Vital Signs IV

A Lighting Study of the

Ball State University Alumni Center

Assembly Hall

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Abstract

This study examines the effectiveness of using daylight as a primary source of illumination in the Assembly Hall of the Ball State University Alumni Center. The study compares the measured light levels of four preset electrical lighting conditions at night, with measured levels of daylight. Our intent is to demonstrate that the equivalent night illumination levels can be created without the assistance of electrical light during the day.

We evaluated the effect of manipulating shades, louvered windows and doors on the illumination of the room. As a result of such data collection, we determined that in certain situations the illumination levels of the daylight are similar to the electrical presets. On cloudy days, the light levels are very close to the electrical levels for two of the four settings, yet on sunny days, most of the illumination values are much higher than those of the presets. Thus, the illumination levels of the electrical presets can be achieved using daylighting, under specific conditions.

In addition, our study showed that even though the illumination values can be compared in footcandles, the visual comfort levels are greatly changed. With the use of daylight alone, functions such as slide presentations will be affected by glare problems that may make it difficult to view what is being displayed. The "feel" of the room is also altered under these conditions. We conclude that the use of *both* daylight and electrical light may be used in conjunction to create the best environment in which to do certain types of work.

These images show the room in use for a night function. Since the users comfort is the primary focus of this study, we established the night preset electrical illumination levels as the desired target setting, to be created using daylighting.

Introduction

This lighting study of the Assembly Hall in the Alumni Center was conducted as a part of a course called Vital Signs IV offered through the Department of Architecture and directed by the faculty and staff from the Center for Energy Research/Education/Service (CERES) at Ball State University in Muncie, Indiana.

The Vital Signs Project is a curriculum materials development effort funded by the Energy Foundation, Pacific Gas & Electric, and the National Science Foundation. The project is coordinated through the Center for Environmental Design Research at the University of California, Berkeley. The project encourages interdisciplinary students to examine architecture, lighting, and mechanical systems in existing buildings with attention to energy use, occupant well being, and architectural space making.

The 50,000 square foot Alumni Center at Ball State University was designed by the world-class architectural firm Pei, Cobb, Freed and Partners on property adjacent to the football stadium. The Center is a multi-level, geometrical structure centered around a triangular, 47-foot glass conservatory with an adjacent hexagon-shaped assembly hall capable of accommodating 300 people for dining and 480 people in a conference seating arrangement. Conference and meeting room spaces are used for smaller formal and informal meetings and events. Full audio-visual capacity allows the center to be connected to campus audio, data and video communications systems with plans for eventual uplink and downlink capability. A library is available which is designed to display alumni accomplishments and illustrate the impact alumni have made on society. A spacious reception and lobby area greets visitors and hosts special events. Administrative spaces are also provided that are used to conduct alumni relations. An expansive landscaped garden area located directly adjacent to the Assembly Hall is designed to host special outdoor events. Rows of trees lining main streets leading to the Center, in addition to the property the Alumni Center occupies, create an elegant entryway to campus.

Among the several various areas of the Alumni Center, our group chose the large Assembly Hall because it was seen to have many different aspects to study. The 72' x 72' hexagonal has an area of 4,300 square feet and stands two stories high. A large, folding dividing wall can be used to divide the room to simultaneously accommodate two separate events or when the entire space is unnecessary. Four of the six walls contain glass doors to the outside with a window on each side of the door. Both the doors and windows also have wooden blinds on them that are used to diffuse the sunlight during the day. At the very top of each of the six walls there is a 3' x 3' window in which the shades are lowered by a remote control.

According to Tom Baker, the project architect for the Alumni Center, the architect's intentions were focused around using daylight. He wanted to provide adequate light levels from daylight without the excessive use of artificial light and to provide a place with an attachment to nature. This outdoors effect creates a place of visual relief for the guests.

The artificial lighting of the Assembly Hall was especially interesting to our group. He also stated that The lighting system is composed of a large, fluorescent luminaire located in the center of the room, several large and small spotlights, many incandescent chandeliers capable of dimming, and fluorescent covelights at the top of each wall. The entire system is controlled by a computer, which is programmed with several preset lighting schemes. Only four of the lighting presets were studied in our research; they are:

Preset 1: "House Full" consists of all fixtures on and at full brightness.
Preset 2: "House Half" consists of the large spotlights, covelights, and chandeliers at half brightness.
Preset 3: "Large Spots" consists of the large and small spotlights, and chandeliers at half brightness.
Preset 4: "Covelights" consists of large spotlights at half brightness, small spotlights, chandeliers at quarter brightness, and covelights off.

The first two presets are usually used for large gatherings and specific events that warrant a bright room. The third preset is used during banquets and speeches. The fourth preset is primarily used when slide shows are shown or a projector is used. It provides just enough brightness to write notes but dark enough to see the projection easily and comfortably.

