UNIVERSITY of CALIFORNIA Riverside

DIVISION OF BIOMEDICAL SCIENCES
GROSS ANATOMY SUITE STUDY

FINAL
DECEMBER 6, 2006

prepared by CO ARCHITECTS

formerly Austen+Allen-LA
5055 Wilshire Boulevard, 9th Floor
Los Angeles, California 90036
www.coarchitects.com
323.525.0500 phone, 323.525.0955 fax

TABLE OF CONTENTS

TABLE OF CONTENTS

APPENDICES

ACKNOWLEDGEMENTS

LIST OF PARTICIPANTS

CAPITAL AND PHYSICAL PLANNING

Tim Ralston, Assistant Vice Chancellor
Kieron Brunelle, Principal Educational Facilities Planner
Bill Johnson, Senior Educational Facilities Planner
Berent Pippert, Campus Space Manager

FOCUS GROUP, BIOMEDICAL SCIENCES

Craig V. Byus, Dean and Program Director, Divison of Biomedical Sciences
Neal L. Schiller, Associate Dean & Chair of the Division, Divison of Biomedical Sciences
Faye Dawson Brock, Director of Instructional Support Unit, Divison of Biomedical Sciences
Lynn Hice, Management Services Officer, Divison of Biomedical Sciences
James Colgan, Lecturer, Divison of Biomedical Sciences

ACKNOWLEDGEMENTS

CONSULTANT TEAM

ARCHITECTURE

CO Architects Los Angeles

5055 Wilshire Boulevard, Suite 900
Los Angeles, CA 90036
Office: (323) 525-0500, Fax: (323) 525-0955

Scott P. Kelsey, **Principal-in-Charge**

Jonathan Kanda, **Project Architect**

Duke Sakiyabu, **Designer**

MEP

Consulting Solutions Inc.

10650 Scripps Ranch Boulevard, Suite 210
San Diego, CA 92131
Office: (858) 564-3777, Fax: (858) 564-3799

Pervez Mobin, PE, **Principal**

COST ESTIMATING

Davis Langdon

301 Arizona Avenue, Suite 301
Santa Monica, CA 90401
Office: (310) 393-9411, Fax: (310) 393-7493

Chris Sterparn, **Associate**

1.0 EXECUTIVE SUMMARY

1.1 OVERVIEW

The following study defines the project scope of the proposed facilities renovation for the Division of Biomedical Sciences (Biomed) at the University of California, Riverside (UCR). The facilities are located primarily on the basement level of the Statistics Computer Building (Stat Comp) on the UCR campus. There are additional offices on the first floor of the Stat Comp building as well as two portable trailers adjacent to the campus greenhouses. The proposed renovation is comprised of 1,590 assignable square feet (ASF) in class lab space and 2,115 ASF in a gross anatomy suite, both of which are located at the basement level of the Stat Comp building. The purpose of the study is to establish the goals, parameters and constraints of the project in sufficient detail to provide conceptual guidance for the subsequent design phases of the project and to confirm the estimated construction cost.

In conjunction with long term UCR Academic Planning goals, the Biomed program is expected to increase class size from twenty-four to forty students. This growth, coupled with the poor condition and inefficient use of the class lab space and gross anatomy lab, presents the main impetus for renovation of these facilities. The goals of this project include the following:

- Allow for a significant increase in students and create, where possible, more efficient layout of space to accommodate that growth.
- Increase safety and security.
- Bring all renovated spaces into compliance with applicable codes and regulations.
- Facilitate potential upgrades in audiovisual infrastructure and equipment.

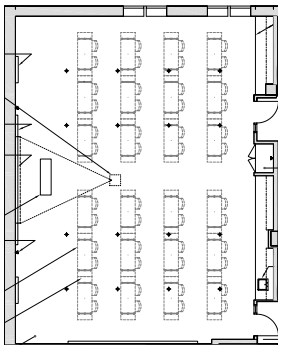
2.1 SPACE PROGRAM SUMMARY

Assignable Square Feet: **3,705**

Room Use Code	Room Code	Program Name / Space Type	Capacity	ASF/Ea.	Quantity	TOTALS
Instructional						
200-260	B0601	Class Lab/Lecture	49	1,590	1	**1,590**
200-261	B0632	Gross Anatomy Lab	41	1,193	1	**1,193**
	B0632E	Model Room	12	220	1	**220**
					Subtotal:	***3,003***
Offices						
300-310L	B0632F,G	Faculty Offices	1	128	2	**256**
					Subtotal:	***256***
Support						
700-721	B0632A	Storage	1	31	1	**31**
	B0632B	Wash Room	5	155	1	**155**
	B0632C,D	Locker Room	22	130	2	**260**
					Subtotal:	***446***
RENOVATION TOTAL ASF						**3,705**

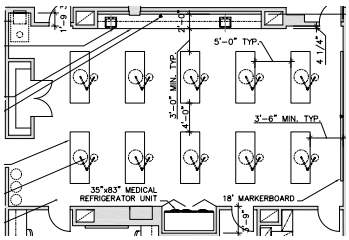
2.2 SPACE DESCRIPTIONS

A general overview of the spaces to be renovated are described below. The overview provides a brief description of the primary function of spaces, requirements for functional adjacencies and the basic planning criteria for each category.



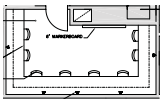
Class Lab

- The Class Lab provides space for both traditional didactic instruction and group learning activities. Current student capacity is twenty-four with a maximum capacity of forty-eight students. Support space includes storage casework and a sink along one wall. Existing wireless connectivity will be maintained to allow movable tables and chairs to be reconfigured for different instructional methods. The room contains marker boards, a ceiling-mounted digital projector and manual projection screen for instructional purposes.



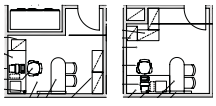
Gross Anatomy

- The Gross Anatomy lab houses the equipment and facilities for the gross anatomy, or macroscopic anatomy, course. The lab has a maximum capacity of ten tables. Four students are assigned per table. All plumbing fixtures, including two stainless steel sinks and an emergency eyewash/ shower unit, are arranged along one wall. Base cabinets provide storage and an alcove with lockable doors houses a medical refrigerator unit. The proposed arrangement of gross anatomy tables and associated overhead light fixtures will be such that additional tables and lights can be added as required. Telecom and data service is provided in raceway service overhead to accommodate possible addition of AV equipment as required. The room contains marker boards for instructional purposes.



Model Room

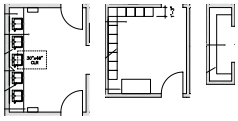
- The Model room provides space for equipment, instrumentation and prep space for the Gross Anatomy lab. Wall and base cabinets for storage and display purposes are provided.



Offices

- Two faculty offices, at 128 ASF each, are located adjacent to the gross anatomy lab. They will be as open as possible to allow for maximum flexibility in the arrangement of the spaces.

2.0
PROGRAM REQUIREMENTS



(l-r) Wash room, Locker room, & Storage room

- The Wash room is open and adjacent to the gross anatomy lab for ease of accessibility. A handicap accessible lavatory is provided. The Locker rooms are directly adjacent to the wash room and provides storage for the students' belongings during gross anatomy instruction. Adjustable shelves are provided in the storage room, directly adjacent to the gross anatomy room.

2.3 SPECIAL DESIGN REQUIREMENTS

2.3.1 ACCESSIBILITY

Providing accessibility for persons with disabilities requires special design considerations. The facility must conform to applicable local, state and federal regulations. Early design consideration should be given to the following accessibility aspects:

- Accessible work stations should be provided in the laboratories based on code requirements.
- Location of accessible work stations as close as possible to eyewash and safety showers.
- An 18" clearance on the pull side and 12" clearance on the push side of doors opposite the hinged side is required.

Some general criteria and guidelines for accessible work stations are as follows:

Work surfaces should be located 30" to 34" above the floor with wheel-chair clearance below. Adjustable work surfaces can provide a range of possible height adjustments.

Service controls, equipment, and equipment controls should be located within easy reach for persons with limited mobility. Controls require have single-action levers or blade handles for easy operation.

Aisle widths and clearances should be adequate for maneuvers of wheel-chair bound individuals based on code requirements.

2.4 HVAC DESIGN PARAMETERS

Safety

The laboratory HVAC system should promote the safe operation of the building and the health and comfort of the occupants. The laboratory environment may contain harmful chemical vapors, particulates and biological aerosols. These hazardous substances must be continuously removed from the breathing zone of the laboratory users. Specifically, formaldehyde exposure within the Gross Anatomy suite should conform to CalOSHA requirements (*California Code of Regulations, Title 8, Section 5217*).

The HVAC design will be based on regulatory requirements and guidelines along with good engineering practices. Code requirements are a minimum standard.

Containment

Containment is provided by the negative pressure of the gross anatomy space relative to corridors and surrounding non-lab spaces. To effectively maintain the negative pressure in the lab, doors to the lab should be equipped with closers, must remain closed as much as possible and should not be held open.

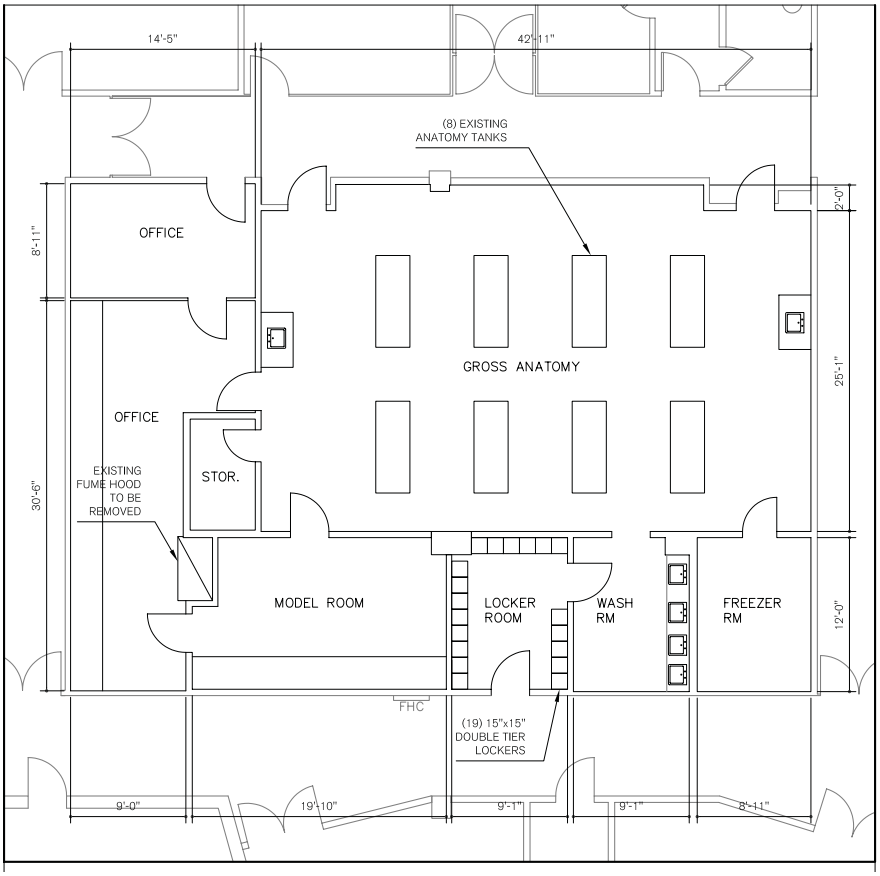
The gross anatomy space will be continuously ventilated 24 hours a day.

Supply air shall be effectively distributed into all portions of the laboratory space by ceiling diffusers or perforated ceiling panels.

Air from the Gross Anatomy lab and other spaces which might contain hazardous materials or odors shall be exhausted outdoors and not recirculated.

Air from offices and other clean areas may be recirculated or directed toward negative pressure laboratories.

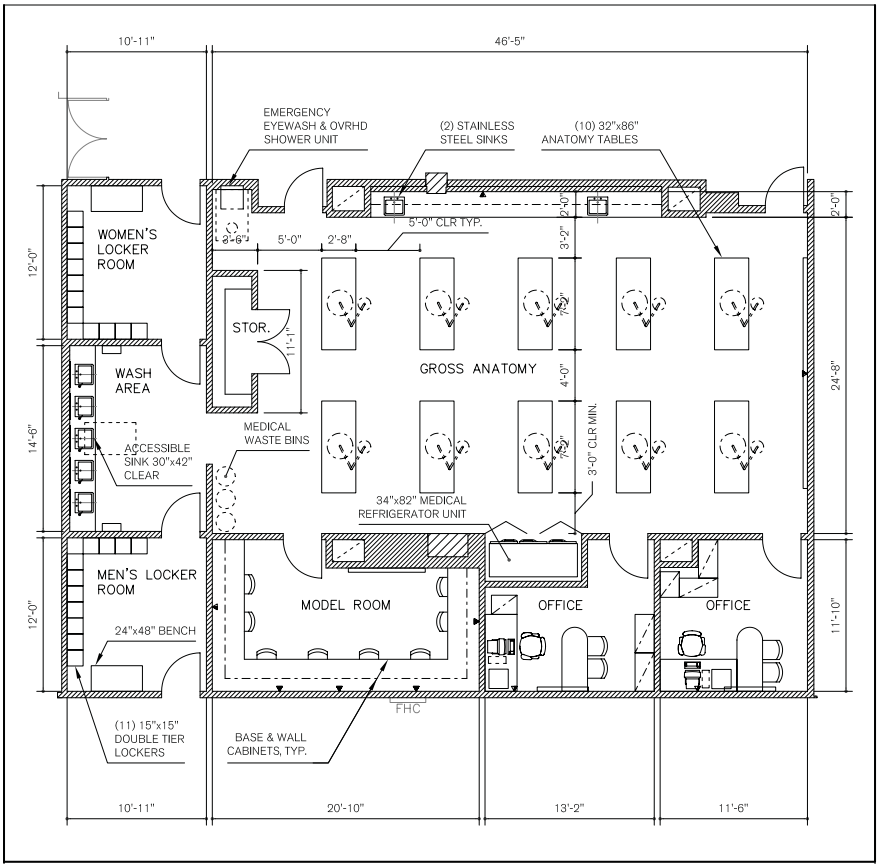
3.1 DESIGN SCHEMES



GROSS ANATOMY SUITE EXISTING DEFICIENCIES

- Existing equipment and fixtures are in poor condition and should be replaced.
- The flooring, composed of vinyl tile, is in very poor condition. The flooring is non-continuous as visible gaps in the seams are apparent, allowing fluids to penetrate into the subfloor beneath. The relative smoothness of the existing flooring presents a slipping hazard if it becomes wet.
- The current layout of anatomy tables, lights, and lockers cannot accommodate the expected increase in students.
- There is no accommodation for potential use of AV technology within the gross anatomy lab.
- No accommodation for handicap accessibility.
- No emergency eye wash/ shower.

3.1 DESIGN SCHEMES



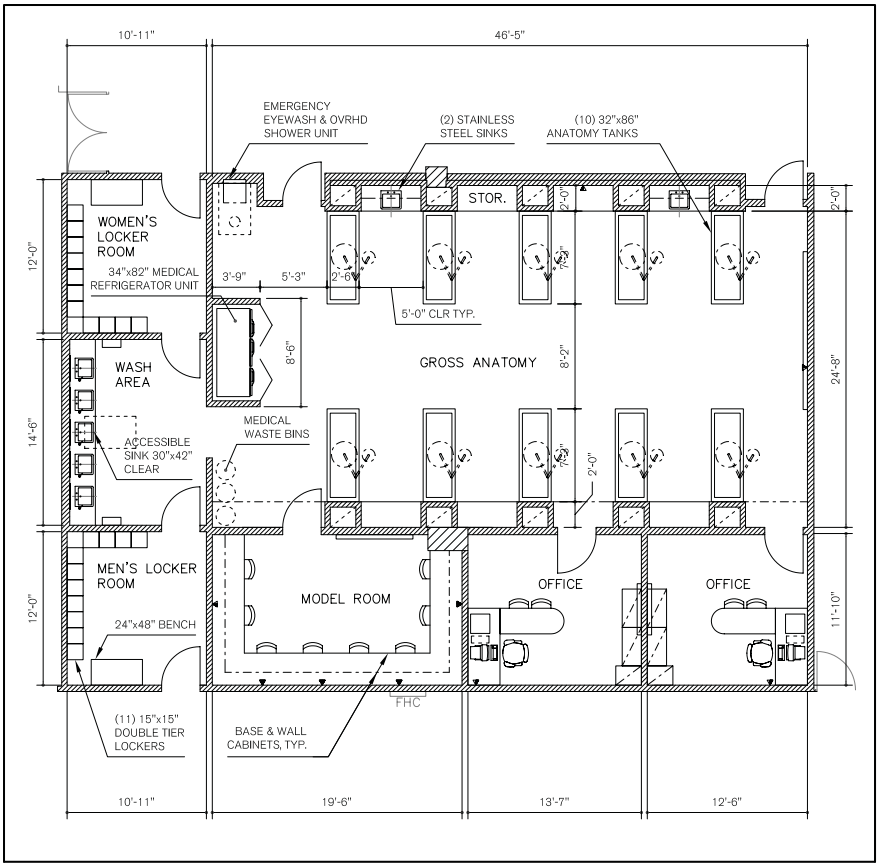
GROSS ANATOMY SUITE
PREFERRED SCHEME
Pros:

- Increase in potential number of gross anatomy tables to a maximum of 10.
- Replacement of cold room storage with medical refrigerator unit.
- Creation of separate locker rooms for male and female students.
- Improved flow of students from locker rooms to gross anatomy lab.
- Creation of two separate office spaces conducive to efficient layout.
- Addition of emergency eyewash/ shower unit in alcove.

Cons:

- Substantial demolition of existing walls and relocation of plumbing fixtures.

3.1 DESIGN SCHEMES



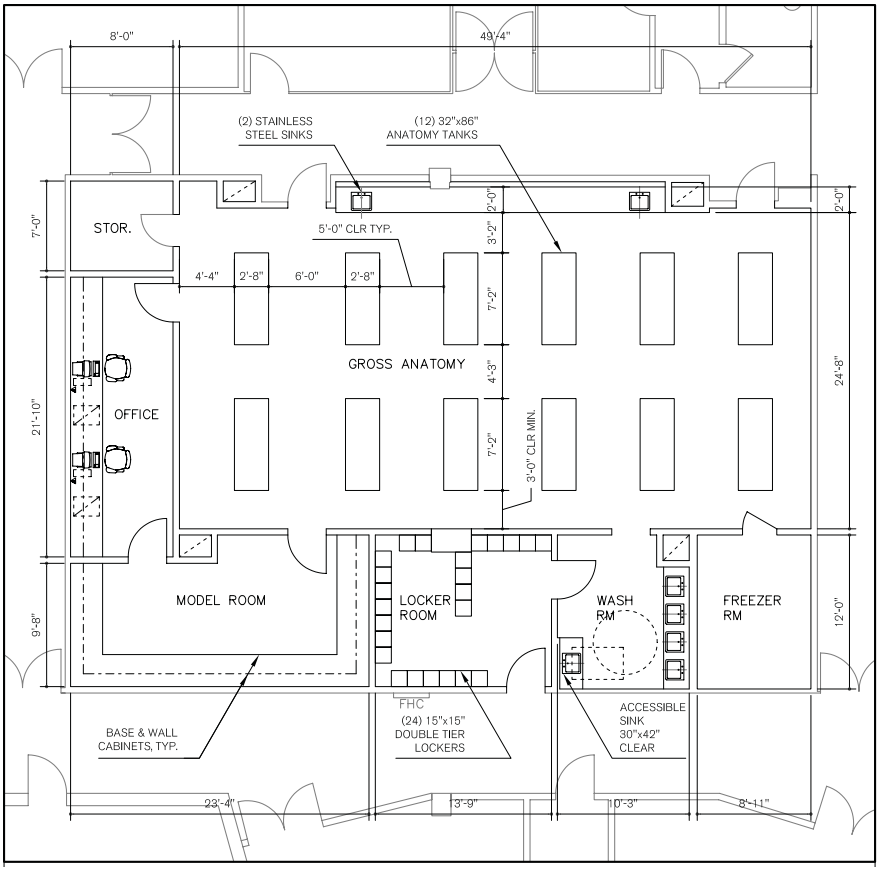
GROSS ANATOMY SUITE
ALTERNATE SCHEME (Sidedraft or downdraft table option)
Pros:

- Increase in potential number of gross anatomy tables to a maximum of 10.
- Dedicated exhaust system for each anatomy table
- Replacement of cold room storage with medical refrigerator unit.
- Creation of separate locker rooms for male and female students.
- Improved flow of students from locker rooms to gross anatomy lab.
- Creation of two separate office spaces conducive to efficient layout.
- Addition of emergency eyewash/ shower unit in alcove.

Cons:

- Increased cost for custom anatomy tables and associated return air chases and plenums.
- Fixed anatomy table arrangement.
- No separate storage room.
- Substantial demolition of existing walls and relocation of plumbing fixtures.

3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



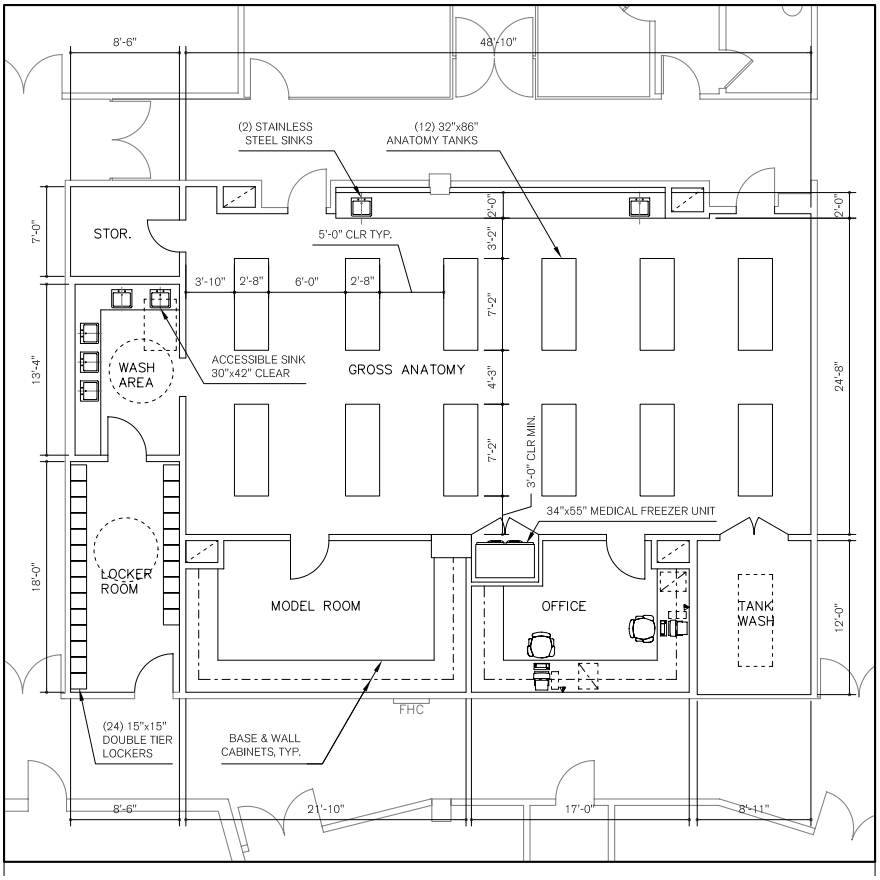
GROSS ANATOMY SUITE
SCHEME 1
Pros:

- Increase in potential number of gross anatomy tables to a maximum of 12.
- Minimal demolition of existing walls and relocation of plumbing fixtures.
- Increase in storage space.

