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Faubion PK-8 School: Daylight Analysis

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FAUBION PK-8 SCHOOL DAYLIGHT ANALYSIS

In Coordination with
BOORA ARCHITECTS



ABSTRACT

Light is the first thing that captures your eye after you are born and is often the last thing you see before you fall asleep. Light makes humans, objects, spaces, architecture and everything we see around us visible by its reflection. Everyday, people are confronted with light and shadow, two elements that are complementary. Daylight is a natural element that changes every minute, caused by the rotation of the earth around the sun. It informs us of days, time, seasons, which causes humans have to surrender to this. Architecture must adapt this element in its design process.

Daylight creates a relationship between inside space and outside space, through openings which are created by design. Glazing is the most important element in designing architecture to allow the inside spaces to communicate with the outside world and to provide the inside space with daylight. As Donald Nicholson-Smith states, "The same room can be made to give very different spatial impressions by the simple expedient of changing the size and location of its openings." Understanding the daylighting system of a building and analyzing its effects are the key to developing the right type of design.

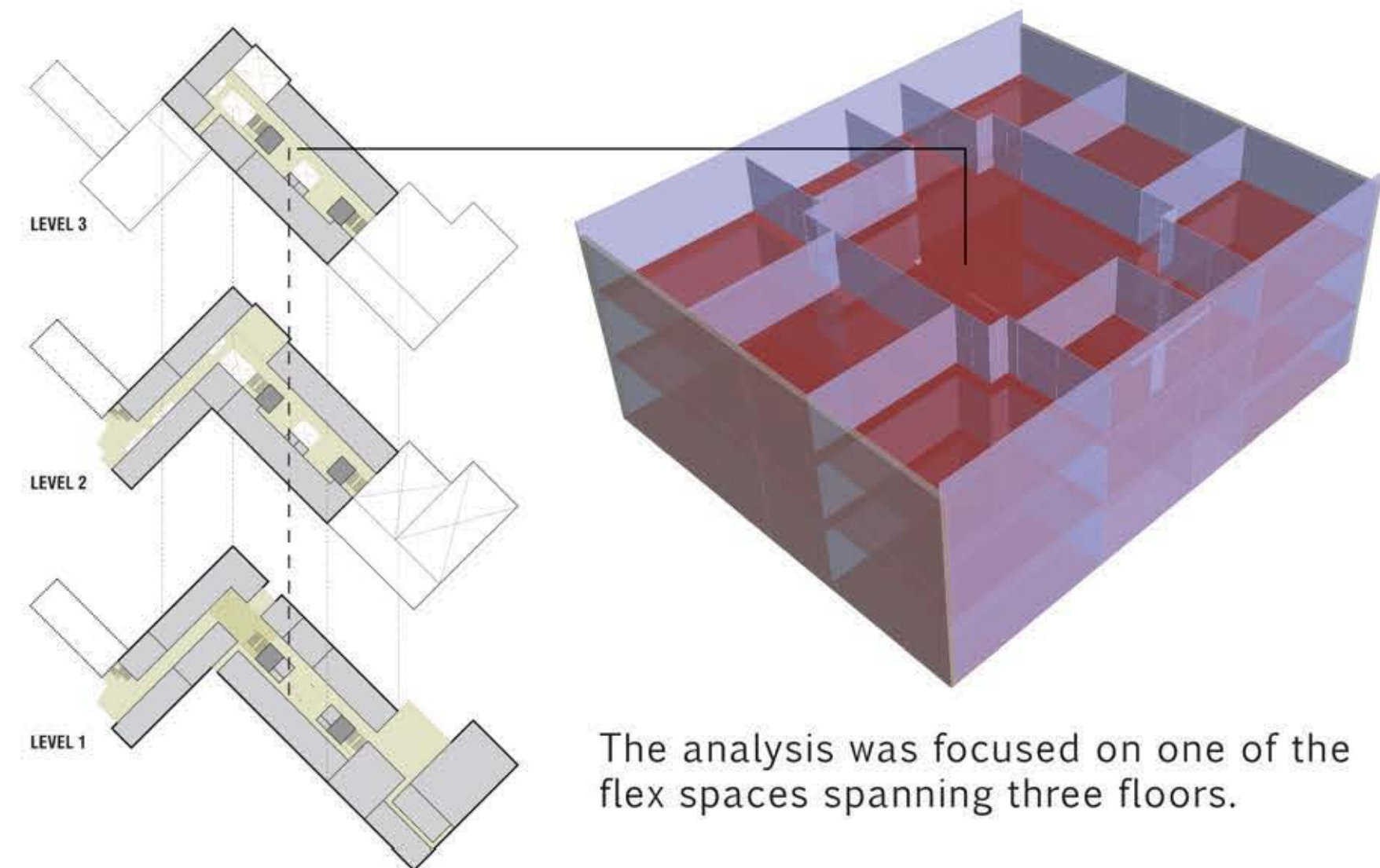
PROJECT

Portland Public Schools, Boora Architects, and Concordia University are working on the remodel of the Faubion PK-8 School. The rebuilt Faubion PK-8 will become the heartbeat of the neighborhood, offering wrap-around services to Faubion families. A portion of the combined building and access will be on contiguous with Concordia property.

