

ORIGINAL ARTICLE

The Research on Lighting Design of Parks

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Abstract

Based on the survey of the parks in Tai'an by questionnaire survey, on-the-spot investigation and in-depth interview, the paper analyzes the tendencies of visitors in modern landscape lighting design forms and methods from two terms: primary attributes and the preferences of artistic lighting design. To increase the safety of the parks is a pressing need for visitors. Visitors have a pressing need for increasing the safety of the parks' lighting and artistic quality. Most visitors think the parks' lighting has blind spots and the brightness is not enough. Visitors' night activities in the park will be insecure. As to artistry aspects, people prefer strong artistic style of lamps and lanterns to the common, such as ethnic style and animal image; Tourists prefer to use white light and yellow light to illuminate trees, because these colors make people feel more warm and amiable. This research provides basic data for lighting design of parks.

Key words : Parks, Lighting design, Visitors, Tendencies

1. Introduction

Our country has the custom of viewing lanterns while enjoying the scenery since ancient times. People hang all kinds of colored lanterns around the rally on The Lantern Festival. The lights were on full blast. Now people can't help decorating lanterns express the feeling of pleasure on the day of festival. Lighting culture is the show of higher requirements for cultural life of the people of the spirit in the environment of stable nation and welfare people. In recent years, the municipal government and the competent department of construction have invested a great amount of capital in constructing lighting

facilities to improve urban lighting. We have made great achievements. But as a part of the city lighting, the parks' lighting did not get the attention they deserved. At present, some parks' landscape lighting constructions have not plans and much messy. And some issues abuse showy colored light around. Some parks' lighting brightness is too high and has serious light pollution. Some people decorative lighting casually, leading to each landscape elements' lighting following his own policy. It is difficult to coordinate the beauty of individual to form a whole view, and to highlight the overall characteristics of parks (He, 2013). It wastes a large amount of energy, and don't

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achieve the goal of urban beautification, affecting the whole city environment, also do not accord with the requirement of green lighting. A good garden landscape lighting design will make an enhanced effect on digging and inheriting historical culture, making the city special features culture brand and enhancing urban grade (Peng, 2010). Landscape lighting should, therefore, through the original design, showing urban culture connotation, promoting local culture and improving urban nature landscape and human landscape, highlighting the regional feature of landscape at night. That is to say, we should use the art of modelling of lamps and lanterns lighting according to the functions and characteristics of the parks and the concrete object .

The research shows that suitable park lighting can make crime rate and traffic accidents low greatly, and can make the residents of the city feel safe and comfortable about the urban environment. Though unified planning of the park lighting, using science and advanced lighting techniques and methods, we can make the night scene more artistic and enhance ornamental of parks (Zhang et al., 2011). This paper takes two representative open parks for example in Tai'an city, by questionnaire survey, on-the-spot investigation and in-depth interview and other methods, analysing the tendencies of visitors in modern landscape lighting design forms and methods from two terms: primary attributes and the preferences of artistic lighting design, understanding the needs of the people in-depth, getting a mass of first-hand data which were collected and analyzed, in order to provide scientific basis for landscape lighting design.

2. Materials and methods

2.1. Investigation methods

2.1.1. Investigation time and place

The investigation was conducted in East Lake Park

and South Lake Park in Tai'an city during September, 2013.

Tai'an East Lake park, built in 2004, having a total area of nearly 100,000 square meters, located in the east of the old city center. The interconnecting between original East Lake park and Five Horse Lake, has provided many entertainment facilities to enrich the outdoor life of residents. The scenic areas adjacent to the residential area, have a lot of landscape essays, such as "Mountain and Flowing Water", "Spring Lake Plumbing", "Water Creek Bamboo Path", "Bloom Rhyme Flow" and so on.

Tai'an South Lake Park is the largest comprehensive park in the urban area, covering an area of 170,000 square meters, the integration of ecological, cultural and recreational natures. The park is divided into six functional division : the main entrance area, youth activity center, sightseeing district, children's activity area, forest area and water sports area. The main attractions are the "peace and prosperity", "good weather", "twelve lotus bridge", "wang yue pavilion", "the marble boat" and so on.

