity at Partial Build-Out: **5,300**

See Opinion of Probable Cost, Part III, Section 2.0.0

Animal Holding Rooms 4630 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Holding Rooms - Large (1800) cages per room **(3600) subtotal cages**	22'x22'	21.5' x 21.5'	**2**	x	**462**	=	**925**
Holding Rooms - Small (740) cages per room **(2960) subtotal cages**	11'x22'	10.5' x 21.5'	**4**	x	**226**	=	**903**
Behavior Rooms (100) cages per room **(200) subtotal cages**	11'x22'	10.5' x 21.5'	**2**	x	**226**	=	**452**
Quarantine Room holding for non-certified animals (200) cages per room **(200) subtotal cages**	14'x15.5'	13.5' x 15'	**1**	x	**203**	=	**203**
Quarantine Vestibule anteroom to Quarantine	14'x6.5'	13.5' x 6'	**1**	x	**81**	=	**81**
Receiving Room temporary holding for certified animals	11'x11'	10.5' x 10.5'	**1**	x	**110**	=	**110**
Procedure/Holding Rooms (300) cages per room **(1200) subtotal cages**	11'x22'	10.5' x 21.5'	**4**	x	**226**	=	**903**
ABSL3 Suite (800) cages **(800) subtotal cages**	49.5'x22'	49' x 21.5'	**1**	x	**1054**	=	**1054**

Vivarium Support 3622 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Dirty Cage Wash Cage Rack Washer, future tunnel washer Bulk Autoclave, bedding disposal system	33' x 33'	32.5' x 32.5'	1	x	1056	=	1056
Chem Store storage of chemicals for cage washing	11' x 5.5'	10.5' x 5'	1	x	53	=	53
Clean Cage Wash bedding dispenser	22' x 33'	21.5' x 32.5'	1	x	699	=	699
Clean Cage Store	22' x 22'	21.5' x 21.5'	1	x	462	=	462
Feed/Bed Store	11' x 22'	10.5' x 21.5'	1	x	226	=	226
Necropsy	11' x 14'	10.5' x 13.5'	1	x	142	=	142
Irradiation Room	11' x 11'	10.5' x 10.5'	1	x	110	=	110
Barrier Locker/Shower/Toilet	16' x 16'	15.5' x 15.5'	2	x	240	=	481
Unisex Toilet	8' x 11'	7.5' x 10.5'	1	x	79	=	79
Cold Store	8' x 11'	7.5' x 10.5'	1	x	79	=	79
Janitor	8' x 11'	7.5' x 10.5'	2	x	79	=	158
	8' x 11'	7.5' x 10.5'	1	x	79	=	79

Vivarium offices 527 asf

	Planning Module (centerline of wall)	Clear Dimension (face of wall)	Quantity		Clear Area (face of wall)		Assignable Area
Vivarium Offices	11' x 11'	10.5' x 10.5'	**2**	x	**110**	=	**221**
Break Room	18' x 18'	17.5' x 17.5'	**1**	x	**306**	=	**306**

VIVARIUM SPACE (ASF)	PROGRAM AREAS				NOTES
	NUMBER	EACH	AREA	TOTAL SF	NOTES
ANIMAL HOLDING ROOMS				4,518	
Holding Rooms - Large	2	460	920		22' x 22'
Holding Rooms - Small	4	226	904		11' x 22'
Behavior Rooms	2	226	452		11' x 22'
Quarantine Room	1	203	203		14' x 15.5'
Quarantine Vestibule	1	81	81		14' x 6.5'
Procedure Rooms	4	226	904		11' x 22'
ABSL3 Suite	1	1,054	1,054		22' x 49.5'
VIVARIUM SUPPORT LABS				3,734	
Dirty Cage Wash	1	1,055	1,055		33' x 33'
Chemical Store	1	53	53		5.5' x 11'
Clean Cage Wash	1	699	699		22' x 33'
Clean Cage Store	1	462	462		22' x 22'
Feed/Bed Store	1	226	226		11' x 22'
Necropsy	1	142	142		11' x 14'
Irradiation Room	1	110	110		11' x 11'
Janitor	2	79	158		8' x 11'
Janitor	1	79	79		8' x 11'
Receiving Room	1	110	110		11' x 11'
Cold Store	1	80	80		possibly be located within loading
Barrier Locker/Shower/Toilet	2	240	480		16' x 16'
Non-Barrier Toilet	1	80	80		8' x 11'
OFFICES				525	
Staff/Vivarium Manager Office	2	110	220		11' x 11'
Break Room	1	305	305		18' x 18'
TOTAL VIVARIUM ASF				**8,777**	

NON-ASSIGNABLE VIVARIUM	PROGRAM AREAS				NOTES
	NUMBER	EACH	AREA	TOTAL SF	NOTES
VIVARIUM MECHANICAL				2,520	
Vivarium AHU	1	2,015	2,015		
Vivarium Electircal Room	1	185	185		
Vivarium Elevator Machine Room	1	100	100		
Steam Generator Room	1	110	110		
Bedding Disposal Equip Room	1	110	110		
BUILDING SUPPORT				450	
Vivarium Elevator	1	100	100		
Vivarium Dumpster Area	1	100	100		
Vivarium Loading Dock/Area	1	250	250		
MISC GSF				4,240	
Circulation, Walls, MEP, etc.			4,240		confirm per bldg. layout
NON-ASSIGNABLE SPACE				**7,210**	

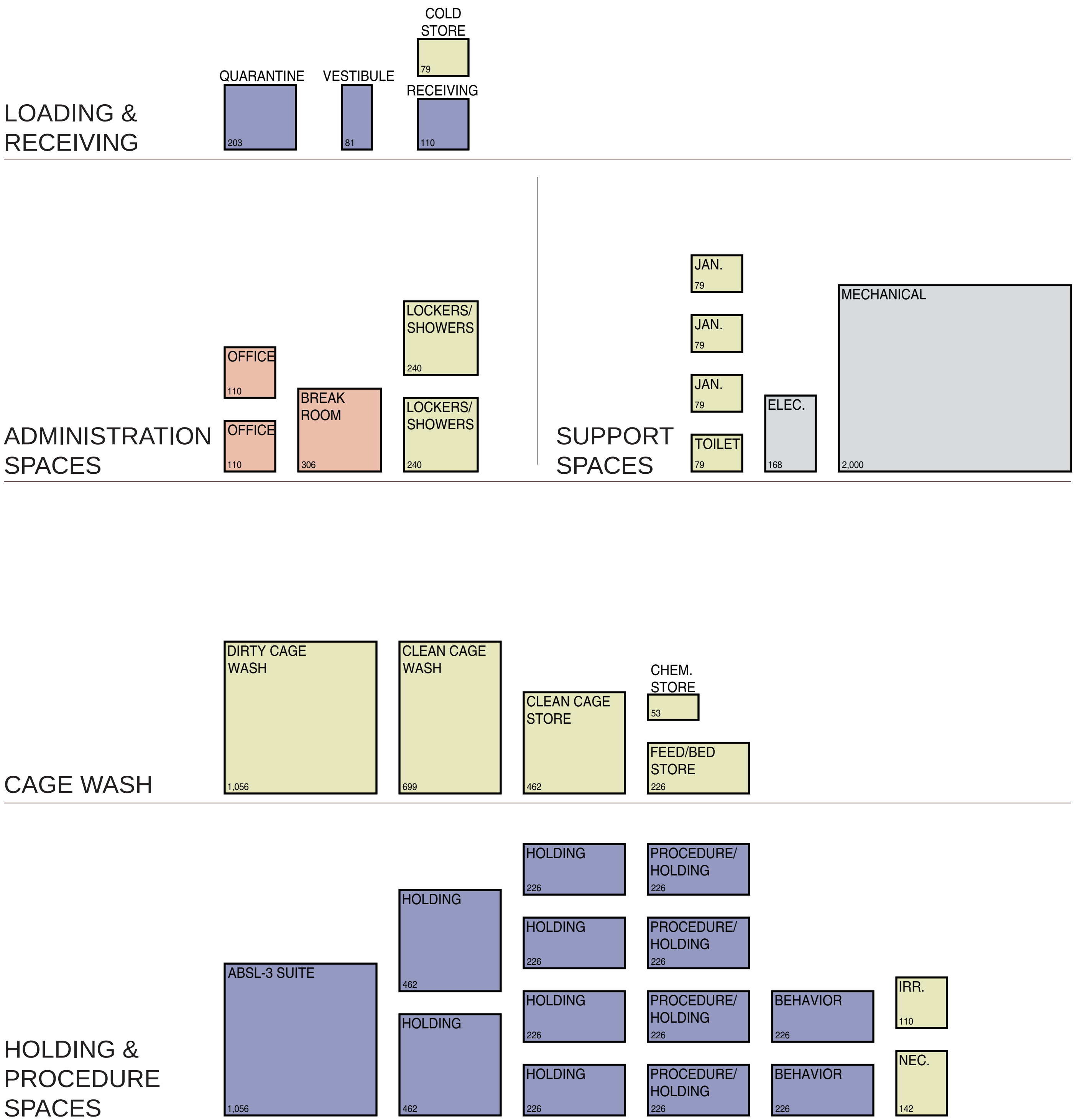
TOTAL VIVARIUM AREA (GSF)	**15,987**
ASF/GSF	**55%**

PART II - VIVARIUM

PROGRAM ANALYSIS

4.0.0

The following is a graphic analysis of the program areas listed in Section 3.0.0. This diagram is organized by program type and illustrates every room to be included in the Vivarium. It explains the basic sizes and quantities of spaces and possible relationships with each other.


LOADING & RECEIVING
QUARANTINE
203
VESTIBULE
81
COLD STORE
79
RECEIVING
110
ADMINISTRATION SPACES
OFFICE
110
OFFICE
110
BREAK ROOM
306
LOCKERS/ SHOWERS
240
LOCKERS/ SHOWERS
240
SUPPORT SPACES
JAN.
79
JAN.
79
JAN.
79
TOILET
79
ELEC.
168
MECHANICAL
2,000
CAGE WASH
DIRTY CAGE WASH
1,056
CLEAN CAGE WASH
699
CLEAN CAGE STORE
462
CHEM. STORE
53
FEED/BED STORE
226
HOLDING & PROCEDURE SPACES
ABSL-3 SUITE
1,056
HOLDING
462
HOLDING
462
HOLDING
226
HOLDING
226
HOLDING
226
HOLDING
226
PROCEDURE/ HOLDING
226
PROCEDURE/ HOLDING
226
PROCEDURE/ HOLDING
226
PROCEDURE/ HOLDING
226
BEHAVIOR
226
BEHAVIOR
226
IRR.
110
NEC.
142

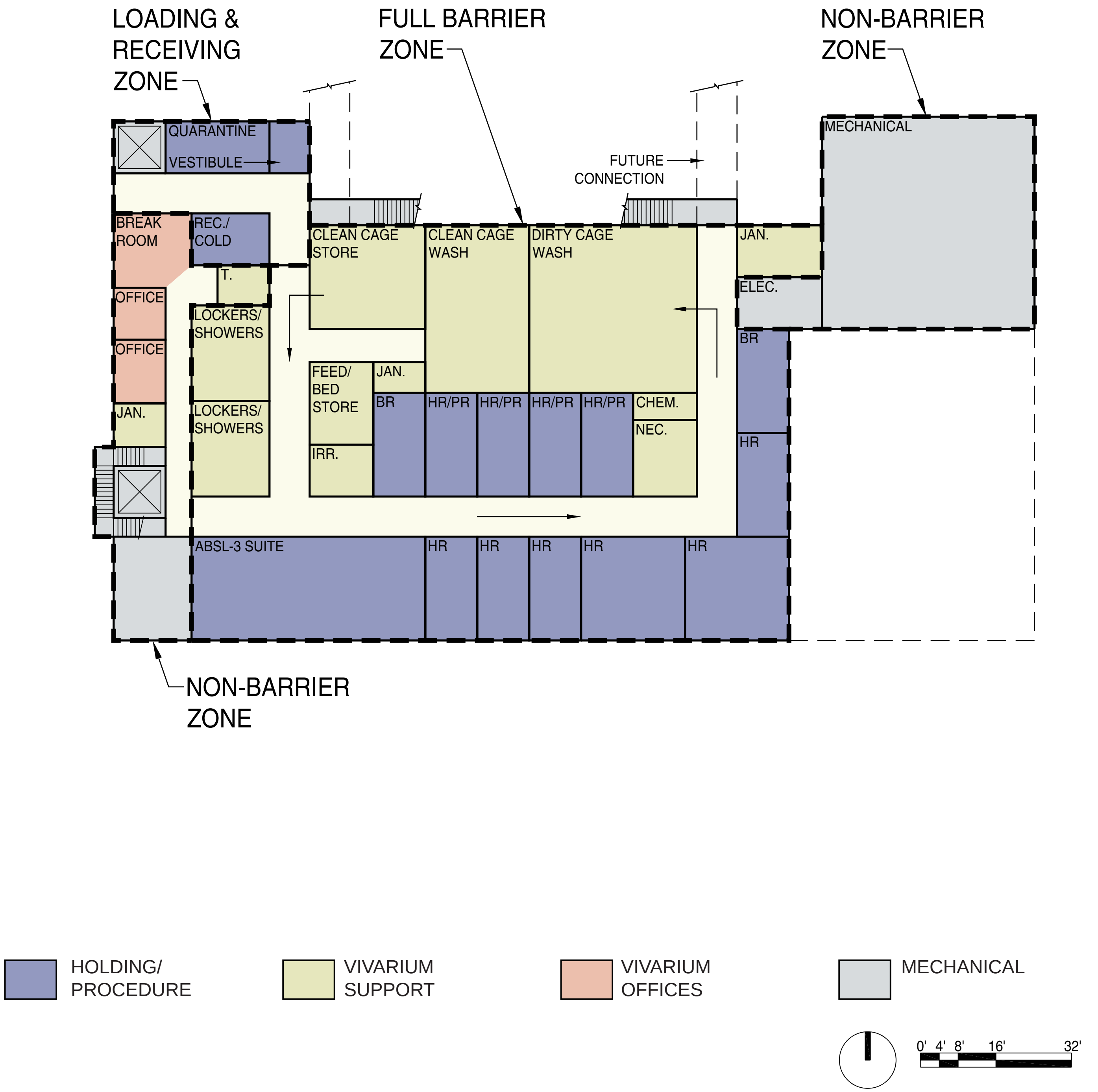
PART II - VIVARIUM

FUNCTIONAL REQUIREMENTS

5.0.0

The Adjacency Diagram on the following page does not represent a vivarium design. Rather, it begins to demonstrate a thoughtful organization of the Space Program based on adjacencies, user groups, building efficiency, site and cost.

ADJACENCY DIAGRAM

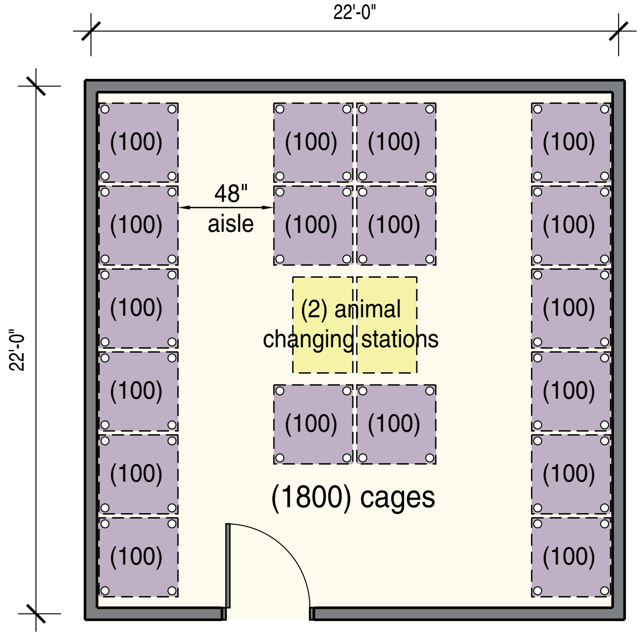


PART II - VIVARIUM

ROOM DATA SHEETS

6.0.0

LARGE HOLDING ROOM



(18) Rotary cage racks

ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to other holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Door: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: Positive or negative to corridor depending upon use
- (3) VAV valves- (1) for room exhaust; (1) for cage rack exhaust; (1) for room supply air
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- BMS Environmental monitoring controls
- Sound attenuation in ductwork

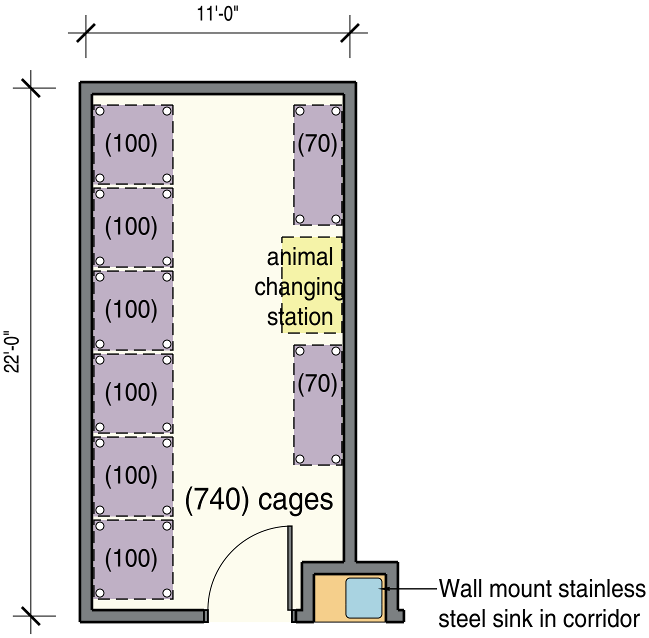
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

PLUMBING
- Automatic cage watering system

CONTRACTOR FURNISHED EQUIPMENT
- None

UCSB FURNISHED EQUIPMENT
- Cage racks (include supply fan unit at wall)
- Animal changing station

SMALL HOLDING ROOM



ARCHITECTURAL

- Occupancy: B
- Adjacency: adjacent to other holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Door: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less

STRUCTURAL

- Concrete slab on grade

MECHANICAL

- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: Positive or negative to corridor depending upon use
- (3) VAV valves- (1) for room exhaust; (1) for cage rack exhaust; (1) for room supply air
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- BMS Environmental monitoring controls
- Sound attenuation in ductwork

ELECTRICAL

- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

PLUMBING

- Automatic cage watering system
- Hot/cold water at sink located in corridor- total of two sinks in corridor

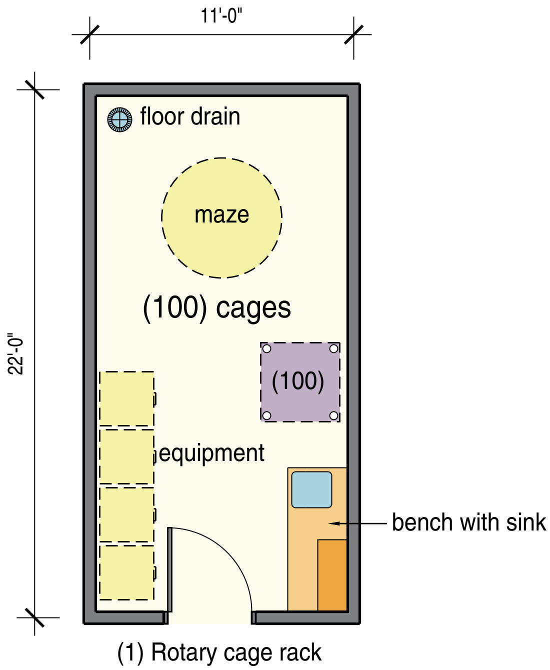
CONTRACTOR FURNISHED EQUIPMENT

- None

UCSB FURNISHED EQUIPMENT

- Cage racks (include supply fan unit at wall)
- Animal changing station

BEHAVIOR ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to other holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Door: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: Negative to corridor depending upon use
- (3) VAV valves- (1) for room exhaust; (1) for cage rack exhaust; (1) for room supply air
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- BMS Environmental monitoring controls
- Sound attenuation in ductwork

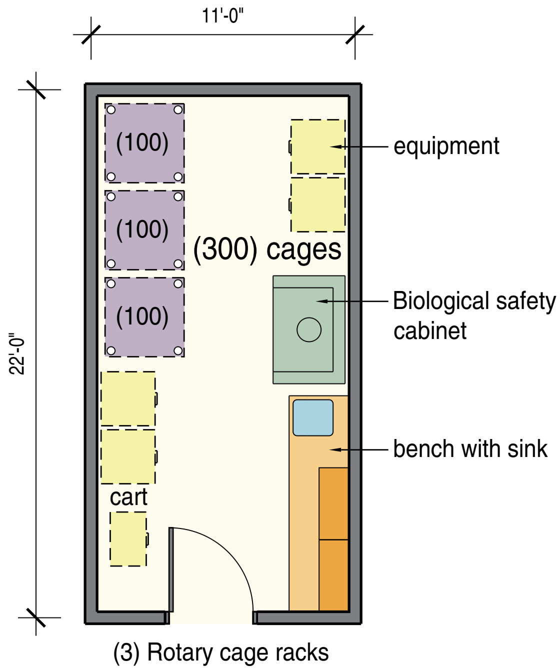
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

PLUMBING
- Hot/cold water at sink
- Floor drain
- Hot/cold water hose bib at maze

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel casework and sink

UCSB FURNISHED EQUIPMENT
- Cage rack (include supply fan unit at each rack)
- Testing maze equipment
- Scientific equipment

PROCEDURE/ HOLDING ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to other holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Door: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less
- Backing in walls for future wall cabinets/shelves

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: Negative to corridor
- (3) VAV valves- (1) for room exhaust; (1) for cage rack exhaust; (1) for room supply air
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- BMS Environmental monitoring controls
- Sound attenuation in ductwork

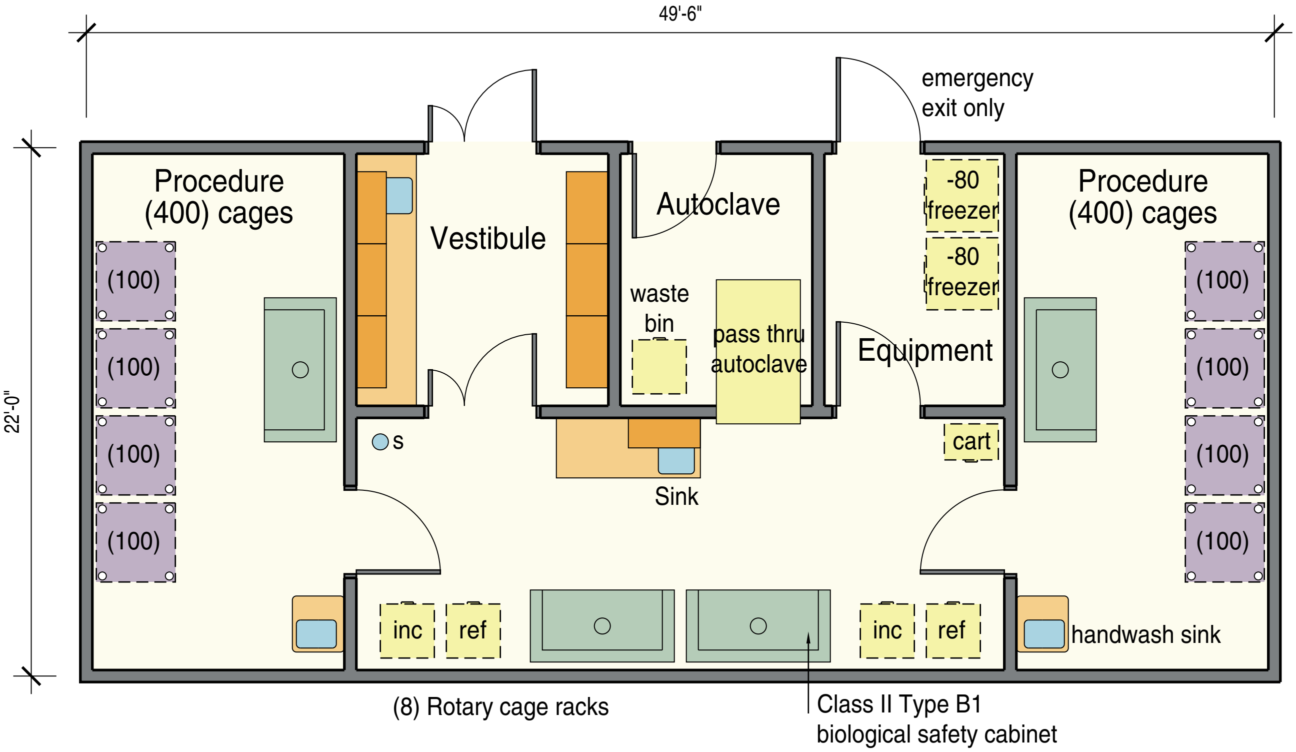
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

PLUMBING
- Domestic Hot/cold water at sink with vacuum breaker
- RO/DI pure water at sink (Type II- 1 meg ohm)
- O_2 with local cylinder
- Vacuum
- Drench hose at sink

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel casework and sink
- Mobile stainless steel cabinets below stainless steel work surface
- Biological safety cabinet- Class II Type B1 (100% exhaust) with thimble connection

UCSB FURNISHED EQUIPMENT
- Cage racks (include supply fan unit at each rack)
- cart

ABSL-3 SUITE



Architectural
- Occupancy: B
- Adjacency: None
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Doors: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less
- All wall, ceiling, and floor penetrations sealed

Structural
- Concrete slab on grade

Mechanical
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- VAV exhaust valve at each cage rack above ceiling
- Environmental monitoring controls
- Dedicated exhaust air
- Sound attenuation in ductwork

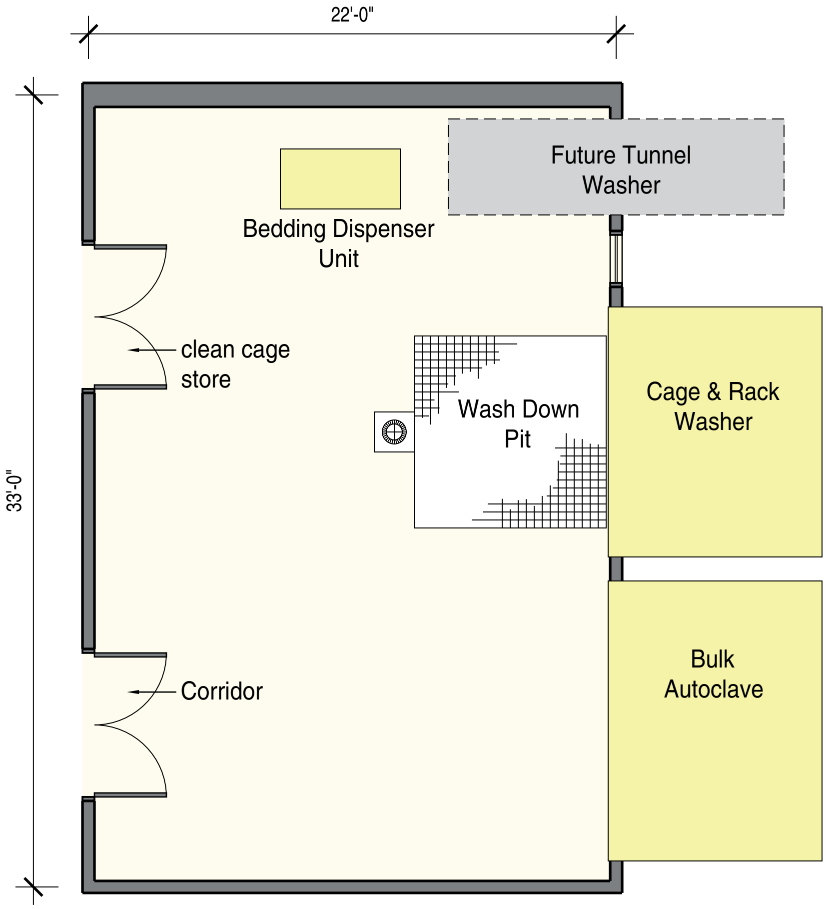
Electrical
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

Plumbing
- Potable hot/cold water
- RO/DI pure water (Type II- 1 meg ohm)
- Vacuum

Contractor Furnished Equipment
- Stainless steel casework
- Stainless steel sinks
- 24x36x48 pass thru autoclave
- Biological safety cabinets (100% exhaust)

UCSB Furnished Equipment
- Refrigerators
- Incubators

CLEAN CAGE WASH



ARCHITECTURAL

- Occupancy: B
- Adjacency: adjacent to clean cage wash
- Floor: troweled on epoxy with coved base
- Walls: fiberglass over concrete backer board
- Ceiling: 9' waterproof gypsum board with epoxy paint
- Doors: 3^0x8^0 pair with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL

- Concrete slab on grade
- Recessed pit at autoclave, cage rack washer

MECHANICAL

- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-50% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 12 air changes per hour- air change rate may be higher due to equipment heat gain

ELECTRICAL

- 480v60a3ph
- 208v30a3ph
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING

- Potable hot/cold water
- RO/DI pure water (Type II- 1 meg ohm)
- Steam
- Drain at wash down pit, autoclave, and tunnel washer

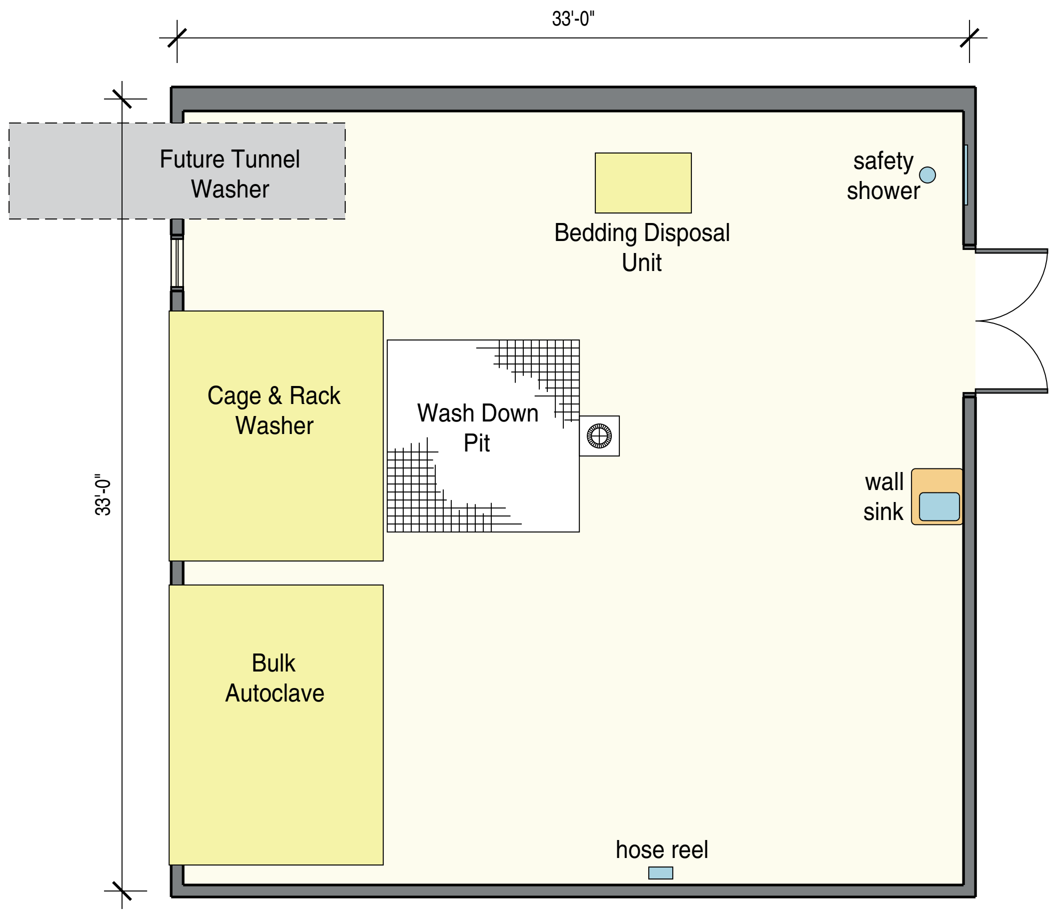
CONTRACTOR FURNISHED EQUIPMENT

- Bedding dispenser unit
- Bulk autoclave
- Cage rack washer
- Future tunnel washer

