LIGHT AND THE SPIRIT OF PLACE: Case Study: The Design of a Small Public Library

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Massachusetts Institute of Technology

Abstract

The thesis uses the design of a small public library as a vehicle for the exploration of natural light in architectural space. A process for designing and evaluating the design of light spaces has been formulated. Three major devices are used. First, a "light program" matches the designer's intentions about the desired character of each program space with specific qualities of natural light. Second, references of existing light places are gathered. These reference images exhibit some or all aspects of the desired light conditions, and are used as a spring-board for design. Third, large scale light models are built as devices for observing and evaluating design projections. Criteria set up through the "light program" are referred to as the basis for evaluations of the design.

Thesis Advisor.................................................................

Chester Sprague
Associate Professor of Architecture
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Introduction
It is almost impossible to separate the visual perception of space from the quality of the light which inhabits it. Space limited by material is revealed through light; light in space, in turn, is generated by the form. The mutual reciprocity of these two opposite elements - the one concrete and static, the other immaterial and infinitely suggestible - makes the study of one without an understanding of the other incomplete. The study of architectural design tends to be heavily weighted toward the manipulation of form with only some notions about the quality of light. This is understandable since form-making is the more tangible task. Yet, in built reality the quality of light has enormous evocative power, not only in defining and revealing form, but in determining the spirit of the place.

This thesis is an attempt to investigate the dialogue between light and form, and to begin to use natural light as an expressive design tool. In order to direct and confine the exploration, a specific architectural design problem was used as the medium of the project. Decisions about light quality were subject to particular conditions of use and of intentions about the
character of the place. Decisions about form were made primarily in service to the ideas about light.

Many building types or spaces could have served as the vehicle for this exploration, but it was important to be committed to making a special place. I chose a small public library as the design problem. There are two basic reasons behind this choice. First, because the central activity of the building is a visual task, the problem contains in it important requirements for light needs. Second, I have long been intrigued by this building type as a place of physical repose and mental activity: the library needs a special atmosphere of peacefulness and quiet. The mood or spirit of place must be strong enough to support this internalized activity of reading and medition, and the evocative power of light can play a significant role in its creation.

To make an architectural design with natural light as the focal issue required particular attention to the process by which decisions were made. The process which evolved had four basic parts: first, making clear of my intentions about the place and its spirit; second, considering how these intentions related to light quality; third, projecting these "light intentions" into "light forms"; and fourth, finding a technique through which I could explore and evaluate these projections.
I began by studying historical precedents in library design as a means of reviewing the changing attitudes toward the library as a public institution. This gave me a frame of reference for clarifying my own attitudes toward what kind of a place the small urban library should be. I examined several current programs for library buildings in the range of 15,000 - 25,000 square feet in order to provide for myself a typical program to work from. Several of the key spaces were then carefully considered each in terms of its desired qualities of place and light. Images of existing places which illustrated some of these qualities were collected. Some were analyzed as references for design; some were left as image/impressions.

A "light program" was constructed as a tool for synthesizing and particularizing specific ideas and images about spaces and their light qualities. Several generic light-related issues were identified and applied to the selected elements of the space program. This matrix resulted in a kind of performance standard which could apply to a range of design solutions. A list of physical determinants for each light issue was made as an aid in generating forms and later in evaluating them.

The site is a rectangular 30,000 square lot adjoining a park in a medium density residential/institutional neighborhood in Cambridge, Massachusetts. The
details of the context were not of major importance. Since the problem was set up to address the issues of the inner world of the library, the site-related variables which I dealt with were limited to sun direction, views, and relationship of the building to the street edges and to the park.

The schematic design of the building was generated from these site factors as well as from functional issues of library planning. Although the latter was not dwelt heavily upon, it was important in providing a tangible point of departure for the design and the light exploration. The images and references gathered earlier helped to generate specific light forms which could then be studied in models.

Large scale light models were employed as the major design tool. Materials used in the models were chosen to roughly approximate - in texture, color, and transmittance - the appearance of actual building materials. Model photographs taken under natural light conditions, provided a fairly accurate rendition of the quality of the light in the space. From these photographs evaluations and design projections were made. Although the criteria set up in the "light program" were a useful basis for analysis, specific design decisions were generated from a more complex and
subjective frame of reference relating more to images and feelings about a sense of place than to particular requirements.

