LIGHTING OBSERVATION STUDY

learning objectives and outcomes

OBJECTIVES

This is an investigation in analyzing and documenting the lighting qualities of an existing space both aesthetically and functionally. Students will learn to operate a light meter and evaluate empirical data to form educated opinions and offer solutions to existing problems. This assignment is a way to introduce awareness of the luminous environment and begin practicing vocabulary, measurement tools and graphic representation conventions necessary to investigate the interaction between light and space. This exercise could be used as a stand alone activity or to inform studio projects where lighting will be a prominent component of the design aesthetic.

TASK ONE

- INTERACT - with spatial environments on more than an architectural level
- OBSERVE - how light not only reveals architecture but affects our experiences with space

TASK TWO

- DOCUMENT - empirical data to form well-supported opinions based on fact
- ANALYZE - the synthesis of experiential observation and data collection to determine common threads between light and experience
- CONCLUDE - use lighting vocabulary and data analysis to form well-supported opinions and offer grounded solutions to problems

EDUCATORS NOTE- the above project is broken into three distinct task options to allow for different levels of engagement with the problem. An Addendum is provided showing additional ways to graphically present lighting quality.

ASSIGNMENT

Your assignment is to conduct an on site evaluation of the lighting design for an existing space located within an on-campus building. Special attention should be placed on lightings purpose in revealing, accenting and defining space as well as its importance and role in how people experience and interact within the environment.

TASK ONE: space selection and preliminary observation

Select a building in which daylight plays an important role in illuminating the space. In selecting the space for your analysis, you should consider both the aesthetic relevance of the lighting scheme as well as the functional uses of the space over the course of the day and week. The idea is to carefully select a space that will provide a variety of lighting needs and opportunities throughout the day. Evening activities will require well-conceived and implemented electric lighting designs and should be noted and examined throughout your investigation.

1. Floor plan identifying architectural features, layout of space and circulation.
2. Reflected ceiling plan identifying electric lighting components and spatial use patterns.

TASK TWO: lighting analysis

Your analysis will assess both the measured light level across the space and the visual quality of the luminous environment created during the day and in the evening. Three kinds of data will be collected related to space lighting performance including but not limited to:

1. Floor plan showing illumination levels recorded within a determined grid.
2. Lighting analysis chart assessing quantity, quality and success of lighting.

TASK THREE: summary and conclusions

The information collected should be assembled, documented in a professional manner and conclusions should be drawn as to the successes and weaknesses of the lighting scheme. Weaknesses should be discussed and alternative solutions should be proposed for the increased success and quality of the lighting scheme.

1. Summary of observations and analysis
2. Conclusions and recommendations

TASK ONE

space selection and preliminary observation

SPACE SELECTION

Select a space in a building in which daylight plays an important role in illuminating the space. In selecting the space for your analysis, you should consider both the aesthetic relevance of the lighting scheme as well as the functional uses of the space over the course of the day and week. The idea is to carefully select a space that will provide a variety of lighting needs and opportunities throughout the day. Evening activities will require well-conceived and implemented electric lighting designs and should be noted and examined throughout your investigation. The preliminary investigation of the two proposed spaces will be reviewed to select the one that best fits the learning objectives and goals of this assignment.

SPACE 1: engineering building lobby

The proposed site is a lobby space located within the university's Engineering building. The space serves as a transition corridor between two distinct architectural portions of the building and not only provides necessary circulation space but also supplies zones for social and academic gathering. It is utilized primarily during the daylight hours and as such relies heavily on daylight to supply illumination to the space. See further documentation provided below.



