a thesis by
Mark Turner
Ball State University 1975
FORWARD

This document is intended to serve as a guide and a tool for design; it is intended that this program grow with the project, as the project is evaluated. For this reason, the program will consist of four parts. The first part is a basic description of the project; it deals with the issues of who is the client, the context of the project, the budgetary considerations. In short, the first part introduces the project.

The second part elaborates more on the project itself, dealing with size, space requirements, user needs, site information, and cost per square foot. It will delineate the problem, setting forth all known data and problems. This is the section that will continue to grow, as more data becomes available, or is generated.

The third part is intended to be an appendix of sorts, containing reference data, soil surveys, etc. This will save the designer valuable time by providing this information at his fingertips. As with the second part, the third part will grow as new data becomes available.

The fourth part is to be added beginning with the start of the schematic design phase. This will become a record of the project, in itself a useful accumulation of data.
PURPOSE OF THE DOCUMENT

The purpose of this program is to bring together all the relevant data pertaining to the design of a Joint Research Library Facility for the Amherst Campus of the State University of New York at Buffalo, and to then serve as a design tool and reference for the designing of that facility.

ACKNOWLEDGEMENTS

I should like to thank, for their kind help and consideration (not to mention encouragement):

Mr. John Neal, Asst. Vice President, Facilities Planning  SUNYAB
Robert Surra AIA
Anthony Carlino - Architect.
CHARACTER OF THE PROJECT

University Influence

The university, and in particular the facilities which exist now, and make up the spine will have a definite influence on the design of the library. This is necessary if the campus is to retain a sense of unity.

- Architectural appearance of each facility as individual to provide identity and uniqueness.
- Formation and identity of focal points along the spine.
- Formation and identity of focal points within each facility.
- Transition from facility to facility - focal points.
- Scale of facilities: individual/individual; individual/mass.
- Human scale.

Community Influence

The university exists as a community within a community, so much so that a perimeter road will prevent either the community or the university from encroaching on the other. Still, it is because the community wants the university that it is there. The university serves the community. This must be remembered.
The State University of New York at Buffalo (SUNY/AB) has grown in the past 10 years to become one of the largest universities in the state. It has exceeded its capacities and capabilities at its Main Street Campus in Buffalo. With no room left for expansion, SUNY/AB has begun a whole new campus in the adjacent town of Amherst, just to the north.

The site of this new campus is near to the geographic center of the town of Amherst, and is near to many shopping areas, apartment complexes, recreational facilities, and major traffic arterials. The campus is being built to the west of Millersport Highway, a four lane highway that originates near the Main Street Campus. It is along this corridor that a rapid transit system will be developed linking the two campuses.

Full development of the campus will cross Millersport, at which time a high speed loop will be completed around the campus, and the campus lake will be completed.

3 See Site Analysis Maps for details of traffic arterials.
The structure of SUNY/AB - Amherst Campus is organized on a central spine system which encloses the college green and provides a second level pedestrian system. Seven faculties and major facilities form this spine, together with commercial, social and recreational facilities, each of which functions as a node, or focal point. The hierarchy of these nodes and connections is what gives the spine its character.

The Joint Research Library, because of its location in the spine is not just a node in a succession of nodes; it is also a major focal point, a cross roads between the faculties of Education, Arts and Letters, and later the Social Sciences. For this reason the library should be considered to be the center of the south spine, the center of circulation and activity.
NATURE OF THE PROJECT

Purpose.

The purpose of this thesis is to design a joint research library facility for the Amherst campus, SUNYAB, and to experience firsthand the procedures and problems in dealing with state governmental agencies.

The purpose of the project, the design of a joint research library facility, is to provide the Amherst Campus, and particularly the Faculties of Education, Philosophy and Arts and Letters, with a comprehensive research library at a central location in respect to these colleges. This library will contain general reference works and all the works used by the above Faculties, an audio visual library, and a computer center for research.

Identification.

The Joint Research Library will become a link in the southern spine of the east complex, or Phase II of the construction. Phase I, the activity complex, was begun in 1972, and included the Administration Building, the Central Library, and Student Center. Phase II was begun in 1973, and consists of O’Brien Hall (Law & Economics) Baldy Hall (Education & Philosophy) and Clemens Hall, (English and Modern Languages). The Library will complete the spine between Baldy Hall and Clemens Hall.
Objectives

- to work within the structure of the new campus and relate to the whole university.
- to express the nature of the spine through the interior and exterior treatment of the building.
- to respond to students, whether users or passersby, by creating a series of focal points through the building.
- to create a hierarchy of these focal points.
- to respond to the needs of persons using this facility, staff and/or students.
- to identify the library as a nodal point in the spine.

