

Lighting Design - Weekly Blog

Week 6

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Lighting Design Strategies

Based on Programmatic use and Intended Vibes

The workshop this week focused on lighting design for an existing space, but for a different programmatic use. We explored not only the application of the fixture and luminaire types we have been learning about, but how we can use them to create an aura and vibe to meet our design intent.



The space studied was Phillip John's Glass House in New Canaan, CT, USA. It was completed in 1949 and is 1,815 square feet (~170 square meters), 55 feet long by 33 feet wide. It is made of an almost entirely glass facade, only broken by steel mullions. It seamlessly integrates into the landscape by being completely transparent. Its isolated location and the surrounding trees provide the space with privacy. Residential floor plan has no walls aside for the centre core with the wash closet.



Richard Kelly completed the lighting design. The challenge for him was reducing the mirror effect of the clear glass at night. His solution was minimising the interior lighting and illuminating the surrounding trees to create continuity and flow from day to night (photo above).

During the day, the space relies almost entirely on natural lighting. As seen in the image on the left, there are no overhead lights in the centre of the space. Instead, there are recessed lighting fixtures in the corners and middle edges. The results are that the interior lighting conditions reflect the exterior and time of day, adding to the narrative of being connected to nature and the landscape.

Photo Sources:

Architectural Digest, <https://www.architecturaldigest.com/story/architect-philip-johnson-glass-house-modernism-article>

ArchDaily, <https://www.archdaily.com/501008/light-matters-richard-kelly-the-unsung-master-behind-modern-architecture-s-greatest-buildings?>

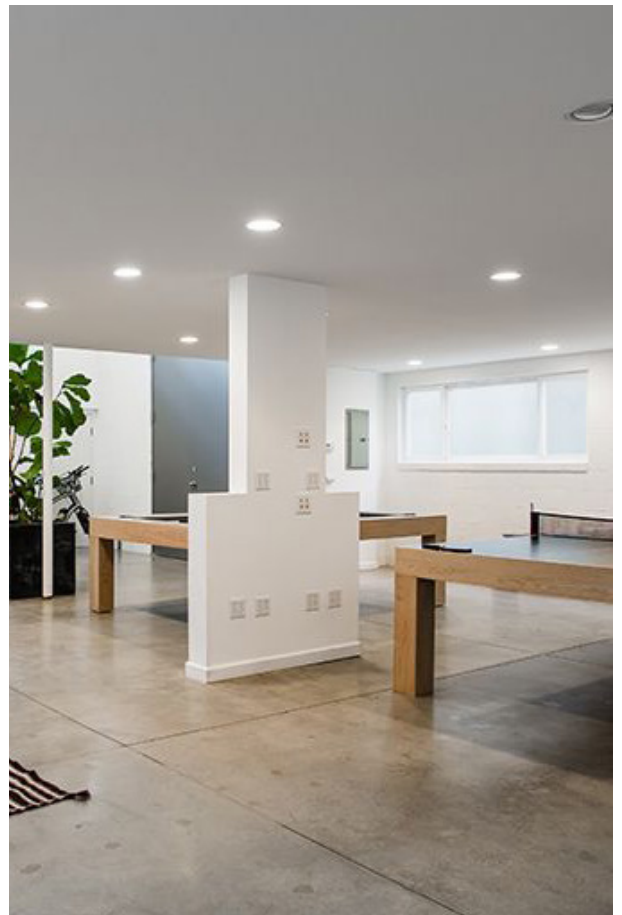
Home Adore, <https://homeadore.com/2016/03/03/glass-house-philip-johnson/>

Suit the Function and Context

Senior Craft and Board Game Room

The function my group designed for was a senior craft and board game room. The images on this page are examples that inspired our designs. Regardless of the interior layout, colours, and furniture, the spaces feel warm and welcoming.

The main strategies are overhead recessed lighting, pendants, and adjustable task lighting whose fixture can be moved based on the user's preference. All but one space also includes windows.



The space requires an abundance of bright lights. Senior citizens often have poor and worsening vision. Having the space be dedicated for tasks that require concentrated and specific light sources for this audience, the biggest challenge was making the space have sufficient lighting levels at a higher CCT, while making the space feel comforting and welcoming, rather than sterile and cold.

Sticking with the original narrative of connecting the occupant with the surrounding landscape, there is a balance of keeping the glazing while controlling the natural light. Solutions could include adjustable internal shading devices, as well as permanent external additions like overhangs and vertical louvers.



My group and I aimed to design a flexible and adaptable space, one that can suffice many uses. While the primary function is for crafts and games, it can also serve as a gathering place or temporary art gallery. Therefore, the lighting design should be able to meet the demands of multiple functions.

