Practical Discussion on Safety Management of Temporary Electricity at Construction Sites

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Abstract: In recent years, the scale of construction projects in China has continuously expanded. From residential projects to large public buildings, the reliance on temporary electricity during the construction period has increased. Core construction equipment such as tower cranes, steel processing equipment, and concrete vibrators, as well as temporary lighting and small electric tools, all require power supply through temporary electricity systems. However, due to the characteristics of temporary electricity, some construction companies have management loopholes, leading to frequent safety accidents such as electric shocks and short-circuit fires. Based on this, this paper first analyzes the three core characteristics of temporary electricity, then expounds on the importance of its safety management. Finally, centering on the idea of whole-process control, specific management strategies are proposed. The aim is to provide construction companies with actionable plans for temporary electricity safety management, reduce the occurrence of safety accidents, and promote the improvement of safety management levels at construction sites.

1. Introduction

Throughout the entire process of construction engineering, temporary electricity is a crucial component ensuring the execution of work. From dewatering equipment during excavation to high-power machinery during construction, and temporary lighting during the decoration phase, almost all construction phases rely on temporary electricity support. However, unlike the permanent electricity system fixed long-term after building completion, temporary electricity has distinct characteristics of "temporariness," "mobility," and "complexity." These features make temporary electricity a high-risk aspect of construction safety management. Therefore, an in-depth discussion on the safety management of temporary electricity at construction sites is of great significance for achieving dual guarantees of project safety and progress.

2. Characteristics of Temporary Electricity at Construction Sites

2.1 Temporariness

The primary purpose for construction companies to set up temporary electricity systems is to meet the electricity demand during the specific period from project commencement to completion, not for long-term use. Before construction begins, companies plan the temporary power distribution system and procure equipment based on the construction plan. After project completion, when site operation of construction equipment and temporary lighting is no longer needed, companies promptly dismantle facilities like temporary distribution boxes, cables, and grounding devices, unlike the permanent internal building power distribution system which remains long-term[1]. The selection and configuration of temporary electricity equipment are designed for short-term use. Cables chosen are often lightweight and mobile, not armored buried cables for permanent distribution; installed distribution boxes use simple bracket fixation, not permanent structures embedded in walls, and are dynamically adjusted according to construction phases.

2.2 Mobility

The power supply layout of temporary electricity is adjusted synchronously with the movement

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of construction machinery. On one hand, during foundation construction, workfaces are mostly concentrated around the foundation pit, requiring companies to install temporary distribution boxes and lines nearby[2]. During main structure construction, work is mostly done inside floors, necessitating the addition of temporary sub-distribution boxes on each floor, connected to the ground main distribution box via vertical cables. During the decoration phase, work is carried out in various rooms, requiring the addition of temporary sockets nearby. On the other hand, equipment like vibrators and welding machines need to move to different areas with tasks, requiring companies to re-lay temporary cables or relocate switch box positions for these devices to ensure safe power supply after movement.

3. Importance of Safety Management for Temporary Electricity at Construction Sites

3.1 Ensuring the Safety of Construction Personnel

Construction personnel frequently interact with equipment reliant on temporary electricity, such as tower cranes, vibrators, welding machines, and temporary lighting. If safety management is inadequate—for instance, if distribution lines lack insulation protection, the grounding or neutral system fails, or leakage protectors are not installed as required or malfunction—personnel may suffer electric shocks while operating equipment or touching lines. Minor shocks can cause injuries affecting work capacity, while severe shocks can be life-threatening. This not only brings irreparable pain to the worker's family but can also cause panic among site personnel, disrupting team stability[3]. Therefore, ensuring temporary electricity safety management is the primary responsibility of construction companies to protect their workers' lives and a baseline requirement for all site management tasks.

3.2 Ensuring Smooth Progress of the Project Schedule

Construction processes are interlinked; nearly every phase, from excavation and main structure pouring to decoration, relies on temporary electricity support. Tower cranes need power to lift materials; concrete vibrating equipment needs power for pouring; steel bar cutters and benders need power for processing; temporary lighting ensures normal operation during night or indoor work. If problems occur in temporary electricity safety management, it can directly cause shutdowns of all electricity-dependent equipment on site. Equipment shutdowns halt construction sequences, leading to schedule delays. This may cause economic losses for the construction unit. For the construction company, extended schedules increase costs like labor and equipment rentals, and may cause missed opportunities for bidding on subsequent projects, severely impacting overall project benefits.

3.3 Protecting the Property Assets of Construction Enterprises

Construction sites typically store a large amount of high-value equipment, materials, and large machinery like tower cranes and construction elevators. Damage to these assets due to temporary electricity accidents can cause economic losses for the company. For example, short circuits caused by damaged insulation on temporary lines can ignite nearby flammable materials like cement bags or wood, causing fires. If not controlled promptly, fires can destroy materials and small equipment on site, and potentially damage large machinery like tower cranes and elevators. Repairing or replacing this equipment requires significant investment. In severe cases, partially completed structures might be damaged, requiring rework and further increasing costs. Moreover, if accidents affect adjacent residential buildings or public facilities, the construction company may face compensation liabilities for third-party property, adding economic burdens[4]. Regulatory authorities conduct regular safety inspections at construction sites. If a company fails to meet temporary electricity safety management requirements—such as not preparing a dedicated temporary electricity plan, electricians working without certificates, or leakage protectors not tested as required—the company may face penalties like work stoppages for rectification or fines according to the law. Once work is stopped, the company not only faces schedule delays but also receives

negative records in the regulator's credit rating system, potentially affecting its qualification for future project bids.