Views of the northeast side of the Alumni Center

Hypothesis

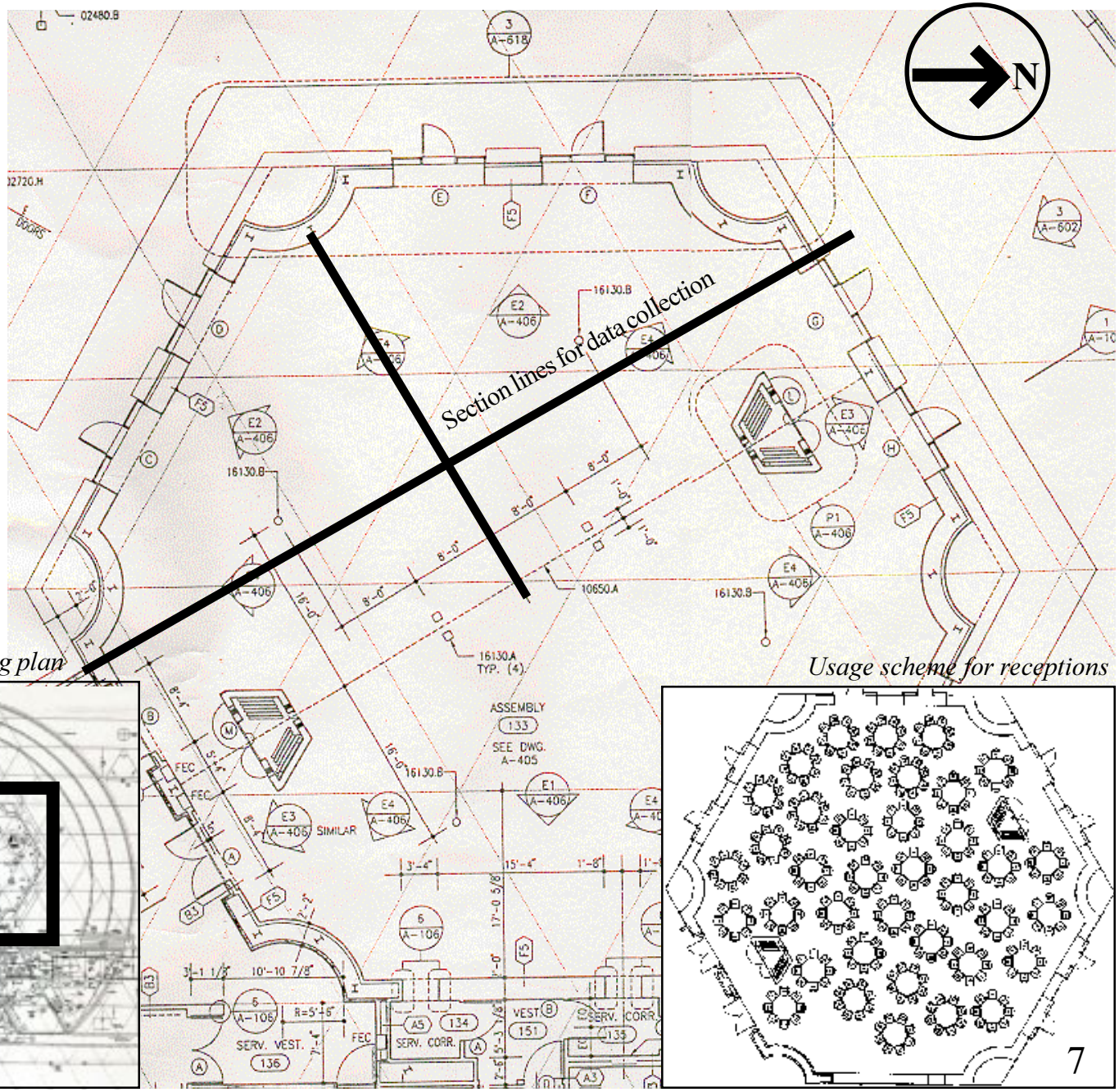
Daylighting can be used on a majority of days to provide comfortable conditions reaching desired illuminance levels without the assistance of electrical illumination.

The Assembly Hall is used for a variety of functions. Presently, daylighting is not utilized. Our study will attempt to prove that daylighting can be used on a majority of days to create comfortable conditions without the assistance of electrical illumination. Our study will also include recommendations on electrical illumination necessary to bring illumination levels to the desired levels on days when daylighting alone is not effective.

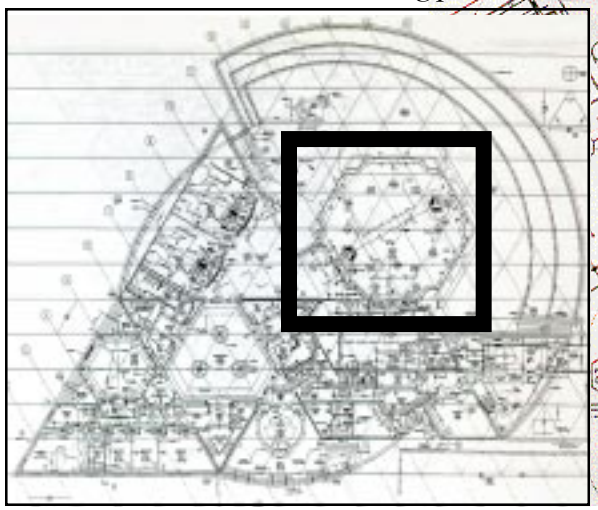
This room has vast opportunities for study. When Matt Stephenson, building manager of the Alumni Center, showed us the presets used for the different events occurring in the room, the value of their establishment as desired settings was an important insight into the needs of illuminance for the variety of functions held there. Each preset offers a different illuminance level for the room. We established the footcandles achieved by each preset to be the desired level at which the space was illuminated.
Since daylighting is not effectively used to illuminate the space during events occurring during the day, we feel that determining whether the desired level can be reached without the use of electrical illumination would be important to helping Matt to reduce energy costs and improve users' comfort in the space. If Tom Baker's estimation of the architect's intention was to provide a place of "visual relief" and connection to the outdoors is correct, then we feel daylighting is a necessary feature of the room.