Cons:

- Office space is reduced and proportions of room unsuitable for efficient layout.
- Inefficient layout of locker space and direct line-of-sight from hallway.

3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



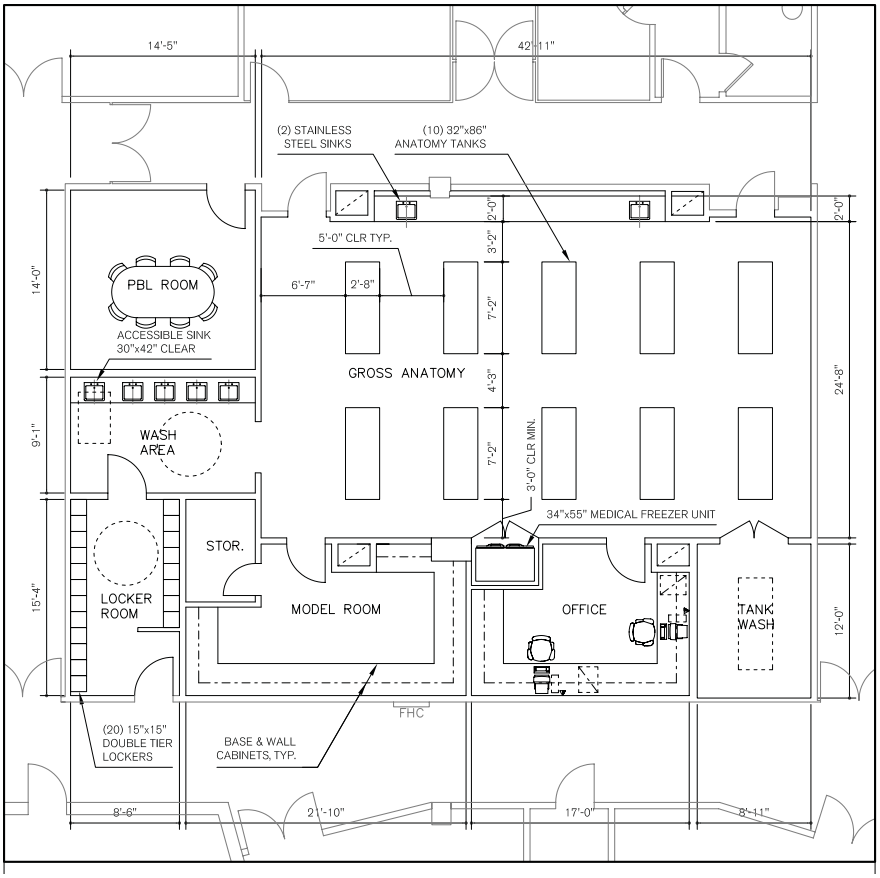
GROSS ANATOMY SUITE
SCHEME 2
Pros:

- Increase in potential number of gross anatomy tables to a maximum of 12.
- Increase in storage space.
- Replacement of cold room storage with medical refrigerator unit.
- Improvement in size and proportions of office space.
- Improved flow of students from locker room to gross anatomy lab.

Cons:

- Substantial demolition of existing walls and relocation of plumbing fixtures.
- Separate offices preferred to shared office space.
- Direct line-of-sight from hallway to locker room.

3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



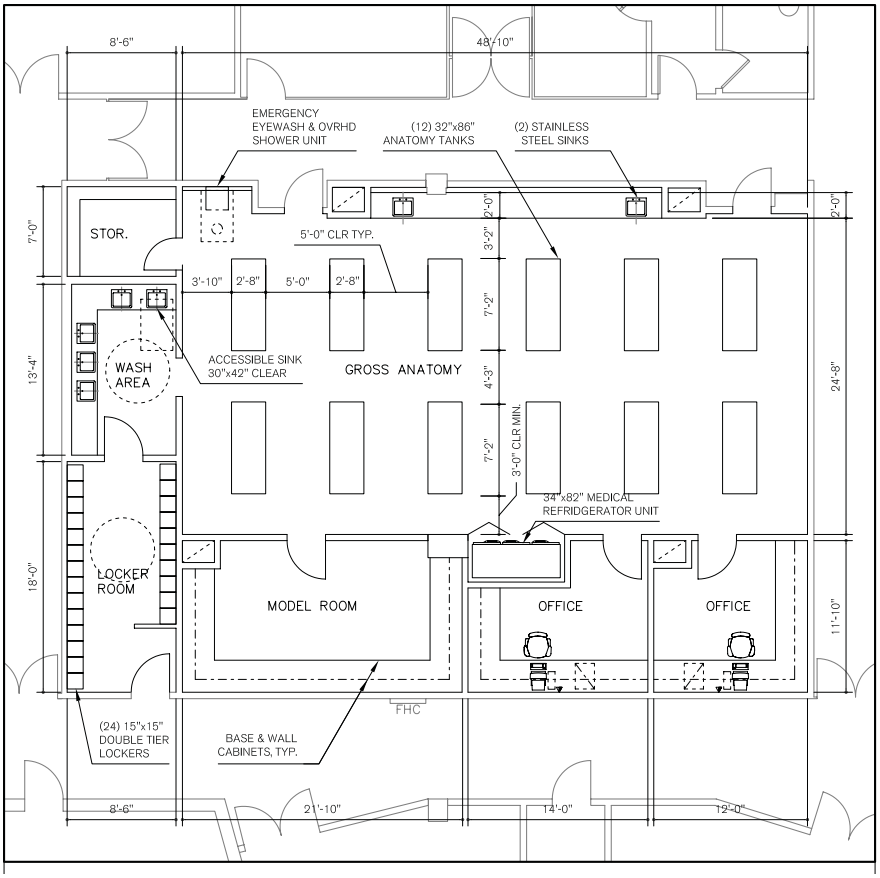
GROSS ANATOMY SUITE
SCHEME 3
Pros:

- Increase in potential number of gross anatomy tables to a maximum of 10.
- Replacement of cold room storage with medical refrigerator unit.
- Improvement in size and proportions of office space.
- Improved flow of students from locker room to gross anatomy lab with ideal arrangement of wash area.
- Addition of PBL room for instruction and faculty use.

Cons:

- Substantial demolition of existing walls and relocation of plumbing fixtures.
- Separate offices preferred to shared office space.
- Storage space not increased and impacts model room layout.

3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



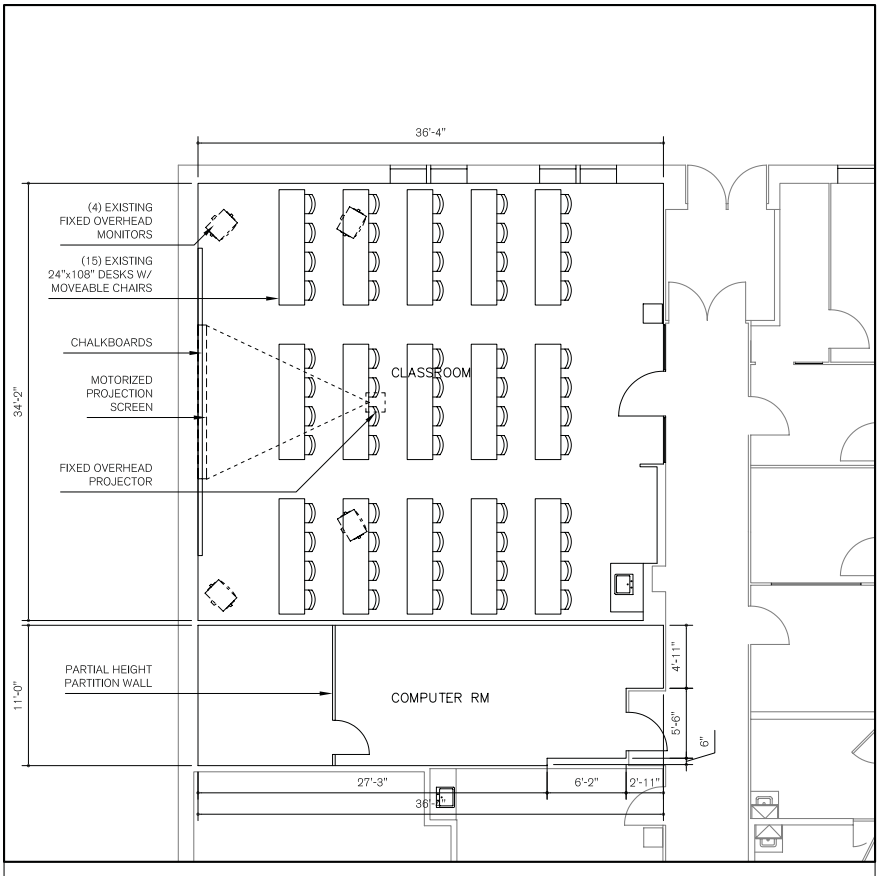
GROSS ANATOMY SUITE
SCHEME 4
Pros:

- Increase in potential number of gross anatomy tables to a maximum of 12.
- Increase in storage space.
- Replacement of cold room storage with medical refrigerator unit.
- Creation of two separate office spaces conducive to efficient layout.
- Improved flow of students from locker room to gross anatomy lab.
- Addition of emergency eyewash/ shower unit in alcove.

Cons:

- Substantial demolition of existing walls and relocation of plumbing fixtures.

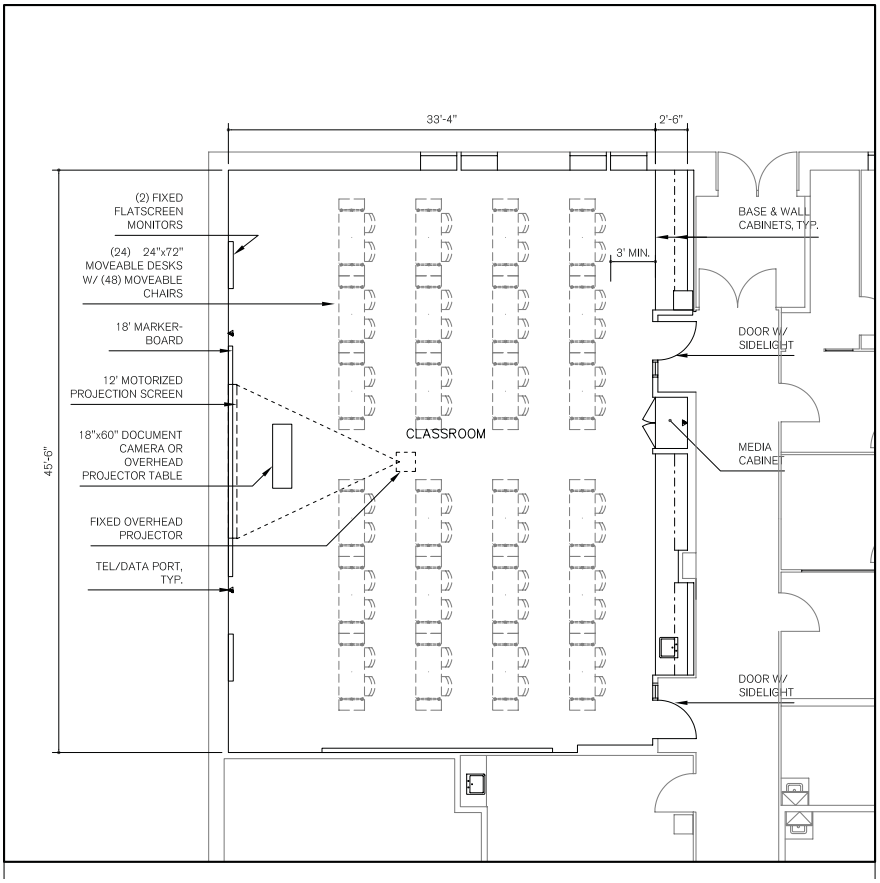
3.1 DESIGN SCHEMES



CLASS LAB
EXISTING DEFICIENCIES

- Existing space and table arrangement insufficient for expected increase in students.
- Exiting from the class lab is inadequate.
- The computer room is not in use and can be eliminated.
- No accommodation for handicap accessibility.
- Insufficient storage.

3.1 DESIGN SCHEMES

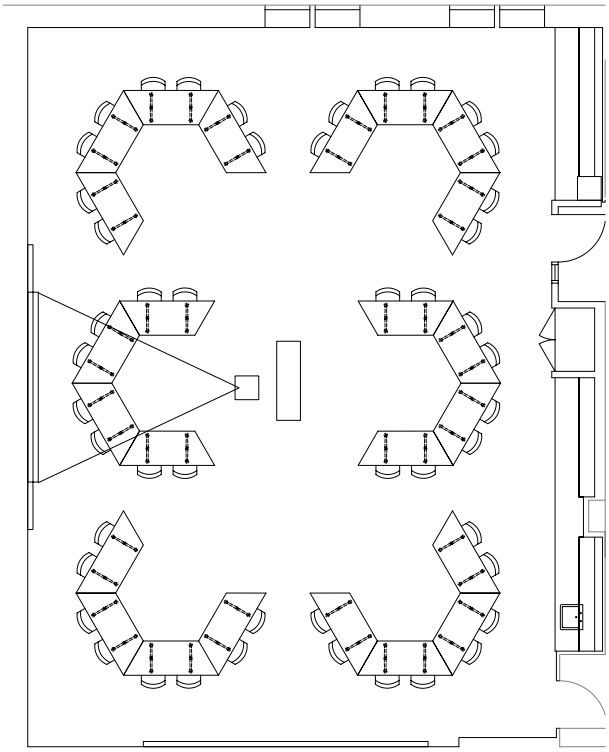


CLASS LAB
PREFERRED SCHEME
Pros:

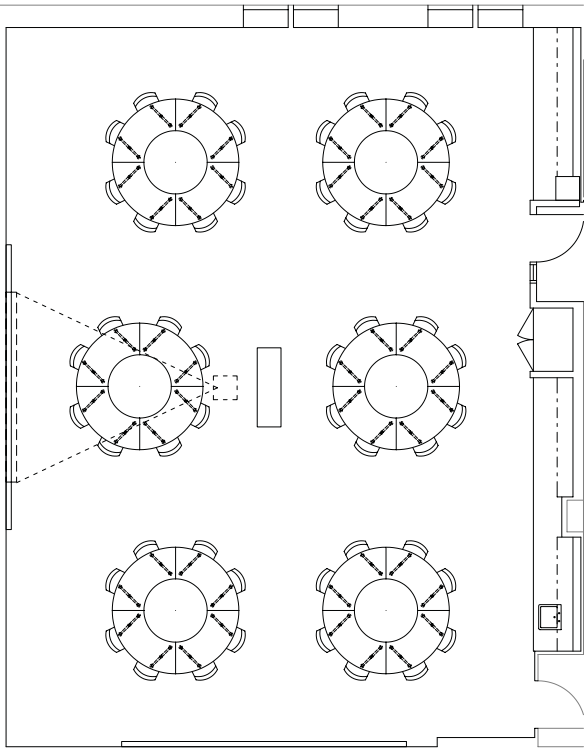
- Improvement in storage, audiovisual, and plumbing service along back wall.
- Increase in space allowing for maximum flexibility in table arrangement.
- Flexibility for display and presentations on two walls
- Flat screen monitors contribute to clutter-free learning environment.

NOTE: Alternate seating arrangements are provided on the following page.

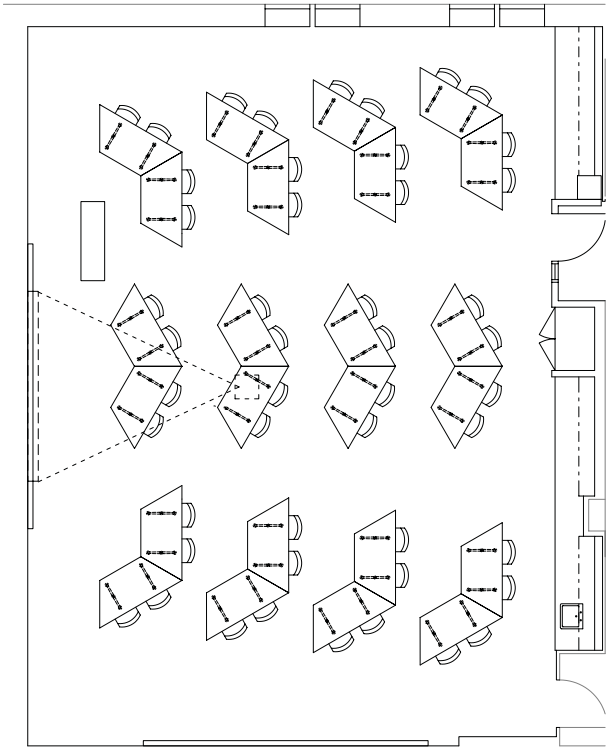
3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



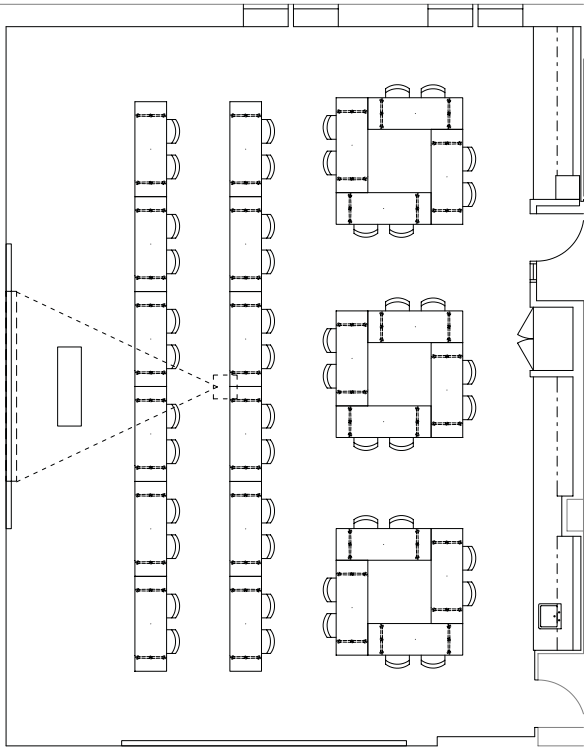
Group learning layout in "U" shape arrangement



Group learning layout w/ circular tables

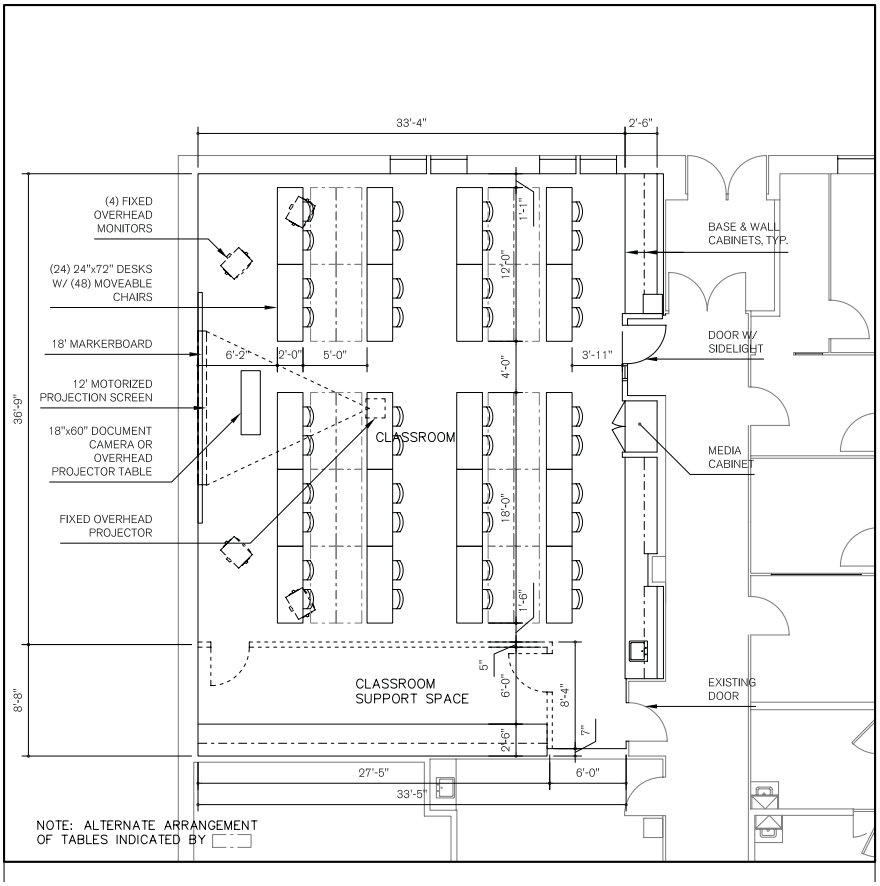


Didactic lecture layout with paired tables



Didactic lecture and group learning arrangement

3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



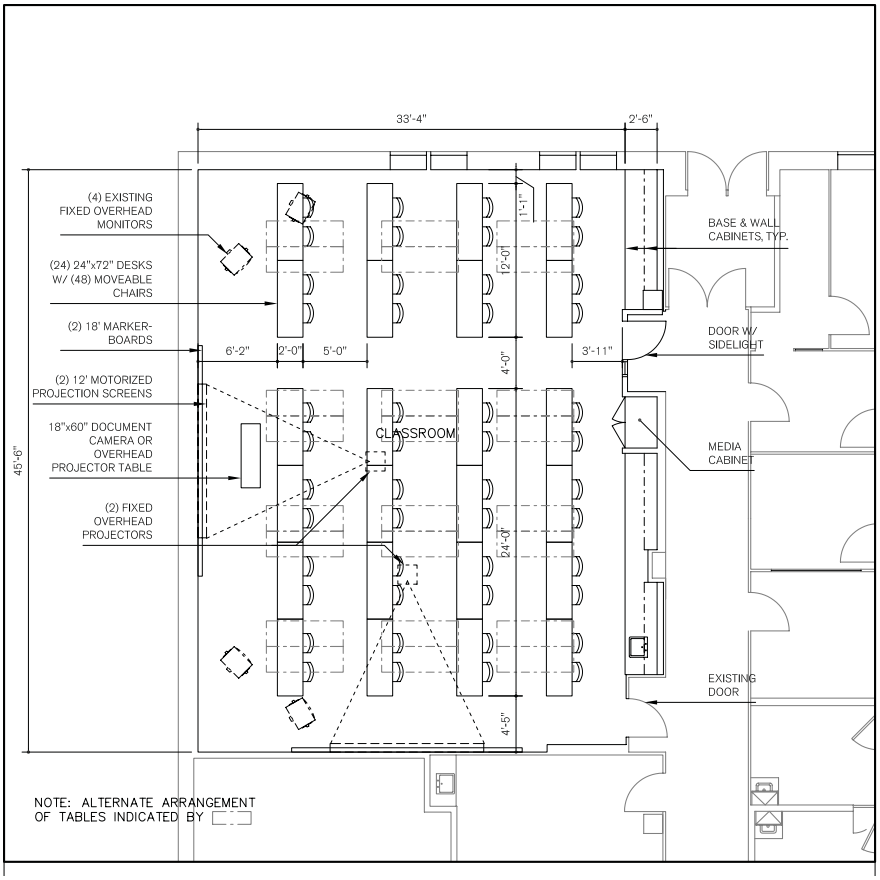
CLASS LAB
SCHEME 1
Pros:

- Improvement in storage, audiovisual, and plumbing service along back wall.
- Increase in space allowing for flexibility in table arrangement.

