Carpenter Center
Cambridge, MA
DAYLIGHT AS A DESIGN FACTOR
Anahita Anandam

BUILDING TYPE & FUNCTION: CENTER FOR THE VISUAL ARTS, STUDIO/ WORK SPACES FOR THE VISUAL ARTS STUDENTS AT HARVARD UNIVERSITY.

ARCHITECT: LE CORBUSIER
BUILT IN 1962
URBAN ENVIRONMENT: MEDIUM DENSITY, NO TREES AROUND THE CHosen AREA I.E THE FOURTH FLOOR STUDIO SPACE.

The area chosen for the daylighting study is the studio at the top of the ramp which served for 30 years as the principal exhibition space, the Josep Lluis Sert Gallery and is now a classroom for drawing and sculpture. This classroom is situated towards the West Site and has deep sun
baffles, or brise soleil facing the sun’s direction. Light is an important factor that has been used in the design of this institution. The floors of studio spaces are penetrated by a flowing ramp connecting Quincy Street with the Prescott street edge of the site.

Le Corbusier carefully designed the sun-control which changes according to the orientation of the different facades and their curvature. The entire building is built out of rough concrete. The 4th floor studio space taken as the space for study contains large working desk surfaces. The windows face South even though the orientation of the façade in that room faces West. Deep Sunshade or brise-soleil protect the glazing. However due to the slanted design, the glazing gets protected differently at different points on the glazing. Deep Light shelves direct light into the work space as seen in the picture below.
Since the windows face South, at section A-A the sunlight will penetrate into the studio space. Sunlight will enter the Studio Space between Oct 1st to March 1st from dawn to dusk. In section A-A where the overhead sun protection is minimized direct sunlight will enter into the studio space throughout the year except for anytime earlier than 6 am and later than approx 6 pm between April 14th to Sept 23rd. This direct sunlight washes the side wall as seen in the photograph.

The space that will be sunlit will the above studio space with the desks during the times mentioned above.
The type of glazing used is synonymous with what was used during the 1960’s which is single pane glass and are sealed directly into the concrete. On talking to students who occupy the space, it came to my attention that many of the workspace adjoining the window space tends to get very cold in the winter and heat up considerably during the summer month.

The portion of space between daylighting and electric lighting is clearly visible due to partition walls being installed at about 5 meters from the edge of the window. All the studio spaces behind the partition needed strong artificial light versus the space next to window was illuminated with natural light almost throughout the year. The addition of the partition wall may have been done after the finish of Le Corbusier’s design. However, the contrast and glare is huge because of the installation of the partition. Some of the illuminance readings in the space can be seen for a cloudy day. However on a bright and sunny day, the contrast and glare problems will rise to higher than 1:3. The space behind the partition wall has to be continuously illuminated with artificial light throughout the day and throughout the year.

INTERIOR FINISHES AND COLOR:
Ceilings were painted white which is good for reflecting the light into the studio space. Strong colors were used in the building but the space under consideration had the rough concrete walls and the angled light reflector were in white.

ARGUMENT THAT LED TO THE DESIGN:
LeCorbusier designed the Carpenter Center with the need to reduce the impact of direct sunlight into the studio spaces. That is why he designed huge brise soleil that would protect the floor to floor glazing from direct sunlight during the summer month. For facades facing West, he oriented the glazing to face South and then further shaded them with huge overhead protections. Hence the impact of the Western sun has been considerably minimized. The design is a brilliant solution in terms of daylighting control and sunshading. As seen in the sections below, light shelves were used to redirect the sunlight deep into space. Unfortunately partition wall placed near the window impact the amount of natural light received beyond this partition wall.
CRITICAL VIEW POINT:

The design of the Carpenter Center is a brilliant one. However, a criticism on it could relate to the choice of material – rough concrete which has a very low reflection coefficient. Hence light that hits the concrete will not get reflected into the space (all light shelves made out of concrete). Ceilings and side walls have been painted white (a very good reflection coefficient).

The second criticism on the Carpenter Center is the design of the skewed glazing. This type of skewed glazing brings in different quantities of sunlight into the space. At section A- A, there is inadequate amount of protection from the sun, and the amount of light received on that surface area is high.

Lastly, the design of the interior partition walls increase the glare and contrast in the space considerably. A more appropriate design should have been taken into consideration and permitted more natural light deeper into the space and decrease the usage of artificial light.