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Research Facilities Design has been responsible for the design of more than one thousand research and teaching laboratory projects throughout the United States and abroad. We are a “Hands-on” organization, characterized by extensive Principal involvement from the inception of programming through the design and construction process.

2015 R&D MAGAZINE LABORATORY OF THE YEAR WINNER
SOUTH AUSTRALIAN HEALTH & MEDICAL RESEARCH INSTITUTE
Projects
- 1,000+ Science Building Projects
- Laboratory Facility projects completed in:
  - 6 continents
  - 17 countries
  - 50 states
- More than 2,500,000 gross square feet of laboratory facilities planning each year
- More than 1,000,000 net square feet of laboratory programming and design each year

Awards
- 113: Design Awards received for Laboratory Building projects
- 10: RFD projects awarded recognition in the R&D Magazine “Laboratory of the Year” program

LEED Projects
- 10: Platinum Certified Projects
- 68: Gold Certified Projects
- 22: Silver Certified Projects
- 4: Certified Projects

Clients
- More than 335 Private & Public Higher Education Clients
- More than 200 Research Institution, Industry and Government Clients
- More than 400 Architectural Teammates, nearly 150 Repeat Architectural Teammates

Firm & Staff
- 4 Principals
- 6 Licensed Architects
- 7 LEED Accredited Professionals
- 2 Mechanical Engineers
- 25 Staff Members
- 35 years firm history

Industry Organizations
RFD supports and actively participates in the following organizations:
- SCUP (31 years)
- Tradeline (26 years)
- PKAL/Learning Spaces Collaboratory (26 years)
- AALAS (16 years)
- SEFA (16 years)
- I²SL/Labs 21 (9 years)
RFD THE FIRM
Research Facilities Design (RFD) is a firm of laboratory design consultants focused exclusively on the programming and design of laboratory buildings for industry, healthcare, research and education. Located coast to coast with offices in San Diego, California and Raleigh, North Carolina, RFD’s staff of architects, engineers, and laboratory planners work cohesively to provide seamless project management and delivery.

FOCUS
RFD’s practice has been built with 100% focus on the programming, design and execution of laboratory, support and core facilities. We do not provide any other services or work on any other project types. As such, our dedicated focus enables us to stay current with the latest trends, standards, codes, regulations and guidelines which impact this specific facility type as well as the ever-changing technology of laboratory furnishings, fume hoods, equipment and instrumentation.

BENCHMARKING
RFD has an unparalleled database of critical area and cost benchmarking information. We have gathered this information from hundreds of projects over the past 30+ years representing a range of science and engineering facility types. When working on a new project, we select the most appropriate representative projects from our historical database to help validate a variety of area and cost ratios during Programming. These ratios include Net/Gross Area ratio, ratio of Laboratory to Laboratory Support Space, Laboratory Density, and Construction Cost/GSF. This process helps give the Owner and Design Team a comfort level with the project parameters at an early stage, allowing the team to proceed into the Design phases with greater confidence.

COLLABORATIVE
Our approach to designing laboratory spaces is highly collaborative. We actively seek input from all project stakeholders including faculty members, researchers, administration staff, maintenance personnel, health and safety officers - as well as the other members of the design team. Within our office itself, our approach follows a similar paradigm whereby intelligent discourse amongst professionals with their own experiences and opinions leads to solutions which are greater than the knowledge of any one individual.

LABORATORY ENGINEERING SERVICES
RFD’s in-house mechanical engineers provide a range of planning, design and consulting services to the Architect and Building Engineers. Our goal is not to eliminate the need for the local MEP engineering team, but to augment and guide the team by preparing laboratory systems design criteria during Programming, laboratory equipment heat gain calculations during the Design Development Phase, and coordination reviews between the laboratory and building system components during the Construction Documents Phase.

RFD also offers additional Laboratory Engineering services such as Laboratory Plumbing (LP) Engineering, Laboratory Electrical (LE) Engineering, and Enhanced Laboratory Engineering. When RFD is contracted to provide the LP and LE services, our engineers provide laboratory plumbing and electrical load calculations, flow rates, points-of-connection schedules, and laboratory piping and electrical design from the points-of connection in the corridor to the points of use in the laboratory. Enhanced Laboratory Engineering services may include the full design of HVAC and process piping systems for specialty areas such as cleanrooms, vivariums, GMP facilities and BSL3 suites.

AWARD-WINNING DESIGN
RFD is proud of its many award-winning innovative projects developed in collaboration with our architectural teammates. Beyond the glamour of the numerous formal awards, we find great satisfaction in developing thoughtful, innovative solutions and details to meet the specific needs of individual clients. While these innovative details do not necessarily result in broad national recognition, they make a huge difference in the daily working environment of the faculty, staff, and students who use RFD-designed laboratory facilities on a regular basis.
As consultants, RFD continually works as part of integrated design teams with architectural firms around the world. With over 400 architect client partners, we are adept at working collaboratively with design teams to deliver quality projects.
ARCHITECT CLIENT PARTNERS

NATIONAL/ INTERNATIONAL FIRMS

AECOM
ANSHEN + ALLEN
ANSHEN DYER ARCHITECTS
ARUP
AYERS SAINT GROSS
BALLINGER COMPANY
BOHLIN CYWINSKI JACKSON
BSA LIFE STRUCTURES
BURT HILL
C.W. FENTRESS J.H. BRADBURN
CANNON DESIGN
CO ARCHITECTS
DMP DESIGNCAMP MOONPARK
ELLERBE BECKET
FENTRESS ARCHITECTS
FLAD ARCHITECTS
FOSTER + PARTNERS
GOODY, CLANCY AND ASSOCIATES
Hammell Green and Abrahamson, Inc.
HASTINGS & CHIVETTA ARCHITECTS, INC.
HDR ARCHITECTURE, INC.
HILLIER GROUP
HOK
HOLABIRD & ROOT
KALLMANN MCKINNELL & WOOD ARCHITECTS
KIERAN TIMBERLAKE
KMD ARCHITECTS
LAKE FLATO
LORD, AECK & SARGENT, INC.
M+W GROUP
MITCHELL GIURGOLA ARCHITECTS
MORPHOSIS
NBBJ
PERKINS & WILL
PFEIFFER PARTNERS
RAFAEL VINOLY ARCHITECTS
RATIO ARCHITECTS
RTKL
SASAKI ASSOCIATES INC.
SHEPLEY BULFINCH
SKIDMORE OWINGS & MERRILL LLP
S/L/A/M COLLABORATIVE
SMITHGROUP JJR
SRG PARTNERSHIP, INC.
STANTEC
STUBBINS ASSOCIATES
SUSAN MAXMAN & PARTNERS ARCH.
URS CORPORATION
WATKINS GRAY INTERNATIONAL
WILSON ARCHITECTS
WOODS BAGOT
ZEIDLER PARTNERSHIP ARCHITECTS
ZIMMER GUNSUL FRASCA ARCHITECTS, LLP
REGIONAL DESIGN FIRMS

360 ARCHITECTS
A & E ARCHITECTS
A. EPSTEIN & SONS
AC MARTIN
ACKROYD
ACTON OSTRY ARCHITECTS
ADAMSON ASSOCIATES, ARCHITECTS
ADP/ERLICH - ROMINGER
AJC ARCHITECTS
ALBERT KAHN ASSOCIATES, INC.
ALLIANCE
ALLER LINGLE ARCHITECTS P.C.
ANDERSON DEBARTOLO PAN
ANDERSON MASON DALE ARCHITECTS
AR7 HOOVER DESMOND ARCHITECTS
ARAI/JACKSON ARCHITECTS & PLANNERS
ARC ARCHITECTS
ARCHITEKTON
ARCHITECTS DESIGN GROUP
ARCHITECTS HAWAII LIMITED
ARCHITECTURAL NEXUS, INC.
ARCHITECTURE INC.
ASA ARCHITECTS
ASHLEY MCGRAW ARCHITECTS
BACCOCK DESIGN GROUP
BARTON MYERS ASSOCIATES, INC.
BASSETTI ARCHITECTS
BDP
BEZER DURST SEIZER
BHDP ARCHITECTURE INC.
BIBB & ASSOCIATES
BJAC
BNIM ARCHITECTS
BOBROW THOMAS & ASSOCIATES
BOORA ARCHITECTS
BOWMAN BOWMAN NOVICK INC.
BOYD A. BLACKNER ARCHITECTS
BROOKS BORG SKILES ARCH. ENG. LLP
BTA
BULL VOLKMAN STOCKWELL
BY ARCHITECTURAL MEANS

CALDWELL ASSOCIATES
CARRIER JOHNSON
CARTER & BURGESS
CATER, RUMA & ASSOCIATES, INC.
CBL ARCHITECTURE
CDG ARCHITECTS
CELLI-FLYNN BRENNAN
CHAMBERLIN ARCHITECTS
CHAMPLIN/HAUPT, INC.
CHAPMAN COYLE CHAPMAN
CHCG ARCHITECTS
CHONG PARTNERS ARCHITECTURE
CHRISTNER INC.
CHRISTOPHER CARVELL ARCHITECTS
CLA ARCHITECTURE INC.
CLARK & ASSOCIATES
CLARK ENERSEN PARTNERS
CLARK NEXSEN
CLIFFORD NAKATA ASSOCIATES
CMKLV, INC.
COLLINS GORDON BOSTWICK ARCHITECTS
COOPER CARRY ARCHITECTS
CPMI
CRAIG, GAULDEN & DAVIS
CRED
CRSS CONSTRUCTION
CSHQA ARCHITECTS
CSNA
CTA ARCHITECT ENGINEERS
DAVIS ARCHITECTS
DAVIS DESIGN
DAVIS FENTON STANGE & DARLING
DAVIS PARTNERSHIP, PC, ARCHITECTS
DCSW ARCHITECTS, INC.
REGIONAL DESIGN FIRMS (CONTINUED)

DEKKER/PERICH SABATINI
DELAWARE ARCHITECTURE
DESIGN PARTNERSHIP, THE
DESIGN PARTNERS, INC.
DESIGN PLUS, INC.
DESIGN WEST ARCHITECTS, INC.
DEWOLFF PARTNERSHIP ARCHITECTS
DICK & FRITSCHE DESIGN GROUP
DOLVEN SIMPSON ASSOCIATES
DONADIO ARCHITECTS
DOWLER - GRUMAN ARCHITECTS
DOWLING SANDHOLM ARCHITECTS
DS ATLANTIC
DUCAR
DURRANT HEIKE
DURRANT ROBERTS/DINSMORE
DWL ARCHITECTS
DWORSKY ASSOCIATES
EDMUND L. HAFER & ASSOCIATES. P.C.
EDSA
EHRLICH ROMINGER
ESHERICK HOMSEY DODGE & DAVIS
EWING COLE
F & D ASSOCIATES
F.J. CLARK, INC.
FANNING / HOWEY ASSOCIATES
FANNING BARD TATUM ARCHITECTS
FERRARO CHOI AND ASSOCIATES, INC.
FFKR ARCHITECTS
FINEGOLD ALEXANDER