Cons:

- Support space not required for class functions.
- Overhead monitors are visual distraction when not in use.

3.1 DESIGN PROCESS (FOR REFERENCE ONLY)



CLASS LAB
SCHEME 2
Pros:

- Increased student capacity.
- Improvement in storage, audiovisual, and plumbing service along back wall.
- Increase in space allowing for maximum flexibility in table arrangement.
- Flexibility for display and presentations on two walls

Cons:

- Overhead monitors are visual distraction when not in use.

4.1 MECHANICAL

4.1.1 GENERAL

The mechanical systems considered included heating, ventilation and air conditioning for the project:

1. Codes and standards.

- California Building Code - 2001
- California Mechanical Code, 2001
- California Plumbing Code, 2001
- California Electrical Code, 2004
- California Energy Code (Title 24, Part 6), 1998
- California Code Regulation for Elevators (Title 24, Part 6), 1998
- California Fire Codes (UBC-1997, NFPA72-1996, NEC-1996), 1998
- California State Referenced Standard Code (Title 24, Part 12), 1998
- Cal OHSA (Title 8), 1998
- National Fire Protection Association (NFPA)
- NFPA 30 - Flammable and Combustible Liquids Code, 1996
- NFPA 45 - Fire Protection for Laboratories using Chemicals, 1996
- NFPA 101 - Safety to Life from Fire in Buildings and Structures, 1997
- CFR 1910.1450 - Occupational Exposures to Hazardous Chemicals in Laboratories (OSHA Standard 29)
- ADA - Americans with Disabilities Act Accessibility Guidelines (ADAAG), U. S. Architectural and Transportation Barriers Compliance Board
- ANSI/CABO A117.1 - Access and Usable Buildings and Facilities, 1992
- ANSI/AIHA Z9.5 - American National Standard for Laboratory Ventilation, 1992
- ANSI Z358.1 - Emergency Eyewash and Shower Equipment, 1998
- HHS (CDC) 93-8395 - Biosafety in Microbiological and Biomedical Laboratories, 3rd Edition, 1993
- NIH Design Policy and Guidelines, Bethesda, MD, Feb. 1996
- Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC Duct Construction Standards, 1995.
- Environmental Protection Agency (EPA).
- South Coast Air Quality Management District (SCAQMD).
- American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Handbooks.
- American National Standards Institute (ANSI).
- Underwriters' Laboratories (UL)
- American Society for Testing and Materials (ASTM)
- American Conference of Governmental Industrial Hygienists, Manual of Recommended Practice.
- UCR Physical Plant Building Standards.
- All Applicable State and Local Codes.

4.1.2 DESIGN CRITERIA

Design criteria may be equal to or greater than the UC Riverside standards. Following are Consulting Solution's recommendations for use on this project:

1. Project location:

Location:	Riverside, California
California Climate Zone:	10
Latitude	34 (ASHRAE Exp. station.
Elevation	986ft (ASHRAE Exp. station).

2. External Design Condition:

External design conditions are based on ASHRAE Climate Data for Region X, 0.1% data for summer, 0.2% data for winter.

Summer:

Dry Bulb	110 degrees F
Wet Bulb	68 degrees F (mean coincident wet bulb)
Design Wet Bulb	75 degrees F (0.1%)
Daily Range	37 degrees F

Winter:

Dry Bulb	34 degrees F (0.2% winter)

3. Internal Design Conditions:

SPACE	SUMMER TEMP (ºF)	WINTER TEMP (ºF)	SUMMER RH (%)	WINTER RH (%)
GROSS ANATOMY LABORATORY AND LABORATORY SUPPORT AREAS	65 ± 3º	65 ± 3º	55 ± 5	UNCONTROLLED
OFFICE AND CLASS LAB AREAS	75 ± 2º	72 ± 3º	55 ± 5	UNCONTROLLED
PUBLIC SPACES	75 ± 2º	71 ± 3º	55 ± 5	UNCONTROLLED
CONFERENCE ROOMS	75 ± 2º	72 ± 3º	55 ± 5	UNCONTROLLED

4. Pressure Relationships:

Corridor, offices and general administrative areas shall be kept positive (in) to laboratory areas. Laboratories shall be kept at negative pressure

(out) in relation to the surrounding areas, to contain odors and prevent migration of any particulate matter. Air movement relationship to adjacent areas should be as follows:

Space Relationship to Adjacent Area	Air Movement
a. Laboratory	In (by 10%)
b. Office Suite	Out
c. Lockers	In
d. Class lab	Neutral

5. Heating and Cooling Loads:

Internal

The loads for the mechanical system will be based on the following combined electrical and process loading for the various spaces. Unless specific information on the equipment heat rejection rate is provided, the suggested loads listed below shall be applied.

a. Office, Conference, and Administrative Support Areas

Lighting	=	1.5 watts per square foot
Equipment	=	5 watts per square foot

b. Teaching (Dry) Laboratories

Lighting	=	2.0 watts per square foot
Equipment (to space)	=	5 watts per square foot
Equipment (to cooling water)	=	5 watts per square foot

c. Research (Wet) Laboratories
Research Wet Areas

Lighting	=	2.0 watts per square foot
Equipment (to space)	=	16 watts per square foot
Equipment (to cooling water)	=	5 watts per square foot

d. Laboratory Support Areas (Dry)

Lighting	=	2.0 watts per square foot
Equipment (to space)	=	5 watts per square foot
Equipment (to cooling water)	=	5 watts per square foot

e. Misc. Areas

Lighting	=	1.5 watts per square foot
Equipment (to space)	=	3 watts per square foot
Equipment (to cooling water)	=	N/A

Some of the spaces will have internal loads, which exceed the values previously noted. The internal loading for these spaces will be determined based on the electrical and process requirements of the equipment to be located in these spaces.

Occupancy

The occupancy heat rejection will be as follows:

Sensible	=	255 Btuh/person
Latent	=	255 Btuh/person

The number of occupants in each space will be based on the actual occupant density listed in the facility program.

6. Ventilation Loads and space Classification:

One hundred percent (100%) outside air system shall be designed for Gross Anatomy Lab and adjacent support areas such as: Locker room, Wash area, Model room and offices as part of the Anatomy Lab. Return air system shall be designed for the class lab and the rest of the remodel areas.

7. Duct System Distribution Criteria:

a. Air velocity at occupied levels will be limited to:

General	50 FPM
Laboratory and Support Spaces	35 FPM
Near Hood Openings	35 FPM

b. Supply Ductwork Sizing (based on diversified CFM):

From Air Handling Unit through Chase to Supply Main at each floor	0.15”/100’ when < 10,000 cfm 2,000 FPM when ≥ 10,000 cfm
Supply Main to Air Terminal Units	0.15”/100’ when < 10,000 cfm 2,000 FPM when ≥ 10,000 cfm (Duct size to AT device = AT inlet size within 15’ of AT)
Air terminal Device (ATD) to Supply Diffuser	0.1”/100’ when < 8,000 cfm

c. Miscellaneous Ventilation Systems:

All Ductwork	0.1”/100’ when < 8,000 cfm 1,600 FPM when ≥ 8,000 cfm

d. Miscellaneous Exhaust Systems:

General Exhaust Ventilation:	0.1"/100' when < 8,000 cfm 1,600 FPM when ≥ 8,000 cfm

e. Sizing Deviations:

Deviations from these criteria will be exercised as deemed necessary for proper air balancing, acoustic control, and duct routing space limitations.

8. Room Air Distribution:

a. Offices:

- Perforated face diffusers.
- Perforated face return grilles.

b. Laboratories and Support Spaces:

- Titus perforated face diffuser or similar when cfm/ft^2 < 4.5
- Krueger TAD diffuser or similar when cfm/ft^2 ≥ 4.5
- Perforated face exhaust grilles

9. Pipe Sizing Criteria:

a. Steam:

- Typical: 6,000 FPM maximum velocity.
- In Mechanical Equipment Rooms: Velocity 10,000 FPM maximum

b. Pumped Steam Condensate:

- 2.5 FPS minimum velocity and 6 FPS maximum velocity.

c. Preheat Hot Water, Heating Hot Water, Chilled Water, and Process Cooling Water:

- 2.5 FPS minimum velocity and 10 FPS maximum velocity.
- Piping 1" and larger will be sized for a maximum pressure drop of 4 ft. per 100 ft.

10. Seismic Criteria:

Seismic design will be based on SMACNA "Seismic Restraint Manual Guidelines for Mechanical Systems", First Edition, 1991; Seismic Hazard Level "A", Connection level 1.

a. Equipment mounted on isolators will be seismically braced using loose cables, telescoping pipes or box sections, angles or flat

plates used as limit stops or snubbers, either integral to or separate from the isolators. Non-rotating, fixed equipment will be bolted directly to the floor or structure.

b. Rectangular and flat oval ductwork with cross-sectional area greater than six square feet and round ductwork with a diameter of at least 28 inches will be restrained, unless suspended by hangers within 12 inches of the supporting structure.

c. The following piping will be braced:

- Gas, vacuum and compressed air piping 1" and larger, unless hanger length is 8" or less.
- All piping in mechanical rooms 1-1/4" and larger, unless hanger length is 6" or less.
- All piping 2-1/2" and larger, unless hanger length is 6" or less.
- All pipe racks.

d. A seismic brace will be provided at a minimum of every second hanger where the hanger length exceeds 6".

11. Air Change Criteria:

A 20 air changes per hour (ACPH) rate will be designed for the Gross Anatomy Lab during normal operation. For the remaining spaces, a minimum of 6 ACPH for dilution and/or removal of odors in general laboratories will be provided. Engineer will calculate actual ACPH requirements based on exhaust device requirements and heat loads generated by equipment, people, lighting, and solar heat gain. The 20 ACPH will only occur during peak use and at other times the system would be in a low ACPH use mode.

12. Air Handling Unit Sizing Criteria:

The existing supply air for the Anatomy Lab comes from a dedicated supply zone from the existing air-handler located on the same level as the Anatomy Lab (basement level). The air from Lab is 100% exhausted through a dedicated exhaust fan located on the roof. The existing airflow CFM to the Anatomy Lab is shown in the table below (also see Attachment A). The readings data was taken on July 27 of 2006 and provided by Pat Simon of UCR Physical Plant. The Anatomy Lab air pressure is slightly negative, which is how it should be.

ANATOMY LAB AIRFLOW		
Grille #	SUPPLY (CFM)	EXHAUST (CFM)
1	810	986
2	701	619
3	785	690
4	798	1023
TOTAL	3,094	3,318
Air Change/ Hour	18.23	19.55

The existing Anatomy Lab is about 1,132 square feet (SF) and with a 9 feet ceiling, the total volume is calculated at 10,185 cubic feet. The total room air change per hour (ACH) calculations for both supply and exhaust are as follows:

Supply ACH = (3,094 x 60) / 10,185 = 18.23
Exhaust ACH = (3,318 x 60) / 10,185 = 19.55

13. Exhaust Criteria:

Dedicated Systems

Dedicated exhaust system is existing and the unit is of adequate size and will be re-used. Following spaces will covered:

1. Gross Anatomy Laboratory
2. Wash Area and Locker Room
3. Model room and Offices connect to Gross Anatomy Lab

There will be total of 10 low exhaust (5 along each wall).

4.1.3 REDUNDANCY

No redundancy shall be provided for new mechanical system serving the remodel area.

4.1.4 MECHANICAL SYSTEM DESCRIPTION

1. Chilled Water System

Chilled water temperature available from the central plant is 38°F to 42°F. However, 46°F will be utilized for design. The minimum return water delta T should be 20°F, with 60°F being the preferred return water temperature.

Existing Chilled water system will be re-used.

2. Steam/Heating/Reheat/Process Systems

   Similar to chilled water, low pressured steam and pumped steam condensate piping are existing and will be re-used.

   Heating hot water piping is also available for tie-in within mechanical room for space heating.

3. Lab Exhaust System

   Existing roof mounted exhaust fan system will be reused for exhausting the Gross Anatomy lab areas. The exhaust fan shall be interlocked with air handler unit.

4. Humidification

   Available low pressure steam within mechanical room will be used for humidification via steam grid, direct injection, and duct-mounted humidifier type.

5. Air Handling Systems

   Gross Anatomy Lab and support areas:

   The existing air handler unit will be re-used to serve the Gross Anatomy Lab and its support areas. See attached sketch M-1.

   The new supply distribution system will consist of high-pressure, externally insulated galvanized steel ductwork with pressure independent electrically actuated supply CAV air terminal devices, reheat coils, low pressure externally insulated ductwork downstream of air terminals, and diffusers. Sound attenuating flexible ductwork with woven nylon fabric type lining will be provided at the supply diffusers to control noise.

   Ductwork will be constructed in accordance with SMACNA standards and duct leakage shall not exceed 1% of the design volumetric flow rate for high-pressure ductwork and 2% for low-pressure ductwork. The use of sound attenuating flexible duct at diffusers and grilles will be limited to seven feet in total length to minimize duct static pressure losses.

   Supply air will be distributed to the Gross Anatomy Lab is as follows: Laminar airflow type of diffuser shall be installed directly above each working bench. Room air will be exhausted out via sidewall low exhaust grilles as shown in sketch M-3.

   The existing roof mounted exhaust fan will be re-used to exhaust all air from Gross Anatomy Lab to outside. The exhaust fan shall be interlocked with existing air handler unit. See attached sketch M-1.

Class lab:

At the present, the class lab is served by an existing AH unit located in the adjacent mechanical room #1. The existing AH unit has supply and return air distribution ductwork. The operating condition of existing AH system is in excellent working condition. Existing supply and return air ductwork will be re-arranged to provide air conditioning to the class lab for the remodel project. At the minimum, the class lab will receive 6 air changes of air per hour. Final sizing airflow amount can be determined during the construction design document phase. See attached sketch M-3.

6. Controls System

    a. The existing control system for the air handling unit and exhaust fan will be re-used.

    b. Existing controls system for the Classroom remodel project shall be reused and reconnected to existing controls system.

7. Add Alternate No. 1 Air Distribution System for 300 CFM Down Draft Table

    In this add alternate the dissecting table will be replaced with down draft table. Each down draft table will be sized for 300 CFM exhaust. Both the existing air-handling unit and existing exhaust fan will be re-used. The supply side will be designed as described above. For the exhaust system instead of low exhaust the exhaust duct will come down and make a hard connection to each of the down draft table.

8. Other Requirements

    - All control devices shall be accessible for service and inspection.
    - Balancing valves shall be in addition to isolation valves and not used for both purpose.
    - Air flow monitor shall be provided for VAV boxes controlled by the EMS.
    - Provide electronic actuators for all control valves and control dampers.
    - A commissioning team other than the design team shall be engaged to complete startup and commissioning.

4.2 ELECTRICAL SYSTEMS

4.2.1 GENERAL

The requirement for the Electrical and Communication systems for this project are to provide a safe and comfortable and efficient work environment for the occupants while being energy efficient and deferring any major maintenance and meet the programmatic needs of the user.

The lighting, power, security, fire alarm and telephone data requirements for the new Gross Anatomy and Class lab will be upgraded from the existing system.

The existing electrical system infrastructure has adequate capacity and will be re-used.

4.2.2 EXISTING ELECTRICAL SYSTEMS

- Normal primary power service at 4.16kV is provided from UCR Campus distribution to two unit substation and distributed to the buildings at 480/277V, and 208/120V, 3 phase, 4 wire, 60 Hz. throughout the building via network of switchboards, distribution panel boards and branch circuit panel boards.

  The unit substation consists:
  CHHV: 1-500kVA, 4.16kV/480-277V, 600A Bus.
  CLHV: 1-500kVA 4.16kV/208-120V, 1600A Bus.
  There is adequate capacity to meet the needs of the Improvement Project.
- Portable Standby Power: Diesel generator located outdoor provides emergency power for operation during utility power outage.
- Lighting – Interior lighting consists of mostly 2x4 fluorescent-lensed fixture in the existing Gross Anatomy Lab and Class lab. In addition to the 2x4 class lab have round incandescent down lights on dimmers. In addition to the 2x4 the gross anatomy lab have pendant surgical lights over each dissecting table.
  The fixtures are in poor condition and will require replacement.
- There is an existing Fire Alarm System but the system in the gross anatomy lab and class lab will require to be upgraded to meet current codes and DSA requirements.
- Telephone/Data Cabling System. The existing system will be utilized for additional voice and data outlet for the gross anatomy lab and class lab.
- There is no existing security system.

4.2.3 CODES AND STANDARDS

The project shall meet the requirements of all applicable codes and shall include but not be limited to the code section references listed below:

- 2002 National Electric Code
- National Fire Protection Association (NFPA).
- National Electrical Manufacturer's Association (NEMA).
- Underwriters' Laboratories (UL).
- Occupational Safety and Health Act (OSHA).
- State of California - Cal OSHA.
- 2003 California Building Code
- 2004 California Electrical Code
- California Title 24.
- UCR Physical Plant Building Standards.

The standards listed below are intended as guidelines for design only. The list is not meant to restrict engineers from using additional guides or standards as desired.

- Electronic Industries Application (EIA) Standard 569.
- Illuminating Engineering Society of North America (IES) Lighting Standards.
- Institute of Electrical and Electronic Engineers (IEEE) Standards.
- Federal Information Processing Standard 5-91.
- National Electrical Manufacturers' Association (NEMA).
- Insulated Power Cable Engineers' Association (IPCEA).
- Certified Ballast Manufacturers' Association (CBMA).
- Underwriters Laboratories, Inc. (UL).
- National Fire Protection Association (NFPA).
- Rules and regulations of local utility companies.
- UCR Campus Standards.
- EIA/TIA

4.2.4 ELECTRICAL DESIGN CRITERIA

1. Energy Conservation:

   a) One of the factors in the energy consumption of a building is lighting. A good control strategy, which eliminates lighting in unoccupied spaces and reduces it where day lighting is available, will contribute to energy conservation to a considerable degree. The way to institute such controls is through a combination of Low Voltage Lighting Control System, Occupancy Sensors. See Section on Lighting for further details.

b) All motors will be of high efficiency or better, especially for air handlers.

c) Energy efficiency design shall be implemented into the project. Computer modeling shall incorporate State of California Title 24 requirements and include both mechanical and electrical power use.

2. System Voltages:

a) A 480/277V distribution system will be used for all major power and lighting loads. Other voltages will be used where size and economy dictate, such as, 208V and 120V for labs, office and convenience outlet.

4.2.5 ELECTRICAL LOAD AND SYSTEM DESCRIPTION

In establishing electrical loads for the new and improved Gross Anatomy Lab and Class lab, Consulting Solutions will look beyond the immediate requirements stated in the project program. The minimum connected load of 25 watts per square feet, which includes other building loads (such as lab facility) multiplied by appropriate demand factors will be used for obtaining the overall electrical load of the TI Project. Power connection to the air handling unit and exhaust fan will remain.

Watts per square foot includes connected load for HVAC system, plumbing system, lab equipment, office equipment, lighting, general outlets, controls, alarm system, Tel/Data system and security system.

1. Electrical Load Calculation Criteria

Administration/Office/Open Workstations

Lighting	1.3 VA/sf
Receptacles	5.0 VA/sf

Class labs

Lighting	1.6VA/sf
Receptacles	5.0VA/sf

Gross Anatomy Lab

Lighting	1.6VA/sf
Power	20.0VA/sf

Mechanical/Plumbing Equipment

Power	Actual equipment load

2. Equipment Sizing Criteria

- Branch Circuit Load Calculations

Receptacles	180 VA per outlet

120 V Receptacles, Surface wireway at benchtop areas	180 VA per outlet
120 V Receptacles, Surface wireway at equipment spaces	1,200 VA per outlet
208V, 30 amp Receptacles	Min. 4,160 VA
Special outlets	Actual installed wattage of equipment served or minimum of 75% of branch circuit receptacle rating
Motors	125% of motor wattage

- Demand Factors

Convenience and Benchtop General Use Receptacles	100% of first 10 kVA plus 50% of all over 10 kVA
Motors	125% of wattage of largest motor plus 100% of wattage of all other motors
Fixed equipment	100% of total wattage

- Minimum Bus Sizes

480V Lab Equipment Panels	100A
120/208V Lab Equipment Panels	225A

- Feeder Size

  Feeders from service entrance to distribution panels to be sized the same as the distribution panel bus size. Distribution panels will be sized for 20% future capacity and space available. Feeders from distribution panels to branch circuit panels shall be sized the same as the branch circuit panel bus size.

- Standards for Sizing Equipment and Systems:

  To ensure maximum flexibility for future systems changes, the electrical system shall be sized as follows: panel boards for branch circuits shall be sized with 15 percent spare ampacity, distribution panels with 20 percent spare ampacity. The panel boards shall be sized with 15% spare circuit breakers

- Load Study and Short Circuit Calculation.

  SKM Software will be used to develop a Demand Load Study, Load Flow and Voltage Drop Study, Short Circuit Fault Study.

4.2.6 NEW ELECTRICAL SYSTEM DESCRIPTION

1. Distribution System:

   - Layout of Conduit: All branch circuits and feeders will be in conduits.

   - Conductors: All conductors will be copper, THWN, 600Volt insulation. Conductor that is installed in underground duct banks will have XHHW type insulation.

   - Receptacle Panelboards: Receptacle panelboards will be circuit breaker type. The neutral for receptacle panels shall be sized to 200% of line bus. All 208/120V panelboard shall be provided with hinged lockable wireway covers and hinged lockable circuit breaker covers. *There will be one new panel for the Gross Anatomy Lab and one for the Class Lab.* All panelboards will be recessed in lab walls.

   - Lighting panel board exists and will be re-used.

2. Electrical Identification

The identification system will consist of plastic laminate (white lettering on red field for emergency and white lettering on black field for normal) and will be installed for each unit of following categories of equipment using mechanical fasteners:

- Panelboards, electrical cabinets and enclosures.
- Disconnect switches.
- Enclosed circuit breakers.
- Fire Alarm Panel.
- Security System Panel.
- Tel/Data System Equipment

Wall plates for receptacles and light switches will be identified with panelboard and circuit number from which served.

3. Grounding System

All parts of the power distribution system will be provided with an equipment ground conductor. This system will extend from the building service

transformer to the branch circuit load or device. All branch circuit and feeder conduit will be provided with a green ground conductor sized per NEC.

4. Interior Lighting

Lighting will be designed to enhance both the overall building architecture as well as the effect of individual spaces within the building. All lighting fixtures will be suitable for operation at 277 VAC except for incandescent which will be suitable for operation at 120 volt.

Interior Lighting: Consideration will be given to the options by direct lighting, indirect lighting, down lighting, up lighting, and lighting from wall-mounted fixtures.

