Construction Pollution Prevention Measures and Effect Analysis of Engineering Projects

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Abstract. By tracking and monitoring the implementation of the construction pollution prevention and control measures for the phase-three engineering project, the pollution situations before and after the construction pollution prevention and control measures are compared. The analysis shows that after carrying out the pollution prevention measures, the control effect of air quality, noise, construction waste, and water pollution has been significantly improved.

1. Project Profile
A phase-three residential construction project is located in the north of Zhengzhou, covering an area of 100.6 acres and a total of 20 buildings. Including 12 bungalows and 8 high-rise residential buildings, the main body is a frame structure system. The design of the project combines the new Asian and the new Chinese architectural style. Besides, several green construction technologies have been utilized, such as energy-saving and environmentally-friendly building materials adopted by the community, new energy street lamps, solar heating, and hot water systems, sintered coal gangue porous bricks, and grass-planting bricks for parking lots.

2. Countermeasures for construction pollution prevention and control of engineering projects

2.1 Construction management measures
(1) Management organization
As the main part of construction pollution prevention and control, the construction unit has established a two-level construction environmental management system and a three-level inspection & implementation system for regional companies and project departments. That is, the leadership should grasp the overall situation, the management should focus on the key points, and the implementation should be well completed[1]. As shown in Figure 1, the green construction leadership team by the company has built a complete guarantee system of the green construction organization structure.
(2) Planning and management
Under the guarantee of the complete organizational system, this project has formulated a green construction dynamic management system based on the PDCA cycle, as shown in Figure 2.
2.2 Measures to prevent and control construction pollution

(1) Air pollution control
The transportation of construction materials, construction waste, equipment, and earthwork shall not pollute the surrounding off-site roads. Close and tight measures should be adopted for transportation to avoid material scattering, flying, and leakage. At the same time, the vehicle must be clean to avoid secondary pollution. A car wash pool that can be used normally should be set up at the entrance and exit of the construction site. In the non-operation area of the construction site, no dust is required to be visually inspected. During the earthwork operation, the dust height in the operation area must be less than 1.5m. During the secondary structure construction and decoration stage, the visual dust height of the operating area should be less than 0.5m. Not only should the site be equipped with professional sprinkler equipment, but a sprinkler cleaning system is also established with responsibilities assigned to individuals. The exhaust emissions of construction machinery and vehicles entering and leaving the site must meet the national annual inspection requirements. It is recommended to use green paints and coatings, and construction workers engaged in toxic, harmful, and pungent odors are required to wear corresponding protective equipment. It is forbidden to burn inferior wood materials on-site and use coal in the domestic fuel. Besides, the discharge of welding fume shall meet the national standards.

(2) Construction waste control
When the construction is completed, the materials should be consumed as expected and the working environment should be clean. Building materials are expected to be taken as needed and cleaned at any time. With airtight garbage containers set up, the garbage in the living area of the construction site is bagged and removed in time. Different types of garbage containers are set up to classify construction waste for centralized transportation. The recycling rate and reuse rate of construction waste are expected to reach 30%. Ways such as paving and foundation landfilling can be used to improve the recycling rate.
of construction waste such as earthwork and gravel, which aims to achieve a recycling rate of higher than 50%. Additionally, the recycling and reuse rate of construction waste generated from demolition is intended to be higher than 40%.

(3) Construction wastewater control
The discharge of wastewater should meet the requirements of the <Integrated Wastewater Discharge Standard>. For different types of wastewater, different treatment facilities should be adopted, including septic tanks, grease traps, and sedimentation tanks, and different treatment methods should be adopted, including oil removal, sediment removal, acid-base neutralization, and sedimentation filtration. Besides, qualified testing agencies are entrusted to conduct water quality testing after sewage treatment and issue related testing reports. It can be discharged into the municipal drainage pipe after the test meets the standard. The storage of toxic and harmful oils and other chemicals should be strictly set up with a water barrier, and the leakage liquid should be collected and safely dealt with.

(4) Other pollution control in construction
Noise monitoring points are set up for real-time dynamic monitoring. Low noise and low vibration equipment is used on the construction site. Methods such as vibration isolation, sound insulation, and noise reduction are adopted to minimize or avoid construction vibration and noise pollution. Loud noises are prohibited by taking advantage of walkie-talkies and the work surface should be equipped with sound insulation facilities. Light pollution is tried to avoid or reduce during construction. Electric welding operations should shield the welding arc light, and take measures to block the light at night [2].

3. Analysis of the implementation effect of construction pollution prevention and control countermeasures
The project has set up a monitoring system on-site as required. According to relevant studies, dust pollution is an important source of construction pollution, and dust pollution accounts for about 42% of the occurrence of PM10. This article intends to select PM10 and noise values to analyze the control effect of air and noise. Therefore, the monitoring data from January 2018 to December 2018 when no measures are taken is selected, and the monitoring data from January 2019 to December 2019 after the construction pollution control measures are taken is also selected. By comparing the average of the selected monthly monitoring data, the average concentration of PM10 and the changes in noise from January 2018 to December 2019 are obtained, as shown in Figure 3 and Figure 4.

![Figure 3 Comparison of the average monthly PM10 concentration in 2018 and 2019](image-url)
According to the above figures, after carrying out construction pollution prevention and control measures following the results of this project in 2019, the concentration of PM10 as an important indicator of dust control has been significantly lower than in 2018. In addition, noise pollution has also been greatly elevated. Therefore, it can be inferred that PM2.5 and waste gas that cause air pollution in construction will also decrease with the decrease of PM10. At the same time, construction waste, construction wastewater, and light pollution have all been significantly improved[3].

References:
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