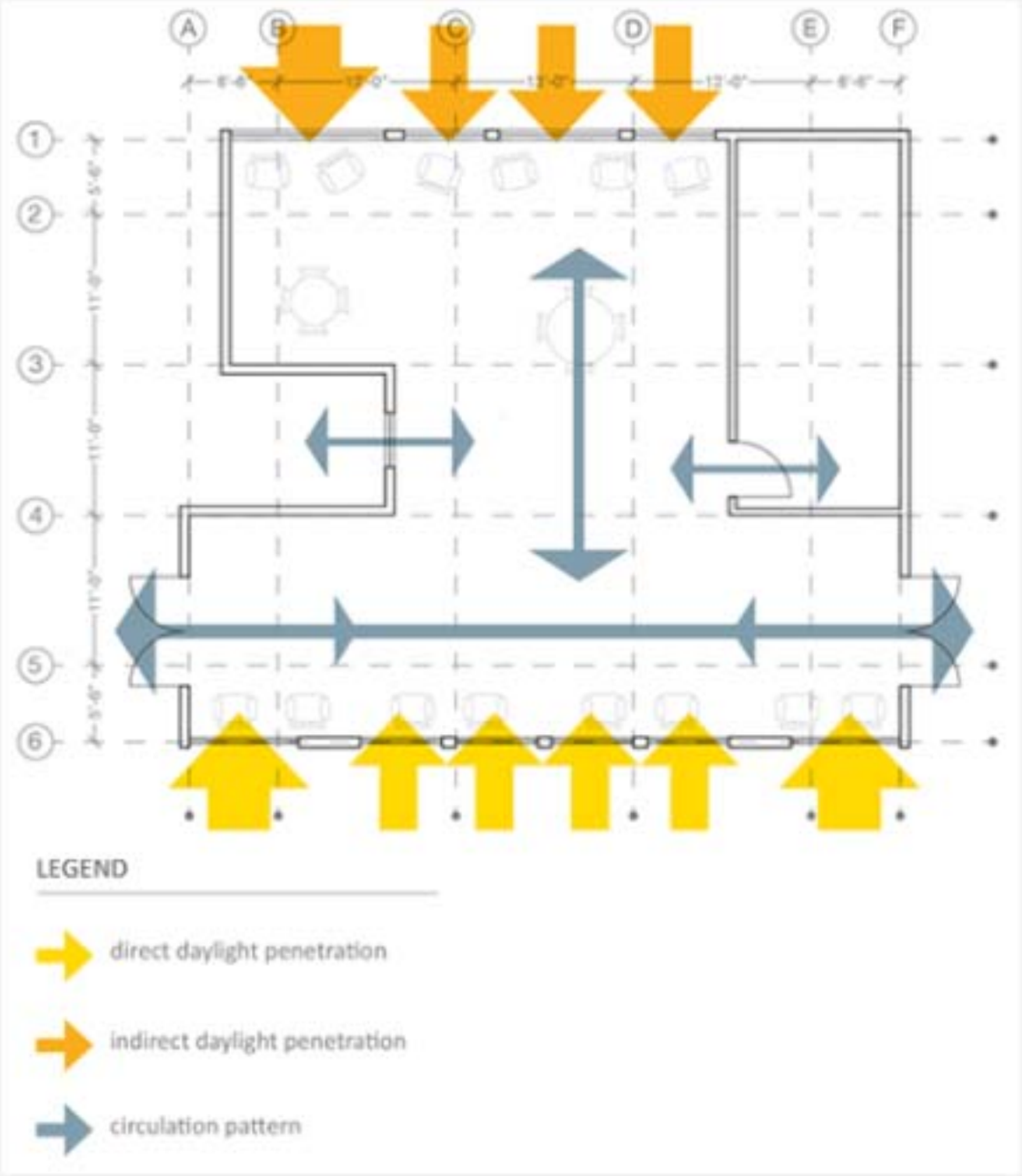


SPACE 2: psychology building lobby

The second proposed site is also a lobby space located within the university's Psychology building. Similar to the first site, the space is a welcome corridor that serves not only a circulation purpose but also a social one. With increased attention placed on architectural aesthetic, this space at the base of an atrium provides daylight from above and pays additional attention to supplemental electric lighting supply due to its daytime and nighttime use patterns. See further documentation provided below.





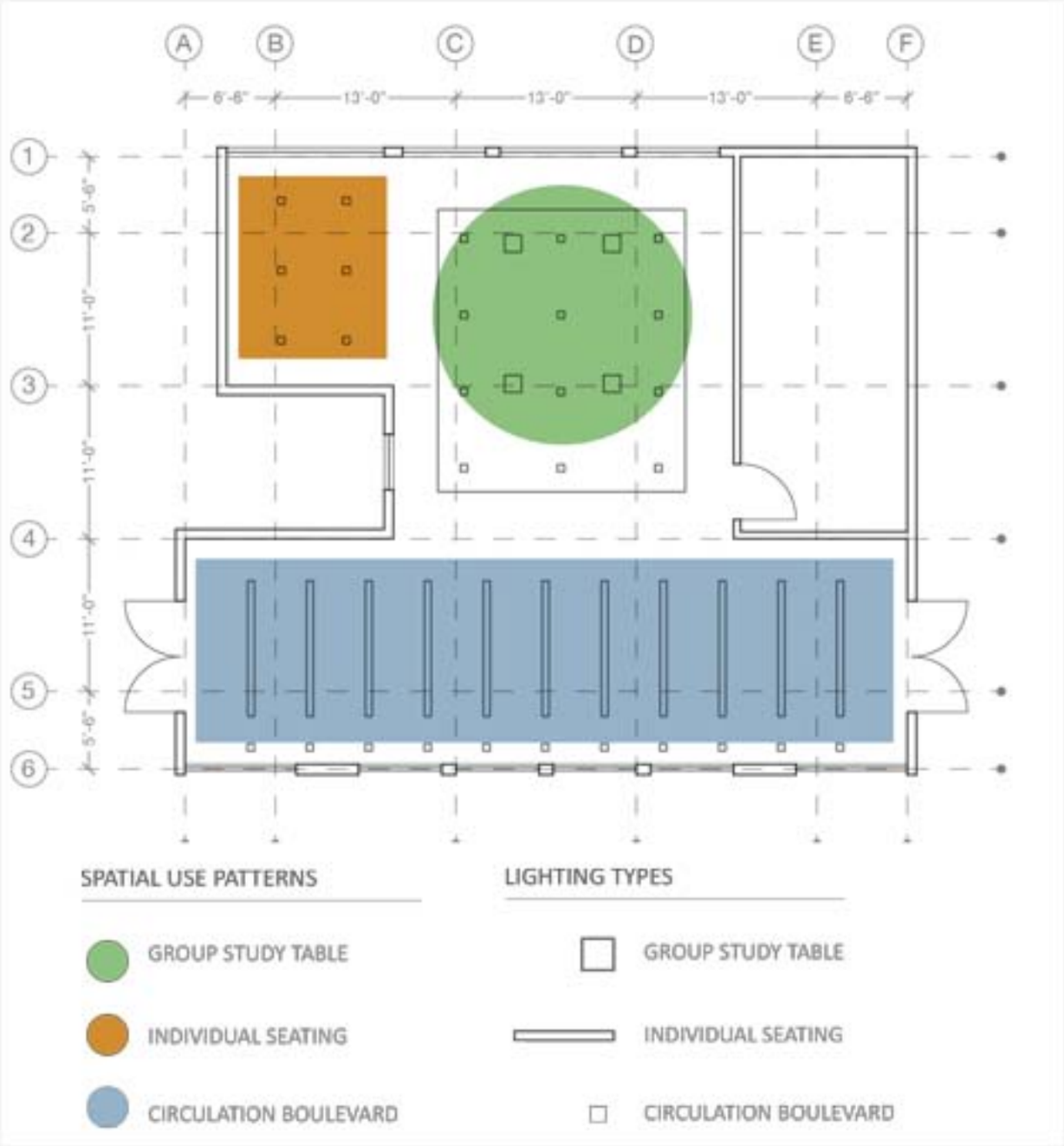


Floor plan identifying architectural features, layout of space and circulation.
—add north arrow and scale

- **BUILDING:** ENGINEERING
- **SPACE TYPOLOGY:** LOBBY
- **DATE OF ANALYSIS:** 10-15-2010
- **TIME OF ANALYSIS:** 6:00 PM
- **PRIMARY FUNCTION:** CIRCULATION
- **SECONDARY FUNCTION:** GATHERING–STUDYING

PRELIMINARY OBSERVATIONS

- Preliminary observations reveal a variety of daylight and electric lighting strategies.
- The space is primarily utilized throughout the day and this relies heavily on daylight from the two perpendicular window walls that border the northern and southern facades.
- The space feels academic and cold suggesting a transitory nature to its habitation.
- As indicated in the diagram to the left, the strongest flow of traffic is a direct east west path of travel with little occupation of the seating areas.
- Light levels appear to vary greatly and will be discussed further after light meter data is collected.