Because of the limits of time and technical resources not all of the spaces in the building, nor all of the "light issues" could be explored. The preliminary imaging and light programming of all the parts was done. However, in-depth study of the actual light in the space through models was limited to the major reading space, the bookstack area, and the individual reading carrels and alcoves.
Intentions and Methodology
The Library as an Urban Place

The history of the public library is rather brief. Until the French revolution collections of printed material were the exclusive valued property of either religious institutions or private individuals. The 19th century saw the flowering of education for the people and simultaneously the proliferation of centralized public libraries. Small public libraries began to spring up in Scandinavia, Northern Europe and America during the latter half of the 19th century providing access to general information for the inhabitants of small towns and outer edges of the city. In aspect these institutions were often miniaturized versions of the grand mid-city libraries - small but dignified monuments to civic pride.

This tradition continued through the early 20th century. In recent years however attitudes towards education, the value of books, and mechanization of retrieval systems have changed the quality of the small public library both in the city and in towns. The very positive wish to make information more broadly and easily accessible has been developed in newer libraries often at the expense of many fine qualities of place. Small libraries have begun to assume a "retail" identity in
order to compete in a world where rapid, often thought-
less consumption of goods if the norm.

I believe that there is a great social need for a 
public place within the fabric of the city that does not 
encourage the frenetic activity that is everywhere out-
side the private domain. A library could be this place. 
To study and engage in another reality, to browse in 
the bookstacks on the chance of uncovering something 
new, or just to sit in peace and comfort - these are 
simple luxuries which should be given a public place. I 
feel therefore that the role of the library is not just 
to make information easily accessible to the public, but 
to offer also a place where the learning, discovery, and 
imagination associated with experiencing these resources 
are allowed to flower.
"Light Program"

For both generating and evaluating the light in service to these ideas about the spirit of the library, the "light program" was used as the primary tool. A preliminary statement of the intended character and function of each element of space programs was made as a guide to more specific considerations about light qualities. These intentions appear also as part of the matrix as reasons behind the light specifications. Two documents follow. The first is a list of generic "light issues" and their "physical determinants". The second is the "light program" matrix which applies these issues to several of the important spaces in the building program. Images of light and spirit of place associated with these spaces, as well as a brief description of the use and desired qualities of each space appear also with the "light program" matrix.
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PHYSICAL DETERMINANTS</th>
</tr>
</thead>
</table>
| Amount of light needed for task  
"How many foot candles?"  
*(not tested) | .Size of light source  
.Shape of light source  
.Material of light source  
.Distance of working location from light source  
.Reflectance of interior walls/ceiling/floors  
.Reflectance of external surfaces |
| Views to outside through light source  
"What is the nature of the view? Active or disengaged?"  
"To whom is the view revealed? individual or collective?" | .Size of light source  
.Orientation of light source  
.Distance of light source from use area |
| Sunlight/diffuse light  
"How much of each?" | .Orientation of light source  
.Screening/shading devices  
.Material of transmitting membrane (glass, glass block, translucent panel) |
| Color of light  
"What kind?"  
*(not tested) | .Orientation of light source  
.Color of transmitting membrane  
.Color of reflecting surfaces inside and outside |
| Gradation of light from light source to use space  
"How much gradation?" | .Relationship of light source to walls; to floor; to ceiling  
.Depth of housing of light source  
.Reflectance of glazing bars; of housing of light source; of walls  
.Angle of housing of light source |
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PHYSICAL DETERMINANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniformity/accentuation of light in space &quot;To what degree?&quot;</td>
<td>Number of light sources</td>
</tr>
<tr>
<td></td>
<td>Location of light source(s)</td>
</tr>
<tr>
<td></td>
<td>Size of light source(s)</td>
</tr>
<tr>
<td></td>
<td>Reflectance of walls; floor; ceiling</td>
</tr>
<tr>
<td></td>
<td>Direction(s) from which light comes</td>
</tr>
<tr>
<td>Visibility of light source to user &quot;How and when visible?&quot;</td>
<td>Location of light source with respect to walls; ceiling</td>
</tr>
<tr>
<td></td>
<td>Location of light source with respect to direction of user movement</td>
</tr>
<tr>
<td>Light transition between interconnected spaces &quot;How continuous or distinct is the transition? Abrupt, dramatic, distinct, graded, or continuous?&quot;</td>
<td>Differential ambient brightness</td>
</tr>
<tr>
<td></td>
<td>Differential brightness of wall planes</td>
</tr>
<tr>
<td></td>
<td>Direction(s) from which light comes</td>
</tr>
<tr>
<td></td>
<td>Differences in ceiling and floor levels</td>
</tr>
<tr>
<td></td>
<td>Amount of wall definition between spaces</td>
</tr>
</tbody>
</table>
Images
Entry/Circulation

