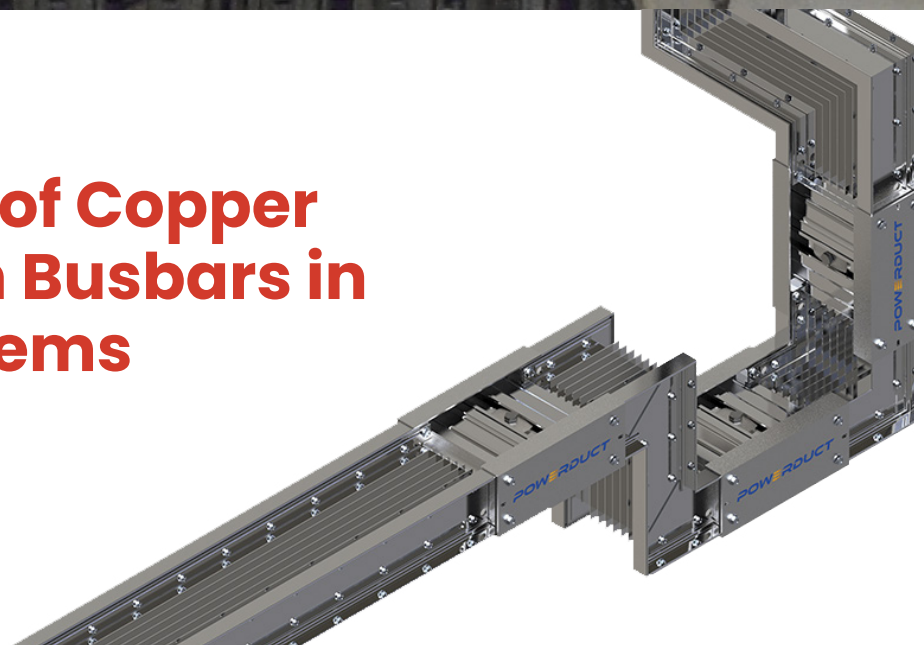


## WHITEPAPER

# Comparison of Copper & Aluminium Busbars in Busway Systems



The pros and cons of using aluminium and copper conductors in electrical equipment has been a talking point in the industry for many years.

Historically, copper has been the conductor of choice for busway systems in Australia, due to its strong mechanical and electrical properties. However, in recent years, the availability of aluminium has seen it become more common as a conducting medium.

### ***So, what is the right option?***

Like anything, both materials have positive and negative characteristics that will affect its overall suitability for a particular application. Performance, size, weight, cost of raw materials, and ease of installation all factor into the decision-making process.

Most busway manufacturers now offer both copper and aluminium solutions, giving end users more options than ever to suit their unique project requirements.

This document aims to provide the information necessary to make an informed decision when designing a busway system for your next project.

## **Conductivity**

Other than silver, copper is the best conductor of electricity and has become the international benchmark when comparing the conductivity of other materials.

The International Annealed Copper Standard (IACS) states that commercially pure annealed copper has a conductivity of 100% IACS. Most reputable busway manufacturers will only use copper that has a conductivity of greater than 99% IACS.

Aluminium has a conductivity of 62% IACS, which often leads to it being overlooked as a viable conductor for use in the construction of busway systems.

Interestingly, when comparing the conductivity of aluminium per kilogram, it is 50% more conductive than copper.

All copper and aluminium busbars in the Powerduct range are electroplated with nickel- tin at contact surfaces, such as plug-in points and the joints at either end of a length of busway, to improve overall conductivity and protects the busbars from the effects of corrosion. Silver plating is available on request.

## Thermal Expansion

Thermal cycling is a phenomenon regularly seen in power distribution systems, which involves the busbar expanding and contracting due to changes in temperature. Aluminium is more susceptible to expansion than copper.

To counteract the potential of thermal expansion occurring, the uniblock joint pack that is used to join lengths of Powerduct together is designed to accommodate 3-4mm of movement per joint. For vertical installations, such as in an electrical riser, spring hangers are provided at each level to allow the busway to expand and contract as needed.

Additionally, an Expansion Joint can be supplied for longer busway runs. This accessory contains internal flexible connections and provides 50mm of linear movement along the installation.

## Size

Due to the reduced conductivity of aluminium, a much larger sized conductor is required to have the same current carrying capacity of a copper conductor. This also increases the overall size of the finished product and can be problematic in commercial applications, which often have spatial restrictions to accommodate other services (e.g. electrical riser cupboards, false ceilings or floating floors).

However, aluminium can be up to 70% lighter than copper, meaning that even though an aluminium busway system would be physically larger than a copper system of an equivalent current carrying capacity it would still weigh significantly less.

### Compare the Pair

A piece of 3 Phase + 100% Neutral Powerduct with copper busbars and a current carrying capacity of 2500A measures 115mm x 254mm and weighs 50kg/m.

