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A classified list of articles, papers, pamphlets and facility checklists in the science facilities collection of the Architectural Services Staff. Professional support of an administrative nature in the areas of architectural design, engineering and construction is provided by the Staff. A bibliography is included, major headings being general planning, space utilization, cost studies, science building type studies, facilities design criteria, construction details, and non-science building type studies. (RK)

Guidelines for Planning Biological Facilities

Commission on Undergraduate Education in the Biological Sciences

American Institute of Biological Sciences

SCIENCE FACILITIES

A CLASSIFIED LIST OF LITERATURE RELATED TO DESIGN, CONSTRUCTION AND OTHER ARCHITECTURAL MATTERS

Architectural Services Staff
Division of Institutional Programs
National Science Foundation

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FORWARD

The National Science Foundation established an Architectural Services Staff in 1963 to provide professional support of an administrative nature in the areas of architectural design, engineering and construction. This support has been employed in the evaluation of proposals to aid the construction of science facilities. The establishment of a reference library was found to be required at the beginning of this activity to provide advice to those who look to the Foundation for guidance in facility design. Gradually, a large collection of reports, papers and other literature has been assembled, dealing with the many aspects of architecture, construction and equipment for science facilities.

This publication is a classified list of the articles, papers and catalogs in the science facilities collection of the Architectural Services Staff. It has been prepared to serve as a bibliography that may be useful to others in searching for pertinent literature on problems they are facing in the design of science facilities, and as a means of informing such persons of the material available for their use, should it be possible for them to visit the offices of the National Science Foundation in Washington, D.C.

In addition to the references included in this publication, the collection includes a large number of manufacturer's product catalogs covering the laboratory equipment, furnishings and construction components often used in the design and construction of science facilities. This literature has not been included in the list because it is of a highly transitional nature with frequent revisions. Visitors to the National Science Foundation will also be welcome to use this portion of the Architectural Service Staff's reference collection to the listed reference material.

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OFFICE OF ARCHITECTURE AND ENGINEERING
DIVISION OF RESEARCH FACILITIES AND RESOURCES
NATIONAL INSTITUTES OF HEALTH
BETHESDA, MARYLAND

LABORATORY DESIGN NOTES

Laboratory Design Notes offer guidance on the technical aspects of research laboratory design and construction, and information on related subjects. These special bulletins are available from this office.

A listing follows of the Laboratory Design Notes now available. A short explanation as to content is included with each title.

The last page of this set is a checklist for your use in ordering these bulletins.

Laboratory Animal Housing (LDN-1)

The housing of non-germfree animals (particularly mice, guinea pigs, rats, hamsters, and rabbits) is discussed in two parts. Part I explains functional requirements, room layouts, and floor plans. Part II give design criteria and details of construction. (8 pages)

Laboratory Animal Facilities (LDN-2)

Describes the requirements of animal research quarantine and production, and gives six typical floor plans. (7 pages)

Bedding for Laboratory Rodents (LDN-3)

The article discusses a wide variety of litter materials. Recommends methods of storage and sterilization, shipping containers, and removal and disposal. (4 pages)

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This is a description of caging materials, size requirements, special caging, watering devices, feeders, and identification. (4 pages)

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Check List for Biological Facilities

Richard McKinsey, U. of Va.

In almost all rooms that are to be occupied the following general features must be considered: types of floor, ceiling, wall, bench, and table top materials to be used; artificial lighting system; built-in equipment; utilities and ventilation requirements.

List of Built-in or "Fixed" Equipment

Base Cabinets

- Cupboards and drawers
  - Special dark room cabinets, microscope cabinets
- Sinks
- Special dark room sinks
- Wall cabinets and floor cases (open or closed)
- Wall tables
- Center tables
- Instructors' desks
- Reagent shelves
- Under counter refrigerators
- Hoods
  - Isotope
  - Perchloric acid
  - Conventional hoods
  - Low velocity hoods
  - "Aero balanced" hoods
- Projection screens
- Tack boards
- Chalk boards
- Venetian blinds
- Dark-out blinds
- Carboy shelves
- Glass drying pegboards
- Graduated cylinder drying racks
- Millwork
  - Notebook cabinets
  - Library shelving
- Sterilizers
  - Indirect steam type
- Dishwashing equipment
- Cage washing equipment
- Intercom system in hall for graduate students
- Telephones in halls for students and assistants

Utilities and Fittings

- Cold water CW (symbols will hereafter be used to designate utilities)
- Hot water HW
- Distilled water DW
- Cold water and cup sink CWS
- Electric AC (110 and 220v) DC, floor outlets
- Gas G
- Air A
- Vacuum V
- Steam S
- Controlled temperature water in dark rooms and tank rooms

In the case of the individual rooms listed, special or specific items are noted that relate to the functional nature of the room. The rooms chosen are those usually provided for in biology buildings. Other room types should be treated in a similar manner.

Animal Rooms

- ☐ Ventilation separate from rest of system
- ☐ Food storage room
- ☐ Food preparation area
- ☐ DW
- ☐ Cage washing area or room
  - ☐ Steam cage washer
  - ☐ Sinks for cage washing
  - ☐ Floor drain
- ☐ Continuous flooring in animal area
- ☐ Floor drain
- ☐ Shelf with A and AC for aquaria

Auditorium

- ☐ Movable screen, chalk, and tack boards
- ☐ Enclosed projection booth
- ☐ Dimming controls for lights
- ☐ Sound system
- ☐ Demonstration table with utilities and sink
- ☐ Storage and preparation rooms
- ☐ Cloakroom or coat area
- ☐ Telephone jacks
- ☐ Public restrooms

Chromatography Room — see wet room

Cold Rooms

- ☐ Floor level with corridor
- ☐ Wall tables with venting holes
- ☐ Storage shelves with venting holes
- ☐ Utilities
  - ☐ CWS
  - ☐ AC
  - ☐ DC
  - ☐ A
  - ☐ G
  - ☐ V
- ☐ Sink
- ☐ Floor drain
- ☐ Temperature recording device

Constant Temperature Rooms

- ☐ Floor level with corridor, no raised thresholds
- ☐ Range of temperature control desired
- ☐ Wall tables
- ☐ Storage shelves
- ☐ Utilities as for cold rooms
- ☐ Sink
- ☐ Special lighting, i.e., grow lights