Room plan and conditions

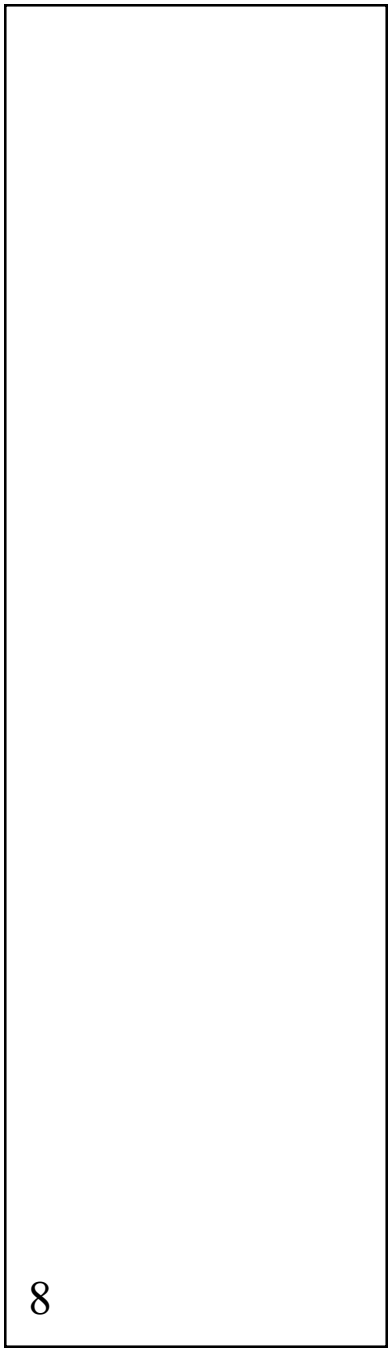
Analysis of room conditions:
Room is located on the northwest side of the alumni center. It receives direct sun in late morning through sunset. Upper windows are located on all six sides of the room, while bottom windows are located on five of the six sides.



Room location in overall building plan



Usage scheme for receptions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Methodology

RESEARCH METHODOLOGY

ACTIVITIES UNDERTAKEN:
Early in the study, the room was qualitatively evaluated and photographed while in use for an evening function. This began our qualitative research of the room. We returned to the room during the night to measure the illuminance levels defined by the presets. The timing of our investigation was important, since there was to be no daylight entering to affect our data.
In addition to our quantative findings, we also photographed the space illuminated by each preset electrical illumination level and described each condition qualitatively. These findings are located within the body of our report.
The data collected during the night served as desired target illumination levels. We adjusted daylighting illuminance levels to match these target levels. There were five testing conditionsusing the manipulation of the louvers and shades and we repeated this process for both cloudy and sunny sky conditions.

TOOLS USED:
Sylvania electronic photometer
Hobo stowaways
Boxcar Software
Microsoft Excel 97 SR-1
Adobe PageMaker 6.5
Nikon FM-2 camera with Macro lens
Microsoft Word 97 SR-1

INDICATIVE PHASE:
Presently, due to several disadvantages, daylighting is not used in the Assembly Hall. Admittedly, the space is controlled in such a manner as to reject daylight. By discussing with a representative from the firm the architect's intentions for the room, we learned of the desire to create a space where employees who often work in offices lacking windows, could relax in a place that is connected to the outdoors, both visually and physically. Our early visits to the site presented a reality different from the desire. Also, our team members experienced a lecture in the space and realized the glare presented by the current situation. Our team took on the project with the goal of determining if daylighting could be used in any capacity to improve the visual connection of the space to the outdoors, and reduce the glare present in the current situation. Our ultimate hope is to recommend a plan of daylighting use that the building manager can utilize to improve the effectiveness of the room and realize the architect's intentions.

Methodology

INVESTIGATIVE PHASE:

Procedure:

1) Measure the four presets (at night to exclude influence of daylighting)
   a) Our study considered the Assembly Hall to be divided into two parts. With this portion of the procedure, the dividing wall was closed separating the room. We selected the southern portion of the room, because the additional windows and doors allow more access to daylighting (See floor plan).
   b) To establish the four presets as desired target levels, we took illuminance measurements with the Sylvania photometer at two-foot intervals along two perpendicular section cuts of the half-room at an elevation of thirty inches.
   c) The Sylvania photometer was placed on the armrests of the chairs which are moveable. This level was selected because the floor condition does not as accurately represent a workplane.

2) Adjust daylighting illuminance levels to match the target illuminance levels from above.
   a) This is achieved by the manipulation of louvers and shades. To facilitate a better understanding of the room, the louvers and shades across the room were handled identically. Either they were all "open" or "closed." The uniform treatment across the section of the room allowed for our measurements to explain where more light was entering and due to the directional orientation of the room, less light was entering.
   b) This is a photometer exercise, where the basic level is attained at a specific time. This could be repeated throughout the day for stationary reference points. By using two perpendicular section cuts of the room, we established a location correspondence to a preset illumination level. To test whether our manipulation of daylighting conditions allowed for the attainment of desired target levels, we repeated our section cuts, data gathering, and analysis in the room for each testing condition. The location recorded was the same throughout. The difference in illumination levels at these locations was the difference between attained levels and the desired target levels.

The windows located at the upper perimeter of the room have remote controlled shades.

c) The Sylvania photometer was placed on the arms of the chairs in the space. By lining-up the chairs arm to arm, proper spacing of measurements taken by the placing the photometer on every fourth arm equaled two feet. By leaving the chairs as they were and altering testing conditions, each measurement became a stationary reference point which was used to evaluate measurements across testing conditions.

d) We repeated this exercise for several days, with varying atmospheric conditions.

3) The five tests performed on each day were:

1. Upper shades open, louvers open
2. Upper shades open, louver frames open
3. Upper shades open, louvers closed
4. Upper shades closed, louvers open
5. Upper shades closed, louver frames open

The image at the right illustrates this placement of chairs.

Louvers closed.

Louvers open.

Louver frames open.

Findings

Our findings are presented in the following pages. The graphs that follow represent the numbers sense of the experiment. The tests found that the numbers in footcandles of the four given presets could be achieved in a relatively close precision.

Preset #1, house full setting, has a footcandle range of 12-73 fc. The attempts to replicate this pre-set on a cloudy day revealed that the maximum footcandle readings were only 12fc. On a sunny day, however, foot-candle readings can be achieved around the perimeter up to 24' towards the center.

Preset #2, househalf, has a footcandle range of 6-18 fc. The attempts to replicate this preset on a cloudy day revealed that foot-candle readings can be achieved in all tests around the perimeter of the room, up to 28' towards the center. On a sunny day the pre-set was nearly matched by having just the upper windows open, but all other tests proved to be too much light.