UCSB FURNISHED EQUIPMENT

- Cage racks and cages

DIRTY CAGE WASH



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to clean cage wash
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' waterproof gypsum board with epoxy paint
- Doors: 3^0x8^0 pair with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL
- Concrete slab on grade
- Recessed pit at autoclave, cage rack washer

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-50% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 12 air changes per hour- air change rate may be higher due to equipment heat gain

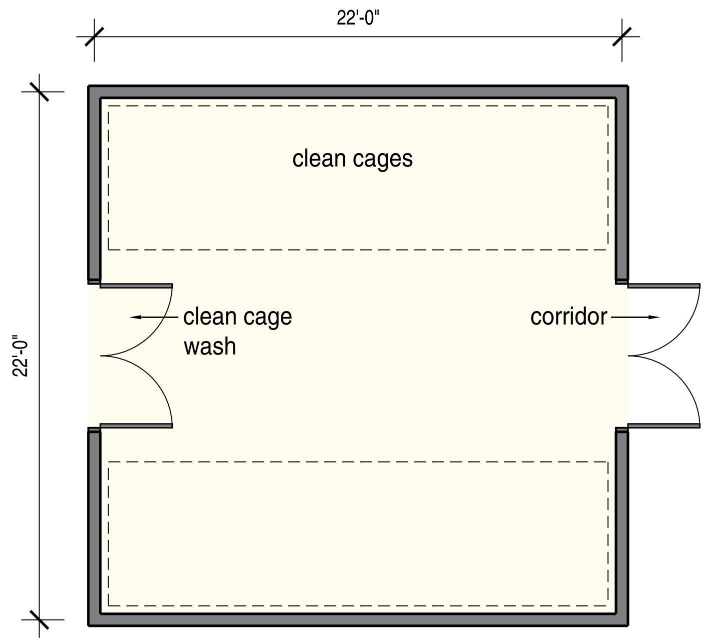
ELECTRICAL
- 480v60a3ph
- 208v30a3ph
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- Potable hot/cold water
- RO/DI pure water (Type II- 1 meg ohm)
- Steam
- Drain at wash down pit, autoclave, and tunnel washer

CONTRACTOR FURNISHED EQUIPMENT
- Bedding disposal system
- Bulk autoclave
- Cage rack washer
- Future tunnel washer

UCSB FURNISHED EQUIPMENT
- Cage racks and cages

CLEAN CAGE STORAGE ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to clean cage wash
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^0x8^0 pair with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: positive to clean cage wash and corridor
- Minimum of 6 air changes per hour

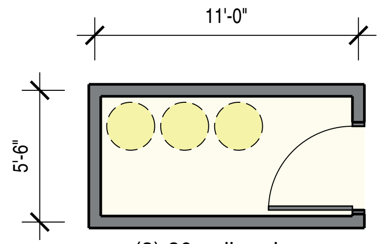
ELECTRICAL
- 110v20a
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- None

CONTRACTOR FURNISHED EQUIPMENT
- None

UCSB FURNISHED EQUIPMENT
- Cage racks and cages

CHEMICAL STORAGE ROOM



(3) 30 gallon drums

ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to dirty cage wash
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^6x8^0 with view window

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 6 air changes per hour

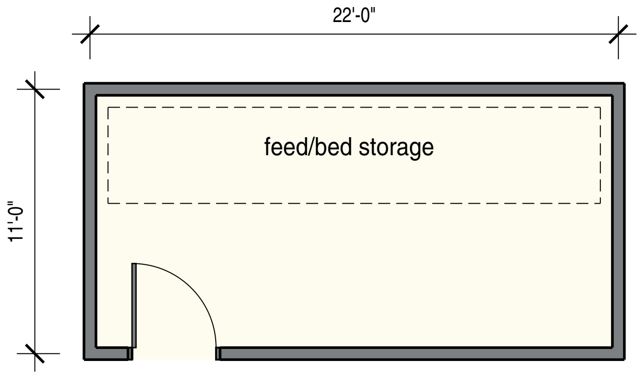
ELECTRICAL
- 110v20a
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- None

CONTRACTOR FURNISHED EQUIPMENT
- None

UCSB FURNISHED EQUIPMENT
- Chemical storage drums

FEED/BEDDING STORAGE ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to dirty cage wash
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^6x8^0 with view window

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 6 air changes per hour

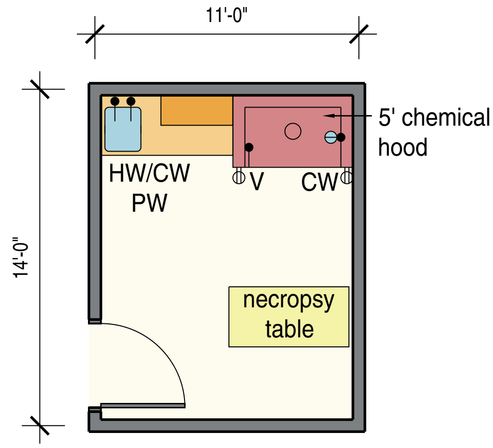
ELECTRICAL
- 110v20a
- Wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- None

CONTRACTOR FURNISHED EQUIPMENT
- None

UCSB FURNISHED EQUIPMENT
- Feed/Bed palettes

NECROPSY ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^6x8^0 with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 12 air changes per hour

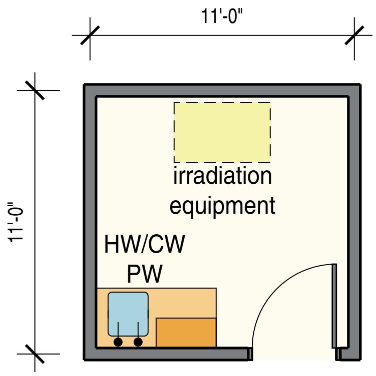
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- Potable hot/cold water
- RO/DI pure water (Type II- 1 meg ohm)

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel casework
- Stainless steel sink
- 5' chemical fume hood
- Necropsy table

UCSB FURNISHED EQUIPMENT
- Scientific equipment

IRRADIATION ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^6x8^0 with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 6 air changes per hour

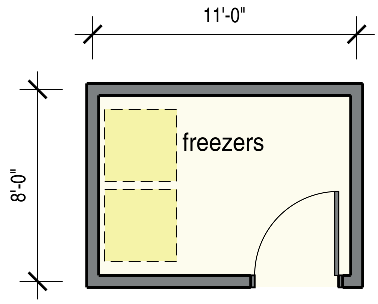
ELECTRICAL
- 208v30a3ph
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- Potable hot/cold water
- RO/DI pure water (Type II- 1 meg ohm)

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel casework
- Stainless steel sink

UCSB FURNISHED EQUIPMENT
- Irradiation equipment

COLD STORAGE ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant waterproof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^6x8^0 with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 6 air changes per hour

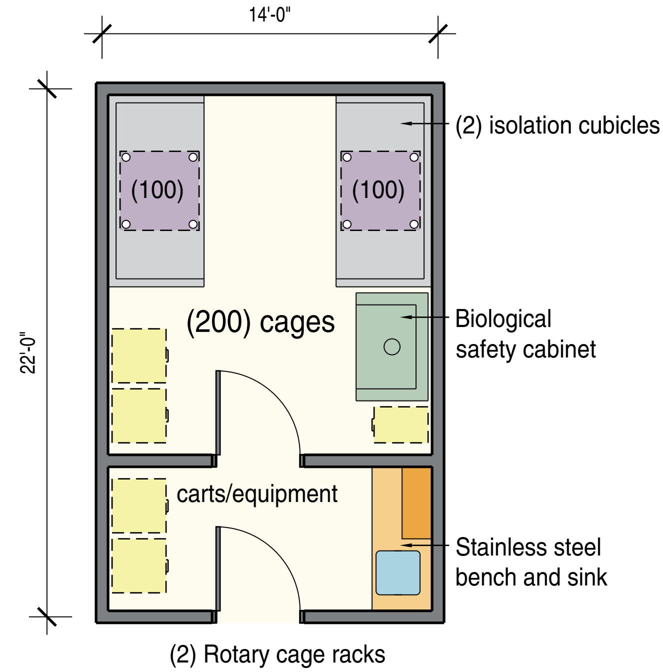
ELECTRICAL
- 110v20a
- Standby power
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- None

CONTRACTOR FURNISHED EQUIPMENT
- None

UCSB FURNISHED EQUIPMENT
- -20 deg. C Freezers

QUARANTINE ROOM



Architectural
- Occupancy: B
- Adjacency: adjacent to other holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Door: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less

Structural
- Concrete slab on grade

Mechanical
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: Negative to corridor
- (3) VAV valves- (1) for room exhaust; (1) for cage rack exhaust; (1) for room supply air
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- BMS Environmental monitoring controls
- Sound attenuation in ductwork

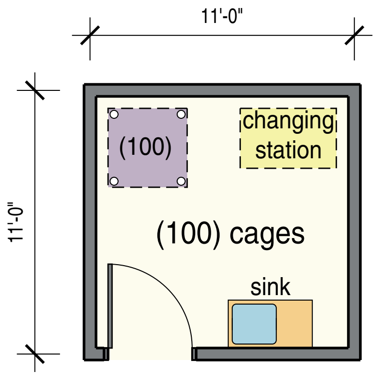
Electrical
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

Plumbing
- Hot/cold water at sink

Contractor Furnished Equipment
- Stainless steel casework and sink
- Isolation cubicle
- Biological safety cabinet- Class II Type B1 (100% exhaust) with thimble connection

UCSB Furnished Equipment
- Cage racks
- Carts
- Miscellaneous equipment

RECEIVING ROOM



(1) Rotary cage rack

ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to Quarantine Room
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint, fiberglass batt sound attenuation
- Door: 3^6x8^0 with red glass view window
- Sound Attenuation: NC 35 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: Positive or negative to corridor depending upon use
- (3) VAV valves- (1) for room exhaust; (1) for cage rack exhaust; (1) for room supply air
- Minimum of 6 air changes per hour- air change rate may be higher due to equipment heat gain
- BMS Environmental monitoring controls
- Sound attenuation in ductwork

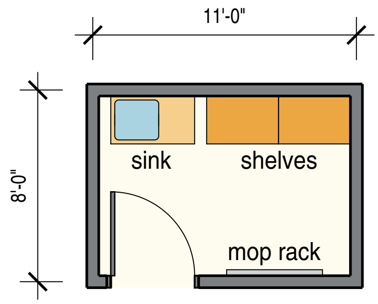
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.
- Circadian lighting controls- two levels, 30 f.c. unoccupied with manual switch for 75 f.c.; white light for day, red light for night

PLUMBING
- Automatic cage watering system
- Hot/cold water at sink

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel sink

UCSB FURNISHED EQUIPMENT
- Cage racks (include supply fan unit at each rack)
- Animal changing station

JANITOR'S CLOSET



ARCHITECTURAL
- Occupancy: B
- Adjacency: adjacent to holding rooms
- Floor: troweled on epoxy with coved base
- Walls: impact resistant water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Door: 3^6x8^0 with view window
- Sound Attenuation: NC 45 or less

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 6 air changes per hour

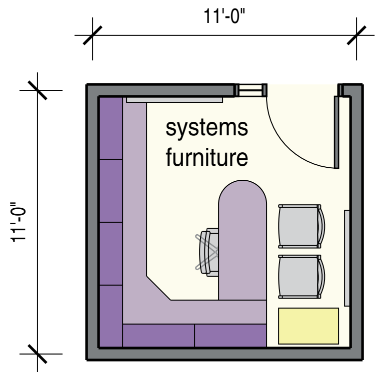
ELECTRICAL
- 110v20a
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- Potable hot/cold water

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel sink
- Mop rack
- Storage shelves

UCSB FURNISHED EQUIPMENT
- Cleaning equipment

VIVARIUM OFFICE



ARCHITECTURAL
- Occupancy: B
- Adjacency: Near break room
- Floor: rubber tile and base
- Walls: gypsum board with enamel paint
- Ceiling: 9' gypsum board with enamel paint
  Door: 3^0x8^0 with view window

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F
- Pressure: positive to corridor
- Humidity: ambient
- 100% exhaust
- Minimum of 4 air changes per

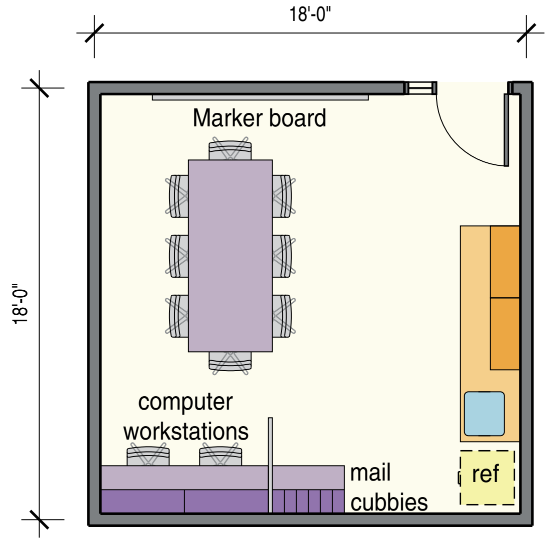
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- None

CONTRACTOR FURNISHED EQUIPMENT
- Marker Board

UCSB FURNISHED EQUIPMENT
- Systems furniture (metal or phenolic resin- no wood materials)

BREAK ROOM



ARCHITECTURAL
- Occupancy: B
- Adjacency: Near vivarium entry
- Floor: rubber tile and base
- Walls: gypsum board with enamel paint
- Ceiling: gypsum board with enamel paint
- Doors: 3^0x8^0 with view window
- Personnel: (7) staff, (2) cage wash staff, (1) supervisor, (1) animal technician, (1) veterinarian

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg. F
- Pressure: positive to corridor
- Humidity: ambient
- 100% exhaust
- Minimum of 4 air changes per hour

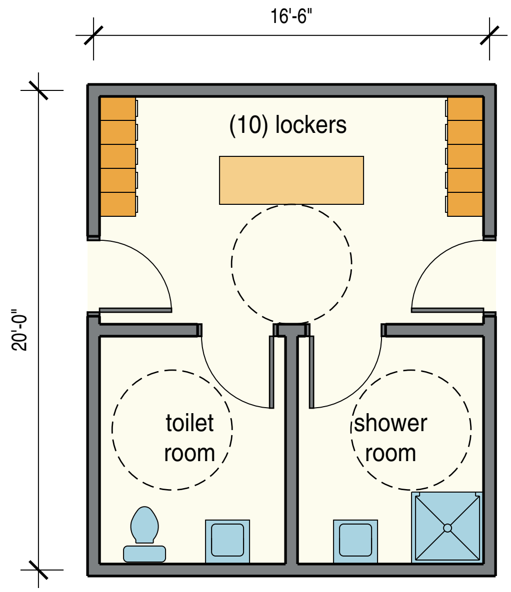
ELECTRICAL
- 110v20a
- Standby power
- Hardwire and wireless data
- Lighting: indirect fluorescent at75 f.c.

PLUMBING
- Domestic hot/cold water at sink

CONTRACTOR FURNISHED EQUIPMENT
- Phenolic Resin casework
- Marker boards
- Tack boards

UCSB FURNISHED EQUIPMENT
- Refrigerator
- Mail cubbies

BARRIER LOCKER & SHOWER



ARCHITECTURAL
- Occupancy: B
- Adjacency: holding rooms
- Floor: ceramic tile with epoxy grout
- Walls: water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^0x8^0

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 4 air changes per hour

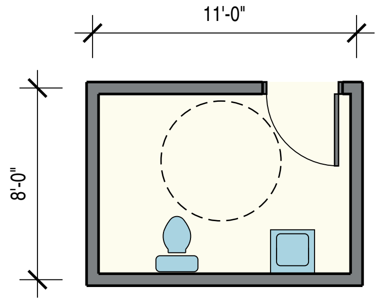
ELECTRICAL
- 110v20a
- Lighting: indirect fluorescent at 50 f.c.

PLUMBING
- Potable hot/cold water
- drains

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel sink
- Toilet
- Waste bin
- (10) full height lockers

UCSB FURNISHED EQUIPMENT
- None

UNISEX TOILET



ARCHITECTURAL
- Occupancy: B
- Adjacency: near break room
- Floor: rubber tile
- Walls: water proof gypsum board with epoxy paint
- Ceiling: 9' gypsum board with epoxy paint
- Doors: 3^0x8^0

STRUCTURAL
- Concrete slab on grade

MECHANICAL
- Temperature: 68-72 deg. F +/- 2 deg F.
- Humidity: 30-70% relative
- 100% exhaust
- Pressure: negative to corridor
- Minimum of 4 air changes per hour

ELECTRICAL
- 110v20a
- Lighting: indirect fluorescent at 50 f.c.

PLUMBING
- Potable hot/cold water
- drains

CONTRACTOR FURNISHED EQUIPMENT
- Stainless steel sink
- Toilet
- Waste bin

UCSB FURNISHED EQUIPMENT
- None

PART II - VIVARIUM

BUILDING SYSTEMS DESIGN CRITERIA

7.0.0

Table of Contents

Section **Page No.**

I. MEP Systems

A. General

B. Project Description

C. Codes and Standards

1. The systems described herein will be designed to conform to the following applicable codes and standards, and authorities having jurisdiction. The code or standard with the more stringent requirement will be followed:

   a. American Association for Lab Animal Science (AALAS)

   b. Association for Assessment and Accreditation of Lab Animal Care International (AAALAC)

   c. 2007 California Building Code

   d. 2007 California Plumbing Code

   e. 2007 International Fire Code

   f. 2007 California Mechanical Code

   g. 2007 California Electrical Code (2005 NEC with 2007 California Amendments)

   h. NFPA 10 Standard for Fire Extinguishers (2002 Edition or latest)

   i. NFPA 13 Standard for Fire Sprinklers (2002 Edition or latest)

   j. NFPA 14 Standard for Standpipes (2002 Edition or latest)

   k. NFPA 20 Standard for Fire Pumps (2002 Edition or latest)

   l. NFPA 72 National Fire Alarm Code

   m. National Electrical Manufacturers Association (NEMA)

   n. Underwriters Laboratories (UL)

   o. California Occupational Safety and Health Act (CalOSHA)

p. NIH 93-8395: Biosafety in Microbiology and Biomedical Laboratories

q. NIH: Design Policy and Guidelines, Bethesda, MD, (Latest Edition)

r. ILAR: Guide for the Care and Use of Laboratory Animals, (Latest Edition)

s. Illuminating Engineering Society (IES)

t. Americans with Disabilities Act (ADA)

u. American National Standards Institute (ANSI)

v. Institute of Electrical & Electronics Engineers (IEEE)

w. Electrical Testing Laboratories (ETL)

x. California State and Local Fire Marshal

D. Engineering Criteria

1. HVAC

a. The air handling systems for vivarium facility will be independent of other building systems. These systems will be designed to maintain a safe and comfortable environment for animals, be adaptable, and be capable of maintaining environmental conditions in any of the animal rooms for any of the species anticipated to be housed in the viviarium.

b. Since most animal studies are of long duration, they must be performed under consistent conditions in order to achieve repeatable results. Thus, failure of the HVAC systems is unacceptable. The air handling units and exhaust fans serving the vivarium will be designed as fully redundant systems. Central HVAC systems will be provided with multiple chillers, boilers, pumps and cooling towers, etc., to improve reliability.

c. The following ventilation objective will be considered: The elimination of drafts which could adversely affect animal health, maintaining consistent temperature and humidity conditions in the individual rooms and controlling the airborne animal hair and particulate count. The systems will be designed with 100% outside air approach and no recirculation within the vivarium spaces. The air handling units serving the vivarium will be fitted with HEPA filters.

d. The air motion and space relative pressurization will be designed to prevent cross contamination between individual spaces. The mechanical systems will be designed to provide sustainable pressurization and will be fitted with pressure independent venture valves. Clean areas of the vivarium, including the clean side of cage and rack washing and clean corridor system will be designed with positive pressure relative to the animal holding areas or soiled areas. Soiled areas such as the soiled side of cage and rack washing and waste holding areas will be maintained at a negative pressure. Potentially infectious population will be maintained at the negative pressure to prevent contagion from migrating to other population. The space pressurization control will allow adaptable modification over the life of the facility.

e. Steam system will be provided for washing any sterilizing equipment. Clean steam system will be provided to support space humidification.

f. Sustainable/Energy conservation design: Selection of the MEP equipment will be based on energy efficiency as one of the main goals of the engineering design. Use of variable frequency drives, premium efficiency motors and energy recovery systems will be considered for the project.

2. Plumbing

a. The specific types of plumbing systems for the vivarium will include waste drainage systems and animal drinking water system. The plumbing systems design will carefully minimize the potential for accumulating dirt. All pipes, mounting brackets and supports will be caulked and sealed during installation. The installation of the exposed piping inside the animal rooms will be minimized. Careful consideration will be given to prevent waste lines from clogging. RO water will be generated to support washing equipment.

b. Fire Protection System: A complete wet sprinkler/standpipe combination system will be provided throughout the vivarium.

3. Electrical

a. The electrical systems for the vivarium will be designed with flexibility, serviceability, reliability and redundancy. The electrical systems for the vivarium will include normal and emergency/standby systems, including distribution panelboards, motor control centers, feeders and risers. Lighting system for vivarium will consist of energy efficient sealed and gasketed wet location listed fluorescent fixtures. Lighting control system will be provided by a programmable time clock.

4. Telecommunication Systems

   a. The telecommunication systems for the vivarium will be designed with flexibility, serviceability, and reliability. The systems will include IT, facility (security and public address), and local area network.

   b. To protect both animals and staff within the vivarium, a keyed access card security system will be provided. CCTV cameras and digital video recorders will be used for security surveillance.

5. Fire Alarm System

   a. The fire alarm system for the vivarium will be a fully addressable system integrated with the sprinkler system.

6. Bio-safety

   a. The major bio-safety concern for the vivarium consists of ventilation, containment of animal dander, odors and infection agents. The exhaust from animal rooms will be discharged directly to the outside with no recirculation of air to other rooms. For protection of the personnel and to minimize the potential for cross contamination of animals, the direction of airflow will be inward to the animal rooms.

7. ABSL-3 Suite

   a. All penetrations in walls, floors and ceilings will be sealed. All electrical, plumbing conduits and piping will be at the point of penetration. All access to the mechanical equipment will be provided outside of the containment facility.

   b. Ventilation will be a single-pass air and all ABSL-3 spaces will be kept negative with respect to the outside corridors. Exhaust ducts will be negative pressure until discharged outside the building.

   c. The facility will be served by dedicated air handling units and dedicated exhaust fans with stand-by capacity. The supply and exhaust ductwork will be provided with air-tight industrial dampers. HEPA filtration will be provided in the air handling units and at the exhaust fans.

d. ABSL-3 will be alarmed to indicate a failure to maintain a negative pressure differential.

8. Vermin Control within vivarium

a. All rooms and areas subject to animal transport or occupancy will be sealed to prevent movement of air into or out of room through any MEP devices.

b. All incoming piping and conduits will have seals located outside of the room.

c. All devices will be weatherproof cover with silicone caulk applied between the cover and the wall, ceiling or floor opening. Caulk will be provided around all conduits, piping and ductwork penetrating the room.

II. Vivarium HVAC System

A. General

1. The HVAC system serving vivarium will be pressure-independent, constant volume (hot water reheat) with volumetric offset differential control and with ten (10) to fifteen (15) ACPH established for animal holding and procedure/behavior rooms.

2. Each room shall be provided with air volume controls to adjust the air changes per hour (ACPH) and adjust the pressure relationship relative to the corridor. The control system will also allow for unoccupied by animals setback of air flowrates. The minimum unoccupied by animals setback will be set to 6 air changes.

3. Animal Holding Rooms (mice, rats, rabbits, etc.) designed by the lab planner shall utilize microisolators/cage rack exhaust systems. Each cage system will have exhaust HEPA blower packs, “Iris” balancing dampers, air filter and ceiling mounted thimble-type connections at the exhaust. Each connection will be utilized to provide “indirectly” connected exhausts from the cages to the building vivarium exhaust system. Supply air will be distributed to the space from the vivarium air handling units. Each blower pack shall be either cage or wall mounted. The connections shall be made with a flexible hose and clamp assembly. Quarantine holding rooms will have air exhaust valves at each isolation cubicle.

4. Animal Holding Rooms, to be designed by lab planner, shall be adaptable to be used as a Procedure Room. The room adaptability shall be for only one function at a time (either Animal Holding Room or a Procedure Room).

5. The air filters shall be commercially available, standard size, exposed, disposable 1" thick filters and will be provided in Animal Holding Rooms at each exhaust grille and point exhaust. Filters shall be easily removable and replaceable without tools.

6. Each Animal Holding Room will contain venturi type valve(s) with hot water reheat coil and duct steam trim humidifier. The valves will be strategically placed in a readily accessible location through ceiling panels or access doors. The valves will be located outside the holding rooms whenever possible.

7. Animal Holding Room temperature and humidity sensors shall be located within the duct and accessible from corridor or allocated rooms with designated access panels. Alternatively, a water-proof wall thermostat may be provided (discussion with users required to decide type of temperature sensors).

8. The biological safety cabinets or necropsy downdraft stations used in the vivarium and requiring exhaust will be served by the dedicated exhaust system.

9. The air handling system serving the animal facility shall be 100% fresh air. There shall be no recirculation of this air. Supply air quantities shall be determined by evaluating the heat loads, minimum dilution/ventilation requirements, AAALAC flow requirements and/or required make-up air for exhaust systems, whichever is greatest.

10. Design of HVAC system shall accommodate potential to adjust initial air movement. For room-by-room criteria, refer to the Matrix included hereinafter.

11. All vivarium systems are expected to operate 24 hours, 7 days a week with varying degrees of occupancy in a 24-hour period.

12. Redundant and parallel systems for supply, exhaust, heating, cooling and humidification will be provided so that environmental conditions can be maintained in Animal Holding Rooms should a unit be out of service.

13. Dedicated exhaust fan system will be provided for cage wash facility. The exhaust ductwork will be stainless steel of all welded construction.

B. Outside Design Conditions

1. Summer: 91°F db/69°F wb

2. Winter: 33°F db

C. Space Design Conditions

Space Type	Minimum O.A. Ventilation Rate	Maximum Design		Minimum Design		Pressurization	Minimum Supply Air Filtration	Remarks
		Max. Temperature (F)	Max. Relative Humidity (%rh)	Min. Temperature (F)	Min. Relative Humidity (%rh)			
Common Areas / Lobbies	Note 1	78	50%	70	30%	Note 6	90%	-
Offices	Note 1	78	50%	70	30%	Note 6	90%	-
Break Room	Note 1	78	50%	70	30%	Note 6	90%	-

Space Type	Minimum O.A. Ventilation Rate	Maximum Design		Minimum Design		Pressurization	Minimum Supply Air Filtration	Remarks
		Max. Temperature (F)	Max. Relative Humidity (%rh)	Min. Temperature (F)	Min. Relative Humidity (%rh)			
Animal Holding and Quarantine/Behavior Rooms	100%	Note 2	50%	70	30%	Note 3 and 5	HEPA	-
Animal Receiving Rooms	100%	Note 2	50%	70	30%	(-)	HEPA	-
Animal Procedure Rooms	100%	Note 2	50%	70	30%	Note 3	HEPA	-
Dirty Cagewash	100%	78	50%	70	30%	(-)	HEPA	-
Clean Cagewash	100%	78	50%	70	30%	(+)	HEPA	-
ABSL-3 Suite	100%	78	50%	70	30%	(-)	HEPA	-
Clean Cage Storage	100%	78	50%	70	30%	(+)	HEPA	-
Chem. Storage	100%	78	50%	70	30%	(-)	90%	-
Feed/Bed Storage	100%	78	50%	70	30%	(-)	90%	-
Necropsy	100%	78	50%	70	30%	(-)	90%	-
Irradiation Room	100%	78	50%	70	30%	(-)	90%	-
Mech. / Elec. Rooms	100% Exhaust		-	-	No Control	None	30%	-
Toilet / Janitor / Locker Rooms	100% Exhaust	78	-	72	No Control	None	90%	-

Note 1: Ventilation rate will be sized based on 20 cfm/person

Note 2: Animal holding and procedure spaces will have temperatures adjustable between 65F and 80F. Rabbit holding rooms will be designed adjustable down to 66°F db. Additional fan coil units dedicated to the rabbit holding rooms will be considered.

Note 3: Animal holding and procedure room pressurization will be adjustable from positive to negative. Initial setup shall be (+) for small animal rooms, (-) for quarantine room. (-) negative; (+) positive.

Note 4: Not used.

Note 5: Low exhaust.

Note 6: Space pressurization will be positive relative to adjacent spaces and otherwise neutral.

D. Internal Load Design Criteria

Space Type	People Load	Lighting Load	Equipment Load	Remarks
Offices/Miscellaneous Areas	100 gsf/person	1.2 W/gsf	1.5 W/gsf	-
Animal Holding Rooms	Note 1	2.0 W/gsf	Note 3 Note 4	-
Animal Procedure Rooms	Note 1	2.0 W/gsf	Note 3 Note 4	-
Dirty Cagewash	200 gsf/person	1.5 W/gsf	Note 2	-
Clean Cagewash	200 gsf/person	1.5 W/gsf	Note 2	-

Note 1: People/animal loads will be based on actual count of people/animals.

Note 2: Equipment loads will be based on actual equipment heat gains as published by manufacturer.

Note 3: Space loads based on estimated equipment heat gain.

Note 4: Exhaust requirements/air change rates will dictate air flow quantity (minimal cooling load and/or code ventilation).

E. Scope of Work and System Concepts

1. Introduction

a. Chilled water, heating hot water and steam will be generated in the building central plant and will be utilized as the main source of cooling, heating, humidification and process loads for the vivarium.

2. Heating

a. Heating hot water 180°F/140°F will be generated by gas-fired boilers.

3. Steam

a. Steam will be generated by a steam boiler. Steam will be used to handle the process and humidification demands by utilizing pressure reducing stations and steam-to-steam heat exchangers. Condensate will be returned to the boiler with a duplex condensate pump. The highest available boiler efficiency will be considered for the project.

F. Chilled Water System Description

1. Chilled water system serving the vivarium will be connected to the building piping distribution system. Use of frictionless water cooled chillers with variable frequency drives with low part load kW/ton performance to reduce energy use of the central chiller plant will be considered.

G. Humidification

1. Humidification will be provided by utilizing steam-to-steam heat exchangers to produce “clean” steam as required to satisfy humidification demands. Soft water will be utilized as a primary source for “clean” steam production.

H. Process Steam

1. 100 psig process steam (cage cleaning, etc.) will be provided by reducing the primary high pressure steam supply to medium pressure steam (75 psig).

I. Preliminary Utility Loads

Service	**Vivarium**
Chilled Water	150 tons
Heating Hot Water	1.8 MBTU
Steam (for Humidification) With 15 psig steam	900 lbs/hr
Steam (Process) 75 psig steam	800 lbs/hr

Note 1: The loads projected above are based on current available information. The values above are order-of-magnitude only for the representative areas indicated. Actual requirements will be defined as the project progresses.
Note 2: All mechanical equipment including controls will be provided on emergency power.
Note 3: Total peak demand airflow.

J. Supply Air Handling Unit Descriptions

1. A supply air system for Vivarium and Vivarium support spaces will be 100% outside air system. The system will consist of two air handling units serving common Vivarium areas each sized for 100% of peak load and two air handling units dedicated to ABSL-3

suite service. The units will be custom built, factory fabricated, double wall units, complete with 4 inch-sided casings, with centrifugal fans, VFD's, flow measuring stations at each fan, cooling coils with UV light section, heating coils, 30% prefilters, 90% after filters, and final HEPA filters, sound attenuators, fan isolation and intake air dampers, controls, marine lights and access doors. Air will be supplied at approximately 55°F db to all constant volume boxes and linear/venture air valves. Each supply air box/valve provided with a reheat coil. Supply air quantities will vary to each space, dependent upon ventilation and cooling requirements. The air handling units will be sized based on the 400 FPM face velocity.

2. The vivarium and ABSL-3 units will be provided with clean steam humidifiers.

3. The supply and exhaust system serving ABSL-3 area will be fitted with 100% shut-off bubble tight industrial isolation dampers.