Table 1
Interior Illumination Levels

Area	Nominal Illumination Level in Foot-candles
Office Space	
Normal Work Station space, Open or closed offices	45-50
Conference Rooms	30-40
Training Rooms, Class Rooms	50-60
Internal Corridors	20-30
Support Spaces	
Toilets	20-30
Staff Locker Rooms	20
Storage Rooms, Janitors' Closets	20
Specialty Areas	
Anatomy Lab (without surgical lights)	100

- Illumination Levels: Lighting levels for interior spaces will be the values indicated in *Table 1*. For those areas not listed in the table, the IES Lighting Handbook will be used as a guide.
- Light Source: Generally, interior lighting will be fluorescent. Down-lights will be compact fluorescent. Dimming will be accomplished for Class labs only using dimming ballast for fluorescent fixtures. Fluorescent dimmers will not be used where harmonics constitute a problem. Incandescent lighting will be used sparingly. It is appropriate where special architectural effects are desired.

General Lighting Fixture Criteria

- Lighting Fixture Features: Lighting fixtures and associated fittings will always be of standard commercial design. Custom designed

fixtures will be avoided. They will be used with express approval from UCR in cases where available standard units cannot fulfill the required function.

- Lighting fixtures will be clearly described in a fixture schedule, including the method of mounting and means of control. Louvered parabolic fixtures or indirect fixtures are recommended in all environments where use of PC terminals are anticipated. Indirect lighting will be used in all open lab and office areas. Lighting fixture in the storage area will be an acrylic-lenses fluorescent fixture. When acrylic fluorescent fixtures are used, lenses will be acrylic prismatic and nominal 0.125 inches thick.

- Lamps and Ballasts: In general, fluorescent lamps will be T-8 3500 degree Kelvin. T-5 lamps may be utilized for direct/indirect fixtures where approved by the architect and owner. Ballast will be electronic type.

a. Lighting Criteria for Building Spaces

- Lab and Office Lighting: Linear direct/Indirect lighting will be used in open lab and office space. A uniform lighting layout with an even level of illuminations will be designed because it will facilitate rearrangement of office areas with minimal fixture relocation. Task lighting will also be provided at each bench top.

- Gross Anatomy and Support Areas: 2'x4', 4 lamp fluorescent troffers with acrylic lens. Gross Anatomy Lab will be provided with triple gasketed light fixture.

  In addition to 2x4 fluorescent fixture Gross Anatomy Lab will be provided with surgical lights over each dissecting table. These will be individually controlled.

- Conference Rooms: These spaces will have a combination of fluorescent and dimmable compact fluorescent.

- Egress and Exit Lighting: Egress and exit lighting will be designed to comply with NFPA 101. Exit lights shall be edge lit green LED.

b. Lighting Controls

All lighting will be provided with manual, automatic, or programmable lighting controls. The application of these controls and the controlled zones will depend on a number of space factors: frequency of use; normal and extended work hours; office plans closed or open. All of these factors will be considered when establishing zones, zone controls and appropriate lighting control. All lighting

controls will meet the California Title 24 requirements. The lighting control will be addressable low voltage system. The Watt Stopper or Square D system will be used.

- All lighting fixtures shall be made in the United States and stocked in Southern California
- Occupancy sensor control of lighting in all conference rooms, bathrooms, assembly rooms.
- Exit signs will be low wattage fixture.

4.3 PLUMBING SYSTEMS

4.3.1 GENERAL

Systems will be designed in accordance with listed applicable Codes, Standards and Authorities having jurisdiction, the Underwriters' and in accordance with current engineering practices.

Utilities shall be provided from the existing building services.

Codes and Standards

The installation shall comply with all applicable codes and standards such as:

- California Plumbing Code (CPC) 2001 Edition.
- California Building Code (CBC) 2001 Edition.
- California Administrative Code:
- Title 8: General Industry Safety Order
- Title 17: Public Health
- Title 24: Building Standards
- Americans with Disabilities Act (A.D.A.)
- ANSI -American National Standards Institute
- UL - Underwriters' Laboratories
- AGA - American Gas Association
- ASME - American Society of Mechanical Engineers
- ASSE - American Society of Sanitary Engineers
- ASTM - American Society for Testing and Materials
- AWWA - American Water Works Association
- NSF - National Sanitation Foundation
- PDI - Plumbing and Drainage Institute
- National Fire Protection Association:
- NFPA 13 Installation of Sprinkler Systems
- NFPA 45 Fire Protection in Laboratories using Chemicals
- NFPA 54 National Fuel Gas Code
- UCR Physical Plant Building Standards.

All other Local and State codes and University of California Riverside standards will be adhered to where applicable and available.

4.3.2 DOMESTIC HOT & COLD WATER (POTABLE)

Potable hot and cold water will be provided for all emergency eyewash units, and all other fixtures and devices that require a potable water supply.

The potable hot and cold-water distribution piping will be sized for a maximum velocity of 6 FPS. Water conservation faucets and fixtures will be utilized to meet and/or exceed required code minimums.

The cold water line, will supply water to the emergency eyewash fixtures. This line will be monitored by an in-line flow sensor, that in turn is connected to an electric alarm gong and building security system for 24 hour observation or to other location(s) as directed by the University Representative.

The domestic hot and cold water systems shall be Type L copper tubing with wrought copper fittings and lead free soldered joints.

All potable hot water piping will be insulated.

All domestic hot and cold water shall be in compliance with UCR guidelines and codes.

4.3.3 SANITARY WASTE

A sanitary waste and vent system will be provided for sanitary waste producing fixtures and equipment. All fixtures will be individually trapped and vented.

The sanitary sewer system will flow by gravity.

Sanitary waste and vent piping above ground will be service weight hubless cast iron pipe. Couplings for above ground shall be approved stainless steel couplings.
The sanitary waste and vent system shall be in compliance with UC Riverside guidelines and codes.

4.3.4 INSULATION

All piping, components, and equipment subject to sweating, heat loss or freezing will be in accordance with State Energy Code with appropriate thickness of insulation.

4.3.5 SEISMIC RESTRAINTS

1. Piping and components will be provided with restraints and anchorage consistent with the seismic zone.

4.3.6 PLUMBING FIXTURES

1. Fixtures will be provided with chromium-plated brass trim and individual stop valves.

2. Emergency eye washers will be provided as required.

3. Sinks and other equipment supplied will be provided with all trim items including combination supply fixtures and traps.

4. Floor drains for general use will be provided with removable gratings and trap primers.

4.3.7 FIRE PROTECTION

All areas of the remodel area will be fully sprinklered by an existing automatic wet sprinkler system. Revise existing piping and sprinkler heads based on Ordinary Hazard, Group II, with a maximum sprinkler head spacing of 130 square feet.

4.3.8 OTHER REQUIREMENTS

- All isolation valves, control valves and strainers shall be accessible.
- All restrooms shall be equipped with floor drains.
- All restroom floors shall be sloped to drain to the floor drain.
- Sloan flush valve are the campus standard and shall be provided. Any substitution must be approved by the Physical Plant.
- The connection of condensation indirect waste lines to direct waste lines will be in mechanical rooms and must be accessible.
- Provide color coded labeling on all piping that will show: type of fluid in pipe, direction of flow, system served.

4.4 FIRE ALARM SYSTEM

The fire alarm system exists and will be upgraded to bring the class lab and gross anatomy lab to code standard. This will include addition of smoke detectors and horn/strobe in the class lab and gross anatomy lab. The fire alarm system shall be Simplex where their price is equal. Price determination should include the initial installed cost plus warranty cost and maintenance cost for the first five years of operation. Physical Plant will receive submittals for review prior to acceptance.

4.5 SIGNAL/COMMUNICATION

The telephone/data system will consists of wall outlets with RJ45 jacks and faceplate in all occupied spaces such as office, gross anatomy lab, class lab. These station outlets will be connected to existing data rack in IDF room via conduit. All telephone/data cabling will be designed.

4.6 SECURITY

The security system will consist of card access system and CCTV surveillance system. All equipment and wiring will be designed.

Card access and CCTV camera will be provided at entrances to Gross Anatomy Lab Suite.

4.7 A/V TECHNOLOGY

The design of the renovation will include the complete integration of a comprehensive network of pathways for audio/visual and information technology. A cable raceway, connecting the Class lab with the Gross Anatomy suite, is recommended to facilitate the integration of the audio/visual network between the two spaces. Audio visual projectors and manual screens will be provided in instructional spaces. Data connections will be available in class labs, teaching labs, and offices.

4.8 APPLICABLE CODES AND REGULATIONS

The following Codes and Standards are provided for general reference as the basis for the study. At the time of design, the most recently adopted versions of all applicable codes as well as the then-current University standards will need to be utilized as the basis for design. The design team will need to make the final determination as to the relevance and application of these codes as well as others that may apply but not be included in the list below.

Building Codes

- California Building Standards Code, Title 24 of the California Code of Regulations. 2001 Edition
- Uniform Building Code, 1997 edition, and 1998 California Amendments
- Uniform Building Code Standards, 1997 edition
- Uniform Mechanical Code, 1998 edition, and 1998 California Amendments
- Uniform Plumbing Code, 1998 edition, and 1998 California Amendments
- Uniform Fire Code, 2000 edition
- National Electric Code, 1999 edition, and 1998 California Amendments
- California Code of Regulations, California Administrative Code Title 24, 1998 edition
- California Code of Regulations, Title 8, Industrial Relations
- California Code of Regulations, Title 19 - Public Safety
- California Code of Regulations, Title 21 - Public Works
- California Health and Safety Code, current regulations
- California Administrative Code Title 8 - Industrial Relations
- California Administrative Code Title 19 - Public Safety
- State of California Fire Code, 2001 Edition
- NFPA 10, National Fire Protection Association Standard for Portable Fire Extinguishers, 2000 edition
- NFPA 13, National Fire Protection Association Installation of Sprinkler Systems, 2000 edition
- NFPA 14, National Fire Protection Association Installation of Standpipe and Hose systems, 2000 edition
- NFPA 24, National Fire Protection Association Installation of Private Fire Service Mains and Their Apparatus, 1995 edition
- NFPA 30, National Fire Protection Association Flammable and Combustible Liquids Code, 2000 edition
- NFPA 45, National Fire Protection Association Standard on Fire Protection for Laboratories Using Chemicals, 2000 edition
- NFPA 72, National Fire Protection Association National Fire Alarm Code, 1993 edition
- NFPA 101, National Fire Protection Association Code for Safety to Life from Fire in Buildings and Structures, 2000 edition

Reference Standards and Regulations

- University of California, Riverside Campus Standards and Design Criteria.
- Americans with Disabilities Act (ADA), 1991, Title 3 and ADA P.L. 101-336
- Federal Standard 29 CFR Part 1910.1450 Occupational exposures to hazardous chemicals in laboratories
- American National Standards Institute 2358.1: Emergency Eyewash and Shower Equipment, 1990
- American National Standards Institute/American Industrial Hygienists Association 29.5 Standard for Laboratory Ventilation, 1992
- National Institutes of Health NIH 76-900 Safety Standards for Research Involving Chemical Carcinogens, Office of Research Safety
- National Institutes of Health NIH 81-2385 Guidelines for the Laboratory Use of Chemical Carcinogens, 1981
- Cast Iron Soil Pipe Institute (CISPI)
- Manufacturers Standardization Society (MSS)
- National Bureau of Standards
- Plumbing & Drainage Institute (PDI)
- South Coast Air Quality Management District (SCAQMD)
- Underwriters Laboratory (U.L.)
- Illuminating Engineering Society of North America (IES)
- Sheet Metal and Air Conditioning Contractors National Affiliation (SMACMA)
- Institute of Electrical & Electronics Engineers (IEEE)
- National Electrical Manufacturers Affiliation (NEMA)
- Occupational Safety and Health Administration (OSHA)
- American National Standards Institute (ANSI)
- American Society of Testing Materials (ASTM)
- American Welding Society Code (AWSC)
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
- Standard 62
- Standard 90 A, B, C Energy Conservation in New Building Design
- Standard 100 Energy Conservation in Existing Buildings
- ASHRAE Fundamentals
- ASHRAE Systems and Applications
- ASHRAE Equipment

All of the above codes, standards and requirements should be reviewed as to the currently adopted version at the time of the design.

Occupancy Designation

The occupancy group designation within the California Building Code for laboratory buildings is governed by the type, quantity and storage methods for hazardous materials and chemicals used for research within the building. Common occupancy designations for laboratory buildings include “B” and “H-8”. The program for the building includes offices, teaching laboratories and university classrooms. The University General Assignment Classrooms will fall within the assembly occupancy classification Group “A” which is defined as; “Any building or portion of a building having an assembly room with an occupant load of less than 300 or more than 300 without a legitimate stage, including such buildings used for educational purposes and not classified as a group E or Group B Occupancy”.

B-2 Occupancy Summary

There are limits on quantities of hazardous materials, which can be used and stored in laboratories under B-2 occupancy classification. These limits are described in Tables 3-I and 3-E of the California Building Code (CBC) (see appendix) as “Exempt Amounts of Hazardous Materials Presenting a Physical [or Health] Hazard, Maximum Quantities per Control Area”. The Department understands these limitations and will manage the chemical inventory as required to stay within the guidelines.

The amounts shown are the maximum allowed per laboratory control area. Control areas are limited to 10,000 square feet in size and must be separated by a one-hour fire resistive occupancy separation. In Type I buildings, which do not exceed three (3) stories in height, the two-hour floor separation is often a convenient way of separating control areas.

Fire Sprinklers: 100% Sprinklered Building, Ordinary Hazard

H-8 Laboratory Occupancy Summary

An “H-8” occupancy is required by the University for lab uses. This occupancy (in the California Building Standards Code) is intended for laboratories and similar areas used for scientific experimentation or research having quantities of materials not in excess of those listed in CBC Table 3-D.1 and 3-I and not otherwise classified as Group B occupancies. Maximum suite size must be 10,000 square feet.

For the purposes of the study, it is assumed that the exempt material storage amounts will not be exceeded, based upon current University experience. However, a chemical inventory for the proposed laboratories should be compiled as early as possible in the schematic design phase of this project so that it can be confirmed whether the needs of those laboratories will be able to be met.

The design team must utilize and apply the current code and code interpretations in force at the time of the design.

NFPA 45: Fire Protection For Laboratories Using Chemicals

Means of Egress: The means of egress for laboratory units and laboratory work areas shall comply with NFPA 101.

Access to Exits: A second means of access to an exit shall be provided from a laboratory work area if any of the following situations exist:

i. A laboratory work area contains an explosion hazard so located that an incident would block escape from or access to the laboratory work area.
ii. A fume hood in a laboratory work area is located adjacent to the primary means of exit access.
iii. A compressed gas cylinder in use which is larger than lecture bottle size, and contains a gas which is flammable or has a hazard rating of 3 or 4 and would prevent safe egress in event of accidental release of cylinder contents.
iv. The required exit doors of all laboratory work areas within Class A or Class B laboratory units shall swing in the direction of exit travel.

Furniture and Equipment: Furniture and equipment in laboratory work areas will be arranged so that means of access to an exit may be reached easily from any point.

Explosion Hazard: Explosion hazard is considered to exist if materials with a reactivity rating of 4 are stored or used, or if highly exothermic reactions or procedures without established properties are planned, or if high pressure reactions are planned.

Program information does not indicate that explosion hazards, as described above, exist in this project.

NFPA 101: Life Safety Code

Means of Egress: Where exits are not immediately accessible from an open floor area, safe and continuous passageways, aisles, or corridors will be maintained leading directly to every exit and will be arranged as to provide convenient access for each occupant to at least two exists by separate ways of travel.

Exit access will be so arranged that it will not be necessary to pass through any area identified under protection from hazards in Chapter 28.

Corridor Width: The minimum width of any corridor or passageway serving as a required exit, exit access, or exit discharge will be 44 inches.

5.1 ESTIMATE SUMMARY

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

OVERALL SUMMARY

	Gross Floor Area	$ / SF	$x1,000
Renovation	4,380 SF	545.42	2,389
TOTAL Building Construction (May 2008)	4,380 SF	545.42	2,389
Escalation to Start Date (May 2009)	12.03%		287
TOTAL Building Construction (May 2009)	4,380 SF	611.04	2,676
Additional Scope			
Group II / III Equipment & Furniture (May 2008)			675
Group II / III Equipment & Furniture (May 2009)			756
Alternates			
Premium for downdraft table option (May 2008)			60
Premium for downdraft table option (May 2009)			67

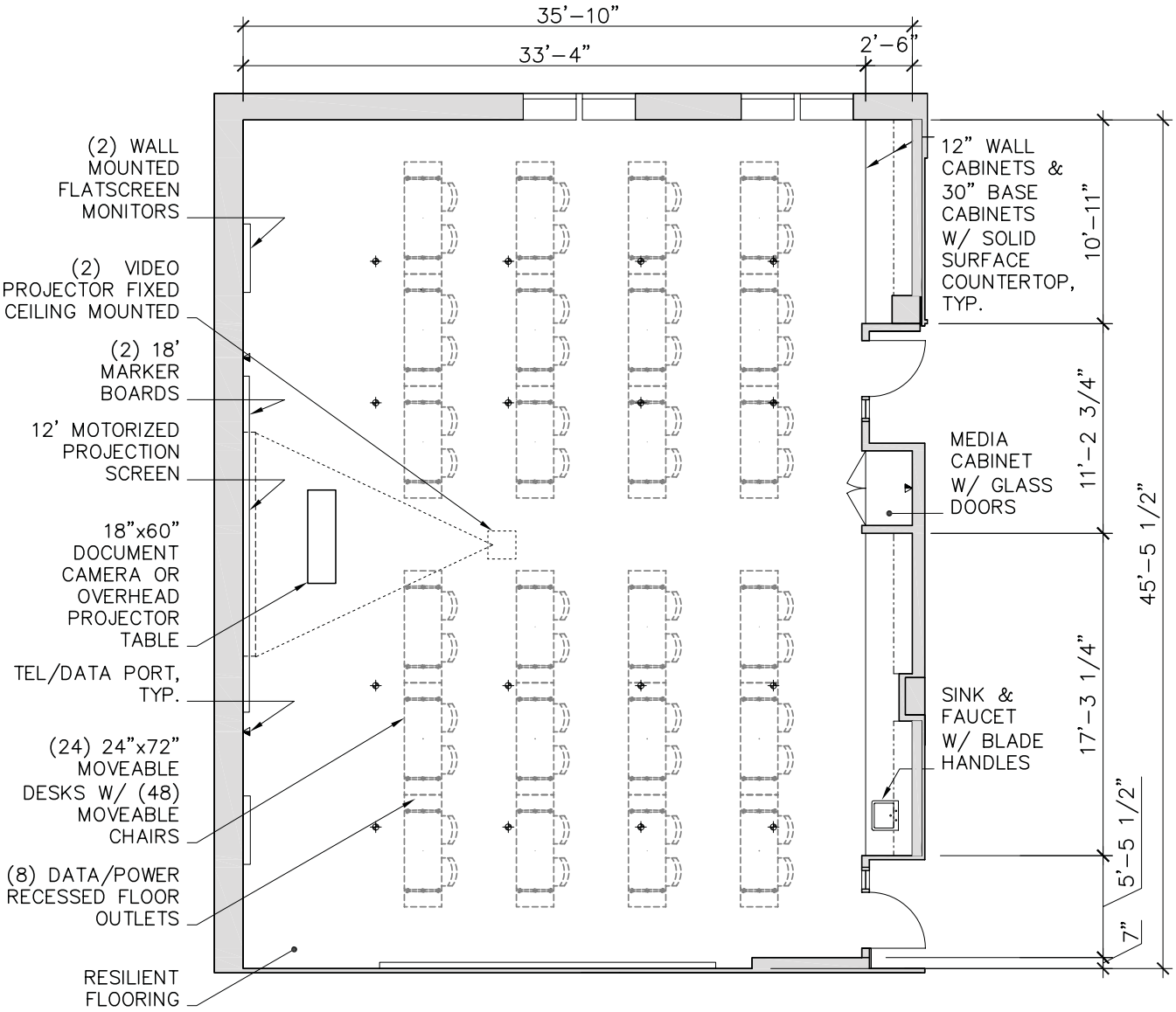
6.0 PROJECT SCHEDULE

PROJECT PHASE	2006				2007				2008			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Project Program Study												
PPG/ State Budget Process												
Preliminary Documents												
UCR Review												
Construction Documents												
Document Review/ Revise Documents												
Bid and Award												
Construction												

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: **Instructional**
SPACE NAME: **Class Lab**
SPACE ID: **B0601**
AREA: **1,590 ASF**



1/8" = 1'-0"

0' 5' 10'

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Instructional
SPACE NAME: Class Lab
SPACE ID: B0601
AREA: 1,590 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Classroom/ Lecture room for didactic lecture, group learning instruction, presentations, and seminars.

QUANTITY: (1)

ASF: 1,590 ASF

OCCUPANCY: (49)

UTILIZATION: 24 hours per day.

ADJACENCIES: NA

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: Existing windows. Provide shades for sun control.

ROOM FINISHES:
- **Floor:** Resilient tile.
- **Base:** 4" rubber base.
- **Ceiling:** Acoustic Tile.
- **Partitions:** Gypsum Board, Paint.

DOORS: (2) 3'-0" x 7'-0" with 1'-0" sidelight panel.

ACOUSTICS: Acoustic isolation for Classroom. Provide floor to floor partitions.

SIGHTLINES: Design space to allow clear views to markerboards and projection screen.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 75°F ±2°F Summer, 72°F ±3°F Winter

HUMIDITY: 55% ±5%

VENTILATION: 50 FPM, Recirculated Air.

AIR CHANGES: 6 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface, dimmable to 5fc.

POWER: 110V, 60A, 1 phase.

DATA: (3) ethernet data ports located near projection screen, (1) located near media cabinet.

TELECOMMUNICATIONS: (2) phone outlet.

AUDIOVISUAL:
1. Data projection.
2. Overhead projection.
3. Slide projection.

VIDEO: Video/data projection.

PIPED SERVICES: Sink with hot and cold water.

SECURITY: Lockable doors.

