Installation Report

White LED Lighting Effects can Contribute to the Design of Building and Landscape

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ABSTRACT

In this paper, I will describe three cases: a roadway lighting (universal design), sign built-in lighting (PV system), and an enactment lighting for facade on buildings (interactive). These cases are some of the projects utilizing white LED lighting completed by lighting designer Miki Matsushita in 2007.

KEYWORDS: universal design, PV system, interactive

1. Introduction

I have worked as a lighting designer for 24 years. Compared to my initial working situation, my working style and environment have changed dramatically in many aspects including technology, the needs of the clients, the number of the lighting designers involved, and the cooperation of designers from foreign countries. I am constantly striving to maintain pace with the lighting industry where progress is relatively rapid. In addition to Japan, my company manages lighting design projects for Pacific Rim and other Asian countries by utilizing our geographical advantage from Fukuoka in Kyushu, Japan’s southernmost island. Our work entails management of the internal-and-external environment lighting for architecture, environment lighting for community buildings, and lighting plans for events. Generally, we work directly with the owners of the businesses or event management personnel.

2. Design Concept

At first, I was delighted to manage a lighting design company that I adore. I was satisfied with this fact alone. However, recently, I have begun to manage the company considering the challenges associated with a changing business model and company growth. I manage with a keen eye on designing new lighting that is unique to my industry. This lighting idea is based upon the concept in Japan where the gradation of the subdivided gray in light and shadow can be distinguished. The Japanese have cultivated this idea in the monsoon climate. Also, as a “Sensible Philosopher of Lighting,” I have always wanted to see objects. To do this, I must question myself: how can I express lighting using beautiful words? How can I create beautiful shadows within my work? How can I highlight the existence of lighting? Using new optical technology, I would like to create a view of the world that cannot be expressed by a computer.

3. Effort on LED Lighting

As mentioned above, I have been working in East Asia since 1994. I became interested in LED as a concept. From the viewpoint of a lighting designer, I provided various ideas to a Korean and Taiwan semiconductor manufacturer to utilize LEDs as lighting devices. At that time, I designed full color LED visions and guide plates in trains, emergency lamps at construction sites. Meanwhile, I have taken initiative in utilizing the LED as a new light source within an actual design plan. In the 21st century, like other light sources, white LED became a light source that can be utilized freely for its lighting effect. The lighting design world is not similar to the traditional analog world. It has fallen under the realm of digitalized lighting. Lighting equipment using LEDs are being manufactured all over the world as can be seen by various examples using full color LEDs both indoor and outdoor. Pertaining to white LED, however, lighting manufacturers are concentrating their power on increasing the lm/w at present. As a lighting designer, the most important thing I must consider is how to utilize its effect. Since some projects undertaken continue for 5 to 10 years, I need to anticipate the technology development in advance of the completion of these projects. In this paper, considering above-mentioned circumstances, I would like to release some of our planning design cases utilizing white LED lighting projects for urban development of universal design.
4. Lighting Design for Roadway

Earlier, I discussed environmental lighting projects. The redevelopment projects to make new towns within a city require long periods of time. But the work provides a great sense of satisfaction. The Kashiwakamachi project is a huge land readjustment project that covers the JR Kagoshima-chohonsen station and three private railway stations. It is situated in an 8 km parcel of the northeast district outside Fukuoka City. The project is planned for various urban functions that will become a nucleus of the newly developed city center to form a traffic base and multifunctional central location. In addition, the project will introduce basic developments such as an elevated railroad structure and the development of turnpikes and station squares. For nighttime lighting, we considered the environmental symbiosis within the community building parameters. We plan to use recyclable materials for the lighting equipment. Also, we will use low energy light sources. Specifically, the turnpike is called a center mall. The lead character is a person, not a car. This is our design concept. There are only two lanes of the roadway. The walkway and cycle track require wide spaces at both sides of the roadway. This space will be comfortable for people. We have designed this based upon planning which places importance on pedestrian-bicycle space. Specifically, we built LED footlights into stones that lined the cycle tracks, to make clear the separation with the roadway (Figures 1 and 2). Also, we lit up trees to introduce the light of the vertical plane in addition to improving a lighting balance at the main

Figure 1  Elevation of cycle track

Figure 3  Lighting plot of LED indicator in Chuo Ward

Figure 2  LED footlights into stones

Figure 4  LED line indicator at intersection
intersection that is also one of the bases. To call attention to the intersections for the disabled, we installed LED underground-buried lights. Thus, we completed “Human-friendly environment lighting” coupled within a bustling location.