K. Table 1 – Main Air Handling Units System Components

Main Air Handling Units	Components													
	Pre-filter (30%)	After Filter (90%)	Hot Water Heating Coil	Cooling Coil with UV Light Section	Sound Attenuator (Built In with the Fans)	Supply Fans (Quantity Active)	Economizer Section	Final Filter – HEPA	% Outside Air (Minimum)	Volume Control (VFD's)	Sound Attenuator	Unit Discharge Temperature	Humidifier	Remarks
AHU-1	*	*	*	*	*	1		*	100	*	*	53	*	Note 1 Note 2
AHU-2	*	*	*	*	*	1		*	100	*	*	53	*	Note 1 Note 2
AHU-3	*	*	*	*	*	1		*	100	*	*	53	*	Note 1 Note 3
AHU-4	*	*	*	*	*	1		*	100	*	*	53	*	Note 1 Note 3

Note 1: The variable volume drives will be provided to compensate for filter loading and for future flexibility.

Note 2: The HVAC equipment serving vivarium and ABSL-3 suite will be on stand-by power.

1. The supply and exhaust air handling units and respective ducts will be sized based upon 100% of the connected load, including the air distribution systems, with no diversity taken.

2. Thermostatic zoning (separate thermostats and associated boxes and/or air valves with reheat) in the building will be as follows:

   a. Each procedure and animal holding room

   b. Every 100'-0" length of "people" corridor

   c. One zone per 1000 SF of lobby area

d. Each procedure room

e. Each alcove

f. Each two structural bays in the vivarium area (column line-to-column line)

3. Vivarium and ABSL-3 areas will be served via linear or venturi valves.

L. A run around energy recovery system will be provided to pre-coil and pre-heat the air handling units outside air intake. The heat recovery coils will be provided in the air handling units and in the vivarium exhaust air stream with additional filter rack. A dedicated piping system with a distribution pump, VFD drives and controls will be provided.

M. Exhaust Air/Ventilation Systems

1. Exhaust air from the vivarium spaces shall be ducted to the roof. General exhausts shall be combined into common plenums with independent risers. Any special type of exhaust shall be separately ducted to dedicated fans on the roof (separate risers) in individual 2-hour rated enclosures.

2. The exhaust plenum with by-pass inlet air damper arrangement will be provided.

3. All exhausts shall discharge a safe distance above the roof to prevent recirculation through proper dispersion of the airstream into the atmosphere. Discharge stacks or plume fans shall be designed to release the exhaust air at a minimum level higher than any human working on the roof and at a sufficiently high velocity to enable the exhaust air to disperse. The final height, location and discharge velocities will be in accordance with the Wind Consultant's recommendations.

4. Tracking of the exhaust air with the supply air in each space will be controlled by DDC adjustable constant volume (CV) control air devices, which will be interlocked with the associated supply CV control air devices. Vivarium pressurization and constant volume bio-safety cabinet exhaust rates shall be controlled by the Building Management DDC Control System (BPCS).

5. The vivarium fans will be provided with variable frequency drives (VFD’s). The ganged/general exhaust system's static pressure will be maintained by modulating VFD’s in conjunction with dampers at the ducted inlet to the exhaust module in response to duct-mounted static pressure sensor(s). The fans will run at a constant variable volume as required to maintain a high and safe discharge plume. The entire inside of the exhaust unit casings, and all internal parts and materials, shall be coated

with air dry Heresite protection. Stand-by capacity for vivarium exhaust and ABSL-3 exhaust will be provided.

6. Dedicated exhaust fan system will be provided for cage wash facility. The exhaust ductwork will be stainless steel of all welded construction.

N. Ductwork Distribution

1. Supply air ductwork shall be provided from the AHU's to the inlet of the variable/constant volume (VCV) and constant volume (CV) control air devices, constructed of medium pressure single wall interior sheet metal with exterior foil faced wrapped insulation. Low pressure ductwork downstream of the VCV/CV control air devices shall be constructed of single wall interior sheet metal with exterior foil faced wrapped insulation. Exposed ductwork will be insulated sheet metal. No internal duct insulation lining shall be provided.

2. All ductwork shall be hung neatly in appearance and perpendicular/parallel to building lines. Takeoffs from high pressure mains shall be hard ducted with a lateral tee or bellmouth fittings. Mylar or Kraft-foil facing on the internal insulation inside the VCV/CV boxes shall be provided to prevent the possibility of fiber glass entering the airstream and the conditioned spaces.

3. The ganged general exhaust ductwork will be primarily galvanized sheet metal, with direct branch runouts to laboratory fume hoods and wet/washing areas constructed of welded 16 gauge Type 316 stainless steel.

4. All supply VCV boxes (all types) and general exhaust boxes shall be provided with “Hospital-grade” sound attenuators with no exposed liner facing the air stream.

O. Ductwork Sizing Criteria

Ductwork	Maximum Velocity FPM			Maximum Friction Loss Per 100 Feet of Duct Inches
	NC40	NC35	NC30	
Mains	1250			0.08
Final Run-Out to Grille and Diffuser	600	500	400	0.08

P. Vivarium Environmental Monitoring and Control System

1. Monitoring and control of temperature, humidity and air flow in each vivarium space will be provided by the local vivarium dedicated DDC control system. The vivarium control system shall be fully integrated into the campus' Johnson Controls central building automation system. Separate monitoring with dedicated computer front end will also be provided and be located in the vivarium manager's office.

Q. MEP Energy Conservation Strategies

1. Several energy saving strategies have been explored in the next design phase. These included the following:

   a. Utilization of variable frequency motor controllers.

   b. Premium efficiency motors.

   c. Enhanced minimum piping and duct insulation.

   d. Use of run around heat recovery coil system to extract heat from vivarium exhaust to pre-coil and pre-heat air handling units outside air intake.

   e. Use of frictionless water cooled chillers with variable frequency drives with low kW/ton performance to reduce energy use of the central chilled water system.

   f. Upsize the air handling units to 400 FPM and main distribution ductwork to reduce internal system losses. This will allow reduction of size of fan motors.

Preliminary Major HVAC Equipment List with Additional Capacity to Serve Vivarium

Unit Designation	Location/Service	Description
AHU-1 AHU-2 (Notes 1 and 2)	Basement Mechanical Room	Custom factory build-up 100% OSA air handling units with capacities as follows: AHU-1: 25,000 cfm AHU-2: 25,000 cfm For air handling unit components please refer to the table with Air Handling units description.
AHU-3 AHU-4 (Notes 1 and 3)	Basement/Mechanical Room	Custom factory built-up 100% OSA air handling unit. AHU-3: 4,000 cfm; AHU-4: 4,000 cfm. For air handling unit components refer to the table with Air Handling units description.
Process Steam	Basement	1700 #/hr additional steam capacity for steam boilers (one stand-by). Condensate system to include two duplex condensate pumps.
HWP-1 HWP-2	Basement/wet mechanical room/Building Heating	Two hot water pumps, one pump stand-by. Each pump 120 GPM with VFD's.
Hot Water Boiler	Basement/wet mechanical room/Heating Hot Water Boiler Capacity	Two steam to water shell and tube type. (2) 1,800 MBTUH output
Cooling Chiller Capacity	Basement/Chilled water	150 cooling ton capacity for vivarium service system to include circulating pump and VFD's water cooled frictionless chiller system
Humidification HE-5 HE-6	Basement/wet mechanical room/Clean Steam Humidification System	Steam-to-steam shell and tube type. Primary/stand-by. Each heat exchanger 900 #/hr output capacity.
Vivarium Exhaust	Roof	Laboratory exhaust fans similar to M.K. Plastics type exhaust fan. 25,000 cfm capacity each (one stand-by).
ABSL-3 Exhaust	Roof	Laboratory exhaust fans similar to M.K. Plastics type exhaust fan. 4,000 cfm capacity each (one stand-by) with HEPA bag-in/bag-out assembly.
Misc. Fans (Approximately 6)	Roof	Exhaust fans for toilet exhaust, wet exhaust, biosafety exhaust, etc. Wet exhaust will be fully welded stainless steel ductwork
Run Around Heat Recovery System	Roof	The system will be designed with recovery coils in the air handling units and in the vivarium exhaust air stream, dedicated piping loop and circulating pumps.

Note 1: One AHU is stand-by power.
Note 2: General vivarium service.
Note 3: ABSL-3 suite service.

III. Electrical System

A. Design Philosophy

Electrical system components and distribution system will be designed to incorporate the following characteristics:

1. Flexibility:

   a. Spare breakers will be provided to address maintenance and testing, as well as future loads. By allowing breakers to be removed and tested, the spares can used to maintain continuity of service with only a minimum disruption and outage.

2. Serviceability:

   a. Locating electrical equipment in electrical closets and machine rooms and not in vivarium areas will minimize the amount of electrical equipment that needs to be serviced.

   b. Distribution and branch circuit panel boards will have door-in-door construction (hinged trim door) for ease of, and efficient one person service/maintenance.

3. Reliability and Redundancy:

   a. Due to the recent nationwide extended utility power outages there has been a trend in many research and development institutions to design electrical power systems for an increased level of demand beyond the Code mandated requirements for vivarium electrical systems.

   b. Emergency/standby power will be provided from the local standby/emergency generator as the back-up to the primary power system to continue and maintain vivarium operations during extended power outages. Backup source of emergency power will deliver emergency power to the life safety, and standby systems including all vivarium outlets, lighting, mechanical and vivarium equipment of the vivarium area.

B. Sustainability

1. During detailed design, the team will explore various opportunities to incorporate sustainable design principles within the building.

2. Some of the elements specified within the Electrical systems that will be incorporated into the base design are as follows:

    a. Utilization of variable frequency motor controllers

    b. High-efficiency light fixtures, lamps and ballasts

    c. High efficiency transformers

    d. Enhanced system commissioning

C. Codes and Standards

1. The systems described herein will be designed to conform to the applicable codes and standards, and authorities having jurisdiction. Refer to Codes and Standards List, Section I.C.1 above.

D. Load Calculation Criteria:

1. Design Voltages:

Secondary Voltage:

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

2. Overall space *demand* loads (which will also be used for the floor equipment sizing criteria) are as follows:

Administration/ Office	
Lighting	1.2 VA/ square foot
Receptacles	5.0 VA/ square foot
Circulation and Restrooms	
Lighting	0.8 VA/ square foot
Receptacles	1.5 VA/ square foot
Storage/ Support Rooms	
Lighting	0.6 VA/ square foot
Receptacles	1.5 VA/ square foot
Mechanical/ Plumbing/ Elect. Equipment Rooms	
Lighting	0.8 VA/ square foot
Receptacles	1.5 VA/ square foot

Animal Holding Rooms	
Lighting	2.0 VA/ square foot
Power and Lighting	2.0 VA/ square foot
Animal Procedure Rooms	
Lighting	2.0 VA/ square foot
Power	10.0 VA/ square foot

3. Branch Circuit Load Calculations:

Lighting	-	Actual installed wattage
Receptacles	-	180 VA per outlet
Surface Mounted Raceway	-	180 VA per outlet
Special Outlets/Fixed Equipment	-	Actual installed wattage of equipment served
Motors	-	125% of motor wattage

4. Demand Factors:

Lighting (continuous load)	-	125% of total wattage
Receptacles	-	100% of first 10 kVA plus 50% of balance
Fixed Equipment/ Specialty Outlets	-	100% of total wattage
Motors	-	125% of wattage of largest motor plus 100% of wattage of all other motors

5. Minimum Bus Sizes:

480Y/277V Normal and Emergency Lighting Panels	-	100A
480Y/277V Normal and Standby Equipment Panels	-	225A
208Y/120V Branch Panels	-	225A
480V Motor Control Centers	-	600A

d. Feeder Sizes:

Feeders from service entrance to distribution panels to be sized the same as the distribution panel bus size.

Feeders from distribution panels to secondary distribution panels to be sized the same as the feeder circuit breaker size.

Standby laboratory branch panels and normal power office panels will typically be fed from a 150A/3P circuit breaker.

E. Scope of work

1. The scope of work includes the following major systems:

a. Normal electrical distribution system including distribution panelboards switchboards, motor control centers, feeders, risers.

b. Emergency/Standby power system including distribution panelboards, motor control centers, feeders, risers.

c. Branch circuit wiring, devices, motor, control and alarm.

d. Grounding.

e. Lighting systems including lighting fixtures and lighting control.

f. Telecommunication system.

g. Fire Alarm system.

F. Normal Power Distribution System

1. System description

a. The Vivarium portion of the UCSB Bioengineering building will be served with normal electrical power from the building main switchgear.

b. The main building main switchgear will feed 480Y/277 volt distribution panelboard and dry type 480-208Y/120 volt transformer. This transformer will feed 208Y/120 volt panelboard. All distribution equipment will be located in the vivarium electrical room.

c. All electrical power distribution components will have a short circuit withstand rating that exceeds the available fault duty at that point in the system. Components will be fully rated, no series ratings will be allowed.

d. All power distribution equipment will be fabricated with copper bussing and conductors.

e. Branch panelboard will be equipped with main breakers and may be located within electrical room or outside of the vivarium proper in non-rated corridors.

f. All distribution equipment will be sized for an additional 20% spare capacity. This provision will be developed and finalized with the Project Team during Schematic Design.

g. Feeders serving lighting and miscellaneous power circuits will be sized for 20% greater capacity than required by code to allow for future growth.

h. Normal power will be supplied to office, toilets, and miscellaneous storage areas only.

2. Equipment and Materials

a. Distribution Panelboards:

i. The distribution panelboards will be dead front, totally enclosed in NEMA 1 enclosure.

ii. Copper bussing will be provided in all distribution panelboards. Main breaker will be equipped with solid state, true RMS trip unit.

iii. Feeder breakers will be group mounted front accessible bolt-on thermal-magnetic molded case type with adjustable magnetic trip settings.

b. Panelboards:

i. All lighting and receptacle panelboards will have 42 poles per section, except where shown to be less.

ii. Copper bussing will be provided in all panelboards.

iii. Main circuit breaker will be provided in panelboards. Circuit breakers will be molded case quick-make, quick-break, with thermal magnetic trip, bolt-on type. Panelboards will be door-in-door type.

iv. Minimum interrupting capacity will be 10,000 AIC for 120/208 volts and 14,000 AIC for 277/480 volts.

c. Transformers:

i. Distribution transformers will be dry type air cooled, 3-coil, 2 winding type, with a minimum of (2) 2-1/2 percent taps above and (4) 2-1/2 percent taps below rated voltage. Transformers from 25 kVA to 112.5 kVA will be rated 115°C temperature rise above 40°C ambient and will be capable of carrying a 15 percent continuous overload without exceeding a 150°C rise in the same ambient. Transformers above 112.5 kVA will be rated 80°C temperature rise above 40°C ambient and will be capable of a 30 percent continuous overload without exceeding a 150°C rise in the same ambient. The top of the enclosure will not exceed maximum temperature of 35°C above a 40°C ambient. All winding material will be copper. Transformers will be minimum K-9 rated. All office area transformers shall be specified as K-13 rated.

ii. Sound levels will not exceed:

1) 45 dB for 25-50 kVA transformers
2) 50 dB for 51-150 kVA transformers
3) 55 dB for 151-300 kVA transformers
4) 65 dB for 300-500 kVA transformers

G. Emergency Power System

1. System description

a. The Vivarium portion of the UCSB Bioengineering building will be served with standby and emergency electrical power from the building's distribution system

b. Emergency/Standby power will be distributed as follows:

Emergency and Legally Required Standby Power (per CEC 700 and 701)

480Y/277V, 3 phase, 4 wire - Life safety egress and exit lighting

208Y/120V, 3 phase, 4 wire	-	Fire alarm

Optional Standby Power (per CEC 702)

480V, 3 phase, 3 wire	-	Motors 1/2 HP and larger
480Y/277V, 3 phase, 4 wire	-	Fluorescent lighting, large vivarium equipment and mechanical equipment
208Y/120V, 3 phase, 4 wire	-	Receptacles, motors under 1/2 HP, small vivarium equipment, telecommunication, security and control equipment

c. As required by NEC, emergency power will be distributed in a dedicated raceway. Emergency power feeder will be routed from building's emergency distribution board to a vivarium emergency egress lighting panel. Emergency power distribution transformers will be located in vivarium electrical room to transform voltage from 480V to 208Y/120V between the emergency lighting panel and the emergency branch circuit panelboard.

d. The standby distribution panel dedicated to vivarium and located in vivarium electrical room will feed dry type 480-208Y/120 volt transformer and motor control center(s). This transformer will feed 208Y/120 volt secondary distribution panel located in these same electrical room. Standby branch circuit panelboards will be located in the electrical rooms.

e. Standby motor control centers serving mechanical equipment will be located in proximity to the equipment being served.

f. Lighting panel will be fed from the circuit breaker(s) which will be equipped with ground fault protection.

g. All electrical power distribution components will have a short circuit withstand rating that exceeds the available fault duty at that point in the system. Components will be fully rated, no series ratings will be allowed.

h. All power distribution equipment will be fabricated with copper bussing and conductors.

i. All distribution equipment will be sized for an additional 20% spare capacity. This provision will be developed and finalized with the Project Team during Schematic Design.

j. Feeders serving lighting and miscellaneous power circuits will be sized for 20% greater capacity than required by code to allow for future growth.

k. Feeders serving Motor Control centers will be sized as required by code plus 25% spare capacity.

2. Equipment and Materials

a. Distribution Panelboards:

i. The distribution panelboards will be dead front, totally enclosed in NEMA 1 enclosure.

ii. Copper bussing will be provided in all distribution panelboards. Main breaker will be equipped with solid state, true RMS trip unit.

iii. Feeder breakers will be group mounted front accessible bolt-on thermal-magnetic molded case type with adjustable magnetic trip settings.

b. Panelboards:

i. All lighting and receptacle panelboards will have 42 poles per section, except where shown to be less.

ii. Copper bussing will be provided in all panelboards.

iii. Main circuit breaker will be provided in panelboards. Circuit breakers will be molded case quick-make, quick-break, with thermal magnetic trip, bolt-on type. Panelboards will be door-in-door type.

iv. Minimum interrupting capacity will be 10,000 AIC for 120/208 volts and 14,000 AIC for 277/480 volts.

c. Transformers:

i. Distribution transformers will be dry type air cooled, 3-coil, 2 winding type, with a minimum of (2) 2-1/2 percent taps above and (4) 2-1/2 percent taps below rated voltage. Transformers from 25 kVA to 112.5 kVA will be rated 115°C temperature rise above 40°C ambient and will be capable of carrying a 15 percent continuous overload without exceeding a 150°C rise in the same ambient. Transformers above 112.5 kVA will be rated 80°C temperature rise above 40°C ambient and will be capable of a 30 percent continuous overload without exceeding a 150°C rise in the same ambient. The top of the enclosure will not exceed maximum temperature of 35°C above a 40°C ambient. All winding material will be copper. Transformers will be minimum K-9 rated. All office area transformers shall be specified as K-13 rated.

ii. Sound levels will not exceed:

1) 45 dB for 25-50 kVA transformers
2) 50 dB for 51-150 kVA transformers
3) 55 dB for 151-300 kVA transformers
4) 65 dB for 300-500 kVA transformers

d. Motor Control Centers:

i. Pre-assembled MCC assemblies will include prefabricated steel structure which will house a combination of motor circuit protectors (MCP) and full voltage or solid state reduced voltage type motor starters, control transformers, thermal-magnetic molded-case feeder circuit breakers, auxiliary contacts and other accessories as required to make the units complete and functional.

ii. The MCC power main horizontal buses will be minimum 600A copper, braced for minimum of 65,000 amps RMS symmetrical. A copper neutral bus rated at 100% capacity and copper ground bus rated at 50% capacity will be furnished over the entire length of the MCC. Copper bussing will be provided in all motor control centers.

iii. Each MCC starter will have a separate fused control transformer (480-120V) rated to supply the connected loads plus 25% spare capacity, three (3) electronic overloads, including phase loss protection, and two (2) normally-open and two (2) normally-closed auxiliary contacts. Operator interface devices will include H-O-A selector switches, red "run" pilot lights and green "ready" pilot lights. Each starter will have load shed capabilities.

iv. Each starter and feeder circuit breaker will be padlockable in the "off" position.

H. Point-Of-Use System

1. Point-of-use system will be provided for vivarium area.

2. The following criteria will be used in designing the branch circuitry:

a. General Lighting:

i. 277V lighting will generally be limited to 3200 VA per 20A, 1-pole circuit.

ii. 120V lighting will generally be limited to 1500 VA per 20A, 1-pole circuit.

b. Wiring Devices:

i. Convenience receptacles will be specification grade heavy-duty 20 amperes, 125 volts, 3-wire, duplex, grounding type.

ii. Toggle switches will be full size, heavy duty, AC type, quite type, rated for 120/277 volts, 20 amperes.

iii. Ground fault protection will be provided for outlets within 4’-0” of a sink edge, and other wet locations.

iv. All duplex and special purpose receptacles indicated for specific equipment will typically be on a separate dedicated circuit.

v. All receptacles in vivarium area will be GFCI type with stainless steel weatherproof coverplates mounted 48"above finished floor.

vi. Corridors will be designed with a receptacle on critical branch spacing of approximately 40 feet.

vii. Building support (equipment rooms, storage) will be designed with one (1) duplex receptacle per wall or one (1) per every 150 square feet, whichever is greater.

viii. Wall plates will be stainless steel.

ix. All receptacle nameplates will be permanently engraved with panel name and circuit number.

c. Raceways:

i. All wiring will be installed in conduit

ii. All wiring will be run concealed within furred walls and above hung ceilings, except as otherwise noted.

iii. Conduit will not be permitted to be direct buried in concrete floor, wall and ceiling slab.

iv. Wiring in MER spaces will be run exposed in conduit and mounted at minimum 7’-0” AFF where achievable.

v. Wiring in MERs, exterior, and areas that exposed to physical damage will be in rigid galvanized steel conduit.

vi. Raceways for feeders and branch circuits will be metallic, rigid galvanized steel conduit (RGS), intermediate metal conduit (IMC) or electrical metallic tubing (EMT) subject to the restrictions of the National Electrical Code, minimum size 3/4". EMT will not be used in concrete construction or where subjected to mechanical damage.

vii. PVC conduit will not be allowed in exterior spaces.

viii. Flexible steel conduit (aluminum is not allowed) will be utilized for short runs to lighting fixtures and final connection to motors.

d. Branch Wiring:

i. All conductors will be copper.

ii. Minimum conductor size will be #12 AWG. Minimum neutral size for all shared circuits will be #10 AWG.

iii. Branch circuit conductors will be single-conductors 600V rated with THHN-/THWN insulation with continuous color-coding.

iv. Homeruns will be limited to (8) eight current caring conductors.

v. Circuits of different panels or different voltages will not be installed in the same conduit.

e. Vivarium Area

i. Animal Holding Rooms:

1) One (1) double duplex receptacle will be installed on each wall spaced no further than 12 feet apart.

2) Ceiling mounted twist-lock receptacles will be provided for connection to racks.

3) One (1) dedicated double duplex receptacle will be installed for changing station.

ii. Procedure Rooms:

1) Duplex receptacles will be installed 24" on center at the perimeter laboratory benches. Special purpose outlets will also be provided as necessary to support equipment layout.

2) Ceiling mounted twist-lock receptacles will be provided for connection to equipment.

3) 208V and dedicated 110V outlets will be provided per program.
4) All receptacles will be GFCI type with stainless steel weatherproof coverplates mounted 48"above finished floor.

iii. In general, only three (3) to four (4) duplex receptacles will be connected to an individual branch circuit. Receptacles will be alternately wired and connected to different branch circuits.

iv. Specialized equipment, such as changing stations, fume hoods, biosafety cabinets, ice machines, refrigeration equipment, will be supplied from dedicated branch circuits.

v. All vivarium rooms except offices and miscellaneous storage spaces will be supplied with power from standby panelboards.

I. Transient Voltage Surge Suppression:

1. Transient voltage surge suppression (TVSS) will be not provided on both the normal and emergency power distribution systems.

Preliminary Major Electrical Distribution Equipment List Serving Vivarium

Unit Designation	Size (Each)	Total Quantity	Description
Emergency Power Distribution Equipment			
Life Safety Lighting Panels	30 circuit, 100A main lugs, 3 ph, 4-wire	1	
Emergency Step Down Transformers	15 kVA 480V primary, 208Y/120V 3 ph, 4-wire Secondary	1	
Emergency Receptacles Panels	100A, 208/120V, 3ph, 4-wire, 42 circuits panel with a main breaker.	1	
Standby Lighting Panels	30 circuit, 100A main lugs, 3 ph, 4-wire	1	
Standby Step Down Transformer	150 kVA 480V primary, 208Y/120V 3 ph, 4-wire Secondary	1	
Standby Distribution Power Panel	600A, 208/120V, 3-ph, 4-wire panel with main breaker	1	
Standby Receptacles Panels	225A, 208/120V, 3ph, 4-wire, 42 circuits panel with a main breaker.	4	
Standby Power Equipment Panels	225A, 480/277V, 3-ph, 3-wire, 42 circuits panel with a main breaker.	1	
Standby Motor Control Center Additional Emergency 150 kW Power Capacity	600A, 480/277V, 3-ph, 3-wire,	1	
Normal Power Distribution Equipment			
Distribution Panelboard	400A 480/277V, 3-ph, 4-wire with main breaker	1	
Lighting Panels	100A, 480/277V, 3-ph, 4-wire, 42 circuit panel with main lugs only.	1	
Distribution Step Down Transformers	75 kVA, 480V, primary, 208Y/120V 3 ph, 4-wire secondary	1	
Distribution Power Panels	400A, 208/120V, 3-ph, 4-wire panel with main breaker	1	
Panelboards	225A, 208/120V, 3ph, 4-wire, 42 circuits panel with a main breaker	TBD	

IV. Lighting System

A. A lighting system for vivarium illumination will be provided.

B. The vivarium lighting system will consist of energy efficient sealed and gasketed wet location listed fluorescent fixtures.

C. Exit signs will be State Fire Marshall approved LED type, located in all paths of egress.

D. Life Safety lighting will be provided by unswitched branch circuits. These unswitched branch circuits will be fed from life safety lighting panel.

E. Lighting Levels (in footcandles):

Animal Holding Rooms:	-	30/90 (bi-level)
Circulation:	-	15-20
Office:		
Task	-	40-60
General	-	30
Mechanical/Electrical:		
Task	-	40
General	-	10-20
Restrooms:	-	10-20

F. Lamps and Ballasts:

1. All lamps shall be TCLP compliant.

2. Generally, fluorescent lamps will be 4 foot programmed-start with a 4100°K color temperature and a minimum color rendering index of 85 or greater.

3. Ballast will meet State of California standards, be UL listed, high-frequency solid state, high power factor, class A with auto-resetting built-in thermal protection. Electronic ballasts will have a maximum total harmonic distortion of 10 percent.

G. Lighting Control System:

1. Core elements such as circulation corridors, equipment areas and restrooms along with the will be controlled by a programmable time clock.

2. The lighting control for each animal room will consist of two switching devices. The first device will be provided by UCSB approved manufacturer and will control the middle lamp of each three-lamp fixture and will provide a programmable automatic control for the light/dark cycle on adjustable time and duration schedule for each animal room. The second device will provide control for the cleaning cycle and will be a motion sensor or a timer that will control the remaining two lamps of the three-lamp fixtures. The low and high level lighting can be bypassed by manual room light switches. Animal holding rooms shall each be equipped with a light sensing device to indicate remotely the status of the lights in a specific room.

V. Telecommunications System

A. Refer to previous telecom plans described in the Master Plan DPP.

B. The Vivarium's telecom requirements will be consistent with campus standards and will be planned and developed in consultation with campus data/telecommunication staff during the design phase.

VI. Fire Alarm System

A. The fire alarm system for the vivarium will be part of the building fire alarm system.

B. The following initiating devices shall be provided, in accordance with NFPA 72:

1. Area Smoke Detectors
2. Duct Mounted Smoke Detectors
3. Heat Detectors
4. Manual Pull Stations
5. Monitoring Modules (for Fire Protection Systems and devices)
6. Addressable Control Modules (for output signals to other “systems”)

C. The flowing Notification devices shall be provided in accordance with NFPA 72 and ADA requirements:

1. Horns.
2. Combination horn/strobe devices
3. Strobe devices.

D. The following systems shall be interfaced with the fire alarm system for control:

1. HVAC Fan Systems – Fan shutdown/restart/exhaust/purge
2. HVAC Fire/Smoke and Smoke Dampers – Control & Status
3. Smoke Doors – Release
4. Security Systems – Fail-Safe release

E. Manual Pull Stations:

1. Manual pull stations will be provided at each floor egress and will be spaced, such that the travel distance to any pull station is less than 200'-0".

2. Pull stations will be of a rugged construction, double-action of the non-coded type with a key reset switch.

F. Smoke Detectors:

1. Smoke detectors will also be located at elevator vestibules, electric rooms, telecom rooms, equipment rooms, and other locations as required by code. Duct smoke detectors will be located at each air-handling unit and combination fire smoke damper.

2. Smoke detectors will be the analog type to differentiate between a dirty head (requiring service) and detection of smoke.

G. Heat Detectors:

1. Heat detectors will be provided in areas which are not feasible for smoke detectors such as elevator machine rooms, mechanical spaces venting steam.

H. Alarm Indicating Appliances:

1. Visual strobe units will meet the requirements of ADA, UL and NFPA. A strobe unit will be provided at locations dictated by code.

2. Audible units in public spaces will be horns with a peak output of 89 dBA at 10'-0".

3. Utilization of low frequency horns in vivarium area will be discussed during schematic design.

VII. Plumbing System

A. Vivarium Design Criteria

1. A non-potable hot and cold water piping system supplied from the Laboratory system shall be provided to all of the vivarium area sinks and equipment except handwashing sinks which will be supplied from the domestic system. For specific requirements, refer to the room data sheets.

2. An animal automated drinking water system will be provided, complete with controls and a storage tank.

3. Tempered water will NOT be supplied to all emergency showers and eyewashers.

4. Vacuum will be supplied from the central system to equipment and outlets.

5. Compressed air will be supplied from a central system to equipment and outlets.

6. Specialty gases will be provided by point of use cylinders as required. Location of cylinders and distribution will be further defined in the next phase of the design.

7. RO water will be supplied through a continuous piping loop from the central system.

8. Waste from chemical room sinks, handwash sinks, floor drains, cage and rack washer area drains and equipment drains will be piped to the laboratory waste system.

B. Sanitary Waste and Vent System

1. A complete sanitary waste and vent system throughout the entire Vivarium area, serving the toilet rooms, mechanical equipment and floor drains. Systems shall run by gravity flow to site sewer. The vent system shall be cast iron with hub and spigot, or no hub joints. Sanitary waste system shall be wrapped (20 mil. Polyethylene tape with 50% overlap) stainless steel schedule 40 pipe with mechanical joints. Use of pvc piping will be further evaluated in the next phase of the design.

C. Cold Water Systems

1. A complete domestic cold water system shall be provided throughout the vivarium. The system shall be designed to provide a minimum pressure of 35 psi at the highest/furthest outlet.

2. All domestic type fixtures shall be supplied from the domestic water system. Water make-up to the mechanical equipment shall be supplied through local backflow preventers.

3. A dedicated non-potable cold water system will be provided to supply water to the sinks and equipment requiring one. The system will be separated by the use of duplex reduced pressure backflow preventers.

4. The piping will be Type L copper with lead free soldered joints. Piping will be sized for a maximum velocity of 8 fps. The piping will not be insulated.

D. Hot Water Systems

1. Complete domestic hot water and hot water circulation systems throughout the vivarium, to serve the toilet, pantry, etc., areas will be provided. The hot water shall be supplied from gas fired instantaneous duplex water heater 180 gph capacity. Hot water shall be distributed throughout the vivarium at a temperature of 120°F. A hot water return system shall be provided to maintain the hot water supply temperature. A hot water recirculation pump shall be provided, it shall operate when the temperatures of the hot water system drops to 110°F.

2. A separated dedicated non-potable hot water system with duplex gas fired water heaters will supply hot water to the sinks and equipment. The system will be supplied from the non-potable cold water system. Hot water shall be distributed throughout the building at a temperature of 120°F.

3. The piping will be Type L copper with lead free soldered joints. Piping will be sized for a maximum velocity of 8 fps. This piping will be insulated.

E. Animal Automated Drinking Water System

1. An Animal Watering System Package will be provided to serve all animal holding rooms in the vivarium. As part of the package a monitoring/control system will provide automatic flushing of the animal water distribution loops, water leak detection, water pressure monitoring as well as pH adjustment or chlorination.

2. Storage for 12 hours of animal room use will be provided by a storage tank located downstream of the Animal Watering System Package.