Constraints

- second level pedestrian system along axis of spine
- maintenance of earth colors for spine architectural treatment
- shuttle, bus road
- book security
- crosswise ground level circulation (perpendicular to spine)\(^2\)
- future expansion and addition
- budget

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1 See site maps.
2 See Site Analysis - Constraints.
MONEY

The university has a static total budget of 650 million dollars. With an estimated inflation rate of 6% compounded annually, building construction costing 75 million dollars in 1971 will cost 151 million in 1985, or double that cost in eleven years. At this rate, one can see that more construction from 1971-75 is much more desirable than construction delayed to later dates. Time is valuable in the sense of capital capability of the university.4

As a base for calculations, the labor market can handle a maximum of 100 million dollars per year, setting a maximum completion date at 6.5 years. Considering that the university must be phased for ultimate coordination and rapid execution, phase 2 is scheduled to begin at the earliest in 1973.5

The university functions under a unique system of financing present only within the state institutional structure. The money obtained through state bonds, was earmarked by the state legislature in a total package for the university construction budget. University tuition serves as collateral for the bonds. With either an increase in admissions or tuitions, the bonding capacity is increased. All interest on the bonds is paid by the state and is guaranteed by the federal government.

Individual budgets per building are founded on a base budget with an additional estimated escalation factor per year. In the past, cost overruns have generally come out of a 30% general contingency fund. Today the architect must allow for a 5% budget cut thru the use of deduct alternates. In construction there is a 10% contingency fund for specific buildings and a general 5% contingency fund for all buildings constructed within that year. If construction runs over its 10% allotted contingency, then funds are extracted from the general fund. Excess monies flow into the general fund for additional structures.

Five million dollars (1975) is budgeted for the Joint Research Library. The project size is 80,000 S.F. This gives a cost per square foot of 62.50. According to latest cost data guides the median cost for library facilities if 45.00 per S.F.

4,5 Prepared by Facilities and Planning Dept. SUNY/AB
JOINT RESEARCH LIBRARY

The Research Library will be the major library on the Amherst Campus. It will house the General Reference Collection, and all the works used by the Faculties of Education, and Arts and Letters. It will have a multi-level connection to Christopher Baldy Hall and a second level connection to Samuel Clemens Hall.

Spaces - Description.

LIBRARY - STACKS

FUNCTION
1. to contain approx. 400,000 volumes
2. to provide a place for study and research

WORK STATIONS
1. Stack area for 400,000 volumes
2. 1200 reader stations
3. 300 study carrels

EQUIPMENT
1. Library stacks
2. Study Carrels and furniture
3. Photocopiier(s)

SPECIAL BUILDING REQUIREMENTS
1. Floors
   . All floors in the library are to be capable of supporting library stacks; i.e., a live load of 150 pounds per square foot.
   . All floors in the stacks and study spaces are to be carpeted.
2. Lighting
   . Lighting shall meet current I.E.S. recommendations for reading and libraries.
3. Acoustics
   . The stacks and study areas are to be treated in such a way as to be a quiet, serene environment.

CARD CATALOGUE

FUNCTION
1. Allow easy and rapid location of books.
2. Lists all books and films available.

WORK STATIONS
1. The card catalogue
2. Convenience tables
EQUIPMENT

1. Card Catalogue; tables
   Personnel ---
   Area 1200

CHARGE DESK

FUNCTION
1. Serves students who wish to borrow a book.
2. Keeps records of books out.
3. Provide work station for library staff.
4. Is an important part of the library security system.

WORK STATIONS
1. Charge desk - four card-punch machines
2. File space for charged books
3. Staff desk

EQUIPMENT
1. Card punch machines
2. Counter
3. Electronic security device
   Personnel 6
   Area 200 S.F.

TECHNICAL PROCESSING

FUNCTION
1. Permits 24 hour return of borrowed books
2. Allows staff to check in books and organize them prior to reshelving

WORK STATIONS
1. Return book chute - drop area
2. Check in counter and work table
3. Book carts

EQUIPMENT
1. Book carts (4)
2. Work table
   Personnel 4
   Area 400 S.F.
INTERLIBRARY LOAN SERVICE

FUNCTION
1. Provides users with ability to check out books from other libraries in the university or university system.

WORK STANDARDS

INTER LIBRARY LOAN SERVICE

WORK STATION
1. Incro-Fiche Card File
2. Communication Station
3. Shelves

EQUIPMENT
1. Incro Reader
2. Telephone

| Personnel | 2 |
| Area      | 300 |
RESERVE BOOK AREA

FUNCTION
1. To "hold" certain books; which are removed from general circulation to insure availability.