FKP ARCHITECTS, INC.
FLATOW MOORE SHAFFER McCabe
FLETCHER THOMPSON
FONG & CHAN ARCHITECTS
FOSS ASSOCIATES
FREELON GROUP, INC., THE
FISHBECK, THOMPSON, CARR & HUBER
FXFOWLE ARCHITECTS, PC
GARZA/BOMBERGER & ASSOCIATES
GAUDREAU, INC.
GDP ARCHITECTS
GIDEON TOAL ARCHITECTS
GLASS ASSOCIATES, INC.
GLENN LIVINGGOOD PENZLER ARCHITECTS
GOULD EVANS
GRILLIAS PIRC ROSIER ALVES
GSBS PC
GSI ARCHITECTS
GUND PARTNERSHIP
GUNN PARTNERSHIP
GUNN LEVINE ASSOCIATES, INC.
H. BARKER ARCHITECTS
HAHNFELD HOFFER STANFORD ARCHITECTS/ INTERIORS/PLANNERS, INC.
REGIONAL DESIGN FIRMS (CONTINUED)

HANSCOMB ASSOCIATES
HANSEN LIND MEYER
HARPER & PARTNERS
HARTMAN+ MAJEWSKI DESIGN GROUP, THE
HCH ARCHITECTS
HARVARD JOLLY
HERBERT, LEWIS, KRUSE, BLUNCK
HERSHENOW + KLIPPENSTEIN ARCHITECTS
HILL PARTNERSHIP, INC.
HKS, INC.
HOLLAND BASHAM ARCHITECTS
HULSING & ASSOCIATES ARCHITECTS
HUMMEL, LAMARCHE HUNSUCKER
INDUSTRIAL DESIGN CORPORATION
INTEGRUS ARCHITECTURE
J.N. PEASE ASSOCIATES
JAMES CUBITT & PARTNERS
JAMES STRAPPER ARCHITECT
JBA ARCHITECTS
JENNINGS HACKLER & PARTNERS, INC.
JENSEN HASLEM ARCHITECTS
JENSEN HASLEM CAMPBELL & HARDCASTLE
JHP
JK ARCHITECTURE PARTNERSHIP
JMA ARCHITECTS
JOHN A. RUSSELL CORPORATION
JOHN HARA ASSOCIATES INC. ARCHITECTS
JOHNSON FAIN & PEREIRA ASSOCIATES

JONES & KELL ARCHITECTS
JOVA DANIELS BUSBY
KAJIMA ASSOCIATES
KELL MUNOZ WIGODSKY ARCHITECTS
KIRCHNER ARCHITECTURE
KLIPP COLUSSY JENKS DUBOIS
KROH/BROESKE ARCHITECTS
KS ARCHITECTS
LANGDON WILSON
LEAVENGGOOD ARCHITECTS
LEE, BURKHART, LIU, INC.
LEVIN PORTER ASSOCIATES
L’HEUREUX PAGE WERNER, PC
LIEBHAARDT BOTTON & ASSOCIATES
LIEBHAARDT, WESTON & ASSOCIATES
LIONAKIS BEAUMONT
LITTLE & ASSOCIATES
LMN ARCHITECTS
LOCKWOOD, ANDREWS & NEWMAN, INC.
LOEBL SCHLOSSMAN & HACKL
LPA
LUNDAHL & ASSOCIATES
MACLACHLAN, CORNELIUS & FILONI, INC.
MALONE BELTON ABEL P.C.
MARLENE IMIRZIAN & ASSOCIATES
MARMON MOK LLP
MBT ARCHITECTURE
McGRANAHAN ARCHITECTS
McCLERNON ARCHITECTS/PLANNERS PA
McGRAW/ BALDWIN ARCHITECTS
MELE/AMANTEA ARCHITECTS
MENG ASSOCIATES
REGIONAL DESIGN FIRMS (CONTINUED)

METZER JOHNSON ARCHITECTS, INC.
MICHAEL BARBER ARCHITECTURE (MBA)
MILLER/HULL PARTNERSHIP, LLP
MITHUN, INC.
MORRIS ARCHITECTS
MSGS ARCHITECTS
NEIL STANTON PALMER
NEPTUNE THOMAS DAVIS ARCHITECTS
NEUMANN MONSON
NEUMANN MONSON WICTOR ARCHITECTS
NICEK LESTER & ASSOCIATES
NITSCHKE/SWD
NOGLE ONUFER ASSOCIATES
NPD ARCHITECTS
OAKLEY ASSOCIATES
OLYMPIC ASSOCIATES CO.
OPSIS ARCHITECTURE
ORCUTT/WINSLOW PARTNERSHIP
OZ ARCHITECTURE
PAGE SOUTHERLAND PAGE LLP
PATRICK MCCLENNON ARCHITECTS
PAUL ROBERTS + PARTNERS
PAULIEN & ASSOCIATES, INC.
PBJ ARCHITECTS
PECKHAM GUYTON ALBERS & VIETS, INC. (PGAV)
PERFORMA, INC.
PERRY DEAN ROGERS PARTNERS ARCHITECTS
PIEPER, O’BRIEN, HERR ARCHITECTS
PILAR GOODWIN ALEXANDER & LINVILLE (PGAL)
POLSINELLI SHALTON & WELTE
QUAD 3 GROUP, INC.
REGIONAL DESIGN FIRMS (CONTINUED)

RSP ARCHITECTS
RUDOLPH & SLETten, INC.
SAIC-FREDERICK, INC.
SBRA
SCHACHT ASLANI ARCHITECTS
SCHAEFER JOHNSON COX FREY & ASSOC.
SCHENKEL SHultz
SCHMIDT, GARDEN, ERIKSON
SCOTT ELLINWOOD & ASSOCIATES
SCOTT LOUIE & BROWNING
SDS ARCHITECTS
SELLARDS & GRigg, INC.

SEVERNS, REID & ASSOCIATES, INC.
SGPA ARCHITECTURE & PLANNING
SHAUGHNESSY FICKEL AND SCOTT
SHIVE-HATTERY
SHW GROUP LLP
SIZELER THOMPSON BROWN ARCHITECTS
SLATERPAULL | HORD COPLAN MACHT
SMITH, HINCHMAN & GRYLIS/SOUTHWEST, INC.
SMP/SHG INC.
SMPC ARCHITECTS
SOLOMON CORDWELL BUENZ
SPIllIS CANDELA & PARTNERS

SSOE, INC.
STAFFORD KING WIESE ARCHITECTS
STEINBERG ARCHITECTS
STEPHEN WOOLLEY ARCHITECTS
STH ARCHITECTURAL GROUP, INC.
STONE MARRACCINI PATTerson ARCHITECTS
STRAKA JOHNSON
STUDIOS ARCHITECTURE
SUSMAN TISDALE GAYLE
SWINERTON & WALBERg CO.
TAPANAM ASSOCIATES, INC.
TAYLOR - WHITNEY ARCHITECTS
TAYLOR & ASSOCIATES ARCHITECTS
TBP (THE BLUROCK PARTNERSHIP)
TECHNICAL DESIGN INC.
TECTONICS, ARCH, PLNRS & ENGRS.
THOMAS HACKER ARCHITECTS
THOMAS PETERSEN HAMMOND ARCHITECTS
THOMPSON MATHENY CORP.
TMP ASSOCIATES, INC.
TOM GREEN & CO.
TREANOR ARCHITECTS
TSP
TUCKER SADLER NOBLE CASTRO ARCH.
TURPIT & POTTER ARCHITECTS
URBAN DESIGN GROUP, INC.
URS GREINER, INC.
VAN BOERUM & FRANK ASSOCIATES, INC.
VAN H. GILBERT ARCHITECTS
VCBO ARCHITECTURE
VEAzeY PARROTT & SHOULders
VMDO ARCHITECTS
VOA ASSOCIATES
WARE & MALCOLM
WATKINS HAMILTON ROSS ARCHITECTS, INC.
WEST LAKE REED LESKOSKY
WILSON & COMPANY
WOODWARD DESIGN + BUILD
WRNS STUDIO
WWCOT
ZABALA GILTZOW ALBANESE
ZEOS PARTNERSHIP
ZIMMERMAN DESIGN GROUP
RFD has collected data for more than thirty years on our hundreds of Laboratory Building projects. From this database we routinely develop benchmarks for a range of building and laboratory components. Data is selected to match specific project types ranging from biomedical and engineering research to undergraduate teaching laboratory facilities for institutional, public and private owners.
INTRODUCTION
Benchmarking, (also referred to as Critical Ratios or Metrics) is the application of relevant data for use as a guide or confirmation for early building design decisions. RFD has collected data for more than twenty five years on our hundreds of Laboratory Building projects. From this database we routinely develop benchmarks for a range of building and laboratory components. Data is selected to match specific project types ranging from biomedical and engineering research to undergraduate teaching laboratory facilities.

NET TO GROSS RATIO
Sometimes referred to as the efficiency ratio, the Net to Gross Ratio is a measure of the Net or usable area against the total gross area of a building. This ratio is important in the early programming and planning of a building because the Net area of a building is what can be used, whereas the Gross area is the area that must be built and paid for. Until the building is designed, the Gross SF can be predicted based on benchmarking metrics. Net to Gross Ratio’s for laboratory buildings are lower than for non-laboratory buildings due, in part, to their more robust mechanical systems.

LABORATORY SUPPORT RATIO
A common mistake in the early programming of laboratory buildings is to underestimate the additional area required to support the primary research or teaching laboratories. As a means of checks and balances, RFD has been tracking laboratory support area compared against primary laboratory area in each of our projects. The resulting Laboratory Support Ratio measures the laboratory support area against the total of the laboratory plus laboratory support area within a building. Alternatively this ratio is measured as laboratory area against laboratory support area.
LABORATORY DENSITY RATIO
Because laboratories cost more to build than offices, classrooms or most other non-laboratory uses, it is important to understand the ratio of laboratory space relative to the overall building area for a project. Our Laboratory Density Ratio is a measure of total Laboratory + Laboratory Support Area against the overall Gross Area of a building. All other things being equal, a building with a Laboratory Density of .45 will be more expensive to build than a building of the same size with a Laboratory Density of .35.

