

A photograph of a library bookshelf. The top shelf is filled with books. The middle shelf is mostly empty, with a few books on the left and right sides. The bottom shelf is also filled with books. The title 'How Glare Stacks Up' is overlaid in yellow text across the middle shelf.

How Glare Stacks Up

Leaders: Alison Kwok, Jon Meendering, Mike Kroelinger

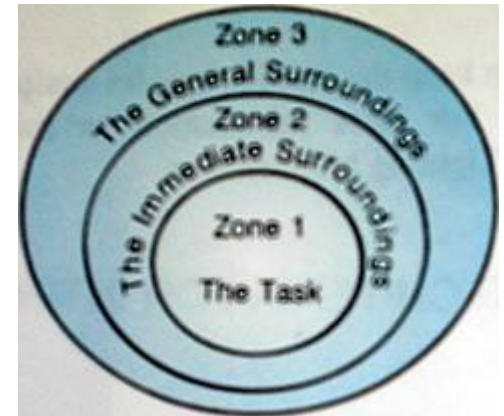
Team: Linda Howard, Mandy Martineau,
Nick Reisen, Jonee Kulman Brigham



- Direct glare is a common concern in daylight spaces where reading tasks are performed
- The IESNA Handbook 9th edition, design guide lists direct glare as a “very important” concern for reading stack areas
- Initial observations of team showed instances of direct and reflected glare in 5th floor stack areas on the south side of the library

Hypothesis

“Stacks in direct sunlight exhibit more conditions associated with glare than those out of direct sunlight.”



- The conditions associated with glare are studied through a short occupant survey and measurement of luminance contrast ratios between the task and its immediate and general surroundings.
- IESNA recommends that the maximum luminance ratio between tasks and immediate surroundings is no greater than 1:5. The ratio between tasks and overall surroundings should be no greater than 1:10.

Methodology

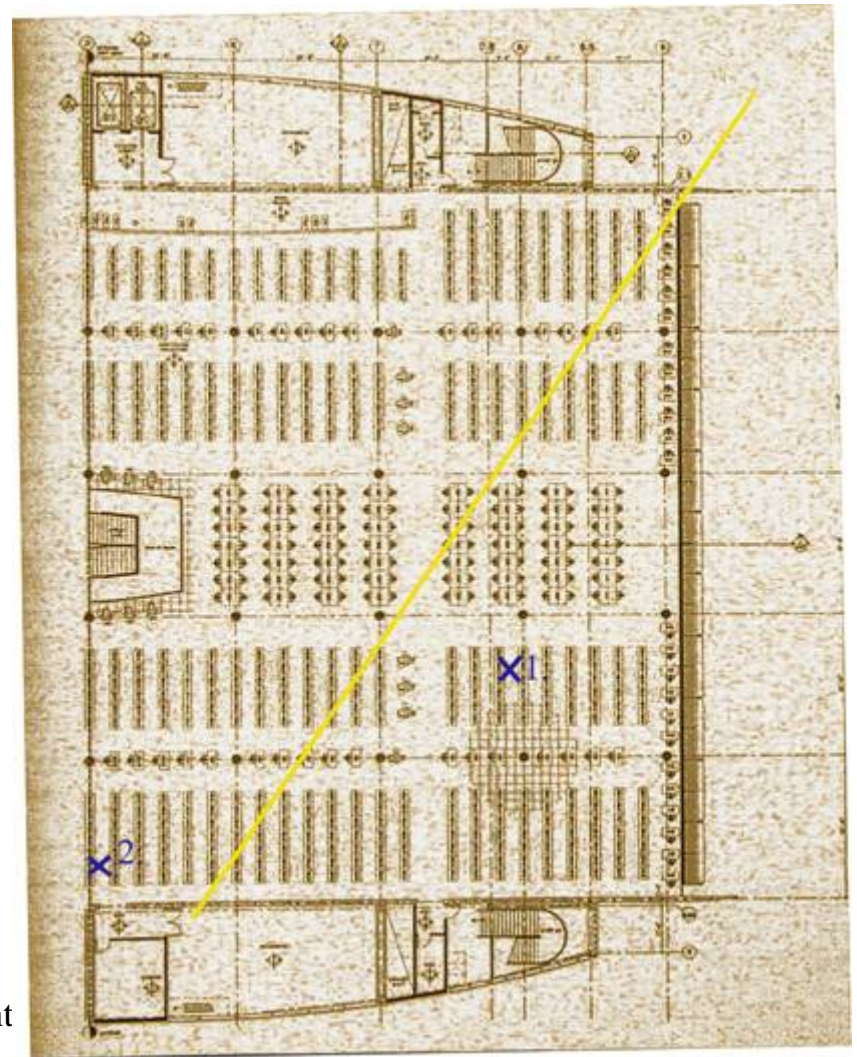
Time of testing: 10:30 to 12:00 am,
January 9, 2004