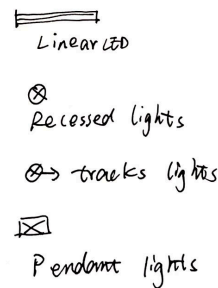
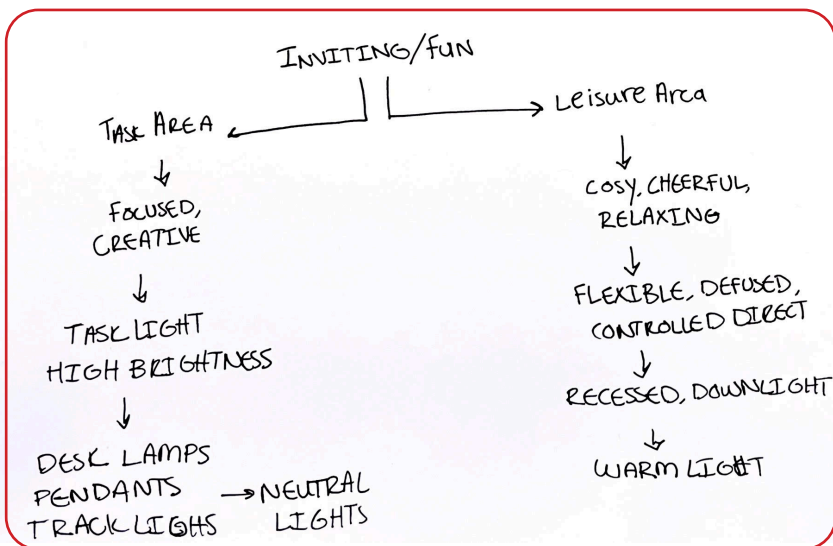
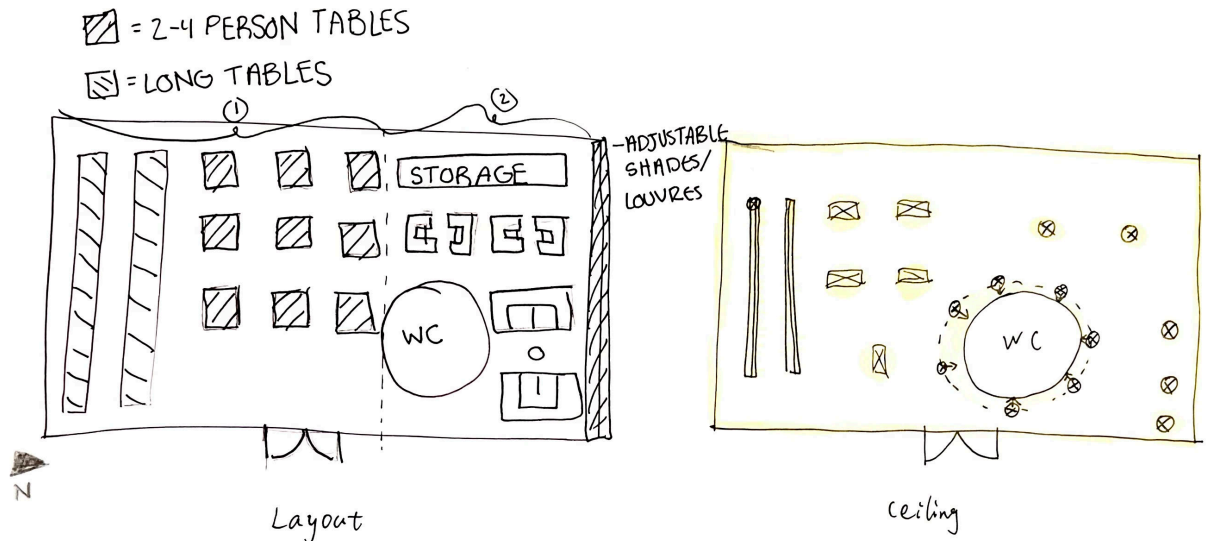
Photo Sources:

Home Beautiful, <https://www.housebeautiful.com/room-decorating/living-family-rooms/g26090946/game-room-ideas/>

Houzz, https://www.houzz.co.uk/photos/craft-room-ideas-and-designs-phbr1-bp~t_10362~a_34-397,

Closet Factory, <https://www.closetfactory.com/blog/10-craft-room-organization-tips/>

Word Tree and Lighting Design



My group and I split the space into two areas. The area on the left is for crafting and board games. The word tree is outlined in red above. In this area, we aimed for the atmosphere to be creative and focused. The strategies used are task lighting and high brightness. The luminaires we chose were a combination of desk lamps and track lights. We would use neutral bulbs to create a comforting yet focused environment.