Reflected ceiling plan including electrical lighting components and spatial use patterns

DAYLIGHTING OBSERVATIONS

- A great deal of daylight floods the space from the north and south facing window walls.
- Daylight provides the highest percentage of illumination to the space but also creates a dramatic gradient of light wash as we move to the center of the room.
- Aesthetically, the window walls provide ample light to the space but are more of a visual move to keep the exterior of the building reading as if it was two smaller buildings. this keeps more within the architectural context of the university as a whole.

ELECTRIC LIGHTING OBSERVATIONS

- The lobby is utilized primarily during daylight hours and thus electric lighting predominantly serves to define spatial use patterns then to add necessary illumination.
- The space is primarily utilized for east-west circulation; a series of linear fluorescent lighting has been added to define the main circulation boulevard.
- Located in the study area are a series of recessed downlights and surface mounted pendant lighting elements are used to define the geographic positioning of the furniture layout below.
- Electric lighting elements do not appear to be aesthetically integrated into the space.

repeat observations for space two

TASK TWO
lighting analysis

Your analysis will assess both the measured light level across the space and the visual quality of the luminous environment created during the day and evening hours. You will be responsible for collecting three kinds of data related to the space lighting performance and to draw comparative conclusions from the data and observations assembled.

FLOOR PLAN WITH ILLUMINANCE GRID

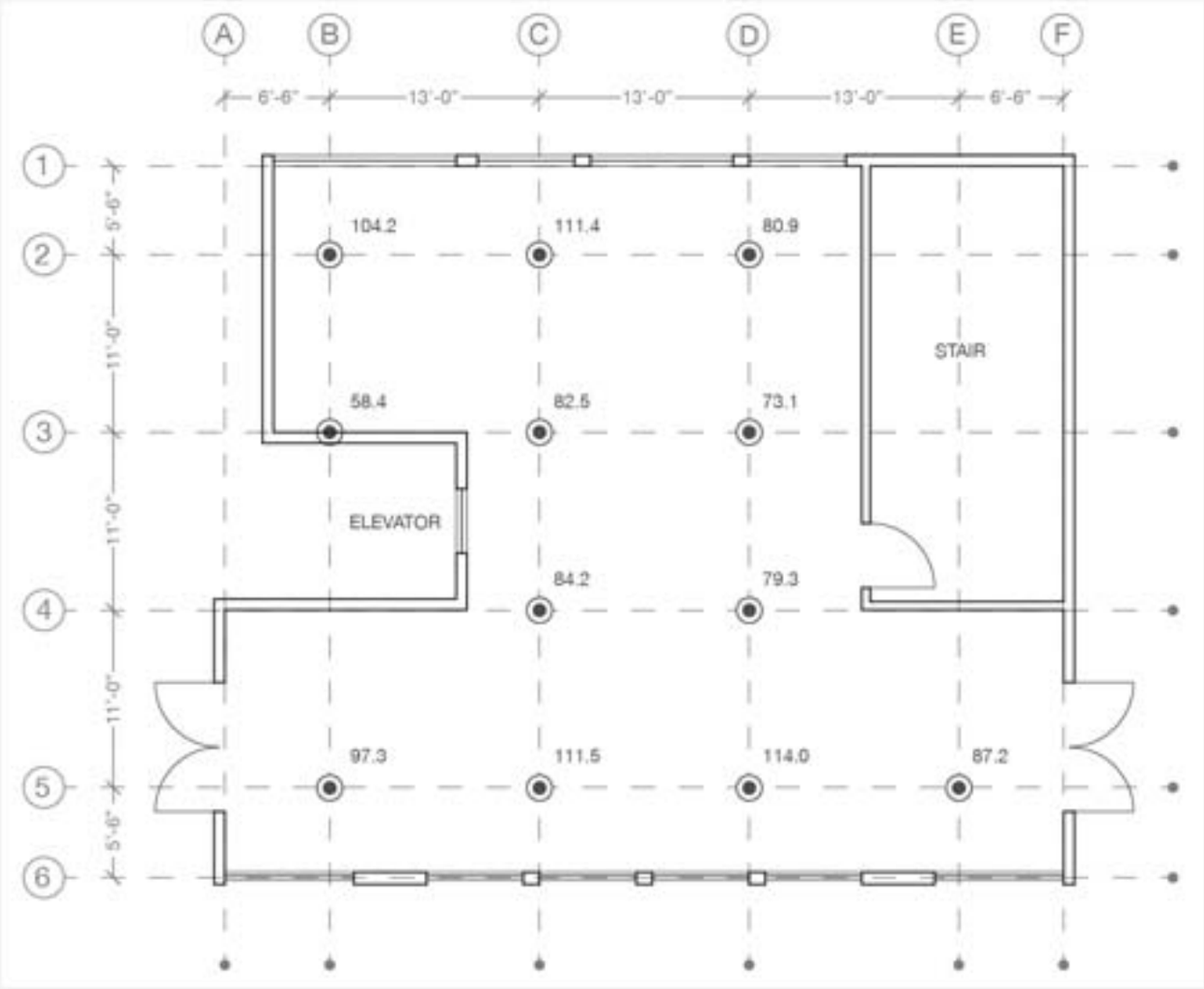
Create a data collection plan that will be used to gather and record your observations and critical light lumen level readings. You will be required to not only express your opinion of the lighting experience within the space but to utilize a hand held light meter to gather data points for critical analysis. In order to do so a few parameters must be established.

