

Energy Conservation and Natatorium Planning Layout

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Abstract: *Undeniably, a good architecture should be novel in design, at the same time, it should be ecologically and environmentally friendly. From macroscopic perspective, site selection is closely related to the overall with energy conservation. As a large-scale sports building, natatorium is closely bonded with factors such as population distribution, population size, and zoning. A proper planning layout will increase the level of resource utilization and achieve the aim of energy conservation.*

Keywords: planning; energy conservation; site selection

1. Introduction

Natatoria can be divided into large natatoria for swimming events and natatoria for public. City sports center is formed by large natatorium and other sports buildings nearby. Because of its large investment and wide influence, the sports center receives more attention. It should be coordinated with the development of the city. The site selection of natatorium should be in accordance with the overall planning of city construction and the requirements of culture and sports facilities layout. Optimization of energy conservation will be achieved if its site planning takes the factor of urban function division and population distribution into consideration.

2. Existing Problems in Architectural Design

2.1 Unreasonable Scale-positioning of Natatorium

(1) Existing problems

Oversized natatorium is a widespread problem in China. Swimming events are few while the seats for audiences are too many, and the operation costs of facility protection are too high. All these factors lead to unnecessary resource waste. To be more specific, too much attention has been paid to natatorium for large events while the construction of medium

and small swimming pool has been neglected; the quantity of swimming pools for training and for public use are insufficient; and to the disadvantage of function shift, rooms for auxiliary functions are not enough.

(2) Countermeasures

To solve the problem of improper scale positioning, priority should be shifted to the construction of small unifunctional natatoria. Unifunctional natatorium equipped with various service facilities is small in scale, low in investment and operating costs, and flexible in management. Besides, the update of its facilities and services is fast. Combined with other sports and entertainment facilities, scale effect will be achieved.

The construction of large natatorium should be reasonable and practical; and at the meantime, consideration should be given to the development of small natatorium. Small natatorium has its advantages. Therefore, relevant research and development should be accelerated. The construction of small natatorium, which is the trend of future development, will contribute to energy conservation. For instance, Daqing Bayi Agriculture University Natatorium is a successful case in terms of reasonable size positioning and functional layout. The size of this natatorium is only 50*20m with 8 swimming lanes. Part of the audience seats are designed as single stand. The natatorium is open to public. All these factors brought down the costs, reduced the energy consumption, and greatly improved the quality and use efficiency of the swimming pool (Fig. 1).

2.2 Lack of Unified Planning Between Natatorium and Other Sports Buildings

The coordination between natatorium and other sports buildings has been overlooked in planning. Therefore, these sports stadiums cannot form a service network for the convenience of citizens. Necessary facilities for natatorium are either redundant or insufficient in one region.

(1) Manifestation of the problem

In the past, natatoria were usually constructed near stadium and gymnasium to form a large-scale sports center. In the process of urban development, city center becomes increasingly crowded. For this matter, some newly-planned natatoria are



Fig 1:Daqing Bayi Agriculture University Natatorium

constructed in suburbs. Traffic pressure of downtown areas could be relieved, but the long distance between natatorium and downtown makes it inconvenient for citizens to reach. The low usage rate of natatorium results in longer investment recovery cycle, unstable operation situation, and waste of social resources.

(2) Countermeasures

Natatorium should be arranged reticularly to provide a convenient service for the public. According to the survey report, reasonable service radius of natatorium should ensure that 66% of the citizens reach the destination with no more than 6-mile journey and 80% reach the destination within 25 minutes. Therefore, it is unwise to place all natatoria in city center or to place all of them in suburbs. They should be

distance and sightlines should be taken seriously. The site should try to avoid mutual interference with other public buildings and sites. Fourthly, the site should coordinate with urban construction. Public facilities such as local power, heating power, plumbing pipe network as well as transportation facilities should be fully utilized so as to reduce construction investment and save daily operation cost.

3.2 Site selection for large-scale competition natatorium

At present, it is a common practice home and abroad to establish large-scale competition natatorium within city sports center. Natatorium has a close relationship with surrounding buildings and it plays an important role in the sports center. In most cases, natatorium, gymnasium and stadium are built together, like the three legs of a tripod. Stadium stands in the center, surrounded by gymnasium and natatorium. In this kind of arrangement, power equipments and pipe network can be planned together and shared after installation, and daily operating expenses will be largely reduced. Besides, it is also convenient for the public. Green land and central plaza could

