

Power Plant Tubular Busbar Construction



Overview

The busbar's material composition and cross-sectional size determine the maximum current it can safely carry. Busbars can have a cross-sectional area of as little as 10 square millimetres (0.016 sq in), but may use metal tubes 50 millimetres (2.0 in) in diameter or more as busbars. use very large busbars to carry tens of thousands of to the that.

Key Takeaways

Tubular busbars in power plants are hollow conductors, typically aluminium or copper, designed to carry high currents efficiently while minimizing weight, heat, and electromagnetic forces.

Overview
Tubular busbars are used to interconnect major electrical equipment such as generators, transformers, and switchgear in power plants and substations. They are preferred for high-current applications due to their hollow tubular design, which provides excellent mechanical strength, efficient heat dissipation, and reduced material usage compared to solid bars .

Materials

- Aluminium Tubular Busbars: Made from high-purity aluminium or alloys (e.g., 6061, 6063), aluminium busbars are lightweight, corrosion-resistant, and cost-effective. They are commonly used in new installations and can carry continuous currents of 1250–2000 A depending on diameter and wall thickness .



- **Copper Tubular Busbars:** Copper is used for extensions to existing copper systems or where higher conductivity is required. Copper busbars offer superior electrical performance but are heavier and more expensive .

Design and Geometry

- **Hollow Tubular Structure:** The hollow cross-section maximizes the surface area for heat dissipation while maintaining rigidity. Typical diameters range from 100–120 mm with wall thicknesses around 10 mm .
- **Isolated-Phase Bus (IPB):** In large power plants, each phase may be enclosed in a separate grounded metal housing with polymer or porcelain insulators. This configuration reduces magnetic forces, limits short-circuit stresses, and minimizes external magnetic fields .

Fittings and Connectors

- **Open Terminal Systems:** Fittings include clamps, joints, and sliding or fixed connectors designed to avoid deformation of the tubular conductor. Aluminium systems follow ENA TS 41-11, while copper systems follow ENA TS 41-16 .
- **Sliding and Fixed Clamps:** Sliding fittings allow thermal expansion, while fixed fittings provide mechanical stability. Typically, two clamps are used on fixed fittings for mechanical reasons .
- **Copper-Aluminium Connections:** Special precautions are taken to prevent electrochemical corrosion at dissimilar metal joints .

Support and Insulation

- **Support Insulators:** Tubular busbars are mounted on polymer or porcelain insulators to maintain electrical clearance and mechanical stability .
- **Support Structures:** Steel frameworks or substation structures provide mechanical support, accounting for wind loads, short-circuit forces, and thermal expansion .

Operational Considerations

- **Current Carrying Capacity:** Determined by cross-sectional area and material conductivity. Aluminium busbars are optimized for weight and heat dissipation, while copper busbars provide higher conductivity for the same cross-section .
- **Thermal Management:** The tubular design allows effective heat dissipation, reducing temperature rise during high-current operation .
- **Safety and Standards:** Construction must comply with BS EN 61936-1 for power installations exceeding 1 kV AC, ensuring proper handling of short-circuit currents and environmental forces .

Summary

Tubular busbars are a critical component in power plant electrical systems, combining mechanical strength, high current capacity, and thermal efficiency. Aluminium is preferred for new installations due to its lightweight and corrosion resistance, while copper is used for high-conductivity requirements or extensions to existing systems. Proper design of fittings, supports, and insulation ensures safe and reliable operation, particularly in high-current and isolated-phase configurations.

Article Content

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The purpose of this document is to detail the requirements of Northern Powergrid in relation to the tubular busbar systems and

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Busbar

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A typical layout of such a bus system in a thermal power plant is illustrated in Figure 31.2 (a) and (b). It may comprise sections noted

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The busbar system consists of the isolator and the circuit breaker. Busbars are available in a variety of shapes and

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