ROOM CONTENTS

GROUP I:

Built-in Equipment:
- (1) Motorized Projection Screen
- (1) Built-in base cabinets and wall cabinets for storage; provide knee opening for computer workstation.
- (1) Built-in Media Cabinet for remote audiovisual equipment; glass doors for slide projection cabinet.
- (2) Markerboards

GROUP II & III:

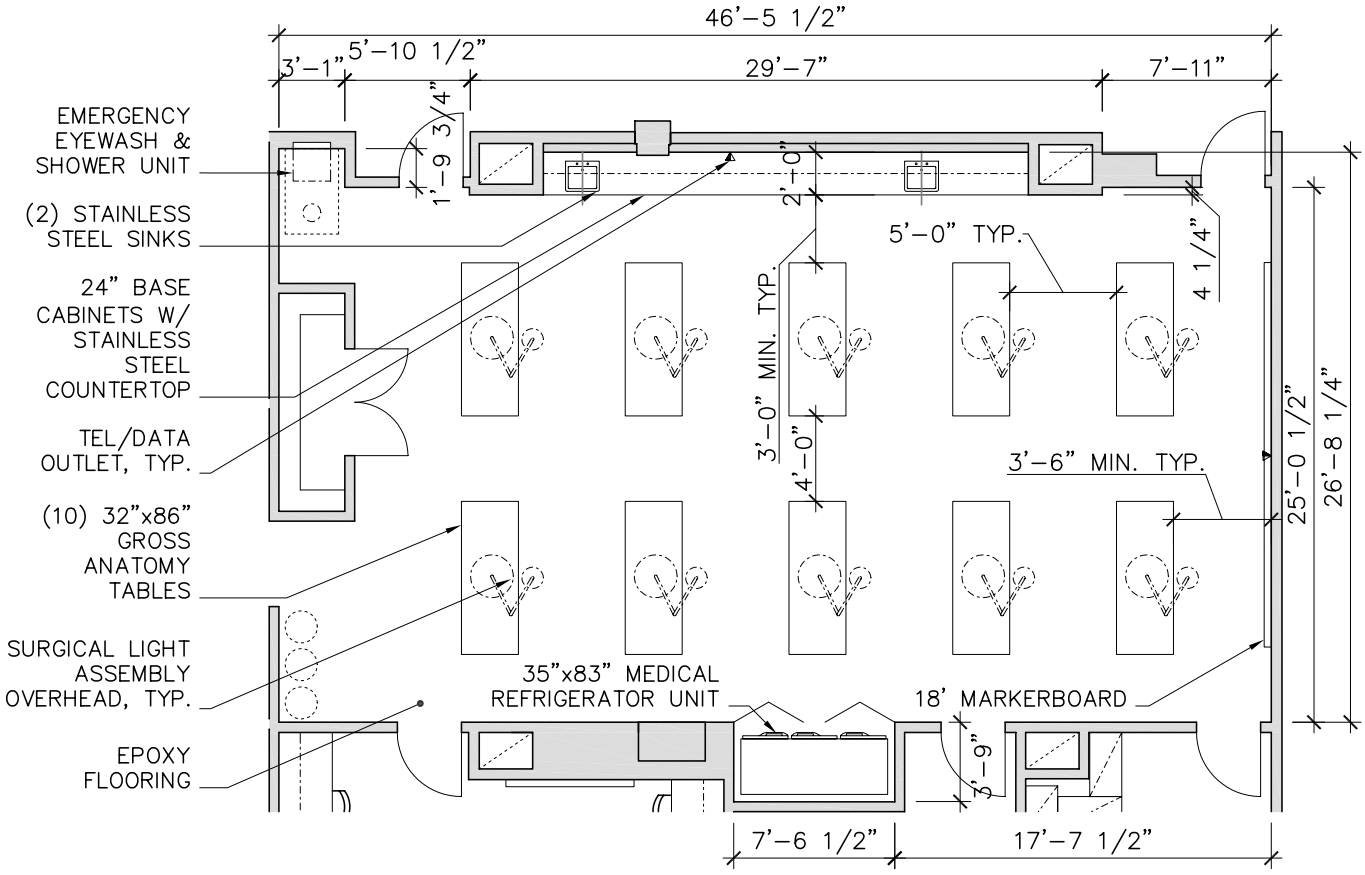
Movable Equipment:
- (2) Wall mounted flatscreen monitors

Furnishings:
- (24) 24" x 72" movable desks.
- (48) Chairs w/t arms
- (1) 18" x 60" movable table

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: **Instructional**
SPACE NAME: **Gross Anatomy lab**
SPACE ID: **B0632**
AREA: **1,193 ASF**



1/8" = 1'-0"

0' 5' 10'

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Instructional
SPACE NAME: Gross Anatomy lab
SPACE ID: B0632
AREA: 1,193 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Gross anatomy space for dissection group learning instruction and presentations.

QUANTITY: (1)

ASF: 1,193 ASF

OCCUPANCY: (41)

UTILIZATION: 24 hours per day.

ADJACENCIES:
Storage
Wash room
Model room
Offices

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: No requirement.

ROOM FINISHES:
Floor: Epoxy flooring.
Base: 4" integral cove base.
Ceiling: Acoustic Tile, Mylar coated.
Partitions: Gypsum Board, Epoxy Paint.

DOORS:
3'-0" x 7'-0"
7'-6" x 7'-0"

ACOUSTICS: Acoustic isolation for Laboratory. Provide floor to floor partitions.

SIGHTLINES: Design space to allow clear views to markerboard.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 65°F ±3°F

HUMIDITY: 55% ±5%

VENTILATION: 35 FPM, Outdoor Air.

AIR CHANGES: 20 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface, dimmable to 5fc.

POWER: 110V, 60A, 1 phase.

DATA:
(3) ethernet data ports, 1 located adjacent to markerboard.
(1) Wireless port

TELECOMMUNICATIONS: (1) phone outlet.

AUDIOVISUAL: TBD.

VIDEO: No requirement.

PIPED SERVICES: (2) Stainless steel sinks with hot and cold water.

SECURITY:
1. Lockable doors.
2. Card reader access for all entries from hallway.
3. Closed-circuit camera for all entries from hallway.

ROOM CONTENTS

GROUP I:
Built-in Equipment:
(10) Ceiling mounted lighting assemblies for individual gross anatomy table
(10) Surgical lights, halogen
(1) Recessed, barrier-free eyewash/ shower station with ceiling mounted shower head.
(1) Built-in base cabinet w/ stainless steel countertop
(2) Stainless steel sinks
(1) 35" w x 83" l x 85" h three section medical refrigerator unit.
(1) 18' Markerboard.

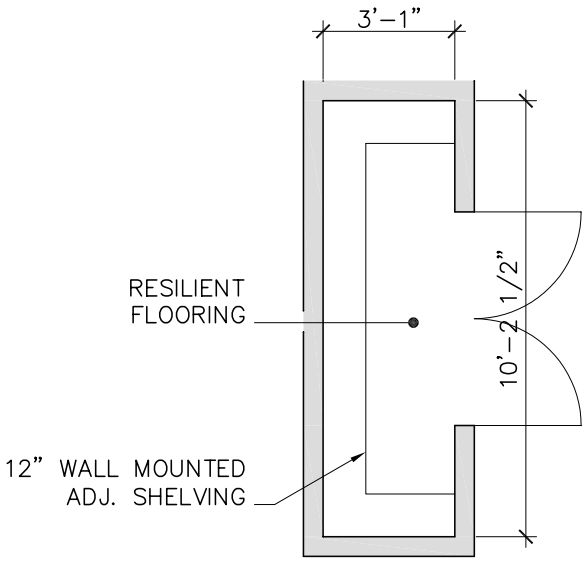
GROUP II & III:
Movable Equipment: (10) 32" x 86" movable gross anatomy tables.

Furnishings: NA

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: **Support**
SPACE NAME: **Storage**
SPACE ID: **B0632A**
AREA: **31 ASF**



1/4" = 1'-0"

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Support
SPACE NAME: Storage
SPACE ID: B0632A
AREA: 31 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Primary storage space for gross anatomy.

QUANTITY: (1)

ASF: 31 ASF

OCCUPANCY: NA

UTILIZATION: 24 hours per day.

ADJACENCIES: Gross Anatomy lab

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: No requirements.

ROOM FINISHES:
- **Floor:** Resilient tile.
- **Base:** 4" rubber base.
- **Ceiling:** Acoustic Tile.
- **Partitions:** Gypsum Board, Paint.

DOORS: 3'-0" x 7'-0".

ACOUSTICS: No requirements. Provide floor to floor partitions.

SIGHTLINES: No requirements.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 75°F ±2°F

HUMIDITY: 55% ±5%

VENTILATION: 35 FPM, Outside Air.

AIR CHANGES: 6 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface.

POWER: 110V, 60A, 1 phase.

DATA: No requirements.

TELECOMMUNICATIONS: No requirements.

AUDIOVISUAL: No requirements.

VIDEO: No requirements.

PIPED SERVICES: No requirements.

SECURITY: Lockable door.

ROOM CONTENTS

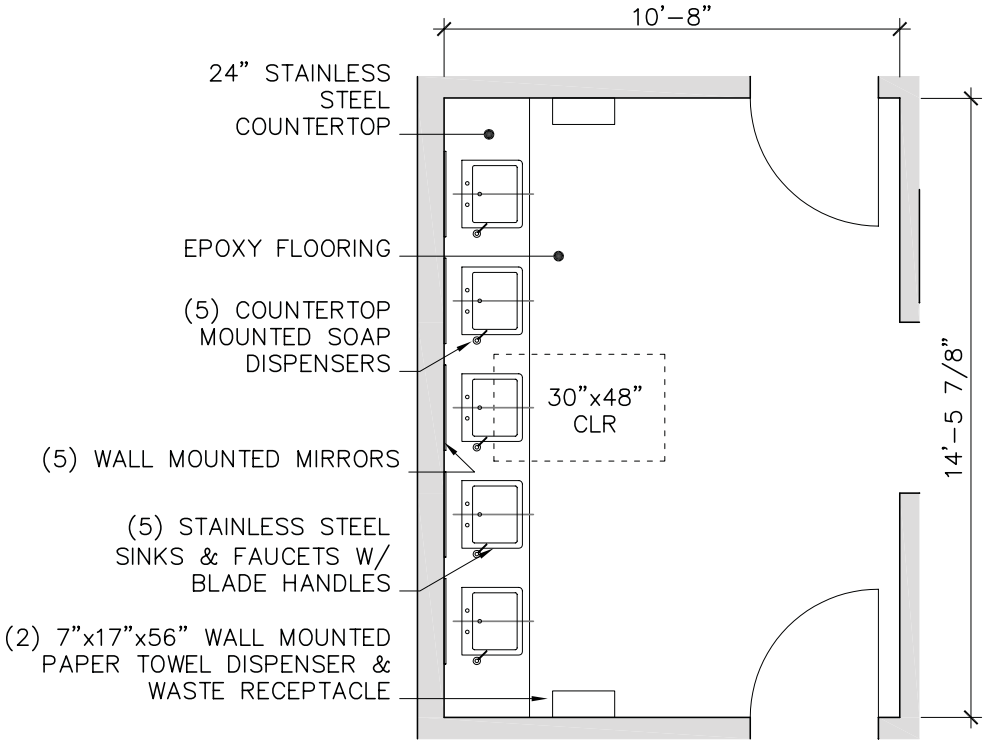
GROUP I:
- **Built-in Equipment:** Adjustable shelving mounted on three walls for storage.

GROUP II:
- **Movable Equipment:** No requirements.
- **Furnishings:** No requirements.

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Support
SPACE NAME: Wash room
SPACE ID: B0632B
AREA: 155 ASF



1/4" = 1'-0"

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Support
SPACE NAME: Wash room
SPACE ID: B0632B
AREA: 155 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Wash room for pre- and post cleanup during gross anatomy instruction.

QUANTITY: (1)

ASF: 155 ASF

OCCUPANCY: 5

UTILIZATION: 24 hours per day.

ADJACENCIES: Wash room

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: No requirements.

ROOM FINISHES:
- **Floor:** Epoxy flooring.
- **Base:** 4" integral cove base.
- **Ceiling:** Acoustic Tile, Mylar coated.
- **Partitions:** Gypsum Board, Epoxy paint.

DOORS: 3'-0" x 7'-0".

ACOUSTICS: Acoustic isolation for Wash room. See Acoustic Design Criteria. Provide floor to floor partitions.

SIGHTLINES: No requirements.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 65°F ±3°F

HUMIDITY: 55% ±5%

VENTILATION: 35 FPM, Outside Air.

AIR CHANGES: 6 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface.

POWER: 110V, 60A, 1 phase.

DATA: No requirements.

TELECOMMUNICATIONS: No requirements.

AUDIOVISUAL: No requirements.

VIDEO: No requirements.

PIPED SERVICES: (5) Sinks with hot and cold water.

SECURITY: Lockable door.

ROOM CONTENTS

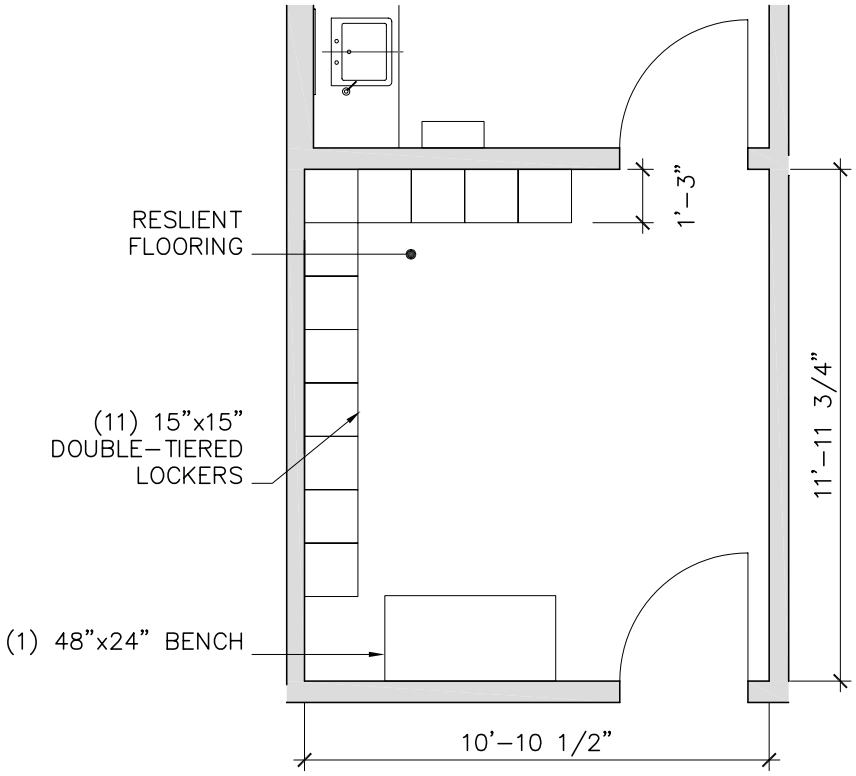
GROUP I:
- **Built-in Equipment:** (1) Built-in stainless steel countertop on two walls.
  (5) Stainless steel sinks.
  (5) Countertop mounted soap dispensers.
  (2) Paper towel dispenser and waste receptacle.
  (5) Wall mounted mirrors.

GROUP II & III:
- **Movable Equipment:** No requirements.
- **Furnishings:** No requirements.

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Support
SPACE NAME: Locker room
SPACE ID: B0632C, D
AREA: 2 @ 130 = 260 ASF



1/4" = 1'-0"

0' 1' 5'

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Support
SPACE NAME: Locker room
SPACE ID: B0632C, D
AREA: 2 @ 130 = 260 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Locker room for storage of student belongings during gross anatomy instruction.

QUANTITY: (2)

ASF: 130 ASF

OCCUPANCY: NA

UTILIZATION: 24 hours per day.

ADJACENCIES: Gross Anatomy lab

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: No requirements.

ROOM FINISHES:
- **Floor:** Resilient tile.
- **Base:** 4" rubber base.
- **Ceiling:** Acoustic Tile.
- **Partitions:** Gypsum Board, Paint.

DOORS: 3'-0" x 7'-0".

ACOUSTICS: No requirements. Provide floor to floor partitions.

SIGHTLINES: No requirements.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 65°F ±3°F

HUMIDITY: 55% ±5%

VENTILATION: 35 FPM, Outside Air.

AIR CHANGES: 6 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface.

POWER: 110V, 60A, 1 phase.

DATA: No requirements.

TELECOMMUNICATIONS: No requirements.

AUDIOVISUAL: No requirements.

VIDEO: No requirements.

PIPED SERVICES: No requirements.

SECURITY:
1. Lockable doors.
2. Card reader access for all entries from hallway.
3. Closed-circuit camera for all entries from hallway.

ROOM CONTENTS

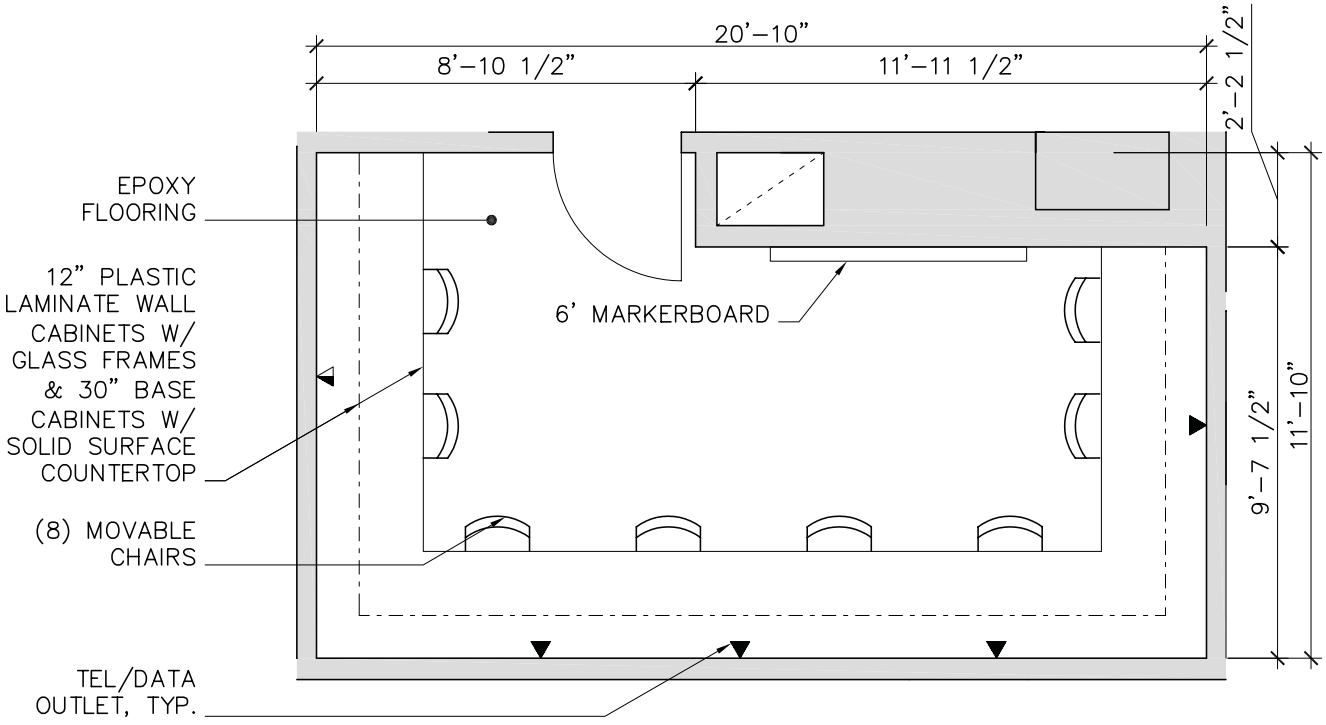
GROUP I:
- **Built-in Equipment:** (11) 15” x 15” double-tier lockers.
  (1) 48” x 24” bench.

GROUP II & III:
- **Movable Equipment:** No requirements.
- **Furnishings:** No requirements.

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: **Instructional**
SPACE NAME: **Model room**
SPACE ID: **B0632E**
AREA: **220 ASF**



1/4" = 1'-0"

0' 1' 5'

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Instructional
SPACE NAME: Model room
SPACE ID: B0632E
AREA: 220 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Gross anatomy support space for display, presentation, and group learning instruction.

QUANTITY: (1)

ASF: 220 ASF

OCCUPANCY: (12)

UTILIZATION: 24 hours per day.

ADJACENCIES: Gross anatomy lab

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: No requirement..

ROOM FINISHES:
- **Floor:** Epoxy flooring.
- **Base:** 4" rubber base.
- **Ceiling:** Acoustic Tile.
- **Partitions:** Gypsum Board, Epoxy paint.

DOORS: 3'-0" x 7'-0" with 1'-0" sidelight panel.

ACOUSTICS: No requirements. Provide floor to floor partitions.

SIGHTLINES: No requirements.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 65°F ±3°F

HUMIDITY: 55% ±5%

VENTILATION: 50 FPM, Outside Air.

AIR CHANGES: 6 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface, dimmable to 5fc.

POWER: 110V, 60A, 1 phase.

DATA: (5) ethernet data port.

TELECOMMUNICATIONS: (1) phone outlet.

AUDIOVISUAL: No requirement.

VIDEO: No requirement.

PIPED SERVICES: No requirement.

SECURITY: Lockable doors.

ROOM CONTENTS

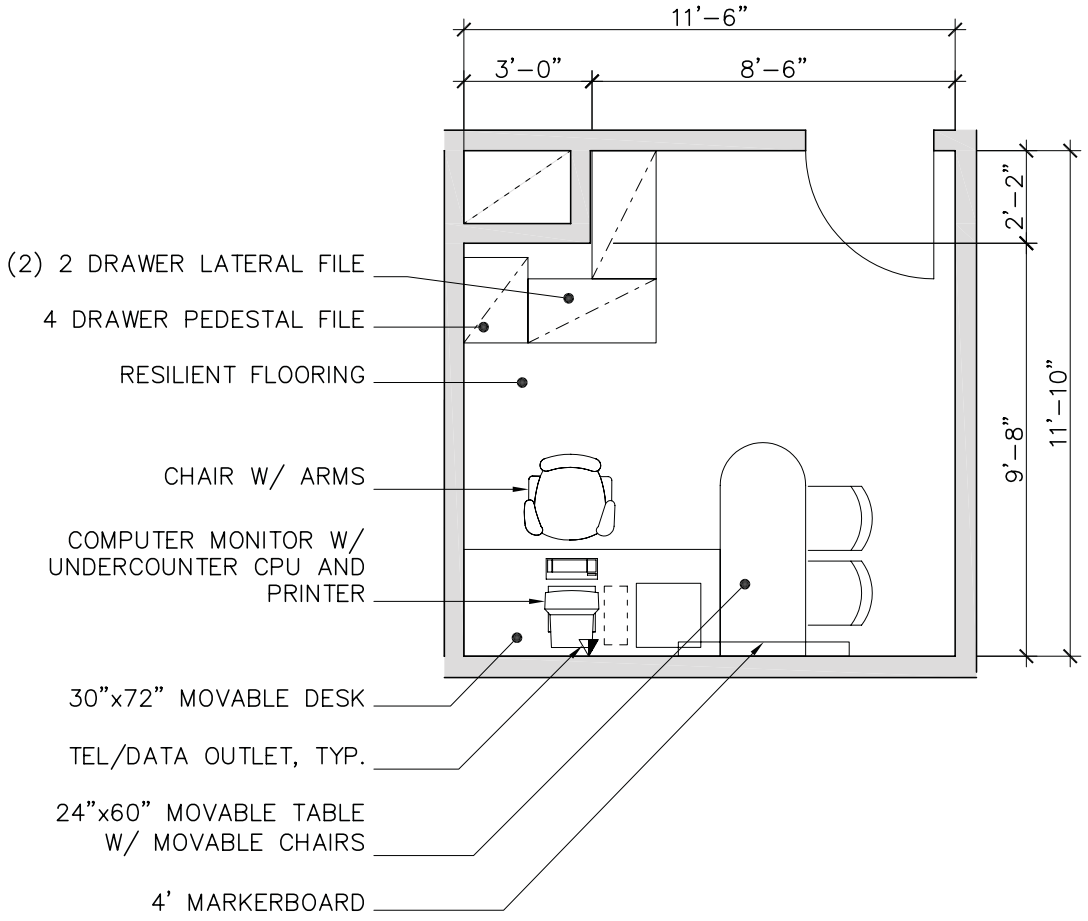
GROUP I:
- **Built-in Equipment:** (1) Built-in base cabinets for storage and wall cabinets w/ glass doors for display
  (1) Markerboard.