BUILDING CONSTRUCTION COST
The first question often asked about a new laboratory building project is “How much will it cost to build?” The construction cost of a laboratory building is influenced by many variables including location, time and specific program of uses. We have found that tracking and normalizing laboratory building construction costs provides a useful tool for preliminary planning. From our large database of projects, utilizing project size, geographic adjustments and inflation factors we are able to select projects of similar programs and generate an average construction cost for a projected laboratory building, while taking into account project specific factors such as laboratory density, hood density, and special purpose components.
TEACHING LABORATORY CHARACTERISTICS
By tracking specific disciplines of Teaching Laboratory functions we have been able to provide important data on Area per Student Station, Fume Hood & Sink Density and Piped Service Utilities. The range of teaching disciplines for which data is available includes General, Organic and Advanced Chemistry, General Biology, Microbiology, Cell/Molecular Biology, and Anatomy / Physiology, General and Advanced Physics, Earth Science and Electronics.

RESEARCHER STATION RATIO
The capacity of many research buildings is measured by researchers at the bench. This number is independent of the number of Principal Investigators as laboratory group sizes can vary dramatically. The Research Station Ratio measures the number of bench research stations against the number of laboratory modules or overall laboratory and laboratory support area. This ratio, coupled with the Laboratory Density Ratio, can help guide the programmatic development of a project based on bench researcher counts.
EQUIVALENT LINEAR FEET RATIO
An effective tool for comparing one research facility against another, or a proposed facility against one that exists, is to measure the specific areas that are used by researchers. The Equivalent Linear Feet Ratio counts the total linear footage of bench + write-up work station + fume hood + equipment within the primary, as well as, support laboratory areas. This total linear footage is divided by the number of bench researcher stations for the building or a given area.

MISCELLANEOUS BENCHMARKS
Over the years we have been asked many general questions about laboratory building design including, “What size planning module should we use?”, “What is the best floor to floor height for our new building?”, “How wide should the main corridor be for our new laboratory building?” While our experience gives us a feel for the answers to these questions we have also benchmarked these and other features of our projects to provide information that is valuable in the early planning stages of a new laboratory building project.
RFD has provided laboratory consulting for many of the world’s most prestigious and established research institutes. This experience has afforded us a comprehensive knowledge of the many issues facing scientific research today.
New Interdisciplinary Research Building  
University of Toronto Mississauga  
Toronto, ON, Canada

Frost Institute for Chemistry and Molecular Science  
University of Miami  
Coral Gables, Florida

Anatomy/Zoology Addition for Health Sciences Education  
Colorado State University  
Fort Collins, Colorado

South Australian Health & Medical Research Institute (SAHMRI)  
Government of South Australia  
Adelaide, Australia

Translational Research Institute & Qatar Biobank  
Hamad Bin Khalifa Medical City  
Doha, Qatar

Health Sciences Biomedical Research Building II  
University of California, San Diego  
La Jolla, California

Janelia Farms Research Campus  
Howard Hughes Medical Institute  
Loudoun County, Virginia

School of Medicine Research Building  
University of California, Riverside  
Riverside, California

Drug Discovery Building  
The Scripps Research Institute  
Palm Beach County, Florida

Advanced Technology Building  
The Scripps Research Institute  
Palm Beach County, Florida

Biomedical Research Building  
The Scripps Research Institute  
Palm Beach County, Florida

Center For Molecular Medicine  
University of Nevada, Reno  
Reno, Nevada

Bell Tower Genomics Research Building  
University of North Carolina  
Chapel Hill, North Carolina

Cha Pangyo Research Center  
Pangyo Techno Valley  
Seoul, Korea

Center For Clinical Sciences Research  
Stanford University School of Medicine  
Stanford, California

Dell Pediatric Research Institute  
University of Texas  
Austin, Texas

Max Planck Florida Institute for Neuroscience  
Jupiter, Florida

Headquarters Research Building  
Biogen-IDEC Pharmaceuticals  
San Diego, California

Powell-Focht Bioengineering Building  
University of California, San Diego  
San Diego, California

Sandler Neurosciences Laboratory & Clinical Research Building 19A  
University of California, San Francisco, Mission Bay  
San Francisco, California

Cancer Research Laboratory Building  
Loma Linda University Cancer Institute  
Loma Linda, California

Institute For Drug Development  
Cancer Therapy & Research Center  
San Antonio, Texas

Christopher S. Bond Life Sciences Center  
University of Missouri, Columbia  
Columbia, Missouri

Biomedical Research Laboratory  
Hauptman Woodward Institute  
Buffalo, New York

Cancer Research Laboratory Building  
 Huntsman Cancer Research Institute, University of Utah  
Salt Lake City, Utah

Research Center of Excellence II  
University of Nebraska Medical Center  
Omaha, Nebraska

Sir Alexander Fleming Research Building  
Imperial College of Science, Technology & Medicine  
London, England

Kenneth Norris Jr. Cancer Research Institute  
University of Southern California  
Los Angeles, California

Zilkh Neurogenetic Institute  
University of Southern California  
Los Angeles, California

Norman Hackerman Building  
University of Texas, Austin  
Austin, Texas

Biomedical Research Laboratory Building  
The Children’s Memorial Medical Center  
Chicago, Illinois
South Australian Health & Medical Research Institute (SAHMRI)
Government of South Australia
Adelaide, Australia

90,717 NSF of laboratory and laboratory support space in a 315,009 GSF Building for Biomedical Research, Research Support, Animal Facility, and Cyclotron/cGMP Facility. Facility includes four Flexible Core Facilities embedded within the laboratory suites, which are designed for maximum flexibility and adaptability. Laboratories were designed without identification of the Institutes’ research focus being identified, so benchmarking was a critical guide in planning. All research and support spaces are designed to be readily adaptable as equipment, instrumentation and speciality requirements are known.

Completed
2014

Awards
Laboratory of the Year 2015
LEED Gold Certification

Gross Building
315,009

Net (Assignable) Building
187,849

Laboratory & Laboratory Support
90,717

Construction Cost
$176,664,600

Reference
Peter Fitzsimmons
Sr. Project Manager
0610874257218
peter.fitzsimmons@health.sa.gov.au
This state of the art research facility has achieved LEED Platinum Certification. The building houses laboratories for research in the fields of Medicinal Genomics, Neuroscience and Reproductive Medicine. The laboratories are supplemented by support spaces including tissue culture, flexible instrument rooms, controlled environment rooms, and equipment corridors. Core facilities include a Vivarium of 18,000 sf and an Imaging Facility. The Vivarium shares receiving and cage/rack wash with the adjacent Pharmacy Research building through a below grade tunnel optimizing the procedure and holding capacity for the HSBRF2 facility. The Imaging Core accommodates small animal in-vivo imaging with a short term animal housing facility contiguous with the vivarium. Sustainability considerations include unique ceiling profiles that will allow deep penetration of daylight into the research laboratories and special low exhaust which will directly remove rejected heat from ultra-low freezers populating the equipment corridor.

Completed
2014

Awards
LEED Platinum Certified
2015 Honor Award - Committee on the Environment Merit Award - Architecture
2015 Education Award Winner
Honorable Mention by IIDA Oregon Chapter
Merit Award: 2015 AIA San Diego Design Award

Gross Building
195,975

Net (Assignable) Building
121,321

Laboratory & Laboratory Support
89,970

Construction Cost
$104,290,000

Reference
Mark A. Rowland
Project Manager
(858) 822-0725
mrowland@ucsd.edu
Health Sciences Biomedical Research Facility 2
University of California, San Diego
La Jolla, California
RFD has led the design in projects on the forefront of contemporary animal research facility issues, including Barrier Facility design, the use of ventilated racks, transgenic rodent manipulation, automated material handling, and robotic cagewash equipment.
Vivarium Projects

Vivarium Facility
University of Nevada, Reno
Reno, Nevada

Vivarium Facility
MD Anderson Cancer Center
Houston, Texas

Vivarium Facility
University of Texas, Austin
Austin, Texas

Vivarium Facility
University of California, San Francisco
San Francisco, California

Vivarium Facility
Max Planck Florida Institute for
Neuroscience
Jupiter, Florida

Vivarium Facility
Pangyo Techno Valley
Seoul, Republic of Korea

Vivarium Facility
University of California, San Diego
La Jolla, California

Vivarium Facility
University of Texas, Austin
Austin, Texas

Vivarium Facility
University of Hawaii, Kaka’ako Makai
Honolulu, Hawaii

Vivarium Facility
Department of Veterans Affairs
Denver, Colorado

Vivarium Facility
Hamad Bin Khalifa Medical City
Doha, Qatar

Vivarium Facility
University of Nebraska Medical Center
Omaha, Nebraska

Vivarium Facility
University of Missouri
Columbia, Missouri

Vivarium Facility
University of Arizona, College of Medicine
Phoenix Biomedical Campus
Phoenix, Arizona

Vivarium Facility
University of California, Davis / School of Veterinary Medicine
Davis, California

Vivarium Facility
Biogen-IDE Pharmaceuticals Corp.
San Diego, California

Vivarium Facility
University of Southern California
Los Angeles, California

Vivarium Facility
Imperial College of Science, Technology & Medicine
London, England

Vivarium Facility
The Scripps Research Institute
Palm Beach County, Florida

Vivarium Facility
University of Texas, San Antonio
San Antonio, Texas

Vivarium Facility
U.S. Department of Agriculture / Iowa State University
Ames, Iowa

Vivarium Facility
University of British Columbia
Vancouver, Canada

Vivarium Facility
Samsung Medical Center
Seoul, Korea

Vivarium Facility
San Francisco VA Medical Center
San Francisco, California

Vivarium Facility
Washington State University
Pullman, Washington

Vivarium Facility
Alza Corporation
Mountain View, California

Vivarium Facility
University of Wisconsin
Madison, Wisconsin

Vivarium Facility
Government of South Australia
Adelaide, Australia

Vivarium Facility
The Children’s Memorial Medical Center
Chicago, Illinois

Vivarium Facility
University of Cambridge
Cambridge, England, United Kingdom

Out of respect for the security and privacy of our clients and mutual colleagues, we have kept the building name confidential.
This project will create new state of the art neurosciences laboratories for three distinct research entities designed to support collaboration and interaction among researchers. The groups to be housed are the UCSF Neurology Department, the Institute for Neurodegenerative Disorders, and the W.M. Keck Foundation Center for Integrative Neurosciences. The 18,000 NSF vivarium will include rodent holding at conventional and barrier levels, aquatics holding, bird holding, and NHP holding. Support spaces will include procedure rooms, an imaging room, and a large-animal surgery. The corridor system includes both unidirectional loop corridors as well as bidirectional single corridors. A substantial behavioral and electrophysiology testing suite interconnects to the NHP holding areas.