3. At each suite of holding rooms a pressure reducing station will be provided to lower the system pressure to a suitable pressure for animal drinking. Downstream of the pressure

reducing station, piping will be looped through the holding rooms as required. At the end of each loop there will be a solenoid valve for flushing out stagnant water replenishing it with fresh water.

4. The animal watering system will consist of the Animal Watering System Package, pressure reducing stations, interconnect stations (with hose cleaning apparatus), watering manifolds, flushing valves, sanitization injection ports, etc.

5. Distribution piping upstream and downstream of the pressure reducing stations will be stainless steel piping.

6. The system will include a storage tank for a 12 hour reserve capacity. All pumps will be sized at 100% expected flow requirement. 100% stand-by capacity will be available when one pump is in operation.

F. Vacuum System

1. A complete vacuum system will be provided throughout the vivarium. The system shall be supplied from a duplex vacuum pump utilizing dry technology for Laboratory use. The system shall be connected to the bench outlets and shall provide 0.5 CFM with 22 inch Hg at each outlet with a total system drop of 2 inch Hg. Vacuum piping shall be copper Type L tubing with soldered joints.

G. Compressed Air System

1. Vivarium compressed air will be provided from a central system.

2. Compressed air to animal procedure rooms (requiring compressed air) will be distributed at a pressure of 100 psi and dried to 2.8 grains/lb at line pressure and filtered to 3 micrometers maximum particle size, and hydrocarbons remove to below 1 ppm.

3. The system will provide 1 cfm per vivarium equipment with a minimum 50 psig at the furthest equipment and a maximum system pressure drop of 5 psi.

4. 100 psi system will be provided in the main supply with pressure reducing valves at the outlets. Outlets will be designed to provide 1 cfm per outlet at 30 psi of pressure. Localized pressure regulators will be provided to ensure the required pressures are satisfied.

5. The compressed air piping system will consist of (cleaned and capped) Type L copper pipe and wrought copper fittings with brazed joints from a duplex 10 hp compressor rated at 60 scfm.

6. Purification system will consist of a coalescing filter, desiccant air dryer, carbon absorber, particulate after-filter and associated devices. An air receiver will also be provided.

7. The distribution system will be sized so that the uniform friction loss does not exceed 10% of the delivered pressure and the velocity does not exceed 4,000 feet per minute. Branch lines will be taken off the top of the mains.

H. Specialty Gas Systems

1. Special gases will be provided by local gas cylinder stations located in designated closets adjacent to the areas served. Multi-station manifolds with regulators and wall brackets will be provided. Manifolds will be provided with provision to send low and/or high gas pressure alarms to BMS, should it be desired. Each outlet will be assigned a load value of 1.0 cfm per outlet.

2. Special gases will be distributed in copper Type L tubing, ACR cleaned and capped fittings with silver solder brazed joints. All oxygen system valve and components shall be manufactured and listed for oxygen service.

3. These systems will be supplied locally and will be furnished and installed by others.

I. Softened and Reverse Osmosis (RO) Water Systems

1. A soft water and RO system will be provided by the a central RO system. A continuous loop will be designed to maintain the purity of the water. The system is intended to provide CAP Type II (1 megohm-cm) grade water to each lab sink and to specific laboratory equipment (glassware washer, etc). The system will include socket fused PVDF or stainless steel piping with diaphragm valves. Piping layout will be looped to eliminate dead legs including equipment drops down into walls. The system will be rated for 20 gpm continuous flow.

2. Point of use local use polishers will be provided at selected sinks within the vivarium, as specified in the vivarium equipment and furnishings section of this report.

3. Soft cold water supply will be supplied from the central system to supply vivarium equipment requiring soft water, clean steam humidifiers, and other designated equipment.

J. Natural Gas

1. The natural gas system shall be an extension of the municipal distribution system to the vivarium from lab system. A gas supply shall be provided to feed the gas fired equipment. The distribution system shall include all piping, fittings, valves, vents, regulators and connections to suit requirements. Natural gas piping shall be Schedule 40 black steel with threaded joints for piping smaller than 2-1/2" and welded fittings for larger piping.

K. Vivarium Equipment

1. All countertops, sinks, cabinet work, shelves and other equipment or furnishings shall be furnished and installed by the vivarium Equipment Subcontractor. The Plumbing Subcontractor shall install and provide all connections to the vivarium systems for all faucets and gas, compressed air and vacuum outlets. In general, all sinks will be integral with countertops and set in place complete with waste outlet. Once the units are set in place, the Plumbing Subcontractor shall connect the required services.

2. All biological safety cabinets and hoods (if any) shall be furnished and installed by the vivarium Equipment Subcontractor and be erected in place, complete with all integral piping, ready for service connections, including waste.

3. Sinks located in the vivarium shall be provided with wrist handles.

L. Safety Equipment

1. Emergency showers/eyewashes. Location will be provided by lab planner. Vivarium sinks shall be provided with eyewash units and will be specified by lab planner. Eyewash drain will be terminated below the fixture with an open pipe for test water capture.

Preliminary Major Plumbing Equipment/Capacities List Serving Vivarium

Service	Capacities
Hot water and hot water circulating equipment	180 gph capacity with full redundancy
Industrial hot water and hot water circulating equipment	90 gpm, storage type with full redundancy
Animal drinking water system (Vivarium specific system)	Animal automated drinking water system package with 12 hours of animal room use storage capacity
Vacuum System	The system capacity is 50 scfm with full redundancy
Compressed Air System	The system capacity is 60 scfm with full redundancy
Softened and reverse osmosis water system	The RO system will be rated for 20 gpm continuous flow. The softened water will be rated for 90 gpm.

VIII. Fire Protection System

A. Vivarium Design Criteria

1. A complete wet sprinkler/standpipe combination fire protection system shall be provided throughout the vivarium. Cold rooms will be provided with dry pendent heads off of the wet system. High temperature sprinkler heads shall be provided in the glasswash, area near large autoclaves and/or cage washers.

2. Sprinkler heads within animal rooms shall be vermin proof totally sealed type heads. Gasketed cover will be provided for ease of cleaning.

B. Sprinklers

1. The sprinklers system shall be hydraulically designed to meet the following densities:

a. Light hazard - 0.1 gpm per sq. ft. over the most remote 1500 sq. ft.

b. Ordinary Hazard Group 2 - 0.2 gpm per sq.ft. over the most remote 1500 sq.ft.

c. Ordinary Hazard Group H-8 - 0.18 gpm per sq. ft. over the most remote 3000 sq. ft.

d. Protection area per sprinkler head shall be:

i. Light hazard - 200 square feet - smooth ceiling

168 square feet - other types of construction

ii. Ordinary hazard- 130 square feet

e. Application

i. Light hazard - Classrooms
Offices

ii. Ordinary hazard- Mechanical Rooms
Storage Rooms

iii. Ordinary hazard- Group H8 Laboratories

PART II - VIVARIUM

EQUIPMENT SCHEDULE

8.0.0

GROUP 1 EQUIPMENT

EQ-01	**Safety Shower/Eyewash**		
	Watersaver CTSSBF2150		
		Location	Dirty Cage Wash, Necropsy
	Justification: Lab Safety required by code	**Dimensions**	21" width, 33" height, 3.5" depth
		Plumbing	Water, drain at eyewash

EQ-02	**Chemical Fume Hood**		
	Variable Air Volume		
	Labconco Protector XL	**Location**	Necropsy
	Justification: Lab safety required for use of volatile chemicals	**Dimensions**	60" width, 39" depth, 86"height
		Exhaust	600 cfm at 18" sash opening
		Plumbing	cold water, drain, gas and vacuum (preplumbed)
		Electrical	115v (prewired)

EQ-03	**Bulk Autoclave**		
	Getinge 122222		
	Pit mounted	**Location**	Dirty Cage Wash
	Justification: required for sterilization of cages and cage racks	**Chamber Dimensions**	49" width, 86" height, 86" depth
		Exterior Dimensions	140" width, 115" height, 108" depth
		Plumbing	Steam, cold water, compressed air, drain, condensate return
		Electrical	460v 3ph 75amp

EQ-04	**Cage & Rack Washer**		
	Getinge 112222 Pit Mounted	**Location**	Dirty Cage Wash
	Justification: required for washing of cages and cage racks	**Chamber Dimensions**	46" width, 87" depth, 87" height
		Exterior Dimensions	125" width, 107" depth, 115" height
		Plumbing	Cold water, hot water, pure water, compressed air, drain, steam, condensate return
		Mechanical	7" exhaust; 470 cfm connect to building exhaust with air gap
		Electrical	480v 3 ph

EQ-06	**Bedding Disposal System**		
	Hapman Tube Conveyor System Includes Z style conveyor and cage dump station	**Location**	Dirty Cage Wash
		Exterior Dimensions	~36" width, 200' length, 36" height
	Justification: provides for removal of bedding waste	**Electrical**	208v 3ph 20amp

EQ-07	**Bedding Dispenser**		
	Getinge 3600 with dust collection system	**Location**	Clean Cage Wash
	Justification: provides clean bedding in cages	**Exterior Dimensions**	83" width, 74" height, 96" length
		Mechanical	Exhaust: 4 1/2" OD, 650 cfm
		Electrical	120v 60hz 1ph 30amp 3 wire with disconnect switch

EQ-08	**Automatic Watering System**		
	SE Lab Group		
		Location	Controller in Clean Cage Wash
	Justification: provides drinking water to animals		RO Unit in mechanical room
		RO Unit Exterior Dimensions	~60" width, 72" height, 36" depth
		Controller Exterior Dimensions	~30" width, 30" height, 12" depth
		Plumbing	Cold water, pure water
		Electrical	120v 1ph 30amp

EQ-09	**Necropsy Table**		
	Scientek SNT		
		Location	Necropsy Room
	Justification: provides ventilated workspace for necropsy procedures	**Exterior Dimensions**	60" length, 54" height, 30" width
		Plumbing	cold water, hot water, drain
		Mechanical	Exhaust: 600 cfm @ .25" SP
		Electrical	120v 1ph 15amp

EQ-12	**4' Biological Safety Cabinet**		
	Labconco #3441001		
	Biological Safety Cabinet Class II Type B1 100% exhaust	**Location**	Quarantine Room
	Justification: provides protection from air borne pathogens	**Exterior Dimensions**	~55" length, 73" height, 32" width
		Mechanical	Exhaust: 743-771 cfm Provide thimble exhaust connection
		Electrical	115v 1ph 12amp

EQ-13	**6' Biological Safety Cabinet**		
	Labconco #3641001		
	Biological Safety Cabinet	**Location**	ABSL3 Laboratory Suite
	Class II Type B1 100% exhaust		
	Provide (2) biosafety cabinets as part of initial construction for ABSL3 suite	**Exterior Dimensions**	~74" length, 73" height, 32" width
		Mechanical	Exhaust: 1111 - 1151 cfm Provide thimble exhaust connection
	Justification: provides protection from air borne pathogens	**Electrical**	115v 1ph 12amp

EQ-14	**Isolation Cubicle**		
	BH, Inc.		
	Provide (2) isolation cubicles in Quarantine Room	**Location**	Quarantine Room
		Exterior Dimensions	~96" length, 111" height, 48" width
	Justification: provides sterile housing area for quarantine of new rodents	**Electrical**	115v 1ph 12amp

EQ-15	**Autoclave- Medium**		
	Cabinet enclosed		
	Double Door	**Location**	ABSL3 Lab
	Getinge 744LS Biocontainment		
	Push Button Digital Control Pass thru with bioseal	**Chamber Dimensions**	26" width, 36" height, 53" length
	Justification: provides sterilization of potential biohazard material	**Exterior Dimensions**	48" width; 52" depth, 71" height
		Plumbing	Pure water, compressed air, drain, steam
		Electrical	460v 3 ph 75 amp

GROUP 3 EQUIPMENT

EQ-10	**Cage Rack**		
	Animal Care Systems #C89100P 100 cages per rack Provide (30) rotary cage racks with (100) cages per rack for a total of (3,000) cages as part of initial construction Justification: provides ventilated cages for mice and rats	**Location**	Holding Rooms
		Exterior Dimensions	~40" length, 78" height, 39" width
		Mechanical	60 cfm exhaust for each rack connected to building exhaust system
		Electrical	120v 1ph 15amp

EQ-11	**Animal Change Station**		
	Labconco #3830000 Puricare Vertical Flow Station Provide (4) animal changing stations as part of initial construction Justification: provides sterile work area in which cages can be changed	**Location**	Holding Rooms
		Exterior Dimensions	~53" length, 87"height, 30" width
		Electrical	115v 1ph 12amp

FUTURE EQUIPMENT

EQ-05	Tunnel Washer (future)		
	Getinge 3236		
	recessed thru one wall	**Location**	Dirty Cage Wash
	36" belt		
	does not include bedding disposal unit as the Hapman bedding disposal system will be used and will have its own bedding disposal hopper.	**Exterior Dimensions**	60" width, 168" length, 96" height
	With 4' dryer.	**Plumbing**	steam, condensate return, hot water, cold water, drain, sump, compressed air
	Justification: allows for future expansion of vivarium with connection to future buildings	**Mechanical**	18"exhaust; 2,200 cfm static pressure: 0.5
		Electrical	460v 3ph 34 amp

PART III

SCHEDULE / COST

SCHEDULE

1.0.0

SECTION 1.0.0

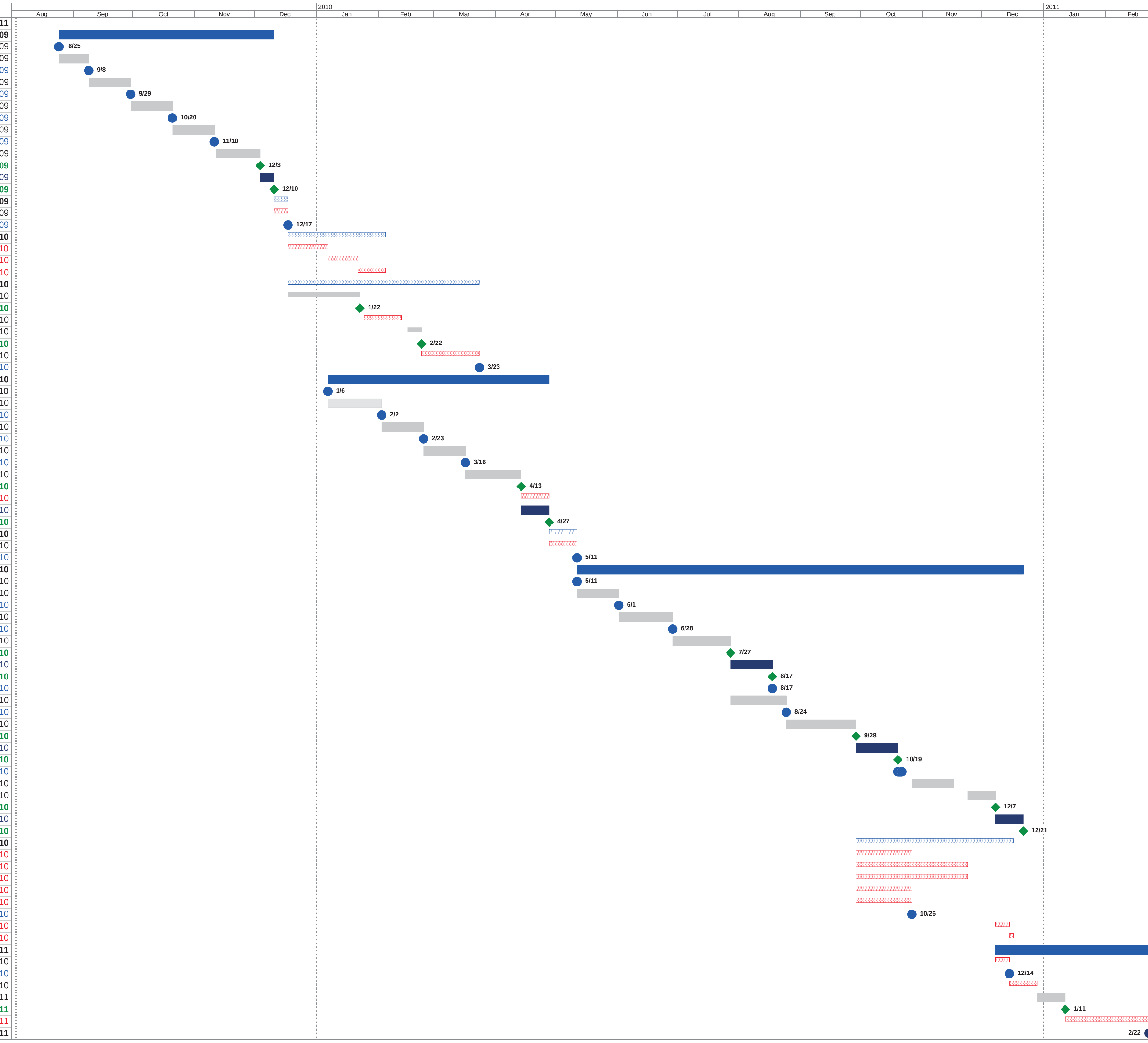
SCHEDULE OVERVIEW

The proposed schedule represents a careful analysis of anticipated work efforts balanced with key milestone dates. Proposed dates and overall schedule is subject to confirmation prior to commencing design.

Key Dates:

Building Committee Meeting #1 / Kick-Off	September 8, 2009
Building Committee Meeting #2	September 29, 2009
Building Committee Meeting #3	October 20, 2009
Building Committee Meeting #4 / DRC Presentation	November 10, 2009
Schematic Design Submittal	December 3, 2009
Value Engineering Workshop #1	December 17, 2009
Building Committee Meeting #5	February 2, 2010
Building Committee Meeting #6	February 23, 2010
Building Committee Meeting #7	March 16, 2010
UC Regent's Presentation	March 23, 2010
Design Development Submittal	April 13, 2010
Value Engineering Workshop #2	May 11, 2010
Steering Committee Meeting #1	June 1, 2010
Steering Committee Meeting #2	June 28, 2010
50% Working Drawings Submittal	July 27, 2010
50% Cost Reconciliation	August 17, 2010
Steering Committee Meeting #3	August 24, 2010
90% Working Drawings Submittal	September 28, 2010
90% Cost Reconciliation	October 20-21, 2010
Final Working Drawings Submittal	December 7, 2010
Start of Construction	February 22, 2011

ID	Task Name	Duration	Start	Finish
1	**Design Schedule**	**378 days**	**Tue 8/25/09**	**Tue 2/22/11**
2	**Schematic Design**	**74 days**	**Tue 8/25/09**	**Thu 12/10/09**
3	NTP - Signed Contract	0 days	Tue 8/25/09	Tue 8/25/09
4	Kick-Off Meeting Preparation	10 days	Tue 8/25/09	Tue 9/8/09
5	Building Committee Meeting # 1 (Kick-Off)	0 days	Tue 9/8/09	Tue 9/8/09
6	Document Preparation	15 days	Wed 9/9/09	Tue 9/29/09
7	Building Committee Meeting # 2	0 days	Tue 9/29/09	Tue 9/29/09
8	Document Preparation	15 days	Wed 9/30/09	Tue 10/20/09
9	Building Committee Meeting # 3	0 days	Tue 10/20/09	Tue 10/20/09
10	Document Preparation	15 days	Wed 10/21/09	Tue 11/10/09
11	Building Committee Meeting # 4 / DRC	0 days	Tue 11/10/09	Tue 11/10/09
12	Complete Submittal	14 days	Thu 11/12/09	Thu 12/3/09
13	**Schematic Submittal**	**0 days**	**Thu 12/3/09**	**Thu 12/3/09**
14	Cost Estimate	5 days	Fri 12/4/09	Thu 12/10/09
15	**Cost Estimate Submittal**	**0 days**	**Thu 12/10/09**	**Thu 12/10/09**
16	**VE - Schematic Design**	**5 days**	**Fri 12/11/09**	**Thu 12/17/09**
17	VE Team Document Review	5 days	Fri 12/11/09	Thu 12/17/09
18	VE Team Meeting / Workshop	0 days	Thu 12/17/09	Thu 12/17/09
19	**Approvals - Schematic Design**	**30 days**	**Fri 12/18/09**	**Thu 2/4/10**
20	DRC Schematic Design Approval	10 days	Fri 12/18/09	Wed 1/6/10
21	CPC Information / Discussion Item	10 days	Thu 1/7/10	Thu 1/21/10
22	CPC SD Approval	10 days	Fri 1/22/10	Thu 2/4/10
23	**Regents Design Review & Project Approval**	**62 days**	**Fri 12/18/09**	**Tue 3/23/10**
24	Prepare Presentation Graphics	21 days	Fri 12/18/09	Fri 1/22/10
25	**Draft Graphics Submittal**	**0 days**	**Fri 1/22/10**	**Fri 1/22/10**
26	OP Design Review	15 days	Mon 1/25/10	Fri 2/12/10
27	Prepare Final Graphics	5 days	Tue 2/16/10	Mon 2/22/10
28	**Final Graphics Submittal**	**0 days**	**Mon 2/22/10**	**Mon 2/22/10**
29	Regents Queue	21 days	Tue 2/23/10	Tue 3/23/10
30	Regents Committee G & B SD & Project Approval	0 days	Tue 3/23/10	Tue 3/23/10
31	**Design Development**	**76 days**	**Wed 1/6/10**	**Tue 4/27/10**
32	Authorization to Proceed - NTP	0 days	Wed 1/6/10	Wed 1/6/10
33	Kick-Off Meeting Preparation	18 days	Thu 1/7/10	Tue 2/2/10
34	Building Committee Meeting # 5 (Kick-Off)	0 days	Tue 2/2/10	Tue 2/2/10
35	Document Preparation	14 days	Wed 2/3/10	Tue 2/23/10
36	Building Committee Meeting # 6	0 days	Tue 2/23/10	Tue 2/23/10
37	Document Preparation	15 days	Wed 2/24/10	Tue 3/16/10
38	Building Committee Meeting # 7	0 days	Tue 3/16/10	Tue 3/16/10
39	Document Preparation	19 days	Wed 3/17/10	Tue 4/13/10
40	**Design Development Submittal**	**0 days**	**Tue 4/13/10**	**Tue 4/13/10**
41	Agency SFM & DSA DD Review & Approval	10 days	Wed 4/14/10	Tue 4/27/10
42	A/E Cost Estimate & Peer Estimate	10 days	Wed 4/14/10	Tue 4/27/10
43	**Cost Estimate Submittal**	**0 days**	**Tue 4/27/10**	**Tue 4/27/10**
44	**VE - Design Development**	**10 days**	**Wed 4/28/10**	**Tue 5/11/10**
45	VE Team Document Review / Estimate Reconciliation	10 days	Wed 4/28/10	Tue 5/11/10
46	VE Team Meeting	0 days	Tue 5/11/10	Tue 5/11/10
47	**Working Drawings and Specifications**	**158 days**	**Tue 5/11/10**	**Tue 12/21/10**
48	Authorization to Proceed - NTP	0 days	Tue 5/11/10	Tue 5/11/10
49	Document Preparation	14 days	Wed 5/12/10	Tue 6/1/10
50	Steering Committee Meeting #1	0 days	Tue 6/1/10	Tue 6/1/10
51	Document Preparation	19 days	Wed 6/2/10	Mon 6/28/10
52	Steering Committee Meeting #2	0 days	Mon 6/28/10	Mon 6/28/10
53	Document Preparation	20 days	Tue 6/29/10	Tue 7/27/10
54	**50% Construction Document Submittal**	**0 days**	**Tue 7/27/10**	**Tue 7/27/10**
55	Cost Estimate	15 days	Wed 7/28/10	Tue 8/17/10
56	**50% Cost Estimate Submittal**	**0 days**	**Tue 8/17/10**	**Tue 8/17/10**
57	Estimate Reconciliation Meeting	0 days	Tue 8/17/10	Tue 8/17/10
58	Document Preparation	20 days	Wed 7/28/10	Tue 8/24/10
59	Steering Committee Meeting #3	0 days	Tue 8/24/10	Tue 8/24/10
60	Document Preparation	25 days	Wed 8/25/10	Tue 9/28/10
61	**90% Review Submittal (DSA | SFM | Peer | Constructability)**	**0 days**	**Tue 9/28/10**	**Tue 9/28/10**
62	Cost Estimate	15 days	Wed 9/29/10	Tue 10/19/10
63	**90% Cost Estimate Submittal**	**0 days**	**Tue 10/19/10**	**Tue 10/19/10**
64	Estimate Reconciliation Meeting	2 days	Wed 10/20/10	Thu 10/21/10
65	Document Preparation / Incorporate Review Comments	15 days	Wed 10/27/10	Tue 11/16/10
66	Backcheck	10 days	Wed 11/24/10	Tue 12/7/10
67	**Final Construction Document Submittal / Bid Submittal**	**0 days**	**Tue 12/7/10**	**Tue 12/7/10**
68	Cost Estimate	10 days	Wed 12/8/10	Tue 12/21/10
69	**Final Cost Estimate Submittal**	**0 days**	**Tue 12/21/10**	**Tue 12/21/10**
70	**Approvals and Reviews**	**57 days**	**Wed 9/29/10**	**Thu 12/16/10**
71	Faculty & Campus Design Review	20 days	Wed 9/29/10	Tue 10/26/10
72	SFM Review	40 days	Wed 9/29/10	Tue 11/23/10
73	DSA Review	40 days	Wed 9/29/10	Tue 11/23/10
74	Peer Team Review	20 days	Wed 9/29/10	Tue 10/26/10
75	Constructability Review	20 days	Wed 9/29/10	Tue 10/26/10
76	Peer Review Meeting	0 days	Tue 10/26/10	Tue 10/26/10
77	DSA Stamp	5 days	Wed 12/8/10	Tue 12/14/10
78	SFM Stamp	2 days	Wed 12/15/10	Thu 12/16/10
79	**Bidding / Construction Award**	**55 days**	**Wed 12/8/10**	**Tue 2/22/11**
80	Preparation / Advertisement	5 days	Wed 12/8/10	Tue 12/14/10
81	Pre-Bid Conference	0 days	Tue 12/14/10	Tue 12/14/10
82	GC Q&A	10 days	Wed 12/15/10	Tue 12/28/10
83	Prepare Addendum	10 days	Wed 12/29/10	Tue 1/11/11
84	**Final Addendum Submittal**	**0 days**	**Tue 1/11/11**	**Tue 1/11/11**
85	Bid Award	30 days	Wed 1/12/11	Tue 2/22/11
86	**Construction Start**	**0 days**	**Tue 2/22/11**	**Tue 2/22/11**



Project: 09-08-04_UCSB Proposed De
Date: Mon 8/3/09

Task | Split | Progress | Meetings | Summary | Project Summary | External Tasks | External Milestone | Deadline

Page 1

OPINION OF PROBABLE COST

2.0.0

SECTION 2.0.0 **OPINION OF PROBABLE COST**

The proposed project targets a construction budget of $50,375,000, including:

$35,100,000 for construction of the Base Building
$11,775,000 for construction of the Vivarium
$3,500,000 for site work and landscape

The Opinion of Probable Cost, located on the following pages, is developed directly from the Proposed Project Program, Blocking & Stacking Concept 3B, Building System Requirements and other relevant information contained within this document as well as the original DPP. It represents a three-story concept with a full basement and can be summarized as follows:

Base Building	34,258 asf	62,300 gsf	$35,130,000
Vivarium + ABSL-3	8,778 asf	15,960 gsf	$11,585,000
Site Work			$3,475,000
Total			$50,190,000

The Opinion of Probable Cost has been developed to provide flexibility in understanding the cost associated with the various project components. For cost evaluation purposes, the project has been divided into six categories, summarized on page 5. Detailed cost breakdowns for each category can be found on the following pages:

Base Building	page 7
Site Work	page 47
Core & Shell for Vivarium & ABSL-3 Suite	page 19
Vivarium Fitout	page 35
ABSL-3 Suite Fitout	page 27
Vivarium Equipment	page 41
Vivarium Shell Strategy	page 5

The Vivarium equipment includes the purchase costs associated with the minimum number of cages and cage racks required for the Vivarium to be operational, about 20 cage racks. The deduction of cage racks listed under the Vivarium Shell Strategy on Page 5 eliminates the purchase costs associated with these 20 cage racks.

CONCEPT DESIGN
COST MODEL

for

Bioengineering Building
University of California, Santa Barbara
Santa Barbara, California

August 4, 2009

CONCEPT DESIGN COST MODEL

for

Bioengineering Building
University of California, Santa Barbara
Santa Barbara, California

Moore Ruble Yudell Architects & Planners
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Santa Monica, CA 90405

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August 4, 2009

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BASIS OF COST MODEL

Cost Model Prepared From	Dated	Received
Drawings issued for concept design		
Building stacking diagrams - Concept 3B	07.21.09	07.22.09
Discussions with the Project Architect and Engineers		

Conditions of Construction

The pricing is based on the following general conditions of construction

A start date of June 2011

A construction period of 24 months

The general contract will be negotiated with one preselected general contractor and competitively bid among qualified main subcontractors

There will not be small business set aside requirements

The contractor will be required to pay prevailing wages

There are no phasing requirements

The general contractor will have full access to the site during normal business

INCLUSIONS

The project consists of a 16,250 gross square foot vivarium and ABSL-3 suite which is to be in the basement of the UCSB Bioengineering building, and the 62,300 gross square foot laboratory building.

The following assumptions have been made for building systems:

Foundations are included in the main building core and shell costs, with a provision for incremental cost allocated to this model. Excavation, shoring and layback are also included, with the assumption that 50% of the excavation can be open cut.

Vertical Structure includes concrete columns, shear walls and retaining walls.

Floor and roof structure includes a slab on grade and an interstitial slab, suspended floors and roof slabs.

Exterior Cladding includes and allowance for medium quality cladding panels, with 35% glazing, exterior hollow metal and glazed entrances, screen walls, sunscreens, and interior face to outside wall.

Roofing, waterproofing and skylights includes waterproofing to basement walls and elevator pits, green roof system, roofing, insulation and roof glazing.

Interior Partitions, Doors and Glazing includes interior gypsum board and steel stud partitions, interior glazing, interior doors, epoxy paint, sealing and caulking.

Interior Finishes include fluid applied flooring to the vivarium, resilient flooring to the labs and lab support, carpet to the office, conference and administrative areas, integral base, epoxy paint to partitions, gypsum board ceilings, epoxy paint.

Function Equipment and Specialties includes all general building equipment, specialties and accessories and includes all fixed specialty vivarium equipment.

Vertical Circulation includes stairs and elevators.

Plumbing includes sanitary and institutional fixtures (installation and local connection only), floor drains, hose bibs, water heating equipment, laboratory process generation equipment and distribution pipework, including air, vacuum, industrial hot and cold water, DI water, special gases, acid waste and test port, gas and roof drainage.

Heating, Ventilating & Air Conditioning includes chilling and heating, pipework distribution including heated hot, chilled, steam and condensate return, air handling units, fan-coil units and terminal boxes. Air distribution and return, including laboratory exhaust ventilation, building management and laboratory pressurization controls and general ventilation.

Electrical includes normal power generation and distribution, emergency power, machine and equipment and user convenience power, lighting, telephone/data, MATV and audio/visual (conduit and cable), complete fire alarm system and allowance for security.

Fire protection includes a complete automatic wet sprinkler system.

INCLUSIONS

BIDDING PROCESS - MARKET CONDITIONS

This document is based on the measurement and pricing of quantities wherever information is provided and/or reasonable assumptions for other work not covered in the drawings or specifications, as stated within this document. Unit rates have been obtained from historical records and/or discussion with contractors. The unit rates reflect current bid costs in the area. All unit rates relevant to subcontractor work include the subcontractors overhead and profit unless otherwise stated. The mark-ups cover the costs of field overhead, home office overhead and profit and range from 15% to 25% of the cost for a particular item of work.

Pricing reflects probable construction costs obtainable in the project locality on the date of this statement of probable costs. This estimate is a determination of fair market value for the construction of this project. It is not a prediction of low bid. Pricing assumes competitive bidding for every portion of the construction work for all subcontractors and a negotiated bid for the general contract, with a minimum of 5 bidders for all items of subcontracted work. Experience indicates that a fewer number of bidders may result in higher bids, conversely an increased number of bidders may result in more competitive bids.

Since Davis Langdon has no control over the cost of labor, material, equipment, or over the contractor's method of determining prices, or over the competitive bidding or market conditions at the time of bid, the statement of probable construction cost is based on industry practice, professional experience and qualifications, and represents Davis Langdon's best judgment as professional construction consultant familiar with the construction industry. However, Davis Langdon cannot and does not guarantee that the proposals, bids, or the construction cost will not vary from opinions of probable cost prepared by them.

