

"Planning" and "construction" of the renovation of the open-air swimming pool

Lingling Chen^{1,*}, Bingzhang Huang¹, Weiwei Huang¹, and Xiaohui Liang²

¹College of civil and architectural engineering, Liuzhou Institute of Technology, Liuzhou, Guangxi, 545616

²College of civil and architectural engineering, Guangxi University of Science and Technology, Liuzhou, Guangxi, 545005

Abstract. The paper combined with the actual situation of setting up outdoor swimming pool facilities in the school analyzes and studies the design content of the preliminary positioning, engineering design, construction design and operation use from the positioning, design, cost, energy saving, management, operation and other aspects of the transformation concept of "planning" and "construction", and provides a reference for the design of the outdoor swimming pool in the school.

Keywords: Open-Air swimming pool, Renovation, Planning, construction.

1 Introduction

Compared with other ordinary sports facilities, swimming venues in schools have the characteristics with single function and high operation and maintenance cost. For solving the problem of open-air swimming pool utilization rate and safety management, the renovation of open-air swimming pool is regard as the important exploration and challenge to the construction and management mode of public sports buildings for recent years. Some schools in Liuzhou City originally built open-air swimming pools and entrusted enterprises relying on social forces for renovation, management and operation. The new model solves the problems on difficult maintenance and management of open-air swimming pools in schools, and changes the basic thinking mode of public sports building construction. A win-win goal is made for both parties.

2 Planning

"Planning" considered as a verb in "Modern Chinese Dictionary" refers to seeking or managing; it refers to the overall planning and feasibility study of the renovation of open-air swimming pools in this article. "construction" as a verb in "Modern Chinese Dictionary" means building and setting up. In this article, "construction" refers to the planned and

* Corresponding author: 20482849@qq.com

purposeful construction of buildings according to the concept of "planning", which can also be understood as put up.

2.1 Scientific orientation, rational design

The type of open-air swimming pool and swimming pool building has always been a complex subject in architectural design research. Open-air swimming pools are generally the integral part of residential areas and schools or supporting facilities, the cost is low compared to swimming pools, but practical and beautiful, and have always been regarded as an important means to improve the quality of residents in residential communities and improve the perfection of supporting facilities in schools. However, issues such as short year-round use times and high maintenance and management costs are the main problems of open-air swimming pools. Compared with open-air swimming pools, large-scale independent swimming pool buildings are generally constructed as an important public facility in the city, which can provide a good indoor environment and can be received all year round, but there are too many swimming pools in the construction of the landmark of their architecture in the city, which greatly increases the construction cost. For the original purpose of the construction of the swimming pool, it is mainly to provide a exercise venue and a comfortable environment for swimmers to get swimming enthusiasts, and the design too luxurious and wasteful is unnecessary.

Some schools in Liuzhou contain swimming pools or swimming pool sports facilities. For open-air swimming pools, the major problems in schools are maintenance and safety management issues, and the general academic calendar is swimming during summer vacations. During prime time, school staff and students are basically not in school, and the utilization rate of open-air swimming pools is even worse. According to the survey, most of the schools in Liuzhou City that contain swimming pools or swimming pools have been idle after the facilities are built. Therefore, how to make better use of them is an important research topic in the future. In the process of transforming, revitalizing, and optimizing the design of the open-air swimming pool, its scientific orientation and rational design are the basis and premise to ensure that it can be reused.

Scientific research is needed from the positioning of the transformation and reuse of open-air swimming pools. The more important basis for judging is what the purpose of transforming them is. From this point of view, the transformation of an open-air swimming pool into a swimming pool is a better way to provide year-round facility services and improve maintenance costs, while the volume or construction standard of the transformed building does not require such high requirements. With designing, it only needs to meet the basic functional requirements or a little more. The design focus mainly on the building energy-saving design, as a result of the transformation of the swimming pool, the equipment operation and maintenance costs of the year-round service are the design content that needs to be considered.

2.2 Scientific orientation, rational design

School students used the supporting swimming pools or swimming pools in schools generally, as actual use, which are mainly used for swimming teaching, and are less used as competition pools. When transforming an open-air swimming pool into a swimming pool, the size of the swimming pool can be reduced without considering the design of the auditorium, which can greatly reduce the construction cost in the architectural design part of the renovation design. Large unnecessary spaces should also be eliminated to pave the way for later energy conservation and energy reduction.

To better control the cost and reduce energy consumption, in the renovation process, there are several points needed to be considered. The first is the selection of the building structure and its enclosure for the transformation of the open-air swimming pool into a swimming pool. The swimming pool is a large-span space, and the selection of the building structure accounts for most of the construction cost, which is also one of the difficulties in the architectural design of the swimming pool. Reducing the capacity of the large-span space, reducing the height of the large-span space, and doing a good job of thermal insulation measures for the enclosure are all important means to reduce costs and reduce energy consumption. The second is that the large energy loss of the swimming pool is the loss of equipment operation. When the open-air swimming pool is renovated, the use of winter constant temperature equipment is the largest source of energy consumption. When the swimming pool is remodeled and the swimming pool is provided, the selection and optimization design of the constant temperature equipment is the focus of energy-saving design to reduce energy consumption.