Preset #3, large spots, has a footcandle range of 1-15 fc. The attempts to replicate this preset on a cloudy day revealed that the footcandle readings could be achieved by all tests around the perimeter 10' towards center. Only by having both top and bottom open could the center readings be reached. On sunny days the preset could nearly be matched by having just the top windows open, but other tests allowed too much light.

Light through closed louvers emits glow of daylight into the room.

Light through opened louvers emits beams of daylight into the room.

Light through opened louver frames floods room with direct day-l

Preset #4, covelight, has a footcandle range under 2 fc throughout. Cloudy and sunny day tests allowed too much light to achieve preset.

Visual comfort in the space, however, was not the same in the nighttime presets and daytime readings. Our data on cloudy days remained rather uniform throughout the section. On sunny days, however, with the louvers or the blinds open, there were beams of sunlight falling at differing locations in the room. They may create uncomfortable conditions if the light falls on a table that is being used because it may cause a great deal of glare in a person's field of view. It could shine in on the people themselves, creating discomfort for the user. Sunlight streaming into the room may also result in unpleasant conditions for viewing audio-visual presentations. All of these may cause the users of the room to squint to see what is taking place, or cause minor irritation of the eye.

In addition, the atmosphere created by the daylighting should be of concern. This is because even though the footcandles measured may be close to those of the presets, the feel of the room may not be pleasing. The atmosphere is something that users may consider being an indicator of how well they will be able to work, or pay attention in the space. This is important in The Assembly Hall because of the variety of important functions that are held there. In relation to these ideas, many factors must be looked at before making decisions on how to effectively light the Assembly Hall during the day.

Light through opened blinds emits beams of daylight onto floor and walls.

Light through opened blinds emits beams of daylight sloped ceiling, blocking the direct beam during portions of day.

Data/Graphs

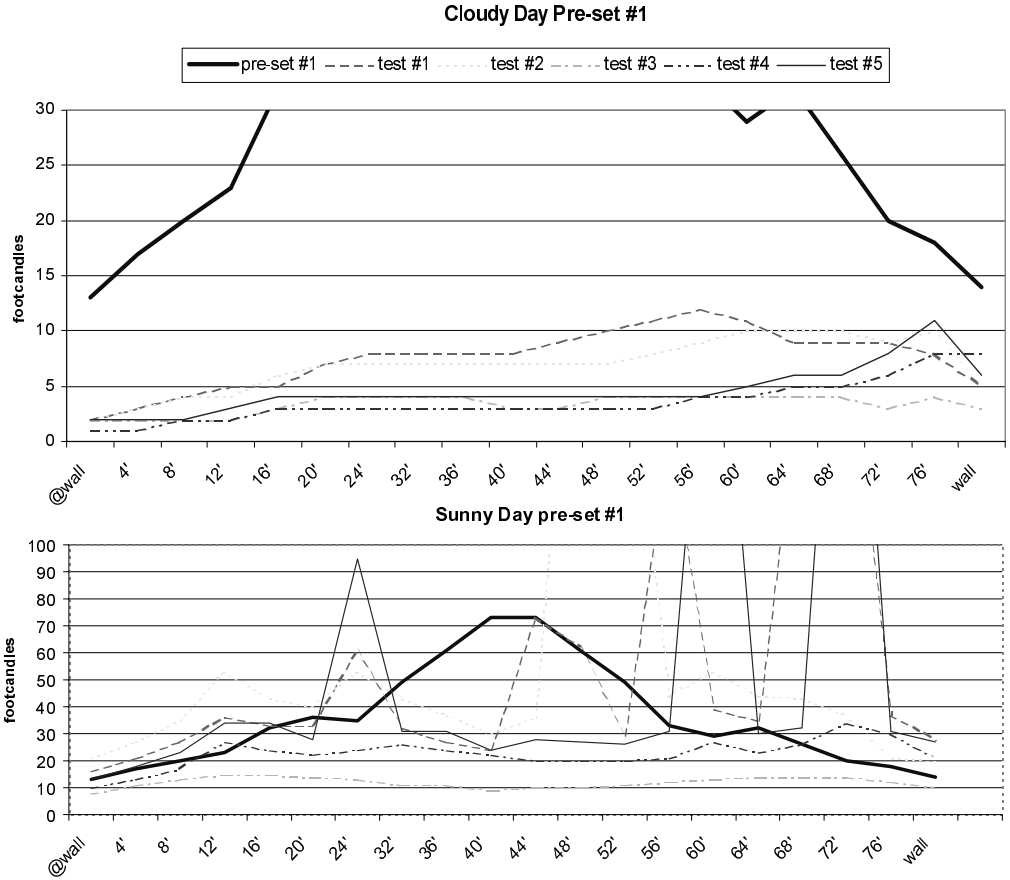
Preset #1 House Full

House Full is preset #1 condition. It uses all of the electrical lighting in the room at full power. We utilized the following tests to attempt to replicate the preset:

#1 - Upper blinds open, lower louvers open
#2 - Upper blinds open, lower louver frames open
#3 - Upper blinds open only
#4 - Upper blinds closed, lower louvers open
#5 - Upper blinds closed, lower louver frames open

The graphs below represent a section through the room with test data compared to preset readings.

House full preset at night



Note: Cloudy day graphs range up to 30fc. Sunny day graphs range up to 100fc

Findings for Preset #1

The footcandle levels are high under the house full preset ranging from 12fc to 73fc.

Cloudy Days:
Our readings found that the footcandle levels could not be achieved. The highest fc is achieved when the upper windows and lower level blinds are open. These settings only achieved about 5-10 fc.

Sunny Days:
Our readings found that foot candle readings could be achieved around the perimeter of the room. When the blinds are open light levels can be achieved about 24' into the room on the perimeter. Preset levels could not be achieved in the center of the room.