EXCLUSIONS

Owner supplied and installed furniture, fixtures and equipment

Loose furniture and equipment except as specifically identified

Audio visual equipment

Hazardous material handling, disposal and abatement

Compression of schedule, premium or shift work, and restrictions on the contractor's working hours

Testing and inspection fees

Architectural, design and construction management fees

Scope change and post contract contingencies

Assessments, taxes, finance, legal and development charges

Environmental impact mitigation

Builder's risk, project wrap-up and other owner provided insurance program

Land and easement acquisition

Cost escalation beyond a start date of June 2011

Site utility connection charges and fees

FM-200

Fire pump

Booster pump - domestic water

Sump pump and elevator pit drainage

'Grey' water

Independent 3rd Party Mechanical and Electrical Commissioning

Humidification (except for Vivarium)

UPS - By Owner

Clocks

Telephone/data 'active' equipment - including hubs, routers, LAN, servers, switches, PBX and the like

Public address/paging

OVERALL SUMMARY

	GFA	$/SF	$x1,000
Base Building			
Building	62,300 SF	563.89	35,130
Site Work			3,475
TOTAL Base Building New Construction	62,300 SF	619.67	38,606
Vivarium			
Basement Core and Shell	16,250 SF	331.64	5,389
ABSL - 3 Suite Fitout	1,055 SF	484.89	512
Vivarium Fitout	15,195 SF	283.92	4,314
Vivarium Equipment	15,195 SF	158.48	2,408
Equipment Tax			170
Vivarium Shell Strategy			
Eliminate Cage Racks (20 racks)			(428)
Behavior Rooms (1)	242 SF	(373.74)	(90)
Procedure Rooms (2)	484 SF	(461.82)	(224)
Holding Rooms - Small (2)	484 SF	(481.90)	(233)
Holding Rooms - Small (2)	484 SF	(481.90)	(233)
TOTAL Vivarium New Construction	16,250 SF	712.90	11,585
TOTAL New Construction	78,550 SF	638.96	50,190
Equipment Excluded			
Tunnel Washer			430

Please refer to the Inclusions and Exclusions sections of this report

VIVARIUM COMPONENT SUMMARY

		Base Building 62,300 SF		Vivarium C&S 16,250 SF		ABSL-3 Fitout 1,055 SF		Vivarium Fitout 15,195 SF		Viv / ABSL-3 Equip. 16,250 SF		Site 80,000 SF		Total 78,550 SF	
	Gross Area:	$/SF	$x1,000	$/SF	$x1,000	$/SF	$x1,000	$/SF	$x1,000	$/SF	$x1,000	$/SF	$x1,000	$/SF	$x1,000
1. Foundations		10.09	629	35.00	569	0.00	0	0.00	0	0.00	0	0.00	0	15.25	1,198
2. Vertical Structure		21.28	1,326	34.69	564	0.00	0	0.00	0	0.00	0	0.00	0	24.05	1,890
3. Floor & Roof Structures		38.79	2,416	28.46	463	0.00	0	0.00	0	0.00	0	0.00	0	36.65	2,879
4. Exterior Cladding		54.53	3,398	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	43.25	3,398
5. Roofing, Waterproofing & Skylights		9.15	570	4.34	71	0.00	0	0.00	0	0.00	0	0.00	0	8.15	640
Shell (1-5)		133.84	8,338	102.50	1,666	0.00	0	0.00	0	0.00	0	0.00	0	127.36	10,004
6. Interior Partitions, Doors & Glazing		37.29	2,323	3.17	52	75.83	80	30.84	469	0.00	0	0.00	0	37.22	2,923
7. Floor, Wall & Ceiling Finishes		13.75	857	1.50	24	30.00	32	20.00	304	0.00	0	0.00	0	15.49	1,217
Interiors (6-7)		51.04	3,180	4.67	76	105.83	112	50.84	772	0.00	0	0.00	0	52.70	4,140
8. Function Equipment & Specialties		26.65	1,660	2.50	41	15.00	16	2.50	38	119.88	1,948	0.00	0	47.14	3,703
9. Stairs & Vertical Transportation		10.67	665	9.23	150	0.00	0	0.00	0	0.00	0	0.00	0	10.38	815
Equipment & Vertical Transportation (8-9)		37.32	2,325	11.73	191	15.00	16	2.50	38	119.88	1,948	0.00	0	57.51	4,518
10 Plumbing Systems		37.29	2,323	22.62	368	39.91	42	20.82	316	0.00	0	0.00	0	38.82	3,049
11 Heating, Ventilating & Air Conditioning		86.41	5,384	78.45	1,275	135.68	143	94.22	1,432	0.00	0	0.00	0	104.82	8,233
12 Electric Lighting, Power & Communications		61.58	3,837	20.40	331	50.18	53	34.53	525	0.00	0	0.00	0	60.42	4,746
13 Fire Protection Systems		5.50	343	2.54	41	7.50	8	5.00	76	0.00	0	0.00	0	5.96	468
Mechanical & Electrical (10-13)		190.78	11,886	124.01	2,015	233.26	246	154.57	2,349	0.00	0	0.00	0	210.00	16,496
Total Building Construction (1-13)		**412.99**	**25,729**	**242.90**	**3,947**	**354.09**	**374**	**207.91**	**3,159**	**119.88**	**1,948**	**0.00**	**0**	**447.58**	**35,157**
14 Site Preparation & Demolition		0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	3.00	240	3.06	240
15 Site Paving, Structures & Landscaping		0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	16.31	1,305	16.61	1,305
16 Utilities on Site		0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	12.52	1,001	12.75	1,001
Total Site Construction (14-16)		**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**0.00**	**0**	**31.83**	**2,546**	**32.42**	**2,546**
TOTAL BUILDING & SITE (1-16)		**412.99**	**25,729**	**242.90**	**3,947**	**354.09**	**374**	**207.91**	**3,159**	**119.88**	**1,948**	**31.83**	**2,546**	**480.00**	**37,704**
General Conditions	12.50%	51.62	3,216	30.34	493	44.55	47	26.00	395	15.02	244	3.98	318	60.00	4,713
Contractor's Overhead & Profit or Fee	3.50%	16.26	1,013	9.54	155	14.22	15	8.16	124	4.74	77	1.25	100	18.89	1,484
PLANNED CONSTRUCTION COST	***August 2009***	**480.87**	**29,958**	**282.78**	**4,595**	**412.86**	**436**	**242.06**	**3,678**	**139.64**	**2,269**	**37.06**	**2,964**	**558.89**	**43,901**
Contingency for Development of Design	10.00%	48.09	2,996	28.31	460	41.71	44	24.22	368	2.09	34	3.70	296	53.44	4,198
Escalation to Start Date (June 2011)	3.50%	18.51	1,153	10.89	177	16.11	17	9.35	142	4.25	69	1.43	114	21.29	1,672
Construction Contingency	3.00%	16.42	1,023	9.66	157	14.22	15	8.29	126	2.22	36	1.26	101	18.56	1,458
Vivarium Equipment Tax										10.46	170			2.16	170
Vivarium Shelling Strategy										(74.37)	(1,208)			(15.38)	(1,208)
RECOMMENDED BUDGET	***June 2011***	**563.89**	**35,130**	**331.64**	**5,389**	**484.89**	**512**	**283.92**	**4,314**	**84.29**	**1,370**	**43.44**	**3,475**	**638.96**	**50,190**

BASE BUILDING AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Level B	2,600		
Level 1	21,500		
Level 2	18,250		
Level 3	18,250		
Level 4	1,700		
SUBTOTAL, Enclosed Area		62,300	
Covered area	incl.		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			62,300

Control Quantities

				Ratio to Gross Area
Number of stories (x1,000)		4	EA	0.064
Gross Area		62,300	SF	1.000
Enclosed Area		62,300	SF	1.000
Mezzanine Area		1,275	SF	0.020
Assignable Area				
Lab/Lab Support		17,831	SF	0.286
Office/Conference		13,865	SF	0.223
Lecture Hall		2,096	SF	0.034
Non-assignable program				
Building support		4,262	SF	0.068
Mechanical		5,035	SF	0.081
Grossing				
Gross up		19,211	SF	0.308
Footprint Area		21,500	SF	0.345
Volume		1,002,000	CF	16.083
Basement Volume		46,800	CF	0.751
Gross Wall Area		51,500	SF	0.827
Retaining Wall Area		11,500	SF	0.185
Finished Wall Area		40,000	SF	0.642
Windows or Glazing Area	38.83%	20,000	SF	0.321
Roof Area - Flat		21,500	SF	0.345
Roof Area - Total		21,500	SF	0.345
Roof Glazing Area		500	SF	0.008
Interior Partition Length		5,600	LF	0.090
Finished Area		62,300	SF	1.000
Elevators (x10,000)		2	EA	0.321

BASE BUILDING COMPONENT SUMMARY

	Gross Area:	**62,300 SF**	
		$/SF	$x1,000
1. Foundations		10.09	629
2. Vertical Structure		21.28	1,326
3. Floor & Roof Structures		38.79	2,416
4. Exterior Cladding		54.53	3,398
5. Roofing, Waterproofing & Skylights		9.15	570
Shell (1-5)		133.84	8,338
6. Interior Partitions, Doors & Glazing		37.29	2,323
7. Floor, Wall & Ceiling Finishes		13.75	857
Interiors (6-7)		51.04	3,180
8. Function Equipment & Specialties		26.65	1,660
9. Stairs & Vertical Transportation		10.67	665
Equipment & Vertical Transportation (8-9)		37.32	2,325
10 Plumbing Systems		37.29	2,323
11 Heating, Ventilating & Air Conditioning		86.41	5,384
12 Electric Lighting, Power & Communications		61.58	3,837
13 Fire Protection Systems		5.50	343
Mechanical & Electrical (10-13)		190.78	11,886
Total Building Construction (1-13)		**412.99**	**25,729**
14 Site Preparation & Demolition		0.00	0
15 Site Paving, Structures & Landscaping		0.00	0
16 Utilities on Site		0.00	0
Total Site Construction (14-16)		**0.00**	**0**
TOTAL BUILDING & SITE (1-16)		**412.99**	**25,729**
General Conditions	12.50%	51.62	3,216
Contractor's Overhead & Profit or Fee	3.50%	16.26	1,013
PLANNED CONSTRUCTION COST	***August 2009***	**480.87**	**29,958**
Contingency for Development of Design	10.00%	48.09	2,996
Escalation to Start Date (June 2011)	3.50%	18.51	1,153
Construction Contingency	3.00%	16.42	1,023
RECOMMENDED BUDGET	***June 2011***	**563.89**	**35,130**

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
Foundations				
Premium for additional foundation complexity, shoring and excavation. All foundations are carried in the base building.	21,500	SF	29.25	628,875
				628,875
2. Vertical Structure				
Columns and pilasters				
Concrete columns	340	CY	1,650.00	561,000
Shear walls				
Shear walls	3,450	SF	55.00	189,750
Retaining walls				
Basement walls	11,500	SF	50.00	575,000
				1,325,750
3. Floor and Roof Structure				
Floor at lowest level				
Slab on grade, perimeter haunch, subgrade, premium for stepped slabs	21,500	SF	12.50	268,750
Suspended floors				
Concrete slabs, beams, and girders	40,800	SF	31.25	1,275,000
Mezzanine	1,275	SF	37.50	47,813
Roof structure				
Concrete slabs, beams, and girders	21,500	SF	27.50	591,250
Equipment pads, equipment curbs, wall curbs				
Equipment pads, equipment curbs, wall curbs	62,300	SF	1.25	77,875
Miscellaneous				
Miscellaneous metals	62,300	SF	2.50	155,750
				2,416,438

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
4. Exterior Cladding				
Exterior Cladding	45,300	SF	75.00	3,397,500
				3,397,500
5. Roofing, Waterproofing & Skylights				
Waterproofing				
Waterproofing to elevator pits	2	EA	1,500.00	3,000
Waterproofing to walls below grade	11,500	SF	5.50	63,250
3/4" Drainage mat	11,500	SF	2.75	31,625
Filter fabric	11,500	SF	1.35	15,525
Roofing				
Roofing system including insulation	19,568	SF	14.00	273,952
Green roof system	1,932	SF	30.00	57,960
Roof glazing - allow	300	SF	125.00	37,500
Roofing accessories				
Roofing accessories	21,500	SF	1.25	26,875
Balustrade & Railing				
Glazed railing	100	SF	375.00	37,500
Caulking and sealants				
Caulking and sealants	45,300	SF	0.50	22,650
				569,837
6. Interior Partitions, Doors & Glazing				
Partitions				
Metal studs	95,000	SF	4.50	427,500
Blocking	95,000	SF	0.50	47,500
Sealing and caulking	95,000	SF	2.50	237,500
Partition surfacing				
5/8" gypsum wallboard taped & sanded	180,000	SF	5.00	900,000
Epoxy paint	40,000	SF	1.75	70,000
Paint	140,000	SF	1.75	245,000
Sound insulation				
Batt insulation	95,000	SF	1.05	99,750

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Interior doors, frames and hardware				
Doors				
Single (wood), 3'6" x 7'	160	EA	850.00	136,000
Installation	160	EA	150.00	24,000
Frames	160	EA	200.00	32,000
Hardware	160	EA	500.00	80,000
Premiums for vision panels, door lites, hold opens, closers, kick plates, push plates, auto openers, gasketing, fire ratings	160	EA	150.00	24,000
				2,323,250

7. Floor, Wall & Ceiling Finishes

Floor, wall, and ceiling finish	62,300	SF	13.75	856,625
				856,625

8. Function Equipment & Specialties

Function equipment and specialties - general	62,300	SF	3.75	233,625
Function equipment and specialties - laboratory	17,831	SF	80.00	1,426,480
				1,660,105

9. Stairs & Vertical Transportation

Stairs - egress	7	EA	25,000.00	175,000
Stairs - accent	2	EA	50,000.00	100,000
Elevators - passenger (3-stop hydraulic)	1	STP	165,000.00	165,000
Elevators - freight (4-stop traction)	1	STP	225,000.00	225,000
				665,000

10. Plumbing Systems

Sanitary fixtures and local connection pipework - low flow type (allow)	80	EA	1,875.00	150,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Institutional fixtures - local connection and emergency eyewash	17,831	SF	2.50	44,578
Sanitary waste, vent and service pipework				
Floor/trench drains and sinks, < = 6" (8/level)	30	EA	2,500.00	75,000
Hose bibs, 3/4"	1	LS	12,500.00	12,500
vent and domestic service pipework	80	EA	3,250.00	260,000
Reduced pressure backflow preventers, < =	1	LS	15,500.00	15,500
Mechanical make-up systems	1	LS	7,500.00	7,500
Water treatment, storage and circulation				
Domestic hot water generation - 75 gallon storage, 110 deg F	1	EA	12,500.00	12,500
Industrial hot water generation - 75 gallon storage, 120 deg F	1	EA	18,750.00	18,750
Circulatory pumps, 1/2 hp	2	EA	1,000.00	2,000
Laboratory service equipment				
Duplex lubricated air compressor with regenerative air dryer, 15 hp	1	LS	55,500.00	55,500
Vacuum pump, duplex (liquid ring pump), receiver, valves, muffler and controls - exhaust	1	LS	50,000.00	50,000
RO/DI - including sand filters, water softening, RO water system, pumps and deionizers	1	LS	200,000.00	200,000
Laboratory service piping, valves and insulation				
Including vacuum, air, laboratory gas, RO/DI, industrial hot and cold water, potable water, special cylinder gases, fume hood connections, accessories, monitors, valves, filters and specialties	17,831	SF	55.00	980,705
Laboratory waste and vent	17,831	SF	15.00	267,465
Natural gas				
Pipework, fittings, < = 3"	200	LF	67.50	13,500
Seismic shut-off	1	LS	10,000.00	10,000
Valves and specialties	1	LS	15,500.00	15,500
Surface water drainages and pipework, < 8"	24	EA	3,750.00	90,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Test purge and sterilize	400	HR	105.00	42,000
				2,322,998

11. Heating, Ventilation & Air Conditioning

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Heat generation and chilling equipment				
Chilling				
Packaged chillers with 410a refrigerant - E Pak technologies, 100 tons (325 SF/ton)	2	EA	100,000.00	200,000
Process equipment cooling - heat exchanger/pumps (skid-mounted)	1	LS	85,000.00	85,000
Chemical water treatment systems	1	LS	25,000.00	25,000
Heating				
Parker heating hot water boilers - 810 mbth, gas-fired (25 bth/SF)	2	EA	22,500.00	45,000
Steam generator re sterilizers, 2washers & dryers	1	LS	45,000.00	45,000
Chemical pot feeder	1	LS	12,500.00	12,500
Thermal storage and circulation				
Including steam/condensate, chilled & heating hot water circulatory equipment, variable speed drives and vibration isolation	62,300	SF	1.50	93,450
Piping, fittings, valves and insulation				
Chilled, heated hot water, steam and condensate drainage	62,300	SF	12.00	747,600
Radiant heating				
Perimeter radiant heating	1	LS	22,500.00	22,500
Air handing equipment				
Air handling units, supply/return fans, cooling and heating, air filters, variable speed control, seismic isolation - sound attenuated				
Laboratory/HEPA filtration, 100% outside air, VAV, return fan (2 cfm/SF)	40,000	CFM	7.00	280,000
Offices, supply and return fans, economizer, cooling coil (1.30 cfm/SF)	60,000	CFM	5.00	300,000
Fan-coil units, 24 hour service, chilled water coiled type	1	LS	25,000.00	25,000
Server cooling	1	LS	50,000.00	50,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Terminal boxes (1/600 SF)	80	EA	875.00	70,000
Air distribution and return (allowance)				
Galvanized sheet metal ductwork	135,000	LB	8.50	1,147,500
Specialty fumehood exhaust ductwork, stainless steel, type 316 - fumehood to point of dilution with general laboratory ductwork & BSL-3 only	15,000	LB	18.50	277,500
Flexible ductwork	2,750	LF	9.50	26,125
Dampers, volume	525	EA	75.00	39,375
Dampers, smoke/fire	1	LS	95,000.00	95,000
Insulation	95,000	SF	3.00	285,000
Sound attenuation - supply and return	100,000	CFM	0.35	35,000
Diffusers, registers and grilles	62,300	SF	2.00	124,600
Controls and instrumentation - Johnson Controls				
Direct digital energy management system - allow	465	Pts	1,350.00	627,750
Laboratory controls, variable air volume	17,831	SF	22.50	401,198
Test and balance air systems	1,150	HR	105.00	120,750
LEED Commissioning	550	HR	105.00	57,750
Unit ventilation/exhaust fans				
Laboratory, 20,000 cfm, CV - Strobic type	2	EA	67,500.00	135,000
General	1	LS	10,000.00	10,000
				5,383,598

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
12. Electrical Lighting, Power & Communication				
Main service and distribution				
Including main switchboard, metering, surge suppression, motor control, 277/120 V distribution boards, transformers, bus duct, feeder conduit and cable - allowance	1,500	kVA	350.00	525,000
Emergency power				
Emergency power generator - including 1,000 gallon belly tank, 277/120 V distribution equipment and feeders @ 33%	500	KW	825.00	412,500
UPS				by owner
Machine and equipment power				
Connections and switches, including conduit and cable				
Elevators	1	LS	15,000.00	15,000
Mechanical equipment - allow				
50 - 20 hp	5	EA	3,500.00	17,500
20 - 10 hp	15	EA	2,750.00	41,250
< 5 hp	25	EA	1,250.00	31,250
Miscellaneous connections, < 100 A - including loading dock, audio-visual, specialty, security, power hardware, fire alarm, BMS and telephone/data equipment power	1	LS	115,000.00	115,000
User convenience power				
Panelboard breakers, 120 V (allowance)	504	EA	85.00	42,840
Feeder conduit and cable	960	LF	45.00	43,200
Wire mold/receptacles, including conduit and cable (1/55 SF)	1,140	EA	300.00	342,000
Lighting				
Panelboard breakers, 277 V (allowance)	546	EA	115.00	62,790
Feeder conduit and cable	1,040	LF	45.00	46,800
Fixtures/switching, including conduit and cable	62,300	SF	13.00	809,900

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Lighting and power specialties				
Grounding	1	LS	15,000.00	15,000
Lighting control - LV relay energy management	1	LS	37,500.00	37,500
Daylight dimming	1	LS	50,000.00	50,000
Cable tray	950	LF	65.00	61,750
Telephone and communications				
Telephone/data				
Telephone/data outlets, including conduit and cable (1/100 SF)	665	EA	800.00	532,000
IDF/MDF rough-in	4	EA	15,000.00	60,000
Building backbone - fiber/copper	1	LS	55,000.00	55,000
MATV, including conduit only	1	LS	15,000.00	15,000
Audiovisual - conduit and cable	1	LS	140,000.00	140,000
Alarm and security				
Fire alarm systems	62,300	SF	4.50	280,350
Security - perimeter intrusion and lab suite entry doors	1	LS	85,000.00	85,000
				3,836,630

13. Fire Protection Systems

Automatic wet sprinkler system - complete	62,300	SF	5.50	342,650
				342,650

14. Site Preparation & Building Demolition

	N/A
	0

15. Site Paving, Structures & Landscaping

	N/A
	0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*

16. Utilities on Site

				N/A
				0

BASEMENT CORE AND SHELL AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Level B	16,250		
SUBTOTAL, Enclosed Area		16,250	
Covered area	N/A		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			16,250

Control Quantities

			Ratio to Gross Area
Number of stories (x1,000)	1	EA	0.062
Gross Area	16,250	SF	1.000
Enclosed Area	16,250	SF	1.000
Volume	292,500	CF	18.000
Basement Volume	292,500	CF	18.000
Gross Wall Area	5,750	SF	0.354
Retaining Wall Area	5,750	SF	0.354
Elevators (x10,000)	1	EA	0.615

BASEMENT CORE AND SHELL COMPONENT SUMMARY

	Gross Area:	**16,250 SF**	
		$/SF	$x1,000
1. Foundations		35.00	569
2. Vertical Structure		34.69	564
3. Floor & Roof Structures		28.46	463
4. Exterior Cladding		0.00	0
5. Roofing, Waterproofing & Skylights		4.34	71
Shell (1-5)		102.50	1,666
6. Interior Partitions, Doors & Glazing		3.17	52
7. Floor, Wall & Ceiling Finishes		1.50	24
Interiors (6-7)		4.67	76
8. Function Equipment & Specialties		2.50	41
9. Stairs & Vertical Transportation		9.23	150
Equipment & Vertical Transportation (8-9)		11.73	191
10 Plumbing Systems		22.62	368
11 Heating, Ventilating & Air Conditioning		78.45	1,275
12 Electric Lighting, Power & Communications		20.40	331
13 Fire Protection Systems		2.54	41
Mechanical & Electrical (10-13)		124.01	2,015
Total Building Construction (1-13)		**242.90**	**3,947**
14 Site Preparation & Demolition		0.00	0
15 Site Paving, Structures & Landscaping		0.00	0
16 Utilities on Site		0.00	0
Total Site Construction (14-16)		**0.00**	**0**
TOTAL BUILDING & SITE (1-16)		**242.90**	**3,947**
General Conditions	12.50%	30.34	493
Contractor's Overhead & Profit or Fee	3.50%	9.54	155
PLANNED CONSTRUCTION COST	***August 2009***	**282.78**	**4,595**
Contingency for Development of Design	10.00%	28.31	460
Escalation to Start Date (June 2011)	3.50%	10.89	177
Construction Contingency	3.00%	9.66	157
RECOMMENDED BUDGET	***June 2011***	**331.64**	**5,389**

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
Foundations				
Premium for additional foundation complexity, shoring and excavation. All foundations are carried in the base building.	16,250	SF	35.00	568,750
				568,750
2. Vertical Structure				
Columns and pilasters				
Concrete columns	150	CY	1,650.00	247,500
Retaining walls				
Basement walls	5,750	SF	55.00	316,250
				563,750
3. Floor and Roof Structure				
Floor at lowest level				
Slab on grade, perimeter haunch, subgrade	16,250	SF	12.50	203,125
Interstitial floors				
Metal plank walkway system over Vivarium in interstitial space - allow	5,500	SF	25.00	137,500
Equipment pads, equipment curbs, wall curbs				
Equipment pads, equipment curbs, wall curbs	16,250	SF	2.50	40,625
Miscellaneous				
Miscellaneous metals	16,250	SF	5.00	81,250
				462,500
4. Exterior Cladding				
				N/A
				0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
5. Roofing, Waterproofing & Skylights				
Waterproofing				
Waterproofing to elevator pits	1	EA	1,500.00	1,500
Waterproofing to walls below grade	5,750	SF	6.50	37,375
3/4" Drainage mat	5,750	SF	2.75	15,813
Filter fabric	5,750	SF	1.35	7,763
Caulking and sealants				
Caulking and sealants	16,250	SF	0.50	8,125
				70,575
6. Interior Partitions, Doors & Glazing				
Partitions				
Metal studs	2,000	SF	4.50	9,000
Blocking	2,000	SF	0.50	1,000
Sealing and caulking	2,000	SF	2.50	5,000
Partition surfacing				
5/8" gypsum wallboard taped & sanded	4,000	SF	5.00	20,000
Epoxy paint	4,000	SF	1.75	7,000
Sound insulation				
Batt insulation	2,000	SF	1.05	2,100
Interior doors, frames and hardware				
Doors				
Single (wood), 3'6" x 7'	4	EA	850.00	3,400
Installation	4	EA	150.00	600
Frames	4	EA	200.00	800
Hardware	4	EA	500.00	2,000
Premiums for vision panels, door lites, hold opens, closers, kick plates, push plates, auto openers, gasketing, fire ratings	4	EA	150.00	600
				51,500

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
7. Floor, Wall & Ceiling Finishes				
Floor, wall, and ceiling finish	16,250	SF	1.50	24,375
				24,375
8. Function Equipment & Specialties				
Function equipment and specialties				
General building equipment	16,250	SF	2.50	40,625
				40,625
9. Stairs & Vertical Transportation				
Stairs	2	EA	25,000.00	50,000
Elevators (2-stop hydraulic)	1	EA	100,000.00	100,000
				150,000
10. Plumbing Systems				
Sanitary fixtures and connection piping	12	EA	2,000.00	24,000
Fixtures and connections - institutional				n/a
Sanitary waste, vent and service piping				
Floor/trench drains and sinks, < = 6", including trap primers (allow)	20	EA	2,750.00	55,000
Rough-in sanitary fixtures, including waste, vent and domestic water service pipework	12	EA	3,000.00	36,000
Domestic hot water heating equipment				
Gas fire domestic hot water heater (duplex), pumps - 180 gph	2	EA	12,500.00	25,000
Laboratory & Vivarium process gas generation				
Air compressor, duplex - 60 cfm	1	LS	35,000.00	35,000
Vacuum pump, duplex - 50 cfm	1	LS	32,500.00	32,500
RO water, 20 gph continuous flow	1	LS	75,000.00	75,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Laboratory/Vivarium service pipework				
Service piping, valves and insulation - Including vacuum, air, deionized water, laboratory gas, industrial hot and cold water, potable, water, special gases, instrument air, fume hood connections, accessories, monitors, valves, filters and specialties (S & C) only	1	LS	57,500.00	57,500
Acid waste and neutralization				TI
Animal watering				
Animal watering system - stainless steel piping, controls, monitoring, chlorinator, storage tank and automatic room watering distribution system				TI
Test purge and sterilize	120	Hr	105.00	12,600
Natural gas, including pipework, fittings	1	LS	15,000.00	15,000
				367,600

11. Heating, Ventilation & Air Conditioning

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Heat generation and chilling, including circulatory				
Connections to (E) building chilled water generation systems	1	LS	35,000.00	35,000
"Clean" steam generation, 900 #/hr, (steam-steam) shell & tube type heat exchangers	2	EA	27,500.00	55,000
HHW (steam-water) shell & tube type - 1,800 mbth	2	EA	15,500.00	31,000
Pumps				
HHW, 120 gpm	2	EA	7,500.00	15,000
CHW pumps	2	EA	10,000.00	20,000
VFDs	4	EA	6,550.00	26,200
Piping, fittings, valves and insulation				
Chilled water, steam, condensate drainage and hot water system - (S & C)	16,250	SF	4.50	73,125

Item Description	***Quantity***	***Unit***	***Rate***	***Total***
Air handling equipment				
Air handling units, supply/return fans, cooling and preheating, air filters, variable speed control, 100% outside air, economizer (allow)	58,000	CFM	6.50	377,000
HEPA filters at Vivarium cages				TI
Humidification at Vivarium Air Handlers				TI
Air distribution and return - (S & C)				
Galvanized sheet metal ductwork	15,000	LB	9.00	135,000
Specialty fumehood exhaust ductwork, stainless steel, type 316	7,500	LB	20.00	150,000
Dampers. smoke/fire	1	LS	25,000.00	25,000
Insulation	10,000	SF	3.00	30,000
Diffusers and return air grilles				
Diffusers, registers and grilles				TI
Independent exhaust ventilation				
Laboratory, Strobic (variable speed drives)	29,000	CFM	3.75	108,750
HEPA filter	1	LS	15,500.00	15,500
Controls, instrumentation and balancing				
DDC and pressurization controls - S & C	16,250	SF	10.00	162,500
Test and balance air systems	150	Hr	105.00	15,750
				1,274,825

12. Electrical Lighting, Power & Communication

Item Description	***Quantity***	***Unit***	***Rate***	***Total***
Main service and distribution etc.				
Emergency or uninterrupted power				
Stand-by motor control center, 480/277 V	600	AM	65.00	39,000
Machine and equipment power				
Connections and switches, including conduit and cable				
Miscellaneous connections, < 100 A - including mechanical & specialty equipment, fire/smoke dampers, VAV boxes, fire alarms, telephone/data, security, audio/visual etc.	1	LS	50,000.00	50,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
User convenience power				
Panelboard breakers, 120 V	294	LF	95.00	27,930
Feeder conduit and cable	420	LF	40.00	16,800
Transformers, 480-120/208 V	240	kVA	75.00	18,000
Receptacles, including conduit and cable				TI
Lighting				
Panelboard breakers, 277 V	168	LF	95.00	15,960
Feeder conduit and cable	400	SF	25.00	10,000
Fixtures/switching, including conduit and cable - code min.	16,250	SF	2.00	32,500
Lighting and power specialties				
Lighting control	1	LS	15,000.00	15,000
Telephone and communications systems (S & C)	16,250	SF	2.50	40,625
Alarm and security systems				
Fire alarm systems - code min.	16,250	SF	2.50	40,625
Security	1	LS	25,000.00	25,000
				331,440

13. Fire Protection Systems

Automatic wet sprinklers system - complete	16,500	SF	2.50	41,250
				41,250

14. Site Preparation & Building Demolition

	N/A
	0

15. Site Paving, Structures & Landscaping

	N/A
	0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
16. Utilities on Site				
				N/A
				0

ABSL - 3 SUITE FITOUT AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
ABSL - 3 Suite Fitout	1,055		
SUBTOTAL, Enclosed Area		1,055	
Covered area	N/A		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			1,055

Control Quantities

			Ratio to Gross Area
Number of stories (x1,000)	1	EA	0.948
Gross Area	1,055	SF	1.000
Enclosed Area	1,055	SF	1.000
Interior Partition Length	125	LF	0.118
Finished Area	1,055	SF	1.000

ABSL - 3 SUITE FITOUT COMPONENT SUMMARY

	Gross Area:	**1,055 SF**	
		$/SF	$x1,000
1. Foundations		0.00	0
2. Vertical Structure		0.00	0
3. Floor & Roof Structures		0.00	0
4. Exterior Cladding		0.00	0
5. Roofing, Waterproofing & Skylights		0.00	0
Shell (1-5)		0.00	0
6. Interior Partitions, Doors & Glazing		75.83	80
7. Floor, Wall & Ceiling Finishes		30.00	32
Interiors (6-7)		105.83	112
8. Function Equipment & Specialties		15.00	16
9. Stairs & Vertical Transportation		0.00	0
Equipment & Vertical Transportation (8-9)		15.00	16
10. Plumbing Systems		39.91	42
11. Heating, Ventilating & Air Conditioning		135.68	143
12. Electric Lighting, Power & Communications		50.18	53
13. Fire Protection Systems		7.50	8
Mechanical & Electrical (10-13)		233.26	246
Total Building Construction (1-13)		**354.09**	**374**
14. Site Preparation & Demolition		0.00	0
15. Site Paving, Structures & Landscaping		0.00	0
16. Utilities on Site		0.00	0
Total Site Construction (14-16)		**0.00**	**0**
TOTAL BUILDING & SITE (1-16)		**354.09**	**374**
General Conditions	12.50%	44.55	47
Contractor's Overhead & Profit or Fee	3.50%	14.22	15
PLANNED CONSTRUCTION COST	***August 2009***	**412.86**	**436**
Contingency for Development of Design	10.00%	41.71	44
Escalation to Start Date (June 2011)	3.50%	16.11	17
Construction Contingency	3.00%	14.22	15
RECOMMENDED BUDGET	***June 2011***	**484.89**	**512**