Dark Rooms

- ☐ Water chillers for sinks, controlled temperature for water
- ☐ Floor drain
- ☐ Cabinets with light-tight drawers
- ☐ Developing sink with constant temperature water faucet, CW & HW faucet, and tray storage below
- ☐ Corridor in-use light
- ☐ Pass-thru-light baffle between enlarger and developing rooms
- ☐ Wall AC outlets above sinks and benches for developing and enlarging lights
- ☐ Area on separate room temperature control, zoning

Electrically Isolated Areas

- ☐ Shielded enclosures
  - ☐ Panel construction
  - ☐ Entire room shielded
- ☐ Filters for electrical power entering room

Electron Microscope Area

- ☐ Area on separate room temperature control, zoning area for power supply
- ☐ Microscope room
- ☐ Water line with filter and gage-pressure 30 to 40 lbs sq in
- ☐ Air line with gage and drain to blow out water
- ☐ Dimming lights with adjustable switch
- ☐ Special design needed to reduce vibration
  - ☐ Dehumidification

EM Preparation Room

- ☐ Hood, note type
- ☐ Stand-up bench space
- ☐ Sit-down bench space
- ☐ Wall table
  - ☐ Utilities, list necessary types

Dark Room for EM

- ☐ See items under dark room listing

Glassware Washing and Autoclaving Area

- ☐ Floor drain
- ☐ Glassware washer with steam exhaust hood
- ☐ Glassware dryers
- ☐ Glassware washing sink with powered brushes
- ☐ Glassware drying racks
- ☐ Sterilizers
  - ☐ Indirect steam type
  - ☐ Built-in with access area with floor drain
  - ☐ Steam exhaust hood
  - ☐ Steam and water resistant wall finish
- ☐ Glassware storage area

Isotope Area

- ☐ Area on separate room temperature control, zoning

Isotope Preparation Area

- ☐ Stainless steel-lined hood with stainless steel venting
  - ☐ "Absolute" filter
  - ☐ "Aero balanced" type
  - ☐ Low velocity type, desirable in this area
- ☐ Emergency shower and drain
- ☐ Room for high activity and/or high energy nuclides
- ☐ Room separately vented
- ☐ Utilities
  - ☐ AC
  - ☐ DC
  - ☐ G
  - ☐ A
  - ☐ DW

- ☐ V
- ☐ CWS
- ☐ Sinks
- ☐ Stand-up benches
  - ☐ Sit-down benches

Counter Room

- ☐ AC wall outlets for counters
- ☐ Wall tables
- ☐ Sit-down benches

Lecture Rooms

- ☐ Raised lecture platform
- ☐ Chalk, tack boards, and screen
- ☐ Dark-out blinds
- ☐ Telephone jacks
- ☐ Demonstration table with sink and utilities
- ☐ Provision for control of lights by projectionist
- ☐ Floor flush-mounted AC outlet for projectors
- ☐ Light over chalk board
- ☐ Light for lectern
- ☐ Flooring resistant to chair leg indentation and cigarettes

General Office

- ☐ Switchboard
- ☐ Waiting area or room
- ☐ Room for duplicating and other office machines
  - ☐ Sink
  - ☐ AC strip above benches
- ☐ Room for records, built-in filing cabinets
- ☐ Floor cases for catalogs
- ☐ Chairman's office
- ☐ Separate room for secretaries

Staff Offices

- ☐ AC wall outlets
- ☐ Telephone jack
- ☐ Chalk board
- ☐ Bookshelves
- ☐ Area for filing cabinets

Research Areas

- ☐ Chemical-resistant flooring
- ☐ Floor drains
- ☐ Hoods
  - ☐ "Aero-balanced" type
  - ☐ Low velocity type
  - ☐ Perchloric acid type, low velocity
- ☐ Utilities
  - ☐ AC
  - ☐ DC
  - ☐ CW & HW
  - ☐ DW
  - ☐ A
  - ☐ G
  - ☐ V
  - ☐ CWS
- ☐ Carboy shelves near sinks
- ☐ Glassware drying racks
- ☐ Graduated cylinder drying racks
- ☐ Chalk boards
- ☐ Floor cases and wall cabinets
- ☐ Flush floor AC outlets
- ☐ Wall space with AC outlets for equipment
- ☐ Sit-down benches, 31" high
- ☐ Stand-up benches, 37" high
  - ☐ Reagent shelves
- ☐ Wall tables
- ☐ Shelving for books

Shop

- ☐ Impact-resistant continuous flooring
- ☐ Floor drain
- ☐ Sound and vibration isolating walls
- ☐ AC outlet strip above table tops
- ☐ Work benches
- ☐ Sink with CW & HW
- ☐ A
- ☐ Pegboard for tools
- ☐ Open shelving
- ☐ Ducking for dust collectors to individual pieces of equipment

Seminar Rooms

- ☐ Telephone jack
- ☐ AC wall outlets
- ☐ Chalk board
- ☐ Screen
- ☐ Dark-out blinds
- ☐ Food preparation area
- ☐ Light switch near projector location

Sterile Transfer Rooms

- ☐ Smooth washable wall surfaces
- ☐ Absolute filter
- ☐ Electrostatic filter
- ☐ Germicidal lamps
- ☐ Positive air pressure in room
- ☐ Separate room temperature control, zoning
- ☐ Wall tables
- ☐ Utilities
  - ☐ G
  - ☐ AC

Stock Room

- ☐ Checkout counter, set back from corridor
- ☐ Bench near checkout counter for packages
- ☐ Area for caretaker with record storage facilities and desk
- ☐ Locked fenced area for alcohol storage
- ☐ Open adjustable shelving
  - ☐ Provision for movable clear plastic dust curtains on some areas of shelving
- ☐ Bin for corks and stoppers
- ☐ Bin for glass tubing
- ☐ Stand-up bench with sink and utilities
- ☐ Floor drain

Tank Room

- ☐ Concrete floor-mounted tanks with suitable finish
- ☐ Stainless steel floor tanks
- ☐ Water chillers for tanks, temperature controlled water
- ☐ CW & HW for tanks
- ☐ Shelf above tanks for aquaria with AC and A
- ☐ Ceramic tile or continuous flooring
- ☐ Floor drain
- ☐ Separate room temperature control, zoning