WORK STATIONS
1. Charge counter
2. Space for 2000 volumes
3. Reading stations for 30 students

EQUIPMENT
1. Stacks for 2000 volumes
2. 30 study carrels

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<thead>
<tr>
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</table>

LIBRARY OFFICE

FUNCTION
1. To provide the librarian with a private space
2. To provide private space for meetings.

WORK STATIONS
1. Librarian's Desk
2. Vertical File

EQUIPMENT
1. Desk
2. File

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LIBRARY STAFF OFFICES (4)

Similar to above, except can be arranged as a group office.

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</table>

PERIODICAL LIBRARY

FUNCTION
1. To house all the periodical literature required by the faculties using the joint research library.
WORK STATIONS
1. Reading Stations for 200 students
   60 of these will be carrels
2. Reference Stations.
3. Staff desk for information, assistance and security.
4. Stacks for a periodical library.

EQUIPMENT
1. Stacks for 90,000 volumes
2. Reader Stations - 60 carrels, 140 other
3. 2 (minimum) photocopiers
4. Information Counter
5. Electronic security devices.

Personnel 4
Area 10 500

MICRO FILM LIBRARY

FUNCTION
1. To maintain and enlarge the universities' collection of works on microfilm
2. To provide a broader scope of reference material that is available to students

*Note: Microfilm materials will be shelved with books; each floor will have a control station where a student will be assigned an electronic carrel to use microfilm material.

WORK STATIONS
1. Control stations (4)
2. Film readers, copiers.

EQUIPMENT
1. Film Files - for microfilm, microfiche
2. Film Readers, film copiers

Personnel 4
Area 1200

AUDIO-VISUAL AIDS CENTER

FUNCTION
1. To house films, filmstrips and video tapes
2. To house and maintain audio/visual equipment
3. To prepare audio visual aids for students and faculty.

WORK STATIONS
1. Film Library
2. Information and charge desk
3. Workroom for aids preparation
4. Office space
EQUIPMENT
1. Film repair, editing, & preview equipment
2. Tape equipment - audio and video
3. Copy equipment
4. Dry mount press, paper cutter

Personnel: 10
Area: 3800 S.F.

COMPUTER CENTER

FUNCTION
1. To provide a central location for computer terminals
2. To provide the computer an environmentally stable space
3. To make the computer as a research tool available to students

WORK STATIONS
1. Computer Center Classroom
2. Reader/Printer
3. Keypunch and Data Terminals
4. Programmers/Instructors - (3)
5. Staff Offices - (2)

EQUIPMENT
1. Honeywell or IBM computer hardware
   30 Keypunch
   10 Keyboard Terminals

Personnel: 6
Area: 1900 S.F.
<table>
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<tr>
<th>Space Requirement Summary</th>
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<td>Micro Film</td>
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<td>Work Room</td>
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<td>Keypunch</td>
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<td>Store Rooms</td>
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<tr>
<td>Spine Corridor</td>
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</table>

Total Area: 79 300
Total Personnel: 47
SITE ANALYSIS

PROPOSED CAMPUS PLAN

FORESTS AND BODIES OF WATER
SITE ANALYSIS

SITE IS STATE OWNED AND THEREFORE ZONED. SITE COVERAGE AND HEIGHT RESTRICTIONS DO NOT APPLY.
SITE ANALYSIS  SLOPE & SOIL

SITE RESTS ON COMPACT GLACIAL TILL WITH UNDERLYING SHALE AND DOLOMITE LIMESTONE.
SITE ANALYSIS

SECOND LEVEL PEDESTRIAN CONNECTION TO CLEMENS HALL

UTILITY TUNNEL CONNECTION

FUTURE EXPANSION

MULTI-LEVEL CONNECTION TO BALDY HALL

BASEMENT LEVEL CONNECTION

UTILITIES

- ALL UTILITIES (WATER, ELECTRICITY, & CHILLED WATER) WILL BE DELIVERED THROUGH THE UTILITY TUNNEL.