Entry/Exit
Waiting
Book check/information
Exhibits
Conversation

This zone provides the transition between the active and extroverted nature of the street and the quiet and more introverted nature of the library. On one level, it is a buffer between the two very different worlds. On another, it is a place of orientation and access to the book collection and other uses of the building.

The entry area is thus a kind of mixing chamber which contains in it elements of the different places which it brings together. It is also about movement and a process of selection.

Circulation or movement spaces in the building have similar transition functions, and can be considered in the same light as the entry zone.
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PROJECTED NEED</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of light</td>
<td>May range from 10 ft. -c to 500 ft. -c.</td>
<td>Zone of transition from bright outside to dim interior</td>
</tr>
<tr>
<td>Views to outside</td>
<td>Views of street diminish as user penetrates more deeply into building</td>
<td>Transition zone; needs gradual change of focus</td>
</tr>
<tr>
<td></td>
<td>Collectively experienced views</td>
<td>Most public part of building</td>
</tr>
<tr>
<td>Sunlight or diffuse light</td>
<td>Mixture of the two types; diffuse light more dominant deeper inside the building</td>
<td>This space is primarily movement-related, and does not need to support long-term visual concentration</td>
</tr>
<tr>
<td>Color of light</td>
<td>Mixture of warm and cool; cool colors predominate inside building</td>
<td>Transition from active zone to quiet, cerebral use place</td>
</tr>
<tr>
<td>Gradation of light from</td>
<td>Medium control, but avoid glare</td>
<td>Movement sequence should be punctuated with light to enliven and highlight the progression</td>
</tr>
<tr>
<td>light source to space</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uniformity/accentuation</td>
<td>Accent the control desk; create rhythm of movement</td>
<td>See above</td>
</tr>
<tr>
<td>LIGHT ISSUE</td>
<td>PROJECTED NEED</td>
<td>REASON</td>
</tr>
<tr>
<td>--------------------------</td>
<td>------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Visibility of light source</td>
<td>May be visible</td>
<td>Clarity of space</td>
</tr>
<tr>
<td>Light transition</td>
<td>Street to Entry: smooth</td>
<td>Adjustment of eye to change in light level: orientation</td>
</tr>
<tr>
<td></td>
<td>Entry to Stacks: smooth</td>
<td>Allow for possibility of easy flow of movement from street to stacks</td>
</tr>
<tr>
<td></td>
<td>Entry to Lounge: smooth/distinct</td>
<td>Part of public domain but not as active</td>
</tr>
<tr>
<td></td>
<td>Entry to Reference: distinct</td>
<td>Special place within a special place</td>
</tr>
</tbody>
</table>
Images
Bookstacks/Circulating Materials

Search for a specific book(s)
Search for books of a general topic
Non-directed browsing
Incidental reading and writing

The purpose of the bookstacks is to organize a relatively large collection of written material such that a specific book, author, or topic of information may be easily found by the library user. The open stack also permits the user to be casual or directed in his search, and to briefly use, or make choices about the books as he finds them. This process of selection demands a high degree of concentration on the part of the user, and the space should not provide other distractions.