GROUP II & III:
- **Movable Equipment:** No requirements.
- **Furnishings:** (8) Movable chairs

A1.0
DETAILED SPACE REQUIREMENTS AND DIAGRAMS

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: **Offices**
SPACE NAME: **Faculty office**
SPACE ID: **B0632F, G**
AREA: **2 @ 128 ASF = 256 ASF**



1/4" = 1'-0"

0' 1' 5'

NOTE: DIAGRAMS ARE FOR REFERENCE ONLY

SPACE TYPE: Offices
SPACE NAME: Faculty office
SPACE ID: B0632F, G
AREA: 2 @ 128 ASF = 256 ASF

SPACE DESCRIPTION

GENERAL DESCRIPTION:
Gross anatomy support space for display, presentation, and group learning instruction.

QUANTITY: (2)

ASF: 128 ASF

OCCUPANCY: (1)

UTILIZATION: 24 hours per day.

ADJACENCIES: No requirement.

ROOM DIMENSIONS: 9'-0" minimum ceiling height.

NATURAL LIGHT: N/A.

ROOM FINISHES:
- **Floor:** Resilient tile.
- **Base:** 4" rubber base.
- **Ceiling:** Acoustic Tile.
- **Partitions:** Gypsum Board, Paint.

DOORS: 3'-0" x 7'-0" with vision panel.

ACOUSTICS: Acoustic isolation for Office. See Acoustic Design Criteria. Provide floor to floor partitions.

SIGHTLINES: No requirements.

SIGNAGE: Room name and number.

BUILDING SYSTEM REQUIREMENTS

TEMPERATURE: 75°F ±2°F Summer, 72°F ±3°F Winter

HUMIDITY: 55% ±5%

VENTILATION: 50 FPM, Outside Air.

AIR CHANGES: 6 AC/Hr.

LIGHTING LEVELS: Fluorescent, 75fc at work surface.

POWER: 110V, 60A, 1 phase.

DATA: (1) ethernet data port.

TELECOMMUNICATIONS: (1) phone outlet.

AUDIOVISUAL: No requirement.

VIDEO: No requirement.

PIPED SERVICES: No requirement.

SECURITY: Lockable doors.

ROOM CONTENTS

GROUP I:
Built-in Equipment: (1) Markerboard.

GROUP II & III:
Movable Equipment:
(1) Computer
(1) Monitor
(1) Printer

Furnishings:
(1) 30”x72” Movable desk
(1) Chair w/ arms
(1) 24”x60” Movable table
(2) Movable chairs w/t arms
(1) 4 drawer pedestal file
(2) Lateral files, 2 drawer

CO ARCHITECTS

formerly Anshen+Allen-LA
5055 Wilshire Boulevard, 9th Floor
Los Angeles, California 90036
www.coarchitects.com
323.525.0500 phone, 323.525.0955 fax

Meeting Minutes

Meeting Date: **June 20, 2006**

Meeting Number: 1

Purpose: User Group Mtg. w/ UCR Biomed faculty, Capital Planning, & Academic Planning/ Budget

Location: Statistics Computer Bldg, Rm B0621

Project: Gross Anatomy Suite Study

CO Job Number: 25006.010

UCR Job Number:

Prepared By: Duke Sakiyabu

Date Prepared: June 21, 2006

Distribution: Attendees

File: 5.6.2 5.06

Attendees:

UCR Attendees:
Craig Byus, Biomed
Neal Schiller, Biomed
Faye Brock, Biomed
Lynn Hice, Biomed
Jim Colgan, Biomed
Bill Johnson, CPP
Berent Pippert, CPP
Kieron Brunelle, APB

A/E Team Attendees
Scott Kelsey, CO
Jonathan Kanda, CO
Duke Sakiyabu, CO
Pervez Mobin, CSI

Item	Summary	Action By	Due Date
1.	Jonathan Kanda of CO Architects outlines the purpose of the meeting is to present options for the Gross Anatomy Suite and Classroom and get the feedback of the faculty and staff representing the UCR/UCLA Thomas Haider Program in Biomedical Sciences in order to agree on a specific design direction. CO Architects presented three planning options for the spaces outlined above.		
2.	Option 1 After initially reviewing the first option, Lynn Hice mentions that an eyewash/ shower unit is a requirement for the Gross Anatomy lab. Brief discussion regarding what the maximum hazard would be and applicability of the shower facility. CO Arch will include the eyewash/ shower unit in the GA lab. General consensus on eliminating room B0605 adjacent to the classroom (B0601) and creating a larger classroom space.	CO	
3.	Option 2A Neal Schiller questions planned increase in student capacity to 48 students (12 anatomy tables) as presented in Option 1. Leads to review of Option 2A, which assumes a maximum of 40 students (10 anatomy tables). Biomed faculty questions the purpose of tank wash room indicated on plans. Scott Kelsey explains its use in cleaning the anatomy tables and the faculty come to an agreement that this is not required. Discussion regarding elimination of the cold room and replacing it with a standalone medical refrigerator unit. Craig Byus explains the majority of the	CO	

Participants are asked to respond with corrections or additions to these minutes within one week of receipt, otherwise CO Architects will consider this to be an accurate record of the meeting.

existing cold room will be cleaned out. Jim Colgan mentions he will only need enough storage capacity for a maximum of 20 brains. Agreement that a three section medical refrigerator unit should be sufficient for present and future needs.

Jim Colgan indicates storage area should accommodate the temporary storage of medical waste, composing of 3 or 4 bags of mostly used gowns, gloves, and paper.

Berent Pippert questions faculty on whether they should consider planning for a maximum of 48 students now rather than only 40 and having to revise that number later. Comments from C. Byus and N. Schiller that they do not expect increase in students for 5-8 years. Once they reach 40-48 students they will require a new building as a medical school. Bill Johnson and faculty agree that completion of new building is unpredictable and planning for 48 students now would be preferable.

Kieron Brunelle questions whether PBL room adjacent to the GA lab could be later outfitted to accommodate increase from 40 to 48 students.

Discussion regarding the addition of a support space in the classroom space as indicated in Option 2A. After discussion of microscope storage needs and class preparation needs, consensus that support space is not required.

4. Option 2 — CO/ CPP

CO Arch. presents Option 2, similar to Option 2A but accommodates 48 students (12 anatomy tables). S. Kelsey and J. Kanda mention that initial arrangement of tables and wiring for future overhead lights should be considered now to facilitate additional growth in anatomy tables and associated overhead lights.

J. Colgan states preference for 2 separate offices rather than the shared scheme as indicated on the plan. Also prefers having additional door to hallway rather than just to the GA lab. Pervez Mobin states that the GA lab would be kept at negative pressure, mitigating odors coming from GA lab.

Doors to hallway lead to discussion of security of GA lab. L. Hice states a requirement for a card reader and video camera at every entry from the hallway into the GA lab. B. Johnson mentions cost of reader/ camera but main consideration is reduction of potential entrances into the GA lab. Agreement to keep access to offices from GA lab only but CO Arch. to look into possibility of relocating door from hallway closer to offices.

Discussion turns to arrangement of students in classroom. S. Kelsey reviews how the group learning format (TEAL model) differs from a traditional didactic lecture format. C. Byus responds he is open to arrangement of students in classroom for group learning, but only if another room was available for didactic learning. B. Pippert mentions possible availability of another classroom for lecture. He is to identify which classroom and the student capacity it has. S. Kelsey states rearranging the classroom between the two learning models on a regular basis is impractical. Agreement among Biomed faculty that a group learning arrangement alone would meet resistance from other faculty members and instructors. Agreement for CO Arch. to look into table arrangement that could provide for both group learning and didactic lecture models with minimal table rearrangement.

General discussion regarding the need for existing monitors in the classroom space leads to consensus on replacing them with updated monitors (i.e. LED). Faye Brock states so long as the same media (i.e. VHS, slides, etc.) can be presented, there should be no objection among the instructors to the upgrading of A/V equipment.

Participants are asked to respond with corrections or additions to these minutes within one week of receipt, otherwise CO Architects will consider this to be an accurate record of the meeting.

5. Cost

S. Kelsey gives rough estimate of cost as follows:

Appr. 3800 ft² of construction at $350/ ft² = $1.3 mil.

In addition, estimate $250K - $300K for A/V and equipment.

6. Agreement for CO Arch. to revise plans based on meeting and submit them to B. Johnson for review with Biomed faculty. Once approved, CO Arch to submit plans to cost estimator and schedule with B. Johnson a meeting to review revised plans and costs. — CO

End of Meeting Minutes

Participants are asked to respond with corrections or additions to these minutes within one week of receipt, otherwise CO Architects will consider this to be an accurate record of the meeting.

CO ARCHITECTS

formerly Anshen+Allen-LA
5055 Wilshire Boulevard, 9th Floor
Los Angeles, California 90036
www.coarchitects.com
323.525.0500 phone, 323.525.0955 fax

Meeting Minutes

Meeting Date: **August 16, 2006**

Meeting Number: 2

Purpose: User Group Mtg. w/ UCR Biomed faculty, Capital Planning, & Academic Planning/ Budget

Location: Statistics Computer Bldg, Rm B0621

Project: Gross Anatomy Suite Study

CO Job Number: 25006.010

UCR Job Number:

Prepared By: Duke Sakiyabu

Date Prepared: August 17, 2006

Distribution: Attendees

File: 5.6.2 5.06

Attendees:

UCR Attendees:
Craig Byus, Biomed
Neal Schiller, Biomed
Faye Brock, Biomed
Lynn Hice, Biomed
Jim Colgan, Biomed
Mary Ann Baker, Biomed
Bill Johnson, CPP
Berent Pippert, CPP
Kieron Brunelle, CPP
Lionel Bradford, Comm.
Ross Grayson, EH+S
Russell Vernon, EH+S
Jason Day, Police

A/E Team Attendees
Scott Kelsey, CO
Jonathan Kanda, CO
Duke Sakiyabu, CO
Tony Ngo, CSI

Item	Summary	Action By	Due Date
1.	Bill Johnson opens meeting by reminding attendees the meeting is focused on the long-term solution to the Gross Anatomy suite/ Class lab and not the interim solution which is a separate discussion. Jonathan Kanda of CO Architects begins by asking the Biomed faculty for comments on the draft Gross Anatomy Suite draft study.		
2.	Neil Schiller questions the actual usage of the planned locker room. General assessment that locker room should accommodate changing scrubs and storage as opposed to only storage (w/ students changing in restrooms). This requires separate rooms for male and female students, reducing the GA lab space and the number of anatomy tables that can be accommodated. Discussion and consensus that reduction of potential class size from 48 to 40 students is acceptable. Ross Grayson recommends including a shower into the locker room. General agreement a shower should not be included in the design, citing low potential frequency of use and significant space impact on the GA lab suite. CO to redesign GA suite to accommodate said revisions.	CO	
3.	Russell Vernon questions whether the offices can exit through the GA lab if the lab is considered a high hazard space. JK explains code allows for exiting through GA lab because the offices are considered accessory use spaces. NS explains similar conditions exist in research labs. CO Arch to verify high hazard space conditions and exiting requirements for	CO	

Participants are asked to respond with corrections or additions to these minutes within one week of receipt, otherwise CO Architects will consider this to be an accurate record of the meeting.

GA lab.

4. NS questions faculty what AV requirements are necessary for the Model room. Mary Ann Baker explains the room is primarily for the examination of clean samples. Computer networking and multimedia presentations are stronger possibilities in this room than in the GA lab. Jim Colgan lists light boxes should be included, at one per station, mounted on the wall. Scott Kelsey asks if boxes can be replaced with computer monitors. General discussion regarding practicality of students bringing laptops through GA lab into the Model room. In all regards, confirmation from JK that infrastructure for either option will be included in cost model. — CO

   JC confirms current size of Model room (eight stations) is sufficient and should not be reduced. Storage should be utilized in base and wall cabinets wherever possible, both in the Model room and GA lab.

5. Lynn Hice gives update on the installation of security cameras for the GA lab suite. Three cameras will be installed at entrances to the suite, along with swipe key and keypad access. An emergency phone will be located nearby the main entrance. Security cameras will tape to a unit, access to which Jason Day requests should be restricted. The server room on the first floor is suggested by Berent Pippert as a possible location.

6. EH+S confirms an emergency phone should be included in the GA lab. — CO

7. Discussion regarding AV requirements for the Class lab focuses on requirements for the students. Although the Class lab has a wireless network in place and would be maintained, faculty recognizes need for power and more robust network connectivity for the students' laptops. SK points out this connectivity is especially important in a group learning format. After brief review of potential seating arrangements, general consensus that floor outlets (telecom/data/power) going to powered tables should be required. A grid arrangement is appropriate since actual seating arrangement will not be determined until later. Tim Ralston and SK confirm this is part of infrastructure discussion and should be included in the revised cost model. — CO

   SK asks if Class lab should maintain a 48 student capacity, in light of the reduction in the GA lab. Craig Byus confirms capacity should be maintained to accommodate graduate students, in addition to the undergraduates.

8. CO Arch presents an alternate scheme for the GA lab using sidedraft tables recommended by RG. This scheme accommodates 10 anatomy tables, each attached at one end to a duct connection at a wall.

   RG presents information regarding a project similar in design and the efficacy of sidedraft tables in removing formaldehyde vapors from the cadavers.

   SK lists other projects using the "ballroom" type scheme as presented in the draft study.

   After discussion, JC does not see problems with the sidedraft table option from an instructional point of view.

   Sidedraft option:

   Pros:

   - very effective in reducing formaldehyde vapors, exceeding the OSHA standard

   - alcoves created by table arrangement conducive to multiple storage options

   Cons:

   - flexibility of table arrangement very limited

   - higher premium for custom-made sidedraft tables

   - dedicated ductwork for each table adds to construction costs

   - high CFM requirement per table (1000 CFM) requires larger air handling unit

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Ballroom option:

Pros:

- allows for flexibility in table arrangement

- less premium attached to ductwork and air distribution

- air handling unit for this scheme can be accommodated in existing mechanical room

Cons:

- OSHA air quality standard cannot be conclusively met without actual testing

- at maximum capacity, space clearances are at the minimums

- less potential for storage

9.	Bill Johnson anticipates that Physical Plant, as a maintenance issue, will require rigid connections to the sidedraft tables.	CO
	RG to contact the sidedraft table fabricator and confirm costs.	UCR
	BJ should contact Pat Simone and/or Chris Flanders from Physical Plant and get them in touch with Tony Ngo to confirm the condition and capability of the existing mechanical system.	Biomed
	Tony Ngo to evaluate locations for a larger air handling unit associated with the sidedraft tables.	CSI
	Biomed faculty to contact UCLA regarding the air quality in their GA lab, which is a ballroom scheme.	
	As the above information becomes available, the potential costs will be included in the cost model.	
	CO Arch to revise plans from faculty recommendations.	

End of Meeting Minutes

Participants are asked to respond with corrections or additions to these minutes within one week of receipt, otherwise CO Architects will consider this to be an accurate record of the meeting.

CONCEPT DESIGN
COST PLAN

for

Biomedical Science Study
University of California, Riverside
Riverside, California

DAVIS LANGDON

December 9, 2006

CONCEPT DESIGN COST PLAN

for

Biomedical Science Study
University of California, Riverside
Riverside, California

CO Architects
5055 Wilshire Boulevard
9th Floor
Los Angeles, California 90036

Tel: (323) 525-0500
Fax: (323) 525-0955

December 9, 2006

DAVIS LANGDON
301 Arizona Avenue
Suite 301
Santa Monica
California 90401
Tel: 310.393.9411
Fax: 310.393.7493
www.davislangdon.com

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

CONTENTS

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

BASIS OF COST PLAN

Cost Plan Prepared From	Dated	Received
Outline Specification		
Gross Anatomy Suite Study DPP	7/20/2006	8/2/2006
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 May 2008

A construction period of 5 months

The general contract will be competitively bid with qualified general and 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 may not have full access to the site during normal business hours

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

INCLUSIONS

This project consists of the renovation of 4,380 sf of existing space to become Biomedical Science program.

The cost plan includes the following functions for building systems:

Floor and roof structure includes general repair to floor slabs following the interior demolition of the existing space and the miscellaneous alterations to accept the new program.

Interior partitions, doors and framing includes new partitions, doors and glazing

Floor, wall and ceiling finish includes new finish for all new program spaces.

Function equipment and specialties include corner guards and crash rails, washroom compartments and accessories, shelving, cabinets, counters and casework, light control and vision equipment, lockers, misc. medical equipment.

Plumbing includes sanitary and institutional fixtures, floor drains and associated connection pipe work.

Heating, Ventilating & Air Conditioning includes campus provided chilling, steam and heating, pipe work distribution including heated hot, chilled, equipment cooling, steam and condensate return, (1) new air handling unit and humidification. Air distribution and return, including biomedical exhaust ventilation, building management and laboratory pressurization controls and general ventilation.

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

Fire protection includes a complete automatic wet sprinkler system - reconfigure (E).

Demolition includes demolishing the interior existing fitout.

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

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 general contractors, with a minimum of 3 bidders for all items of subcontracted work and 3-4 general contractor bids. 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 judgement 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.

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

EXCLUSIONS

Owner supplied and installed furniture, fixtures and equipment (Group II/III equipment and furnishings are included separately as additional scope items.)

Loose furniture and equipment except as specifically identified

Hazardous material handling, disposal / abatement

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

Design, testing, inspection or construction management fees

Architectural and design 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 May 2008

Audio visual equipment (Group II/III equipment and furnishings are included separately as additional scope

Medical and laboratory gases - CA, Vac, O2 etc.

Domestic hot water heater - upgrades

Roof drainage reconfiguration.

CHW/HHW circulatory pumps

(E) classroom air handler - upgrades

Stainless steel biomedical exhaust ductwork

Upgrades to (E) normal and emergency power distribution equipment and feeders

UPS - By Owner

Public address

Centralized clocks

Utility upgrades

Biomedical Science Study
University of California, Riverside
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

OVERALL SUMMARY

	Gross Floor Area	$ / SF	$x1,000
Renovation	4,380 SF	545.42	2,389
TOTAL Building Construction (May 2008)	4,380 SF	545.42	2,389
Escalation to Start Date (May 2009)	12.03%		287
TOTAL Building Construction (May 2009)	4,380 SF	611.04	2,676
Additional Scope			
Group II / III Equipment & Furniture (May 2008)			675
Group II / III Equipment & Furniture (May 2009)			756
Alternates			
Premium for downdraft table option (May 2008)			60
Premium for downdraft table option (May 2009)			67

Please refer to the Inclusions and Exclusions sections of this report

Biomedical Science Study University of California, Riverside
Renovation
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

RENOVATION AREAS & CONTROL QUANTITIES

Areas

	SF	SF	SF
Enclosed Areas			
Renovation	4,380		
SUBTOTAL, Enclosed Area		4,380	
Covered area			
SUBTOTAL, Covered Area @ ½ Value			
TOTAL GROSS FLOOR AREA			4,380

Control Quantities

			Ratio to Gross Area
Number of stories (x1,000)	1	EA	0.228
Gross Area	4,380	SF	1.000
Enclosed Area	4,380	SF	1.000
Classroom / Lecture	1,590	SF	0.363
Gross Anatomy Lab	1,193	SF	0.272
Model room	220	SF	0.050
Faculty Offices	256	SF	0.058
Storage	31	SF	0.007
Washroom	155	SF	0.035
Locker Room	260	SF	0.059
Building Gross Up (walls and shafts only)	675	SF	0.154
Volume	70,080	CF	16.000
Interior Partition Length	600	LF	0.137
Finished Area	4,380	SF	1.000
Plumbing Fixtures (x1,000)	9	EA	2.055

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

RENOVATION COMPONENT SUMMARY

Gross Area: 4,380 SF

		$/SF	$x1,000
1. Foundations		0.00	0
2. Vertical Structure		0.00	0
3. Floor & Roof Structures		8.46	37
4. Exterior Cladding		0.00	0
5. Roofing, Waterproofing & Skylights		0.00	0
Shell (1-5)		8.46	37
6. Interior Partitions, Doors & Glazing		80.73	354
7. Floor, Wall & Ceiling Finishes		29.36	129
Interiors (6-7)		110.09	482
8. Function Equipment & Specialties		97.27	426
9. Stairs & Vertical Transportation		0.00	0
Equipment & Vertical Transportation (8-9)		97.27	426
10. Plumbing Systems		12.10	53
11. Heating, Ventilating & Air Conditioning		78.72	345
12. Electric Lighting, Power & Communications		46.35	203
13. Fire Protection Systems		7.50	33
Mechanical & Electrical (10-13)		144.67	634
Total Building Construction (1-13)		360.49	1,579
14. Site Preparation & Demolition		4.57	20
15. Site Paving, Structures & Landscaping		0.00	0
16. Utilities on Site		0.00	0
Total Site Construction (14-16)		4.57	20
TOTAL BUILDING & SITE (1-16)		365.06	1,599
General Conditions	15.00%	54.79	240
Contractor's Overhead & Profit or Fee	5.00%	21.00	92
PLANNED CONSTRUCTION COST	*December 2006*	440.86	1,931
Contingency for Development of Design	10.00%	44.06	193
Escalation to Start Date (May 2008)	12.50%	60.50	265
RECOMMENDED BUDGET	*May 2008*	545.42	2,389

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
No work required				*N/A*
				0
2. Vertical Structure				
No work required				*N/A*
				0
3. Floor and Roof Structure				
Slabs on grade				
Repair existing slabs on grade to accommodate revised program	4,380	SF	2.75	12,045
Miscellaneous				
Misc. iron	1	LS	25,000.00	25,000
				37,045
4. Exterior Cladding				
No work required				*N/A*
				0
5. Roofing, Waterproofing & Skylights				
No work required				*N/A*
				0

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
6. Interior Partitions, Doors & Glazing				
Partition cores and framing				
4" metal stud, blocking	11,200	SF	5.50	61,600
Removals	4,880	SF	10.00	48,800
Partition surfacing				
3/8" gypsum wallboard taped and sanded	22,400	SF	3.50	78,400
3/8" gypsum wallboard underlayment	22,400	SF	2.75	61,600
Paint	22,400	SF	1.25	28,000
Sound insulation				
Batt insulation	11,200	SF	1.25	14,000
Sealing and caulking	11,200	SF	1.00	11,200
Interior doors, frames and hardware				
Door assemblies	20	EA	2,500.00	50,000
				353,600
7. Floor, Wall & Ceiling Finishes				
Floors and bases				
Classroom / Lab - resilient tile	1,590	SF	6.50	10,335
Gross Anatomy Lab - epoxy	1,193	SF	9.50	11,334
Model room - epoxy	220	SF	9.50	2,090
Faculty Offices - resilient tile	256	SF	6.50	1,664
Storage - resilient tile	31	SF	6.50	202
Washroom - epoxy	155	SF	9.50	1,473
Locker Room - resilient tile	260	SF	6.50	1,690
Building Gross Up (walls and shafts only)	675	SF	1.50	1,013
Walls				
Classroom / Lecture	8,132	SF	3.50	28,460
Gross Anatomy Lab - epoxy paint	6,101	SF	2.50	15,253
Model room - epoxy paint	1,125	SF	2.50	2,813