4. Strategies for Safety Management of Temporary Electricity at Construction Sites

4.1 Refining Preliminary Preparations for Site Temporary Electricity

Preliminary preparations for temporary electricity at construction sites are the foundation for ensuring subsequent electrical safety. Construction companies need to implement specific measures at multiple levels, ensuring each step has clear responsibilities and standardized actions, laying a solid foundation for safety management. Specific operations are as follows:

First, the technical department must organize the preparation of a dedicated temporary electricity plan tailored to the project's actual conditions, avoiding generic templates. Before drafting the plan, the technical department should collect core project information, including overall scale, a list of electrical equipment needed for each phase, the on-site working environment, and surrounding power supply conditions. Based on this information, the technical department must complete three key tasks: 1) Accurately calculate the electrical load to prevent transformer overload or line tripping due to inaccurate estimates; 2) Design the distribution system, specifying the quantity and location of main distribution boxes, sub-distribution boxes, and switch boxes, planning line routes to ensure compliance with the three-level distribution and two-level protection requirement; 3) Formulate equipment protection measures, defining protection standards for distribution boxes and cables according to different working environments[5]. After completion, the plan must be submitted to the technical supervisor for review, and then submitted to the supervision unit for verification. Implementation can only proceed after the supervision unit confirms the plan's compliance and feasibility, preventing disconnection between the plan and the actual site.

Second, the procurement department must purchase qualified temporary electricity equipment and materials strictly according to the plan's requirements, resolutely - eliminate non-standard or inferior products. When selecting suppliers, prioritize manufacturers with production qualifications and good reputations, requiring them to provide product certificates, test reports, and other qualification documents. Avoid purchasing unmarked, unqualified "three-no" products. During procurement, staff must strictly adhere to the specifications in the plan: cables must be insulated and match the load grade; distribution boxes must have rainproof and dustproof functions; leakage protectors' operating current and time must match the equipment type. Upon arrival, quality inspectors must inspect each batch: check cable insulation for integrity and damage; verify internal wiring of distribution boxes for standardization and exposed terminals; test leakage protectors for sensitive operation. Ensure all equipment and materials meet safety standards; prohibit entry of any unqualified products.

4.2 Strengthening Installation and Layout Practices for Site Temporary Electricity

The installation and layout of temporary electricity are key steps in implementing the preliminary plan. They must be performed by certified electricians following specifications, supervised throughout by the technical department, and inspected simultaneously by the safety department to ensure every step meets safety standards, mitigating risks like short circuits and electric shocks at the source.

First, electricians must strictly install the three-level distribution system according to the plan, ensuring the setup and configuration of main, sub-, and switch boxes comply with regulations. For box placement, follow the principles of safety, convenience, and distance from hazards. The main distribution box should be near the power intake point, on high ground without water accumulation, avoiding vehicle traffic or water immersion. Sub-distribution boxes should be placed according to load distribution, within 30 meters of workfaces for easy connection and reduced line loss[6]. Switch boxes must adhere to the "one machine, one switch, one leakage protector, one box" rule: each electrical device has its own switch box equipped with a leakage protector and isolation switch. The distance between the switch box and the device should not exceed 3 meters to prevent voltage drop

or accidental pulling due to long lines. For installation details, fix distribution boxes on sturdy brackets; add rain and dust covers to doors; securely fasten internal terminals to prevent sparks from poor contact; post warning signs like "Authorized Personnel Only" and "Danger: Electric Shock" on the exterior to keep unauthorized personnel away. After installation, the technical department must verify box locations and quantities against the plan; the safety department must check protective measures and warning signs. Power can only be applied after confirmation.

Second, electricians must lay distribution lines according to the plan's requirements, choosing overhead, buried, or conduit methods based on different scenarios, and implementing protective measures throughout[7]. For overhead lines, use insulated conductors erected on dedicated poles, with height above ground (not less than 2.5m in outdoor areas, not less than 5m crossing vehicle roads). Fix conductors with insulators; strictly prohibit tying them directly to trees, scaffolding, or steel structures to prevent wear or breakage due to movement. For buried lines, excavate trenches at least 0.7m deep, lay fine sand or soft soil at the bottom, place the cable in the trench, protect it with bricks or concrete slabs on top, then backfill. Place identification markers every 20 meters along the cable path; add steel pipe protection where crossing roads or buildings to prevent damage from vehicles or machinery[8]. After laying, electricians must test the insulation resistance of conductors. The technical department must check line routes and laying methods against the plan, ensuring no loopholes in line protection.

5. Conclusion

The construction industry is a vital pillar of the national economy but also one with high safety risks. Temporary electricity safety accidents are common hazards. If a single construction project neglects temporary electricity safety management, causing casualties or property loss, it not only negatively impacts the project itself but may also raise public doubt about the industry's safety management level, harming its overall image. Conversely, if construction companies prioritize and effectively manage temporary electricity safety, they can not only ensure their project's smooth progress but also set a benchmark for safety management within the industry. This can encourage more companies to value temporary electricity safety, thereby enhancing the safety management level of the entire construction industry, reducing safety accidents, and maintaining healthy and stable development order.

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