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
				N/A
				0
2. Vertical Structure				
				N/A
				0
3. Floor and Roof Structure				
				N/A
				0
4. Exterior Cladding				
				N/A
				0
5. Roofing, Waterproofing & Skylights				
				N/A
				0
6. Interior Partitions, Doors & Glazing				
Partitions				
Metal studs	3,500	SF	4.50	15,750
Blocking	3,500	SF	0.50	1,750
Sealing and caulking	3,500	SF	2.50	8,750
Partition surfacing				
5/8" gypsum wallboard taped & sanded	5,500	SF	5.00	27,500
Epoxy paint	5,500	SF	1.75	9,625

Item Description	***Quantity***	***Unit***	***Rate***	***Total***
Sound insulation				
Batt insulation	3,500	SF	1.05	3,675
Interior doors, frames and hardware				
Doors				
Single (wood), 3'6" x 7'	5	EA	850.00	4,250
1.5 leafs (wood), 4'6" x 7'	2	EA	850.00	1,700
Installation	7	EA	150.00	1,050
Frames	7	EA	200.00	1,400
Hardware	7	EA	500.00	3,500
Premiums for vision panels, door lites, hold opens, closers, kick plates, push plates, auto openers, gasketing, fire ratings	7	EA	150.00	1,050
				80,000

7. Floor, Wall & Ceiling Finishes

Floor, wall, and ceiling finish	1,055	SF	30.00	31,650
				31,650

8. Function Equipment & Specialties

Function equipment and specialties - general	1,055	SF	15.00	15,825
				15,825

9. Stairs & Vertical Transportation

				N/A
				0

10. Plumbing Systems

Fixtures and connections - institutional	1	LS	5,000.00	5,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Laboratory/Vivarium service pipework				
Service piping, valves and insulation - Including vacuum, air, deionized water, laboratory gas, industrial hot and cold water, potable, water, special gases, instrument air, fume hood connections, accessories, monitors, valves, filters and specialties	1	LS	20,000.00	20,000
Acid waste and neutralization	1	LS	15,000.00	15,000
Test purge and sterilize	20	Hr	105.00	2,100
				42,100

11. Heating, Ventilation & Air Conditioning

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Piping, fittings, valves and insulation				
Chilled and hot water system	1,055	SF	8.00	8,440
Air distribution and return				
Galvanized sheet metal ductwork	1,750	LB	9.00	15,750
Specialty fumehood exhaust ductwork, stainless steel, type 316	4,000	LB	20.00	80,000
Insulation	1,750	SF	3.00	5,250
Diffusers and return air grilles				
Diffusers, registers and grilles	1	LS	2000.00	2,000
Controls, instrumentation and balancing				
DDC and pressurization controls	1	LS	27,500.00	27,500
Test and balance air systems	40	Hr	105.00	4,200
				143,140

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
12. Electrical Lighting, Power & Communication				
Machine and equipment power				
Connections and switches, including conduit and cable				
Miscellaneous connections, < 100 A - including mechanical & specialty equipment, fire/smoke dampers, VAV boxes, fire alarms, telephone/data, security, audio/visual etc.	1	LS	10,000.00	10,000
User convenience power				
Receptacles, including conduit and cable	1	LS	5,000.00	5,000
Lighting				
Fixtures/switching, including conduit and cable	1,055	SF	12.00	12,660
Telephone and communications systems	1	LS	5,000.00	5,000
Alarm and security systems				
Fire alarm systems	1,055	SF	5.00	5,275
Security	1	LS	15,000.00	15,000
				52,935
13. Fire Protection Systems				
Automatic wet sprinklers system - complete, including pre-action	1,055	SF	7.50	7,913
				7,913
14. Site Preparation & Building Demolition				
				N/A
				0
15. Site Paving, Structures & Landscaping				
				N/A
				0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
16. Utilities on Site				
				N/A
				0

VIVARIUM FITOUT AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Vivarium Fitout	15,195		
SUBTOTAL, Enclosed Area		15,195	
Covered area	N/A		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			15,195

Control Quantities

			Ratio to Gross Area
Number of stories (x1,000)	1	EA	0.066
Gross Area	15,195	SF	1.000
Enclosed Area	15,195	SF	1.000
Footprint Area	15,195	SF	1.000
Volume	273,510	CF	18.000
Basement Volume	273,510	CF	18.000
Interior Partition Length	1,520	LF	0.100
Finished Area	15,195	SF	1.000
Elevators (x10,000)	1	EA	0.658

VIVARIUM FITOUT COMPONENT SUMMARY

	Gross Area:	**15,195 SF**	
		$/SF	$x1,000
1. Foundations		0.00	0
2. Vertical Structure		0.00	0
3. Floor & Roof Structures		0.00	0
4. Exterior Cladding		0.00	0
5. Roofing, Waterproofing & Skylights		0.00	0
Shell (1-5)		0.00	0
6. Interior Partitions, Doors & Glazing		30.84	469
7. Floor, Wall & Ceiling Finishes		20.00	304
Interiors (6-7)		50.84	772
8. Function Equipment & Specialties		2.50	38
9. Stairs & Vertical Transportation		0.00	0
Equipment & Vertical Transportation (8-9)		2.50	38
10. Plumbing Systems		20.82	316
11. Heating, Ventilating & Air Conditioning		94.22	1,432
12. Electric Lighting, Power & Communications		34.53	525
13. Fire Protection Systems		5.00	76
Mechanical & Electrical (10-13)		154.57	2,349
Total Building Construction (1-13)		**207.91**	**3,159**
14. Site Preparation & Demolition		0.00	0
15. Site Paving, Structures & Landscaping		0.00	0
16. Utilities on Site		0.00	0
Total Site Construction (14-16)		**0.00**	**0**
TOTAL BUILDING & SITE (1-16)		**207.91**	**3,159**
General Conditions	12.50%	26.00	395
Contractor's Overhead & Profit or Fee	3.50%	8.16	124
PLANNED CONSTRUCTION COST	***August 2009***	**242.06**	**3,678**
Contingency for Development of Design	10.00%	24.22	368
Escalation to Start Date (June 2011)	3.50%	9.35	142
Construction Contingency	3.00%	8.29	126
RECOMMENDED BUDGET	***June 2011***	**283.92**	**4,314**

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
				N/A
				0
2. Vertical Structure				
				N/A
				0
3. Floor and Roof Structure				
				N/A
				0
4. Exterior Cladding				
				N/A
				0
5. Roofing, Waterproofing & Skylights				
				N/A
				0
6. Interior Partitions, Doors & Glazing				
Partitions				
Metal studs	23,150	SF	4.50	104,175
Blocking	23,150	SF	0.50	11,575
Sealing and caulking	23,150	SF	2.50	57,875
Partition surfacing				
5/8" gypsum wallboard taped & sanded	30,850	SF	5.00	154,250
Epoxy paint	30,850	SF	1.75	53,988

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Sound insulation				
Batt insulation	23,150	SF	1.05	24,308
Interior doors, frames and hardware				
Doors				
Wood doors	32	EA	950.00	30,400
Installation	32	EA	150.00	4,800
Frames	32	EA	200.00	6,400
Hardware	32	EA	500.00	16,000
Premiums for vision panels, door lites, hold opens, closers, kick plates, push plates, auto openers, gasketing, fire ratings	32	EA	150.00	4,800
				468,570

7. Floor, Wall & Ceiling Finishes

Floor, wall, and ceiling finish	15,195	SF	20.00	303,900
				303,900

8. Function Equipment & Specialties

Function equipment and specialties - general	15,195	SF	2.50	37,988
				37,988

9. Stairs & Vertical Transportation

				N/A
				0

10. Plumbing Systems

Fixtures and connections - institutional	1	LS	25,000.00	25,000

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Laboratory/vivarium service pipework				
Service piping, valves and insulation - Including vacuum, air, deionized water, industrial hot and cold water, potable, water, accessories, monitors, valves, filters and specialties	15,195	SF	10.00	151,950
Acid waste and neutralization	1	LS	35,000.00	35,000
Animal watering				
Animal watering system - stainless steel piping, controls, monitoring, chlorinator, storage tank and automatic room watering distribution system	1	LS	86,000.00	86,000
Test purge and sterilize	175	Hr	105.00	18,375
				316,325

11. Heating, Ventilation & Air Conditioning

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Piping, fittings, valves and insulation				
Chilled water, steam, condensate return and hot water system	15,195	SF	15.00	227,925
Air handling equipment				
Duct-mounted reheat coils	35	EA	750.00	26,250
HEPA filters at Vivarium cages - S & Exhaust	1	LS	100,000.00	100,000
Humidification at Vivarium Air Handlers	1	LS	100,000.00	100,000
Air distribution and return				
Galvanized sheet metal ductwork	29,850	LB	9.00	268,650
Specialty fumehood exhaust ductwork, stainless steel, type 316	14,900	LB	20.00	298,000
Insulation	24,900	SF	3.00	74,700
Diffusers and return air grilles				
Diffusers, registers and grilles	15,195	SF	3.00	45,585
Controls, instrumentation and balancing				
DDC and pressurization controls , variable air volume	15,195	SF	17.50	265,913
Test and balance air systems	235	Hr	105.00	24,675
				1,431,698

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
12. Electrical Lighting, Power & Communication				
Machine and equipment power				
Connections and switches, including conduit and cable				
Miscellaneous connections, < 100 A - including mechanical & specialty equipment, fire/smoke dampers, VAV boxes, fire alarms, telephone/data, security, audio/visual etc.	1	LS	57,500.00	57,500
User convenience power				
Receptacles, including conduit and cable	15,195	SF	5.00	75,975
Lighting				
Fixtures/switching, including conduit and cable	15,195	SF	15.00	227,925
Telephone and communications systems	1	LS	47,500.00	47,500
Alarm and security systems				
Fire alarm systems	15,195	SF	4.00	60,780
Security	1	LS	55,000.00	55,000
				524,680
13. Fire Protection Systems				
Automatic wet sprinklers system - complete	15,195	SF	5.00	75,975
				75,975
14. Site Preparation & Building Demolition				
				N/A
				0
15. Site Paving, Structures & Landscaping				
				N/A
				0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
16. Utilities on Site				
				N/A
				0

VIVARIUM EQUIPMENT AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Vivarium Fitout	15,195		
SUBTOTAL, Enclosed Area		15,195	
Covered area	N/A		
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			15,195

Control Quantities

			Ratio to Gross Area
Number of stories (x1,000)	1	EA	0.066
Gross Area	15,195	SF	1.000
Enclosed Area	15,195	SF	1.000
Footprint Area	15,195	SF	1.000
Volume	273,510	CF	18.000
Basement Volume	273,510	CF	18.000
Interior Partition Length	1,520	LF	0.100
Finished Area	15,195	SF	1.000
Elevators (x10,000)	1	EA	0.658

VIVARIUM EQUIPMENT COMPONENT SUMMARY

	Gross Area:	**15,195 SF**	
		$/SF	$x1,000
1. Foundations		0.00	0
2. Vertical Structure		0.00	0
3. Floor & Roof Structures		0.00	0
4. Exterior Cladding		0.00	0
5. Roofing, Waterproofing & Skylights		0.00	0
Shell (1-5)		0.00	0
6. Interior Partitions, Doors & Glazing		0.00	0
7. Floor, Wall & Ceiling Finishes		0.00	0
Interiors (6-7)		0.00	0
8. Function Equipment & Specialties		128.21	1,948
9. Stairs & Vertical Transportation		0.00	0
Equipment & Vertical Transportation (8-9)		128.21	1,948
10. Plumbing Systems		0.00	0
11. Heating, Ventilating & Air Conditioning		0.00	0
12. Electric Lighting, Power & Communications		0.00	0
13. Fire Protection Systems		0.00	0
Mechanical & Electrical (10-13)		0.00	0
Total Building Construction (1-13)		**128.21**	**1,948**
14. Site Preparation & Demolition		0.00	0
15. Site Paving, Structures & Landscaping		0.00	0
16. Utilities on Site		0.00	0
Total Site Construction (14-16)		**0.00**	**0**
TOTAL BUILDING & SITE (1-16)		**128.21**	**1,948**
General Conditions	12.50%	16.06	244
Contractor's Overhead & Profit or Fee	3.50%	5.07	77
PLANNED CONSTRUCTION COST	***August 2009***	**149.33**	**2,269**
Contingency for Development of Design	1.50%	2.24	34
Escalation to Start Date (June 2011)	3.00%	4.54	69
Construction Contingency	1.50%	2.37	36
RECOMMENDED BUDGET	***June 2011***	**158.48**	**2,408**

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
				N/A
				0
2. Vertical Structure				
				N/A
				0
3. Floor and Roof Structure				
				N/A
				0
4. Exterior Cladding				
				N/A
				0
5. Roofing, Waterproofing & Skylights				
				N/A
				0
6. Interior Partitions, Doors & Glazing				
				N/A
				0
7. Floor, Wall & Ceiling Finishes				
				N/A
				0

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
8. Function Equipment & Specialties				
Function equipment and specialties - vivarium				
Safety shower / eyewash	4	EA	2,266.00	9,064
Chemical fumehood (6'0")	1	EA	10,536.00	10,536
Bulk Autoclave	1	EA	340,000.00	340,000
Cage and rack washer	1	EA	250,000.00	250,000
Tunnel washer	1	EA		
Bedding disposal system	1	EA	167,500.00	167,500
Bedding dispenser	1	EA	50,000.00	50,000
Animal watering system	1	EA	164,000.00	164,000
Necroscopy table	1	EA	15,795.00	15,795
Cage rack (50% capacity)	20	EA	16,769.50	335,390
Animal change stations	4	EA	8,000.00	32,000
Quarantine 4' biosafety cabinet	1	EA	12,000.00	12,000
ABSL - 3 Biosafety cabinet	2	EA	15,000.00	30,000
Isolation cubicle	2	EA	47,952.00	95,904
ABSL - 3 autoclave	1	EA	169,918.00	169,918
Casework	1	EA	60,000.00	60,000
Installation	1	EA	170,000.00	170,000
Furniture	3	EA	12,000.00	36,000
				1,948,107
9. Stairs & Vertical Transportation				
				N/A
				0
10. Plumbing Systems				
				N/A
				0
11. Heating, Ventilation & Air Conditioning				
				N/A
				0

Item Description	Quantity	Unit	Rate	Total
12. Electrical Lighting, Power & Communication				
				N/A
				0
13. Fire Protection Systems				
				N/A
				0
14. Site Preparation & Building Demolition				
				N/A
				0
15. Site Paving, Structures & Landscaping				
				N/A
				0
16. Utilities on Site				
				N/A
				0

SITEWORK AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Sitework Area	80,000		
TOTAL GROSS SITE AREA			80,000

SITEWORK COMPONENT SUMMARY

	Gross Area:	**80,000 SF**	
		$/SF	$x1,000
14 Site Preparation & Demolition		3.00	240
15 Site Paving, Structures & Landscaping		16.31	1,305
16 Utilities on Site		12.52	1,001
TOTAL BUILDING & SITE (1-16)		**31.83**	**2,546**
General Conditions	12.50%	3.98	318
Contractor's Overhead & Profit or Fee	3.50%	1.25	100
PLANNED CONSTRUCTION COST	***August 2009***	**37.06**	**2,964**
Contingency for Development of Design	10.00%	3.70	296
Escalation to Start Date (June 2011)	3.50%	1.43	114
Construction Contingency	3.00%	1.26	101
RECOMMENDED BUDGET	***June 2011***	**43.44**	**3,475**

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
14. Site Preparation & Building Demolition				
Site preparation & building demolition				
Site preparation & building demolition	80,000	SF	3.00	240,000
				240,000
15. Site Paving, Structures & Landscaping				
Site paving, structure & landscaping				
Site paving, structure & landscaping	60,000	SF	21.75	1,305,000
				1,305,000
16. Utilities on Site				
Mechanical				
Water mains, domestic and fire				
Domestic and fire water, < = 6"	611	LF	75.00	45,825
Metering	1	LS	12,500.00	12,500
Valves and specialties	1	LS	20,000.00	20,000
Connections to existing	1	LS	10,000.00	10,000
Sewer				
Underground pipework, 6"	246	LF	100.00	24,600
Manholes	2	EA	7,800.00	15,600
Connections to existing	1	LS	10,000.00	10,000
Natural gas				
Underground pipework, fittings, < = 2"	464	LF	55.00	25,520
Metering	1	LS	10,000.00	10,000
Valves and specialties	1	LS	10,000.00	10,000
Connections to existing	1	LS	10,000.00	10,000
Central chilling				
Chilled water pipework, fittings, 6"	474	LF	200.00	94,800
Valves and specialties	1	LS	25,500.00	25,500
Connections to existing campus loop infra-structure	1	LS	20,000.00	20,000
Electrical				
Replace EMH 2-111 8' x 8' x 8', including grounding	1	EA	15,000.00	15,000
Switchgear, 15 kV				
S & C Vista Series 6-way switch	1	EA	37,500.00	37,500
12 x 6 switch vault	1	EA	17,500.00	17,500

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
12.47kV/277/480 V pad mounted transformer - liquid filled	1	EA	47,500.00	47,500
Mains power feeder conduit and cable, (6) 5"	300	LF	375.00	112,500
Extend 15 kV cables				
New switch position #2 - SW 572	500	LF	175.00	87,500
New switch position #1 - SW 408	800	LF	175.00	140,000
Connections to existing switches	2	EA	10,000.00	20,000
Telecommunications/signals - fiber optic/cabling	1,300	LF	55.00	71,500
Inter-connections between HV switchgear	1	LS	50,000.00	50,000
Trade demolition				
Including removal of the following systems				
12.47 kV distribution	800	LF	45.00	36,000
Fiber-optic cabling	800	LF	10.00	8,000
Cold water	330	LF	20.00	6,600
Sewer	450	LF	25.00	11,250
Chilled water	140	LF	45.00	6,300
				1,001,495

PART IV

APPENDIX

CONCEPT STUDIES

1.0.0

SECTION 1.0.0 **BUILDING CONCEPT**

Two blocking-and-stacking concepts were developed representing an initial approach to program / budget reconciliation. These diagrams intended to aid the establishment of desired relationships and priorities. Key elements addressed in subsequent explorations included –

- Concept 1
  – The desired lab / office relationship - offices directly across the corridor from laboratories
  – ICB is a research oriented group and includes visiting researchers. This space should be located near labs.

- Concept 2
  – Locating laboratories on two floors to provide a greater sense of connection and community

The understandings gained through discussions on Concepts 1 & 2 were used in the development of Concept 3, which was presented in the Draft DPP Document.

- Concept 3
  –Kept desired lab / office relationship as in Concept 1
  –Organized students into 3-5 desk offices
  –Bioengineering Offices on Level 2, ICB Offices on Levels 3 and 4

Following the issuance of the Draft DPP, three revised concepts were developed to address comments regarding the size and arrangement of the faculty and graduate student offices. Concept 3B was selected to be the Building Concept Blocking & Stacking Diagram found in Section 6.2.0 on page 65.

- Concept 3C
  –Organized all faculty and students into 140asf offices along main corridor
  –18 interior offices

- Concept 3D
  –Organized all faculty and students into 140asf offices along two corridors
  –All offices arranged along a perimeter wall

	17 October 2008				02 June 2009				02 June 2009				
ASSIGNABLE SPACE (ASF)	**SCHEME B DPP PROGRAM**				**CONCEPT 1 - PROGRAM AREAS**				**CONCEPT 2 - PROGRAM AREAS**				Items revised from Scheme B - DPP
55% Efficient	**NUMBER**	**EACH**	**AREA**	**TOTAL SF**	**NUMBER**	**EACH**	**AREA**	**TOTAL SF**	**NUMBER**	**EACH**	**AREA**	**TOTAL SF**	**NOTES**
RESEARCH LABS				15,223				13,358				13,853	Does not include BSL-3 Suite (see Vivarium)
Bio Research Lab Modules	7	1,979	13,853		27	495	13,358		28	495	13,853		asf of an 11' x 46' modules - approx = 495sf
BSL3 Lab Modules	1	1,370	1,370										3 -11' x 33' modules - locate in Basement
SHARED LAB SUPPORT				5,458				4,318				4,318	
Procedure/Equip. Room	4	462	1,848		3	462	1,386		2	693	1,386		orig DPP lists 4 / **area increased - Con 2**
Freezer Room	4	226	904		3	226	678		2	339	678		1 per floor, orig DPP lists 4 / **area increased**
Cold Room	4	226	904		3	226	678		2	339	678		1 per floor, orig DPP lists 4 / **area increased**
Warm Room	2	163	326		2	163	326		2	163	326		
Autoclave Room	4	226	904		3	226	678		2	339	678		1 per floor, orig DPP lists 4 / **area increased**
Media Prep	1	462	462		1	462	462		1	462	462		
Bio/Chem Waste	1	110	110		1	110	110		1	110	110		
OFFICES				17,045				15,961				15,961	
PI Office	10	140	1,400		10	140	1,400		10	140	1,400		
Visiting Faculty Office	2	140	280		2	150	300		2	150	300		
PD/GS Office	44	140	6,160		110	55	6,050		110	55	6,050		44 x 2-3 avg = approx 110 students = 55sf/desk
				7,840				7,750				7,750	
BioEngineering Admin Offices													
Chair Office	1	180	180		1	180	180		1	180	180		
Staff Office	4	140	560		4	140	560		4	140	560		
Small Reception Office	1	140	140		1	140	140		1	140	140		
Storage Room	1	226	226		1	226	226		1	226	226		
Small Conference Room (10 seats)					1	200	200		1	200	200		reduce to 200sf / place with BioE Suite
Copy/Mail Room					1	140	140		1	140	140		placed with BioE Suilte
				1,106				1,446				1,446	
ICB Admin Offices													
Director Office	1	180	180		1	180	180		1	180	180		
Staff Office	19	140	2,660		19	140	2,660		19	140	2,660		
Large Reception Office	1	433	433		1	433	433		1	433	433		
Storage Room	1	226	226		1	226	226		1	226	226		
Small Conference Room (10 seats)					1	200	200		1	200	200		reduce to 200sf / placed with ICB Suite
Copy/Mail Room					1	140	140		1	140	140		placed with ICB Suite
				3,499				3,839				3,839	
General Areas													
Lecture Hall (100 seating capacity)	1	2,096	2,096		1	2,096	2,096		1	2,096	2,096		
Small Conference Room (10 seats)	2	301	602										moved
Large Conference Room (30 seats)	2	591	1,182		1	500	500		1	500	500		Reduce from 2 to 1 @ 500sf - 30+ capacity
Copy / Mail Room	2	140	280										moved
Kitchen	4	110	440		3	110	330		3	110	330		1 per floor, orig program lists 4
				4,600				2,926				2,926	
BASE BUILDING ASF				**37,726**				**33,637**				**34,132**	

NON-ASSIGNABLE SPACE	SCHEME B DPP PROGRAM				CONCEPT 1 - PROGRAM AREAS				CONCEPT 2 - PROGRAM AREAS				
	NUMBER	EACH	AREA	TOTAL SF	NUMBER	EACH	AREA	TOTAL SF	NUMBER	EACH	AREA	TOTAL SF	NOTES
BUILDING SUPPORT				4,231				4,142				3,682	
Janitor Closet	4	79	316		3	79	237		3	79	237		1 per floor, orig program lists 4
Recycling Space	4	10	40		3	10	30		3	10	30		1 per floor, orig program lists 4
Custodial Supply	1	100	100		1	100	100		1	100	100		at loading
Building Recycling Room	1	110	110		1	110	110		1	110	110		at loading
Receiving Area	1	226	226		1	226	226		1	226	226		at loading
Vending	1	63	63		1	63	63		1	63	63		
Lobby	1	1,056	1,056		1	1,056	1,056		1	1,056	1,056		
Shower/Locker	2	110	220		2	110	220		2	110	220		ground floor
Restrooms	6	350	2,100		6	350	2,100		4	350	1,400		1 pair each per floor
Restrooms									2	120	240		
MECHANICAL SPACES				2,905				4,925				4,925	
A/V Telecom Closet	4	110	440		3	110	330		3	110	330		1 per floor, orig program lists 4
Electrical Closet	4	110	440		3	110	330		3	110	330		1 per floor, orig program lists 4
Main Electrical	1	400	400		1	500	500		1	500	500		ideally on first floor
Boiler Room			0		1	750	750		1	750	750		previously located on roof
Chiller Room			0		1	690	690		1	690	690		previously located on roof
Vacuum Pump Room	1	525	525		1	525	525		1	525	525		first floor or basement
Pure Water / R.O. Generation	1	1,100	1,100		1	1,100	1,100		1	1,100	1,100		locate in basement
Wet Mechanical			0		1	700	700		1	700	700		locate in basement
MISC GSF (per efficiency % req'd)				24,138				19,015				19,588	
Circulation, Interaction Areas,			24,138				19,015				19,588		confirm per bldg. layout
Walls, etc.													
NON-ASSIGNABLE SPACE				**31,274**				**28,082**				**28,195**	
BASE BUILDING AREA (GSF)				**69,000**				**61,719**				**62,327**	Includes Basement MEP spaces not
ASF/GSF				55%				55%				55%	accounted for in DPP.
ROOFTOP MECHANICAL													
Boiler Room	1	750	750				0				0		locate in Basement
Chiller Room	1	690	690				0				0		locate in Basement
Building AHUs	1		0		1	3500	3,500		1	3500	3,500		
OUTDOOR AREAS													
Covered Bicycle Storage	1	1,089	1,089		1	1,089	1,089		1	1,089	1,089		
Loading Area	1	250	250		1	250	250		1	250	250		
Electrical Service Yard	1		0		1	1300	1,300		1	1300	1,300		co-locate near Loading Area

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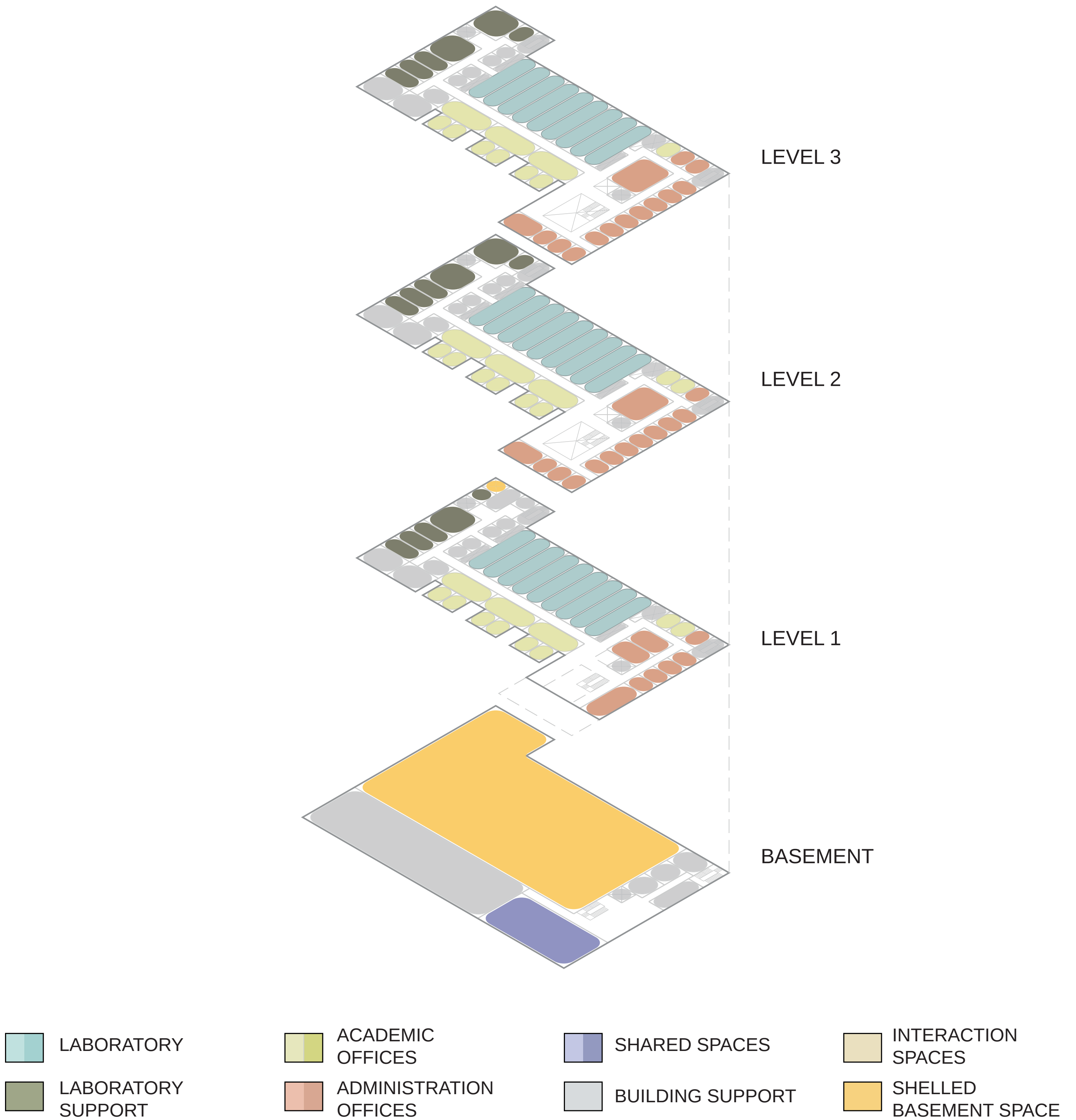
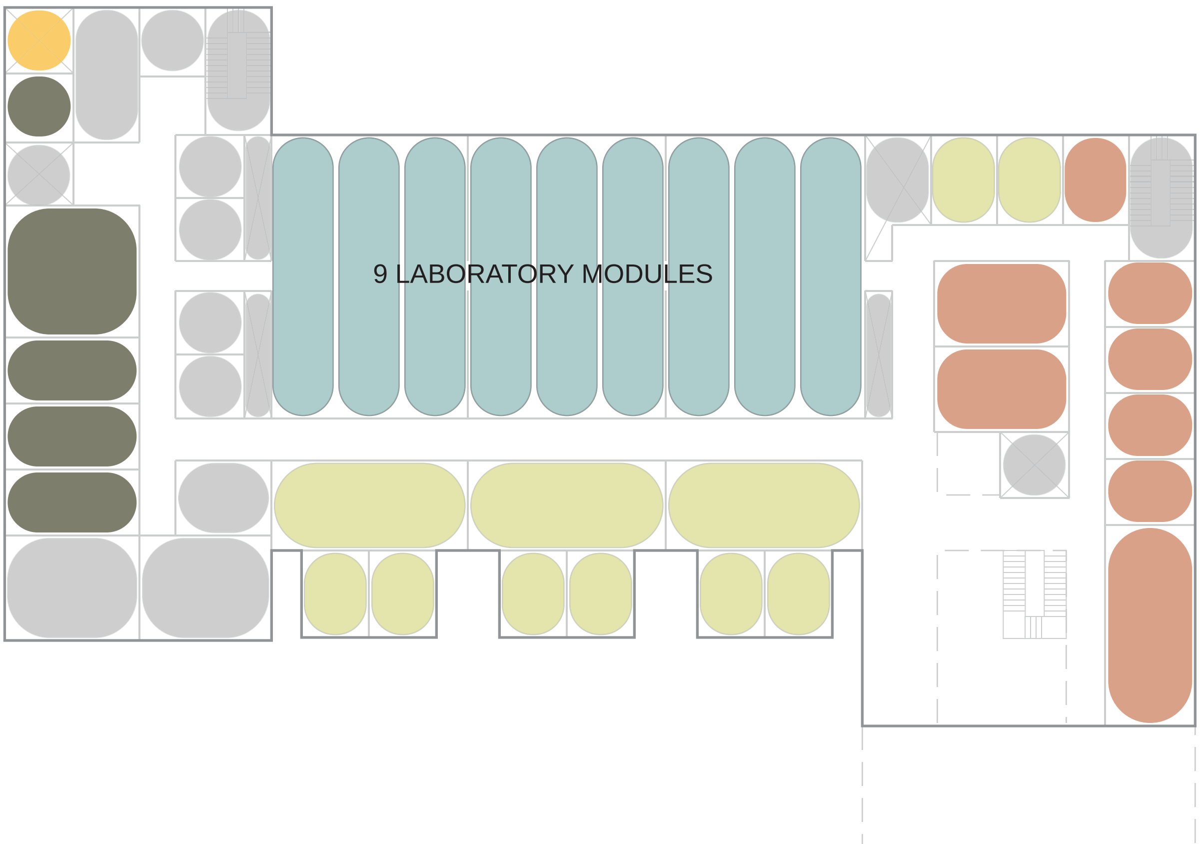
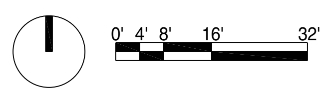
FLOOR STACKING DIAGRAM