SCALE: 1" = 60'
CLIMATE

AVERAGE MONTHLY TEMPERATURES

NORMAL MONTHLY PRECIPITATION
CONCEPT

Spatial separation as a function of light requirements

East-West orientation
CLIMATE

MEAN MONTHLY HOURS SUNLIGHT

SUN ANGLES
CLIMATE

AVERAGE WIND SPEEDS

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DIRECTION

WIND DIRECTION: RELATIVE PERCENT
## SPATIAL REQUIREMENTS

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<th>Study Space</th>
<th>Work Space</th>
<th>Reading Space</th>
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<th>Public Area</th>
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<th>View Out</th>
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<th>Natural Light</th>
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<td>Charge Desk</td>
<td>Library Office</td>
<td>Staff Offices</td>
<td>Study Carrels</td>
<td>Card Catalogue</td>
<td>Return Books</td>
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<td>Periodicals</td>
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<td>Audio Visual</td>
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| COMPUTER CENTER |  |
| READER / PRINTER |  |
| RESEARCH |  |
| STAFF |  |

| LOUNGE |  |
| VENDING |  |
| RESTROOMS |  |

| ENTRY |  |
| MECHANICAL |  |
| JANITORY CLOSET |  |
| STORAGE |  |
SUNY / AB

JOINT RESEARCH LIBRARY

CONCEPT / SCHEMATICS
1. USERS
   SOURCE -> ENTRANCE -> LOBBY
   -> REFERENCE ROOM
   -> CARD CATALOGUE
   -> STACKS -> CARRELS
   -> PERIODICALS
   -> STACKS -> CARRELS
   -> AUDIO VISUAL
   -> PREVIEW
   -> MICRO FORMS
   -> FILM READERS
   -> COMPUTER CENTER

2. STAFF
   SOURCE -> STAFF ENTRANCE -> STAFF AREA -> WORK STATIONS

3. MATERIALS
   SOURCE -> RECEIVING -> CHECK-IN -> CATALOGING -> SHELVING
   RETURN BOOKS
   BANK CHUTE -> RETURN BOOK ROOM -> CHECK-IN -> SHELVING
light well

light well

Spaces requiring light

Spaces not requiring light

East-West orientation of spine
- repetition of elements
- more "hassle" for users

- film readers in some carrels
**SCHEMATICS**

- **Clemeurs Hall**
- **Baby Hall**

"Physical" split to express ground level circulation

**Comments/Thoughts:**
- Response to external factors
- Formwise, "ends" Baby Hall
- Interior circulation a problem
comments/thoughts:

- more effective termination
- circulation problems

"split" emphasizes end of spine
read "opening"

vertical circulation

lobby

thoughts: internal circulation improved, but not optimum
INTERNAL CIRCULATION IS NO LONGER A PROBLEM.
RELATIONSHIPS WITH EXISTING BUILDINGS.
Comments/thoughts: Circulation is improving, but still awkward.
March 21, 1975

Mr. Mark Turner
411 Wheeling Avenue
Muncie, Indiana 47303

Dear Mr. Turner:

This is in response to your request for information about the library facilities to be constructed on our Amherst Campus.

There are two major buildings which will house the library facilities on the Campus. Since you mentioned Anthony Carlino in your letter, I presume the one that you are interested in is the one on which Carlino's office worked and which we have working-titled the "Joint Research Library".

I am enclosing the only maps that are presently available which show the Amherst Campus. We have another brochure the same size which has a much larger map of the Amherst Campus, but that brochure is presently out of print. We expect a new one to be printed in about six weeks and if you would like, I would be happy to send you one of those when it is available.

The Research Library is viewed by us as the major library on the Amherst Campus. It will house the General Reference Collection and all of the works used by the Faculties of Education, Social Sciences and Administration, and Arts and Letters.

It will have a multi-level connection to Christopher Baldy Hall, immediately to the left and it will have a single-level enclosed pedestrian bridge to English and Modern Languages (which has been renamed Samuel Clemens Hall) to the east. That bridge will be at the second floor elevation.

The building will have a net assignable area of 154,171 square feet. Contained in the space will be 2400 reader stations, stacks to house about 800,000 volumes and working space for a staff slightly over 100.

The program called for all floors in the library to be capable of carrying library stacks, i.e., all floors were designed for a live load of 150 pounds per square foot.

The site for the building is quite tight - delimited by Baldy Hall on the west, Putnum Way (a road which is complete) on the south and east and an underground utility corridor which runs east and west about fifteen feet north of the proposed building line. It is from this utility corridor that all service for the library will be obtained.
The site is relatively flat. It is entirely on compacted fill.

As you may already know from your discussions with Carlino, the Architect on this project was given several constraints in addition to the facility program itself. There was, for example, a two-volume Campus Master Plan which stipulated building masses, exterior textures, and color pallet among other things. The Architect was obliged to conform to all of these stipulations and to the facility program as he designed the facility.

If you would like further information, please call on me and I shall try to provide it. You may be interested to know, incidentally, that bids will be opened on this library on Wednesday, the 25th of this month.