Teaching Laboratories for General Introductory Course

- ☐ Screen
- ☐ Chalk and tack boards
- ☐ Dark-out blinds
- ☐ Student notebook storage
- ☐ Purge system
- ☐ Floor drains
- ☐ Chemical-resistant flooring
- ☐ Demonstration table with sink and utilities, raised platform
- ☐ Student sit-down tables
  - ☐ Center waste trough
  - ☐ Sinks at both ends
  - ☐ Cup sinks
- ☐ Wall cabinets and floor cases
- ☐ Microscope storage wall cabinets with locks
- ☐ Utilities for student tables
  - ☐ G
  - ☐ A
  - ☐ V
  - ☐ AC
  - ☐ DC
  - ☐ CW & HW
  - ☐ DW
  - ☐ CWS
- ☐ Stand-up wall benches with utilities, see list above
- ☐ Glassware drying racks
  - ☐ Graduated cylinder drying racks

Preparation Room

- ☐ One preparation room for all introductory teaching labs
- ☐ Separate preparation rooms
- ☐ Utilities, see above for student labs
- ☐ Hood
  - ☐ "Aero-balanced" type
  - ☐ Low velocity type
- ☐ Utilities, see listing for teaching labs
- ☐ Floor drain
- ☐ Open shelving
- ☐ Floor storage cases
- ☐ Wall cabinets

Office for Introductory Course

- ☐ AC
- ☐ Telephone jack
- ☐ Space for filing cabinets

Room for Teaching Assistants

- ☐ Open shelves
- ☐ Base cabinets with locks
- ☐ AC wall outlets
- ☐ Telephone jack

Physiology Laboratories

- ☐ Chalk and tack boards
- ☐ Stand-up benches
  - ☐ Reagent shelves
- ☐ Sit-down benches
- ☐ Utilities, see list for introductory labs
- ☐ Dark-out blinds
- ☐ Hood
  - ☐ Provision for steam
  - ☐ "Aero-balanced" type
  - ☐ Low velocity type
- ☐ Floor drain
- ☐ Wall stand-up benches with utilities
- ☐ Purge system
- ☐ Prep room, see list for introductory course preparation room
  - ☐ Autoclave

Other Teaching Labs

- ☐ Base cabinets, benches, utilities, etc., as appropriate

Wet Rooms

- ☐ Floor drain
- ☐ Ceramic tile or continuous flooring
- ☐ Room vented separately
- ☐ Separate room temperature control, zoned
- ☐ Hood, see types listed for "Research areas," low velocity type desirable
- ☐ Emergency shower with drain
- ☐ Fume-resistant washable walls
- ☐ Utilities, see list for "Research areas"

COMMISSION ON UNDERGRADUATE EDUCATION IN THE BIOLOGICAL SCIENCES

APPLICATION FOR BIOLOGICAL FACILITIES CONSULTANT SERVICE

(Please type or print all information)

Institution _____

City _____ State _____ Zip Code _____

Individual making request _____

Title _____ Department _____

Telephone: Area Code _____ Number _____ Ext. _____

Names of Consultants preferred (list in order of choice):

1. _____

2. _____

3. _____

Our Institution requests the services of a Consultant under the following terms:

☐ One day "at home" review of program, equipment, and building plans by Facilities Consultant

- ☐ $75 Consultant's fee to be paid by CUEBS
- ☐ $75 Consultant's fee to be paid by Institution

☐ Additional days (up to a maximum of three) including site visits and consultation with faculty and staff at institution requesting services. Fee, at $75, plus travel and actual living expenses, to be paid by institution. Consulting services beyond three days will be arranged directly with the Consultant.
Preferred dates for visit: _____

_____
Signature of the President or Finance Officer

_____
Title

_____
Institution

_____
Address

_____

CUEBS CONSULTANTS BUREAU

BIOLOGICAL FACILITIES CONSULTANTS PROGRAM

Upon application, and if so requested, CUEBS will pay the Consultant fee for one day of a Consultant's time. In order to help the Consultant use this day effectively, the interested department will be asked to send to the Consultant a completed set of checklists, any preliminary planning, and any other supporting information available. The Consultant, working at his home institution, will review the plans and submit a report to the department or institution. If additional consulting services are required, CUEBS will arrange for up to three additional days at the expense of the institution. Travel expenses and the standard Consultant fee of $75 per day will be paid directly to the Consultant by the institution. Any further consulting work will be negotiated directly with the Consultant. Consulting fees for such intensive and detailed work generally run considerably higher than $75 per day.

After a specific Consultant is agreed upon, please forward all preplanning material and supporting information directly to him.

Please return the enclosed Application Form to:

CUEBS Consultants Bureau
Suite 403
1717 Massachusetts Avenue, N. W.
Washington, D. C. 20036

JB/bjs
7-21-66

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Signature of the President or Finance Officer

_____

Title

_____

Institution

_____

Address

_____

OFFICE OF BIOLOGICAL EDUCATION
OF THE AMERICAN INSTITUTE OF BIOLOGICAL SCIENCES

AIBS FACILITIES CONSULTANTS
November 1968

Each of the men listed below can offer competent comment on the design and construction of biological facilities. While each is primarily a biologist, he has special experience in construction to complement his biological insight. As this list will be revised frequently, please check with AIBS for a copy of the latest revision.

C. Ritchie Bell
University of North Carolina
North Carolina

George A. Buck
Flint Community College
Michigan

J. Wendell Burger
Trinity College
Connecticut

Edward C. Horn
Duke University
North Carolina

Addison E. Lee
University of Texas
Texas

Robert S. Leisner
AIBS
Washington, D. C.

William T. Mooney, Jr.
El Camino College
California

Thomas B. Roos
Dartmouth College
New Hampshire

Gerald M. Scherba
California State College
San Bernardino
California

Paul A. Spradlin
University of Michigan
Michigan

Erich E. Steiner
University of Michigan
Michigan

Harold J. Zabsky
Miami-Dade Junior College
Florida

EJK/md
11/15/68

NOTES ON THE ROLE OF A CONSULTANT...

