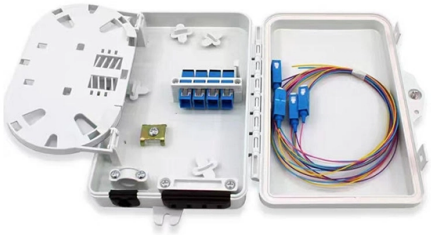
Standard requirements for the size of tunnel electrical distribution boxes



Overview

The document provides design guidelines for mechanical, electrical, and plumbing systems in tunnels.

Key Takeaways

Tunnel electrical distribution boxes must be robust, modular, and sized to accommodate voltage, cable capacity, and protective devices while ensuring safe operation in harsh tunnel environments.

Enclosure and Protection Requirements

Tunnel distribution boxes are typically housed in heavy-duty steel or IP55–IP67 rated enclosures to withstand dust, water, concrete casting, and mechanical impacts. The enclosures must provide sufficient space for circuit breakers, transformers, switches, and socket outlets, while allowing for safe cable terminations and heat dissipation. Modular designs with hinged covers or pull-out rails are preferred for easy installation and maintenance.

Voltage and Power ConsiderationsHigh-voltage input: For long tunnels, voltages may be stepped up to 3300 V at the entrance and stepped down to 400 V / 230 V and 110 V at intervals. Low-voltage distribution: 400 V is used for heavy machinery, pumps, and fans, while 110 V powers tunnel lighting and small tools. Transformers: Step-down transformers are often installed every 200–400 meters depending on voltage drop and lighting requirements.

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Socket and Circuit Ratings

Industrial socket outlets: Typically rated at 16A, 32A, 63A, 125A, with higher ratings (up to 630A) for specialized equipment. Protection: Each socket is individually protected by MCBs and 30 mA RCDs, with pilot pins for Earth Continuity Monitoring on higher-current sockets. Plug-in flexibility: Boxes are designed to allow plug-in or extendable connections to move forward with tunneling operations.

Size and Layout Guidelines

While exact dimensions vary by project, sizing is determined by: Cable cross-section and number of conductors: For example, 400 V cable link boxes may accept SWA cables up to 95 mm^2 4C with switchgear rated up to 250 A. Internal component space: Enough room must be provided for MCBs, MCCBs, transformers, and wiring without overcrowding, ensuring compliance with electrical safety standards. Height and spacing: Distribution boxes are often wall-mounted at 3 meters height in tunnels with 4-meter diameters, spaced according to transformer and lighting requirements.

Modularity and Expansion

Tunnel distribution boxes are often modular, allowing sections to be added as tunneling progresses. Features like segregated terminations, plug-and-socket interlocks, and extendable busbars enable safe expansion without isolating the entire system.

Summary

In practice, tunnel electrical distribution boxes must balance robustness, modularity, and sufficient internal volume to accommodate all electrical components, cable connections, and protective devices. Their size is determined by voltage level, cable capacity, socket ratings, and operational requirements, rather than fixed dimensions, with enclosures designed to meet IP55–IP67 standards and allow safe, flexible installation in harsh tunnel environments.

Article Content

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Energy distribution boxes, tunnel lighting

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1926.408

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