Test Locations:

#1 south facing stack, several rows
in from south wall with direct
sun patches

#2 north facing stack, at center of
library with no direct sun

- Electric lights on in both locations
- 2 sections of stack length
- Observer position at midpoint of 2 sections, standing against opposite stack



Methodology

Task Objects:

Book #1 Grey Matte binding with
blue Title

Book #2 Black Binding with
white text, under shiny cover

Placement:

4th shelf up, mid shelf

Location 1: to the right, in direct
sun

Location 2: to the left (no direct
sun)



Methodology

Survey:

- 5 participants
- 2 males, 3 females;
2 from AoC, 3
from the Public
- Age ranges:14-
mature
- Randomly selected
- Answered
questions read to
them



Methodology

Luminance Readings:

- Minolta LS 100 1 degree luminance meter
- Taken from occupant view point
- Hi,lo readings taken for each task book
- 3 measurements taken for each shelf, minimum 36 readings at each stack
- Random variety of types of bindings (dark, light, reflective, matte)

Methodology

Illuminance Readings:

- Taken in order to eliminate the book binder material reflectance value disparity.
- Illuminance measured using the EXTECH Datalogging Light Meter.
- Taken at same points as luminance.



Survey Part I. (Direct Sun)

Bookstand 1

1. Please read the titles of the books labeled with blue tape and rate the following:

Ease of legibility. (Circle one for each)							
Book 1	Easy	1	2	3	4	5	Difficult
Book 2		1	2	3	4	5	
Level of physical comfort:							
Book 1	Uncomfortable	1	2	3	4	5	Comfortable
Book 2		1	2	3	4	5	

2. Now considering the view of the bookshelf in front of you, rate the following. (Circle one for each)

a. Brightness Levels	1	2	3	4	5
	Not Bright Enough	Adequate			Too Bright
b., Light Contrast Levels	1	2	3	4	5
	Not Enough Contrast	Adequate			Too Bright

Survey Part II. (No-direct sun)

Bookstand 2

1. Please read the titles of the books labeled with blue tape and rate the following:

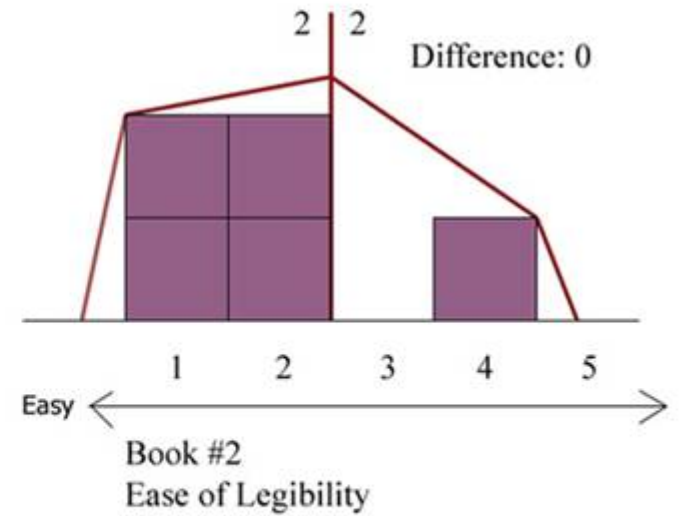
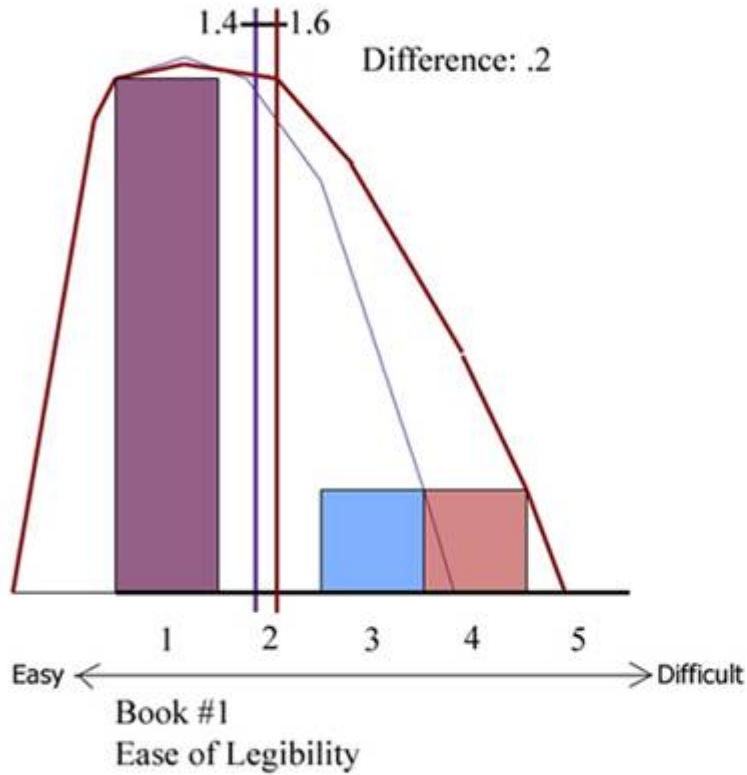
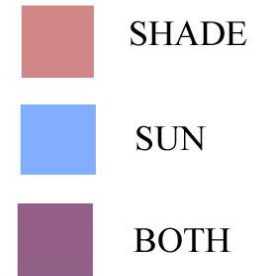
Ease of legibility. (Circle one for each)							
Book 1	Easy	1	2	3	4	5	Difficult
Book 2		1	2	3	4	5	
Level of physical comfort:							
Book 1	Uncomfortable	1	2	3	4	5	Comfortable
Book 2		1	2	3	4	5	