Very truly yours,

John A. Neal
Assistant Vice President
Facilities Planning

JAN:rw

Attachment
The Ecology of Study Areas

An effective study environment is as much a matter of administrative rules and educational programming as architecture. Empty classrooms and cafeterias are used often when available. For this reason it is futile and economically wasteful to try to design the "ideal" reading place, with the hope that this will satisfy all the patrons. There is no single reading station, carrel, or lounge chair, that will satisfy everyone's needs. The only feasible solution is to provide a variety of reading stations which differ in important respects and let users discover the areas most suitable for them personally.

More research is needed on the design and use of carrels. Carrels tend to be used by someone concerned with privacy and reducing visual distractions. Problems with carrels are lack of writing space and ventilation. These problems can be remedied by better design.

Summary from:
The Ecology of Study Areas
Cooperative Research Project No. 61121
Robert Sommer
University of California, Davis Campus 1968
### 11. Tables and Appendices

#### Table 1

Reasons for Studying in the Library

<table>
<thead>
<tr>
<th>Reason</th>
<th>Average % of students at 16 colleges and universities N = 1563</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiet</td>
<td>51</td>
</tr>
<tr>
<td>Convenience or proximity</td>
<td>29</td>
</tr>
<tr>
<td>Materials</td>
<td>27</td>
</tr>
<tr>
<td>Atmosphere conducive to study</td>
<td>21</td>
</tr>
<tr>
<td>Few distractions, little movement</td>
<td>20</td>
</tr>
<tr>
<td>Concentrate better</td>
<td>10</td>
</tr>
<tr>
<td>Can relax or be comfortable</td>
<td>6</td>
</tr>
<tr>
<td>Group study, friends nearby</td>
<td>4</td>
</tr>
<tr>
<td>Not crowded, privacy</td>
<td>3</td>
</tr>
<tr>
<td>Habit</td>
<td>2</td>
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</table>

**Physical Factors**

<table>
<thead>
<tr>
<th>Reason</th>
<th>Average % of students at 16 colleges and universities N = 1563</th>
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</thead>
<tbody>
<tr>
<td>Temperature good</td>
<td>5</td>
</tr>
<tr>
<td>Well-lit</td>
<td>4</td>
</tr>
<tr>
<td>Tables, desks comfortable or good for study</td>
<td>4</td>
</tr>
<tr>
<td>Space to spread out materials</td>
<td>3</td>
</tr>
<tr>
<td>Chairs comfortable, good for study</td>
<td>2</td>
</tr>
<tr>
<td>Item</td>
<td>Excellent</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Lighting</td>
<td>50</td>
</tr>
<tr>
<td>Ventilation</td>
<td>32</td>
</tr>
<tr>
<td>Temperature</td>
<td>23</td>
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<tr>
<td>Comfort of chairs</td>
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</tr>
<tr>
<td>Table height</td>
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<tr>
<td>Table size</td>
<td>34</td>
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<tr>
<td>Access to educational material</td>
<td>30</td>
</tr>
<tr>
<td>Atmosphere for study</td>
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</tr>
<tr>
<td>Ease of concentration</td>
<td>15</td>
</tr>
<tr>
<td>Quietness</td>
<td>12</td>
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<tr>
<td>Possibility for privacy</td>
<td>18</td>
</tr>
<tr>
<td>Possibility for relaxing</td>
<td>17</td>
</tr>
<tr>
<td>Space to spread out materials</td>
<td>24</td>
</tr>
<tr>
<td>Possibility of talking</td>
<td>22</td>
</tr>
<tr>
<td>Pleasantness of surroundings</td>
<td>33</td>
</tr>
<tr>
<td>Arrangement of tables</td>
<td>25</td>
</tr>
<tr>
<td>No. of carrels</td>
<td>18</td>
</tr>
<tr>
<td>Windows</td>
<td>35</td>
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<tr>
<td>Ceiling height</td>
<td>42</td>
</tr>
<tr>
<td>Color of walls</td>
<td>31</td>
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<tr>
<td>Floor covering</td>
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</tr>
<tr>
<td>Room size</td>
<td>31</td>
</tr>
<tr>
<td>Snack facilities</td>
<td>12</td>
</tr>
<tr>
<td>For smokers only: smoking</td>
<td>5</td>
</tr>
<tr>
<td>Major Distractions for Library Patrons</td>
<td>Number of times mentioned:</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td></td>
<td>#1 distraction only</td>
</tr>
<tr>
<td>People coming in and out</td>
<td>62</td>
</tr>
<tr>
<td>Other students talking</td>
<td>60</td>
</tr>
<tr>
<td>Thinking of other things</td>
<td>38</td>
</tr>
<tr>
<td>Noises other than talking</td>
<td>24</td>
</tr>
<tr>
<td>Too many people/friends nearby</td>
<td>15</td>
</tr>
<tr>
<td>Too hot/too cold</td>
<td>12</td>
</tr>
<tr>
<td>Watching other people in the room</td>
<td>11</td>
</tr>
<tr>
<td>Library staff talking</td>
<td>9</td>
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<tr>
<td>Uncomfortable furniture</td>
<td>8</td>
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<tr>
<td>Not being able to relax</td>
<td>4</td>
</tr>
<tr>
<td>Limited library material</td>
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</tr>
<tr>
<td>Poor ventilation</td>
<td>3</td>
</tr>
<tr>
<td>Poor lighting</td>
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<tr>
<td>Not being able to smoke</td>
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</table>
Table 6

