The Effective Application of the Sustainable Development Concept in Construction Engineering - Case Study of the Construction Work of Modern Art Design Teaching and Training Centre by Shanghai Art & Design Academy

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Abstract. Manpower, machine, material, law, and environment are the five driving factors in a construction project; the joint workforce of real estate owners, project supervision, construction management, engineering design and other staff in the process of project implementation imposes itself with a significant characteristics of looseness, due to different units having their own interest demands. As an organizer, how to lead this "talent-intensive" but loose technical team and promote their proactiveness; how to complete the project under the premise of low consumption, high quality and high efficiency, while the individual interests are also met remains a challenge. Therefore, on top of a comprehensive organizational structure, an effective construction management system and a strict quality supervision system/measures, team building and the psychological satisfaction of the needs of the staff remain key to the achievement of goals. In the process of construction projects, to improve technology efficiency and meet the concept of sustainable development, green construction technology should be enhanced in applications. On the premise of meeting the requirements of the project, it is essential to enhance sustainability of the construction work, avoid excessive consumption of materials, reduce construction costs, and to minimize the impact on the surrounding environment. The utilization of green construction technology can effectively achieve environmental benefits, avoid excessive interference, and eventually improves the effectiveness and environmental management level of the construction project.

1. Introduction

The quality of construction projects is based on the concept of quality. Due to the single-piece nature of construction engineering units, on top of the common quality characteristics of general products, they also have their own special features, such as engineering adaptability, safety performance, economic characteristics, and operation life. These quality characteristics are manifested in different purposes and can meet people's different needs. The construction quality of a construction project refers to whether the building structures or objects meet the requirements of the design documents and relevant regulations. Construction project quality management refers to "all management functions of formulating and implementing the quality policy", which includes quality system, quality control and quality assurance. Quality management has a development process from low to high, which would mainly experience the
stages of quality inspection, statistical quality control, quality assurance and current strategic quality management [1].

2. Motivate the management team according to the "Hierarchy of Needs" in construction projects

Fundamentally, motivation is the behaviour that promotes the team or individual functions to carry out the work better on the basis of the evaluation of the performance of the team or different individual functions. From a certain level, motivation is also the behaviour that meet the needs of the team or talents. To satisfy the needs and better inspire, you must understand the request of the team plus the individuals, and also the request of the same individual at different stages. The quality of individuals inside a technical talent teams is driving high, their expectations of the team are getting higher and higher, and consequently they hold higher expectations towards both the team and themselves. Therefore, as a team, first thing first, we must meet the reasonable material needs of technical talents (basic motivation). If this is not even possible, it will be difficult to retain and attract talents. Secondly, they must be provided with suitable positions, sufficient authorization to operate, career responsibilities and recognition of values, so as to avoid the situation of "overcapacity of underachievers" and "appropriate use of young talents" as much as possible. Every technical talent has his own individualized needs, and strong inner initiative to bring the needs to life [2]. This kind of motivation will prompt them to work hard to achieve their needs. Therefore, to build and operate an efficient team of technical talents, we must be able to use and make good use of the "Hierarchy of Needs" to grasp the team members' mental demand to the greatest extent.

3. Sustainable Development Application on Construction Works – Green Construction Technology

In modern projects, green construction technology has great applicable significance to sustainable development. From the perspective of human development, environment is the material basis for our survival, and the long-term survival of mankind can only be achieved by environmental protection. The application of green construction technology can effectively realize environmental protection. To reduce environmental pollution and realize the environmental protection goals of enterprises, green construction technology should be leveraged as much as possible. Green construction technology can meet the basic requirements on sustainability by the common people. Avoid environmental damage, and realize the application significance of construction engineering on the basis of meeting the principles of environmental protection. Before applying sustainable green construction technology, it is necessary to conduct a comprehensive study of the topography, environmental conditions, climate conditions, and hydrological characteristics of the construction site, and conduct a systematic analysis based on previous work experience [3]. Moreover, targeted green construction technology is also applied on decoration projects in construction engineering, which is in line with the core concept of sustainable development. Green decoration technology can effectively reduce the scale of pollution generated during building decoration and create a more favourable living environment. This is even more important given the current situation of the gradual expansion of the urban population, which brings more significant pressure to the urban ecological environment. In the actual decoration construction process, relevant staff also need to enhance market supervision and actively adopt the most advanced environmental technology [4].

4. Sustainable Green Construction Technology in Construction Works

In the actual construction process, proper purchase of materials needs to be conducted, and ensure the supply chain fully functioning on the basis of high quality control. At the same time, fire prevention, moisture-proof and waterproof treatment should be properly carried out in all aspects of daily management of transportations and storage.

Electricity is one of the most applied energy resources in construction work. All technical mechanical equipment and auxiliary tools need electric drive. With the improvement of automation on construction
work, the application of power equipment increases, resulting in the continuous increase of power consumption. In the construction process, an effective power management system should be adopted. In the whole construction process, reasonable energy consumption standards should be formulated and implemented effectively.

In the process of construction, the solid waste produced by the construction site is one of the major links that consume manpower and financial resources. In the construction of earthwork excavation and earthwork backfill, the effective utilization of wastes should be realized to avoid environmental pollution. The waste can be recycled for subsequent construction and used as filling material for foundation, while the leftover materials of concrete structure can be used as foundation cushion material.