2.1.2. Investigation contents and methods

In order to get more useful information, in this paper we used questionnaire survey as the main method of this research, combined with the method of on-the-spot investigation and in-depth interview. The questionnaire survey is widely used in sociology research. It is determined to be the most effective mode for the works which need a large number of data collection. The questionnaire contains several standardized and certain structure questions which is designed unified in advance. A higher response rate with more valid information was provided through the method of answering and returning questionnaire at once. We believe that the strengths of this approach far outweigh the weaknesses particularly when testing the use of a questionnaire survey with a small sample size(Dai and Zhang, 2008).

In this study, the questionnaire consisted of three sections: visitors' basic information (gender, age, level of education and profession), the cognition of lighting, and the preferences of artistic lighting design.

2.1.3. Investigation findings

A total of 280 questionnaire copies were distributed(half for weekdays and half for weekends) in September, 2013. And the effective rate was 97.9%, for a total of 274 valid surveys were returned. We used Excel 2007 to handle the survey data statistics. In the process of questionnaire survey and on-the-spot investigation, the tourists who had the strong sense of participation were selected to have an in-depth interview. We listened to the comments and suggestions from the public directly through face-to-face exchanges.

2.2. Analytic methods

The analysis method used in this study are inductive analysis method and image evaluation method. Inductive analysis method refers to summarize existing research, content, methods, identify deficiencies which is the starting point of the study through reading literature extensively and understanding the relevant theories and research results. Image analysis method is by investigating the existing lighting conditions, shooting and collecting

relevant pictures. According to the two aspects of lamps model and lighting color, we selected out of 11 pictures as a medium for tourists to choose from. Finally, the questionnaires were taken back immediately after the completion. We used mathematical statistical methods to process those data, acquiring the lighting design forms and methods of meeting tourists' needs.

3. Results and discussion

3.1. Visitors' Basic Information

The questionnaire used four indicators (gender, age, profession and level of education) to reflect the basic information of participants, more details are shown in Table 1.

In order to ensure the scientific and convenient effect of the research, we reference a large number of literatures from domestic and foreign. The age group of participants is divided into five sections: 18 years old and younger for the juvenile stage, 19~26 years old for youth stage, 27~45 years old for middle-aged stage, 46~55 years old for old stage, 56 years old and older for retired nursing stage.

The statistical results of the survey data show that gender composition of the investigated visitors is roughly 1:1. The age distribution of the people being investigated are mainly focused in the 19~26 age group (the proportion of it occupies up to 31.4%) and

Table 1. The basic information of visitors

Gender		Age							
Male	Female	≤18	19-26	27-45	46-55	≥56			
49.6%	50.4%	7.3%	31.4%	31.0%	16.4%	13.9%			
Profession					Level of education				
Student	Staff of enterprises	Civil servant	Private owner	Retiree	Others	Junior high school or lower	Senior high school or vocational school	College and University	Master degree or above
24.5%	33.2%	19.3%	8.8%	8.0%	6.2%	22.3%	36.9%	35.8%	5.1%

the 27~45 age group accounted for 31.0%. However, the participants of 56 years old or older have the smallest proportion, which is due to certain limitation, such as level of education, vision and other physical conditions. Hence, these factors make it difficult for elderly to participate in the questionnaire well. The participants of 18 years and below have the minimum proportion in the questionnaire, because the participants of this age have a lot of schoolwork, having very little spare time to go to the park. In terms of occupational composition, there are mainly students (the proportion of it occupies up to 24.5%) and staffs of enterprises (the proportion of it occupies up to 33.2%), both accounting for 57.7% of the total. And also a variety of other different sectors are included in this questionnaire. In terms of the level of education, 72.7% of the total are the people having senior high school, vocational school, college and university level education. Overall, the samples extracted in this survey and the basic information of the participants are relatively abundant and representative in terms of gender, age, occupation and education level.