Concordia and Faubion have collaborated as neighbors for 63 years. During this time, many of the Concordia education students have completed a part of their field experience at Faubion.

Concordia provides over 200 student volunteers each semester to help tutor and mentor Faubion students in the classrooms, and teach in the SUN after-school program. Concordia student nurses also support Faubion's health and wellness efforts. Working with Faubion teachers, Concordia students have helped improve education of Faubion students in reading, math and science and dramatically reduced playground discipline referrals.

"In just a few short years, Faubion and Concordia University students will eagerly cross the threshold into a one-of-a-kind, distinguished school," said LaShawn Lee, principal of Faubion PK-8. "Our partnership is an exquisite example of a community bound together to enhance the lives of children and families through academics, health, nutrition, and safety."



The analysis was focused on one of the flex spaces spanning three floors.

PROCESS

To find the optimal solution for placement of atrium skylights and floor openings to maximize natural lighting for the flex space between classrooms within a PK-8 school and the Concordia Education Center. The purpose of this daylighting is to minimize the number artificial lights within the space for both cost efficiency and productivity of the students. Studies show naturally lit spaces improve overall health, comfort, and mood of occupants.

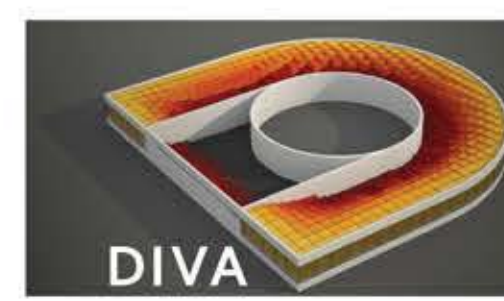
Using computer simulation software and working with the design team at Boora we produced multiple iterations of daylight analysis of the flex spaces. The main focus in determining the amount of natural light entering the building will be on the size, shape and location of skylights which will be modeled using Rhino 3D. The analysis was made using Diva software for Rhino with a goal of showing how much daylight distribution can be achieved using different variables within the skylight design.

We looked at various configurations of skylight placement by breaking down the sizes of the openings and drawing analysis through Diva to find the optimal size and position of the skylight for the design. Each person in the group has taken on different sizes of the opening to attempt to maximize daylight autonomy on all three floors:

Software Used



Rhino 3D
 Used to change the sizes and positions of skylights and floor openings.



DIVA
 Daylight analysis software, used as a plugin within Rhino.

Workflow



Using a combination of Rhino3d and Diva to achieve proper analysis showing the amount of daylight flooding the desired spaces.

