

STUDIO 8551

Assignment no. 1.

DAYLIGHTING

...proof of concept exercise
daylighting models.

Project presented by:

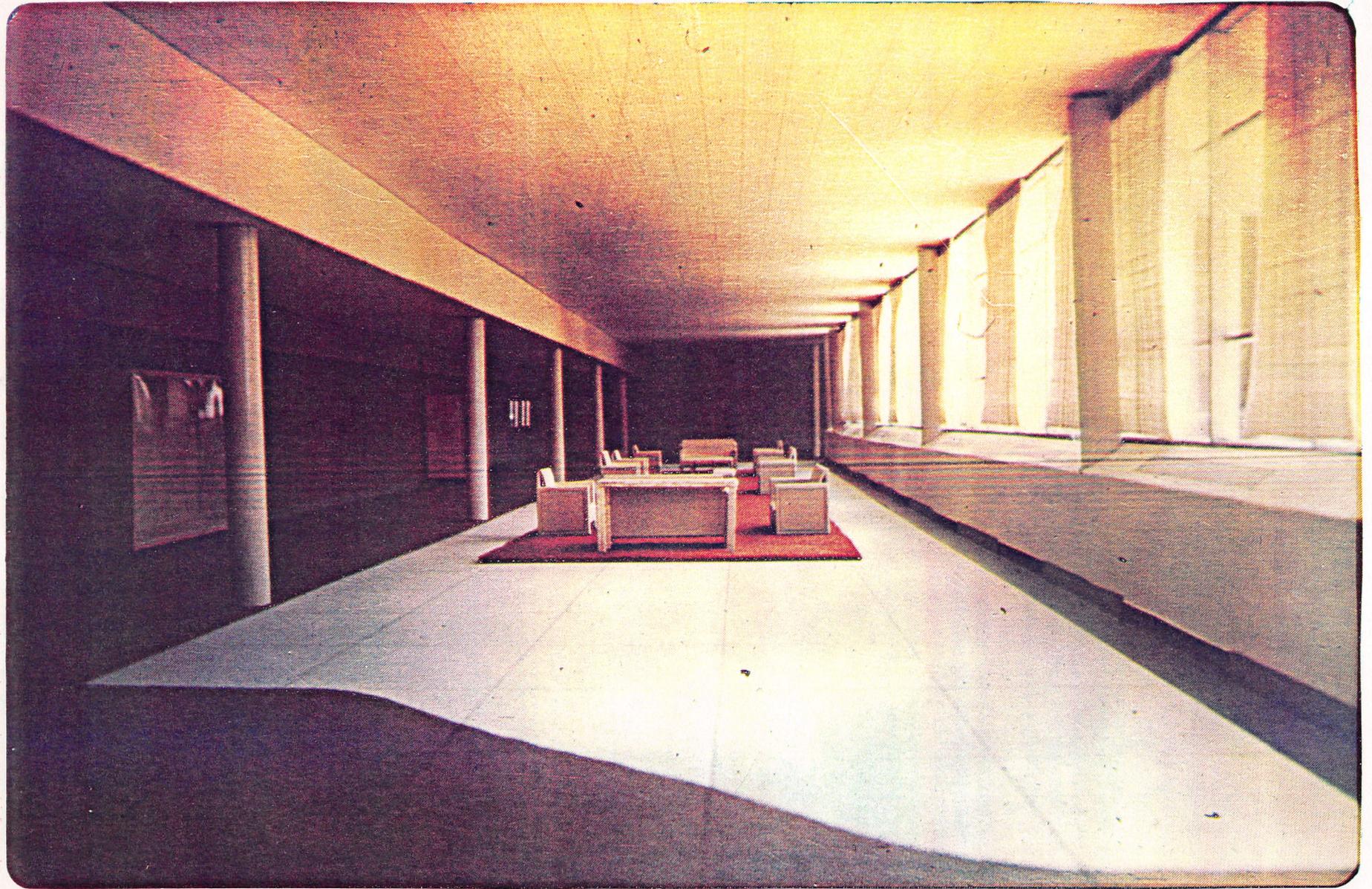
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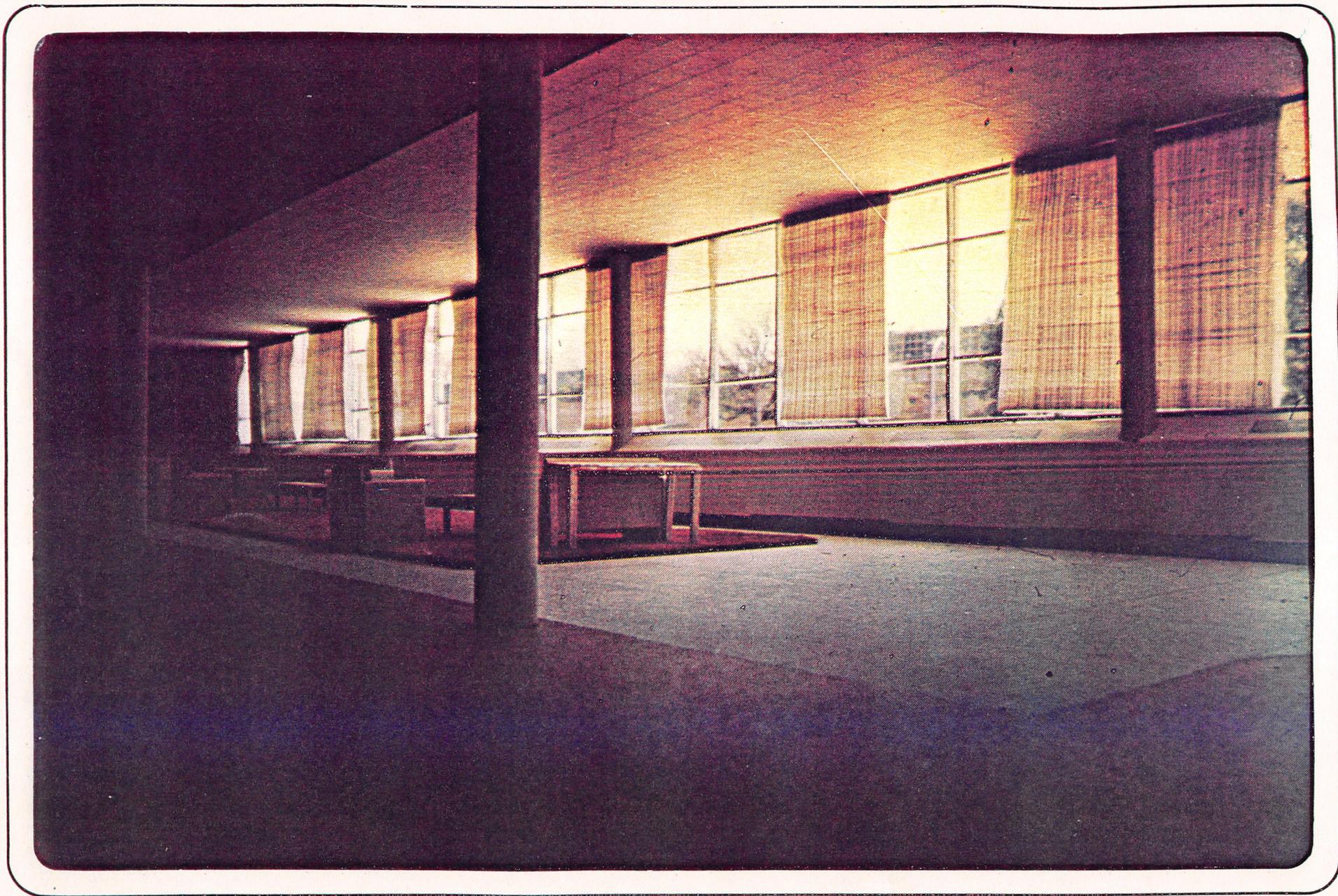
April 16, 1982

