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# *Construction of quality management system of flower border based on PDCA cycle*

**Yang Xucheng*, Li Wei**

*Karst Research Institute, Guizhou Normal University, Guizhou, China*
**Corresponding author:1817892913@qq.com*

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***Abstract:*** Flower borders are quite different from conventional greening in terms of design, construction, acceptance and maintenance, which brings many challenges to the improvement and optimization of the quality of flower borders. This paper combines the PDCA cycle management theory, discusses the idea and feasibility of applying the PDCA cycle to the quality management of flower garden projects, and constructs a flower garden quality management system based on the PDCA cycle. The study helps the flower border design, construction, acceptance and maintenance teams to improve the quality management methods, and through the improvement of the management system, to enhance the standard of flower border quality management, to bring more and better flower border landscaping works, and to improve and beautify the human environment.

## 1. Introduction

### 1.1 Concept of Flower Border

The flower border, which originated in the United Kingdom[1], is a collection of annual and biennial flowers, as well as persistent and bulbous flowers. Ornamental grasses and vines are used as a skeleton or background, with different textures, plant shapes, and colors mixed together to create a changing landscape throughout the four seasons[2].

The cultivation of flower borders has been a practice in foreign countries for over a century. Western developed countries have consistently maintained a leading position in the quality of flower borders worldwide. Although China has been importing flower borders for over forty years, it has only experienced rapid development in the domestic landscape industry in the last decade. Compared to other types of landscapes, flower borders are highly valued for their excellent aesthetic effect, diverse plant species, rich colors, and changing seasonal phases, as well as their ecological and natural advantages[3]. They meet the current public demand for landscape greening and are increasingly favored by designers. Flower borders have now become an indispensable part of urban greening landscapes.

### 1.2 Unlike conventional greening, flower borders have the following characteristics in design, construction, acceptance and maintenance:

#### 1.2.1 Complexity of design

The flower border design should take into account the arrangement of various colors and the placement of plants at different heights. It should be achieved through the integration and contrast of different shapes and colors to create an artistic aesthetic with rhythm and rhyme. Additionally, the design of the flower border is a complex four-dimensional design that involves a variety of plants with rich changes in time and space, making it challenging to ensure the quality of the design.

#### 1.2.2 Flexibility in construction

Because of seedling specifications, character, site topography, ornamental perspective and other factors, the flower border will not be completely in accordance with the design program drawings for construction, in order to ensure the quality of the flower border, the need for the construction process, according to the site needs and the actual situation of the seedlings on the program adjustments and modifications[4].

#### 1.2.3 Difficulty of quality acceptance

The seedlings of the flower border are selected from the nursery after the state of the better plants, after transplanting will be due to changes in the growing environment and changes, coupled with the habit of the plant itself, there will be different landscape performance at different times, but these need to go through a period to be able to see, the actual project is seldom to do a number of acceptance, an acceptance is difficult to do to achieve a comprehensive, scientific assessment.

#### 1.2.4 Difficulty of conservation varies

Three parts planting and seven parts maintenance, in the later stage of maintenance and use, according to the actual performance of the seedlings need to be adjusted and local redesign, and because of the more plant species of the flower border, the need for different habit of the plant for more refined maintenance.

The maintenance of the quality of the flower border is inextricably linked to the management of each stage of design, construction, acceptance and maintenance of the flower border[4], which poses a great challenge to the long-term maintenance of the quality of the flower border.

## 2. Analysis of Quality Issues in Flower Border Projects

China is still in the stage of learning and imitation to foreign flower concept, planting form and cultivation of flower plant species, etc. The level of flower design, construction and maintenance in different areas of the country are also uneven, and there are some different problems in different stages of the project[5-7].

### 2.1 The concept of flower border design needs to be improved

Some designers focus solely on the visual effect when designing flower borders, neglecting ecological and natural perspectives. This is often due to insufficient understanding of plant habits and poor selection of plant species, resulting in inadequate space for plant growth[6]. Secondly, there is no careful layout and design of the flowering period of plants, resulting in a shorter ornamental period of the landscape. This fails to satisfy the needs of three seasons of flowers and four seasons of scenery.

Thirdly, the combination of plant varieties is unreasonable. Some designers, in pursuit of instant effect, mix plants with different or opposite habits in the project. Thirdly, the combination of plant species is often unsuitable. Some designers plant species with different or opposing habits in the same area for the sake of immediate effect. This can result in some plants failing to grow normally or even dying, which is contrary to the original intention of the flower garden. It also leads to additional consumption of project funds in the cost of seedlings. Furthermore, the configuration of flower garden seedlings exhibits a significant issue with plant species. The domestic flower garden landscapes in different regions lack distinct regional characteristics and styles, resulting in homogeneity[7].