Scientific selection of environmental protection materials remains crucial. Nowadays, in the process of decoration projects, relevant staff should prioritize the use of low-carbon environmental materials. Environmental materials with low pollution and low consumption should be the first choice. It is also necessary to ensure that the building raw materials conform to the established specifications, especially in the process of foundation construction, certain industrial wastes are preferred to be utilized, which mainly include mineral admixtures, rather than those high polluting cement in the traditional sense [4].

Figure 1. Sustainable Green Construction Technology in Construction Works.

5. Case Study of the Construction Work of Modern Art Design Teaching and Training Center by Shanghai Art & Design Academy

The project is located in the Jiading campus of Shanghai Art & Design Academy, with Jiaxing Road to the east and Shuping Road to the south. The planned construction site is 5950 square metres and the total construction area is 3,052 square metres (including 4,484 square metres underground and 25568 square metres above ground). The building has one basement level, 10 floors above the ground floor inside the main building, 4 floors in the podium, and a frame shear wall structure system.

Due to the prospective work of the technicians, the space for optimizing foundation pit maintenance was detected: Because the depth of the foundation pit is 4.40-6.25m and the site is narrow and there is no grading condition, the design adopts the SMW construction method pile foundation pit protection plan; the SMW construction method pile is the multi-axis drilling mixer used to drill to a certain depth on site, and at the same time, the cement-based strengthening agent is sprayed at the drill bit to be repeatedly mixed and stirred with the foundation soil. The overlapping construction is adopted between the construction units, and then the cement. Before the soil mixture is hardened, insert H-shaped steel or steel plate as its stress-reinforcing material. When the cement hardens, it will form a waterproof underground wall with certain strength and rigidity, continuous integrity and no joints, and set it on top of it. A cast-in-place concrete crown beam, the crown beam is supported by large-diameter steel pipes transversely to prevent the lateral soil pressure formed by the soil outside the pit after the excavation of the foundation pit forcing the crown beam to move inward and deform; the upper end of the mixed soil body uses the crown beam as a fulcrum, the bottom of the bottom (section) of the foundation pit (the depth is generally twice the height of the crown beam to the bottom of the pit) as the fulcrum; in this way, the mixed soil forms a simple force model with better mechanical properties; The actual depth of the foundation pit (the effective depth from the top of the crown beam to the bottom of the pit)
determines the depth (length) of the cement mixing pile and the inserted section steel; that is, the amount of maintenance work also determines the construction period and cost of this part.

The original foundation pit maintenance design plan adopts the usual plan of uniform maintenance of the dam body in the scope of the building foundation that is easier to operate and control; the calculated construction cost exceeds the investment control cost. In this regard, under the premise of ensuring safety under the care of the leaders of the academy, the technical unit, together with design experts and senior experts in the industry, were organized to conduct multiple rounds of comparison, selection and optimization of the enclosure plan, and appropriate releases were taken according to the site and groundwater level. A foundation pit treatment plan that combines slope and SMW construction method pile foundation pit support; that is, appropriate slope treatment according to site conditions to minimize the impact of active earth pressure on maintenance of the dam body, and move the crown beam elevation at the top of the dam body section down Up to the slope elevation, the treatment method of the depth (pile length) of the foundation pit retaining pile is correspondingly reduced. At the same time, the foundation pit outside the basement is separated from the deep foundation pit using natural slope excavation. Layout drawing and pit section view correspondingly reduce the plane area of the foundation pit and reduce the maintenance scope of the foundation pit. The above treatment plan was implemented after expert evaluation and approval. This plan saved more than 1 million yuan in maintenance costs for foundation pits. Finally, under the premise of ensuring the safety of the construction environment, the operation cycle was shortened and the project cost was saved, which laid a good foundation for the smooth implementation and high-quality completion of the project. It ensures that the project is high-quality, efficient, and completed on time, and the project cost is always under control. The completion acceptance was passed once, and it was certified as a high-quality structural project in Shanghai. The project quality and appearance effect were highly recognized by the leaders, and good economic and social benefits were obtained, and a satisfactory answer was given to the school.

Figure 2. Modern Art Design Teaching and Training Centre after the construction complete.

6. Conclusions
In a knowledge-based team, how to effectively mobilize the enthusiasm and initiative of team members so that 1+1 can achieve greater than 2 effectiveness is a direction worthy of research and development. A scientific management system is an effective means to maintain a cohesive team: 1. Standardization and cohesion: through the establishment of team norms, work rules are formed, so that the team has a unified action rule, direction and basic understanding norms; 2. Goal cohesion: To attract team members by establishing scientific and clear goals, and in the process of achieving common goals, make everyone's thoughts, feelings, and actions consistent; 3. Core cohesion: team leaders, through their own role models, become the core of the team, plays the role of attracting members and forming cohesion; in a talent-intensive team, the loyalty of employees to professional skills is often higher than that of the organization, and traditional administrative management methods are difficult to work. Only by using modern management methods and tools, creating a culture of learning knowledge and continuous learning and sharing, and striving to create and enhance the ability of employees to learn and use knowledge, can the formation of the core values of the organization be promoted, thereby attracting
talents, retaining talents, enhancing technology, The cohesion of management talents on the team, the stability and development of the team can have a reliable foundation, and the technical strength and competitiveness of the team can be further enhanced.

![Management Team on the site.](image)

**Figure 3.** Management Team on the site.

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