- Illumination grid with a minimum of three points in each direction - select height of measurements based on primary uses
- Points should be evenly spaced but can vary in the "x" and "y" direction (see example below)

LIGHTING ANALYSIS CHART

Create a chart will be used to gather and record your observations and illuminance readings. Assess lighting quality as well as quantity, making connections between these to establish a success rate for the lighting installation.

- Light meter results should be compared to zoning diagrams, overall aesthetic appearance and visual experience.



Daytime with Clear Sky

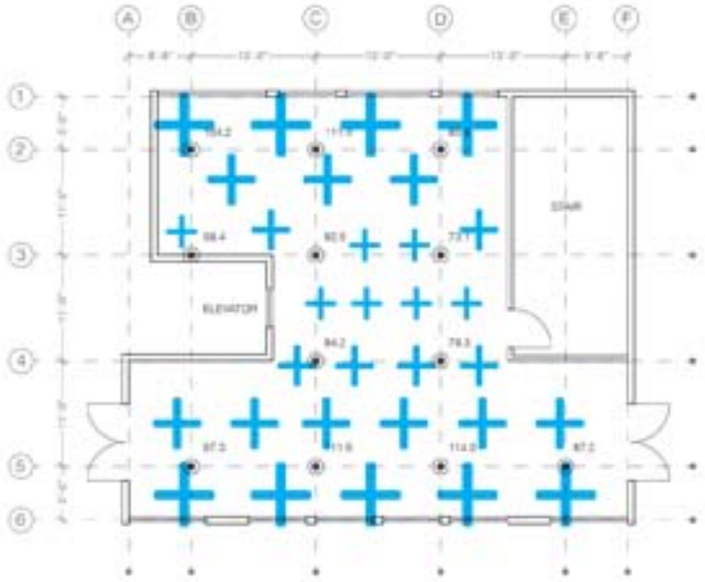
- **BUILDING:** ENGINEERING
- **SPACE TYPOLOGY:** LOBBY
- **DATE OF ANALYSIS:** 10-15-2010
- **TIME OF ANALYSIS:** 4:00 PM
- **PRIMARY FUNCTION:** CIRCULATION
- **SECONDARY FUNCTION:** GATHERING–STUDYING

LEGEND

LOCATION OF ILLUMINANCE METER READING
UNITS = FOOTCANDLES (LUMENS/SQ.FT.)
MEASUREMENTS TAKEN AT 36" ABOVE FLOOR

LIGHT METER DATA ANALYSIS CHART

GRID LOCATION	LIGHTING LEVELS IN FC						LIGHT PURPOSE		SUCCESS	SPAT IAL USE PATTERN
	A	B	C	D	E	F	FUNCTIONAL	AESTHETIC	RATE 1 - 10	
1	NA	NA	NA	NA	NA	NA	YES	NO	7	NA
2	NA	104.2	111.4	80.9	NA	NA	YES	NO	7	INDIVIDUAL STUDY
3	NA	58.4	82.5	72.1	NA	NA	YES	YES	7	GROUP STUDY
4	NA	NA	84.2	70.3	NA	NA	YES	YES	7	GROUP STUDY
5	NA	97.3	111.5	114.0	87.2	NA	YES	NO	7	CIRCULATION
6	NA	NA	NA	NA	NA	NA	YES	NO	7	NA