Thus stacks must support simultaneously movement and pause, and should operate as a connective tissue between the major circulation system and specific places to be.
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PROJECTED NEED</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of light</td>
<td>40 to 60 ft. -c.</td>
<td>Visual task requirement</td>
</tr>
<tr>
<td>Views to outside</td>
<td>Disengaged</td>
<td>Emphasis on books</td>
</tr>
<tr>
<td>Sunlight/diffuse light</td>
<td>All diffuse</td>
<td>Visual task predominant</td>
</tr>
<tr>
<td>Color of light</td>
<td>Cool-ish</td>
<td>Clarity; cerebral task</td>
</tr>
<tr>
<td>Gradation of light</td>
<td>Maximum gradation</td>
<td>Reduce brightness differentials which would attract attention to light source</td>
</tr>
<tr>
<td>Uniformity/accentuation</td>
<td>Maximum uniformity of light from floor to ceiling; people and objects should not cast shadows</td>
<td>Visual task requirement</td>
</tr>
<tr>
<td>Visibility of light source</td>
<td>May be visible, but should not attract attention</td>
<td>Directness and simplicity of space use; light source is not meant to intrigue user</td>
</tr>
<tr>
<td>Light transition</td>
<td></td>
<td>Easy access to stacks</td>
</tr>
<tr>
<td></td>
<td>Bookstack to Entry/ Circulation: continuous/ graded</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bookstack to Carrels: graded/distinct</td>
<td>Privacy of carrels</td>
</tr>
<tr>
<td></td>
<td>Bookstack to Reference: distinct/dramatic</td>
<td>Distinguish borrowing function from in-house use</td>
</tr>
</tbody>
</table>
Carrels

Intensive reading
Intensive writing

The purpose of the carrel is to provide for a single person a place where needed materials are directly within reach. This enables the user to engage in long periods of uninterrupted work. The location and design of these carrel spaces should reinforce the highly individual and internalized nature of the activity; and also should provide connections to a larger context as a source of relief from intense concentration.
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PROJECTED NEED</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of light</td>
<td>50 ft. - c. +</td>
<td>Visual task requirement</td>
</tr>
<tr>
<td>Views to outside</td>
<td>Disengaged</td>
<td>Restful; connected to, without active engagement with, outside world</td>
</tr>
<tr>
<td></td>
<td>Carrel user controls view</td>
<td>Privacy of carrel</td>
</tr>
<tr>
<td>Sunlight/diffuse light</td>
<td>Diffuse light</td>
<td>Even lighting of reading surface</td>
</tr>
<tr>
<td>Color of light</td>
<td>Warmish</td>
<td>Sense of physical comfort</td>
</tr>
<tr>
<td>Gradation of light</td>
<td>Maximum</td>
<td>Avoidance of glare</td>
</tr>
<tr>
<td>Uniformity/accentuation</td>
<td>Desk surface should be evenly lit</td>
<td>To avoid visual fatigue or disturbance for long-term study</td>
</tr>
<tr>
<td>Visibility of light Source</td>
<td>Visible to carrel user and part of architecture of carrel</td>
<td>Carrel scaled to be one-person environment</td>
</tr>
<tr>
<td></td>
<td>Not completely visible from outside carrel enclosure</td>
<td></td>
</tr>
<tr>
<td>Light transition</td>
<td>Carrel to Bookstack: distinct/graded</td>
<td>Sense of separation with easy physical access</td>
</tr>
<tr>
<td></td>
<td>Carrel to Entry/ circulation: distinct</td>
<td>Carrel enclosure should contain its own light but may borrow light from circulation space</td>
</tr>
</tbody>
</table>
Images
Reference Area/Non-Circulating Materials