Reasons for Studying in Carrels and Other Library Areas

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<thead>
<tr>
<th></th>
<th>Carrel Studiers</th>
<th>Students in all Other Areas</th>
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<tbody>
<tr>
<td></td>
<td>N = 103</td>
<td>N = 1457</td>
</tr>
<tr>
<td>Materiales</td>
<td>9</td>
<td>26</td>
</tr>
<tr>
<td>Quiet</td>
<td>37</td>
<td>23</td>
</tr>
<tr>
<td>Not crowded, privacy</td>
<td>39</td>
<td>18</td>
</tr>
<tr>
<td>Few distractions, little movement</td>
<td>47</td>
<td>14</td>
</tr>
<tr>
<td>Group study, friends</td>
<td>2</td>
<td>14</td>
</tr>
<tr>
<td>Convenience, proximity</td>
<td>3</td>
<td>13</td>
</tr>
<tr>
<td>Habit</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Can relax, be comfortable</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Concentrate better</td>
<td>20</td>
<td>2</td>
</tr>
</tbody>
</table>

**Physical Factors**

<table>
<thead>
<tr>
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</tr>
<tr>
<td>Windows</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Tables/desks comfortable, good for study</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Temperature good</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>
CHAPTER IV

RECOMMENDATIONS

General Recommendations

1. A decision on the quality of the building and a statement of the funds available, if the amount is definitely limited, should be made by the institution before the program for the architect, which specifies other requirements, is approved. Having been informed of these decisions, the architect will then have some idea as to how far the institution is prepared to go if the new structure is to include anything beyond the bare minimum for a plain, factory-like building. The architect should report promptly to the institution if he has been asked in the program for elements that are undesirable, impractical, or impossible. Extras may include, among other things, sturdier construction, better quality, aesthetic features, increased comfort and convenience for the users and the staff, and satisfactory atmospheric conditions for both these groups and for the collections. None of these should be forgotten.

All architectural projects involve compromises. The same dollar cannot be used in more than one way. Decisions should be made with all available facts at hand. The architect or a consulting cost estimator may sooner or later suggest changes in details specified in the program. The changes may be good ones, but the institution should know why additional funds are required, if they are, or how costs can be reduced, if they must be. Economizing in the wrong places should be avoided and the institution must decide what are the right places given its circumstances. Quality of lighting is important and should not be subordinated. It should be searched for diligently. Do not neglect it, but remember it does not necessarily result from higher costs and may be impaired by high intensities.

2. Keep in mind and continually emphasize that satisfactory lighting plays a large part in making a comfortable, convenient and attractive place to work, and that good lighting is essential to a good library as an aid to reading speed and the comprehension and retention of what is read. Light, to be satisfactory, must be of high quality. It must not come from a source shining in the eyes, nor should there be glare and reflections, shadows, or too great contrast between the reading surface and its surroundings. Light must be suitable in intensity for the area that it illuminates. As experience has often demonstrated, high intensity alone is not the solution. If high intensity is provided, it must be combined with high quality or the installation will be unsatisfactory.
3. A functional lighting installation is nearly as essential as a high quality one and functionalism may properly be considered an important part of quality. Flexibility, which will provide satisfactorily for changing needs in the years ahead, is closely related to function.

4. Aesthetic aspects in library lighting construction may have to be subordinated to quality and function, but they are important. Although many students and scholars are so wrapped up in their work that they seem oblivious to quality, function, and aesthetics, they may still be subconsciously attracted to the library by them. Others are definitely influenced by these factors, some by quality and function, some by the aesthetic effects, and some by all three.