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Washroom - epoxy paint	793	SF	2.50	1,982
Locker Room - paint	1,330	SF	1.50	1,995
Column furring and finish				
Column furring and finish	11,200	SF	1.25	14,000
Ceilings				
Classroom / Lecture	1,590	SF	7.50	11,925
Gross Anatomy Lab - mylar coated ACT	1,193	SF	8.00	9,544
Model room	220	SF	6.50	1,430
Faculty Offices	256	SF	5.00	1,280
Storage	31	SF	1.50	47
Washroom - painted gyp	155	SF	17.50	2,713
Locker Room - ACT	260	SF	6.50	1,690
Building Gross Up (walls and shafts only)	675	SF	1.00	675
Soffits and bulkheads	1	LS	5,000.00	5,000
				128,604

8. Function Equipment & Specialties

Protective guards, barriers and bumpers				
Corner guards, wall guards and bumper rails	4,380	SF	5.00	21,900
Prefabricated compartments and accessories				
Prefabricated compartments and accessories - misc.	4,380	SF	0.75	3,285
Washroom accessories	5	EA	600.00	3,000
Shelving and millwork				
Shelving	75	LF	75.00	5,625
Cabinets and countertops				
Counters, base cabinets, wall cabinets	175	LF	550.00	96,250
Classroom				
Moveable tables	24	EA		*Group 2 & 3*
Moveable chairs	48	EA		*Group 2 & 3*
Gross anatomy tables	10	EA		*Group 2 & 3*

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Office				
Moveable desk	2	EA		*Group 2 & 3*
Moveable chair	2	EA		*Group 2 & 3*
Moveable table	2	EA		*Group 2 & 3*
Moveable chairs	4	EA		*Group 2 & 3*
4 drawer pedestal file	2	EA		*Group 2 & 3*
Lateral files -2 drawer	4	EA		*Group 2 & 3*
Presentation/display boards, insignia and graphics				
Wall mounted flat screen monitors	2	EA		*Group 2 & 3*
Marker boards - 18'	3	EA	2,250.00	6,750
Marker boards - 6'	2	EA	750.00	1,500
Interior code and directional signage	4,380	SF	1.00	4,380
Light control and vision equipment				
Projector mounts	2	EA	500.00	1,000
Motorized projection screen 12'	1	EA	11,500.00	11,500
Amenities and convenience items				
Double tiered lockers (15" x 15")	48	EA	250.00	12,000
Special use equipment				
Medical refrigerator unit	1	EA	20,000.00	20,000
Sinks	8	EA	750.00	6,000
Surgical lights	10	EA	7,500.00	75,000
A/V equipment (refer to UCR Communications Telemedicine Equipment List - 08/15/06)	1	LS	157,860.00	157,860
				426,050

9. Stairs & Vertical Transportation

No work required	*N/A*
	0

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
10. Plumbing Systems				
Sanitary fixtures and local connection piping	9	Fx		
Classroom and laboratory sinks	8	EA	1,750.00	14,000
Emergency eyewash and shower	1	LS	3,000.00	3,000
Sanitary waste, vent and service pipework				
Floor/trench drains and sinks, < = 6", allow re saw-cut and patch	2	EA	5,000.00	10,000
Rough-in sanitary fixtures, including waste, vent and domestic service pipework	8	EA	3,250.00	26,000
Water treatment, storage and circulation				
Domestic hot water heaters				Existing
Laboratory service piping, valves and insulation				
Including vacuum, air, laboratory gas, RO/DI, industrial hot and cold water, potable water, special gases, fume hood connections, accessories, monitors, valves, filters and specialties				N/a
Laboratory waste and vent, including sampling port - Option LW-2				N/a
Surface water drainage, OD and pipework, < 8"				Existing
				53,000
11. Heating, Ventilation & Air Conditioning				
Thermal storage and circulation				
Expansion tanks				
Air separators				
Pumps				
Chilled water				Existing
Steam/condensate return, duplex				Existing
Heated hot water				Existing

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Piping, fittings, valves and insulation				
Chilled, PCW, heated hot water, steam and condensate drainage	4,380	SF	15.00	65,700
Air handing equipment				
Reuse (E) gross anatomy air handling unit				N/a
Reuse (E) classroom air handling unit				N/a
Duct-mounted humidification at Gross Anatomy - allow	2	EA	12,500.00	25,000
VAV - allow	10	EA	1,250.00	12,500
Air distribution and return				
Galvanized sheet metal ductwork - replace and reconfigure (E)	8,000	LB	9.50	76,000
Specialty fumehood exhaust ductwork, stainless steel, type 316 L				Excluded
Exhaust stack - 15', galvanized sheet metal, 16 gauge	1	EA	15,000.00	15,000
Flexible ductwork	170	LF	9.50	1,615
Dampers, volume	34	EA	75.00	2,550
Dampers. smoke/fire	10	EA	1,250.00	12,500
Insulation	5,000	SF	3.00	15,000
Diffusers, registers and grilles				
Laminar flow type, 4 x 2	20	EA	1,000.00	20,000
Ceiling, 2 x 2	14	EA	175.00	2,450
Controls and instrumentation				
Direct digital energy management system - including Biomedical negative pressurization controls	4,380	SF	18.00	78,840
Test and balance air systems	88	HR	115.00	10,120
Unit ventilation/exhaust fans				
In-line exhaust fan, 4,700 cfm	1	EA	7,500.00	7,500
				344,775

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
12. Electrical Lighting, Power & Communication				
Main service and distribution				Existing
Emergency power				Existing
Machine and equipment power				
Connections and switches, including conduit and cable				
Mechanical equipment				
< 5 hp	2	EA	2,750.00	5,500
Miscellaneous connections, < 100 A - including, audio-visual, specialty, security, power hardware, fire alarm, BMS and telephone/data equipment power	1	LS	25,000.00	25,000
User convenience power				
Wiremold/receptacles, including conduit and cable (1/65 SF)	67	EA	350.00	23,450
Lighting				
Panelboard breakers, 277 V	84	EA	105.00	8,820
Feeder conduit and cable	200	LF	35.00	7,000
Fixtures/switching, including conduit and cable	4,380	SF	12.50	54,750
Lighting and power specialties				
Lighting control - daylighting	1	LS	10,000.00	10,000
Telephone and communications				
Telephone/data outlets, including conduit and cable	4,380	SF	7.00	30,660
Audiovisual rough-in	1	LS	5,000.00	5,000
Alarm and security				
Fire alarm systems	4,380	SF	4.00	17,520
Security	4,380	SF	3.50	15,330

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Renovation — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
				203,030
13. Fire Protection Systems				
Automatic wet sprinkler system - complete (reconfigure (E))	4,380	SF	7.50	32,850
				32,850
14. Site Preparation & Building Demolition				
Demolition	1	LS	20,000.00	20,000
				20,000
15. Site Paving, Structures & Landscaping				
				0
16. Utilities on Site				
				0

Biomedical Science Study University of California, Riverside
Premium for Downdraft Tables
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

PREMIUM FOR DOWNDRAFT TABLES COMPONENT SUMMARY

Gross Area: 1,193 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		3.83	5
7. Floor, Wall & Ceiling Finishes		0.00	0
Interiors (6-7)		3.83	5
8. Function Equipment & Specialties		12.57	15
9. Stairs & Vertical Transportation		0.00	0
Equipment & Vertical Transportation (8-9)		12.57	15
10. Plumbing Systems		0.00	0
11. Heating, Ventilating & Air Conditioning		8.38	10
12. Electric Lighting, Power & Communications		8.38	10
13. Fire Protection Systems		0.00	0
Mechanical & Electrical (10-13)		16.76	20
Total Building Construction (1-13)		33.17	40
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)		33.17	40
General Conditions	15.00%	5.03	6
Contractor's Overhead & Profit or Fee	5.00%	1.68	2
PLANNED CONSTRUCTION COST	*December 2006*	39.88	48
Contingency for Development of Design	10.00%	4.19	5
Escalation to Start Date (May 2008)	12.50%	5.87	7
RECOMMENDED BUDGET	*May 2008*	49.94	60

Biomedical Science Study University of California, Riverside
Premium for Downdraft Tables
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
1. Foundations				
No Premium				
				0
2. Vertical Structure				
No Premium				
				0
3. Floor and Roof Structure				
No Premium				
				0
4. Exterior Cladding				
No Premium				
				0
5. Roofing, Waterproofing & Skylights				
No Premium				
				0
6. Interior Partitions, Doors & Glazing				
Additional partition	300	SF	15.25	4,575
				4,575

Biomedical Science Study University of California, Riverside
Premium for Downdraft Tables
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
7. Floor, Wall & Ceiling Finishes				
No Premium				
				0
8. Function Equipment & Specialties				
Downdraft table premium	10	EA	1,500.00	15,000
				15,000
9. Stairs & Vertical Transportation				
No Premium				
				0
10. Plumbing Systems				
No Premium				
				0
11. Heating, Ventilation & Air Conditioning				
Premium for additional ductwork, miscellaneous HVAC	1	LS	10,000.00	10,000
				10,000

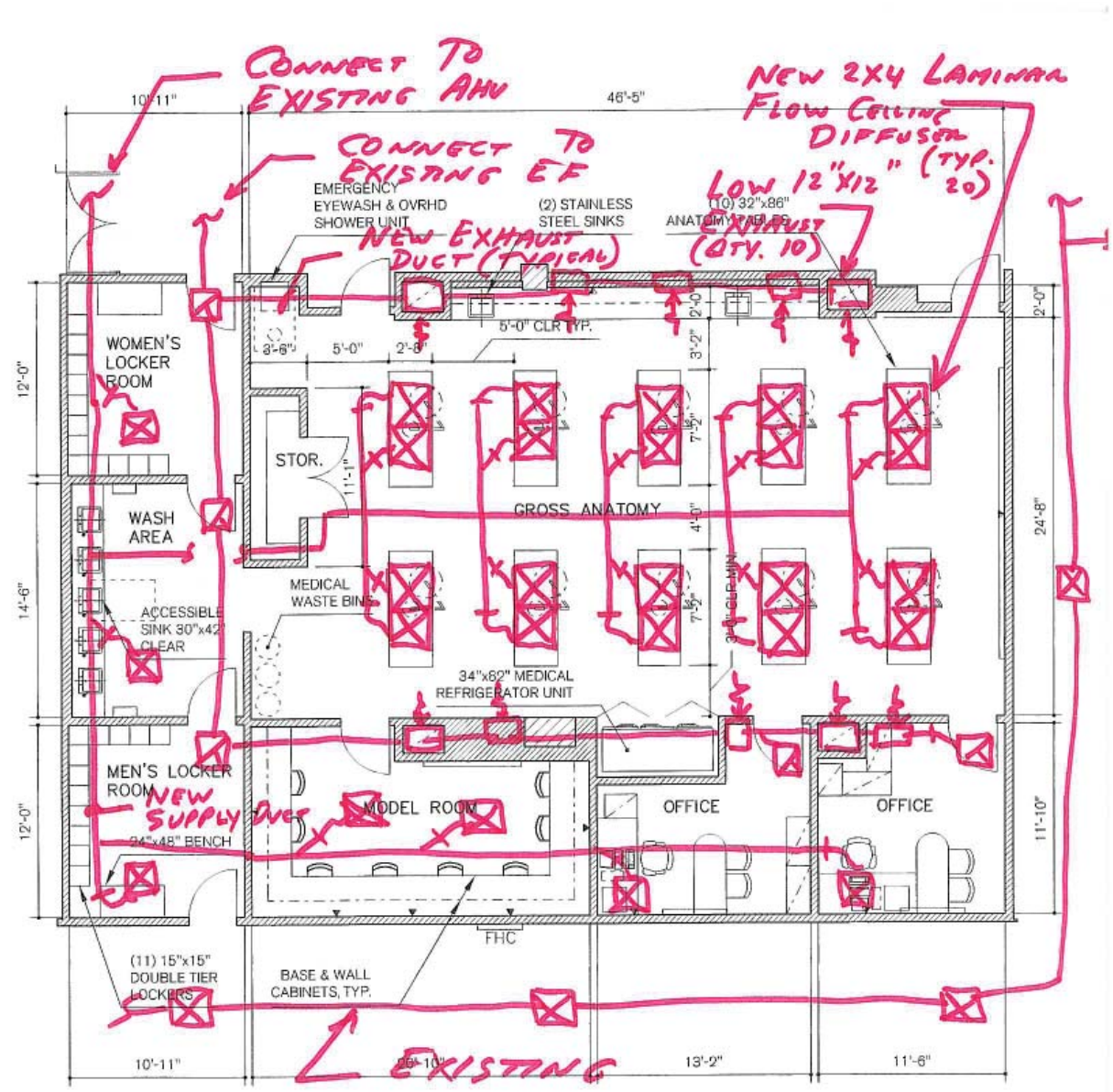
Biomedical Science Study University of California, Riverside
Premium for Downdraft Tables
Riverside, California

Concept Design Cost Plan
December 9, 2006
0168-7497.110

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
12. Electrical Lighting, Power & Communication				
Premium for additional electrical work	1	LS	10,000.00	10,000
				10,000
13. Fire Protection Systems				
No Premium				
				0
14. Site Preparation & Building Demolition				
No Premium				
				0
15. Site Paving, Structures & Landscaping				
No Premium				
				0
16. Utilities on Site				
No Premium				
				0

Biomedical Science Study University of California, Riverside — *Concept Design Cost Plan*
Group II / III Furnishings — *December 9, 2006*
Riverside, California — *0168-7497.110*

Item Description	*Quantity*	*Unit*	*Rate*	*Total*
Group II / III Equipment				
Cabinets and countertops				
Classroom				
Moveable tables	24	EA	1,100.00	26,400
Moveable chairs	48	EA	250.00	12,000
Gross anatomy tables	10	EA	2,250.00	22,500
Office				
Moveable desk	2	EA	1,250.00	2,500
Moveable chair	2	EA	450.00	900
Moveable table	2	EA	750.00	1,500
Moveable chairs	4	EA	250.00	1,000
4 drawer pedestal file	2	EA	175.00	350
Lateral files -2 drawer	4	EA	150.00	600
Presentation/display boards, insignia and graphics				
Wall mounted flat screen monitors	2	EA	7,500.00	15,000
Special Equipment				
A/V equipment (refer to UCR Communications Telemedicine Equipment List - 08/15/06)	1	LS	591,926.00	591,926
				674,676



EXISTING CONSTRUCTION

NEW CONSTRUCTION

NOTE: ALL PLANS AND NOTATIONS ARE FOR REFERENCE ONLY.

0' 5 10 25

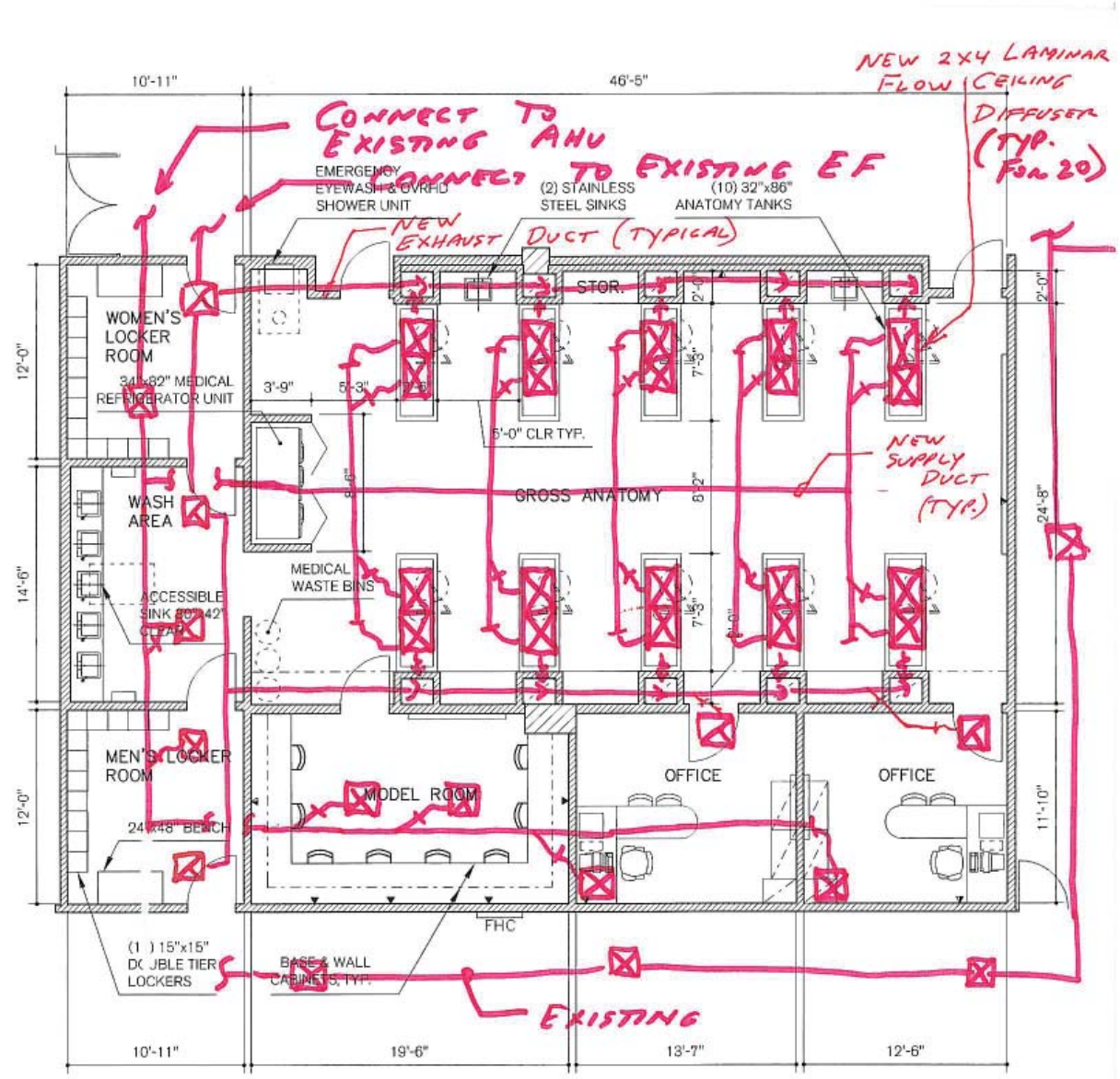
CO ARCHITECTS
formerly Anshen+Allen-LA
5055 Wilshire Boulevard, 8th Floor
Los Angeles, California 90036
323.525.0500 phone, 323.525.0955 fax

UNIVERSITY OF CALIFORNIA, RIVERSIDE
GROSS ANATOMY SUITE STUDY

Date: 10/24/06
Scale: 1/8" = 1'-0"
Drawing: GROSS ANATOMY ENLARGED FLR PLAN
BALL ROOM SCHEME

- M-1

M1.0
MECHANICAL SYSTEM SKETCHES



EXISTING CONSTRUCTION

NEW CONSTRUCTION

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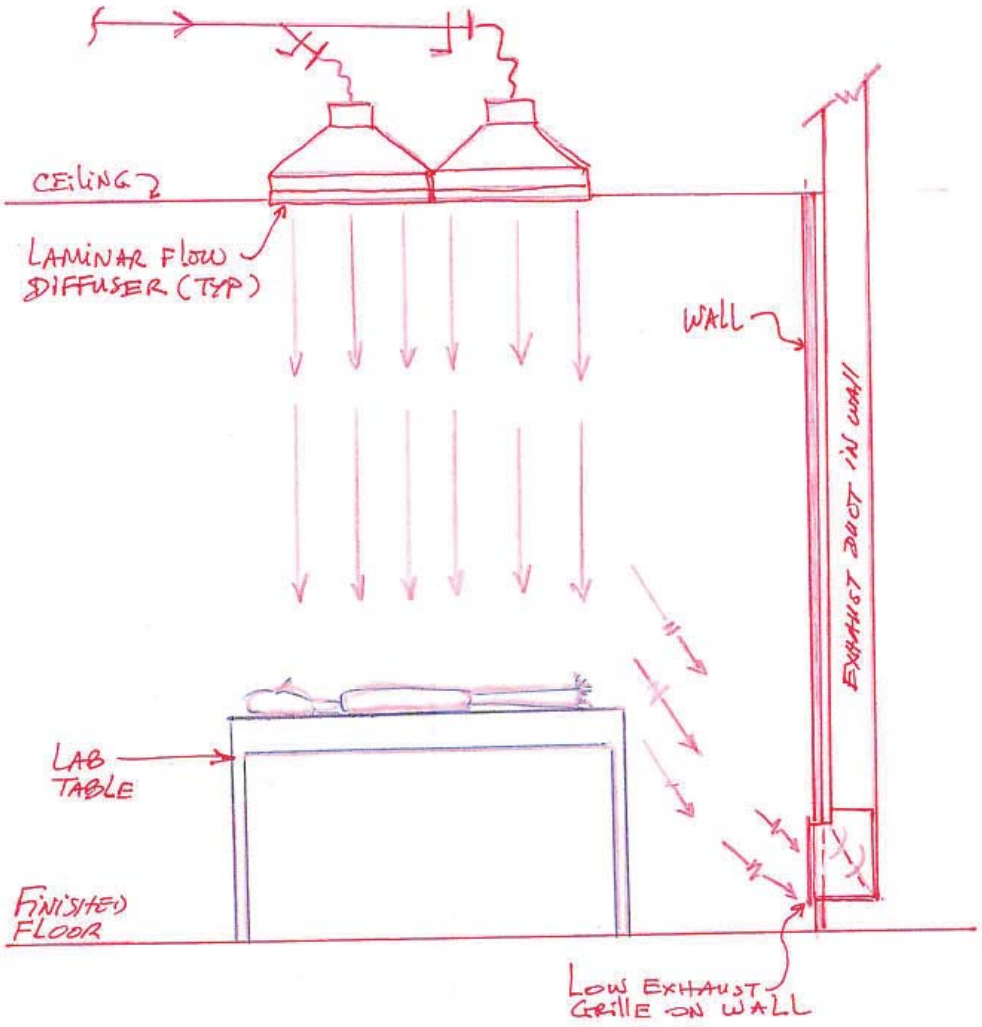
UNIVERSITY OF CALIFORNIA, RIVERSIDE
GROSS ANATOMY SUITE STUDY

Date: 10/24/06
Scale: 1/8" = 1'-0"
M-2
Drawing: GROSS ANATOMY ENLARGED FLR PLAN
SIDEDRAFT TABLE SCHEME