Half house preset at night

Preset #2 House Half

House half is preset #2 condition. It is used in the room to utilize all of the electrical lighting in the room at half power. We utilized the following tests to attempt to replicate the preset:

#1 - Upper blinds open, lower louvers open
#2 - Upper blinds open, lower louver frames open
#3 - Upper blinds open only
#4 - Upper blinds closed, lower louvers open
#5 - Upper blinds closed, lower louver frames open

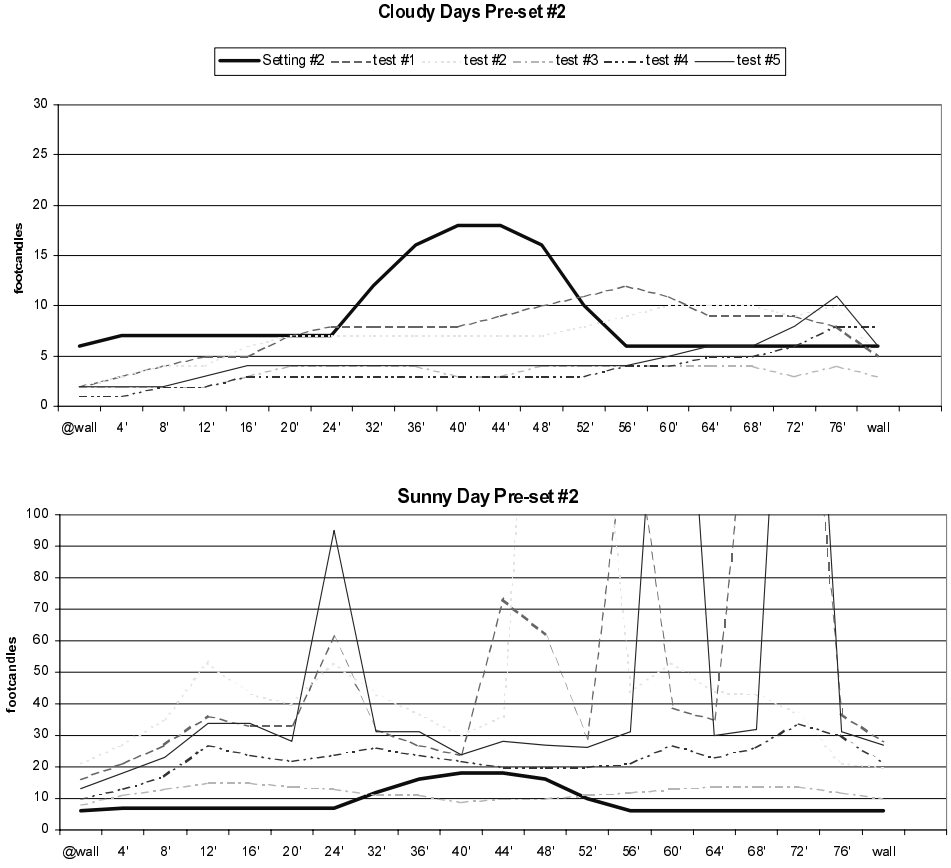
The graphs below represent a section through the room with test data compared to preset readings.

Findings for Preset #2

The footcandle levels are high under the house half preset ranging from 6fc to 18fc.

Cloudy Days:
Our readings found that the footcandle levels could be achieved by all tests around the perimeter of the room, but none in the center of the room.

Sunny Days:
Our readings found that foot candle readings could be achieved closest with just the upper windows open around the perimeter of the room and with just the blinds open near the center. The other tests proved too much light was entering.



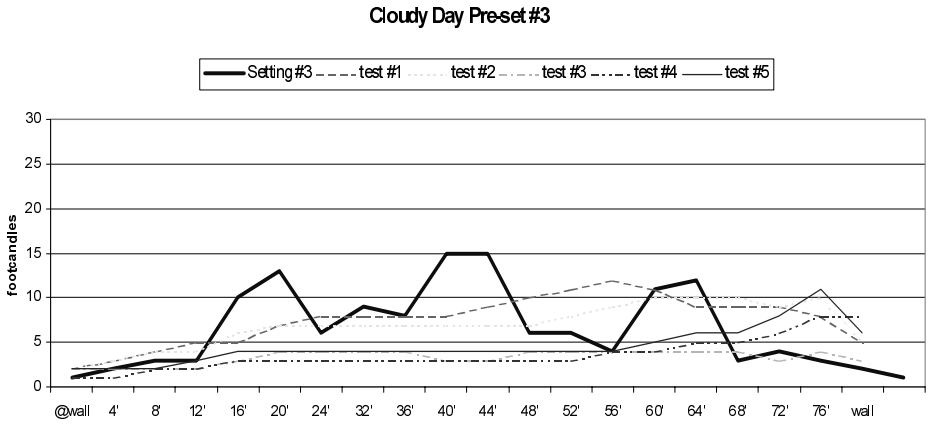
Note: Cloudy day graphs range up to 30fc. Sunny day graphs range up to 100fc

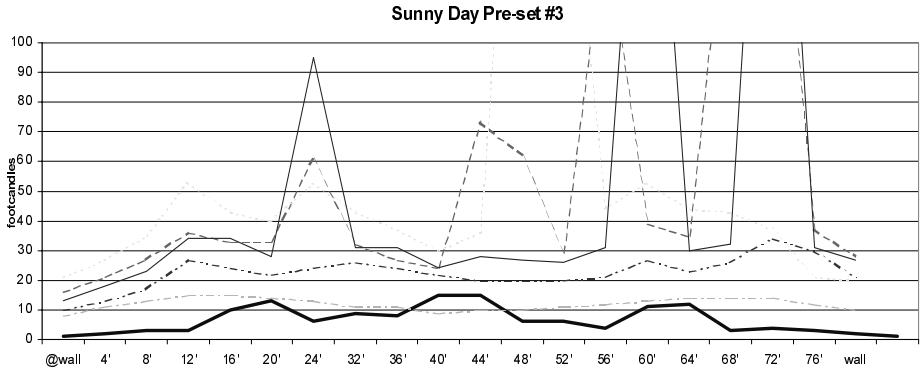
Data/Graphs

Preset #3 Large Spots

Large spots is preset #3 condition. It is used in the room to utilize large and small spots and chandeliers at half power. We utilized the following tests to attempt to replicate the preset:
#1 - Upper blinds open, lower louvers open
#2 - Upper blinds open, lower louver frames open
#3 - Upper blinds open only
#4 - Upper blinds closed, lower louvers open
#5 - Upper blinds closed, lower louver frames open
The graphs below represent a section through the room with test data compared to preset readings.