For the cycle track, we serviced the pedestrian way similarly to a cycle track on a municipal road in Chuo Ward of Fukuoka City (Figure 3). Here, the white LED light garners attention as a foot light, and blue LED lighting is to reduce speed. This LED lighting caused bicycles to operate within the cycle tracks and slow down when approaching intersections (Figure 4). In Fukuoka City, there was growing incidence of pedestrian-bicycle accidents creating significant problems. The lighting plan, however, resulted in the elimination of such accidents from occurring.

5. Sign-and-Lighting Complex Design

Next, I would like to explain about an example at a new campus of a National university corporation Kyushu University. Kyushu University will be moving three separate campuses to one integrated campus. The new campus (Ito campus) is currently under construction. In October of 2005, approximately half of the engineering school building was completed and moving commenced at that time. The general plan is described as a guideline in “The Master Plan for Kyushu University New Campus.” A detailed public space design manual was subsequently derived from the master guideline. There is no requirement for a conventional lighting plan in this manual. As such, we considered the lighting plan which places value on the symbiosis of nature and human beings as “luminous environment.” The vast area of the campus is composed of Western, Central, and Eastern zones and a long turnpike that connects each zone. With regard to the “luminous environment,” each zone was based upon the major development points of the overall concept, the lighting method and the design. A manual for color, temperature, light source, equipment, and sign-and-lighting complex was subsequently completed. All the signage plans in this manual use a PV system and white LED utilizing sunlight (Figure 5). Because all of the signs are charged and illuminated by the PV system, they do not require wired receptacles. Our experiment showed that illumination lasted 8 hours or longer. Specifically, the address sign for campus map is installed in the university at 10 m intervals. In the future, one out of every ten signs will have a white LED installed. Since wiring is not required, these signs can be installed at difficult locations and can also be moved easily allowing for relocations during the long construction process.

6. Kagoshima Tonmankan K Building Facade

Lastly, I would like to explain about an example of facade design using white LED light for dramatic lighting (Figure 6). A 5-story commercial building was planned for construction in busy shopping area in Kagoshima City. The goal was to create a night expression incorporating the unique building architecture and design. Round holes of 75φ were line up at intervals within in the facade, and 1000 white LEDs were arranged (Figure 7). Each LED has a serial number and is computer controlled for various scenes. For the images, I was inspired from an unexpected event. The usage of light in recent cell
phones is unbelievably excellent. The scene change concept that was a party of this design was surprisingly similar to a huge cell phone in the facade of the building. To express a trendy yet novel design that would appear fresh at any moment, but yet create a functional expression by movement, we sent computer generated scene data to the main computer at the building via e-mail attachments to instantly change the scene. This project enables an interactive and auto-and-active enactment. The key word for white LED-lighting design in the future is “Beyond time and space, creating a scene which is always new.” We introduced an attractiveness that can change into anything such as information, signs, enactment and illumination. In other words, I believe that “Lighting designing” with continuous designing is the role of the designers of digitalized light.

7. Conclusion
When we receive requests for work from different business entities and different areas, and we challenged ourselves to meet these new opportunities each time. The more deeply I know the background such as characteristics, histories, environment and ethnicity, and the nature of the products and their affinity with the lighting, the more pleasure I receive when completing the challenges. I will be more attracted by the source if I research the white LED equipment further. The important thing is to design better lighting within the limited time. I believe the possibility of new white LED is a reality. I should effectively utilize it in the lighting design. To do so, I think that I should have eyes of “Sensible Philosopher of Lighting” and always keep watching the future.

References


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Figure 7: Details of K Building Facade