BLOCKING & STACKING DIAGRAM

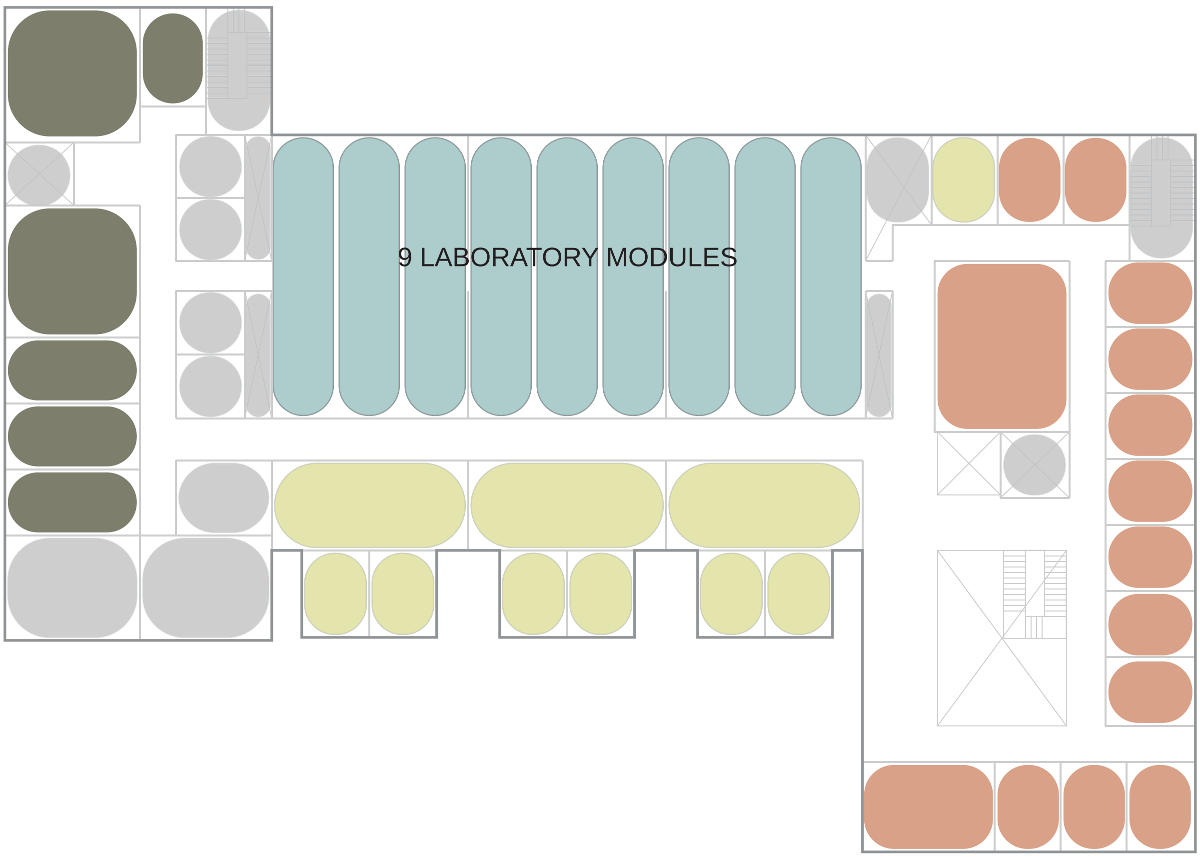


FIRST FLOOR

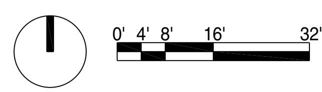


LABORATORY
LABORATORY SUPPORT
ACADEMIC OFFICES
ADMINISTRATION OFFICES
SHARED SPACES
BUILDING SUPPORT
INTERACTION SPACES
SHELLED BASEMENT SPACE

BLOCKING & STACKING DIAGRAM



TYPICAL FLOOR



LABORATORY

LABORATORY SUPPORT

ACADEMIC OFFICES

ADMINISTRATION OFFICES

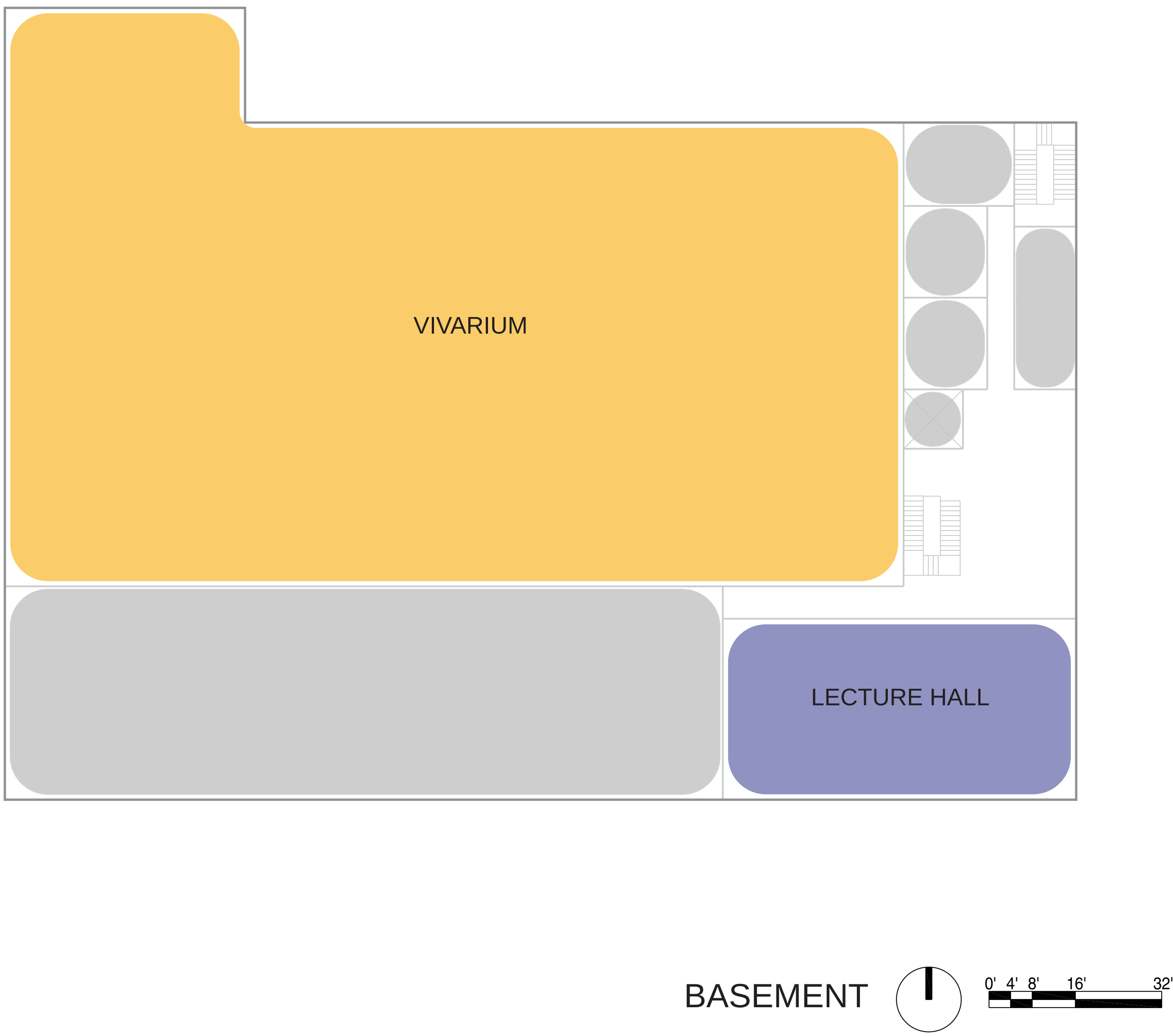
SHARED SPACES

BUILDING SUPPORT

INTERACTION SPACES

SHELLED BASEMENT SPACE

BLOCKING & STACKING DIAGRAM



BASEMENT

LABORATORY

ACADEMIC OFFICES

SHARED SPACES

INTERACTION SPACES

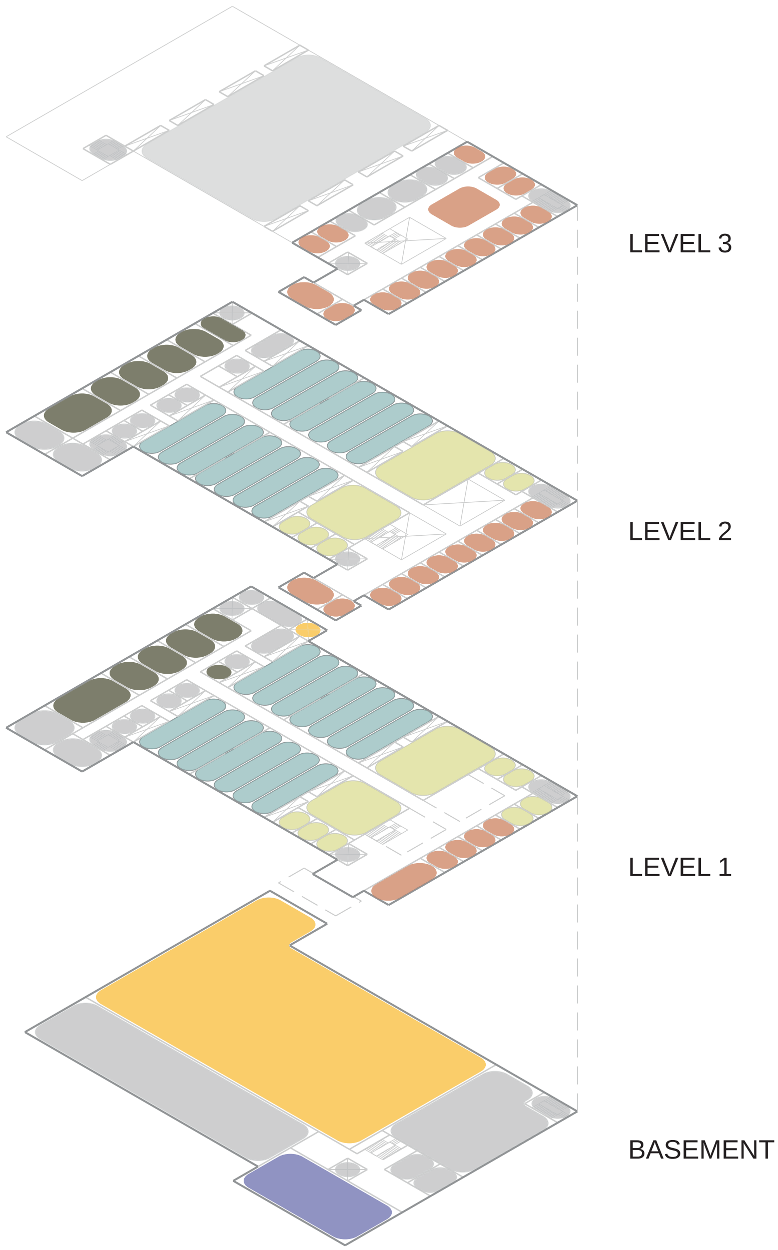
LABORATORY SUPPORT

ADMINISTRATION OFFICES

BUILDING SUPPORT

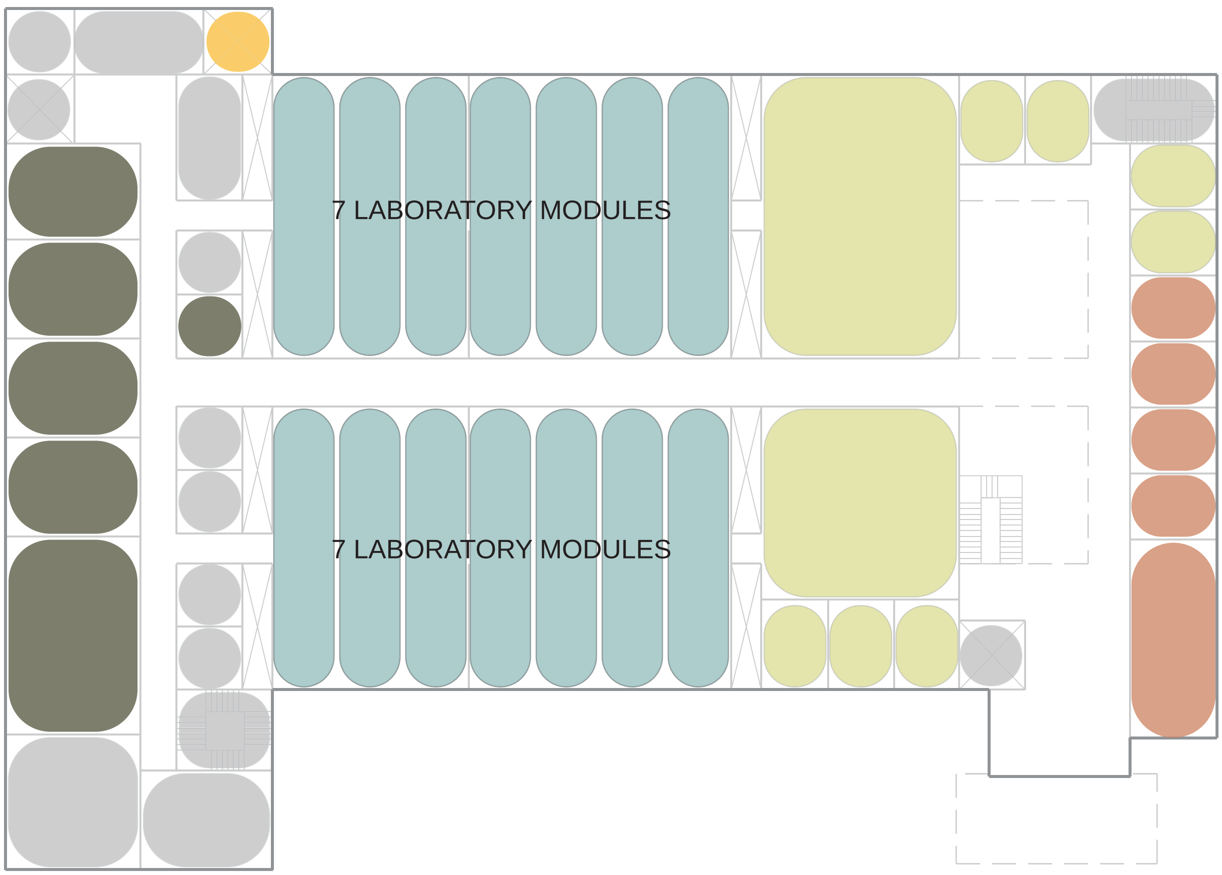
SHELLED BASEMENT SPACE

FLOOR STACKING DIAGRAM

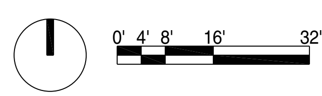


LABORATORY	ACADEMIC OFFICES	SHARED SPACES	INTERACTION SPACES
LABORATORY SUPPORT	ADMINISTRATION OFFICES	BUILDING SUPPORT	SHELLED BASEMENT SPACE

BLOCKING & STACKING DIAGRAM

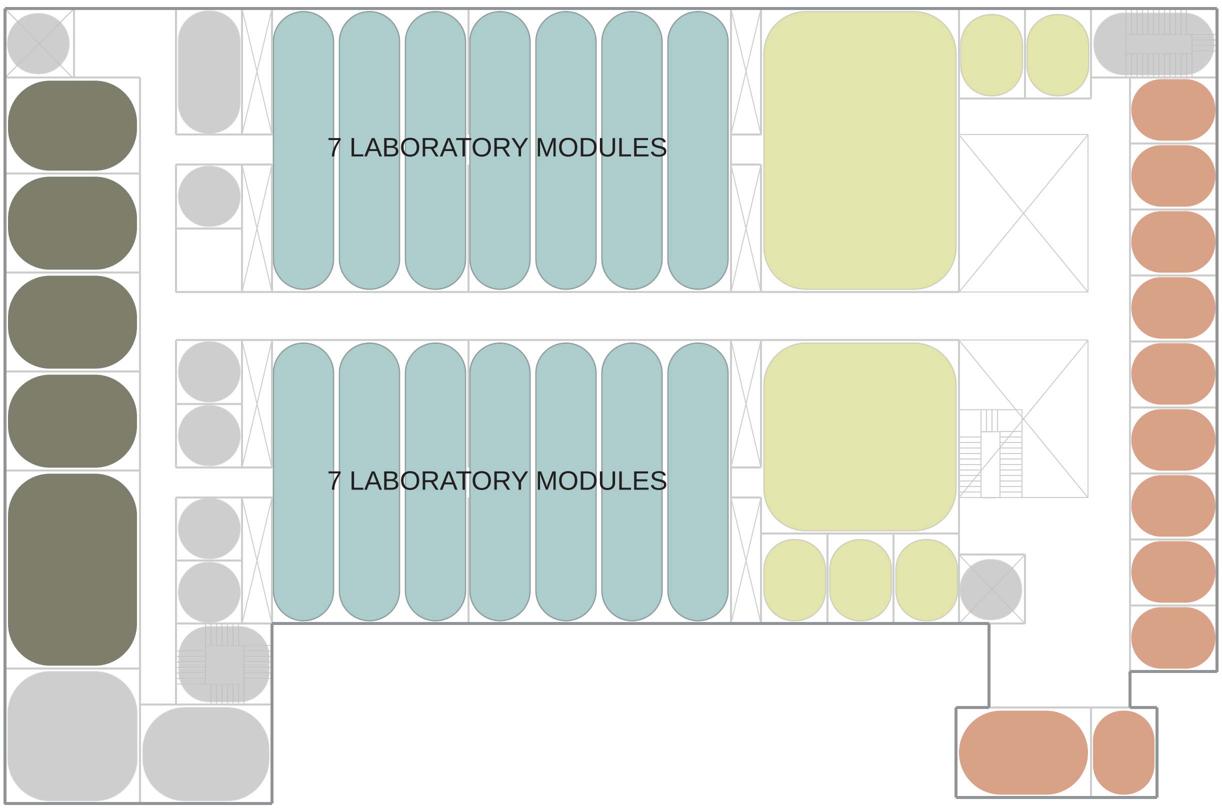


FIRST FLOOR

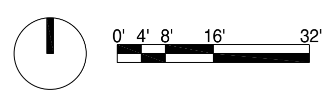


LABORATORY
LABORATORY SUPPORT
ACADEMIC OFFICES
ADMINISTRATION OFFICES
SHARED SPACES
BUILDING SUPPORT
INTERACTION SPACES
SHELLED BASEMENT SPACE

BLOCKING & STACKING DIAGRAM

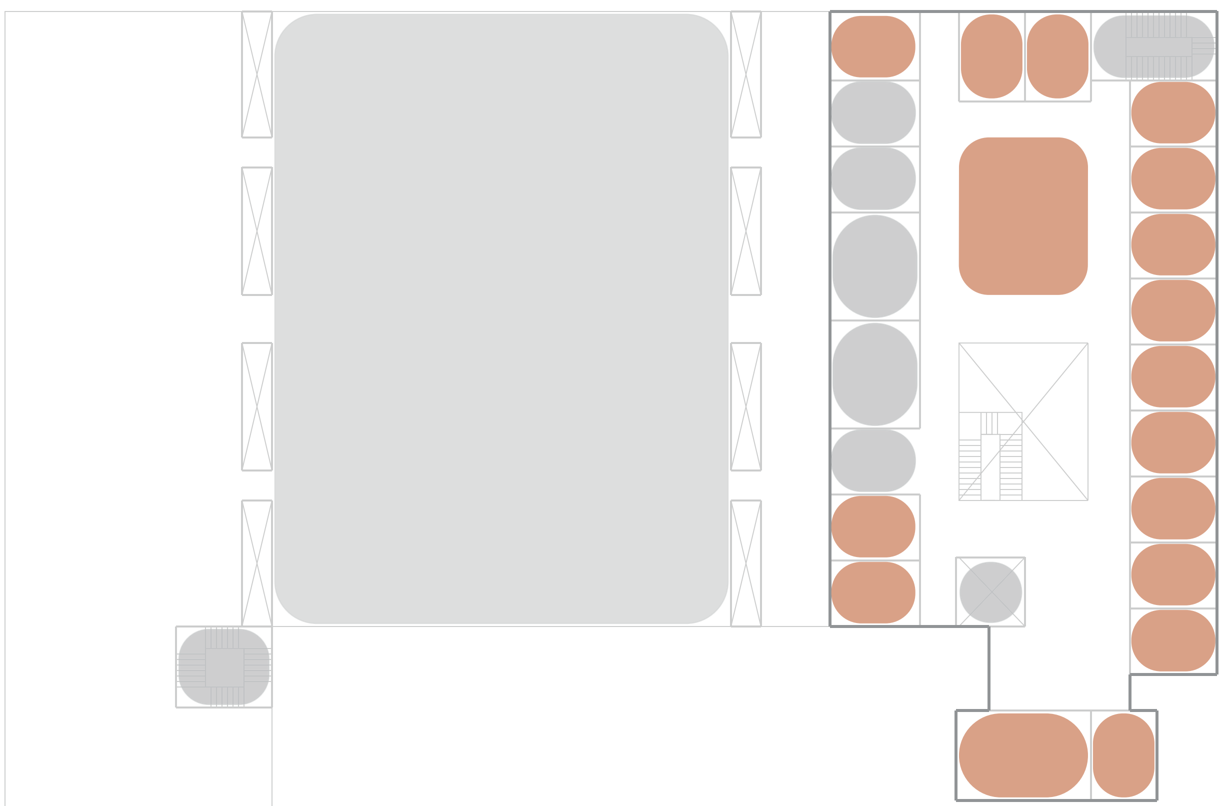


SECOND FLOOR

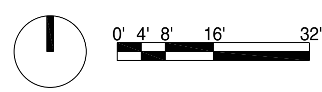


LABORATORY	ACADEMIC OFFICES	SHARED SPACES	INTERACTION SPACES
LABORATORY SUPPORT	ADMINISTRATION OFFICES	BUILDING SUPPORT	SHELLED BASEMENT SPACE

BLOCKING & STACKING DIAGRAM



THIRD FLOOR



LABORATORY

ACADEMIC OFFICES

SHARED SPACES

INTERACTION SPACES

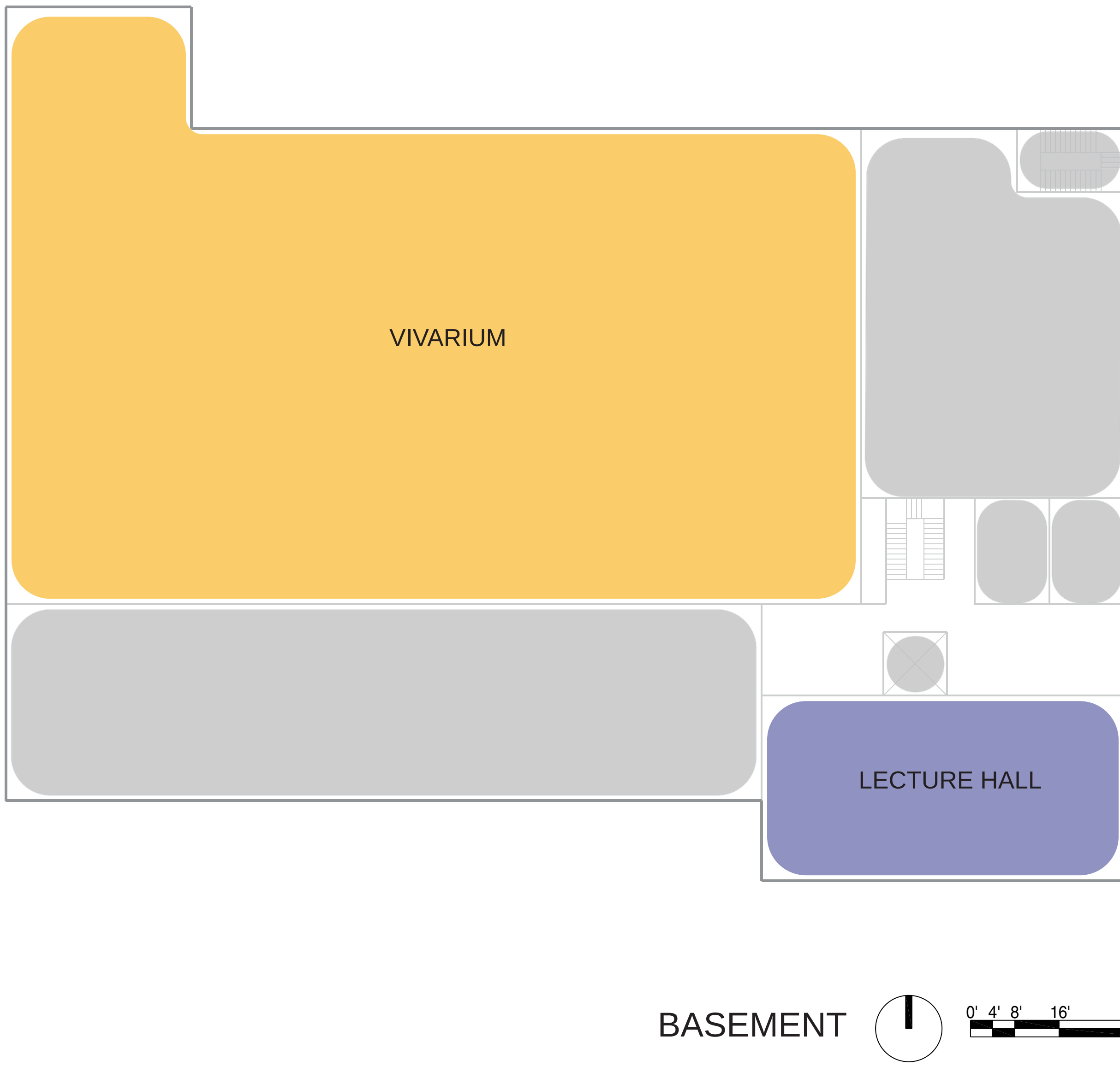
LABORATORY SUPPORT

ADMINISTRATION OFFICES

BUILDING SUPPORT

SHELLED BASEMENT SPACE

BLOCKING & STACKING DIAGRAM



BASEMENT

LABORATORY	LABORATORY SUPPORT
ACADEMIC OFFICES	ADMINISTRATION OFFICES
SHARED SPACES	BUILDING SUPPORT
INTERACTION SPACES	SHELLED BASEMENT SPACE

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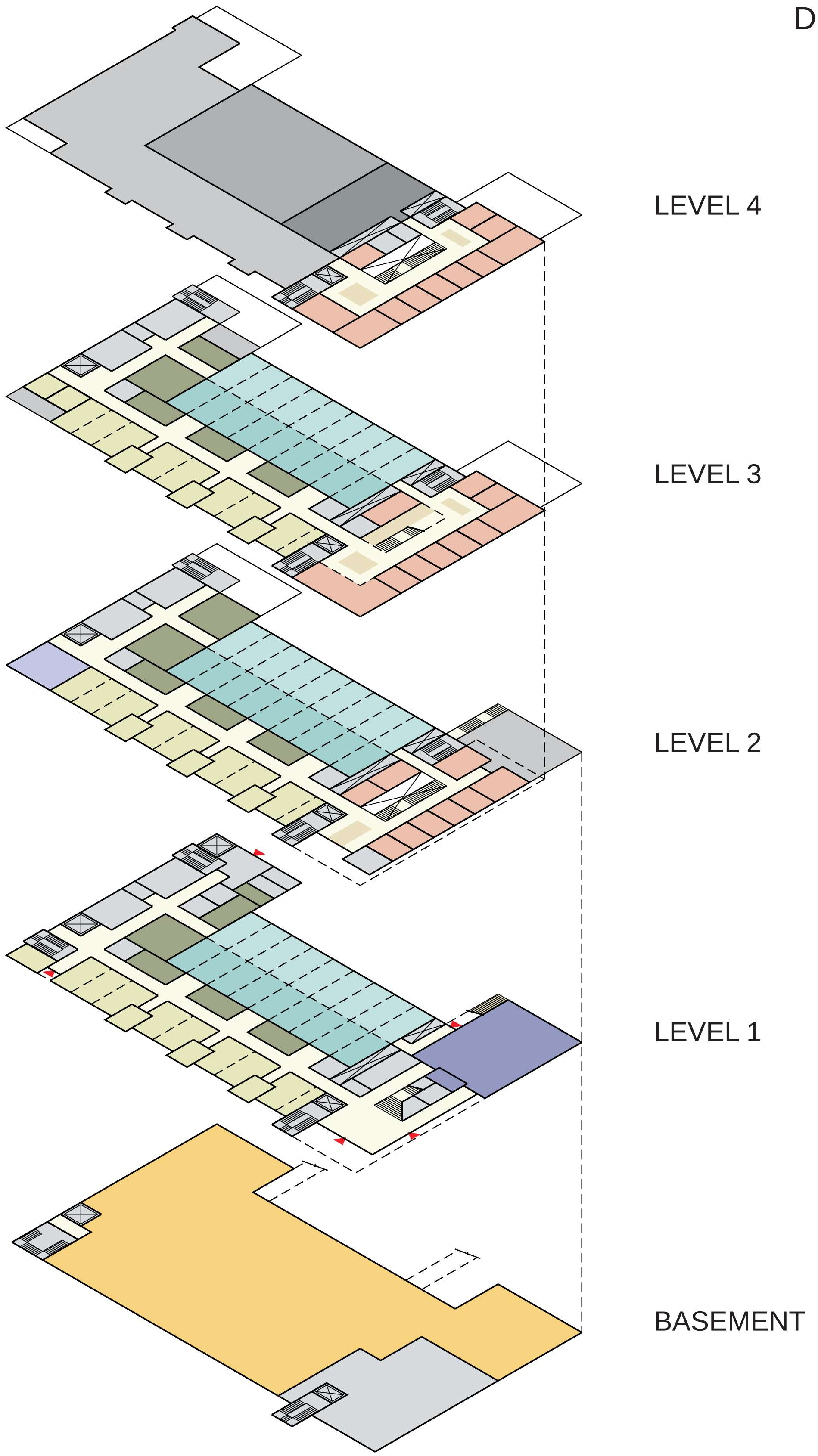
The matrix below highlights the differences between the original Scheme B Program and the Concept 3 Program.