Completed
2012

Awards
LEED Gold Certification
Regional Design-Build Award Winner
in 2013 DBIA WPR Design-Build Awards Competition
"Best New R&D Project in 2013"
San Francisco Business Times

Gross Building
265,900

Net (Assignable) Building
169,700

Laboratory & Laboratory Support
112,250

Vivarium Total Net Area
17,885

Construction Cost
$150,000,000

Reference
Jane Czech
Director of Administration
University of California, San Francisco
(415) 476-3877
jane.czech@ucsf.edu
Confidential Building
University of California, San Francisco
San Francisco, California
This building combines research and clinical space to provide UNR researchers the opportunity to push the boundaries of translational research in cooperation with several private-partner clinical research groups. The research in this building focuses on Microbiology and Immunology; Pharmacology; Physiology; and Infectious Diseases. The vivarium facility includes conventional holding facilities as well as a barrier facility with an embryo rederivation suite. The vivarium has been designed with the capabilities to accommodate either conventional ventilated caging or disposable caging systems. The corridor system is a bi-directional single corridor. Automation systems include bedding disposal and bulk detergent delivery. A BSL3 holding room is embedded within a BSL3 research suite within the laboratory portion of the building.

Completed
2010

Gross Building
87,875

Net (Assignable) Building
41,005

Laboratory & Laboratory Support
32,907

Vivarium Net Area
32,907

Construction Cost
$62,500,000

Reference
Lyle Woodward
Director, Facilities Services
(775) 784-6514
lylew@unr.edu
Confidential Building
University of Nevada, Reno
Reno, Nevada
Understanding the special needs for high bay, cleanroom technology, demanding services such as high pressure air, high pressure steam, high volume cooling water systems and heavy structural and electrical loads allows RFD to program working engineering space to meet each client’s diverse and often unique requirements.
Engineering Projects

Structural & Materials Engineering Building
University of California, San Diego
San Diego, California

Stinson Remick Hall
University of Notre Dame
Notre Dame, Indiana

Physics & Nanotechnology Building
University of Minnesota
Minneapolis, Minnesota

Masdar Institute of Science & Technology (MIST)
Abu Dhabi Future Energy Company
Masdar City, Abu Dhabi, UAE

Engineering, Science & Technology Facilities
Universiti Teknologi Petronas
Kuala Lumpur, Malaysia

Richard & Barbara Silverman Hall For Molecular Therapeutics & Diagnostics
Northwestern University
Evanston, Illinois

Engineering Building
University of California, Santa Barbara
Santa Barbara, California

Stanley Hall
University of California, Berkeley
Berkeley, California

Engineering Building
University of Kentucky
Lexington, Kentucky

Centennial Engineering Building
University of New Mexico
Albuquerque, New Mexico

Biorenewables Complex
Iowa State University
Ames, Iowa

Snell Hall
Western Kentucky University
Bowling Green, Kentucky

Patrick G. & Shirley W. Ryan Hall, Center For Nano-Fabrication & Molecular Self-Assembly
Northwestern University
Evanston, Illinois

Energy Biosciences Institute
University of California, Berkeley
Lawrence Berkeley National Laboratory
Berkeley, California

Chu Hall - Solar Energy Research Center (SERC)
Lawrence Berkeley National Laboratory (LBNL)
Berkeley, California

Interdisciplinary Science & Engineering Building (ISEB)
University of Delaware
Newark, Delaware

Chemical & Biological Engineering/Chemistry Building South Wing Renovation
South Dakota School of Mines & Technology
Rapid City, South Dakota

Engineering & Industry Building
University of Alaska, Anchorage
Anchorage, Alaska

Wilsdorf Hall for Materials Science, Engineering & Nanotechnology (MSENT)
University of Virginia
Charlottesville, Virginia

Science & Engineering Building
American University in Cairo
Cairo, Egypt

Center for Nanoscale Science & Engineering
North Dakota State University
Fargo, North Dakota

Ann Robert H. Lurie Biomedical Engineering Building
University of Michigan
Ann Arbor, Michigan

Engineering Building / Kingsbury Hall
University of New Hampshire
Durham, New Hampshire

Qualcomm Institute/ CALIT2
University of California, San Diego
San Diego, California

Materials Science & Research Building
University of California, Riverside
Riverside, California

Engineering VI Phase I
University of California, Los Angeles
Los Angeles, California

Nanotechnology Building
University of Texas, Austin
Austin, Texas

Bioproducts, Sciences & Engineering Laboratory
Washington State University, Tri-cities
Richland, Washington

Applied Engineering Technology Building
University of Texas, San Antonio
San Antonio, Texas

RFD  RESEARCH FACILITIES DESIGN | Laboratory Design Consultants | We have laboratory planning down to a science.
Campbell Hall Replacement
(High-Precision Quantum Measurement Laboratory)
University of California, Berkeley
Berkeley, California

10,551 NSF of laboratory and laboratory support space in a 104,000 GSF building for the Department of Physics. Research conducted in the CIPQM include: the application of atomically-resolved microscopy to observe dynamical processes at the nanoscale; quantum nanomechanics, an emerging discipline focused on the measurement and control of mechanical properties of nanostructures; interferometry with ultracold atoms, with applications ranging from basic research on fundamental physics to ultra-high precision gyroscopes and gravitational field detectors; solid-state magnetometers and amplifiers at the quantum limit, a precision measurement field with many applications in physics, earth exploration and medical devices that sense faint magnetic fields; and advanced optical metrology techniques at the nanoscale. The 10,000-square-foot space comprises 10 to 15 high-quality modular laboratories will house researchers from a range of disciplines, including physics, electrical engineering, chemistry and molecular and cell biology.

Completed
2014

Award
LEED Gold Certified

Gross Building
104,000

Net (Assignble) Building
78,000

Laboratory & Laboratory Support
10,551

Construction Cost
$87,372,000

Reference
Alicia Rosenthal, AIA, LEED AP
Senior Project Manager
(510) 642-3071
arosenthal@cp.berkeley.edu
Campbell Hall Replacement
(High-Precision Quantum Measurement Laboratory)
University of California, Berkeley
Berkeley, California
Arthur Weisberg Family Applied Engineering Complex
Marshall University
Huntington, West Virginia

35,550 NSF of laboratory and laboratory support space in 137,740 a GSF
Building for the Departments of Engineering, and Computer Science, Biology,
Chemistry, and the Marshall University Research Corporation (MURC). Facility
includes laboratories for instruction in Hydraulics/Pneumatics, Thermal and
Energy, Fluids and Hydraulics, Environmental Engineering, Industrial Controls,
Circuits and Electronics, Transportation, Fire protection and Safety Technology,
Industrial Hygiene and Ergonomics, Cybersecurity and Networking, Digital
Forensics, Gaming and Geospatial Analysis, Computer Graphics, Ecology,
Environmental Microbiology, and Chemistry. Research laboratories are
provided for Advanced Materials Testing, Water Engineering, Genomics,
Environmental Chemistry, Phycology, and Incubator Start-Ups. Collaborative
Learning Labs are provided to foster faculty/student interaction. Specialized
support spaces include prep and storage for instructional laboratories, cold
room, autoclave, tissue culture, equipment rooms, mud room, and shell space
for a future Class 100/1000 photolithography cleanroom suite.

Completed 2015
Award LEED Gold Certified
2016 Outstanding Design (Post Secondary) by American School & University
Gross Building 137,740
Net (Assignable) Building 76,393
Laboratory & Laboratory Support 35,550
Construction Cost $47,750,000
Reference
Ronald May
Director of Facilities Planning and Management
(304) 746-2500
mayr@marshall.edu
RFD’s programming, design and construction experience in new Academic Cleanroom Facilities includes cleanrooms that range in size (200 NSF – 20,000 NSF) and classification (100 – 100,000) as well as intended use (Semiconductor, BioNano & Satellite Assembly).
Structural & Material Science Engineering Research Building
University of California, San Diego
San Diego, California

Stinson Remick Engineering Building
University of Notre Dame
Notre Dame, Indiana

Physics & Nanotechnology Building
University of Minnesota
Minneapolis, Minneapolis

Stanley Hall for Bioengineering
University of California, Berkeley
Berkeley, California

Energy Biosciences Institute
University of California, Berkeley
Lawrence Berkeley National Laboratory
Berkeley, California

Center of Excellence For Nanoelectronics & Nanomaterials
North Dakota State University
Fargo, North Dakota

Qualcomm Institute/ CALIT2
University of California, San Diego
San Diego, California

Center For Biotechnology & Interdisciplinary Studies
Rensselaer Polytechnic Institute
Troy, New York

Christopher S. Bond Life Sciences Center
University of Missouri
Columbia, Missouri

Marcus Nanotechnology Research Center
Georgia Institute of Technology
Atlanta, Georgia

William H. Foege Bioengineering Building
University of Washington
Seattle, Washington

Engineering Building
University of California, Santa Barbara
Santa Barbara, California

Peter L. & Clara M. Scott Laboratory
Ohio State University
Columbus, Ohio

Johnson Hall
University of Washington
Seattle, Washington

Ann Robert H. Lurie Biomedical Engineering Building
University of Michigan
Ann Arbor, Michigan

Engineering & Science Research Complex
University of Maine
Orono, Maine

Engineering Building
Boise State University
Boise, Idaho

Engineering, Science & Technology Facilities
Universiti Teknologi Petronas
Kuala Lumpur, Malaysia

Goldwater Center For Science & Engineering
Arizona State University
Tempe, Arizona

Cahill Center For Astronomy & Astrophysics
California Institute of Technology
Pasadena, California

Nanotechnology Building
University of Texas, Austin
Austin, Texas

Masdar Institute of Science & Technology (MIST)
Abu Dhabi Future Energy Company
Masdar City, Abu Dhabi, UAE

Powell-Focht Bioengineering Building
University of California, San Diego
La Jolla, California

Patrick G. & Shirley W. Ryan Hall, Center For Nano-Fabrication & Molecular Self-Assembly
Northwestern University
Evanston, Illinois

Analytical Laboratory Building
Ohio Dept. of Health/ Ohio Environmental Protection Agency/Ohio Dept. of Agriculture
Reynoldsburg, Ohio

Jerry R. Junkins Electrical Engineering Building
Southern Methodist University
Dallas, Texas

Materials Science & Research Building
University of California, Riverside
Riverside, California

Media Laboratory
Massachusetts Institute of Technology
Cambridge, Massachusetts

Moore Laboratory of Engineering
California Institute of Technology
Pasadena, California

Tucker Technology Center
Texas Christian University
Fort Worth, Texas
Helios SERC scientists are developing solar-driven chemical converters that will create transportation fuels from water and carbon dioxide. Centered at Berkeley Lab, and funded by the U.S. Department of Energy, this program includes experts from LBNL, UC Berkeley and partners from several other universities. Research focuses on advanced nanomaterials for use in solar light collectors and electrodes, a new generation of catalysts for energy-efficient chemistry, and specialized soft and hard membranes for integrating the light harvesting, charge separating and fuel forming components.

