Lighting technique design guide

TUBULAR SKYLIGHTING
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   Morgan Lewis Law Firm, Washington D.C.
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Skylights are tools for delivering Daylight deep into interiors of one-story buildings or into the top floor of multistory buildings. They also bring daylight into the lower floors of multistory buildings through light wells and reflective devices.

Skylights come in a variety of shapes and sizes and can be made of a variety of materials to meet a number of different design situations.

However, sometimes it's impractical to deliver natural light to all spaces with these traditional skylighting techniques. Tubular Skylighting technique is a good alternative.
What are Tubular Skylights?

A type of Skylight which delivers natural light to a room where a traditional skylight or vertical glazing is impractical.

They typically consist of three components:

1. A small, clear acrylic dome located on the roof, which allows sunlight to enter.
2. An adjustable cylindrical aluminum shaft that has been treated with a highly reflective coating.
3. A translucent diffuser lens located on the interior ceiling, which disperses light throughout the room.

Installation:
The Dome is typically installed between rafters and joists on the roof, and the adjustable aluminum tube extends from the roof to the ceiling of the interior.
Prismatic emitters and diffusers
Advantages of tubular skylights:

1. Minimized heat gain and loss.
2. Almost all ultraviolet radiation is absorbed.
3. Good Color rendering (almost 100% CRI)

Applications

Good for residential, industrial, and commercial lighting.
Case Study:

Morgan Lewis Law Firm

Building description & Considerations

- Government building in Washington D.C. located on Pennsylvania Avenue between the White House and the Capitol building.

- Renovated in 1997, Two new floors added to the existing 12 story building and matching rear extension created a linear rectangular atrium.

- Renovation increased the working space by 25% and anticipated a better working environment.

- Skylight added to daylight the atrium (60’ long, 150’ high and just 8’ wide) and the windows of the office spaces facing the atrium to keep the users of the building aware of the weather outside.

To the disappointment of the users of the building, the traditional skylight provided over the linear atrium did not fully serve the purpose. The lower floors of the atrium were dark and gloomy as the sun’s rays could not reach deep down.
The task was assigned to Carpenter Norris Consulting to devise a way to bring daylight down to the base of the atrium and the solution, The ‘SOLAR LIGHT PIPE’- a 120-ft.-long glowing work of functional art brings a luminous, glittering shaft of sunshine to every floor of the firm's work space.

The solar light pipe was also a symbolic representation of the visionary approach of the Firm.
Components of the Solar Pipe

1. Sailing yacht fittings which secure the Pipe at the top and base, made of woven stainless-steel cables.

2. Translucent lycra fabric skin of the outer cylinder, which surrounds the cone and softens the bright light traveling through it.

3. Diamond-shaped panes of prismatic glass set within a stainless-steel and aluminum cylindrical cone support system (6' at the top and 18" at the bottom).
How the Solar Light Pipe Works

A heliostat reflects the sunlight onto a secondary mirror. The secondary mirror redirects the light down a 120-ft.-long, cone-shaped cylinder, which is made of diamond-shaped panes of prismatic glass set within a stainless-steel and aluminum support system. As the sunlight travels down the cone and hits its angled pieces of serrated glass, it refracts outward and bounces off and through the translucent fabric skin of an outer cylinder, which surrounds the cone and softens the bright light traveling through it.

The outer cylinder is actually a tension structure made of Lycra fabric stretched over stainless-steel compression rings that are held in place by steel arms radiating from the cone-shaped core. The stretched translucent fabric diffuses the bright reflections.
How the heliostat works

A heliostat, automatically tracks the sun as it crosses the sky, constantly reflects direct sunlight to any desired location or to distribution systems or special lighting effects within the building. In the absence of sunlight, the heliostat tracks two 2000W Xenon search lights which have a reasonably long lamp life, Have color-change capability and are dimmable, too. The whole system is controlled by a DMX 512 interface.
Since the heliostat tracks the sun throughout the course of the day and redirects the sun's light through the cone-shaped shaft, employees on every level gain a true sense of the sun's movement and variable quality as the day wears on.

But the heliostat can only track the sun when the sky is clear. As a result, they integrated an artificial light source into the fixture that would produce qualities similar to those of the sun on overcast days or at night.
CONCLUSION

Influence on the space and employees

- Provides the users with a sense of environment outside.
- It alleviates mood disorders associated with lack of daylight.
- Acts as a powerful stimulant and creates a visually interesting space.
- Provides a healthier and more tolerable working environment for the employees.