

**The Analysis and Research of “Sponge Campus” Drainage System
Problem——A Case Study of the New Campus of Guangxi Polytechnic of
Construction**

Chunyi Duan

Guangxi Polytechnic of Construction, Guangxi 530000, China;

dcyjoyce@126.com

Abstract: All According to some research of sponge cities and the drainage system domestic and overseas, the concept of low impact development rainwater system view is applied to the construction of campus water cycle system. Then in New Campus of Guangxi Polytechnic of Construction as a case study, analysing the various reasons for waterlogging based on the actual situation of new campus of Guangxi Polytechnic of Construction, analysed and arranged its feasibility, and combined with the ideas and methods of construction of sponge cities, and prepared the corresponding design plan to guarantee the purpose of the balanced development of the campus natural water system.

Keywords: Sponge Campus; Planning and Construction; Management System.

1. INTRODUCTION

This paper applied the theory of Sponge City to campus environment and put forward the concept of "Sponge campus". The concept of "Sponge City" was first proposed in 2012 (in the 2012 Low-Carbon City and Regional Development Technology BBS). Sponge City is an important way to realize the harmonious development of urban construction and natural resources, and a low impact model on the development of rainwater system, which is to the maximum extent to restore the natural hydrological environment of the City. Base on the summary of the research on the construction of Sponge City. This paper defined "sponge campus" namely: In order to protect the original ecology, construct the campus environment, adhered to the quality of sponge "penetration" and "absorb" to purify rainwater, for realizing the coordinated development of environment and water resources and ensuring the natural and orderly way of daily life on campus.

2. Construction Plan of "Sponge Campus"

2.1 Coordinate with the sponge city planning.

The construction of sponge city runs through all stages of urban planning and needs to be coordinated and coordinated from top to bottom. Campus is an important part of the city, with the surrounding environment of the subtle changes may produce a chain reaction, where will be greater scope of influence. As an important part of the city, campus have to ensure that the drainage system connection smoothly in urban pipeline and support effective development for the sponge city.

2.2 Construction of ecological environment restoration.

The main philosophy of the low impact development application of drainage system which is used by sponge campus is green rainwater infrastructure technology. It mainly control the source of the runoff generation and flow, in order to achieve the purpose of regulating water balance system and improving the environment. The construction of "sponge campus" is with similar as Sponge cities construction, which is to exchange the ever rapid discharge way the rain into combination of rainwater treatment by " Infiltration, retention, storage, purification, use, discharge ". Giving full consideration to the campus problem such as waterlogging, runoff pollution, ecological restoration, overall planning the construction of each link. Controlling the source processing, reducing the discharge volume, and promoting the rainwater infiltration and accumulation in the process of rainwater purification and recycling, so as to optimize the drainage and utilization of rainwater.

2.3 Load-bearing balance of resources.

The purpose of building "sponge campus" is to promoting harmonious balanced development of city and water, to protect urban environment function optimization campus facilities in a particular environment at the same time. Drainage system of campus was developed, planed and constructed within a certain time according to predict the population and the scale. Normal use within the planning permission range must can meet the requirements of campus drainage. With the development of education cause in our country, the phenomenon of campus recruitment is becoming more and more frequent, the inflowing of a large number of students were to accelerate the construction of campus building, which is adding to the burden of campus drainage, producing the problem such as the waterlogging. Therefore, expanded campus personnel and building construction in an allowing conditions of the resource supply is a necessary and sufficient.

2.4 Management and maintenance.

Most colleges and universities school dozens or even hundreds of years, even when using the most advanced planning and construction materials. Howere, after a long time using there would be also a big loss with the passage of time. The campus environment and conditions were always changing, when the constant of the drainage system was difficult to adapt to the environment. That would easy to form the campus waterlogging. On the other hand, campus drainage system maintenance management system was often not perfect because of a lack of attention. Many campus could not be handled in a timely manner at the time of onset of

rainstorm waterlogging, which caused badly damaged of the campus infrastructure and campus life. Therefore, drainage system must management for regular maintenance and necessary repairs.