Large spots preset at night





Note: Cloudy day graphs range up to 30fc. Sunny day graphs range up to 100fc

Findings for Preset #3

The footcandle levels are low under the preset #3, ranging from 1fc to 15fc.

Cloudy Days:
Our readings found that the footcandle levels could be achieved by all tests for the first 10' of perimeter, but were to small towards the center of the room.

Sunny Days:
Our readings found that foot candle readings could be achieved throughout the room by having just the upper windows open. Other tests proved too much light entering the room.

Covelight preset at night

Preset #4 Covelight

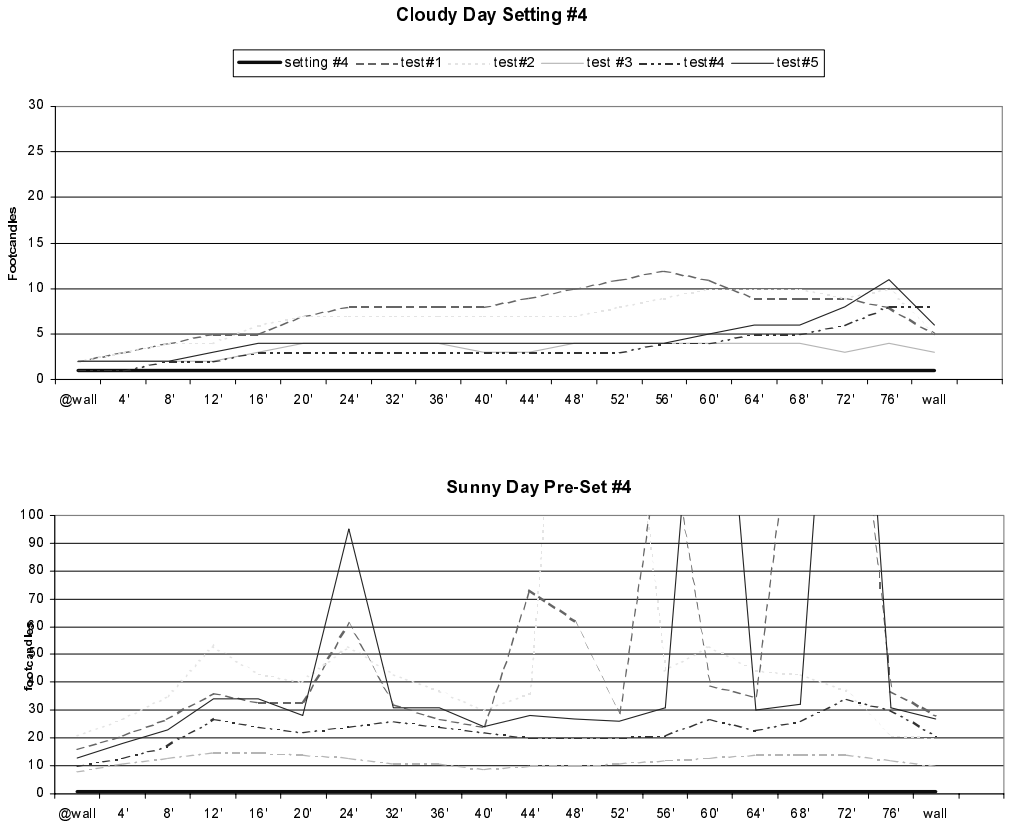
Covelight preset #4 is used in the room to utilize large spots at half, small spots and chandeliers at quarter, and covelights off. We utilized the following tests to attempt to replicate the preset:
#1 - Upper blinds open, lower louvers open
#2 - Upper blinds open, lower louver frames open
#3 - Upper blinds open only
#4 - Upper blinds closed, lower louvers open
#5 - Upper blinds closed, lower louver frames open
The graphs below represent a section through the room with test data compared to preset readings.

Findings for Preset #4

The footcandle levels are extremely low for preset #4. They were under 2 fc throughout the room.

Cloudy Days:
Our readings found that the foot-candle levels could not be achieved. The lowest fc achieved proved to be too much for the preset. Closing all openings is the closest replication of the preset

Sunny Days:



Note: Cloudy day graphs range up to 30fc. Sunny day graphs range up to 100fc

Test Conditions

Test condition comparisons
The images on these pages show the effects of the tests on the lighting conditions in the assembly in direct comparison to each other. The view is looking from the entrance of the room towards the west facing windows.

Test #1
upper blinds open
lower louvers open

Test #2
upper blinds open
lower louver frames open

Interior Space on cloudy day

Comparison: *The sunny day gave the room a brighter feel. Direct beams are broken up in both, but more intense on sunny day.*

Comparison: *Beams are more concentrated. Once again the room is brighter overall on the sunny day. Both conditions cause glare.*

Interior Space on sunny day

Test #3
upper blinds open
lower louvers closed

Comparison: *Room recieves flood of light from above. Beams are more intense through upper windows on sunny days.*

Test #4
upper blinds closed
lower louvers open

Comparison: *Room feels much darker in both with upper windows closed. Beams are more intense once again on sunny days.*

Test #5
upper blinds closed
lower louver frames open

Comparison: *Without the upper windows the lighting levels are low. Open louver frames allow streams of light on sunny days.*

Conclusions

The following are conclusions based upon the study of daylight illumination levels in the Assembly Hall. They are presented in four different sections consisting of quantitative and qualitative conclusions, as well as recommendations and general conclusions.