3.2. Visitors' cognitions on lighting

In the fast-paced modern lifestyle, people are immersed in a mass of work, and a comfortable nightlife often become the best time for leisure activities. Parks should provide a walk, entertainment, leisure and other aspects of the service function for visitors at night. A vibrant night view of parks must have a wealth of features to meet the demand of different levels and ages on nightlife, so the night view design of parks is particularly important (Deng and Xu, 2010). Lighting design is the key to the night view design, should be given adequate attention. According to the data obtained from the survey, 52.9% of the respondents tourists believe that park lighting need to get attention, 32.8% of visitors showed less concern for the lighting, and only 14.3%

of visitors never concerned about the lighting conditions. This shows that the majority of people stated that parks should have a good lighting condition, and people who without concern for the lighting conditions are only a small part of the population (Fig. 1).

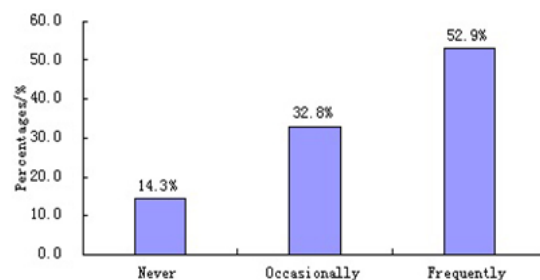


Fig. 1. The degree of concern on the park lighting.

In terms of the overall brightness of the lighting, 56.2% of the visitors said that the overall lighting brightness is dim at night, 16.8% of visitors considered that overall lighting brightness is brighter, however, the people who said the overall brightness is appropriate only account for 27.0% (Fig. 2). Survey results showed that most people think the parks is dark at night. Street lamps in the parks are less 50 power and the distance is greater than 50 meters, causing some areas without good lighting. These shows that not only the users of parks did not pay enough attention to the parks lighting, but also landscape designers did not give enough attention to the lighting design. In the process of building the parks night view lighting, some people just light up a part of sign buildings, often acting in accordance with their intentions, ultimately leading to poor effects of the parks' lighting. Although devoted a lot of manpower, material and financial resources into lighting, the actual effect is poor (Tong, 2013). Park lighting is not only a main method to create the night environment of parks in urban, but also the premise of protecting the safety of visitors in gardens. By

setting a right artificial lighting in place, we can increase the visibility of city parks at night, enhancing the security of the venues, reducing crime and accidents and ensuring the safety of visitors.

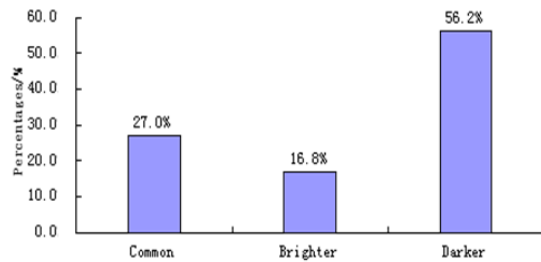


Fig. 2. The brightness of the light of the parks.

Survey data showed that 52.2% of visitors considered the parks lighting has blind spots, only 21.2% of the visitors said “no”, and another 26.6% of visitors paid no attention to this question. This result is relevant to visitors' attention to the parks' lighting. Mostly tourists who ignored this problem would think there is no blind spots in the parks (Fig. 3). From this, the visitors urgently needs to have a good artificial lighting, by eliminating the blind spots in parks ,we can protect personal and property safety of visitors at night. While brightening the night view of parks, effectively improve the safety of the parks to meet users' physical security needs.

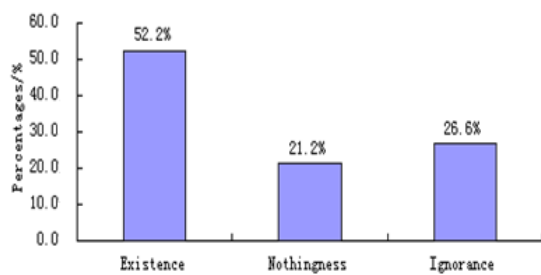


Fig. 3. The existence of blind spots of the park lighting.

