# 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, devices such as vibrators and welding machines have to be transferred to other places with tasks, which forces the enterprise after completing the work of laying temporary cables or changing switch box positions for these devices in order to ensure that there is power supply continuously after moving.

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

### 3.1 Ensuring the Safety of Construction Personnel

Construction workers often come into contact with equipment that depends on temporary electricity like tower cranes, vibrators, welding machines and temporary lighting. When the safety management is not in place—such as insulation protection absent in distribution lines, grounding or neutral system failure, leakage protectors not installed according to regulations or associated malfunction—electric shocks may occur when personnel start equipment or touch lines. Mild shocks can cause injuries to working capacity, while severe shocks can directly kill. Not only does this cause irreversible trauma to the deceased worker's family, it can also lead to panic among personnel on the site resulting in destabilization of teams [3]. As a result, temporary electricity safe management is the first responsibility of construction enterprises to guarantee that workers alive working safely, and it is the foundation requirement of all site management work.

### 3.2 Ensuring Smooth Progress of the Project Schedule

Construction processes are interconnected, as almost all construction stages, such as excavation and pouring the main structure to decoration need temporary electricity support. Tower cranes require power to carry building materials; concrete vibrating equipment needs power when pouring; steel bar cutters and benders need power for processing, and temporary lighting can ensure normal operation during the night or indoor working conditions. When temporary electricity safety management has a problem, it will directly lead to shutdown of all electricity-dependent equipment on site. One reason is that equipment shutdowns can freeze the construction sequence and push back schedules. This may even result in economic losses to the construction unit. In the case of a construction company, longer schedules also mean larger costs for labor and equipment rentals, as well as potential loss of opportunity to submit bids for later work, which can dramatically reduce overall project benefits.

### 3.3 Protecting the Property Assets of Construction Enterprises

Large equipment, materials and substantial machinery (comparable to tower cranes and elevators) are often stored in building websites as such sites typically have high-value assets. For instance temporary electricity accidents can damage these assets which will result in economic losses to the company. For instance, damaged insulation on temporary lines can short circuit and set nearby flammable materials like cement bags or wood alight and cause fires. If not promptly extinguished, fire can destroy materials and small equipment on the site, as well as cause damage to larger machinery such as tower cranes and elevators. Because this equipment is expensive to repair or replace. In extreme situations, incomplete structures may get destroyed and require costly rework to effect repairs. In addition, if disasters affect surrounding houses or public facilities, the construction company may pay compensation for third-party property and bear economic costs [4]. Regulatory bodies perform routine inspections of construction sites to ensure safety. Companies that do not comply with temporary electricity safety management requirements, such as failing to prepare a dedicated temporary electricity plan, electricians working without certificates or leakage protectors tested as required, etc., will be punished by the authorities for stopping work for rectification and

ordering fines according to law. Hiring up involves not only project delays but also getting black marks in the regulator's track record system for failures to be on time, which could jeopardise its ability to win future contracts.

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

### 4.1 Refining Preliminary Preparations for Site Temporary Electricity

Preliminary preparation for provisional power supply on the construction site is the first step toward achieving electrical safety in subsequent stages. Construction company should take some steps at various levels, where one by one step must be taken adjustable and concrete responsibilities with defined actions so as to create the base plan for safety management. Specific operations are as follows:

The technical department must first prepare a special temporary electricity plan based on project actuals and not on template documents. Core project information such as overall scale, electrical equipment needed for each phase, on-site working environment conditions and surrounding power supply conditions, should be gathered before creating the plan by technical department. According to these three principles, the technical department needed to accomplish three key tasks: 1) Underestimating or overestimating the electrical load of the designated area results in either transformer overload or tripping line fault due to inaccurate estimation. Therefore, load estimation must be accurate; 2) Design of distribution systems, indicating quantity and location for main distribution boxes, sub-distribution boxes and switch boxes while planning routes of lines through meeting present conditions on three-level distribution and two-level protection; 3) Formulation of equipment protection measures according to workplace environment on setting up standard specifications for testing box cables and types [5]. Following the completion of the plan, it must be reviewed by the technical supervisor and then, once verified, submitted to the supervision unit. The supervi- sion unit only approve the plan when they confirm that it is feasible and compliant, so to avoid gaps between planning and implementation on site.