Quantitative:

Preset #1: "House Full"

On cloudy days, illumination levels do not even get close to reaching the high level of illumination required of first preset (house full). So no alteration of the louvers and shade manipulation we studied could be utilized to reach this level.
On sunny days, many of the testing conditions we studied reached the illumination level of the first preset. There was a deficiency of light, however, in the center of the room, where less light was penetrating from the perimeter of the room. Our recommendation would be to supplement daylighting with the center electrical "skylight" fully lit or the pendants on at a dimmed status. We suspect that having the upper shades open, especially during the summer, would create a block of light which would strike the floor and create distraction as it moved through time. These upper perimeter penetrations of light caused the peaks shown in the graphs.

Preset #2: "House Half"

On cloudy days, illumination levels could be most closely created using testing condition #1 (louvers open and upper shades open). However, as stated before for Preset #1, there is a deficiency of light reaching the center of the room. This would need to be supplemented with electrical illumination (center "skylight" or dimmed pendants).
On sunny days, the testing condition most effectively creating the required levels was #3. Having only the upper shades open (louvers closed), created the most identical illumination level to preset #2. This does have some qualitative restrictions due to seasonal use, however, because of the effect that changes in the angle of the sun's rays will have on the space during the summer.

Preset #3: "Large Spots"

On cloudy days, two testing conditions were similar in reaching the illumination levels of this preset. Testing condition #1 (louvers open and upper shade open) and testing condition #2 (louver frames open and upper shade open) both reached the quantitative requirements of preset #3.
On sunny days, only having the upper shades (testing condition #3) open was sufficient enough to reach the desired illumination levels.

Preset #4: "Covelights"

On cloudy days, the illumination levels of all testing conditions were too excessive to create the low levels of illumination required by preset #4. Having the upper shades open on a cloudy day (testing condition #3) was the testing condition most likely to reach the low level.
On sunny days, all of the testing conditions exceeded the lowest levels of "preset" illumination. No recommendations could be made to create this preset condition using daylight.

Qualitative:

In addition to the illumination levels of the room, the visual comfort created is also important. Beyond what the meters tell us about the illumination levels of the room we feel that personal reactions to the levels and type of illumination are an especially important companion to our data. These personal reactions determine visual comfort of the users, which varies depending upon the sky condition, the amount of daylight entering the room, as well as the individual.

When the sky is cloudy, the five conditions we examined provide the user with five different impressions of the Assembly Hall space. This is also true on sunny days when the same five conditions were used. Upon studying the room under these ten varying conditions, we were able to draw conclusions about the feel of the space.

The first testing condition *(louvers open and upper shade open)* creates a feeling of being connected to the outside under both sky conditions. The users can see the sunlight shining in on the room and it seems less confining. This condition may be favorable for social events, but does not work well for purposes of audio/visual presentations, especially slide presentations.
The second testing condition *(louver frames open and upper shade open)* seems more connected to the outdoors as well. It has an open, airy quality and allows light to enter the room, but does not indicate that it is appropriate for slide/speaker presentations because of glare on the screen or distracting sunlight movements.
The third testing condition *(louvers closed and upper shade open)* gives the impression of being in a secluded area. There is a calmness present that makes individuals feel relaxed--even drowsy. The light reflecting off the walls was especially pleasing to the eye. With only the top shades open, the room takes on an entirely new quality.
The fourth testing condition *(louvers open and upper shade closed)* appears to be the most conducive to audio/visual presentations. It has ample lighting that does not present glare problems when there is a cloudy sky condition with much diffused light. We predict that summer clear sky conditions could create more glare having the louvers closed due to the movement of light "shadows" across the floor, so that open louvers might actually reduce glare.

Conclusions

The fifth testing condition *(louver frames open and upper shades closed)* lets in streams of sunlight that fall ontothe floor. This sunlight also falls upon certain work surfaces and may cause glare in the user's field of view . Although it creates a pleasant space initially, the streams of sunlight vary and move with time, causing it to be a distraction to an event which requires spending extensive periods of time in the room.

Recommendations:

- To reduce the amount of glare presented by the louvers (in both closed and open positions), we recommend the planting of dark evergreen trees directly outside the Assembly hall space.
- Rewiring the center electrical skylight with a dimmer control would allow better utilization of daylighting which does not reach the center of the room, yet does not require full illumination from the "skylight" presently.
- Morning daylight does not reach the western part of the room obviously, when the partition wall is closed. Electrical illumination is necessary to supplement daylighting for early morning events.
- During the summer, shades should be used more often in the room at the upper perimeter windows to prevent the traveling beams of light to sweep the floor. However, in winter, due to the changed altitude of the sun, shades can be opened to allow more diffused light into the space.

General conclusions:

If the desired levels of illumination are difficult to create with daylighting, and the louvers are presently never used to admit light into the room, then why are the windows there in the first place? The louvers and shades provide the most interest (without glare) at night when no daylighting is penetrating them. Opening them at night allows the user to view out into the darkness and also have glimpses of the city that is alive with points of light.

If the architect went to the trouble of designing an unusually shaped room so there would be more access to the outdoors and daylighting, then we conclude that his mission was not realized. The louvers were not an addition to the space to reduce the amount of light penetrating the room. The louvers were present in the design before construction was started, in recognition of the potential illumination difficulties present in having windows which face a variety of directions. However the louvers, even in a closed position, still create glare problems. So we argue, why are the windows even there?

Our general conclusion is that the hexagon shape of the room is convenient for a variety of chair and table configurations. However the hexagon, in this instance was not an effective selection based on fenestration placement and daylighting. There are problems of daylighting inherent in the room form. So ultimately, each day will probably present different lighting conditions and manipulations of the louvers and shades. The human energy required to individually reposition the louvers will probably be the death of such a plan, however, because no one will have the time to fool with louvers that do not work well anyway.