The following letter, recently sent by one of our consultants to his host institution, says so many significant things so clearly that we felt it should be available to everyone considering the construction of new facilities.

"Dr. Schein of CUEBS tells me we may work together. I thought I might start off with a sort of stream of consciousness letter.

"As I trust you believe, CUEBS is not trying to impose upon you a national model; it is not trying to act as architect, building committee, or college official. All decisions must be yours. Our role hopefully, is to add grist to your academic decision-making mill. There is a danger that because x colleges recently have done something one way that this may be considered best. We are more concerned that whatever you do be the product of your own thought-through ideas. I am sure that there will be great educational enrichment to all your College as problems are solved by you, not merely left to the genius of an omniscient architect...

"As you well know, the architect is the door through whom the project passes. His selection is a key decision. It is worthwhile ascertaining whether his interest is primarily in total esthetic design, or the use of high grade materials, or in efficient functionalism, or in maximizing the client's dollar. Interest in one area can compromise another. It is also worthwhile to have a meeting with him to learn about the professional codes under which he operates. His prerogatives are not always understood by the outsider. There should be some clear initial understanding when and where the College can interfere. A building can easily get away from one, if the ground rules of mutual relationships are not understood. Faculty should make every effort to establish cordial relationships with the architect and his staff. Disagreements are bound to arise, and it is sometimes easy to visualize the architect as a sort of enemy. Being human, he will cooperate more with sympathetic reasonable people than in an hostile environment. One must realize that once the budget is set, his design approved by the College, he has to fit things together, and everything may not come out quite the way one hoped. The better prepared the Faculty is in initially articulating its needs, the better will be the facility.

"In these days of academic flux, it is not easy to know what is best for tomorrow. One can only do the best one can to project programs a decade or so ahead. There are several things one can not overdo: heavy investment in utilities, maneuverable space, more than ample storage and preparatory space, janitorial space. Needless to say, I urge you to plan for what is best for _____, and do not become standardized on some fictious national model.

"I trust you do not feel this letter to be presumptious or hortatory. Looking forward to our collaborations."

GOVERNMENT GRANTING AGENCIES

The listing below of selected government granting agencies are those to which institutions may make application for funds for new facilities and/or equipment. This listing is by no means inclusive but should serve to assist you in your initial attempts to contact the appropriate program in the appropriate agency. Please bear in mind that many of the programs require matching funds as a contribution.

1. U. S. Atomic Energy Commission
   Washington, D. C. 20545
   Contact: Dr. A. W. Ziegler 654-7722 A.C. 301
   University Relations Branch
   Division of Nuclear Education and Training
   7224 47th Street
   Bethesda, Maryland 20014
   Program: Limited funds available for purchase of equipment. In general, limited to larger institutions with large programs.

2. Department of Agriculture
   Washington, D. C. 20250
   Contact: Dr. T. C. Byerly DU 8-4423 A.C. 202
   Research Facilities Program for the
   State Agriculture Experiment Station
   Program: Proposals evaluated by Dept. of Agriculture, awards allocated to states by formula.

3. Department of Commerce
   Washington, D. C. 20230
   Contact: Office of Regional Development Planning
   Economic Development Administration ST 3-9200 A.C. 202
   U. S. Department of Commerce
   Washington, D. C. 20230
   Appalachian Regional Commission
   Coastal Regional Commission
   Four Corners Regional Commission
   New England Regional Commission
   Ozarks Regional Commission
   Upper Great Lakes Regional Commission
   Program: Each Commission will analyze the problems of its regional economy and develop an over-all strategy for enhancing the growth of the region. Applications to be submitted to state commissions. If approved by the state, application is reviewed and a recommendation made by the Department of Commerce. The Secretary of Commerce has final authority in approving or rejecting application.

4. Office of Education
Washington, D. C. 20202

Contact:	(1)	Title I, Mr. C. G. Norris	962-3118 A.C. 202
	(2)	Title II, Dr. Olof Starmberg	963-7936
	(3)	Title III, Mr. C. G. Norris	962-3118
Program:	(1)	Title I, Undergraduate academic facilities	
	(2)	Title II, Graduate academic facilities	
	(3)	Title III, Loans for academic facilities	

5. Housing and Home Finance Agency
Washington, D. C.

Contact:	(1)	Public Works Planning Advances Program	Mr. L. A. Morris 382-7415 A.C. 202
	(2)	Public Facilities Loan Program	Mr. L. A. Morris 382-7415 A.C. 202
Program:	(1)	Funds advanced to state or public bodies for planning facilities. Repayable later.	
	(2)	Up to 100% of the cost of any public facility may be borrowed. Borrowed money may be used to match other Federal programs.	

6. National Institutes of Health
Bethesda, Maryland 20014

Contact:	(1)	Health Research Facilities Branch	Dr. David Tilson 496-7788 A.C. 301
	(2)	Mental Retardation Program National Institutes of Child Health and Human Development	Dr. Theodore Tjossem 496-2533 A.C. 301
Program:	(1)	Health related research facilities	
	(2)	Large multidisciplinary centers for research in mental retardation.	

7. National Aeronautics and Space Administration
Washington, D. C. 20550
Contact: Mr. Donald C. Holmes 962-3952 A.C. 202
Program: Facilities for NASA - oriented research

8. National Science Foundation
Washington, D. C. 20550

Contact:	(1)	Science Facilities	Dr. J. M. Leise 343-6031 A.C. 202
	(2)	University Science Development Program	Dr. D. D. Smith 343-6538 A.C. 202

National Science Foundation continued:

(3)	Oceanographic Development	Dr. H. J. McLellan 343-5800 A.C. 202
(4)	Specialized Facilities in the Social Sciences	Dr. Murray Aborn 343-6463 A.C. 202
(5)	Facilities and Special Programs in the Biological and Medical Sciences	Dr. J. T. Spencer 343-6525 A.C. 202

Program:
(1) Facilities for graduate-level research and research training
(2) Proposals may include a request for science facilities
(3) Vessels and other specialized facilities
(4) Specialized facilities
(5) Specialized facilities

md
4/8/68

CUEBS-AIBS Facilities Panel

GENERAL BUILDING CHECKLIST

This list of topics is primarily for consideration by the Building Committee and architects, but should be read by all interested in the building so that everyone is aware of the problems of the project and may have the opportunity of offering suggestions pertinent to these problems.