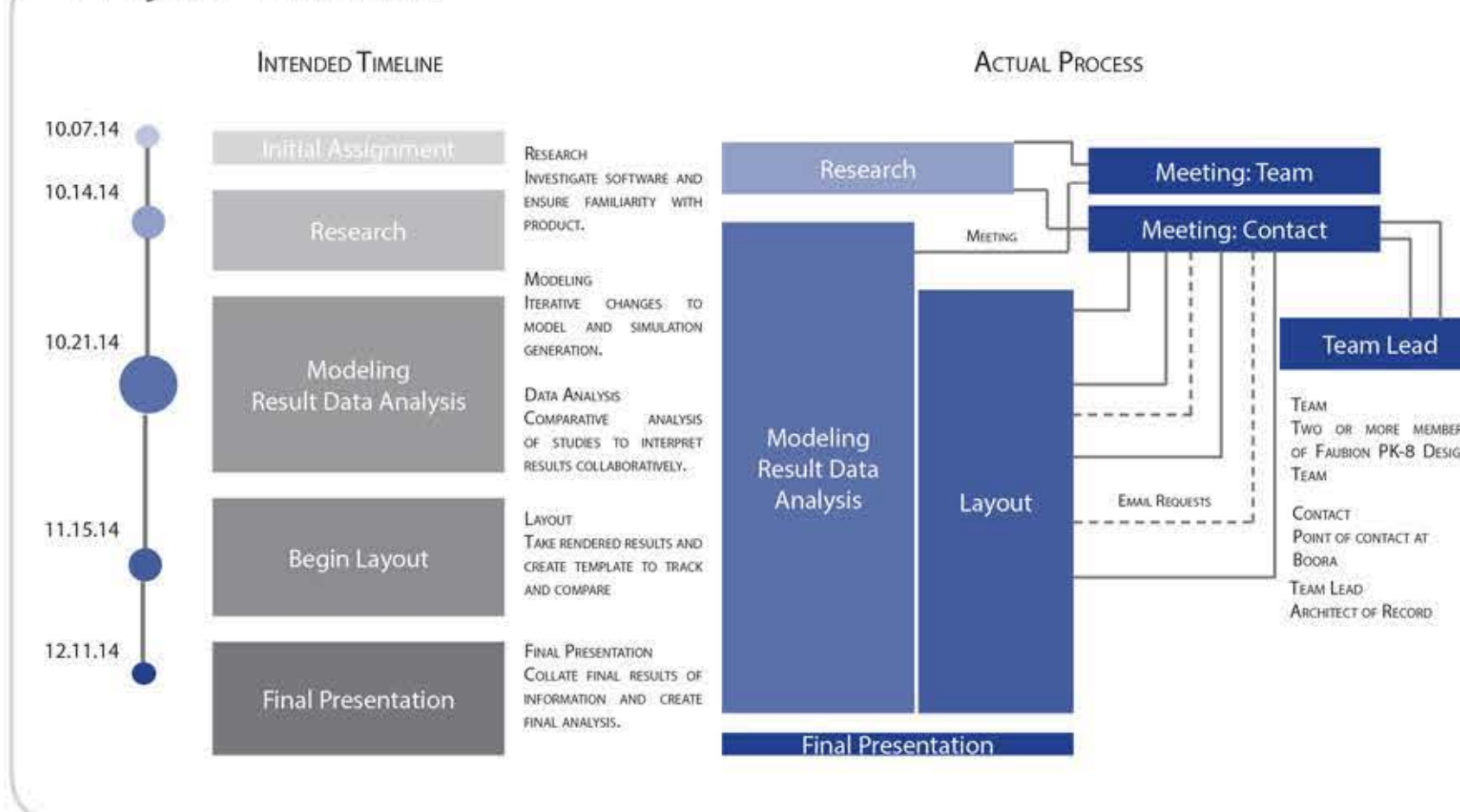


Building is exploded to display day light analysis grid.



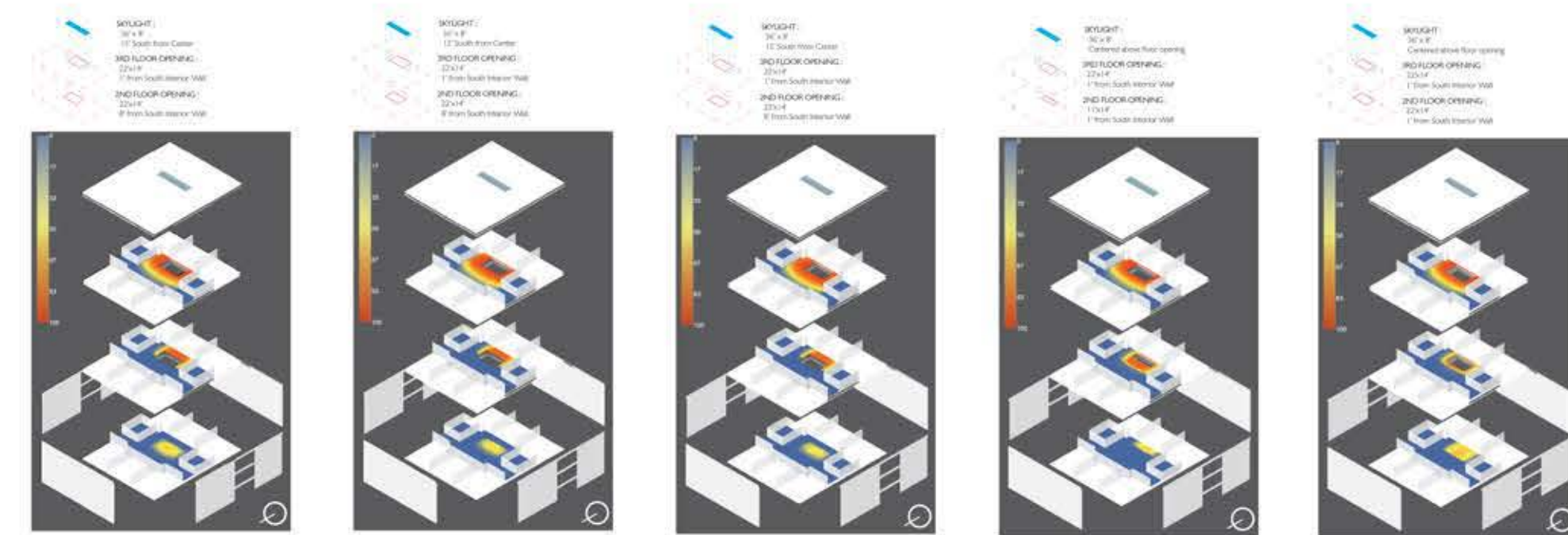
Material, time frame, and luminance settings are applied within Diva software options.

