

# Technical Support - Linear Current Collection

## *The Advantages of Carbon in Current Collection*

Carbon exhibits many operational and financial advantages over metallic materials as a linear current collector, and the benefits to user systems are becoming increasingly apparent as more of the world's railway, third rail and tram/trolleybus systems change to carbon.

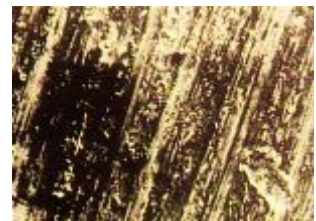
### Overhead current collection

On pantograph systems, the advantages of carbon include:

- Longer collector strip life, with lower maintenance costs and less-frequent replacement
- Longer wire life, giving significant reductions in cost of maintenance for the overhead system
- Reduced mass for better current collection
- Carbon's inert qualities, which ensure that carbon will not weld to the conductor wire - even after long periods of static current loading
- The ability to operate at high speeds (240km/hour and more)
- The virtual elimination of electrical interference to telecommunications and signal circuits
- Negligible audible noise between rubbing surfaces



Carbon



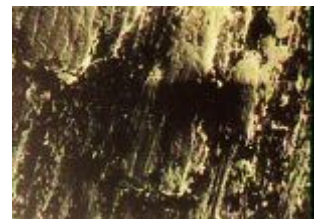
Copper

Laboratory and field comparisons between carbon and copper, sintered bronze or aluminium pantograph collector strips show many examples of up to tenfold increase in collector and wire life and recent studies in Japan show a projected 25% saving in total system operating costs.

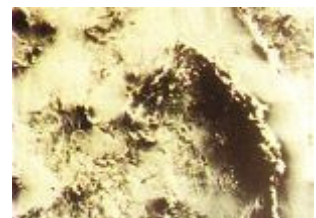
### Third and fourth rail systems

Steel, cast-iron, copper or bronze shoes on third and fourth rail collection systems inflict mechanical damage to the rail because of their relatively high mass.

Their high co-efficients of friction also create excessive wear both to the collector and the rail. Once wear takes place, electrically-conductive - and some times magnetic - debris is created so motor windings and other systems must be protected.



Sintered Metal



Aluminium

Inevitably sparking between damaged rail and collector also occurs, causing

further problems of interference to telecommunications and signalling systems.

The use of carbon-based collector materials virtually eliminates all these problems. Carbon's relatively low mass (one third that of copper) minimises mechanical hammer damage to the rail, and its self-lubricating properties ensure a patina of carbon is deposited on the rail reducing friction and wear and almost completely eliminating sparking.

As an added bonus, the carbon patina provides a degree of natural de-icing capability.



This photograph shows the potential vulnerability of modern capped third rails.

Carbon is particularly valuable as a collector material on systems using capped rails, where the margin for damage is greatly reduced.



These photographs taken under a microscope show the differing wear characteristics to the overhead wire from using carbon, copper, sintered metal and aluminium as a collector material.