The area on the right serves as a leisure space for people to gather before, after, or as an alternative to crafting and board-gaming. We wanted the atmosphere to be cosy, cheerful, and relaxing. This would be achieved by flexible, defused, and controlled direct lighting using recessed lights, down lighting, and adjustable shades on the southern facade. The light would be warm to make the space more homey.

The furniture includes long tables for group crafting. There are linear LEDs above them because this area requires ample brightness and constant light. There would also be adjustable desk lamps for crafts that require more lighting at certain angles. Also in the task area are smaller 2-4 person tables for board games. Pendant lights would be hung above them both for decoration and a concentrated light source.

The leisure area would use track lighting in order to be adjustable and flexible based on the space's function at a given time. They could be altered if someone is reading in a specific area and wants the light to point at the surface of their book, or if the space is being used as a gallery. Recessed lights would highlight the water closet, so warm light bounces off of the red bricks.

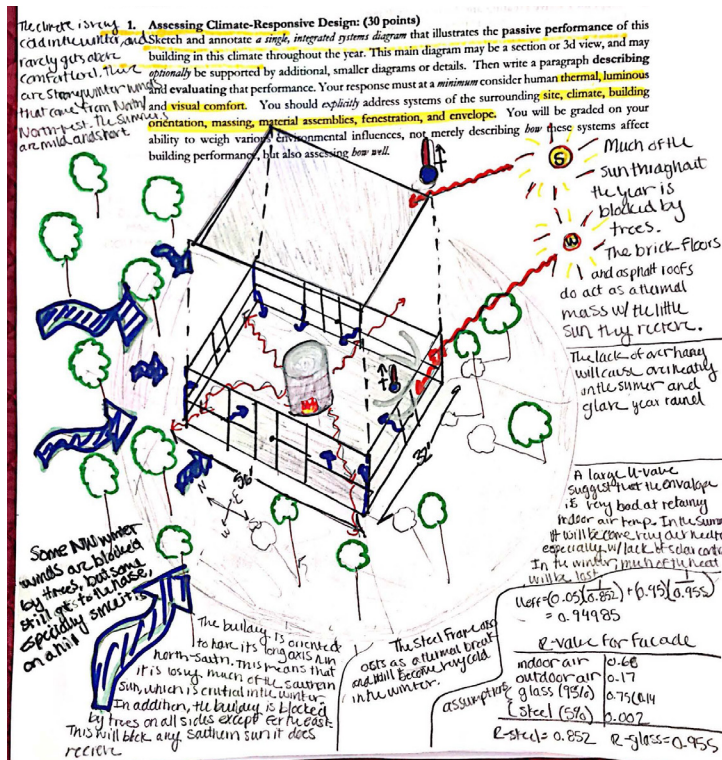
In keeping with the original design, the exterior would also be illuminated to avoid nighttime reflections.

Glass House Environmental Design

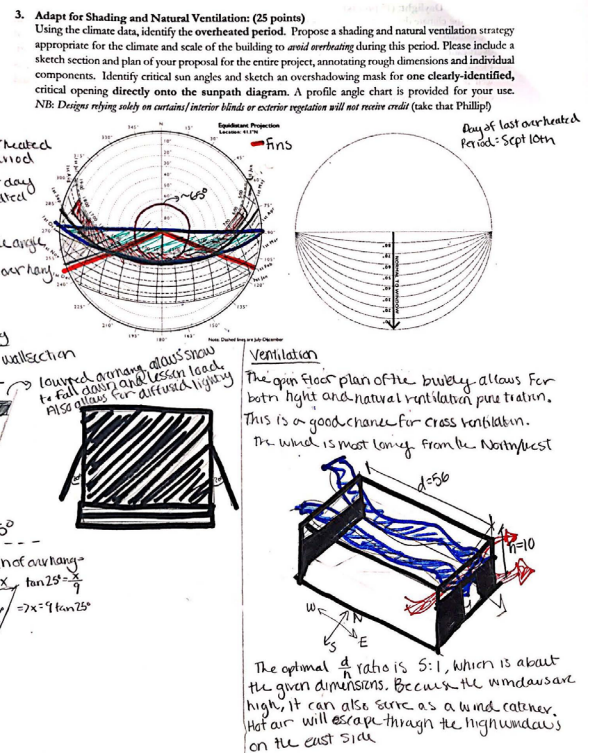
Undergraduate Final Exam

During my undergraduate studies, I took a course on passive architecture and environmental design. For the final exam, we were asked to create a climate response to the Glass House. This included a site analysis, overall critique, shading and natural ventilation design, interior lighting design, orientation, fenestration, wall assemblies, and solar PV sizing.