We can see from the Fig. 4, 46.7% of visitors lacked of security when acting in the parks at night,

28.1% of the visitors did not matter, 25.2% said “no”(Fig. 4). This suggests that the effects of landscape lighting design for visitors' psychological security have not been given due attention. Lighting design is a part of the landscape design, rather than separate, additional individuals (Yan and Yang, 2012). Lighting as a key part of night view of the parks, with its unique features, should create a completely different with daytime and colorful portion landscape effects, thus contributing to an active garden atmosphere, so that while people experience the alternative garden style, getting physical and mental relaxation. Therefore, strengthening the construction of psychological safety in parks lighting design has great significance.

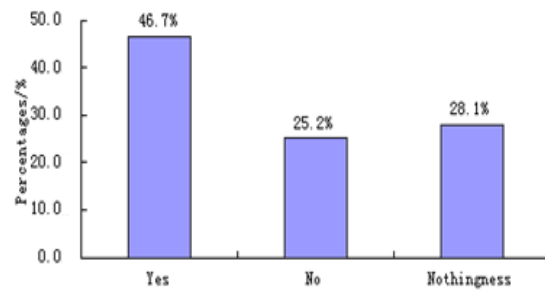


Fig. 4. A sense of security at night in the parks.

3.3. Visitors' preferences and tendentious to artistic lighting

3.3.1. The popular types of street lamp in parks

As is shown in Fig. 5, 59.1% of visitors believed that lamps in the parks have less of number and rather dull, 29.9% of them said the number is average, and 10.9% of people considered there are plurality of lamps in the parks. This shows that tourists have certain demands for style of lamps. Unlike ordinary street lamps, they are courtyard lamps whose height are not too high, and more close to the level of people's eyes, thus its own beauty and color will have a greater effect on people. Therefore, in addition to

meet their lighting features, these lamps much tend to show their art appreciation. During the day, the shape, height and color of the lamps are very helpful to enhance the level of the city's landscape, at night, the lights also sketched out a second image of the parks, making the parks show itself in front of the crowd with a unique way. So increasing the style of the street lamps helps to show the parks' style better and improve the parks' appreciation.

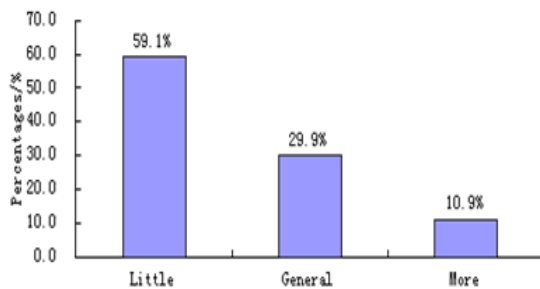


Fig. 5. The number of the types of street lamps.

Shown in Fig. 6, the proportion of modern minimalist style and Japanese "Stone Lantern" style in lamps type is more or less, respectively is 22.6%, 23.7%, lamps which has the animal image and the European classical style accounted for a larger proportion, respectively is 41.2%, 32.8%. Studies have shown that the landscapes of animal elements are in urgent demand by the public. The most favorite types of animals and animal elements are: Butterfly, dove, crane, monkey, panda, dragonflies, goldfish, dolphin, dragon and cartoon animals. Street lamps with Chinese national style are the most popular types from the five styles, the ratio is 56.6%. In today's context of globalization, more and more urban landscape blindly follow the "European" style, becoming more similar, losing its geographical characteristics, making the pursuit of local characteristics of landscape strong increasingly. Lamps which have Chinese national style are an important manifestation of the parks' features, style

and design, and are an important way to learn Chinese landscape culture. Therefore, the design and selection of lamps should take full account of the needs of tourists, giving the lamps with Chinese national style and local characteristics more consideration. In addition, the lamps with the local cultural characteristics is not to win with the body, but a deeper repeated hints of cultural meaning. We should adhere to the people-oriented principle, giving full consideration to the aesthetic needs of different ages, honesty and surprisingly, Simplicity and luxury balance, static and dynamic binding ensuring that in the case without damaging the perfect landscape during the day to enhance landscape of parks at night(Zhou, 2013).