### 2.2 Challenges in improving on-site construction organization and management

The organization and management of the construction site has a great influence on the quality of the flower garden, and the constructor needs to improve the management of the workers, seedlings, machinery and construction quality on the site. Factors affecting the quality of construction organization and management are mainly as follows: firstly, the lack of detailed construction plans and scientific and effective management measures in the management of some projects leads to the confusion of construction site personnel, materials and construction processes, and the construction quality cannot be guaranteed. Secondly, the construction of flower borders requires professional instructors and experienced workers, but some of China's current landscaping workers are mainly retired workers and farmers, with a larger portion of them being less educated and older. Sometimes they can not fully understand the designer's ideas, and can not complete the requirements of the construction instructor, for example, there will be wrong planting position, plant planting Angle deviation, unreasonable plant depth, etc., which will affect the overall quality of the flower border. Sometimes, the number of workers in the construction site is large, which is prone to chaos, and the management mode and management system of workers need to be strengthened. In addition, in the process of on-site construction, it is necessary for the construction workers to adjust and optimize the construction plan according to the personnel, materials and construction progress of the construction site, and the professional standard of some construction workers needs to be further improved.

### 2.3 Problems with quality checking of flower borders

Project acceptance is an important link to ensure the quality of gardens, and the problems in this link mainly include: First, some projects in the acceptance of no clear acceptance criteria, it is difficult to judge whether the project meets the requirements, but also can not be based on the standards of strict control of the quality of the construction; Second, the project acceptance time is unreasonable and acceptance of the number of times is not enough, because the quality of the flower garden will be constantly changing with time, in different construction phases and different seasons will have different performance. Seasons will have different performance, the time arrangement is unreasonable or the number of acceptance inspection is not enough, resulting in the acceptance results are not comprehensive, lack of scientific; Third, Some quality problems cannot be detected and resolved in time during the acceptance process, and are only discovered during later use and maintenance. Not only on the landscape of the flower landscape life impact, but also increase the cost and difficulty of maintenance.

### 2.4 High demands and costs of conservation

In most of the projects in China, the maintenance cost and maintenance difficulty of the flower border is higher than the conventional greening, which is also one of the reasons why the landscape life of the flower border is not as good as the conventional greening. Maintenance difficulties mainly lie in: First, the maintenance of the flower border needs to carry out different degrees of fine maintenance and management of a wide variety of plants with different habits, for example, how to

prune that can maintain the beauty and plant growth, fertilization for the different performance of plants in different seasons, the prevention and treatment of pests and diseases, how to cultivate new plants in order to replace the poor performance or death of the seedlings, etc., which requires professional knowledge and skills and a high level of professional aesthetics. Higher professional aesthetic level. Secondly, because of limited funds, most of the maintenance workers employed on our maintenance team have low cultural level, low professional and artistic level, and it is difficult to meet the requirements of maintenance technology and aesthetic quality. Third, the maintenance of flower landscape is a long-term and detailed planning and design work, but also need to make different maintenance measures in different seasons of the different performance of plants, and in the development and implementation of conservation planning in many of our country's conservation team has to be strengthened; In addition, the project allocated to the conservation stage of the funding budget is small, it is difficult to support the development of high-quality conservation work.

## 3. Overview of the PDCA cycle

PDCA cycle (Plan-Do-Check-Act) is the American quality management master Deming in the statistician Hart put forward by the PDS (Plan-Do-See) on the basis of improvement, so also known as "Deming ring", is a kind of iterative cycle to achieve the goal of management system, with systematic and continuous characteristics, initially mainly used in enterprise total quality management, later, in numerous studies and practices, it has been proved to be a scientific and effective management method., because of its logical scientific rigor, simple and convenient operation, as well as its research and practice. With systematic and continuous characteristics, it was initially mainly applied to the enterprise's total quality management, and later in many studies and practices, it was proved to be a scientific and effective management method, because of its scientific and rigorous logic, simple and convenient operation, and significant management effects, etc., and now it has been widely used in various business processes in different fields, such as project management, quality control, process improvement, product research and development, and so on, product research and development, etc[8]. The PDCA cycle management model can help organizations and enterprises to better adapt to the changing market environment, so that the project can be advanced in an orderly manner, quality and quantity of completion.