The first image (top right) is my overall human technique. I defined the climate as cold and heating dominated, the north-west direction of the winds, and an estimation of the seasonal sun angles. I criticised the materials and their thermal properties like the brick floors not acting as a thermal mass, the large U-values and excessive amounts of glazing, and the steel frames acting as thermal breaks. I recommended cross ventilation strategies since the space is relatively narrow. For shading devices, I recommended vertical fins on the east and west, and a horizontal overhang on the south to protect from excessive summer glare and heat gain.

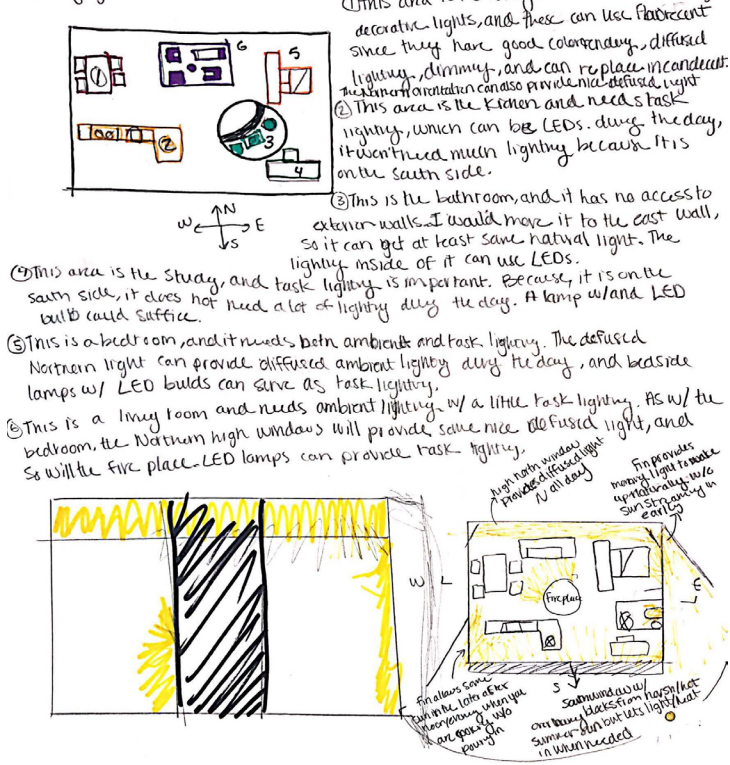


Overall Evaluation and Critique



Shading and Natural Ventilation

④ Daylight



Daylighting

In terms of daylighting, I identified different areas and programmes within the space, and suggested ways to meet their specific needs.

In the dining area, I suggested decorative, fluorescent lights due to their CRI, dimming abilities, and defused lighting applications. In the kitchen and office, I recommended LED overhead lighting and task lights.

Because the bathroom as no access to the exterior walls, I decided to move it to an edge in order to take advantage of natural daylight and added a window. I replaced it with a central fireplace to emit both light and heat.

In the living room and bedroom, I specified ambient and task lighting. Overall, my ideas were similar to this assignment, that the space relies mostly on natural daylighting and needs only a few fittings for nighttime use.

In both designs (the workshop and the final exam), much of the lighting was for specific tasks and covered a smaller area. While these requirements hold true for the actual programme of the Glass House, it is able to rely more on daylight. If occupants are doing crafts on a sunny afternoon, they may need to use the task lights to see clearly what they are doing. This being said, the leisure area of the senior game room can be treated similarly.

One of the major differences between the two designs is the CCT of the lights. The workshop programme requires fixtures with a higher CCT. Because human's vision often forms a slightly yellow hue with age, it is important to attempt to counter this by using warmer bulbs (above 3000 K) that have a more white/blue tint. In the original design, the space is much more relaxed and homey, so the CCT should be lower (below 3000 K) to obtain a more orange and comforting vibe.

If I were to go back and do the design again, I would explore more techniques that light the exteriors as well as the interiors in order to reduce the reflection one receives when looking at the glazed facade in the dark.

For reference the images below show the remaining pages of the final exam. The one on the left pertains to orientation and facade design. I had suggested to replace most of the glazing area with an opaque wall using the assembly shown below. In addition, I suggested that the footprint be rotated 90-degrees, so that the long facade is oriented east-west to protect from evening and morning glare while taking advantage of the natural daylight coming from the south and diffused lighting entering the north side.

The photo on the left shows the sizing calculations for a rooftop PV system based on the building's energy consumption. It also shows the necessary orientation of the panels to for optimal energy capture. However, this system would interrupt the clean, concise, and regular lines that Phillip Johnson aimed to create. In addition, the surrounding trees on the site would block much of the sun. Therefore, this system would be better suited off site or free-standing next to the structure.