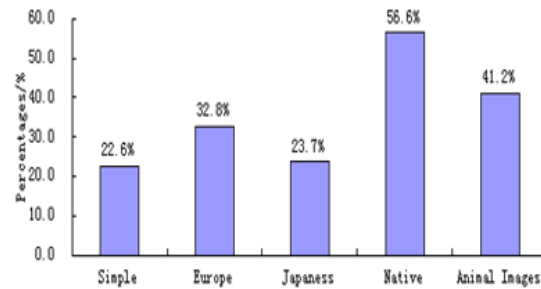


Fig. 6. The popular types of different styles of street lamps.

3.3.2. The popular lighting colors on trees

Beautiful environment is inseparable from decoration of colors. The beauty of colors is bound up with their physical nature. Different colors have different stimuli on human physiology, affecting people's different psychological feeling for different colors.

In the light color, the statistics showed that 47.4% of visitors chose to use white light irradiating trees, 35.0% of the tourists choose a buff light to shining them, selecting green light accounted for 33.6%, only 20.4% of the tourists choose with violet(Fig. 7). So we must consider the psychological feeling of the visitors during design the lighting of trees, reasonable

combination of light colors, adhering to the "two low and one high" light principle: low illumination, low color temperature, high color, making the lighting system of the whole area cosmic, avoiding haze and glare(Zhou, 2013), and avoiding the abuse of the light which resulted in some terrorist strange space and a waste of energy.

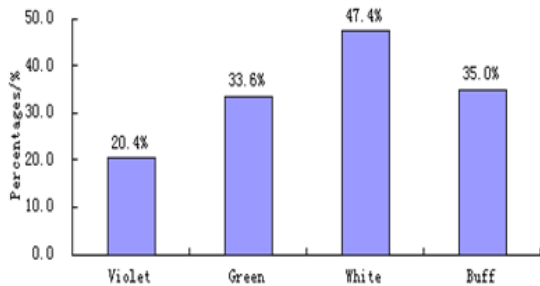


Fig. 7. The popular lighting colors on trees.

4. Conclusions

Combined with questionnaire survey, and on-the-spot investigation in depth interview, researching visitors' cognitions on lighting and the preferences of artistic lighting design, We have drawn several conclusions as follows:

(1) People lack of awareness on the lighting of parks. But most visitors are not satisfied with the current garden lighting conditions. Improving the security of the lighting and clearing safety hazards of lighting are urgently needed for people. (2)Most visitors think the types of street lamps are too small, lacking of artistry and very monotonous. (3)People's favourite lantern types are: with chinese regional characteristics and ethnic customs and with animal images, such as doves, butterflies, goldfish, cartoon images. (4)Tourists prefer to use the appropriate white and buff light illuminating trees, creating a warm, amiable atmosphere, helping to relax and relieve stress.

In summary, to achieve people-oriented, the park

lighting design must basis in-depth analysis of visitors' visual, psychological, behavioral, physiological and other aspects, integrating organically and planning uniformly the lighting design and other various elements design in the parks, creating comfortable sight, nice ambience, and achieving the harmony of light and beauty of the light environment, providing the condition for people to be loved activities, creating a vibrant, harmonious night landscape.

Reference

- Dai, F., Zhang, J. H., 2008, The survey method in planning and design (1) the investigation method of the questionnaire, *Chinese Landscape Architecture*, 10, 82-87.
- Deng, Y., Xu, X., 2010, The night landscape design of living environment, *Anhui Agricultural Science*, 21, 11613.
- He, J., 2013, Talking about upgrading the lighting effect of the city landscape, *Construction and planning*, 1, 25.
- Peng, Y., 2010, Design of landscape lighting, *Anhui Agricultural Science Bulletin*, 10, 180.
- Tong, X., 2013, Discussion on the city night landscape lighting design, *Shanxi architecture*, 16, 116.
- Yan, S., Yang, X., 2012, The pioneering of lighting design in the design, *Art*, 340, 89.
- Zhang, F., Shen, S., Li, F., Liu, J., 2011, Open city park landscape design safety and countermeasure, *Anhui Agricultural Science*, 1, 354-356.
- Zhou, A., 2013, The principles of city park design, *Huazhang*, 16, 333.