5. A library building should be wired throughout in such a way that the available wattage can be increased without drastic alterations to the basic wiring. This capacity for increased wattage will provide flexibility in space assignments and relationships. It will also add comparatively little to the cost if decided upon in advance and may well prove to be an economy in the long run as needs and demands change. It may also be useful if better quality light becomes available in the future from fixtures that decrease intensity. This has sometimes happened in the past. It should be noted, however, that the effectiveness of light sources, including the intensity made available by them, tends to increase year by year with new technical advances, and that the cost of electric current has tended to increase less rapidly than most other things in inflationary periods.

6. A small amount of carefully selected square footage in the library should be wired so that new installations requiring high wattage apparatus can be installed without extensive alterations. It seems doubtful that more than 2 or 3 percent of the library area will ever be needed for this use. The original installations—with the additional wattage possibility recommended in the preceding paragraph—would be adequate to provide more audio-visual carrels if they prove to be needed. It is doubtful that study space for the use of audio-visual material will replace a very large percentage of present reading accommodations in libraries in this next generation; instead, the expected increase in use of audio-visual materials will require a larger percentage of the additional accommodations that will be needed. A similar situation will hold for automated services of various kinds. Changes in library operations will continue rapidly in the years immediately ahead and probably indefinitely; librarians should be prepared for them and should not oppose them when they promote the educational program.

7. There are few reasons, if any, based on quality, function, aesthetic requirements, changes in wiring installations, or the reorganization of library service that will require completely uniform intensity throughout a
building so long as flexibility in space allocations is available and a reasonable margin for an increased amount of current is provided.

4. Recommendations 1 through 7 should be kept in mind in making decisions on the more controversial lighting problems, that is, intensity and cost.

Recommendations Connected with Intensity

1. A variety in readily available lighting intensity in different library areas is useful in order to avoid monotony, which many persons find undesirable, either inside or outside a building.

2. Wiring should be installed so that flexibility in library spatial assignments will be easy to obtain. Light sources should not be placed so far apart that shadows resulting from equipment prevent desirable and space-saving layouts.

3. No two libraries are alike, and the specific figures for intensity, as well as costs for installation and maintenance and operation, vary from library to library now, and this variance will undoubtedly continue to be the case. The formulas given below suggest one possibility and should help engineers to figure out the results in a particular location under the selected intensities.

4. Proposed furniture layouts should be checked with the lighting drawings to make sure that undesirable shadows from partitions, carrel shelving, or book shelving can be avoided. Transparent overlays of the lighting fixtures superimposed on the furniture layout drawings will be useful in some cases a mock-up will be helpful.

5. Make sure that furniture layouts do not require readers to face direct or reflected sunlight or glare.

6. Carrels along the periphery of any area tend to have lower intensity adjacent to the wall and may require ceiling lights parallel to the wall or cove lighting.

Specific Suggestions for Intensities in Different Areas

The author recognizes the controversial aspects of lighting intensities. He knows that many librarians, including members of his advisory committee, do not share his views completely. He puts forward the specific recommendations that follow as his personal opinions in the light of wide experience and study of the subject. He believes that his recommendations are reasonable and adequate. At the same time he also believes that the higher intensities often recommended by illuminating engineers are just as satisfactory if the quality of the light is as high as it should be and if
those concerned are prepared to pay for the additional electric current required. He is convinced that high quality and high intensity light too often do not go hand in hand and he sees no excuse for the use of intensities so many times higher than those considered adequate and satisfactory thirty years ago. In this he concurs with the recommendations of some architects, ophthalmologists, psychologists, such as Dr. Miles A. Tinker, and some other interested and competent persons. Quality in lighting, not intensity, should be the first consideration.

It is suggested that the following "maintained" intensities are adequate for different areas in an average library if the quality is as high as it should be. Quality should be the first consideration.

1. Thirty to 35 footcandles is sufficient for 70 to 80 percent of the general reading areas at the working surface level on tables, desks, and carrels in reading areas and book stacks or other places where continuous reading is carried on. This intensity should be satisfactory for a great majority of persons consulting or reading most printed books, or reading or writing their own notes with a jotter or ink pen or pencil, unless a hard pencil or poor print or poor carbons are being used. The 80-percent figure should be satisfactory in an undergraduate library, but as little as 70 to 75 percent may be preferable in a research library where there is a larger percentage of material with poor print and where more use is being made of defective eyes.

2. Sixty to 70 footcandles is adequate for most of the remaining 20 to 30 percent of the general reading areas. In a room utilizing both lower and higher intensities the higher ones should be confined to one portion, preferably the far end from the main entrance and possibly cut off partially by standard height book shelving or screening of some kind. This protection is not necessary if the intensity is not more than twice as much as in the rest of the room. The higher intensity areas should include the accommodations where maps, manuscripts, archives, and rare books are used and for faculty studies and a limited amount of readily accessible space elsewhere.