2.3 Cluster management, smart operation

The renovation of the open-air swimming pool mainly covers four stages: preliminary positioning, engineering design, construction design and operation to achieve from "planning" to "construction". In these stage, each contains complex branches and contents, and each part is clustered. Management can achieve expected goals more effectively. At the same time, dynamic management of the whole process can also better control costs and optimize energy conservation, ensuring that the quality of the entire project is advanced.

The operation of the swimming pool of the open-air swimming pool after the renovation can be introduced into the operation of smart venues in order to reduce labor costs. At the same time, introducing the crowd control system, equipment operation system, monitoring system, etc. Digital, parametric and visualized information, through quantitative comparative analysis of performance, maximizes and optimizes the operation of the swimming pool to meet the needs of overall green operation.

3 Construction

3.1 Reasonable layout, from the inside to the outside

When the open-air swimming pool is renovated, it should use the principle of use priority, which reflects the design concept of "inside-out" in the architectural design of the stadium. With laying out the indoor space of the swimming pool, the service space should also be arranged around the swimming pool. The functional space of the swimming pool in the school does not need to be very complicated, it only needs to meet the basic functional requirements. Except for the important use space, the swimming pool design part needs to be considered. In addition, the remaining use space or service space can be reduced in volume, or make full use of gray space such as the space under the stairs, partition design, etc. to meet the use requirements.

The swimming pool space is the most important part of the swimming pool. Functional rooms such as the foyer and technical rooms, as well as changing rooms, shower rooms, equipment rooms, etc., should be designed around the swimming pool, and should be divided and organized according to their different functions, and should set up independent entrance and exit for functional requirements.

3.2 Precise modeling, green construction

The renovation of an open-air swimming pool involves the design of multiple disciplines such as architecture, structure, and equipment. The way to make the communication of design information of different disciplines smooth can be jointly processed through BIM technology, and the information of the whole life cycle of the project transformation can be integrated through the visual 3D model of BIM. Accurate modeling can provide the informatized and digital theoretical basis for the construction process, construction progress, and operation stage of the project, and provide the most effective and feasible design scheme for project construction in terms of energy saving, material saving, etc. to achieve related design and synchronous adjustment .

During the renovation and construction of open-air swimming pools, BIM can provide accurate calculation of engineering quantities, modeling analysis of piping systems, etc., and the construction plan can be revised according to the analysis results in a timely manner, avoiding the waste of on-site rework time and construction materials, and optimizing the work flow, at the same time, it optimizes and adjusts the schedule plan, also improves the construction production efficiency, and realizes the sustainable development concept of "green + wisdom", which is a strong support for the implementation of the outdoor swimming pool renovation project.

3.3 Optimizing space, cooperating and innovating

The swimming pool after the renovation of the open-air swimming pool is mainly a one-line space, and the internal space can adopt a composite space pattern that is arranged adjacent to the pool hall, so that meeting the pool hall, service space, office space, etc. service needs. The pool hall and other spaces can be designed with flexible partition walls, which can share and flow space when different needs. Make full use of the triangular space, for example, the space under the stairs can be set up as a storage room to achieve the compactness of the space and save the university, while meeting the comfort and flexibility of use requirements.

The management and maintenance costs of the renovated swimming pool mainly come from water consumption such as backwash water and pool water evaporation, the use of electricity and filter material loss, frequent maintenance and replacement of equipment parts, and the use of swimming pool water heating and air conditioning costs in winter. The school is under big financial pressure when it is used and operated independently. The policy of introducing social forces to jointly run the school can solve the cost of renovation and maintenance, while alleviating the social demand for swimming resources, and greatly improving the utilization rate of school sports resources. This is also the development trend of the management and operation of swimming pools in primary and secondary schools in the future.

4 Conclusion

In addition to meeting the basic functional requirements in the renovation project of the school's open-air swimming pool, "planning" and "construction" should focus on the applicability of architectural design to improve the utilization rate and meet the original intention of the design. At the same time, the appropriate size and structure of the swimming pool are selected to save energy and focus on economy; according to the policies of the local government or relevant management departments, the swimming pool can be operated and developed continuously, so that the sports facilities of the school can be utilized. It is really implemented and used for education.

The renovation of the open-air swimming pool in the school is a design practice of "planning" and "construction". In the renovation and design of sports buildings, it breaks through the habit of traditional professional design. and new ways of operating. Starting from the sustainability of sports building renovation, "planning" and "construction" are effective ways to green development of school open-air swimming pool facilities or sports venues and to improve the overall quality of campus sports buildings.

References

1. Sun Yimin. "planning" and "construction" of stadiums [J]. Chinese Journal of Architecture, 2019(05): 39-42.
2. Wang Fenqiang, Ye Weikang, Sun Yimin, Shen Yonggang, Zhu Xiaojing. Appropriate Technology and Rational Construction—Review of Jiangmen Binjiang Sports Center Design [J]. Journal of Architecture, 2019(05): 43-47.
3. Zhu Xiaoyu. Research on the design of swimming pools in primary and secondary schools in Shanghai [J]. Chinese and Foreign Architecture, 2019, (03): 132-134.
4. Zhang Yueqiang, Ding Jiemin, Zhang Zheng. Coordinated Design of Architecture and Structure in Sports Architecture [J]. Architectural Techniques, 2017, (08): 86-90.
5. Zhang Dong, Shang Yujin. Composite and ecological design of college gymnasiums—Taking the gymnasium design of Dongying Technician College as an example [J]. Huazhong Architecture, 2017,35(07):24-30.