The PDCA cycle management process includes four steps: P, D, C, A. P is to make a plan, the development of the plan first need to sort out the existing problems, analyze the causes of the problems, and develop a corrective action plan for the problems, the plan needs to include clear objectives, implementation methods, step-by-step procedures, personnel arrangements, as well as to deal with the implementation of the process of the problem of the preparatory program, etc. D refers to Do, which is implemented in an orderly manner according to the established plan. This step requires arrangements for personnel arrangement and material preparation, and the process of doing this is the process of quality formation. C is the check, check whether the implementation of the results to meet the requirements of the target, evaluate the quality of the implementation, progress and cost, etc., is different from the plan, after the completion of the inspection work, but also need to publicize the inspection results, list the problems. A refers to Act, which is to process the results checked by step C, sum up the successful experience and the reasons for failure, take the good method as the standard for future reference and compliance, according to the reasons for failure, make corresponding adjustments to the plan and improve the execution method. If the problem cannot be rectified immediately, a new small cycle needs to be carried out. PDCA cycle management system is through the combination of large cycle and small cycle, improve the efficiency and quality of work.[9]

## 4. Construction of quality management system of flower border based on PDCA cycle

### 4.1 Feasibility analysis of constructing a flower border quality management system based on PDCA cycle

The implementation of the flower border project is a complex process that requires the cooperation of many people. The process of design, construction, acceptance and maintenance is a process that requires planning, implementation, inspection and treatment. The management concepts inherent in a flower border project are similar to the PDCA cycle management method. Therefore, it is feasible to bring the PDCA cycle management approach into the quality management of the flower garden project, which can improve the systematic and scientific management of the flower garden project, and it is also of practical significance to construct the quality management system of the flower garden based on the PDCA cycle management mode to improve the quality of the flower garden[10].

### 4.2 Principles of construction

#### 4.2.1 The principle of comprehensiveness

The quality of the flower border is affected by every link of the flower border project, which affects the whole body, so the quality management system should cover all aspects of the design, construction and maintenance of the flower border, and it should include all aspects of the process of carrying out the flower border project to guarantee the quality of the whole process of the flower border[5].

#### 4.2.2 The principle of practicality

Management system should have practical application value, operability, can be applied to the actual flower border project, can guide the designer, construction unit, project quality acceptance unit and maintenance personnel to effectively manage and improve the quality of flower border. Ensure the landing and effect of the management system in the process of carrying out the project[11].

#### 4.2.3 Scientific principle

Flowering management system based on PDCA cycle should be based on scientific theories and methods to ensure that the quality management system has a positive role in promoting the project, rationally arranging the resources and time in order to improve the management efficiency and quality of management, maximize the management of the project, and ensure that the project is safe, economical and efficient[12].

#### 4.2.4 Quality assurance principles

Quality is the primary pursuit and value embodiment of the management system. To ensure the quality of the flower border, it is necessary to strictly follow the national standards and norms during the implementation of the project, comply with the requirements of the project contract, use the appropriate materials and technologies, and carry out regular quality checks to ensure that the quality of the project meets the requirements. A zero-tolerance attitude must be adopted for any quality problems that arise, and continuous rectification must be carried out until the quality meets the requirements[9].

### 4.3 Construction of quality management system of flower border based on PDCA cycle

According to the characteristics of the quality management of the flower border as well as the needs, the corresponding quality management strategy is formulated. In the construction of the quality management system of the flower border, the four phases of P, D, C and A in the PDCA cycle

correspond to the four phases of design, construction, acceptance and maintenance of the entire flower border project, and each phase of the design, construction, acceptance and maintenance of one or more internal mini-cycles, which will manage the process of the design, construction, acceptance and maintenance of the flower border by means of the cycle of planning, implementation, checking and improvement to improve the overall quality of the flower border works continuously, which is analyzed as follows:

### 4.3.1 Flower Border Program Design (Plan P)

Flower border design is the P stage in the PDCA cycle management of the whole flower border project, and there is a small PDCA cycle for the management of this stage. In this small cycle, P's content is the communication and discussion between the design unit and Party A, to determine the style, scale and size of the flower border, capital investment, etc. It is also necessary to survey the design site, measure the area and slope of the site, and carry out a comprehensive investigation of the site's geographical location, light, soil, rainfall and other natural factors.Stage D is to design the program according to the collected information and data; Stage C needs to check the quality and progress of the design scheme according to the requirements of the contract, and check the style, plant varieties and growth habits of the flower border design scheme; first party is to revise the design scheme, solve the problems, form the final design drawing, and deliver it to Party A as a reference for the construction unit. PDAC cycle management, increase the link of team inspection and discussion, bring out the strengths of everyone in the team, so as to improve the quality of the design scheme.