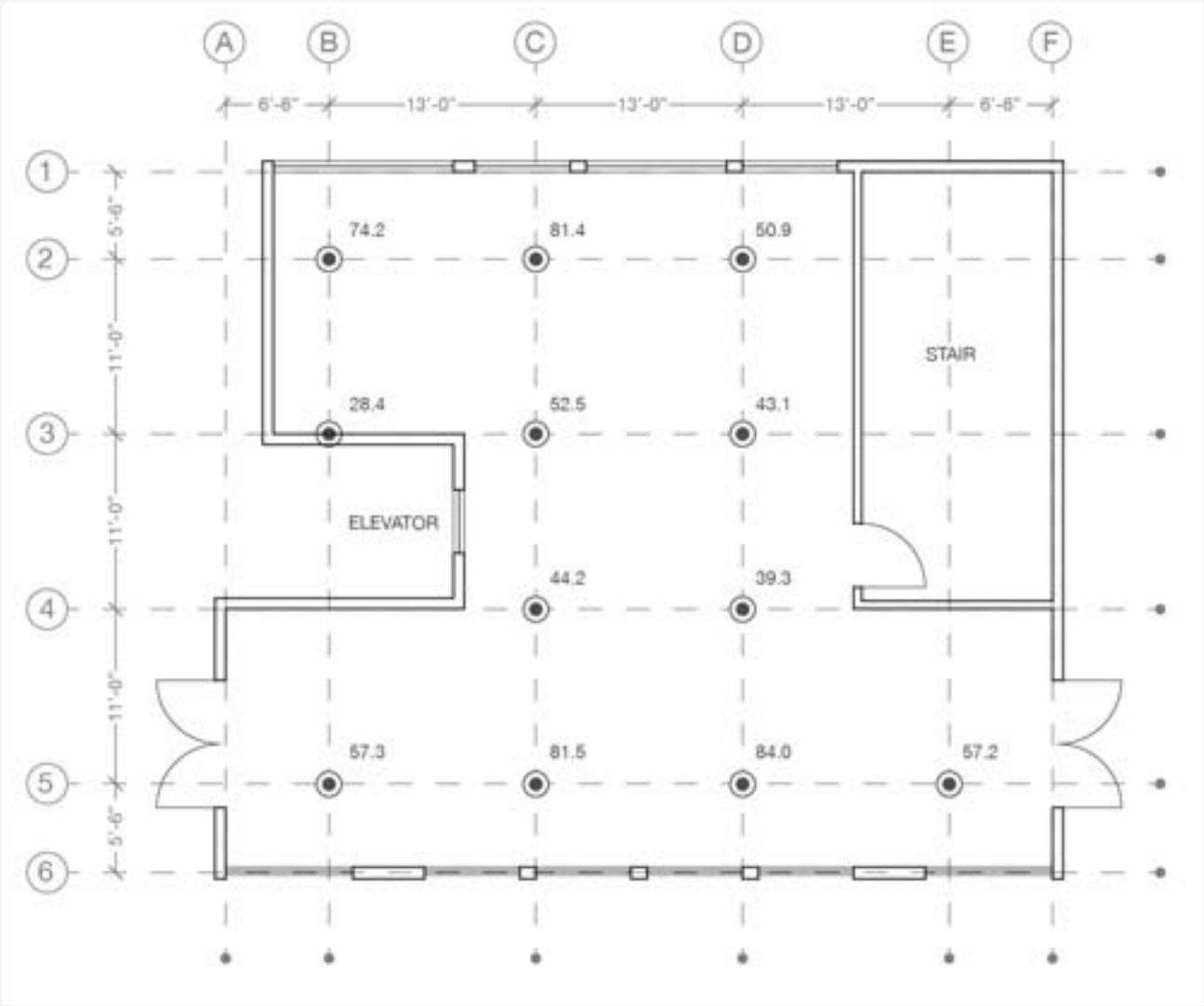
LIGHTING DESIGN SUCCESS

functional and aesthetic

functional or aesthetic

neither

Daytime with Clear Sky



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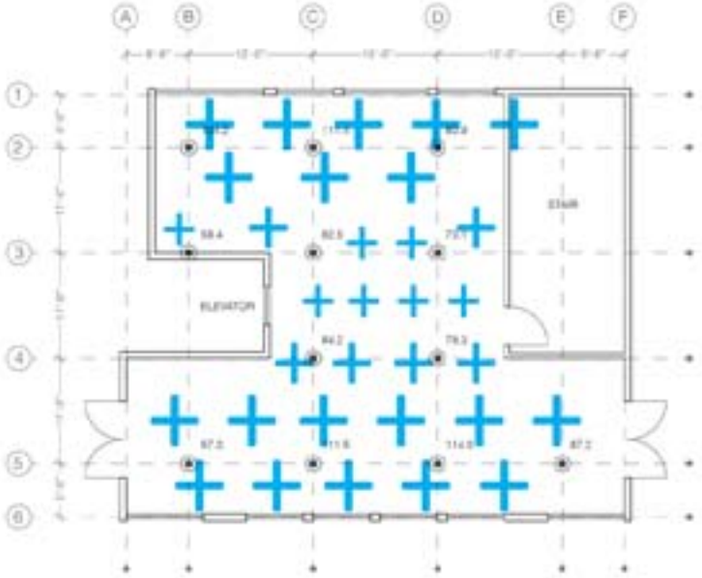
LEGEND

LOCATION OF ILLUMINANCE METER READING
UNITS = FOOTCANDLES (LUMENS/SQ.FT.)
MEASUREMENTS TAKEN AT 36" ABOVE FLOOR

Daytime with Overcast Sky

LIGHT METER DATA ANALYSIS CHART

GRID LOCATION	LIGHTING LEVELS IN FC						LIGHT PURPOSE		SUCCESS	SPATIAL USE PATTERN
	A	B	C	D	E	F	FUNCTIONAL	AESTHETIC	RATE 1 - 10	
1	NA	NA	NA	NA	NA	NA	YES	NO		NA
2	NA	74.2	81.4	50.9	NA	NA	YES	NO	7	INDIVIDUAL STUDY
3	NA	29.4	52.5	43.1	NA	NA	YES	YES	5	GROUP STUDY
4	NA	NA	44.2	39.3	NA	NA	YES	YES	5	GROUP STUDY
5	NA	67.3	81.5	84.0	57.2	NA	YES	NO	7	CIRCULATION
6	NA	NA	NA	NA	NA	NA	YES	NO		NA