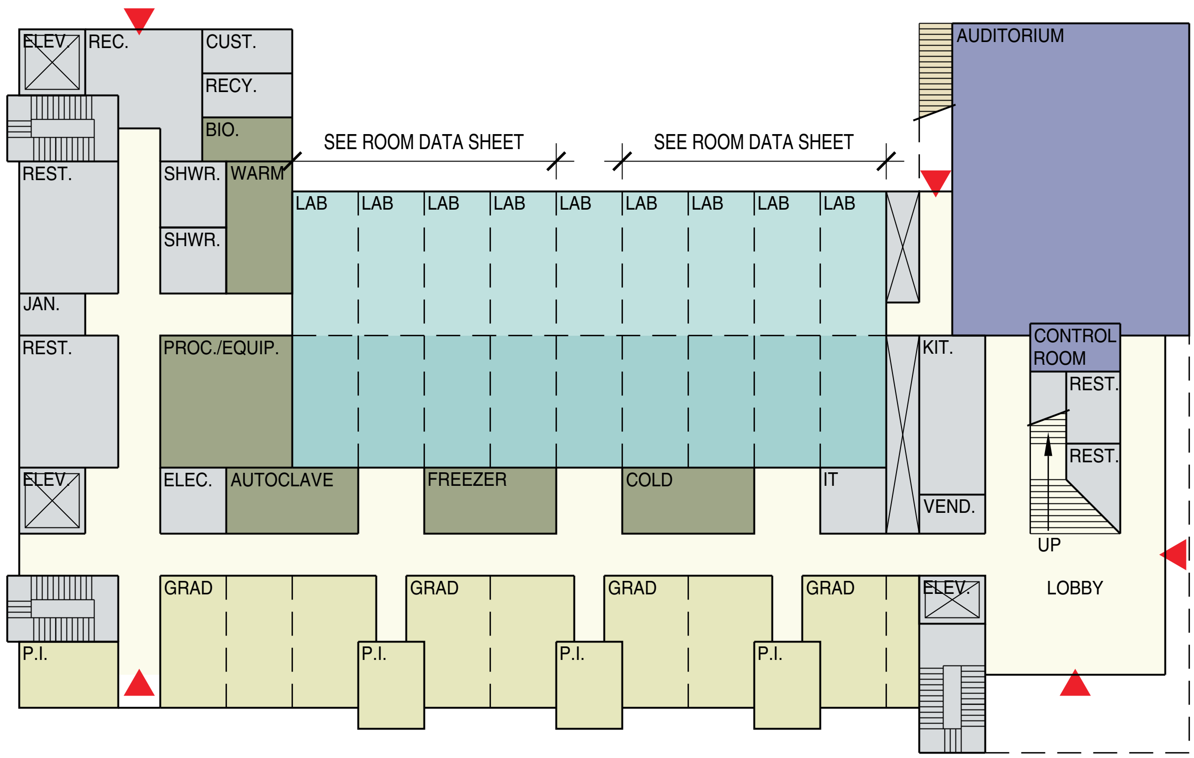
	October 17, 2008				June 23, 2009				
ASSIGNABLE SPACE (ASF)	**SCHEME B DPP PROGRAM**				**CONCEPT 3 - PROGRAM AREAS**				Items revised from Scheme B - DPP
	NUMBER	**EACH**	**AREA**	**TOTAL SF**	**NUMBER**	**EACH**	**AREA**	**TOTAL SF**	**NOTES**
RESEARCH LABS				15,223				13,527	Does not include BSL-3 Suite (see Vivarium)
Bio Research Lab Modules	7	1,979	13,853		27	501	13,527		asf of an 11' x 46' modules - approx = 495sf
BSL3 Lab Modules	1	1,370	1,370						moved to basement area (Vivarium area)
SHARED LAB SUPPORT				5,458				4,318	
Procedure/Equip. Room	4	462	1,848		3	462	1,386		
Freezer Room	4	226	904		3	226	678		
Cold Room	4	226	904		3	226	678		
Warm Room	2	163	326		2	163	326		
Autoclave Room	4	226	904		3	226	678		
Media Prep	1	462	462		1	462	462		
Bio/Chem Waste	1	110	110		1	110	110		
OFFICES				17,045				15,951	
PI Office	10	140	1,400		10	140	1,400		
Visiting Faculty Office	2	140	280		2	140	280		
PD/GS Office	44	140	6,160		110	55	6,050		44 x 2 to 3 avg = approx 110 students = 55sf/desk
				7,840				7,730	
BioEngenering Admin Offices									
Chair Office	1	180	180		1	180	180		
Staff Office	4	140	560		4	140	560		
Small Reception Office	1	140	140		1	140	140		
Storage Room	1	226	226		1	226	226		
Small Conference Room (10 seats)					1	205	205		reduce to 200sf / place with BioE Suite
Copy/Mail Room					1	140	140		placed with BioE Suilte
				1,106				1,451	
ICB Admin Offices									
Director Office	1	180	180		1	180	180		
Staff Office	19	140	2,660		19	140	2,660		
Large Reception Office	1	433	433		1	433	433		
Storage Room	1	226	226		1	226	226		
Small Conference Room (10 seats)					1	205	205		reduce to 200sf / placed with ICB Suite
Copy/Mail Room					1	140	140		placed with ICB Suite
				3,499				3,844	
General Areas									
Lecture Hall (100 seating capacity)	1	2,096	2,096		1	2,096	2,096		
Small Conference Room (10 seats)	2	301	602						moved
Large Conference Room (30 seats)	2	591	1,182		1	500	500		Reduce from 2 to 1 @ 500sf - 30+ capacity
Copy / Mail Room	2	140	280						moved
Kitchen	4	110	440		3	110	330		1 per floor
				4,600				2,926	
BASE BUILDING ASF				**37,726**				**33,796**	

NON-ASSIGNABLE SPACE	SCHEME B DPP PROGRAM				CONCEPT 3 - PROGRAM AREAS				
	NUMBER	EACH	AREA	TOTAL SF	NUMBER	EACH	AREA	TOTAL SF	NOTES
BUILDING SUPPORT				4,931				4,272	
Janitor Closet	4	79	316		3	79	237		1 per floor, orig program lists 4
Recycling Space	4	10	40		4	10	40		
Custodial Supply	1	100	100		1	110	110		at loading
Building Recycling Room	1	110	110		1	110	110		at loading
Receiving Area	1	226	226		1	226	226		at loading
Vending	1	63	63		1	63	63		
Lobby	1	1,056	1,056		1	1,056	1,056		
Shower/Locker	2	110	220		2	110	220		locate on first floor
Restrooms	8	350	2,800		6	350	2,100		2 (men + women) per floor
Restrooms					1	110	110		1 unisex
MECHANICAL SPACES				2,905				5,035	
A/V Telecom Closet	4	110	440		3	110	330		1 per floor
Electrical Closet	4	110	440		4	110	440		
Main Electrical	1	400	400		1	500	500		first floor or basement
Boiler Room			0		1	750	750		
Chiller Room			0		1	690	690		previously located on roof
Vacuum Pump Room	1	525	525		1	525	525		first floor or basement
Pure Water / R.O. Generation	1	1,100	1,100		1	1,100	1,100		
Wet Mechanical			0		1	700	700		locate in basement
MISC GSF (per efficiency % req'd)				23,438				18,785	
Circulation, Interaction Areas,			23,438				18,785		confirm per bldg. layout
Walls, etc.									
NON-ASSIGNABLE SPACE				**31,274**				**28,092**	
BASE BUILDING AREA (GSF)				**69,000**				**61,888**	Includes Basement MEP spaces not
ASF/GSF				55%				55%	accounted for in DPP.
BASEMENT AREA (SHELLED for FUTURE VIVARIUM)									
Open basement area					1	15,960	15,960		(not programmed above)
ROOFTOP MECHANICAL									
Boiler Room	1	750	750						located in Basement
Chiller Room	1	690	690						located in Basement
Building AHUs	1		0		1	3,500	3,500		
OUTDOOR AREAS									
Covered Bicycle Storage	1	1,089	1,089		1	1,089	1,089		
Loading Area	1	250	250		1	250	250		
Electrical Service Yard	1		0		1	1,300	1,300		co-locate near Loading Area

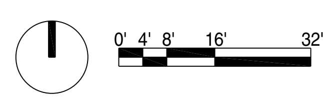
FLOOR STACKING DIAGRAM



BLOCKING & STACKING DIAGRAM



FIRST FLOOR



LABORATORY

LABORATORY SUPPORT

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ADMINISTRATION OFFICES

SHARED SPACES

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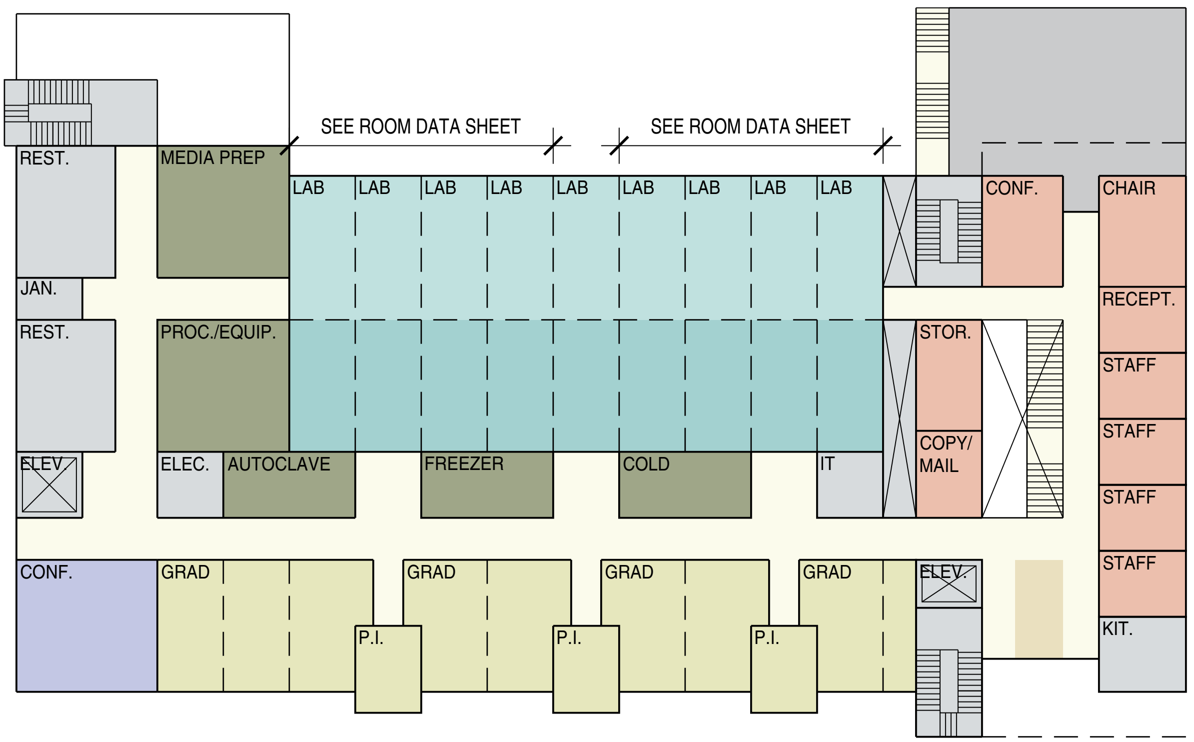
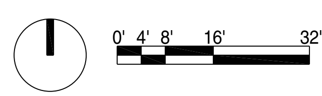
INTERACTION SPACES

VIVARIUM OR SHELLED SPACE

BLOCKING & STACKING DIAGRAM



SECOND FLOOR



LABORATORY	ACADEMIC OFFICES	SHARED SPACES	INTERACTION SPACES
LABORATORY SUPPORT	ADMINISTRATION OFFICES	BUILDING SUPPORT	VIVARIUM OR SHELLED SPACE

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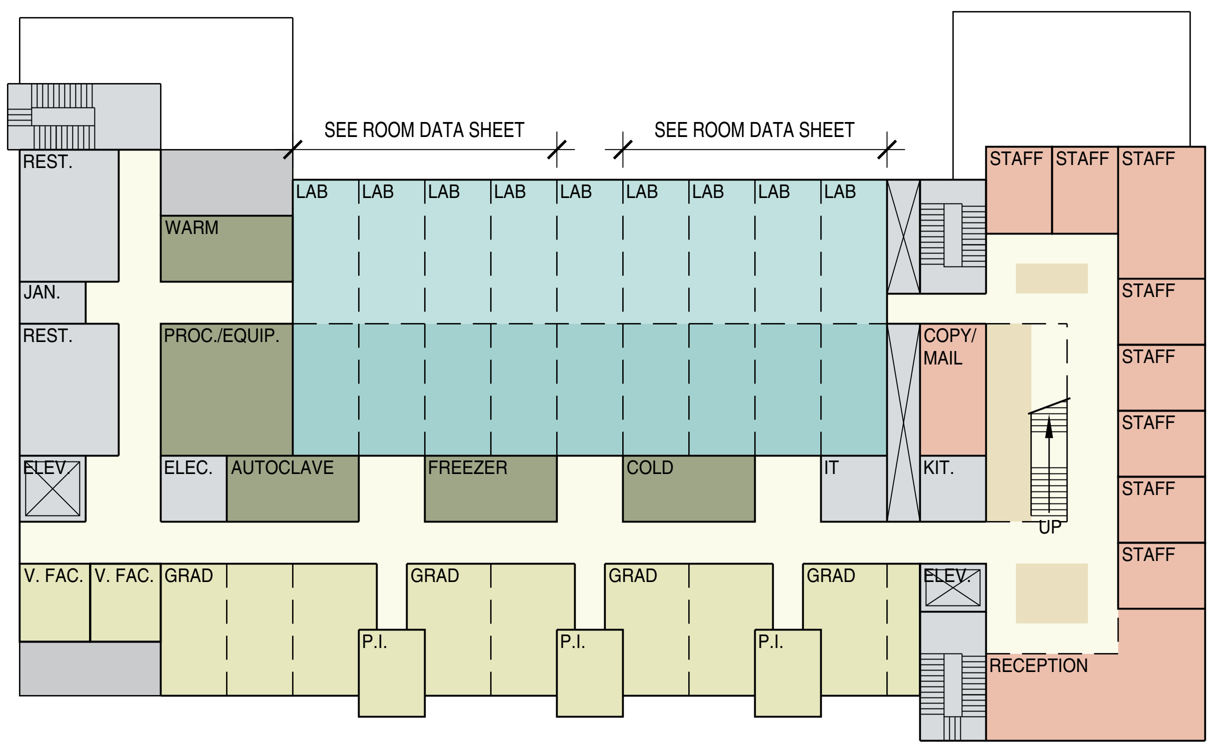
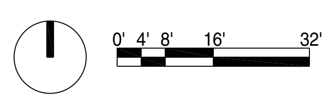


THIRD FLOOR



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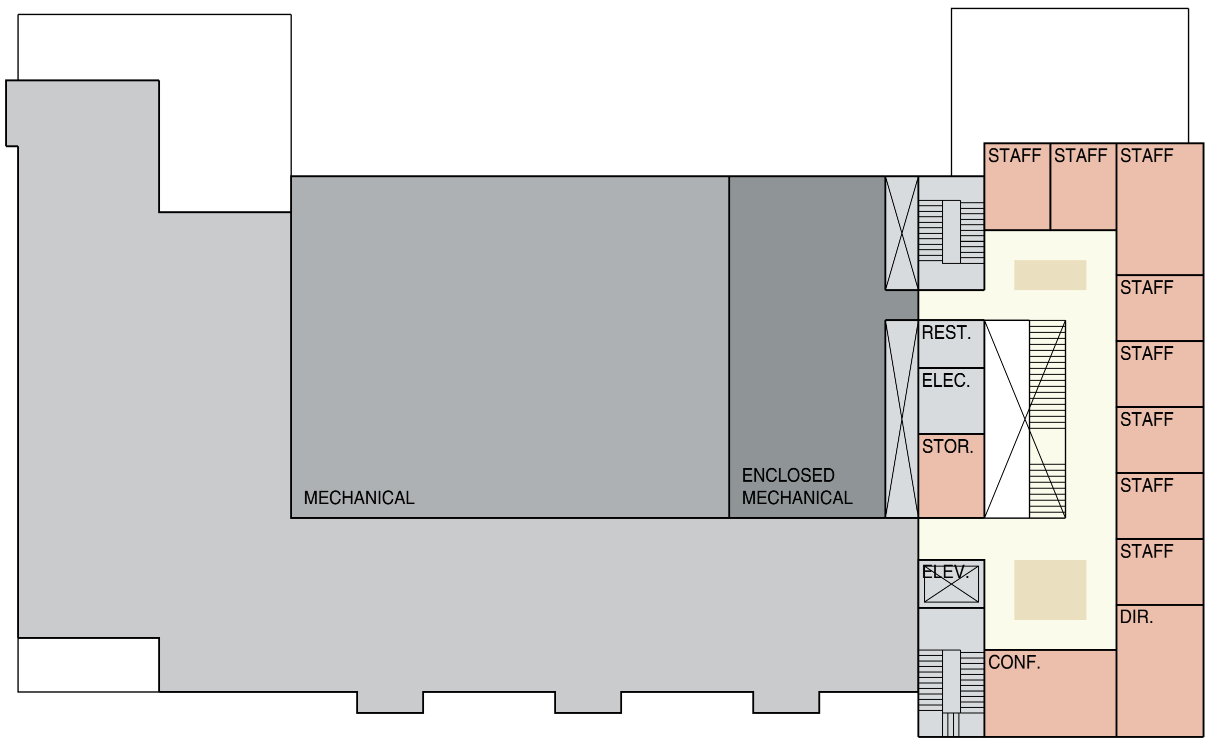

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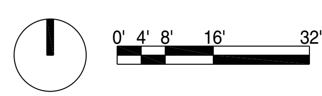

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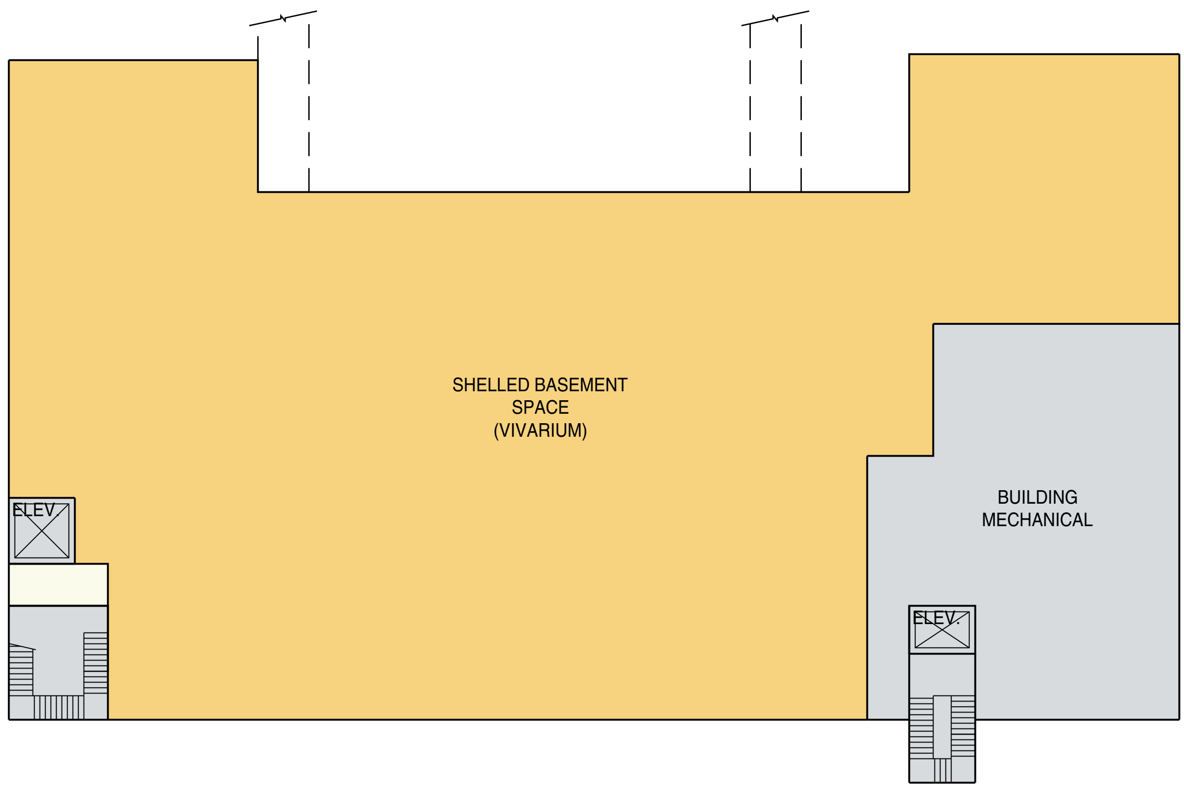
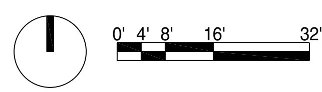


BASEMENT



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ACADEMIC OFFICES	ADMINISTRATION OFFICES
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BLOCKING & STACKING DIAGRAM

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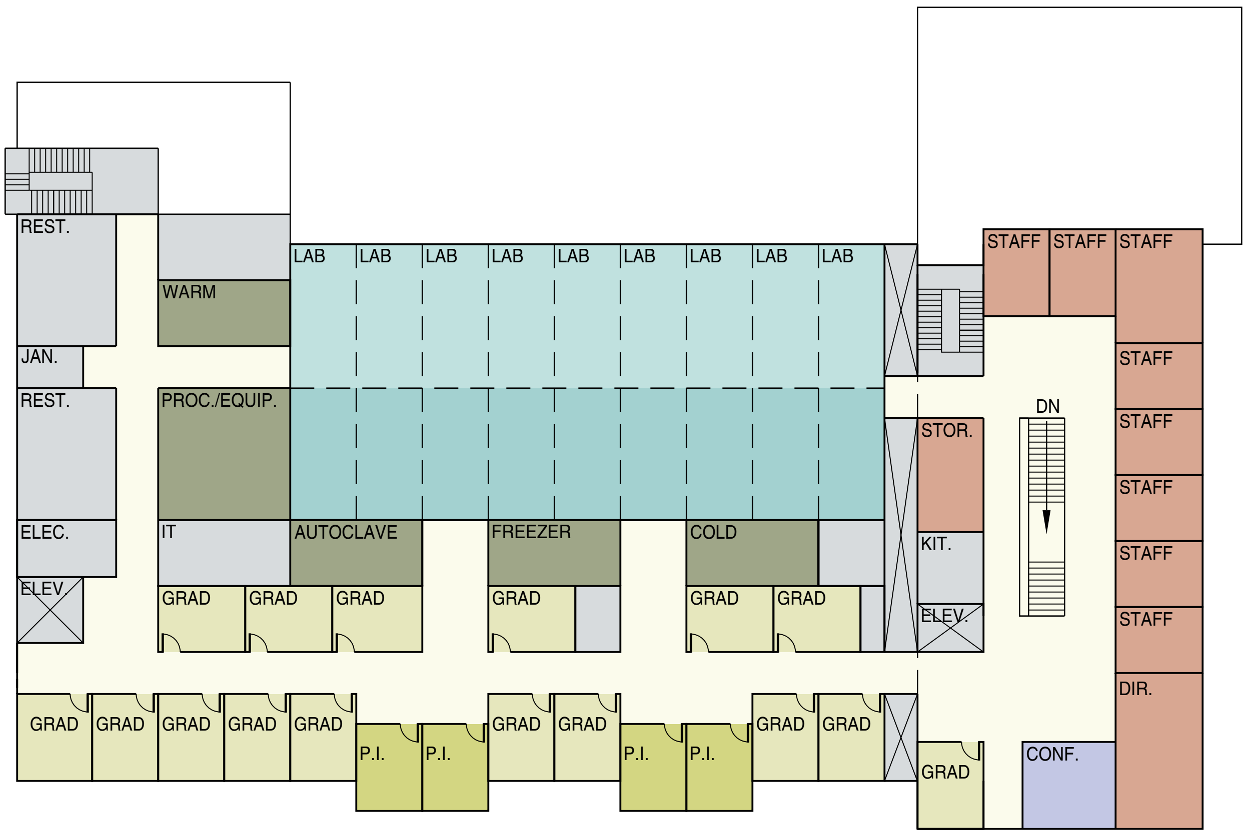

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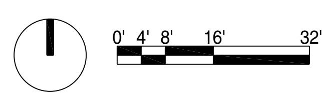

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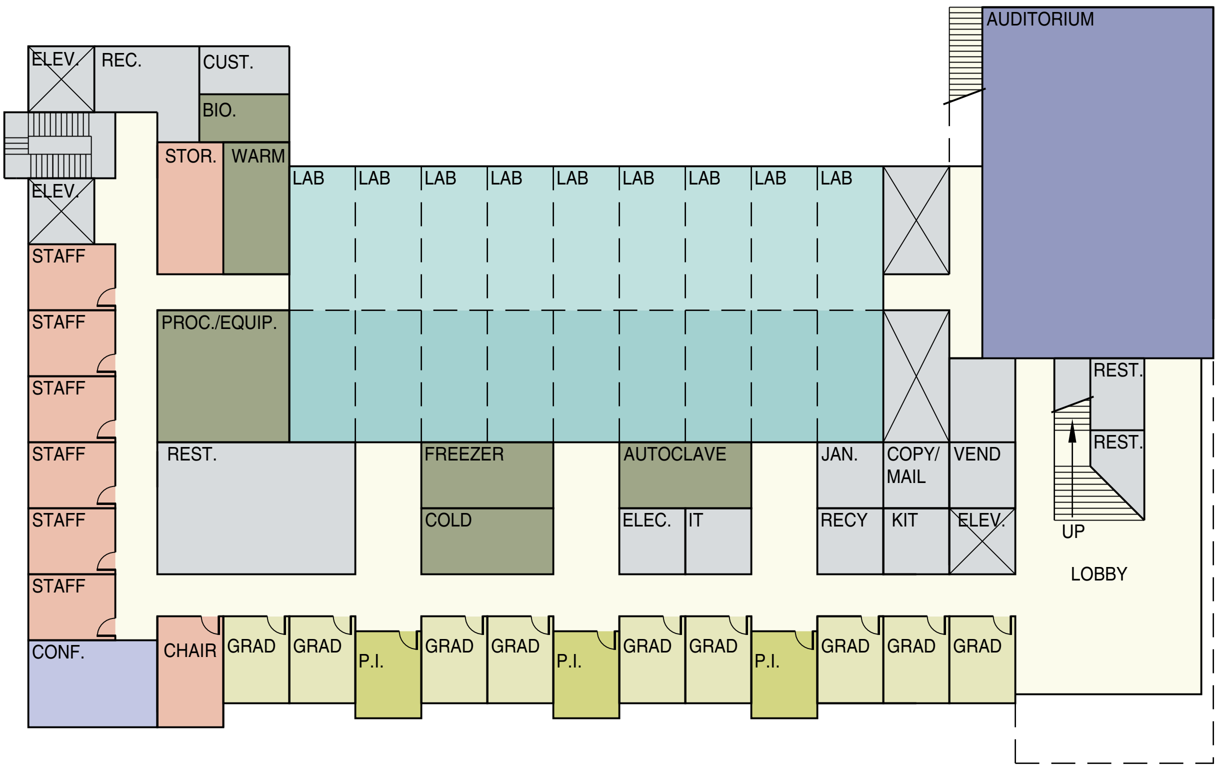
BLOCKING & STACKING DIAGRAM



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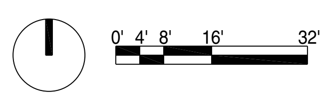

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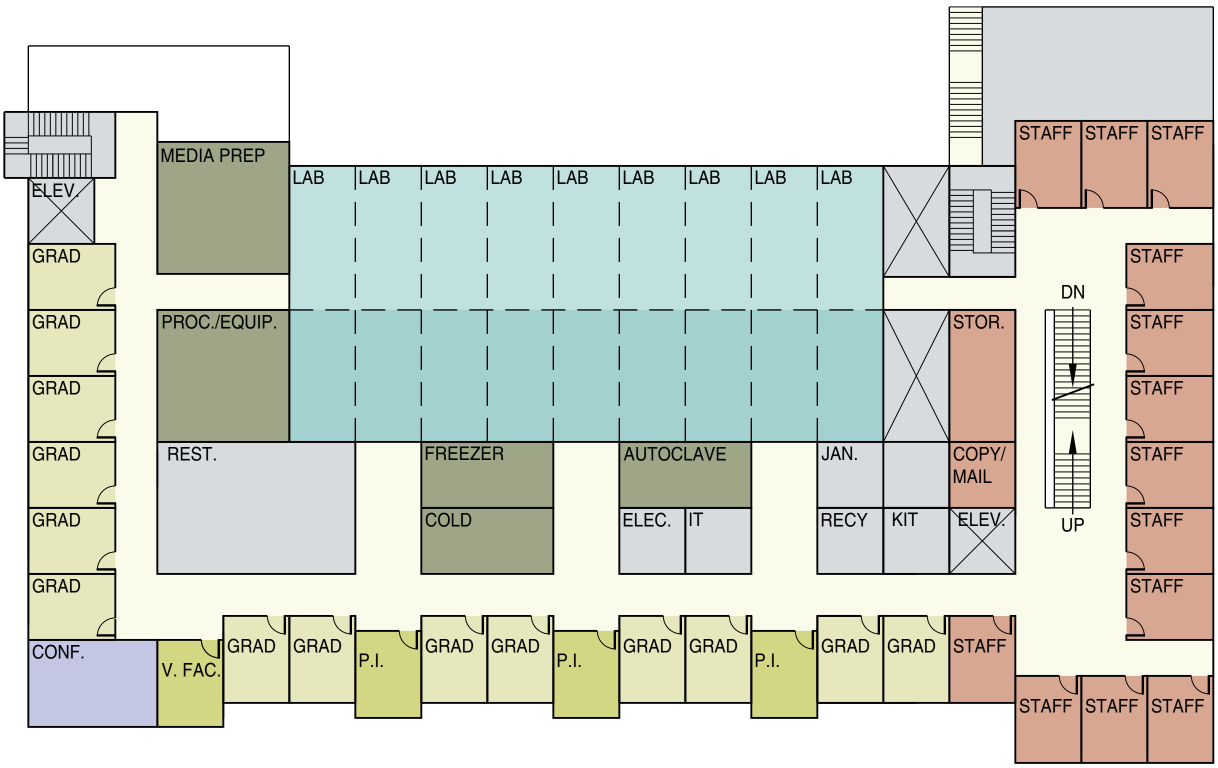

SECOND FLOOR

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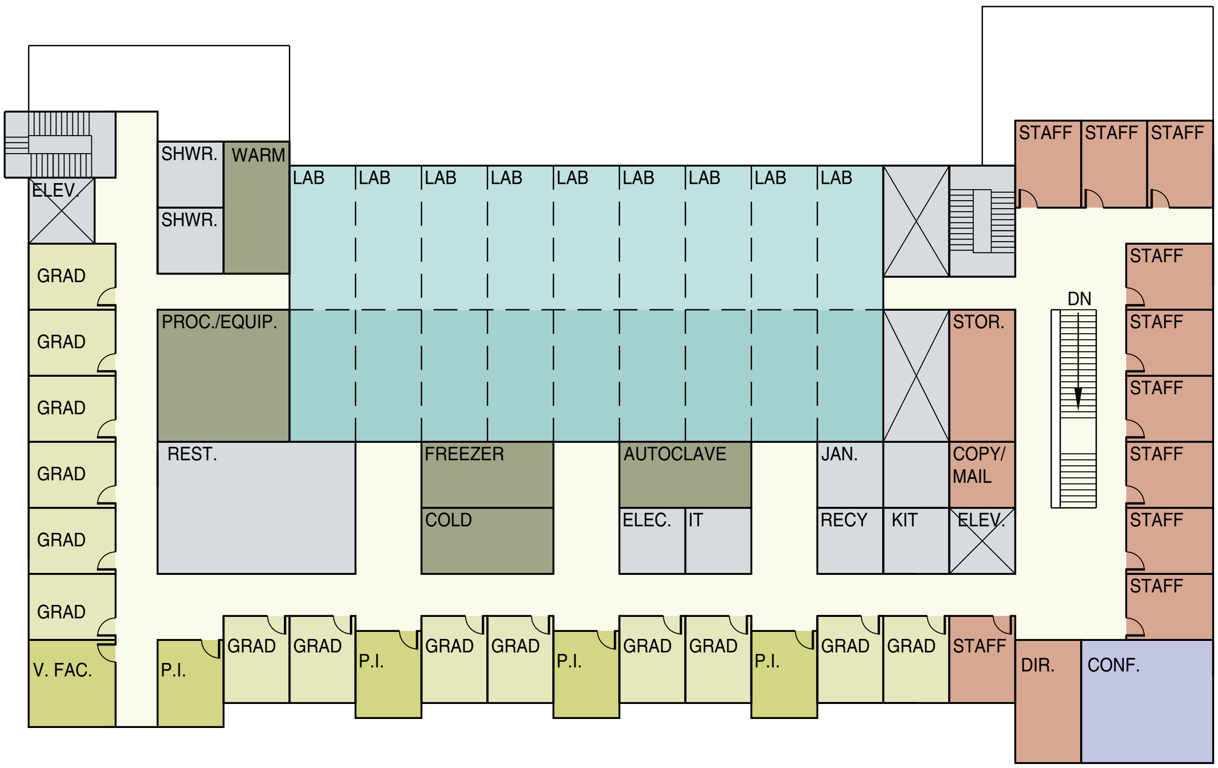

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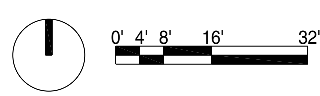

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