### 4.3.2 Flower border site construction (Do D)

The construction phase of the construction unit corresponds to phase D of the PDCA cycle management of the project. The management goal of this stage is to control the process of flower construction and the quality of the finished product, bring the PDCA cycle management method into the management of the construction stage, before the construction work is carried out, the management personnel of the construction unit should communicate with the Party A, the design of the full communication and briefing, and then make a detailed and practical construction plan, including the plan for the site of construction organization and management, the arrangement and management of the personnel, the scheduling of materials, and the regular internal inspection plan for the quality of the finished product, and make the corresponding reward and punishment system for the inspection results. The personnel selection of the construction team should adopt the principle of survival of the fittest, eliminate the workers who cheat, play slippery and have bad working attitude, and screen out the workers who work hard and have a positive attitude, raising the wage level of workers to boost workers' motivation, and attract more young workers. According to the needs of the project construction, the workers should be trained accordingly to ensure that the construction quality meets the national standards and the requirements stipulated in the contract.

### 4.3.3 Project quality acceptance (Check C)

The acceptance phases of the project corresponds to phase C of the PDCA cycle. Project acceptance is an important part of checking and controlling the quality of the finished product of flower border project construction. The acceptance unit should determine the quality acceptance standard of the project with Party A and the construction party according to the relevant standards and the actual situation of the project, as well as the acceptance time and number of times, etc. During the construction of the project, the acceptance personnel should check the quality of the flower garden project strictly according to the determined acceptance standard, supervise the construction team to execute according to the standard, ensure that each plant and each process can meet the requirements, and if quality problems are found, the acceptance unit should notify the construction unit in time and

require the construction unit to check and control the quality of the finished products of the flower garden project. If quality problems are found, the acceptance unit should notify the construction unit in time, and require the construction unit to rework or rectify the quality problems, so as to guarantee the quality of the construction process and the finished products of the project.

### 4.3.4 Use and care of flower border (Act A)

The use and maintenance of a flower border corresponds to phase A of the PDCA cycle of project management. After the completion of design and construction work, the flower border project enters the stage of maintenance and use. Borders are landscapes composed of living plants, which will change with time and seasons, and different quality problems will occur under the influence of different factors such as plant growth habit, pests and diseases, human damage or extreme weather, which need to be dealt with by the maintenance team accordingly. The use of PDCA cycle management mode in the process of flower border conservation and management requires, first of all, the formulation and implementation of a complete conservation plan according to the geographical location, plant types, natural climate and other characteristics of the flower border.According to the different problems in the implementation process, the corresponding management mechanism is supplemented, for example, according to the different needs of plants in different seasons, the development of scientific and reasonable watering, fertilization, pruning and other conservation programs to ensure the timeliness and scientific conservation.Secondly, regular comprehensive inspection to evaluate the effect of conservation work to ensure the health of plants.Third, it is also necessary to conduct skill training for conservation personnel to improve the level of flower border conservation of the team.Finally, it is necessary to do a good job of flower garden maintenance of capital budget and resource management, to avoid waste and unnecessary expenditure. In this way, the combination and matching of big and small cycles, one cycle after another, makes the quality of the flower garden can be continuously guaranteed and improved.

## 5. Conclusion and outlook

The aim of the flower border project is to achieve high quality, and the final landscape effect of the flower border is determined by the level of quality management. This paper proposes a quality management system based on the PDCA cycle. It analyses the problems in the design, construction, acceptance, and maintenance process of flower borders and incorporates relevant research results of the PDCA cycle theory.

During the formulation stage of the quality management plan, it is crucial to communicate and consult with all relevant parties to ensure a full understanding and support of the plan and quality management objectives. This will help clarify the responsibilities and requirements of all parties involved, leading to the effective implementation of the quality management system. During the implementation stage, it is important to strengthen personnel management and provide guidance and supervision throughout the construction process to ensure compliance with the plan's requirements and to prevent or minimize the occurrence of quality issues. The inspection stage involves assessing and monitoring the implementation of quality management. It is essential to establish an effective inspection and assessment mechanism to ensure comprehensive and accurate evaluation of the flower border's quality. Any issues should be promptly discovered, handled, and adjusted through the PDCA cycle of management methods. Regular inspection and assessment help ensure that the flower border's quality complies with the standards and requirements. The processing stage involves implementing treatment and improvement measures based on inspection results. By analyzing problems, identifying causes, and formulating improvement measures, the quality management of flower borders can be continuously enhanced.

Applying the PDCA cycle to the quality management of the flower border project ensures that quality problems in different stages of design and construction are discussed and solved. This

approach also allows for further optimization and improvement during implementation, inspection, and maintenance. Results and lessons learned from failures and treatments can be used as a reference for future quality management. By following this process, the quality management level can be continuously improved and optimized. The summarization and treatment of the results and lessons of failure in the cyclic process can be used as the reference and guidance for the quality management of the later flower border projects, so that the quality management level of the flower border projects can be continuously improved and optimized. Of course, the research in this paper still stays at the theoretical level, and the specific practical effect and application value have to be verified in the subsequent operation of the flower garden project.

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