Chu Hall - Solar Energy Research Center (SERC)  
Lawrence Berkeley National Laboratory  
Berkeley, California

Completed  
2014

Award  
LEED Gold Certified  
2016 Design Award by AIASF

Gross Building  
44,765

Net (Assignable) Building  
19,556

Laboratory & Laboratory Support  
13,736

Construction Cost  
$36,500,000

Reference  
Sheree Swanson  
Project Director  
Lawrence Berkeley National Laboratory  
(510) 486-4025  
sswanson@lbl.gov
Chu Hall - Solar Energy Research Center (SERC)
Lawrence Berkeley National Laboratory
Berkeley, California
The new experimental physics and nanotechnology advancement building provides modern and highly flexible physics & nanotechnology laboratory and laboratory support space. The facility contains 40 new research laboratories for energy, dark matter and nanotechnology research. Co-locating these facilities provides for more efficient use of physical resources, while delivering breakthrough results in translational research for both disciplines. The building also houses a new 10,000 square foot cleanroom facility with ISO 5, 6 & 7 clean bays. RFD programmed and designed the cleanroom layout along with its HVAC, electrical and plumbing systems, including the Hazardous Production Material (HPM) delivery and monitoring systems. The experimental physics and nanotechnology advancement building houses 200 faculty, post doctorate and graduate students and also provides space for visiting researchers.

Completed
2013

Gross Building
143,950

Net (Assignable) Building
78,362

Laboratory & Laboratory Support
49,371

Construction Cost
$64,800,000

Reference
Matt Stringfellow, PE
Senior Project Manager
University of Minnesota
strin027@umn.edu
(612) 626-6212
Physics and Nanotechnology Building
University of Minnesota
Minneapolis, Minnesota
RFD’s work with over 335 academic institutions throughout the U.S., has positioned the firm to advise colleges and universities regarding teaching, research and support spaces that are most appropriate to meet their specific requirements.
Public Undergraduate Experience

Portland State University / Science Building II Renovation
University of Virginia’s College At Wise / Science Building
Minnesota State University, Mankato / Trafton Science Center Addition/Renovation
Minnesota State University, Moorhead / Science Building Addition & Renovation
University of Colorado, Colorado Springs / Osborne Center for Science & Engineering
Southern Illinois University-Edwardsville / Science Building
Kansas State University / Chalmers Hall Biology & Biochemistry Building
St. Cloud State University / Integrated Science & Engineering Laboratory Facility
Auraria Higher Education Campus / Science Building Addition & Renovation
California State University, Stanislaus / Nora And Hashem Naraghi Hall of Science
California Polytechnic State University, SLO / Warren J. Baker Math & Science Center
Utah Valley University / Pope Science Building Addition
Murray State University / Physics Building
Clarion University / Grunenwald Science-Technology Center
Sonoma State University / Darwin Hall
Montana State University / Gaines Hall
Western Kentucky University / Snell Hall
Western State College of Colorado / Hurst Hall Science Complex
Fort Lewis College / Sitter Family Hall
University of Missouri / Christopher S. Bond Life Sciences Center
Purdue University / Hockmeyer Hall of Structural Biology
Oregon State University / Linus Pauling Science Center
North Carolina State University / David Clark Laboratory
Elizabeth City State University / School of Pharmacy

Private Undergraduate Experience

Albion College / Science Facilities Addition/Renovation
Whitworth University / Robinson Science Hall
Agnes Scott College / Mary Brown Bullock Science Building
Grinnell College / Noyce Science Center
Westminster College / Meldrum Science Center
Denison University / Ebaugh Chemistry Addition/Renovation
University of Notre Dame / Jordan Hall of Science
The University of Puget Sound / Harned Hall Science Addition/Renovation
St. Edward’s University / John Brooks Williams Natural Sciences Center
Bard College / Reem & Kayden Center For Science & Computation
Centre College / Young Science Building Addition & Renovation
Dickinson College / Stuart Hall And James Hall
Loyola Marymount University / Science Building
Smith College / Ford Hall Engineering & Molecular Science Building
St. Lawrence University / Johnson Hall of Science
Wilson College / Havens Science Center Addition/Renovation
St. Vincent College / Sis and Herman Dupre Science Pavilion
Colgate University / The Robert Hung Ngai Ho Science Center
John Carroll University / Charles & Helen Dolan Center for Science And Technology
Birmingham Southern College / Elton B. Stephens Science Center
University of Notre Dame / Stinson Remick Engineering Building
St. John’s University / Science Center
Seattle University / Bannan Science Renovation
Michael B. Enzi STEM Undergraduate Laboratory Facility
University of Wyoming
Laramie, Wyoming


Completed
2016

Award
Lab of the Year: Special Recognition for Collaborative Learning Environment, 2017

Gross Building
113,696

Net (Assignable) Building
66,337

Laboratory & Laboratory Support
35,866

Construction Cost
$36,500,000

Reference
Daniel Dale
Professor, Department of Physics & Astronomy
(307) 766-5154
ddale@uwyo.edu
The integration of 35 teaching and research laboratories in 45,000 nsf for the undergraduates and faculty at Loyola Marymount University has established this 110,000 gsf building as a new benchmark for interdisciplinary STEM education. With a focus on sustainability, transparency and engagement this building creates an active center for science education and research. Lower division laboratories are located along the building’s “Main Street” where cross discipline collaboration is encouraged by a range of interaction and soft learning spaces. Upper division and faculty-student research laboratories for biology, chemistry, biochemistry, environmental science and health& human sciences are configured not by department, but clustered into thematic neighborhoods where laboratories are supported by support spaces, student collaboration zones and faculty offices. The scientific education focus of the facility extends outside to an 8,000 sf array of PV solar panels and accessible green roof that will function as a living laboratory for students and faculty.
As specialty laboratory programming and design consultants, RFD works around the world to help guide our clients in the development of optimal solutions that best meet their needs in an economical and efficient, but inspirational manner.
International Projects

Greater Middle East
Masdar Institute of Science & Technology (MIST)
Abu Dhabi Future Energy Company
Masdar City, Abu Dhabi, United Arab Emirates

Science & Technology Building
American University of Cairo
Cairo, Egypt

Translational Research Institute & Qatar Biobank
Hamad Bin Khalifa Medical City
Doha, Qatar

Laboratory Assessment Study
Qatar University
Doha, Qatar

Water Quality Assurance Laboratory
Qatar General Electric & Water Corp.
Al Thumama, Qatar

PM&R Third Floor Laboratories Peer Review
Hamad bin Khalifa Medical Corporation
Qatar

New Research Building Chemical Storage Facility
Qatar University
Qatar

Master Planning & Programming
King Abdullah University of Science & Technology (KAUST)
Thuwal, Saudi Arabia

Scientific Research Building
American University of Beirut
Beirut, Lebanon

Electrical Engineering, Physics, Chemistry & Ecology Laboratories
Habib University
Karachi, Pakistan

Foundation For The Advancement of Science
KFAS Diabetes Research Center
Kuwait City, Kuwait

Asia
Animal Center
National Taiwan University
Taipei, Taiwan

Cha Pangyo Research Center
Pangyo Techno Valley
Seoul, Republic of Korea

Samsung Advanced Biotechnology Research Center
Samsung Medical Center
Seoul, Korea

Engineering, Science & Technology Research/Teaching Buildings
Universiti Teknologi Petronas
Kuala Lumpur, Malaysia

Research & Development Centre
Indian Oil Corporation Limited
Haryana, India

Australia
South Australian Health & Medical Research Institute (SAHMRI)
Government of South Australia
Adelaide, Australia

Biosecurity & Agricultural Facilities
Department of Agriculture & Food
South Perth, Australia

Parkville Comprehensive Cancer Centre
Victorian Premier
Australia

Telethon Institute & Child Health Research Facility
Australia

Biosciences Renewal Project Stage 1
University of New South Wales
Sydney, New South Wales, Australia

United Kingdom
Sir Alexander Fleming Research Building
Imperial College of Science, Technology & Medicine
London, United Kingdom

The South Field Project
The Wellcome Trust/Genome Centre
Hinxton, United Kingdom

The Henry Wellcome Building For Biomedical Research
University of Wales, College of Medicine
Cardiff, United Kingdom

Cornwall House Science Building
Kings College of London
London, United Kingdom

Obstetrics/Gynecology Research Building
Imperial College of Science, Technology & Medicine
London, United Kingdom

Pilot Plant
Imperial College of Science, Technology and Medicine
United Kingdom

Charterhouse Square Re-Development
Queen Mary, University of London
United Kingdom

Immunology Laboratory
United Medical and Dental School
United Kingdom

Hunts House Science Building
Kings College of London
London, United Kingdom

Cambridge Research Institute (CRI)
University of Cambridge Hutchinson
CHA Bio Research Complex
Pangyo Techno Valley
Seoul, Korea

This project establishes a world-class inter-disciplinary translational biomedical research building associated with the CHA Hospital Group. The complex includes research laboratories focused on basic biomedical research, targeted stem cell therapy, cancer research, in-vitro fertilization, molecular genetics, and biotechnology/pharmaceutical research. These research activities are supported by an imaging core, a biobank repository, and a vivarium. In addition to research, the complex includes an in-vitro fertilization research clinic, instructional space, meeting rooms, auditoriums, and guest residences.