Building _____

Departments _____

Gross Square Feet _____

Total funds available:

Institution _____

Grant _____

Other _____

Total

A building represents the interaction of men, money and ideas. Its effectiveness in fulfilling its function is directly related to the degree of communication—and often compromise—achieved by those responsible for its planning and construction. However, it is seldom that a group of administrators, teachers, architects and donors or granting agency representatives have the common background and specialized knowledge in both biology and building necessary for optimum communication efficiency. Items of planning that "are taken for granted" by the different parties involved are usually the items that later produce serious problems and reduce the efficiency of the building and, in turn, of the educational process.

To be sure that the necessary physical requirements of the various spaces in a new biology building are included in the plans, so that they can be properly interrelated with the architectural and structural aspects of the building, the CUEBS-AIBS Facilities Panel has prepared brief, but relatively detailed, checklists for various types of rooms generally found in a biology building. These lists are intended to call attention to the different actual and potential needs in a given space and to provide a means of indicating these requirements in a uniform manner for the use of the architects, planning committee and administration. Since no such lists can cover the requirements for every variation of room use, care should be taken to include on the checklists comments concerning any additional special structural requirements considered necessary. Furthermore, it must be pointed out that the building functions as a unit—each room is *not* independent of all others. Thus, although individual staff members should be responsible for the initial planning of their respective areas of the building, they must operate within certain limits set by the building committee and the architect to avoid costly and unnecessary complications in design and construction. Also, men are mobile. Requests for expensive and highly specialized facilities that cannot be of general use should a particular staff member move or retire will have to be carefully weighed in relation to other departmental building needs.

In an effort to help the building committee furnish the architect with as much information as possible prior to drawing the preliminary plans and to insure the proper functioning of the new building as a unit, the following series of items are presented for the consideration and action (when applicable) of the building committee. The list may seem long and some of the items trivial, but it is the result of considerable experience in both teaching and building. Again, the list cannot be complete, and is no substitute for a competent consultant and an understanding architect. It can, however, serve to point out the many facets of planning required

to produce a building that will help to increase the effectiveness of teaching in the biological sciences and at the same time be compatible with any reasonable esthetic and physical requirements of the institution.

Before effective plans for any building or facility can be drawn, it is necessary for the institution to review carefully the functions of the proposed building in terms of current and future programs, faculty and staff size, and enrollment. Ideally, this should be in the form of a written statement, or outline, on which there is general agreement among those concerned. When this is done the following general details, which are usually the responsibility of the Building Committee and upon which hinge the ultimate functioning of the building, must be considered.

EXTERNAL (other than architecture and landscaping)

1. Location where name and function of building will be displayed
2. Location of entrances relative to current or anticipated campus traffic—pedestrian and vehicular
3. Availability of fire hydrants and accessibility of building to fire-fighting trucks
4. Adequate parking accommodations for staff, students and visitors
5. Accessibility of service dock for large trailer trucks
6. Adequate platform height and canopy height of service dock for trucks
7. Location of external stairway up to the service dock
8. Adequate width of entrances to handle two-way traffic flow and bulky materials
9. Adequate outside lighting
10. Adequate space allowed for future additions to building and for location of separate structures like greenhouse, etc., which are not being currently built

INTERNAL (general)

1. Effective directory at main entrance and smaller one at service entrance
2. Adequate width of entrances, corridors, stairways and doors to handle two-way traffic flow and internal distributions of materials
3. Capability of elevator for handling freight (if building is more than two floors including basement)
4. Architectural provisions for the physically handicapped student

5. Receiving service area

   a. Temporary storage large enough for incoming and outgoing shipments

   b. Storage of trash

   c. Location near elevator and wide stairs

   d. Location of person responsible for receiving materials (If this person performs other functions such as being responsible for a dispensing storeroom or a shop, the location of these areas is important.)

   e. Desk or file for invoices

   f. Small directory to aid in delivery when no one is present

   g. Availability of a telephone or other intra-mural communications

6. Custodial Space

   a. Location on each floor, if possible

   b. Complete utility requirements: lighting, 110 AC outlets, hot and cold water, mop sink, perhaps a telephone

   c. Provision for personnel apparel, record keeping by personnel, record storage, custodial supplies, as towelling, bulbs, etc., custodial equipment, as floor polishers, buckets, etc., considering whether meals, coffee will be prepared in this area

7. Other General Considerations

   a. Number, size, location of toilets, lounges, cot rooms, considering separate staff or faculty toilets

   b. Provision for outer apparel of students, as book and coat racks and lockers

   c. Drinking fountains: type and location

   d. Cigarette urns: location and type

   e. Safety devices: emergency showers, eye-washes, hand sprays, fire alarms, fire extinguishers, fire hoses and other built-in equipment (sprinklers), fire doors, first-aid kits, conspicuous directions for medical aid, night watchmen's "clocks", and provision for emergency lighting and stand-by power

   f. Provision for storage of office supplies and location of duplicating machines

   g. Consideration of a departmental library or reading room and control of same (If librarian duties will be combined with secretarial functions, the location of a departmental office next to the library may be desirable.)

h. Advanced planning and adequate space for storing and dispensing of scientific supplies and equipment

   1. Adequate provision for unused or outmoded equipment and bulk storage

   2. Space required for maintenance of living material for class use

   (While methods dealing with these problems vary widely, inadequate back-up space can cripple good programs and be a constant source of annoyance and frustration.)

i. Provision for storage of audio-visual materials and machines, and preparation of demonstration materials

j. Built-in display or exhibit cases, considering number, size, location and utility requirements

k. Public telephones

l. Provision for clock-actuated signal bell if desired

m. Very careful consideration to the keying system

n. Consideration of building security problems involved in the evening or weekend use of lecture halls and auditoria, and the adjacent lavatories

8. Assignment of specific final room numbers as early as possible (about preliminary plan stage) and use of these numbers rather than temporary numbers for greater accuracy in communication with architect and contractor

9. Gathering of specific information concerning each room, often most easily accomplished by uniform check-lists or work sheets filled out in duplicate by individuals or groups who must plan or use the room (All such sheets should be *dated* and one copy kept for later reference, while one copy is sent to architect.)