Quick information retrieval
Long term study and note-taking
Brief conservation

Since reference books are non-circulating, they are meant to provide a body of general information which is always available to the public. The idea is that these materials are a shared community resource: they are used exclusively in the library. The permanence of this collection gives the library its meaning as a public place. The coexistence of the individual and the group makes the reference area almost a paradigm of the whole building, and suggesting that it could serve as a core or centering point of the library building. The emphasis in this area, like in the carrel, is upon working with rather than looking for books. Yet this type of study place is significantly different from the carrel as it is a communal area where a number of people simultaneously use a variety of different materials. Therefore the problem is to satisfy the individuals' needs for concentration within a collective context.
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PROJECTED NEED</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of light</td>
<td>40 - 60 ft. -c.</td>
<td>Visual task requirement</td>
</tr>
<tr>
<td>Views to outside</td>
<td>Disengaged</td>
<td>Emphasis is on collectivity, centrality</td>
</tr>
<tr>
<td></td>
<td>Collectively experienced view</td>
<td></td>
</tr>
<tr>
<td>Sunlight/diffuse light</td>
<td>Mostly diffuse light; some sunlight is acceptable if it does not strike work surfaces</td>
<td>Must allow for maximum ease of vision, but sunlight may provide visual variety</td>
</tr>
<tr>
<td>Color of light</td>
<td>Warmish</td>
<td>Home-like; sense of physical comfort for long-term work</td>
</tr>
<tr>
<td>Gradation of light</td>
<td>Maximum</td>
<td>Avoid glare</td>
</tr>
<tr>
<td>Uniformity/accentuation</td>
<td>Uniformity desirable; no one spot accentuated</td>
<td>Emphasis on a collective and unifying light-form: the reference area is the &quot;heart&quot; of the library</td>
</tr>
<tr>
<td></td>
<td>Objects and people may cast shadows, but not on work surfaces or book shelves</td>
<td>Visual task requirement</td>
</tr>
<tr>
<td>LIGHT ISSUE</td>
<td>PROJECTED NEED</td>
<td>REASON</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Visibility of light Source</td>
<td>Visible from within space; concealed from view from without</td>
<td>As a microcosm of the whole library, the place explains itself from inside; and it has a sense of specialness from outside</td>
</tr>
<tr>
<td>Light transition</td>
<td>Reference to Entry/Circulation: distinct/dramatic</td>
<td>Sense of specialness needs emphasis to induce quiet, greatest need for quiet in collective work area</td>
</tr>
<tr>
<td></td>
<td>Reference to Bookstack: graded</td>
<td>Stacks are a kind of outgrowth of the reference area</td>
</tr>
</tbody>
</table>
Images
Periodical Lounge

Casual reading or writing
Time-killing/milling about
Conversation
Smoking
Napping

This is the area of the lowest need for internal concentration, and where possibilities for interaction among users is the greatest. This space in the library functions also as a "public living room". It may offer a warm and comfortable place to sit for elderly or indigent persons; it may be a quiet lunch-hour place of refuge for a working person; or a casual meeting place for teenagers who use the library for their school work. Comfort, cheerfulness and variety of experience are desirable qualities of this space.
<table>
<thead>
<tr>
<th>LIGHT ISSUE</th>
<th>PROJECTED NEED</th>
<th>REASON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of light</td>
<td>20 - 500 ft. -c.</td>
<td>Casual, variety of needs</td>
</tr>
<tr>
<td>Views to outside</td>
<td>Medium engagement</td>
<td>Low requirement for individual concentration</td>
</tr>
<tr>
<td></td>
<td>Collective and individual views</td>
<td>Variety of activities</td>
</tr>
<tr>
<td>Sunlight/diffuse light</td>
<td>Mostly diffuse light; some sunny areas</td>
<td>Range of activities; primarily reading; cheerful, relaxed and varied atmosphere</td>
</tr>
<tr>
<td>Color of light</td>
<td>Warm</td>
<td>Cheerful</td>
</tr>
<tr>
<td>Gradation of light</td>
<td>Full range</td>
<td>Casual, differentiated use-space</td>
</tr>
<tr>
<td>Uniformity/accentuation</td>
<td>Some accent given to sitting places along edge within a generally bright field</td>
<td>Strong light connection between outdoor space</td>
</tr>
<tr>
<td>Visibility of light source to user</td>
<td>Visible from within and from without</td>
<td>A place of strong connections to outdoor space; and an open, inviting place within library building</td>
</tr>
<tr>
<td>Light transition</td>
<td>Lounge to Garden: graded/continuous</td>
<td>Indoor extension of garden</td>
</tr>
<tr>
<td></td>
<td>Lounge to Entry: graded</td>
<td>Casual public use; but needs some distinction</td>
</tr>
</tbody>
</table>
Images
The purpose of this area is to provide an outdoor room for casual use in warm weather, as well as a kind of serene view-place for the building from the inside. To be used for reading it must be furnished with reading places sheltered from the direct sun. These may be simple, as a bench beneath a tree; or they could be actual built structures like a gazebo. However, since the choice to read outside also implies a wish to engage somehow with the natural environment, the form and quality of the place should not entirely exclude the possibilities of experiencing changes in the weather.