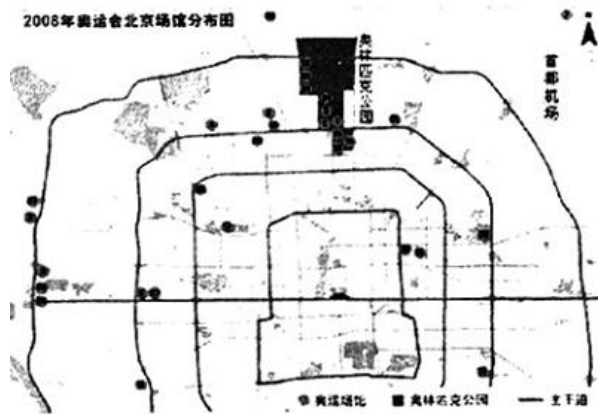


Fig 2: Layout of Beijing Olympic Games Venues

scattered on the basis of reasonable service radius. During the Beijing Olympic Games, competition venues are arranged in accordance with different region characters in Beijing to achieve the aim of sustainable development. Most of the venues are located on university campus or in community center (Fig 2). Except for the main venue in Olympic Center, most of the venues are designed as a multifunctional site for body building, entertainment, training, and competition. Their construction is coordinated with the existing stadiums to achieve the best effect. Some of the venues are remodeled as natatorium, which not only brings convenience to the citizens but also shortens the investment recovery cycle.

3. Energy Conservation and Site Selection of Natatorium

3.1 Principle of site selection

Based on the planning experiences of natatorium home and abroad, the site selection should abide by the following principles so as to create an ecologically friendly environment. First, topography and natural conditions should be taken into account in order to ensure a good lighting and ventilating condition. This will reduce energy consumption in natatorium operation. Secondly, the site should be placed around public parks or green spaces to fully utilize urban public space. This will bring convenience to the citizens, improve the usage rate, and lower the operation costs. Besides, green belt could serve as windbreak, which will improve the microclimate. In summer, it can lower outdoor temperature; in winter, it can prevent wind and dust. Thirdly, proper sound insulation



Fig 3: Shenyang Olympic Sports Center

be planned around the sports center to create a better landscape environment. To conclude, this design will generate scale merit, improve usage rate and save cost. For example, Shenyang Olympic Sports Center project adopted the arrangement of “one main stadium with three additional stadiums”. To be more specific, it is composed by main stadium, gymnasium, natatorium and tennis stadium. The 140-thousand-square-meter main stadium, which covers more than half of the sports center, is the priority of the construction. After construction, it can accommodate 60 thousand audiences (Fig 3).

3.3 Site selection of small-scale natatorium

At present stage, it is advisable to place small-scale natatoriums in school or in community to increase their usage rate, because



Fig 4: Natatorium of Shenyang Jianzhu University

these places have a rich source of customers. By opening it to the public, the problems of high vacancy rate, high operating cost, and waste of public resources will be solved. The design of natatorium should accommodate both sports event and public use. For example, there are spaces for table tennis, snooker and badminton in the natatorium of Shenyang Jianzhu University (Fig 4). These facilities can not only serve the need of the students but also be used for sports events.

4. The Influence of Natural Environment on the Selection of Natatorium Site

Like other energy-saving buildings, in the construction of natatorium, factors such as geography, climate and environment should be taken into consideration so as to achieve the effect of energy preservation. Sun exposure, sunshade and ventilating are important parts in saving energy.

4.1 Sun exposure & the layout and orientation of natatorium

Heating in winter and shading in summer should meet the requirement of energy saving. To achieve this purpose, we should make a good use of solar radiation. In natatorium design, we should consider the following factors – climate conditions, sunlight features, terrain environment, block from other buildings and optimal land utilization so as to make a wise choice in terms of the selection of location, orientation and layout of the natatorium. For example, the hall of swimming pools or training pools, which needs more sunshine, should face south or east. In this way, it will enjoy a better natural lighting and heating effect will be improved in winter. Other auxiliary rooms such as dressing rooms and shower rooms could face north or west, since they are not critical about sunlight.

4.2 Ventilation & the layout and orientation of natatorium

The external wind condition has a direct influence on the thermal environment inside. Because of its special function, natatorium has a high indoor humidity. Ventilation is good for dehumidification, and effective ventilation will lower the indoor temperature in summer and preserve heat in winter. In this way, energy will be saved. So, in the design of natatorium, we should try to facilitate natural ventilation so that less energy will be needed for air conditioning and mechanical ventilation. For example, the swimming pool should be designed in the north-south direction. Predominant wind direction in summer

should be faced, while predominant wind direction in winter should be avoided. The size of the window should be adjusted to control ventilation quantity and wind speed in order to decrease indoor humidity and take away etchant gas.

5. Conclusion

By analyzing factors like radiation, general atmospheric circulation, geography, city function and population, we may come to a more environmental-friendly design of natatorium. Through the application and modification of the factors mentioned above in planning, we will not only create a better indoor environment, but also save a large amount of energy and improve microclimate environment.

References

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