2. Now considering the view of the bookshelf in front of you, rate the following. (Circle one for each)

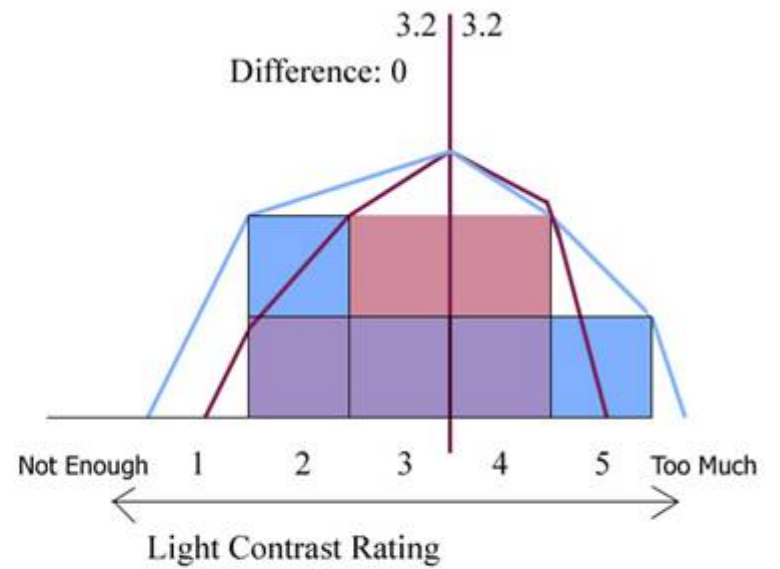
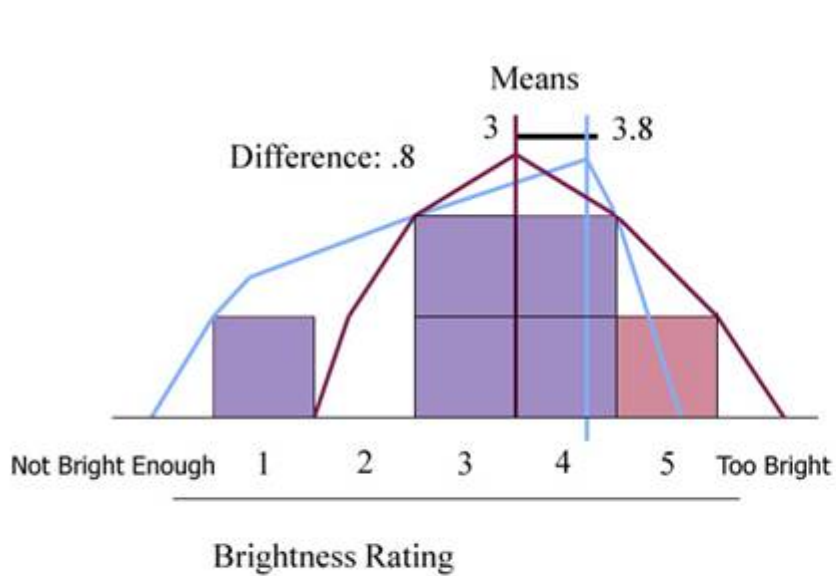
a. Brightness Levels	1	2	3	4	5
	Not Bright Enough		Adequate		Too Bright