10. Consideration of special rooms (shop, greenhouse, animal quarters, photographic rooms, electron microscope room, controlled environment rooms, sterile rooms, radiation room, wet preparation room, e.g. chromatography, glass-blowing room, common dishwashing room, social facilities, alcohol room, storage, herbarium museum, etc.) with BASIC CHECKLIST for each of these rooms listing specific needs and conditions of operation (Help in planning these rooms may often be had from many of the equipment manufacturers; CUEBS-AIBS Checklists are available for some of the rooms.)

Room Number _____

Function _____

Prepared by _____

Date _____

CUEBS-AIBS Facilities Panel

LECTURE ROOMS AND AUDITORIA CHECKLIST

To be most effective, lecture rooms require careful planning effort to insure that internal and external traffic flow, visual aids, and utilities are adequate. Preferably, main lecture rooms or auditoria should have several exits opening into main corridors and to the exterior of the building. A ground floor location is recommended for all lecture rooms that might be used by other departments. In large rooms heating, cooling and ventilating noise levels must be kept low. Noise levels expected from nearby mechanical equipment rooms and outside traffic should be checked.

Because of the angle of the outer seats to the projection screen and blackboard, it is recommended that a lecture room be of greater length than width. Generally, in rooms with a capacity exceeding 45-50 students, a sloped or stepped floor is highly desirable.

Room Size: _____ x _____ ft. Seating capacity _____ students.

Seats:

_____ number
_____ fixed
_____ folding
_____ wood
_____ upholstered
_____ fiberglass

_____ tablet arm
_____ fixed
_____ fold-down
_____ book rack
_____ continuous table

_____ seat numbering system
_____ special provisions
_____ left-handed students
_____ stout students
_____ crippled students

Lecture desk: (Lighting controls, Public Address System controls, Visual Aids and TV controls all should be located on one area of the lecture desk, as well as at other room locations.)

Size _____ x _____ ft. Distance to first row of seats _____ ft.

_____ storage space
_____ movable carts or sections of movable lecture table for demonstrations
_____ utilities (See on BASIC CHECKLIST for this room. If demonstrations are not an integral part of the lectures these utilities may be minimal.)

Floor: flat _____ slope _____ stepped _____

Doors: number _____ size _____ location _____

Aisles: number _____ width _____ location _____

_____ Audio-Visual Facilities (Complete AUDIO-VISUAL CHECKLIST for this room.)

_____ Acoustic Treatment

_____ acoustic panels: number _____ size _____ location _____
other acoustic treatment: _____

_____ Prep and storage room (Direct access to both hall and lecture room is helpful.)
_____ storage cabinets
_____ utilities (Complete BASIC CHECKLIST for this room.) Prep room No. _____

_____ Garment Space
_____ coat and book racks in corridor _____ in room _____
_____ coat room

Room Number _____

Function _____

Prepared by _____

Date _____

CUEBS-AIBS Facilities Panel

DARK ROOM CHECKLIST

Complete General Utilities BASIC CHECKLIST for this room.

Light-proofing (Areas around the entrance and around entering ductwork or pipes should be carefully checked after construction.)

Wall and ceiling finish

_____color
_____reflectivity
_____upkeep

Floor Covering (ceramic tile, with floor drain; *flush* with other floors in building)

Special Electrical Requirements

_____safelight outlets (rheostat), overhead and wall
_____"strip-plug" for printers, etc., above counters
_____heavy duty outlets for driers, washers, etc.
_____outside "in use" warning light

Special Plumbing Requirements

_____chilled water
_____hot water
_____mixing valves
_____processing sinks
_____connections for print washer

Ventilation and cooling; dust filters

Storage Cabinets and Shelves (chemically resistant)

_____general
_____light proof
_____refrigerated

An inexpensive booklet on "Darkroom Design and Construction" is published by the Eastman Kodak Company and is available from them or from Camera Stores.

CUEBS-AIBS Facilities Panel

ELECTRON MICROSCOPE LAB CHECKLIST

Room Number _____

Function _____

Prepared by _____

Date _____

The Electron Microscope Room. Requirements for specific makes of instruments.

Power Supply

110V _____ 220V _____ Single phase _____ Three phase _____ Location _____

Below floor _____ Overhead connection _____ Switch _____

General Requirements

Size of door opening required _____ Floor vibration conditions _____ Stray magnetic fields _____

Dust _____ Air conditioning _____ Light tight _____ Maximum water temperature _____

Water filter _____ Pressure regulator _____ Shut off _____ Safe lights _____ Position of

plumbing for cooling water & drain _____ Plate processing sink _____ Hot and Cold water _____

Mining valve _____ Washable room surfaces _____ Variable room illumination _____ Knee

hold desk space _____ Storage cabinets _____ Plate pre-evacuation _____ Group demonstra-

tion space _____

The Specimen Preparation Room

Work table _____ Storage cabinets _____ Sink _____ Hot _____ Cold _____

Distilled water _____ _____ Gas _____ Vacuum _____ Air _____ Explosion proof refrigerator

_____ Microtome table _____ 110V _____ 220V _____ Single _____ Three

phase _____ Drafts _____ Outlets _____ Vibration _____ Dust _____ Temperature

fluctuation _____ Vacuum evaporator _____ Water outlet _____ Drain _____ Pressure

regulator _____ Power _____ 110V _____ 220V _____ Single phase _____ Three

phase _____ Facilities for low temperature specimen preparation _____

Dark Room

Use dark room check list. Include facilities for automatic print processor microscope plate size _____

Photographic plate numbering device _____

CUEBS-AIBS Facilities Panel

OFFICE CHECKLIST

Room Number _____

Function _____

Prepared by _____

Date _____

Careful considerations should be given the location of the departmental office relative to building traffic and ease of access. Usually a main floor location near the front entrance or lobby is most desirable. A location near the elevator is desirable if the office is multi-departmental and the building multi-story. Related contiguous space, such as seminar-conference room, file room and chairman's office should be planned as a unit. In order to avoid undue intra-office congestion, as posed by internal mailboxes, bulletin boards and waiting space, thought should be given to other possible locations for these items.