Project Timeline

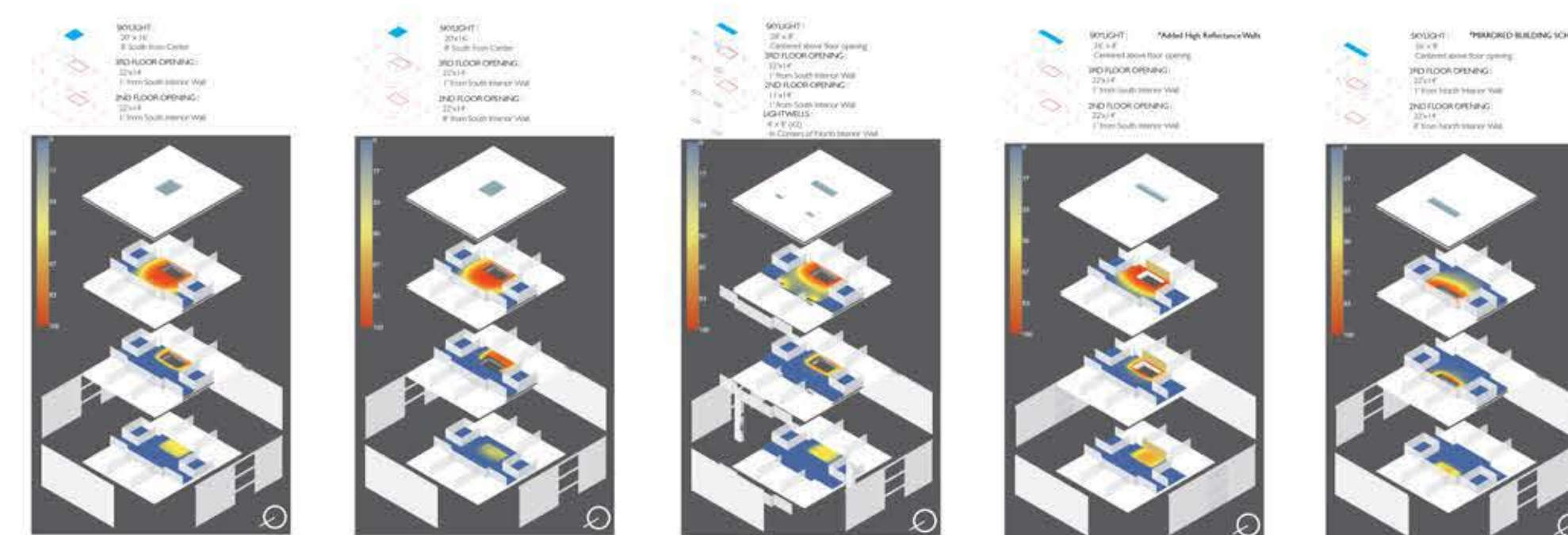


DATA

We have presented the information to Boora and based on the discussions we did an initial comparison and chose which design we would continue moving on with. From there Boora took the analysis and determined which design is better based on recommendations from their lead architects and the client. Our main finding for the project was that working with the longer skinnier skylight which was directly over the floor plate openings provided the best results within the parameters that were provided for us.



The 36'x8' skylight was determined to be the optimal size by Boora, so the majority of our analysis schemes focused on keeping this size while moving and resizing the floor openings.



Additional methods were used to provide a basis of comparison to the 36'x8' schemes including:

- Low reflective (wood) wall
- Adding high reflective wall
- Mirrored floor plan
- Adding light wells

CONCLUSION

The conclusion drawn from our analysis pointed out that having a narrow skylight can be the most effective in bringing in daylight into the atriums of the Faubion School. We have also tried light wells and reflective surfaces none of which dramatically increased the amount of daylight in the space. Additionally, splitting the skylights or the floor plates didn't have much effect, budget wise and structural constrains. One suggested we weren't able to text due to the limitation of the software was to include refractors within the atrium space to help defuse the light into the room.

