

Gantries:

The key to smart motorways

According to research conducted by the World Bank last year, the UK has the most congested roads in Europe. This, combined with the fact that funding for road maintenance has halved since 2010, means that the Highways Agency has been under pressure to find alternative solutions to increase road capacity. Simon Benfield, design director at Ramboll and chairman of the Institution of Engineering Designers; along with Patrick Jansen, head of transport at Ramboll, discuss how smart motorways have offered an answer to these problems



Simon Benfield



Patrick Jansen

Rather than traditional road widening which is expensive, possibly inefficient and has a negative impact on the environment, smart motorways allow control of variable speed limits as well as the opening of hard shoulders. With a huge expansion of smart motorways in recent years and more to be built, Britain is now at the global forefront of these systems.

Gantries remain ever present on our motorways and are now the key to the running of smart motorways as they provide the means of communicating information clearly to drivers; what lanes to use, what the maximum speed limit is, and whether there are particular hazards ahead.

In 2003/4 the Highways Agency concluded that widening roads was an unsustainable method to increase capacity. Their answer was to introduce 'managed motorways' which would allow a central operator to control speed limits and open and close hard shoulders. This required signals for individual lanes, using gantries that spanned the whole road. However, because driver behaviour in these circumstances was unknown (other than from simulator testing) the signals were closely spaced, every kilometre or so, leading to a greater number of structures than before.

Ramboll were able to anticipate the issues caused by this increase in volume and developed new families of gantries within their existing standardised design system. This system was developed at the start of the original widening programme and was built on Ramboll's experience of gantry design dating back to the mid 1970s. With the number of signals increasing, Ramboll identified the need for standard, cost effective and efficient structures which had to be constructed over 'live' motorways. The new gantries were cheap, easy to build and had a reduced construction footprint. Using the design system, gantries could be readily designed to match specific requirements in terms of road alignment, wind speeds, equipment needs and the size of the sign. Ramboll have maintained a close relationship with the fabrication and construction community, allowing them to deliver products which are constantly evolving and improving.

Changing designs

Gantry design changed when managed motorways became smart motorways. On a managed motorway, signs were needed every kilometre. On smart motorways, the level of control is reduced. The hard shoulder is always open and lane speeds are controlled as one, rather than individually. Consequently, there can be significantly fewer gantries over carriageways with the bulk of signs and hardware moving to the sides of the UK's roads. Gantries

are more lightweight and less obtrusive; the *MS4 Cantilever*, for example, is the predominate type – a gantry which Ramboll also helped design.

Now, the most costly part of constructing a gantry is the closing of the road in order to erect it. This must be done as quickly as possible to minimise traffic disruption. Gantries are outfitted offsite and transported in three units – the two legs and the boom. Once the legs have been put up, which can be done in advance, the police implement a rolling block to slow traffic to a crawl. The boom is lifted up and dropped on to the legs. The process takes approximately 10 minutes although it can be done in less – the fastest being six minutes! Occasionally, long lengths of motorway can be closed for a whole night and, in these instances, the rapid erection technique can be used to install multiple gantries at the same time.

It is possible to imagine a future in which there is no longer any need for gantries. The integration between driverless cars and satellites will change the way our roads are built and increase road capacity like never before. We will all be driving in long convoys, with our cars no more than 2cm apart from each other, our journey controlled via satellite. Until then, however, gantries will remain a key tool in the safe implementation of smart and controlled motorways. ☹