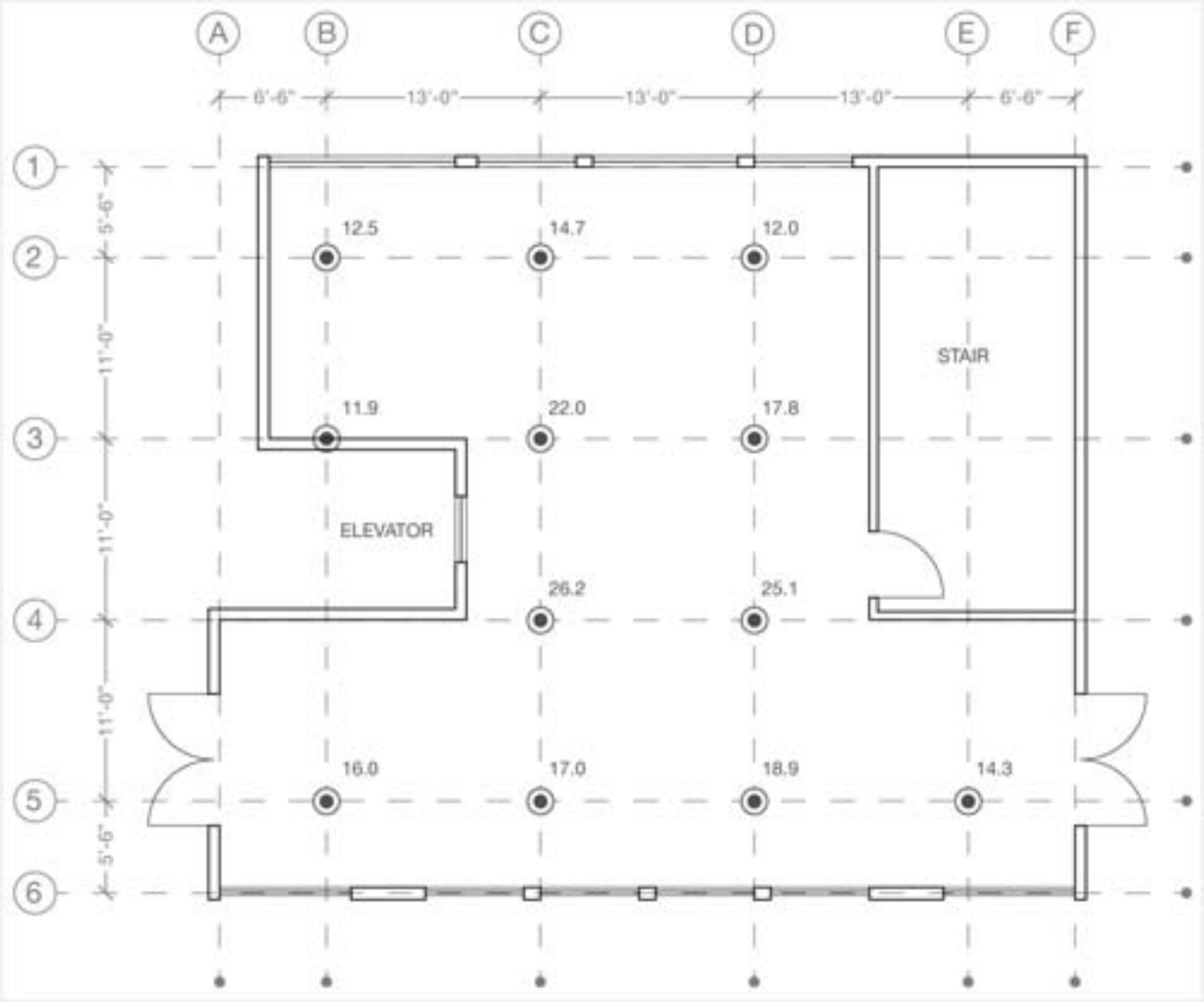
LIGHTING DESIGN SUCCESS

functional and aesthetic

functional or aesthetic

neither

Daytime with Overcast Sky



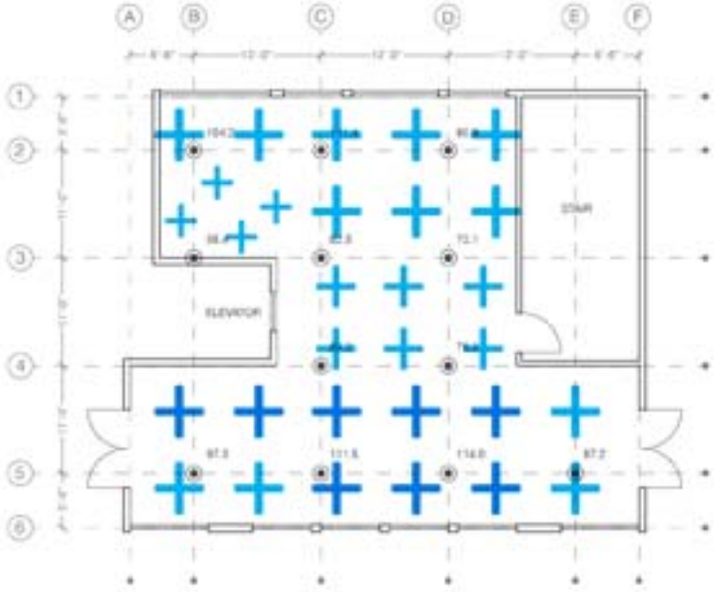
Evening

- **BUILDING:** ENGINEERING
- **SPACE TYPOLOGY:** LOBBY
- **DATE OF ANALYSIS:** 10-15-2010
- **TIME OF ANALYSIS:** 8:00 PM
- **PRIMARY FUNCTION:** CIRCULATION
- **SECONDARY FUNCTION:** GATHERING–STUDYING

M6AI5key

LIGHT METER DATA ANALYSIS CHART

GRID LOCATION	LIGHTING LEVELS IN FC						LIGHT PURPOSE		SUCCESS	SPATIAL USE PATTERN
	A	B	C	D	E	F	FUNCTIONAL	AESTHETIC	RATE 1 - 10	
1	NA	NA	NA	NA	NA	NA	YES	NO	9	NA
2	NA	12.5	14.7	12.0	NA	NA	YES	NO	9	NA
3	NA	11.9	22.0	17.8	NA	NA	YES	NO	9	NA
4	NA	NA	26.2	25.1	NA	NA	YES	NO	9	NA
5	NA	16.0	17.0	18.9	14.3	NA	YES	NO	9	NA
6	NA	NA	NA	NA	NA	NA	YES	NO	9	NA



LIGHTING DESIGN SUCCESS

functional and aesthetic

functional or aesthetic

neither

Evening

TASK THREE

summary & conclusions

OBJECTIVES:

To utilize all of the collected and observed data, you will compare, assess and recommend outcomes and solutions to the existing lighting scheme

SUMMARY OF OBSERVATIONS

ABSTRACT Observations and analysis of the engineering lobby suggests a space designed to provide appropriate and suitable lighting to support the daytime functions of the space. Although the space is subject to the outside weather conditions, it maintains a satisfactory level of lighting throughout the day and evening hours. Electrical lighting has been utilized when necessary to counteract low levels of daylight but no importance has been placed on the aesthetic integration or artful play of lighting within the interior architecture of the space.