INTRODUCTION

The focus of this exercise is to validate the hypothesis that "scaled models can be used as a reliable tool for evaluating the physical characteristics of DAYLIGHT". Construction of a 1/2"=1' scaled model with select materials will provide a sensitive design tool. The model can be fine tuned to accurately simulate the existing building space and provide performance information. A second objective of this exercise is to design a major change to improve the daylight character of the existing space. This improvement can be tested using the daylighting model, and will allow one the means to accurately evaluate the redesign. A final objective is to offer a qualitative evaluation through visual observation and photography. The completed studio project will introduce techniques and concepts involved with the use of models as a evaluative design tool and fundamental knowledge of the quality and physical characteristics of DAYLIGHT.

We have chosen for this project to model the Textile Engineering Bldg. exhibition gallery.





Results from measured data...

TEXTILES BUILDING VS. MODEL

Measurements of DAYLIGHT were taken from within the existing space and model under the exact same conditions. The measurements were taken on a grid pattern with a General Electric type #214 light meter, in footcandles. The values were written on the plans in correlating positions, then the contours interpolated. The ISOLUX plans now provide an accurate visual representation of the lighting levels present in each space and can be used for comparison analysis in evaluating the light levels and the model as a design tool.

DAYLIGHTING FACTORS

CLOUDY DAY 700fc		SUNNY DAY 7000fc	
10 fc	1.4%	10 fc	.1%
20	2.9%	20	.3%
30	4.3%	30	.4%
40	5.7%	40	.5%
50	7.1%	50	.7%
60	8.6%	60	.9%
70	10.0%	70	1.0%
80	11.4%	80	1.1%
90	12.9%	90	1.3%
100	14.3%	100	1.4%
110	15.7%	110	1.6%
120	17.1%	120	1.7%
130	18.5%	130	1.9%
140	20.0%	140	2.0%
150	21.4%	150	2.1%
160	22.9%	200	2.9%
170	24.3%	250	3.7%
		300	4.3%
		350	5.0%
		400	5.7%
		450	6.4%

* the DAYLIGHTING FACTOR is defined as -
the ratio of the interior illumination at a given point
to the illumination available from the unobstructed
sky outdoors.

RESULTS FROM REDESIGN - MODEL

DESIGN STRATEGY - our intentions were to provide accent lighting within the gallery space to emphasize the importance of the central seating area and to provide more natural light into the space for studying activities.

METHOD - construction of a reflective light shelf on the exterior of the building will be simulated on the model. It will be used to illuminate the ceiling plane directly above the area. This should in turn increase the light level in this space.

CONCLUSIONS

This exercise in DAYLIGHTING MODELS provided a very effective method for evaluating and modifying an existing space in model form. It was noted earlier that a learning curve would be encountered in Phase I, but, we now conclude that the entire exercise can be projected to a learning curve based on such experience in modelling techniques and skills of evaluation. The problems and experiences are noted below.

MODELLING PROBLEMS-

Building materials were easy to simulate in terms of color but difficult to simulate in terms of reflectance. Actual building materials such as brick, ceiling tile, carpet, etc., were easy to find with some effort - difficulty occurred in reproducing the waxed flooring which had a distinct sheen to it. The curtains were also difficult to simulate because of the inherent problems due to fabrics and simulating pleats. Although we were successful in achieving equal transmission with a slight difference in visual appearance. Glazing was also difficult to duplicate with the exact same transmission value.

MEASUREMENT PROBLEMS-

The weather provided the largest problem in achieving accurate measurements. Waiting for the perfect day, time, second was important to get acceptable measurements. A period of constant sky luminance is required for the duration of measurement taking to provide correct measured data. Also the size of the light meter itself provided some difficulties in moving it within the model and having it read the same area of illumination represented in the model as in the existing space.

VALIDATION-

We feel that we have successfully modeled the DAYLIGHT characteristics of the Textiles Bldg. Exhibition Gallery, in a sophisticated model form. The isolux plans and photographs confirm this. The model can also be used to effectively evaluate design changes to the existing space, with the DAYLIGHTING MODEL as a reliable design tool.