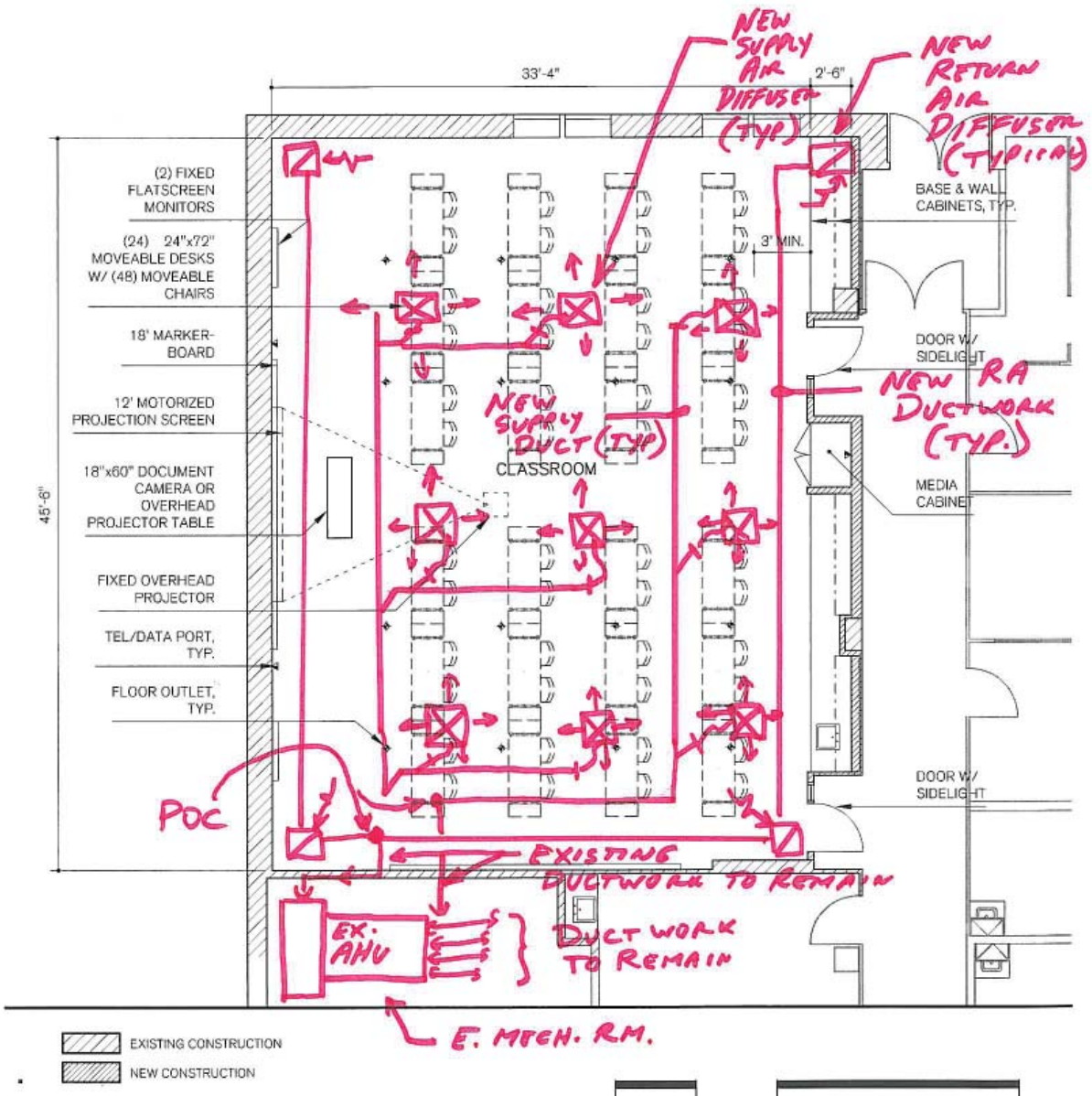
ADD ALTERNATE 1



SKETCH M-3

UCR BIOMEDICAL BLDG.
GROSS ANATOMY & CLASSROOM
UPGRADE DPP

7/-12-06



NOTE: ALL PLANS AND NOTATIONS ARE FOR REFERENCE ONLY.

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formerly Ansben+Allen-LA
5055 Wilshire Boulevard, 9th Floor
Los Angeles, California 90036
323.525.0500 phone, 323.525.0955 fax

UNIVERSITY OF CALIFORNIA, RIVERSIDE
GROSS ANATOMY SUITE STUDY

Date: 10/24/06
Scale: 1/8" = 1'-0"
Drawing: CLASSROOM ENLARGED FLR PLAN

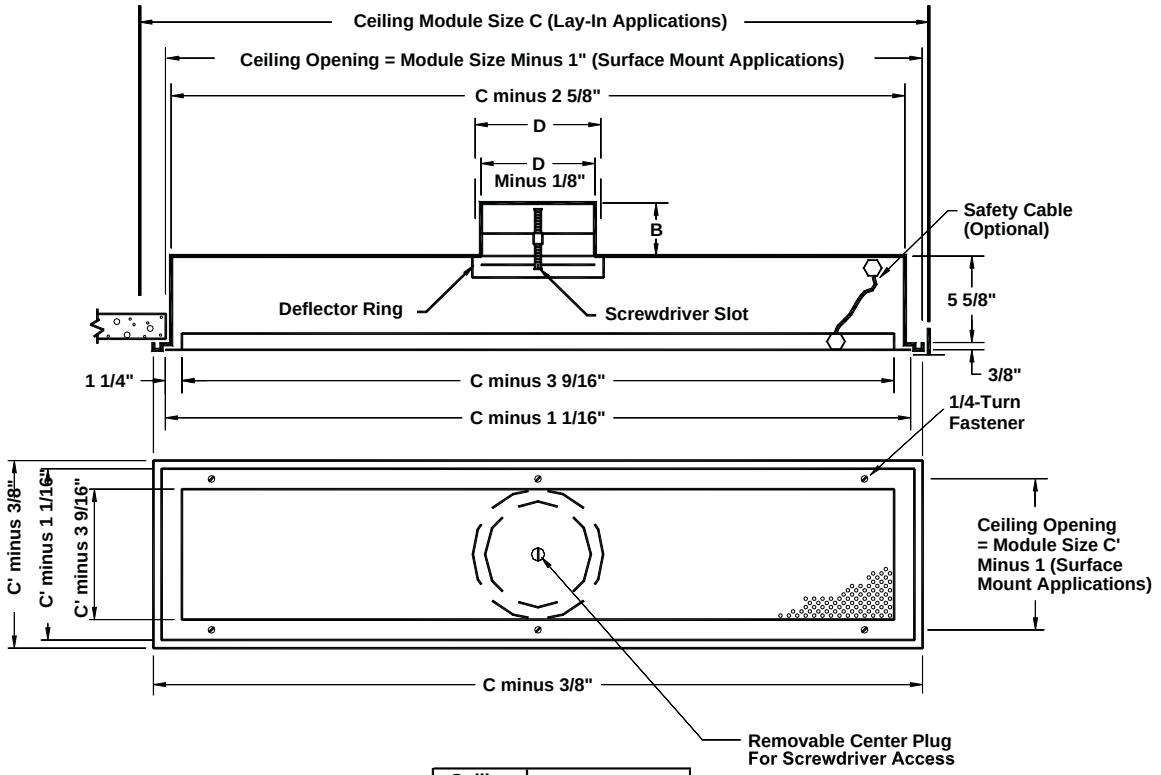
Titus
The Leader in Air Management

Submittal

CED-TLF-AA-1.0 8-17-05

TLF-AA • Removable Face • Distribution and Volume Damper

Critical Environment Diffusion Products
Laminar Flow Ceiling Diffusers • Aluminum • Perforated Face



Ceiling Module C x C	Duct Size D
24 x 24	6, 7, 8, 10, 12
36 x 24	6, 7, 8, 10, 12
48 x 12	6, 7, 8
48 x 24	6, 7, 8, 10, 12
60 x 12	6, 7, 8
60 x 24	6, 7, 8, 10, 12
72 x 12	6, 7, 8
72 x 24	6, 7, 8, 10, 12

Duct Size D	Neck Size B
6, 7, 8	2 1/4
10, 12	2 3/4

Table indicates Availablel Ceiling Modules Sizes C x C' and Nominal Round Duct Sizes D.

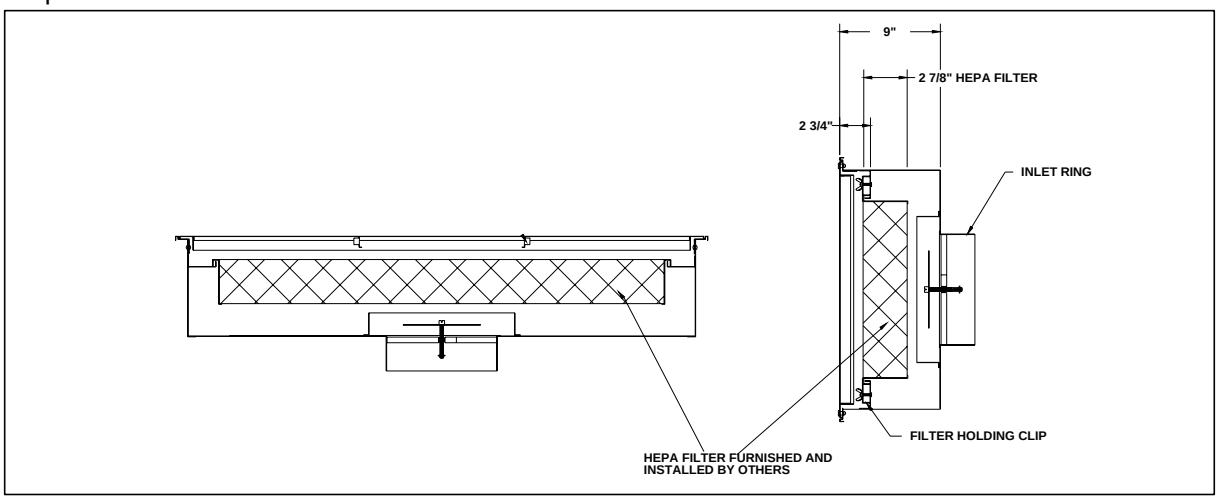
Accessories (Optional) Check ☑ if provided.

☐ Safety Cable

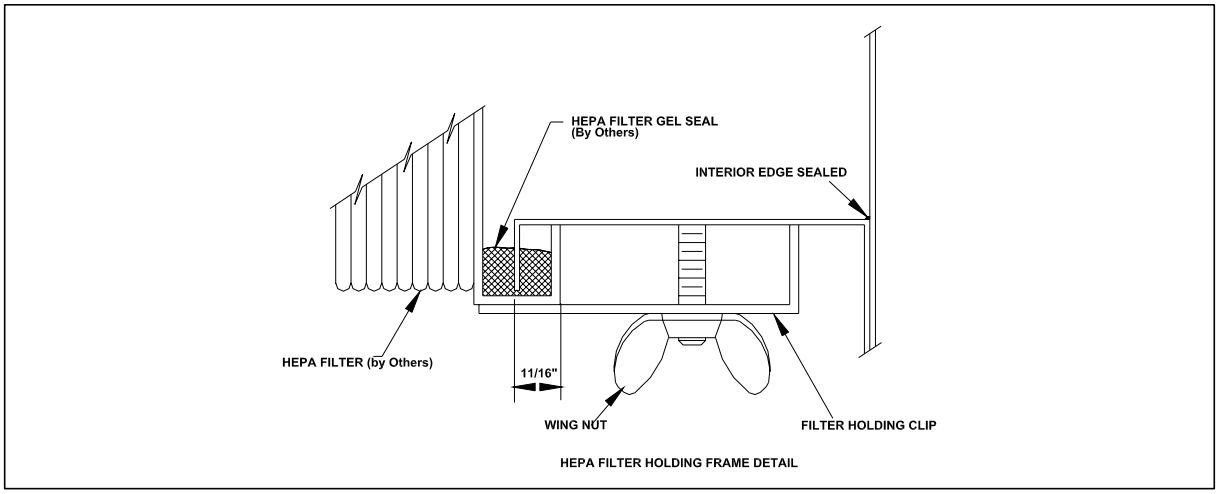
M2.0
LAMINAR FLOW DIFFUSER

Submittal CED-TLF-AA-2.0 8-17-05

Optional HEPA Filter Rack:



HEPA Filter Rack:



Standard Finish: #26 White

General Description

- Model TLF-AA laminar flow diffuser generates a low velocity, evenly distributed, downward moving “piston” of conditioned air.
- Installed over the operating table in a hospital operating room, Model TLF-AA helps to protect the patient from contaminated air. The only appreciable amount of room air entrainment occurs at the boundaries of the moving air mass outside the confines of the operating table. As a result, the patient is effectively isolated from residual room air.
- Model TLF-AA is especially effective in cooling areas with heavy, localized, internal loads, as in the computer room. The column of air delivered by the Model TLF-AA cools the load source directly without generating high velocities in the occupied space.
- Disk type damper in neck is adjustable by rotating entire disk. Accessible after removing center plug.
- Perforated face is quickly removed by loosening ¼ turn fasteners.
- Optional safety cable prevents accidental dropping of perforated face after removal.
- Internal baffles distribute air evenly over perforated face.
- Perforated face has 3/32” diameter holes on ¼” centers on 60° staggered pattern.
- Can be surfaced mounted (left side of drawing above) or laid into conventional T-bar ceiling system (right side of drawing above).
- Optional HEPA filter and gel seal by others; room-side access and rack by factory.

This submittal is meant to demonstrate general dimensions of this product. The drawings are not meant to detail every aspect of the product. Drawings are not to scale. Titus reserves the right to make changes without written notice.

Frequency of Air Changes per Hour – A Key Consideration in Selecting Air Purification Systems

a report by
Airistar Technologies™, L.L.C.

The average person breathes in approximately 16,000 quarts of air per day. Each quart of air contains some 70,000 visible and invisible particles, which equates to a total intake of over a billion particles per day. When it is then considered that Environmental Protection Agency studies show that indoor air within a standard environment may be as much as 100 times more polluted than outside air, it is no wonder that the need for indoor air purification systems is becoming such an important topic. The necessity of air cleaning solutions is especially critical in healthcare environments, where higher concentrations of harmful or infectious micro-organisms are being emitted into the air.

When considering air purification systems, it is typical to evaluate the filter media, product efficiency claims, and the size and portability of the unit. What is less often considered, and yet is quite possibly the single most important factor in the success of any system, is the frequency of air changes per hour (ACH) that the system can create. The rate of ACH determines the rate at which the total volume of air in the room is cleaned by an air purification system, which is a major factor in the degree of air cleaning that can be achieved.

The Importance of ACH

There is no question that filter media selection is critical to the purification process, and also plays a role in determining a system's ability to create air changes, but it is also important to understand that without air changes indoor air cannot truly be cleaned. An air purification system can only clean air that enters the system, and the filtered air only remains clean as long as no new contaminants are introduced into the environment. Given these conditions, it becomes clear that the greatest benefit is achieved when the air in the room is being changed or processed more frequently, as clean air is then able to continually dilute the concentration of unwanted particles in the air. In essence, air changes create a compounding efficiency effect. After operating an air purifier in an undisturbed environment for a period of time, the total air volume in the room will be replenished with clean air, which eventually allows all of the air in the room to be cleaned to the efficiency level of the air purification system.

While there are few instances where air purification will be implemented in this manner, it does become clear that in environments where new airborne contaminants are frequently added, such as medical facilities, there is a need for increased frequency of air changes. Given two systems with equivalent filter effectiveness, the unit with a higher ACH rating will improve the air quality of a room in much less time, which is important, when considering how a large proportion of nosocomial infections are spread. Micro-organisms such as mycobacterium tuber-culosis, measles virus (i.e. rubella), and small pox virus (i.e. variola major) are released into the air as individual droplets via oral or nasal secretions from infected individuals. These infectious airborne disease particles become suspended in the air, where they dry and become attached to other airborne material creating much larger particles called droplet nuclei that are between one and five microns in size. These larger infectious particles can then remain in the air for much longer than the individual micro-organism droplets. The good news is that with proper air circulation and filtration these larger particles can be removed from the air by air purification systems. By increasing the frequency in which an air purification system changes the air in a given environment, it is possible to decrease the concentration level of the most common airborne infectious disease particles in a given space, which helps to protect the health of the staff, visitors and patients of medical facilities.

Figure 1 depicts the types of particles that can be cleaned from the air utilising air purification systems. Most high efficiency particulate arresting (HEPA)-rated systems can remove particles 0.3 microns or larger, although system airflow and efficiency ratings vary.

Defining ACH

Now that the critical importance of air changes to the reduction of airborne particulate has been established, the focus moves to defining and creating indoor air circulation. ACH is defined as, "A value representing the number of times each hour that an enclosure's total volume of air is exchanged with fresh or filtered air."[1] This is not to say that an air change represents

Figure 1: Particle Size Chart

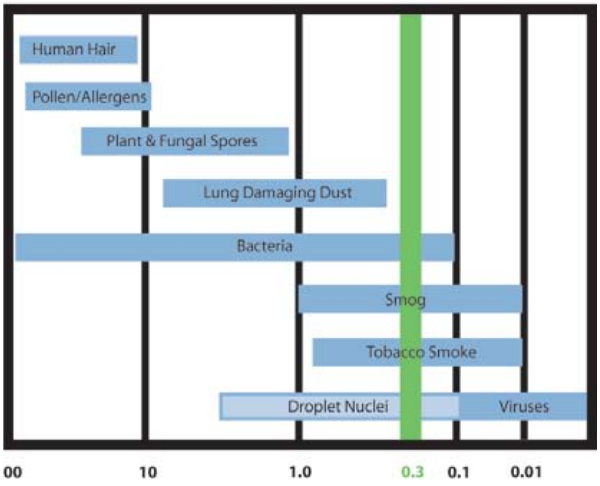


Table 1: Recommended Minimum Total Air Changes per Hour

Area	ASHRAE Handbook (1999) Min. Total Air Changes per Hour
Operating Rooms (recirculating air system)	25
Delivery Rooms (recirculating air system)	25
Recovery Rooms	6
Nursery Suite	12
ICU	6
Patient Rooms	4
Medical Procedure/Treatment Rooms	6
Autopsy Rooms	12
Physical Therapy	6
Positive Isolation Rooms	15
Negative Isolation Rooms	6

Source: Pawangkarat, Chakrapan. "Airborne Infection Control for Hospitals" http://www.thaihvac.com/

removal of all unwanted particles from the air. Instead, an air change represents a complete recycling of the air in a given space through some form of filtration or ventilation, the efficiency of which is determined by the method used to cycle the air.

This definition provides an important piece of criteria for evaluating air purification systems. A system must be designed in such a way that it can pull all of the air in the given space through the system in order to create true air changes. The most contaminated air in any room is typically found from ground level to six feet from the floor. The reason for this is that air particles typically follow the path of least resistance, allowing gravity to pull heavy particles downward. In order to intake the most polluted air, the air purification unit is therefore most efficient if placed on the floor. Allowing for this fact, systems should exhaust clean air upward out of the unit so that the air at the upper levels of the room is displaced by the clean air. The unclean air will then move downward into the air circulation path created by the system. This air circulation pattern is the most effective pattern for achieving ACH in a given space. Another reason to have clean air exhausted upward from a portable air purification system that intakes air from floor level is that if the system's intake placement is too close to the area where clean air is exhausted, the clean air can be drawn back into the system for cleaning a second time, which creates a situation where the air purification system repetitively cleans the same air.

Another key criterion for evaluating air purification systems is the cubic feet per minute (CFM) of air that a system can output. The US Department of Health and Human Services Centers for Disease Control and Prevention (CDC) recommends that healthcare facilities, "Select portable HEPA filters that can re-circulate all or nearly all of the room air and provide the equivalent of >12 ACH". *Table 1* lists recommendations for several specific medical facility locations.

The number of ACH that a system can generate is calculated by dividing the CFM that a system can generate by the cubic feet of the space and then multiplying that number by 60 minutes (see *Figure 2*) For example, if an average air purifier has a clean air output of 150 cubic feet per minute and is placed in a room with the dimensions of 12' W x 15' L x 8' H,

Figure 2

$$\text{Number of Air Changes per Hour (ACH)} = \frac{\text{Airflow of Air Cleaner in Cubic Feet per Min. (CFM)} \times 60 \text{ Min.}}{\text{Cubic Footage of Area (L x W x H)}}$$

the unit needs to clean 1,440 cubic feet of air. Utilising the formula, it is determined that the unit will complete six ACH or roughly one air change every 10 minutes. In order to meet the CDC recommendation within this sample space, the system selected has to have a total clean air output of 300 CFM, which could be met by selecting a single unit that can produce 300 CFM or placing two units in the space.

Increasing the Frequency of ACH

Thus far, the basic principles of ACH have been explored; and several simple ways to evaluate air purification systems in terms of the ability to circulate the air in a given space have been discussed. What is of more interest are the ways in which air purification systems can be designed to create greater airflow and thereby increase the frequency of ACH that a single unit can provide. There are a number of design factors that determine the CFM and ACH a system can output. The most important factor is the selection and placement of filters within the system. As stated previously, the CDC recommends the use of HEPA filtration in medical environments in order to clean the air.

HEPA filtration technology was designed during World War II (WWII) by the Atomic Energy Commission to remove and capture radioactive dust particles in order to protect the human respiratory system. HEPA filters are rated to remove up to 99.97% of all particles 0.3 microns in size or larger, which encompasses most non-viral airborne particles. HEPA filter media also has important efficiency properties that are critical to successful air purification solutions. Not only is the filter media efficient at cleaning the air that passes through the filter, but it is designed in such a way that as particles are captured on the surface of the filter the cleaning efficiency of the filter actually increases before eventually decreasing as the filter becomes filled with particulates.

There is also a new type of filter media called high airflow particulate arresting (HAPA™) that further improves on HEPA technology and can help systems achieve increased air circulation. Like its WWII-era predecessor, HAPA is also rated to remove up to 99.97% of all particles 0.3 microns in size or larger. This filter media is constructed of a totally synthetic melt blown fibre material that is more durable than traditional HEPA filters. It has also shown greater depth loading capacity[2] than HEPA-rated filter material, which means that more particles can collect on the filter surface before the efficiency of the filter begins to decrease. Most importantly, HAPA is less restrictive to airflow than HEPA, which means that systems utilising HAPA filter media are capable of achieving higher CFM output than systems utilising HEPA filtration.

Once the filter media is selected, the placement of the filters, both in terms of filter order and spacing within the system, must be considered as both factors contribute to the level of CFM that a unit can produce. There is no way to define the correct design of an air purification system, but evaluating the way in which airflow is created and restricted by the filter media is one way to better understand the ACH and the efficiency that can be achieved with the unit. The one known truth about filter placement is that the presence of pre-filters within air purification systems is critical to protecting the efficiency of the system. By removing larger particles from the air before the air is cycled through the HEPA or HAPA filter media, higher airflow levels can be maintained for longer periods of time.

Selecting the Right Air Purification System

Creating a clean and safe indoor environment is a complex task. Selecting the correct air purification system is an integral part of this task, and requires a complete understanding of both the environment and the required results. The CDC recommends that healthcare facilities, "Situate portable HEPA units with the advice of facility engineers to ensure that all room air is filtered". Regardless of the process followed to evaluate an air purification system, one thing is clear. Creating ACH is the key to providing a clean air environment. Systems that can provide the recommended frequency of ACH for a medical facility will exponentially improve the quality of the air that is shared by the facility's patients, visitors and staff. ■

1. *www.energyvortex.com*
2. *based on recent testing completed by the manufacturer.*