3. Establish and improve laws and regulations of rainwater management system

The status quo of laws and regulations on sponge construction in our country contains part of the low-impact facilities and rain-flood comprehensive management concerned by sponge city construction. However, at the same time, sponge-based campus construction requirements had not yet been fully covered by the existing laws and regulations and need to be further passed through local planning documents and other forms of perfection.

Based on the Nanning sponge city construction planning laws and regulations, in order to improve sponge campus construction planning, we make a suggestion in five aspects in the following:

3.1 Reduce the standard documents that restrict the development concept and formulate the requirement for zero growth of runoff coefficient after development.

Runoff coefficient refers to the ratio between total runoff and precipitation in a given catchment area. As far as the current urban development, the process of urbanization was very fast and the accompanying damage to the surrounding environment was also growing[1]. As a result, the impervious area of the city was getting larger and larger and the corresponding runoff coefficient was also increasing. The increasing runoff had made it increasingly difficult for urban drainage systems to meet their drainage requirements, resulting in serious surface water rains and heavy pollution to the city. Therefore, the author suggests that some provisions should be added to the relevant clauses. For example, in the newly developed area, the storm flood peak flow should be lower than the pre-development peak flow. At the same time, it is required to build a storage capacity reservoir in the area to ensure Development Zone will not be affected by the accumulation of water. In addition, relevant policies should also be formulated to mandate the zero-growth of runoff coefficients.

3.2 The proposal in the use of rain-based recommendations in laws, regulations and normative documents should be gradually transformed into a mandatory requirement.

At present, most of the relevant legal documents on the utilization of rainwater resources developed and implemented domestically were mainly support, encouragement and suggestion. Since there is no mandatory implementation, the utilization of rainwater resources was not high[2]. Through the investigation and analysis of the relevant legal documents, the author suggests that the current relevant documents should be revised, the previous proposed regulations should be changed to mandatory regulations and the relevant units should be implemented.

3.3 Introduction of low-impact development guidelines based on the concept of rainwater management

Since there was no specific document on rainwater management in the current relevant documents, we proposed. It should be developed and implemented on the rainwater utilization

and management of the document as soon as possible, and take rainwater discharge, pollution control and other aspects of the content into this category. For some large-scale supermarkets, public facilities, residential areas, schools and other areas of rainwater management should have mandatory characteristics of the guidelines for the discharge of rainwater to reduce or avoid the phenomenon of heavy waterlogging pavement.

3.4 Formulating local planning and design guidelines

It should make use of the planning management to regulate sponge campus requirements. In the aspect of planning, it is necessary to integrate the contents of sponge campus planning into a reasonable one by or planning and design guidelines under the existing planning system. In the process of planning, the planning and construction plan review mechanism should be established, which closely links the first plan, the expert administrative review and the review of the leading group. The general planning level focuses on the strategic. The regulatory compliance regulations should pay attention to the implementation of the effect. The special planning level emphasis on integrity

4. CONCLUSION

"Sponge campus" system does not require the construction of a complete renovation or a wide range of building, but gets in the construction of the most effective results with minimum capital investment on the basis of the existing environment. The essence of the construction of sponge campus is to control rainwater runoff at its source. It has a definite mitigation effect on the waterlogging problem of the campus, but it cannot replace the campus drainage system. Sponge campus system play a crucial role when there is the daily small or moderate rain. But for heavy rain, the campus drainage system must be drained excess of rainwater runoff in order to assure the safety operation of the campus. Sponge campus or the drainage system of campus is a problem we should consider in and the coupling of each other is very important.

ACKNOWLEDGEMENTS

This research is supported by 2014 Guangxi University Scientific Research Project (Project name: Analysis and Countermeasures on the Current Situation of Domestic Pollution in Rural Areas of Guangxi Province. Project ID: YB2014519) and 2017 Improvement Project of the Basic Capacity of Young Teachers in Guangxi (Project name: Evaluation and Research on the Typical Measures and Apply of the Low Impact Development of the Rainwater Utilization and the Sponge Campus. Project ID: 2017KY1122).

REFERENCES

- [1] Wang. Discussion on Urban Planning Method based on Sponge City Concept. *South Architecture*, 2015(4) :108-114.
- [2] The Technical Guide for the Construction of Sponge Cities - Low Impact on the Development of Rainwater System Construction. Ministry of Housing and Urban-Rural Development of the People's Republic of China. 2014