Completed
2014

Gross Building
602,780

Net (Assignable) Building
358,619

Laboratory & Laboratory Support
100,528

Construction Cost
$240,000,000

Reference
Jong-Hwa Park
Group Construction Project Manager
82-10-4605-1423
pjh19140@chamc.co.kr
CHA Bio Research Complex
Pangyo Techno Valley
Seoul, Korea
151,000 net square feet of research laboratory space for a new zero-energy zero-carbon footprint campus with a research focus on alternative energy sources, distribution and technology. The project is based on a highly flexible bench laboratory concept which will maximize interaction and collaboration. Specialized assigned support laboratories include laser laboratories, an engine performance laboratory, a gasifier laboratory, and an environmental testing chamber laboratory. Core laboratory facilities include a comprehensive machine/wood shop, an imaging suite, and a cleanroom. The laboratories have been designed using the highest level of sustainability addressing issues such as material sourcing and transport, localized process exhaust systems, and optimization of airflow system operations.
MASDAR Institute of Science and Technology (MIST)
Abu Dhabi Future Energy Company
Masdar City, Abu Dhabi, United Arab Emirates
With more than 90 completed LEED certified projects under our belt, RFD has an extensive understanding of sustainability issues and solutions involved in the design of laboratories. Our team works closely with the owner/user team to determine sustainability goals for the project and develop strategies to achieve those goals in the most creative, cost-effective manner.
LEED Certified Projects

10 LEED Platinum Certified
Chemistry Research Building / Colorado State University
Engineered Biosystems Building 1 (EBB1) / Georgia Institute of Technology
Health Sciences Biomedical Research Facility 2 / University of California, San Diego
Science & Engineering Building 2 / University of California, Merced
Clough Undergraduate Learning Commons / Georgia Institute of Technology
Meldrum Science Center / Westminster College
Tahoe Center for Environmental Sciences / Sierra Nevada College/University of California, Davis
Science Building Renovation / University of Virginia’s College at Wise
Veterinary Medicine 3B / University of California, Davis
Biomedical Research Laboratories - Phase II / Van Andel Institute

68 LEED Gold Certified
Sitter Family Hall (Geoscience, Physics, Engineering) / Fort Lewis College
PACCAR Environmental Technology Building / Washington State University
Life Sciences Building / Loyola Marymount University
Science and Health Building / Northern Arizona University
Warren J. Baker Center for Science & Mathematics / California Polytechnic State University, SLO
Sukup Hall for Agricultural & Biosystems Engineering / Iowa State University
Gehl – Mulva Science Center / St. Norbert College
Thomas Laboratory / California Institute of Technology
Arthur Weisberg Family Applied Engineering Complex / Marshall University
Campbell Hall Replacement / University of California, Berkeley
Chu Hall - Solar Energy Research Center (SERC) / Lawrence Berkeley National Laboratory
Discovery Hall / University of Washington, Bothell
Barbara Lee Science and Allied Health Center / Merritt College
Health Sciences and Student Resource Building / North Seattle College
Structural & Material Engineering Building / University of California, San Diego
Center for Applied Research Laboratory Building 2 / University of Kentucky
Coyne Science Center / Le Moyne College
Energy Biosciences Institute / University of California, Berkeley / Lawrence Berkeley National Laboratory
Molecular Engineering & Sciences Institute (MoIES)/ University of Washington
Norman Hackerman Building / University of Texas, Austin
Stinson Remick Engineering Building / University of Notre Dame
Bell Tower Genomics Research Building / University of North Carolina, Chapel Hill
Rector Science Complex Addition / Dickinson College
Research Laboratory II / Florida Atlantic University, Harbor Branch
Science and Technology Building / Bellevue College
Renew Biological Sciences Complex / University of British Columbia
Natural Science Building / South Puget Sound Community College
Dell Pediatric Research Institute / University of Texas, Austin
Science Building / Spokane Falls Community College
IDEA Center / Austin College
Science, Technology, Engineering, & Math (STEM) Building / Indian River State College
The School of Medicine Research Building / University of California, Riverside
Ford Hall Engineering & Molecular Science Building / Smith College
Matthew Q. Diggs Biosciences III Laboratory for Life Science Research / Wright State University
Stuart Hall and James Hall / Dickinson College
Biorenewables Complex / Iowa State University
Max Planck Florida Institute for Neuroscience
Havens Science Center / Wilson College
Center for Advanced Energy Studies / Idaho State University & Idaho National Laboratory

22 LEED Silver Certified
Indiana University-Purdue University Indianapolis (IUPUI), Science and Engineering Laboratory Building
Physical Science and Engineering Center / Foothill College
New Geology Building / New Mexico Tech & New Mexico Bureau of Geology
Muir Biology Building / University of California, San Diego
National Animal Health and Food Safety Institute / Kansas State Olathe Innovation Campus
MAC-A Science Building / The Buckley School
Bioproducts, Sciences & Engineering Laboratory / Washington State University, Tri-Cities
Science Complex / Albion College
Pope Science Building Addition / Utah Valley University
MARBIONC Marine Biotechnology Research Facility / University of North Carolina, Wilmington
Science Building / Southern Illinois University, Edwardsville
Nora and Hashem Naraghi Hall of Science / California State University, Stanislaus
Chemistry Research Building / Yale University
Castetter Hall South Addition Phase II / University of New Mexico
Vermeer Science Center Renovation / Central College

4 LEED Certified
Eaton Hall / Seattle Pacific University
ABC Complex / Orange Coast College
John A. Burns School of Medicine / University of Hawaii
Science Community Center / Modesto Junior College / Yosemite Community College District
Engineered Biosystems Building EBB1
Georgia Institute of Technology
Atlanta, Georgia

This new integrated research building integrates faculty and students from the Colleges of Sciences, Engineering, and Computing for collaborative research focusing on molecules, cells, organisms, and populations as a composite of the dynamically interacting biological systems. The building includes shared open laboratories, linear equipment corridors and support laboratories for tissue culture, controlled environments, and flexible instrumentation. Core facilities include a small and large animal vivarium and surgery suite, molecular evolution lab and shared instrument centers for flow cytometry and confocal microscopy.

Completed
2015

Award
LEED Platinum Certified
Merit Award by AIA Georgia 2016

Gross Building
215,000

Net (Assignble) Building
134,797

Laboratory & Laboratory Support
83,483

Construction Cost
$86,080,000

Reference
Howard Wertheimer
Director, Office of Capital Planning & Space Management
Georgia Institute of Technology
howard.wertheimer@cpsm.gatech.edu
(404) 894-3563
Engineered Biosystems Building EBB1
Georgia Institute of Technology
Atlanta, Georgia
28,169 NSF of laboratory and laboratory support space in a 67,080 GSF Building for the Departments of Biology, Chemistry, Geology and Physics. Facility includes teaching laboratories for each discipline, flexible teaching laboratories for Integrated Sciences, and Student/Faculty research laboratories featuring flexible, adjustable laboratory casework systems for long-term adaptability. Laboratory support spaces include prep and stock rooms, field equipment storage, tissue culture room, and analytical instrument room.
Meldrum Science Center
Westminster College
Salt Lake City, Utah
The special environments needed for drug discovery, development and scale-up offer rigorous challenges to the laboratory designer. RFD’s experience in navigating these physical and regulatory challenges has developed over many years of involvement with small start-up firms as well as established Pharmaceutical Companies.
Industry & Clinical Projects

Research & Development Facility
Sequenom, Incorporated
San Diego, California

Headquarters Research Building
Biogen IDEC Pharmaceuticals Corporation
San Diego, California

Biotechnology Research Laboratory - B29
Amgen, Inc.
Thousand Oaks, California

NIMO Phase I
Biogen IDEC Pharmaceuticals Corporation
Oceanside, California

ITS Research & Development Center
Syntex (USA) Incorporated (Roche)
San Jose, California

Syva Evergreen R&D Building
Syntex (USA) Incorporated (Roche)
San Jose, California

Vivarium & Research Building
Amgen, Incorporated
Thousand Oaks, California

Research Laboratory Building
Alza Corporation
Mountain View, California

Molecular Biology Research Building
Genentech, Incorporated
South San Francisco, California

Research Building R-8
Syntex Inc. Roche Pharmaceutical
Palo Alto, California

Research Laboratory Building
Telios Pharmaceuticals
La Jolla, California

Human Gene Therapy Research Institute
Iowa Methodist Medical Center
Des Moines, Iowa

Research & Development Facility
Ontogen Corporation
Carlsbad, California

R&D Facility
Neste Resins Corporation
Springfield, Oregon

Research Building Renovation
Midwest Research Institute
Kansas City, Missouri

Research Laboratory Building
Hybritech, Incorporated
San Diego, California

Alytical Services Laboratory
Hewlett Packard
San Diego, California

Analytical Chemistry Laboratory
Parish Chemical Company
Orem, Utah

Research Laboratory Building
Molecular Biosystems, Inc.
San Diego, California

Molecular Biology Building
Baxter Healthcare Corporation
Glendale, California

Device Manufacturing Facility
Baxter Healthcare Corporation
Irvine, California

Oncology Facility
Illex Oncology
San Antonio, Texas

Site Master Plan
Roche Bioscience
Palo Alto, California

Research Laboratory Building
Pioneer Hi-Bred International, Inc.
Johnston, Iowa

Pharmaceutical Pilot Plant
Hybritech, Incorporated
San Diego, California

Bayer Agricultural Division
Bayer Incorporated
Kansas City, Missouri

Institute For Drug Development
Cancer Therapy & Research Center
San Antonio, Texas

Public Health Laboratory
State of Missouri
Jefferson City, Missouri

Springfield Combined Laboratories
Springfield Memorial Hospital
Springfield, Illinois

Central Analytical Laboratory
Southern California Healthcare Systems
Pasadena, California

Health Laboratory
State of Nevada
Reno, Nevada

Clinical Laboratory Facility
Kapiolani Medical Center for Women and Children
Honolulu, Hawaii

Public Health Laboratory
Colorado Department of Health
Denver, Colorado

Clinical GMP Facility
New York University Medical Center
New York, New York

Regional Reference Laboratory
Kaiser Permanente
Berkeley, California
48,600 NSF of research laboratory and laboratory support space in two research buildings totaling 131,600 GSF in the IDEC 360,000 GSF World Headquarters Campus. The research buildings house Preclinical Product Development departments including Analytical Sciences, Clinical Immunology Formulations Sciences and a 10,000 NSF Vivarium. Other research groups focused on monoclonal antibodies and the development of targeted immunotherapy pharmaceuticals include Molecular Biology, Cell Biology, Antibody Discovery and Tumor Immunology. Core Support Facilities for the research complex include a Vivarium with GLP protocol capabilities and radioisotope procedure areas, Radioisotope Research Center, Flow Cytometry, Central Glasswash and a Freezer Farm for long-term storage of materials.