b., Light Contrast Levels	1	2	3	4	5
	Not Enough Contrast		Adequate		Too Bright

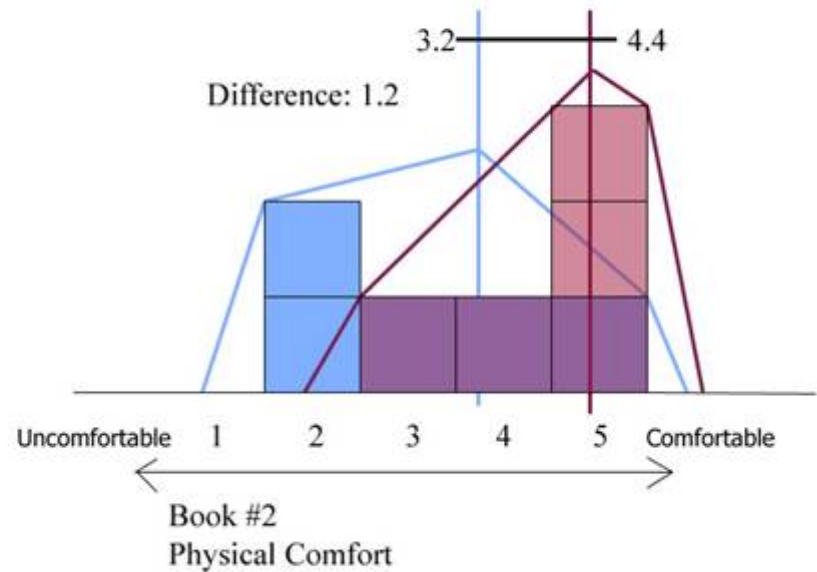
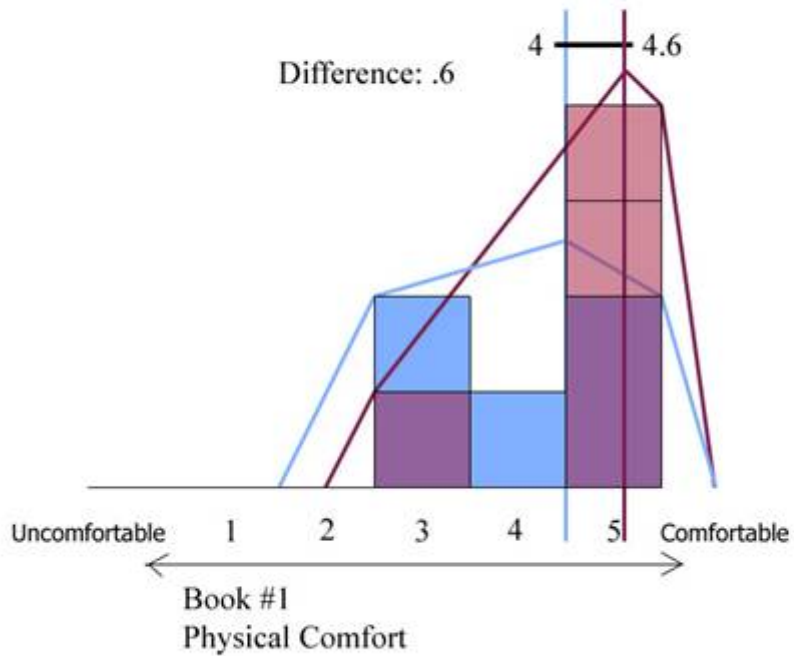
Results



Results



Results



Location #1:
(Direct Sun)

Ratio of
task to immediate
surroundings

Max:

1:2; 1:2.3

Min:

1:0.2; 1:0.25

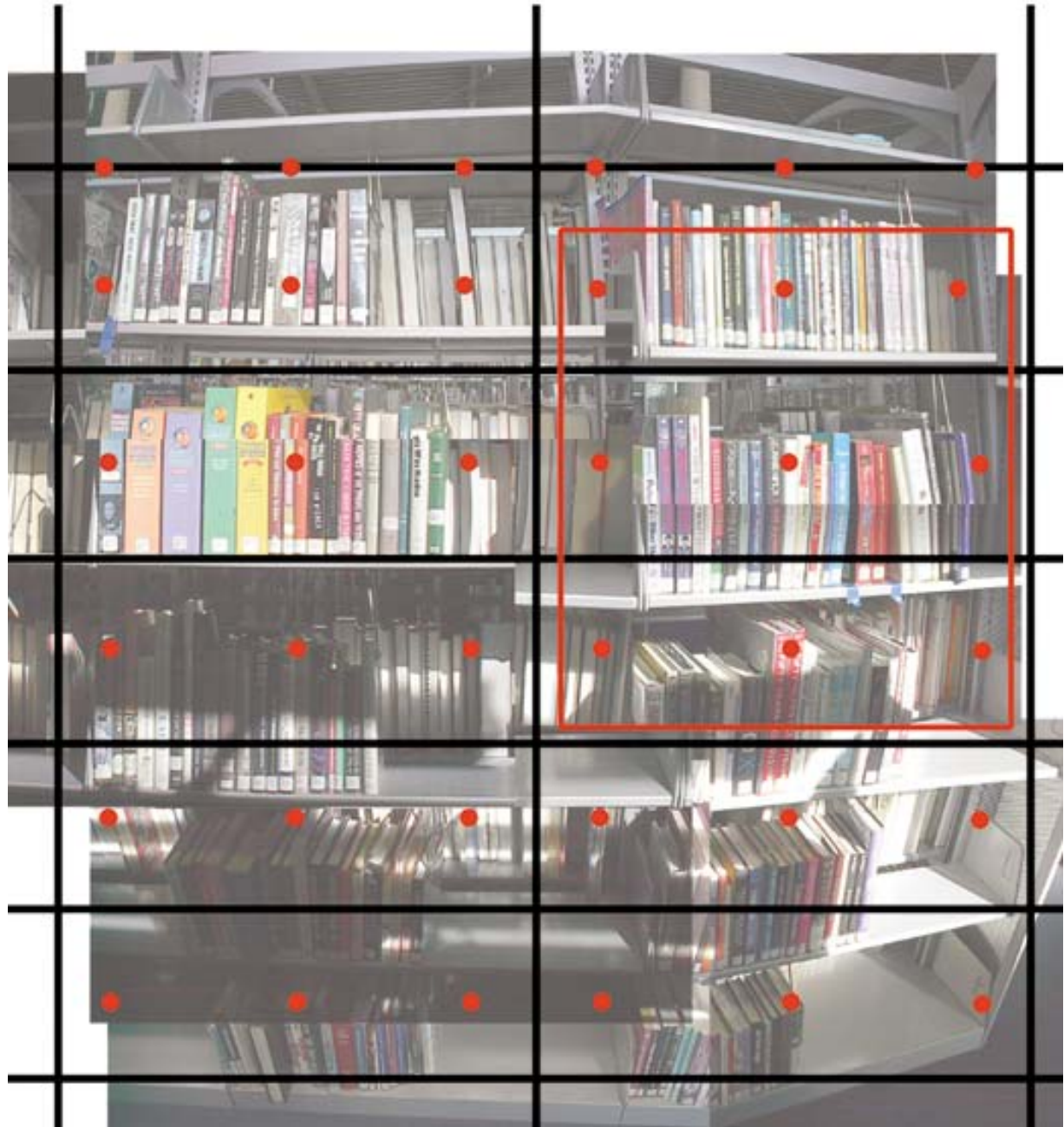
Overall:

Max:

1:50; 1:59

Min:

1:0.6; 1:0.3



Location #2:
(No-direct sun)

Ratio of task to
immediate
surroundings

Max:

1:5; 1:8

Min:

1: 0.3; 1:0.6

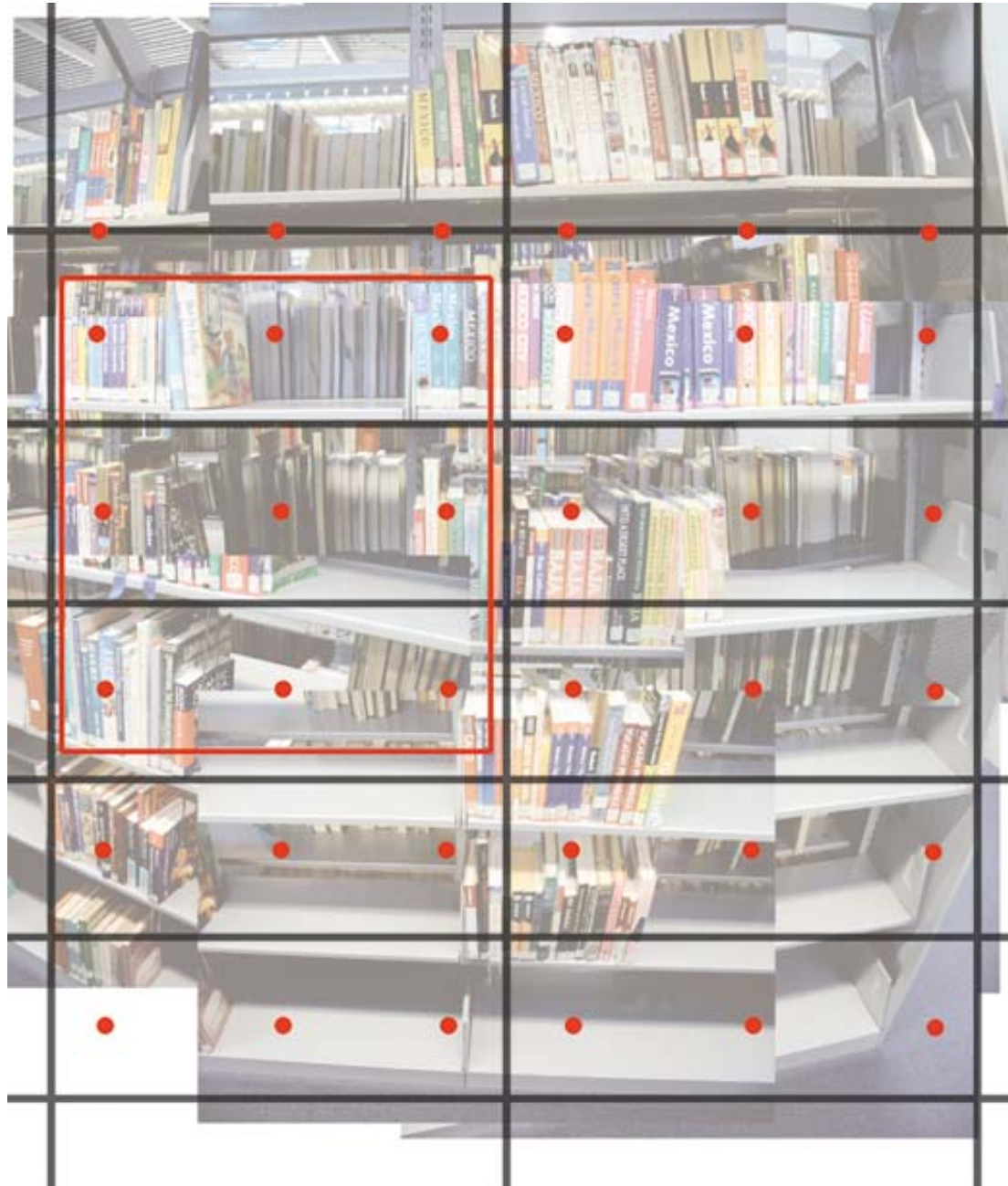
Overall:

Max:

1:6; 1:4

Min:

1:0.6; 1:0.3



Conclusions

- **Survey Conclusions:** Between the direct sun and no-direct sun location, we found that issues of legibility and light contrast were not statistically significant. However, issues of brightness and physical (visual) comfort did show a significant difference between the two groups. That difference is that the interviewees felt that the direct sun presented more of a problem with brightness and was less visually comfortable.
- **Measurement Conclusions:** In the direct sun luminance and illuminance readings point to ratios outside of recommendations for both the immediate and overall surroundings.

Limitations

- Limited number of survey participants.
- Study only reflects condition in stacks at one point in time.
- Light conditions varied at location X-1 during the period of data collection.
- Luminance readings varied partly because of different reflectance values of book covers.



BOOK ENDS