DAYTIME Daytime lighting levels imply an environment that is actively and frequently utilized throughout the hours of 8am and 5pm. Grid locations 2 a-e and 5 a-e demonstrate a space that relies heavily on daylight to supply adequate illumination to all areas of the transition lobby. This allows for the seemingly inadequate amount of electrical lighting supplied to the space. Oddly, the bulk of the electrical lighting resides along the southern window wall, where its implementation is least valuable and most wasteful do to the abundance of daylight. Enough light penetrates the exterior window wall to supply the interior spaces with a comfortable range of illumination for studying and social gathering. If the space were greater in north-south depth, there would need to be a more elaborate electrical lighting scheme. I believe this is why the electrical lighting scheme seems ill-fitted for the environment and appears as an afterthought. The walls and ceiling provide a reflective surface for soft dissipation of daylight throughout the space however the electrical scheme induces frequent hot spots. My final observation of the daytime analysis is that the lighting scheme provides a utilitarian delivery of illumination and pays little homage to the aesthetic integration of lighting into the overall interior experience.

OVERCAST Observations of the lobby space are very congruent with those identified in the above clear sky daytime analysis. One major difference occurs on the interior of the space as lower levels of daylight penetration begin to weaken the interior illumination levels. The space relies heavily on the extensive north-south glazing for ample illumination. During overcast weather patterns the interior environmental experience feels dark and fragmented. The hot spots created by the electrical lighting features are exaggerated and a more dreary environment is left in its place.

EVENING The evening analysis is the most functionally successful of the three time frames. The building is primarily utilized during the hours of 8am and 6pm. as this data was collected after normal occupancy hours, the lighting was significantly lower without fault. No daylighting is present creating a general lack in overall illumination. However the linear fluorescent lighting running along grid 5 b-e provided ample illumination for safe passage through and circulation within the space. The electrical lighting now served to better define the study and gathering tables and served to designate zones in a far more successful manner then when lighting levels were already adequate.

CONCLUSIONS AND RECOMMENDATIONS

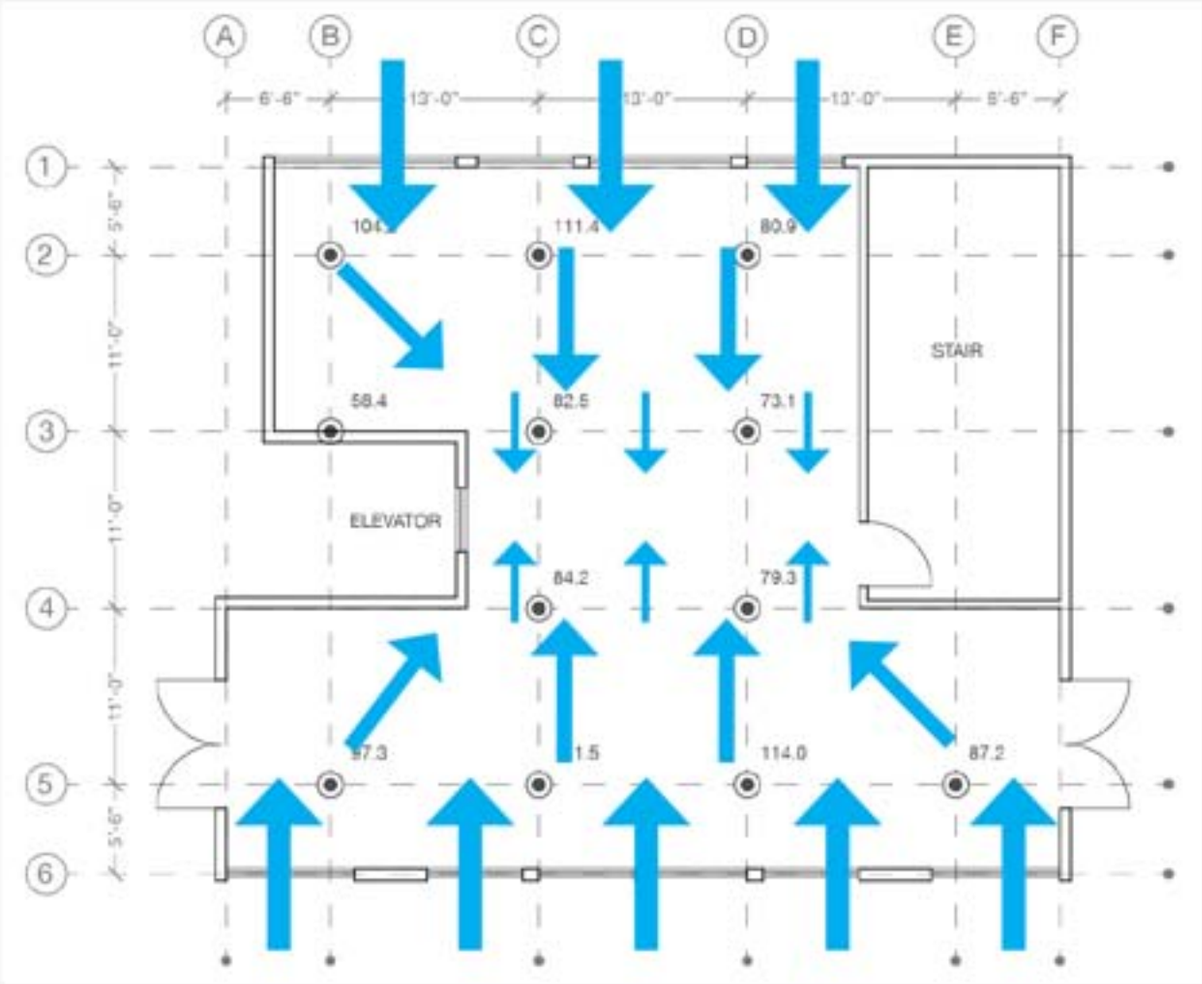
My conclusion after analyzing the engineering lobby space is that it serves its utilitarian and functional purpose quite well. It provides ample lighting at all necessary times of day and greatly reduces waste energy during the evening when the space is not occupied. Even though the electric lighting is secondary to the daylighting, there should be more attention paid to its aesthetic integration into the lobby environment. I question if the lobby is not well utilized in the evening hours because the lighting is poor or if the light levels reflect a space that will not be a destination for students after classroom hours.