Completed
2004

Gross Building
131,600

Net (Assignable) Building
73,400

Laboratory & Laboratory Support
48,600

Construction Cost
$48,300,000

Headquarters Research Building
Biogen-IDEC Pharmaceuticals Corporation
San Diego, California
Headquarters Research Building
Biogen-IDEC Pharmaceuticals Corporation
San Diego, California
36,100 NSF of laboratory and laboratory support space in a 51,100 GSF tenant improvement for Central Specimen Processing, Chemistry, and Cellular Pathology Departments. The facility houses the highly automated analytical testing equipment for Kaiser Permanente’s Northern California Regional Laboratory. The design provides a single, large open laboratory with several small ancillary functional spaces. Laboratory space is provided for Central Specimen Processing, Automated Chemistry, Immunochemistry, Toxicology, Urine Testing, Hematology, Coagulation, Blood Bank, Research & Development, and Central Glasswash. Specimen, reagent, and supplies storage is in automated vertical storage shuttle and carousel units, refrigerated and non-refrigerated.
Regional Reference Laboratory
Kaiser Permanente
Berkeley / Emeryville, California
SAMPLE SCOPE: LABORATORY BUILDING DESIGN SERVICES

This sample scope of service describes RFD’s typical role and delivery methodology for domestic (United States) projects. Specifics will vary relative to the scale and schedule for each project.

RFD is pleased to submit this proposal to serve as Laboratory Design Consultants.

This proposal assumes approximately XXX,XXX NSF of laboratory and laboratory support space in a XXX,XXX GSF building, and includes Programming, Schematic Design, Design Development, Construction Documents and Bidding/Construction Phase services, as follows:

SCOPE OF SERVICES

I. PROGRAMMING PHASE

Upon written authorization from the Architect, RFD will commence with professional services for the Programming Phase.

Review information provided by the Owner and Departmental Representatives.

Conduct interviews with Owner and Departmental Representatives to gather program information.

Prepare room list and area allocations for laboratory and laboratory related support spaces for use by the Architect in a comprehensive project room list.

Prepare Room Diagrams illustrating each type of laboratory space showing benchwork, sinks, fume hoods / biological safety cabinets, fixed equipment and spaces for Owner furnished equipment. These diagrams, produced through interviews with the Departmental Representatives, illustrate the layout and function of each type of space.

Prepare Detailed Space Requirements worksheets for each type of laboratory and laboratory support space, listing environmental conditions, hood requirements, plumbing, electrical, telecommunication, lighting and other pertinent requirements.

Work with the Architect and building Engineers to develop recommendations for laboratory related preliminary Design Criteria for the building’s HVAC, electrical, structural, and plumbing systems. Review with Owner for consistency with existing standards and guidelines, if any.

Review and discuss application of laboratory related building codes, safety standards and guidelines. Discuss development of laboratories that can be operated within standards established by NIH, OSHA, EPA, AAALAC, and others.

Work with the Architect’s team to determine preferred adjacencies within and between specific laboratories and departments.
Work with the Architect’s team to develop a Program Report of recommendations for project scope and function. Report exhibits may include Room List, Space Tabulation, Room Diagrams, Detailed Space Requirements Worksheets, Design Criteria narrative and other appropriate charts, graphs, diagrams, tables, and commentary.

Prepare a preliminary estimate of probable cost for laboratory casework, sinks, fume hoods, biological safety cabinets, local specialized exhaust devices, reagent shelves and wall shelves, and fixed equipment shown on the laboratory diagrams, based on RFD historical unit costs.

Attend up to XX scheduled trips for work sessions on campus or on site or at the Architect’s office during the Programming Phase.

Submit laboratory portions of draft program to the Architect for assembly, reproduction and distribution to the Owner for review.

Revise laboratory exhibits to the Program Report based on review comments.

Submit updated laboratory exhibits to the Final Program Report to the Architect for assembly, reproduction and distribution to the Owner.

II. SCHEMATIC DESIGN PHASE

Upon written authorization from the Architect and based on an approved Project Program RFD will commence with professional services for the Schematic Design Phase.

Work with the Architect’s team to develop schematic design based on the program and input from the Owner, Departmental Representatives, and the Architect’s team.

Review and examine the proposed laboratory planning module for consistency with laboratory design practice including Environmental Health and Safety Guidelines, fume hood locations, efficiency of work spaces, casework flexibility, aisle widths, and compliance with ADA access requirements.

Work with the Architect and building Engineers to develop integrated structural, mechanical, and electrical systems based on the laboratory planning module.

Consult with the building mechanical engineer to develop appropriate mechanical equipment spaces and preliminary sizing of building systems.

Consult with the building electrical engineer to develop appropriate laboratory power requirements.

From two dimensional AutoCAD® electronic .dwg files furnished by the Architect for the approved Schematic Design adjacency floor plans, produce laboratory furnishings fit-out drawings. Fit-out drawings will show fixed laboratory furnishings including casework, sinks, fume hoods and locations for owner furnished equipment.

Review and discuss application of laboratory related building codes, safety standards and guidelines to the Schematic Design for this project. Discuss development of Laboratories that can be operated within standards established by NIH, OSHA, EPA, AAALAC, and others.
Prepare outline specifications for laboratory furnishings and fixed equipment including casework, fume hoods, service fittings, local specialized exhaust devices, reagent shelves, wall shelves, environmental rooms, cold rooms, glassware washers and dryers, sterilizers, and other equipment shown on the laboratory furnishings drawings.

Prepare statement of probable construction cost for laboratory furnishings and equipment based on Schematic Design Documents. Some or all of this estimate may be based on RFD historical unit costs.

Attend up to XX scheduled trips for work sessions or review meetings sessions on campus or on site or at the Architect’s office during the Schematic Design Phase.

III. DESIGN DEVELOPMENT PHASE

Upon written authorization from the Architect and based on approved Schematic Design, produce laboratory design development drawings which integrate structural and mechanical systems in a manner encouraging flexibility for future changes in use of the laboratories.

From two dimensional AutoCAD® electronic .dwg background files furnished by the Architect, produce detailed design drawings at 1/4” = 1'-0” for each laboratory and laboratory support space by interviewing the Departmental Representatives. These drawings will show fixed equipment, laboratory furniture and casework, wall and reagent shelves, overhead service carriers, fume hoods and biological safety cabinets, sinks, cupsinks, service fittings and electrical receptacles, and will locate spaces for Owner Furnished Equipment. Air balance requirements, air change requirements, local specialized exhaust systems, fume hood exhaust air volumes, and other criteria will be shown or described on these drawings in appropriate schedules in a manner which will allow the Architect and Engineers to size the building systems.

Introduce and discuss laboratory casework systems and configurations, integrate with the planning module, and review with the Owner, Departmental Representatives, and the Architect’s team.

Prepare preliminary specifications for laboratory furnishings and fixed equipment including casework, fume hoods, service fittings, local specialized exhausts, reagent shelves and wall shelves, environmental rooms, cold rooms, glassware washers and dryers, sterilizers, and other equipment shown on the laboratory furniture drawings.

Based on final and approved design development drawings prepare room by room laboratory plumbing load calculations for each laboratory and laboratory support space. This task may occur at the beginning of the Construction Document Phase.

Based on final and approved design development drawings prepare diagrams showing proposed laboratory plumbing points-of-connection for each space for coordination with the building engineer. This task may occur at the beginning of the Construction Document Phase.

Based on final and approved design development drawings prepare room by room laboratory electrical load calculations for each laboratory and laboratory support space. This task may occur at the beginning of the Construction Document Phase.

Work with the Architect and building Engineers to locate laboratory electrical panels.
Prepare estimate of laboratory equipment heat gains for each type of laboratory and laboratory support space.

Participate in the review of preliminary design with the Owner, Departmental Representatives, and Architect’s team.

Prepare updated statement of probable construction cost for laboratory furnishings and equipment based on Design Development drawings.

Attend up to XX scheduled trips for work sessions or review meetings sessions on campus or on site or at the Architect’s office during the Design Development Phase.

**IV. CONSTRUCTION DOCUMENTS PHASE**

Upon written authorization from the Architect and based on approved Design Development Documents RFD will prepare Laboratory Construction Documents.

Laboratory Furniture and Casework (LF): From two dimensional AutoCAD® electronic .dwg background files furnished by the Architect, prepare construction drawings at 1/4” = 1′-0” for each laboratory and support space showing casework, fume hoods and biological safety cabinets, local specialized exhaust systems, floor mounted equipment, sinks, cupsinks and service fittings, wall cabinets and shelves, reagent shelves, drying racks, and other laboratory fixed equipment. Spaces for Owner Furnished equipment will be noted on the drawings. Architect will provide updated background electronic file to consultant at least ten working days prior to each required printing for Owner review. RFD will provide AutoCAD® electronic .dwg files of laboratory furnishings plan background to Architect for coordination purposes.

Laboratory Plumbing (LP): Prepare construction drawings of each laboratory and laboratory support space showing piped services from a point of connection (P.O.C.) near the laboratory wall to the laboratory fittings within the laboratory, laboratory waste line to the P.O.C. six inches above the laboratory floor, and laboratory vent lines to the P.O.C. at the laboratory ceiling (excluding the building systems designed by the building engineers). Laboratory piped services may include systems such as hot water, cold water, purified water, steam, laboratory compressed air, vacuum, natural gas and nitrogen. Other local systems related to Owner Furnished equipment and/or research processes are not included.

Laboratory Electrical (LE): Prepare construction drawings for branch circuits within each laboratory and laboratory support space, from the laboratory panel located near the laboratory to the point of use, including emergency power and instrument grounding, but excluding general room lighting. Telecommunication and computer data conduits and terminal boxes are included; telecommunication and computer data design, cabling and devices are not included. Other local power and/or control systems, if any, are not included.

Prepare electrical panel schedules for normal and standby power for laboratory and laboratory support spaces.

This proposal relies on the Architect’s structural engineer for miscellaneous structural details which may be required for plan check and permit processing of LF, LE and LP drawings.
Specifications: In a format compatible with the Architect, prepare specifications for laboratory furnishings and fixed equipment including benchtops and casework, fume hoods, local specialized exhaust systems, canopy hoods, overhead service carriers, sinks, cupsinks, fittings, wall and reagent shelves, wall and floor cabinets and other items supplied by the laboratory furniture contractor. Prepare laboratory plumbing and electrical specifications to be incorporated into plumbing and electrical general specifications.

This proposal is based on provision for up to XX document progress printings and coordination reviews during the Construction Document Phase in addition to final bid document issuance.

Attend up to XX scheduled trips for work sessions or review meetings sessions on campus or on site or at the Architect’s office during the Construction Documents Phase.

V. BIDDING/CONSTRUCTION PHASE

Work with the Architect to prepare addenda and clarification of Laboratory Construction Documents during bidding, as required.

Review laboratory furnishings and equipment bids.

Review shop drawings and submittals for the laboratory furnishings, plumbing and electrical work shown on the Laboratory Construction Documents.

Work with the Architect to review Contractor’s RFIs and provide clarification of drawings for laboratory related items during construction.