DEPARTMENTAL OFFICE

_____ Chairman office adjacent to general departmental office (Two doors from the main office into the chairman's office, and a third door to the corridor are often desirable.)

_____ Complete BASIC CHECKLIST for this room

_____ Conference-seminar room adjacent or near the chairman's office

_____ File room adjacent to main office but separate from it (See below)

_____ File cabinets for current records

_____ Waiting room space for _____ persons

_____ Secretarial space separated from waiting room space by counter-height cabinet or files with counter top

_____ Mailboxes (commercially available panel with combination locks in wall or departmental office or file room and opening into corridor)

_____ Bulletin board (near office but in corridor—perhaps by mailboxes—to reduce office traffic)

_____ Space for secretarial desks (with typewriter panel extensions to allow more desktop work space)

_____ Additional space for one or more tables for sorting

_____ Telephone system

_____ Communication system to other rooms and offices
(PA system, intercom or buzzer system; same location as electrical outlets)

_____ AC outlets, number and location, for electric typewriters, and other office equipment
(Flush floor outlets and wall outlets to permit flexibility of desk arrangement.)

_____ Cases for catalogs unless available in store room or elsewhere

_____ Provision for coats—secretary's and visitors'

FILE ROOM

_____ Complete BASIC CHECKLIST for this room (HW, CW and a sink are desirable.)

_____ Battery of 5 drawer file cabinets for all records except current year

_____ Space for additional typists

_____ Provision for security items (examinations)

_____ Space and AC outlets for:

_____ Duplication equipment _____ Tabulating machines

CHAIRMAN'S OFFICE

_____ Complete BASIC CHECKLIST for this room

_____ Chairman's desk 30'' x 60"' minimum

_____ Telephone with intercom and buzzer to secretary

_____ Provision for small conference table

_____ Provision for chalkboard (This could be screened by drapes or other means for acoustic, aesthetic, or other reasons.)

_____ Chairs

_____ Lockable file cabinet(s)

_____ Bookshelves

_____ Provision for coats

CONFERENCE-SEMINAR ROOM

_____ Complete BASIC CHECKLIST for this room

_____ Complete AUDIO-VISUAL CHECKLIST for this room

_____ Table, conference type (perhaps wedge-shaped or sectional, suitable for 10-12 persons)

_____ Space for additional seating of 30-40 individuals

_____ Provision for folding chair storage

_____ Cabinet (with small sink), coffee facilities, or screened "Pullman kitchen" unit

_____ Bookcases

STAFF OFFICES

(Only one faculty member per office is strongly recommended; a room 10' x 10' approaches minimal effective size.)

_____ Complete BASIC CHECKLIST for this room

_____ Desk _____ Chairs _____ Bookshelves

_____ File Cabinets _____ Provision for coats

_____ Telephone _____ Intercom _____ Buzzer

_____ Chalkboard _____ Tackboard

CUEBS-AIBS Facilities Panel

ANIMAL LABORATORY CHECKLIST

Room Number_____

Function_____

Prepared by_____

Date_____

Laboratory animal facilities must be designed to provide when necessary absolute and always adequate environmental control for a great variety of experimental needs. Such facilities are expensive and most economical when design permits a large degree of adaptation to changing program requirements. In addition to the scientific justification for design criteria, laboratory animal facilities must satisfy legal requirements at the federal, state and local levels of government.

The following checklist is intended to identify major design components in the design of laboratory animal research and training facilities so that adequate housing provisions, proper feeding and watering requirements, good sanitation program, disease diagnosis control and treatment, and essential emergency requirements will be provided.

Location (depending on size)

_____ Separate Building _____ Separate Wing _____ Separate Floor
_____ Separate Room _____ Relationship to teaching and research laboratories

Animal Housing

_____ Quarantine facilities (to house newly received animals)
_____ Isolation facilities (to house ill animals)
_____ Species isolation and project isolation
_____ Long-term housing (aging or chronic studies)

Special Considerations

_____ Traffic flow patterns (clean to dirty)
_____ Ventilation, temperature and humidity controls
_____ Safety (non-slip floors, fireproof and waterproof fixtures, radiation and microbiological)
_____ Standby power source
_____ Building materials (durable, waterproof, fire resistant seamless material)
_____ Dimensions: _____ corridors _____ doors _____ rooms

Sanitation Program

_____ Autoclave (cages, equipment, food and bedding)
_____ Rack-cage washer _____ bottle washer _____ waste can washer
_____ Utility sink _____ refrigeration (perishables, carcasses & soiled waste)
_____ Incinerator and/or destructor
_____ Floor drains

Specialized Laboratories (Should be located with the animal facility)

_____ Research laboratory _____ Surgery, including intensive post-surgical care
_____ Special diets _____ Diagnostic laboratory _____ Radioisotope
_____ Infectious disease _____ Behavioral laboratory _____ Necropsy
_____ Veterinary services

Storage

_____ Food _____ Bedding _____ Supplies _____ Equipment and cages
_____ Refrigeration (for perishables, food, drugs and biologicals)

Administrative Area

_____ Offices (director, clerical, supervisory)
_____ Conference room and library
_____ Lecture room
_____ Locker and shower for staff
_____ Lunch area for animal care staff
_____ Guard service
_____ Overnight accommodations

Room Number_____

Function_____

Prepared by_____

Date_____

CUEBS-AIBS Facilities Panel

CHROMATOGRAPHY AND ELECTROPHORESIS AREA CHECKLIST

Rooms in which chromatographic and electrophoretic techniques are to be used on a frequent and continuing basis should be designed so as to minimize the unpleasant and harmful effect of (1) Noxious, corrosive and penetrating fumes, (2) Spillage of strongly active chemicals, (3) The presence of potentially dangerous sources of current. The major architectural and mechanical features necessary to accomplish the aforementioned goals are related to ventilation, use of appropriate finish materials, (ie. bench tops, walls, floors and ceilings) floor and sink drains, and provision for adequate and proper electrical grounding.