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Kara Heavin, Architecture
Nathan Smothers, Architecture
Beth Walentowski, Elementary Education

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Jeffrey D. Culp	Center for Energy Research/Education/Service, Operations Manager
Robert A. Fisher	Professor of Architecture and Resident Fellow, Center for Energy Research/Education/Service

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Joel Loveland	Associate Professor of Architecture/Adjunct Associate Professor of Landscape Architecture, University of Washington
Jeff Sailer	Graduate Student, University of Florida
Marc Schiler	Associate Professor of Architecture, University of Southern California

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Vital Signs Website: http://www-archfp.ced.berkeley.edu/vitalsigns/index.html
Ball State University Alumni Website: http://www.bsu.edu/univ_adv/alumni/index.html

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Tom Baker, Alumni Center project architect, who offered insight into the architect's intentions for our space through a telephone conference call.

Appendices

I. Reflections about Visiting Scholars

We were fortunate to have input from scholars who have done similar research studies. Their collected wisdom has influenced our studies by conversations that our group had with the individuals. Included below are summations of the thoughts we gleaned from each scholar. We thank them for their valuable time and assistance.

Jeff Sailer provided us with a perspective on working as a group with individuals of diverse majors. Alison Kwok met with us during the very early stages of our project when we were beginning to write the hypothesis. She gave us ideas on how to draft, revise and come to an agreement on the final hypothesis. Bruce Hagland commented on the written hypothesis, but focused more on how to collect and present data. Joel Loveland discussed the research methodology with us. He pointed out ways to measure the illumination of the room through the use of photographs and our own eyes. He talked of the vast difference between electrical light and daylight. Loveland also emphasized the continuous changes of daylight and its unpredictable nature. Marc Schiler focused on the fact that disproving a hypothesis may be just as useful as proving one. He told us to use the illuminance data, but also to consider the glare and visual comfort of the room.

The insights we gained by meeting with these individuals helped us to plan our study, refine it and view the project in a number of new ways.

II. Initial Team Member Reactions

The following statements are personalized narratives based on our initial thoughts on the project and the building (site).

Approaching the building from the parking lot, it was easy to orient oneself to the entry of the Alumni Center. As a circular embrace protruding from the eastern façade, I climbed the stairs and entered into the vestibule of the place. Light poured into the space from an adjacent room, and I was tempted into that space. Before I could gain access to the source of the light, receptionists greeted me from my right side. Although the space with the invitation of light was an interesting one, the room which I became interested in was not one easily demarcated on the path through the building. Instead, the Assembly room was only found by winding around the perimeter hallway, and seeing doors tucked into a side wall. Opening the door to this place, I was met with a room of massive proportions. The two-story hexagon featured windows facing almost every direction. There was potential for it to be an activated, dynamic space if the sunlight were allowed to play. However, I felt a certain sadness in the room because the windows on each story were clothed in heavy wooden blinds, and the room was so very dull. Empty, and unused, I felt this space needed some special attention. That is how I came to accept the proposal of our study of whether daylighting, in and of itself, would be effective in lighting the space and giving the room back its life.

Kara Heavin

During the past weeks of this project, group four, including myself, made a couple of visits to the Alumni Center and compared all the rooms available for research. After further discussion and investigation my group and I had decided on investigating the daylight vs. electrical luminaries in the largest room in the building, the Assembly Hall. The Assembly Hall is a large hexagonal room that stands two stories tall and seats over two hundred guests during many different functions such as dinners, speeches, and football parties. We felt that this room held many opportunities to collect different types of data to assist with our research. The hall contains many "switches" that can be turned on and off according to what is to be occurring. Windows surrounding the room, large and small spotlights, and a very large "skylight" luminaire are just a few examples of the many switches in the Assembly Hall. Our hypothesis was developed fairly quickly when it was noticed how visually comfortable it was in the room when no lights were on. Only daylight coming in through the surrounding windows and reflecting off the wooden blinds lit the room. Thus, my group and I wanted to investigate how the room's lighting set-up could be adjusted for almost every situation and use less energy.

Lucas Gard

Being an elementary education major, I was unsure of what to expect from a study of the lighting of a particular space in the Alumni Center. I did not feel prepared or qualified to participate in such a project. My impressions about the aspects of the building were probably quite different from those of architecture students in the class. I was able to focus on the aesthetics of the rooms, rather than the more technical characteristics. After some thought about this, I came to the realization that it did not really matter how much background in lighting and architecture I had, as long as I was willing to share my strengths with my peers. We are all learning together, and will make the best of it. Our group was able to take varying ideas and choose a space in which to perform our study. We agreed upon the Assembly Hall because of the possibilities for study of daylighting as well as electrical lighting. As we begin our research, I think this will be an interesting endeavor, and prove to teach us skills that we are unfamiliar with at this point.

Beth Walentowski

My initial response to the Alumni Center in our first walk through of the spaces was positive. I went into the building thinking of the lighting, since it was to be our area of study. The importance of lighting, as a design component, was evident immediately upon entering the building. The conservatory is open and skylit from above. This space left an impression from the amount of light that the space pulled into the interior surrounding spaces. As we toured the building the use of shutters and blinds to give daylighting opportunities for spaces was a common theme. Many rooms contained operable louvers on the windows and doors as well. As we continued the tour, the assembly also was very impressive in the optional lighting qualities that can be achieved. The area is used for many activities including presentations, dinners, and various other group events. These various arrangements create many different lighting needs. To fulfill these needs the space was shaped to allow daylighting in on all sides and heights by use of doors and windows. The room also has many electrical lighting devices as well in various forms to refine light quality in the room. Of all the rooms we visited in the tour, the assembly stood out to me as a space with many opportunities for study.

Nathan Smothers