Attend up to XX laboratory furnishings, XX laboratory plumbing and XX laboratory electrical construction site visits to become generally familiar with the progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the Laboratory Construction Documents. (Additional site visits, if required, will be billed as additional services.)

Based on the site visits noted above, prepare a punch list for the laboratory furnishings, laboratory plumbing and laboratory electrical work shown on the Laboratory Construction Documents.

Based on contractor’s marked up drawings, prepare record drawings for Laboratory Furnishings, Laboratory Plumbing, and Laboratory Electrical plan drawings.

Review operations and maintenance manuals for laboratory furnishings, laboratory plumbing and laboratory electrical work.
Sample Laboratory Diagrams

Drawings By Phase
Sample Laboratory Diagrams / Drawings By Phase

The following drawings illustrate typical RFD diagrams and drawings of a laboratory space as created in each phase of the design process.

- **Programming**
  - Room List/ Space Tabulation
  - Detailed Space Requirements
  - Room Diagram

- **Schematic Design**
  - Schematic Design Floor Plan Sketch
  - Schematic Design Floor Plan
  - Laboratory Layout Plan

- **Design Development**
  - Laboratory Furnishings Plan
  - Laboratory Piping Point-of-Connection Plan
  - Laboratory 3-D Images

- **Contract Documents**
  - Laboratory Furnishings Plan
  - 3-D Assisted Laboratory Furnishings Detail
  - Laboratory Piping Plan
  - Laboratory Electrician Plan
## Overall Space Summary

<table>
<thead>
<tr>
<th>Department</th>
<th>November 30, 2005</th>
<th>12/2/2005 Funded</th>
<th>Delta</th>
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<tbody>
<tr>
<td></td>
<td>Lab</td>
<td>Support</td>
<td>Office</td>
</tr>
<tr>
<td>SoM Research</td>
<td>36,300</td>
<td>27,467</td>
<td>7,280</td>
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<tr>
<td>CFS Ctr of Excellence</td>
<td>19,815</td>
<td>0</td>
<td>0</td>
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<tr>
<td>RED Lab</td>
<td>3,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Nevada Cancer Institute</td>
<td>8,630</td>
<td>2,541</td>
<td>980</td>
</tr>
<tr>
<td>Woman's Health</td>
<td>15,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Future Growth</td>
<td>11,760</td>
<td>4,719</td>
<td>1,120</td>
</tr>
<tr>
<td>Core Facilities/BSL3</td>
<td>0</td>
<td>1,936</td>
<td>0</td>
</tr>
<tr>
<td>Vivarium</td>
<td>0</td>
<td>11,597</td>
<td>0</td>
</tr>
<tr>
<td>Building Facilities</td>
<td>0</td>
<td>450</td>
<td>0</td>
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<tr>
<td>Total ASF</td>
<td>94,505</td>
<td>48,710</td>
<td>9,380</td>
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### Research Lab Totals

<table>
<thead>
<tr>
<th>Support / Lab+Support</th>
<th>48,060</th>
<th>34,122</th>
<th>23,100</th>
<th>18,755</th>
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<tbody>
<tr>
<td>PI Lab Allocations @</td>
<td>2.5</td>
<td>Mods/Pl</td>
<td>48</td>
<td>3.0</td>
</tr>
<tr>
<td>Bench Researchers @</td>
<td>3.0</td>
<td>RAs/Mod</td>
<td>300</td>
<td>3.0</td>
</tr>
</tbody>
</table>

### Assumed Net/Gross Ratio

| 0.57 | 0.57 |

### Estimated Total Building Area GSF

| 279,825 | 130,675 |

### Estimated Construction Cost per GSF

| $450 | $450 |

### Estimated Construction Cost

| $125,921,447 | $58,803,553 |

### Estimated Project Cost

| 1.27 | 1.27 |

| $159,920,238 | $74,680,512 |
# Detailed Space Requirements

**Room Name:** BSL3 Suite  
**Department:** Core Facilities  
**Index No.:** 7.21  
**Occupancy:** 4-6

<table>
<thead>
<tr>
<th>UTILIZATION</th>
<th>PLUMBING</th>
<th>CHEMICALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>House of Use</td>
<td>Laboratory Gas (LG)</td>
<td>Bases</td>
</tr>
<tr>
<td>10 hours/day</td>
<td>Laboratory Vacuum (LV)</td>
<td>Acids</td>
</tr>
<tr>
<td>14 hours/day</td>
<td>Laboratory Air (LA)</td>
<td>Solvents</td>
</tr>
<tr>
<td>24 hours/day</td>
<td>Compressed Air, 100 psi (A)</td>
<td>Radiocides</td>
</tr>
<tr>
<td>Other</td>
<td>Industrial Hot Water (IHW)</td>
<td>Carcinogens/Regulated</td>
</tr>
<tr>
<td>MECHANICAL</td>
<td>Industrial Cold Water (ICW)</td>
<td>Chemical Waste Storage</td>
</tr>
<tr>
<td>Temperature</td>
<td>Potable Hot Water (PW)</td>
<td>Biological Storage</td>
</tr>
<tr>
<td>68°-70° ± 2°F</td>
<td>Potable Cold Water (CW)</td>
<td>Radiocide Storage</td>
</tr>
<tr>
<td>Other</td>
<td>Steam</td>
<td>Chemical Storage</td>
</tr>
<tr>
<td>Humidity</td>
<td>Condensate Return</td>
<td></td>
</tr>
<tr>
<td>Uncontrolled</td>
<td>Carbon Dioxide (CO₂)</td>
<td></td>
</tr>
<tr>
<td>Other 30%-50%</td>
<td>Nitrogen Gas (N₂)</td>
<td></td>
</tr>
<tr>
<td>Minimum Air Changes/Hour</td>
<td>Cylinder Gases</td>
<td></td>
</tr>
<tr>
<td>10/15</td>
<td>Inert</td>
<td></td>
</tr>
<tr>
<td>Air Recirculation</td>
<td>Flammable</td>
<td></td>
</tr>
<tr>
<td>Air Pressure Positive</td>
<td>Toxic</td>
<td></td>
</tr>
<tr>
<td>Air Pressure Negative</td>
<td>Floor Drain (FD)</td>
<td></td>
</tr>
<tr>
<td>Additional Supply Air Filtration</td>
<td>Floor Sink (FS)</td>
<td></td>
</tr>
<tr>
<td>Additional Exhaust Air Filtration</td>
<td>Safety Shower/Eyewash (SS)</td>
<td></td>
</tr>
<tr>
<td>Equipment Exhaust</td>
<td>Drench Hose (DH)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HOODS</th>
<th>ELECTRICAL</th>
<th>ARCHITECTURAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Fume Hood</td>
<td>110V, 20A, 1 Phase</td>
<td>Floor</td>
</tr>
<tr>
<td>Radiocide Hood</td>
<td>208V, 30A, 1 Phase</td>
<td>VCT (Chemical Resistant)</td>
</tr>
<tr>
<td>Exhausted Laminar Flow Hood</td>
<td>208V, 30A, 3 Phase</td>
<td>VCT</td>
</tr>
<tr>
<td>Biological Safety Cabinet</td>
<td>460V, 100A, 3 Phase</td>
<td>Welded Steel Sheet Vinyl</td>
</tr>
<tr>
<td>Snorkel</td>
<td>Isolated Ground Outlet</td>
<td>Epoxy</td>
</tr>
<tr>
<td>Canopy Hood</td>
<td>Emergency Power</td>
<td>Carpet</td>
</tr>
<tr>
<td>Low Speed Exhaust</td>
<td>GFCI</td>
<td>Sealed Concrete</td>
</tr>
<tr>
<td>Equipment Exhaust</td>
<td>E</td>
<td></td>
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</tbody>
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<table>
<thead>
<tr>
<th>LABORATORY EQUIPMENT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration Sensitive</td>
<td>**</td>
</tr>
<tr>
<td>Light Sensitive</td>
<td>**</td>
</tr>
<tr>
<td>Vibration Producing</td>
<td>**</td>
</tr>
<tr>
<td>Heat Producing</td>
<td>**</td>
</tr>
<tr>
<td>Noise Producing</td>
<td>**</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REMARKS:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Note 1: Exhaust filtration requirements to be developed.</td>
<td>Note 9: Floor sink for developer</td>
</tr>
<tr>
<td>Note 2: Four Class II A2 (non-exhausted) BSCs</td>
<td>Note 10: Dual lighting for animal holding</td>
</tr>
<tr>
<td>Note 3: Canopy hood for autoclave.</td>
<td></td>
</tr>
<tr>
<td>Note 4: Exhaust for animal rack.</td>
<td></td>
</tr>
<tr>
<td>Note 5: Optical microscopy to 400X.</td>
<td></td>
</tr>
<tr>
<td>Note 6: Domestic water in animal room.</td>
<td></td>
</tr>
<tr>
<td>Note 7: Building steam for autoclave, if available.</td>
<td></td>
</tr>
<tr>
<td>Note 8: Floor sink for autoclave.</td>
<td></td>
</tr>
</tbody>
</table>
Department: CORE FACILITIES
Room Name: BSL-3 SUITE
Area: 1,320 NSF

This diagram is conceptual and is provided only to indicate required furnishings, equipment, and general room proportions. The actual room design may change.

FURNISHINGS

1. Chemical Fume Hood
2. Biological Safety Cabinet
3. Radiolatope Hood
4. Vented Workstation
5. Sneeze Exhaust
6. Laboratory Bench, Standing Height
7. Laboratory Bench, Sitting Height
8. Wall Cabinet
9. Adjustable Shelves
10. Recipient Shelves
11. Toll Storage Cabinet
12. Vented Flammable Storage Cabinet
13. Equipment Space
14. Laboratory Sink
15. Custrink
16. Processing Sink
17. Cylinder Rack
18. Gas Cabinet
19. Safety Shower/Eyewash
20. Overhead Service Conner
21. Pipe Drop Enclosure
22. Movable Demonstration Bench
23. Glassware Washer
24. Glassware Dryer
25. Autoclave
26. Movable Laboratory Table
27. Wire Shelving
28. White Markerboard
29. Block Chalkboard
30. Tackboard
31. Desk
32. Balance Table
33. Writing Table
34. AV Screen
35. Multi-media Projector (Ceiling Mount)
36. File Cabinet
Schematic Design Collaboration
Schematic Design Floor Plan Sketch
Schematic Design Floor Plan
Department: CORE FACILITIES
Room Name: BSL-3 SUITE
Area: 1,320 NSF

This diagram is conceptual and is provided only to indicate required furnishings, equipment, and general room proportions. The actual room design may change.
Design Development 3-D Images
Design Development 3-D Images