Ventilation

_____ Entire area to be separately vented
_____ Purge system
_____ Room or area to be separately zoned for temperature control
_____ Number of hoods
_____ Size of hoods
_____ Types of hoods

Floor

_____ Chemical resistant continuous flooring
_____ Ceramic tile flooring
_____ Floor drain
_____ Hose bib

Wall

_____ High chemical resistant materials
_____ Ease of washing down floor
_____ Sufficient free wall space for large equipment (ie. counter current distribution apparatus, power supplies and floor standing chromatographic apparatus, etc.)

Electrical

_____ Warning light indicating use of equipment in room
_____ Adequate grounding
_____ Chemical resistant cover plates and pedestal boxes
_____ Sufficient circuits for high voltage electrophoresis units
_____ Drying ovens (multiple electrical outlet strips)
_____ Need for varying current sources

Emergency Showers and Eye Washing Baths

_____ Deluge shower
_____ Bench mounted shower
_____ Wall mounted shower
_____ Desk mounted eye wash
_____ Aerated hand spray

Utilities – Special

_____ Pyrex corrosion resistant glass traps and lines in all sinks

CUEBS-AIBS Facilities Panel

AUDIO-VISUAL CHECKLIST

Room Number _____

Function _____

Prepared by _____

Date _____

Complete for each room requiring any of the Audio-Visual items considered.

_____ Chalkboards: number _____ size _____ type _____

location _____ special lighting _____

map and tack strip over _____

_____ Bulletin Board: number _____ size _____ type _____

location _____ special lighting _____

_____ Chart Racks: number _____ length _____ location _____

_____ Demonstration or Display Cases: type _____ location _____

_____ Public Address System (for this room only)

number of speakers _____ location of speakers _____

controls at lecture desk _____ controls at other location _____

_____ Projection Facilities:

_____ Booth _____ Table

Electrical outlets for projectors: _____ wall _____ floor (flush or out of way)

_____ Remote control conduit for lecture desk

_____ Conduit for sound system

_____ Security for projection equipment

Screen: size _____ type surface _____

_____ fixed _____ movable { mechanical _____ / manual _____

Projection control, room lighting control, light-tight curtain controls

_____ control at lecture desk _____ control at other location

(Provide dim light during projection so that notes may be taken.)

_____ Exit lights on separate circuit

_____ Television:

Monitors (tube set)	Audio	Signal Input and Output
location _____	location _____	location _____
number _____	number _____	number _____
_____ 110 v. receptacle		_____ 110 v. receptacle

CUEBS-AIBS Facilities Panel

BASIC CHECKLIST

Fill out for *each* room; in addition, complete any other pertinent checklists for special or specific room use or features (e.g., Lecture, Laboratory, Audio-Visual).

Room Number _____

Function _____

Prepared by _____

Date _____

Area _____ sq. ft.

Proportion _____ x _____ ft.

Capacity _____ persons

Vertical clearance _____ ft.

Communications:

_____ Telephone
_____ Intercom
_____ Buzzer System
_____ Clock
_____ Class bell
_____ Fire alarm

Equipment:

_____ Fixed (built-in) . . . . . Explain in section A, on reverse →
_____ Movable . . . . . " " " B, " " →
_____ Sound and Vibration Insulation . . . . . " " " C, " " →
_____ Heavy Floor Load Requirements . . . . . " " " D, " " →
_____ Special Heating and Ventilating Needs . . . . . " " " E, " " →
_____ Special Lighting Requirements . . . . . " " " F, " " →
_____ Safety Requirements or Problems . . . . . " " " G, " " →
_____ Traffic Problems . . . . . " " " H, " " →
_____ Provision for Expansion of Utilities or Changes in Room Function . . . . . " " " I, " " →

Use J, on reverse, for explanation of special requirements	Floor	Ceiling	WALLS			
			N	E	S	W
1. Finish (Special Requirements)						
2. Picture Molding	---	---				
3. Windows: darkout blinds	---	---				
standard blinds	---	---				
4. Doors: size						
type						
5. Chalkboard (and see AV Checklist)	---	---				
6. Bulletin board (and see AV Checklist)	---	---				
7. Hot Water (HW)						
8. Cold Water (CW)						
9. Distilled Water (DW)						
10. Sink: size						
type						
11. Air						
12. Gas						
13. Vacuum						
14. Steam (high or low pressure)						
15. 110 AC electricity outlets						
16. 220 AC electricity outlets						
17. Other						
18.						
19.						
20.						

Will these specifications meet your needs in 10-20 years?

For Room Number _____
(Basic Checklist explanations)

A. Fixed Equipment:

B. Movable Equipment:

C. Insulation Requirements:

D. Floor Load Problems:

E. Special Heating and Ventilating:

F. Special Lighting:

G. Safety Features:

H. Traffic Problems:

I. Provision for Future Utility Needs or Changes in Room Function:

J. Special Requirements (from Chart):

CUEBS-AIBS Facilities Panel

GREENHOUSE CHECKLIST

Room Number _____

Function _____

Prepared by _____

Date _____

A greenhouse cannot be placed as easily on a new building as many other facilities; thus, its location, with direct access to a corridor of the main building, must be considered early in the planning stage. The greenhouse should be on the south or southwest side of the building where it will receive maximum natural light. A ground level location is generally most satisfactory because of ease of access with plants, soil and similar items and because such a location does not pose a potential flooding problem to other areas. However, where space is drastically limited, roof greenhouses may be necessary.

All temperature and humidity controls should be automatic. Some summer temperature control can be obtained with slat shading and relatively inexpensive evaporative coolers. It is not practical to attempt to air-condition a greenhouse for the usual teaching and research material.

Air pressure outlets and weatherproof electrical outlets will often be needed in addition to the usual water outlets. Some provision might be made for the installation of certain lights on automatic time switches to prolong the effective day length.

Greenhouse space should not be used for storage space or general work space. A headhouse room, with an outside entrance, or with easy access to such an entrance, should be in the main building and adjacent to the greenhouse.

Provision should be made in the headhouse for a small, portable, electric soil sterilizer to be put on the potting bench. Adequate shelves for storage, room for pots, flats, soil, sand, peatmoss, and several large waste cans must be available as well as a sink for pot washing.

If size permits, separate compartments for teaching, research, and display materials are preferable to one large house. Excellent free planning service is available from several of the major greenhouse companies.

Complete the BASIC CHECKLIST for this space. Note special requirements.