IMAGE	OPPORTUNITY	RECOMMENDATION
	HOT SPOTS AND LOW LIGHTING LEVELS	As seen in the image to the left, as the daylight hours transition into evening, the space lacks sufficient lighting to function as a study lounge. the electric lights provide little to no usable illumination as they project directly onto the ceiling creating hot spots. I would replace this lighting with either a cloud lighting feature or a diffused downlighting element. If the intention is to diffuse direct light off of the ceiling to provide soft levels of illumination, then the fixtures selected need to reflect that.
	LACK OF PURPOSE	The space lacks definition as a whole. The lighting levels are fine for circulating from one area to another but it is unclear this a lounge, a study area, a meeting place or simply an expressway from one place to another. If this is a lounge then an appropriate color palette for the walls, more comfortable seating elements and lighting fixtures that promote intimate settings for separation of space. In addition, every surface is reflective. I would recommend that since daytime lighting levels are in abundance, a large rug or other ground covering be installed to reduce the glare off of the floor and aid in defining separate spaces.
	AESTHETICS	The artificial lighting selection feels institutional or corporate. If this is a transition space from one academic building to another with the purpose of slowing traffic and relieving stress, then the lighting should reflect that. Linear fluorescent lighting is uninteresting. It serves its purpose here but could be replaced by more interesting schemes that great a desire to pause and ponder and inhabit.

quality of light diagram: daylight

points of observation

1. WINDOW WALL PROVIDES MAJORITY OF DAYLIGHT DURING HOURS OF OPERATION
2. ELECTRIC LIGHTING SEEMS UNNECESSARY HERE - ENERGY CONSERVATION OPPORTUNITY
3. DUE TO RELIANCE ON WINDOW WALL, LIGHT LEVELS DROP GRADUALLY AS WE MOVE TO THE INTERIOR OF THE ROOM
4. ALTHOUGH LIGHT LEVELS ARE GOOD, ELECTRIC LIGHTING IS NOT SUCCESSFUL. HOT SPOTS ON CEILING HAVE NO VALUE

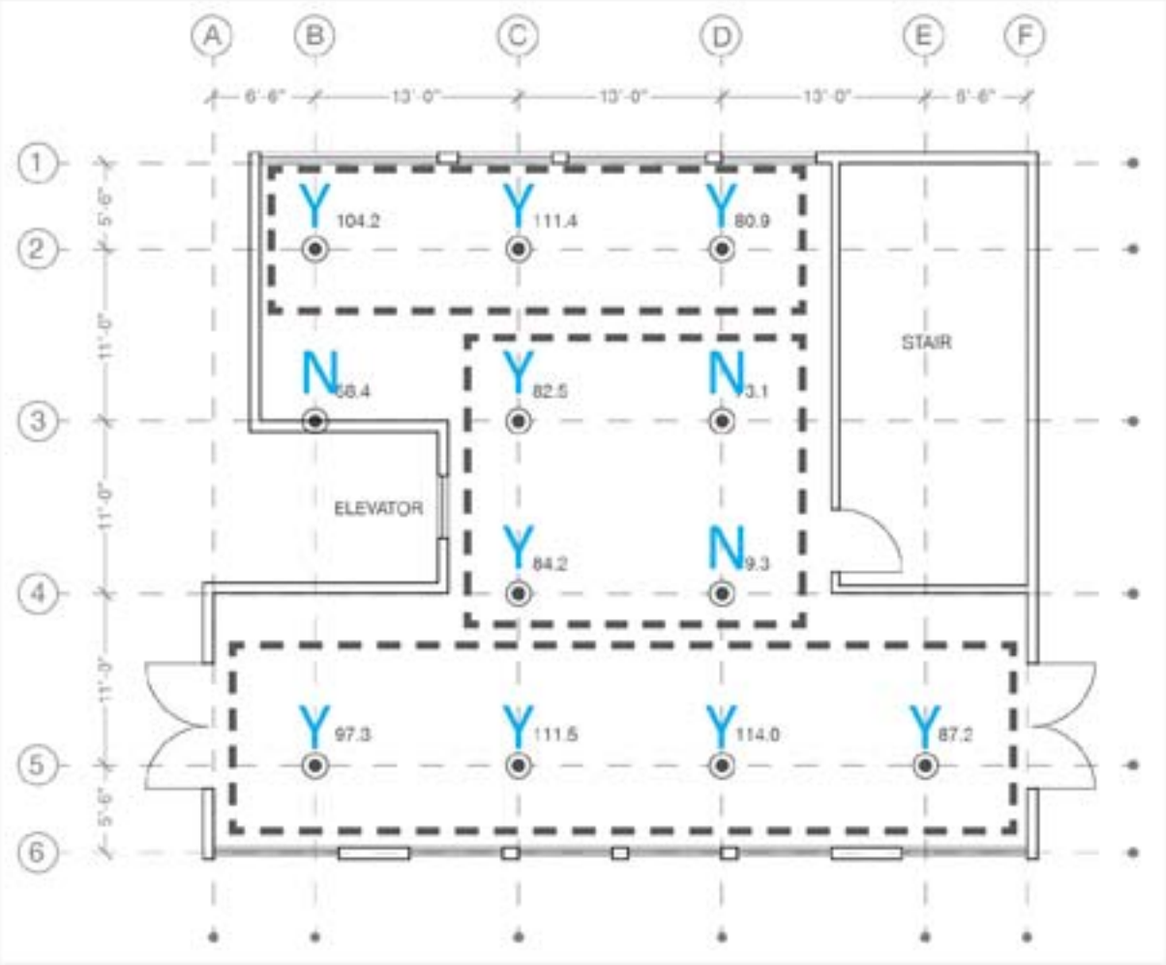


LIGHTING DESIGN SUCCESS

functional and aesthetic

functional or aesthetic

neither



LIGHTING DESIGN SUCCESS

Y functional and aesthetic

N NOT functional or aesthetic

CREDITS

All images excerpted from student projects by S. Bayramzadeh and J. B. Hamill.