Second, all items related to temporary electricity must be procured only according to the requirements of the plan, resolutely eliminate non-standard or inferior products. When selecting suppliers, give priority to manufacturers with production qualifications and good reputations, asking for product certificates, test reports and other qualification documents. Do not buy three-no products that you are unmarked through "three-no" products contracts. In the procurement process, the staff strictly follows the specifications in the plan: cables must be insulated and matched with load grade, distribution boxes must have rainproof and dustproof functions, leakage protectors' operating current time is limited by equipment type. Upon arrival at the location, each batch is to be inspected by quality inspectors: the integrity and damage of cable insulation; standardization of internal wiring in distribution boxes, exposure of terminals; sensitivity test failure testing leakage protectors. Control quality to only allow equipment, or materials that meet safety standards; banning products from entering without qualification.

### 4.2 Strengthening Installation and Layout Practices for Site Temporary Electricity

In the implementation of its preliminary plan, one of the major steps is the installation and distribution of temporary electricity. They have to be carried out by licensed electricians according to specifications, controlled during all the phases by the technical department and at the same time checked by safety in order that every step complies with security requirements to avoid risks like short circuits and electric shocks from its root.

Supervisors will first meticulously perform the installation of a three-level distribution system as per the plan, ensuring the setup and configuration of main, sub-, and switch boxes strictly adhere to regulations. When placing boxes, adhere to safety and ease of use while also keeping them away from dangerous areas. Location: The Main Distribution Box position shall near the power intake pointHigh +Drained clean area, No Water LoggingNo vehicle traffic (no submersible water Drainers) Sub-distribution boxes should be located on a basis of load distribution within 30 meters

of workfaces for easy connection and reduced line loss [6]. Switch boxes observe the principle of "one machine one switch one leakage protector one box": each electrical appliance is equipped with a switch box, and there are separate leakage protectors and isolation switches. Due to the long line, it should not exceed 3 meters when connecting the distance between the switch box and device (the transposed circuit of current becomes smaller and greater than a few lines allow due to voltage drop attracted or pulled off). Installation: used in non-directly mounted precipitate boxes, rain- and dust-proof doors must be provided; terminal is fixed firmly to prevent away spark from poor contact; external with a barrier and items like "Authorized Personnel Only", "Danger, electric shock" or other warning symbols. Once installed, the technical department should confirm locations and quantities of boxes vs the plan; the safety department should check that protective measures were taken; and proper warning signs. The only time power can be done is after confirmation.

Secondly, requires project work from electricians to distribute the lines according to plan requirements and select overhead/buried/conduit methods for different situations as required, while taking protective measures throughout [7]. Overhead lines are insulated conductors fixing due poles as masts in the air (height above ground — not lowered than 2,5m in outdoor areas, on crossing of vehicle roads without lowering than 5m). Fasten conductors using insulators; forbid fastening them directly to trees, scaffolding or steel structures (to prevent movement from wearing or damaging wire). For underground lines, excavate boxes at least 0.7m deep and place a thick layer of fine sand or soft soil, the cable goes inside this trench and bricks or concrete slabs go on top to protect it before backfilling. Install survey markers every 20 m along the cable path; where there are crossings with roads (or buildings), provide protection through a steel pipe to avoid collisions by vehicles or machines [8]. Insulation resistance testing of conductors is a common practice for electricians after laying down. The installation of cables should be checked: line routes and laying methods compared to the plan, checking as much as possible loop-hole free for line protection.

## 5. Conclusion

The construction industry is a significant pillar supporting the national economy; on the other hand, it is one of the most dangerous and risky industries in terms of safety. Common dangers are temporary electricity protection accidents. The failure of temporary electricity management in construction projects can not only affect the quality and safety performance of a single project but also negatively impacts the public image of this industry when causing casualties or property loss, thus leading to doubts about productivity enterprises. On the other hand, construction companies that pay more attention to temporary electricity safety management can not only ensure the smooth progress of their project during construction, but also lead the industry in terms of safety management. This can urge the various enterprises more prizing the temporary electricity safety, thus improving the entire construction industry safety production management level and avoiding security incidents to make sure that development order healthily and stably.

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