3. Areas with 90 to 105 footcandles separated from general reading areas should be available for the few persons with defective vision and also for anyone who has a personal preference for it. This space should not be in the same room with intensities of 30 to 35 footcandles, but could be adjacent to areas with 60 to 70 footcandles. Few libraries should need this very high intensity at more than 3 percent of the total seating accommodations for readers.

4. Some faculty studies and locked carrels used by graduate students, if located in areas with 30 to 35 footcandles, may well have supplementary individual lamps to provide an additional quantity of light. It should be
remembered, however, that local lighting may invite vandalism and that light shining on a working surface from a fluorescent tube under a bookshelf often tends to reflect back into the reader's eyes, particularly if the material being used has a glossy finish. If these areas have been provided with light plug outlets, the user can provide his own lamp.

5. Seventy footcandles is recommended for the staff, the catalog, and the service desks. In most academic libraries these areas include no more than 8 to 10 percent of the total library building. The higher intensity of 70 footcandles for staff members is recommended because they work long, consecutive hours with all kinds of printed and manuscript materials, and they cannot shift from the seats assigned to them without upsetting a basic functional equipment layout. Local lamps to provide part of the intensity are often suitable in administrative offices.

6. In most libraries students can and should be allowed to shift from one reading area to another at will if they prefer different lighting intensities or different seating accommodations of any kind.

7. In book stack aisles 30 to 35 footcandles should be provided on the horizontal plane at 30 inches above the floor. Light-colored floors and ceilings will help because they provide good reflecting surfaces. The stacks can be lighted in one of three ways:

   a. By continuous rows of fluorescent tubes down the center of each aisle. Gaps between one tube and the next should not be more than 2 feet, as light does not extend well lengthwise from the end of fluorescent tubes. The rows are generally placed from 4 to 5 feet apart on centers, varying according to the range and aisle spacings.

   b. By continuous rows of fluorescent tubes at right angles to the stack ranges, with no gaps between them. These should be used only if the ceiling height is great enough so that the lamps will be at least 8 inches above the top of the ranges, so arranged as to prevent the books from overheating. There are two advantages in the right angle arrangement. The lighting strips placed in this way make it easier to shift the ranges to a different spacing. The bottom shelves, which are farthest away from the light source, will be better lighted by right angle than by parallel strips, because the light reaches the vertical surfaces of the backs of books at a wider angle (something over twice the angle from the parallel lighting). This arrangement should not be used unless the lights are to be on whenever the library is open.

   c. By incandescent bulbs not more than 6 feet on centers, used in fixtures with reflectors that will spread the light satisfactorily. They should be installed only in little used, closed access stacks or areas in which time switches turn off the bulbs automatically after a few minutes of use. Fluorescent light is of equal or better quality and, if stack
lights are to be kept on during the entire period of opening, it is less expensive for the same intensity. Emitting less heat, it also reduces the air cooling load, and, with plastic or baffle protectors or with proper color, the ultraviolet rays should not damage binding or paper.

8. Exhibition cases should be lighted so as to call attention to them and make it easier to see the contents and read display labels or notes, but special care is necessary to prevent damage from heat and ultraviolet rays, and to avoid or minimize glare. Methods used in good museum installations may well be followed.

9. Fifteen footcandles, if well distributed, is adequate for vestibules and entrance lobbies, corridors, toilet facilities, stairs, and elevators. These areas are not used for reading, and when one goes from them to the reading areas where the intensity is higher, the eye, having adjusted to the lower intensity, should find intensities recommended for the reading areas and work room entirely adequate.

10. Remember that light intensities are relative. If other buildings throughout the institution are more brightly lighted, there will be pressure for higher intensity in the library, although, when quality is good, the eyes adjust readily and fairly quickly to any intensity between 10 and 150 footcandles. A greater shift is more difficult and unpleasant.

The Table on p. 90 shows estimated comparative operation and maintenance costs for two different libraries with 100,000 gross square feet, one (A) with the variations in lighting intensity among the different areas as suggested in these recommendations, the other (B) with an intensity of 100 footcandles throughout. The writer believes that the library with variations in intensity will be as satisfactory, in some ways more attractive, and considerably less expensive and monotonous than the one with the higher intensity throughout. He proposes and recommends that a program on this general basis with variations to suit the local situation be presented to an architect for his consideration and comments. A good maintenance officer can check on the costs shown in the Table and adjust them to the local situation.