By comparison, a length of the same current rating, but using aluminium busbars, measures 115mm x 325mm, yet weighs only 29kg/m.

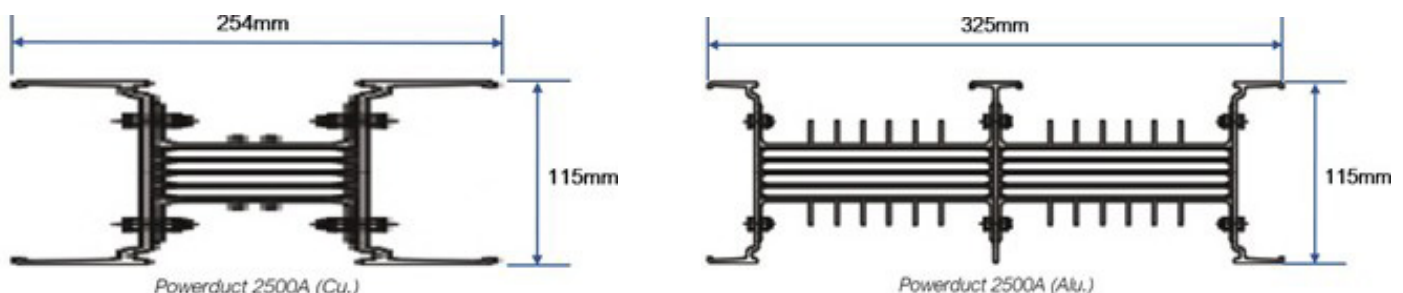


Figure 1: External Dimensions of 2500A Powerduct with Copper and Aluminium Busbars



This reduction in weight can also lead to benefits in other areas such as being easier to install, fewer supports required to hold the busway in place, lower labour costs, lower transportation costs, and could eliminate the need for special lifting equipment.

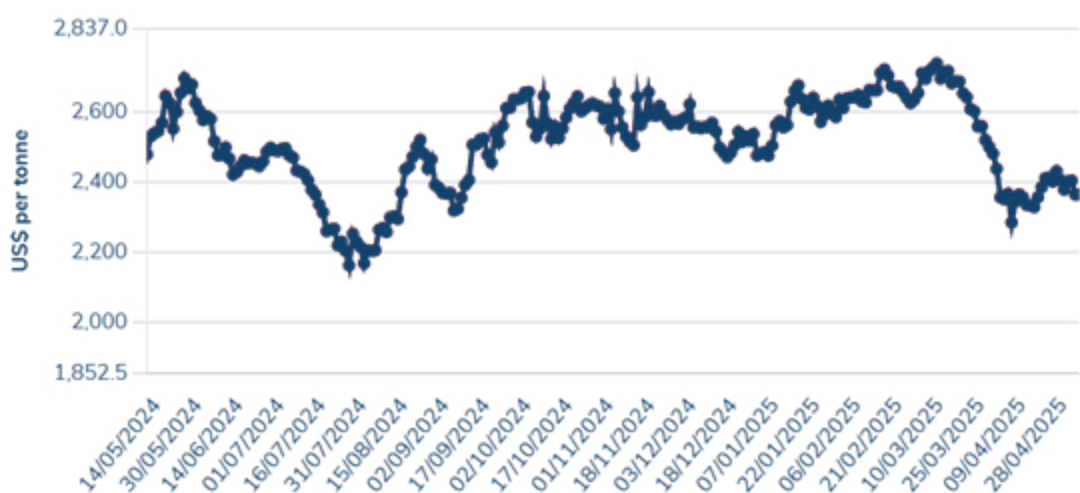
## Cost

The market price of copper is far more volatile than aluminium, due to demand and the overall scarcity of the metal. In contrast, there is an abundance of aluminium available. The London Metal Exchange (LME) currently lists the price ratio of copper to aluminium at more than 3:1 – a significant cost that is passed on to the customer.

This makes aluminium busbars a far more cost-effective option to copper.



Graph 1: LME Copper USD per Tonne (May 2024 – May 2025)



Graph 2: LME Aluminium USD per Tonne (May 2024 – May 2025)

## Sustainability

Although copper and aluminium are both 100% recyclable, there are differences in the way each material is mined and recycled which impact their environmental sustainability.

The recycling process for aluminium uses only 5% of the energy required for primary production and releases only 5% of the associated emissions.

The process of recycling copper differs and uses 15% of the energy required for primary production.

Aluminium is the most recycled industrial metal with over 75% of aluminium ever produced still in use today. By comparison, only 65% of copper produced is still in use.

As the world moves toward a future with less emissions, aluminium is arguably the more sustainable option for use as conductors in busway systems.

*IPD is the exclusive Australian distributor of Powerduct busway systems. For more information on the Powerduct range, visit <https://resources.ipd.com.au/powerduct>.*