A balance of connectedness with a larger context and a sense of containment is important to maintain. (Since the use and form requirements are so varied and casual, the light program issues cannot apply.)
Design
This chapter is a presentation of the final design of the library. It represents the last phase in a process of design and evaluation which is documented in the last chapter. The first part of this chapter - "Site and Building Organization" - includes diagrams and drawings showing the schematic light and architectural design of the building as a whole. The second part focuses on three of the important library spaces: the main space which contains the Book Stacks, Reference Area and some circulation zones; the first floor edge condition which is made up of a series of three to four person reading alcoves; and the second floor edge condition which houses the individual study carrels. These spaces are described by photographs of light models and large scale partial sections and/or plans and elevations.
Main Space:
Reference Area, Bookstacks, Circulation
North, Northeast, Northwest Light

direct sunlight.

2. Detail of skylights.

3. View from Children's wing.

4. View into Reference Area from Entry.

5. View across Reference Area toward Entry.

6. View from second floor.

7. View into Reference Area.
Inhabited Edge: Reading Alcoyes
Inhabited Edge: Carrels
Enclosure Studies

Street Elevation
Garden Elevation
Design Process and Evaluation
This chapter presents the development of the library design through sketches, notes, and photographs of early lighting models. The first part includes several early lighting and organizational concepts. The second part is a documentation of the first scheme which was partially explored in models. Sketch-plans and sections show the lighting and architectural scheme. Photographs of the models are accompanied by evaluation comments which are based on the "light program" criteria. Redesign sketches follow these comments; and in some cases these sketches themselves are taken into models and again evaluated.
Early Organizational and Lighting Strategies
Light Axis: directional

Light Axis
Massing Model

First Modelled Scheme

Light Layers
SKETCH-PLANS AND SECTION
Reference and Bookstacks

Detail of Skylight

View into Reference from Entry

Key Section
EVALUATION

Bookstacks:
- not enough light
- brightness differential too great between central space and bookstack and outer wall and bookstacks
- sense of enclosure too strong; not enough view to outside

Reference Area:
- gradation of light between light source and space too abrupt
- skylight has too strong an accent in space
- light transition from Entry to Reference too abrupt; not enough continuity with entry sequence

Conclusions:
- form of central skylight is too strong and too singular: needs to be broken down
- light should be spread more evenly into adjacent spaces: increase plan dimension of skylight; soften edges where planes intersect
Carrels:
-not enough control of direct sunlight coming in through view window which is only light source
-too strong a distinction between carrel and adjacent space

Reading Alcoves:
-not enough light in alcove
-too strong a distinction between alcoves and adjacent space

Conclusions:
-indirect lighting of inner surface of exterior wall does not succeed in reflecting light deeply into bookstacks; inappropriate focus on wall results in intensified feeling of enclosure; need more views to the outside, and more side light directly illuminating space
-light shaft does not draw enough light down to first floor: make two different conditions on different floors.

Problem: to introduce side light with controlled sunlight and controlled views into building
EVALUATION

Carrels:
- direct sunlight not properly controlled
- scoop does not reflect enough light back onto carrels
- scoop does not conduct light smoothly into bookstacks

Reading Alcoves:
- not enough distinction between alcoves and adjacent space
- not enough light inside alcoves

Conclusions:
- windows above carrels need horizontal screens to control south sun light and to deflect light onto surface of light scoop
- vertical screens on outside help to control east light
- increase depth of alcove; and increase size of its light source
REDESIGN SKETCHES
NATURAL LIGHT


LIBRARY DESIGN


GENERAL


11. Jellico, p. 146
12. Iwamiya and Itoh, p. 56.