

# Zebra's face a brighter future

Zebra crossings have become smarter, not just brighter, with a little help from friends at a road safety 'beacon' council. **Tim Jarvis** has the story.

The day has finally come for a makeover for one of the highway networks most traditional features – the belisha beacon. A familiar sight on the UK's road network for more than 70 years, it has been subject to many improvements over its long career, among them the early replacement of its glass globes with plastic, to deter vandalism, followed in 1953 by globe illumination for enhanced visibility.

More recently, with the declining popularity of zebra crossings among some traffic engineers and visual competition from a brighter streetscene, belisha beacon numbers have been dwindling. But now enhanced beacons are staging a comeback, following a trial with Norfolk County Council.

Various attempts have been made to improve the conspicuity of zebra crossings over the years, including backing boards and illuminated posts. These measures have only been partially successful, with backing boards and cowls being a target for vandals, and contributing to street clutter.

One obvious solution was to make the beacon brighter, which has led to the installation of 100W tungsten lamps, LED lamps and enhanced globes which transmit more light. In residential areas, however, these are usually followed quickly by the installation of cowls and shields to prevent light pollution and nuisance.

Since simply making the beacon brighter was not going to be the solution, any new beacon needed to meet all of the shortcomings of traditional beacons and specifically target:

- Improved conspicuity;

- Reduced energy consumption;
- Dimmable, to reduce light pollution and neighbour nuisance;
- Reduced need for lamp changes and maintenance with a LED design;
- Retrofittable to existing sites without excavation or post replacement;
- Comply with existing regulations;
- Use a vandal-resistant design.

Only by completely reviewing the fundamental purpose of the belisha beacons, and the *Zebra, pelican and puffin pedestrian crossings regulations and general directions 1997*, was a solution found. This research identified that an active backing board could be used to raise the conspicuity of the beacon without trying to transmit additional light inefficiently through the tough plastic globes.

Prototypes of an enhanced belisha beacon were developed to assess the effectiveness of the concept, with measurements taken in order to calculate the light output compared with a high-glow beacon and 60w filament lamp. It was important to ensure that the internal illumination of the globe was not reduced when compared with a standard belisha beacon.

The test results (see tables, pages 17 and 18) show the light output with the beacon in illuminated and non-illuminated states. The measurements were taken with a calibrated light meter at a distance of 30m. The ambient light level was recorded first, and then the two beacons were measured independently.

Results showed that the contrast ratio for a standard beacon was 1.2 to 1.0, meaning that the illuminated state was 20% brighter than non-illuminated. This was used as an indication of the intensity of the

flash, that is to say, the difference between illuminated and non-illuminated states. The enhanced beacon, however, had a contrast ratio of 25.0 to 1.0. This means that the illuminated state is 2,500% brighter than the non-illuminated state. This is enhanced by the black halo, giving a greater contrast resulting in a more visible and intense flash.

Norfolk County Council, a 'road safety beacon' authority, expressed an interest in helping to develop the product further. Norfolk was already aware of the need to improve the visual performance of some of its zebra crossings, and was considering their replacement at some sites with puffin crossings. The chance to develop and trial enhanced belisha beacons fitted in with the council's history of innovation and casualty reduction.

'We were concerned that some of our zebra crossings were no longer conspicuous enough,' says Nev Calder, principal engineer for Norfolk's casualty-reduction team. 'We could see the potential benefits of enhanced belisha beacons and were interested in trialling the innovative zebrite beacons at some of our concern sites.'

The usual range of road safety measures had already been trialled at the selected sites, including high-friction surfacing, brighter lamps and backing boards, without success. The zebrite beacons were installed in March 2006 at two sites, with further trials rolled out over the following few months.

Following the beacons successful performance, and their positive response from the



Earlier bid for conspicuity: Backing boards and cowls

'The light-sensitive dimming was initially introduced to remove the night time nuisance of very bright belisha beacons to nearby residents,' says Calder. 'We were concerned that cowls were not the answer – reducing the visibility of the beacon and becoming a target for vandalism. This is a much smarter solution.'

He adds: 'There is a spin off because, as well as stopping the light pollution, the beacons are also much more energy efficient.'

The conclusion of the cost-effectiveness study led to a change of approach at the council. It has moved away from installing high friction surfacings at crossings as an initial measure, specifying instead enhanced beacons to improve conspicuity first. Norfolk are now installing zebrite beacons as standard and have a prioritised programme of replacement at existing crossings.

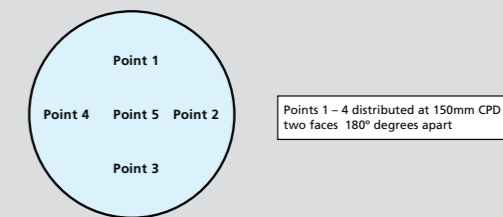
Encouraged by the performance at its existing zebra crossings, Norfolk council was keen to give the beacons a tougher challenge. A pelican crossing with a casualty history was identified as a possible trial for an enhanced zebra, rather than the significant cost of installing a puffin.

'In some circumstances signalled crossings can be less safe, particularly where traffic

Beacon Light Output Test Results – Part 1.

Zebrite Belisha Beacon (Globe Only)					60W Tungsten / Hi-Glow Globe				
Face 1		Face 2			Face 1		Face 2		
Point 1	Point 2	Point 3	Point 4	Point 5	Point 1	Point 2	Point 3	Point 4	Point 5
370	372	411	389	407	363	402	454	386	480
Av: 390					Av: 417				
Ratio: 0.90					Ratio: 0.76				
Av: 426					Av: 417				
Ratio: 0.69					Ratio: 0.85				

Tested by: W. McKay, Head of Research and Development, Westcotec Ltd - August 2006



Conceptual testing: Calculating the light output of the prototype compared with a high-glow and 60W filament lamp

public, Norfolk council wanted to explore if their introduction made economic sense on a wider scale.

Energy consumption and ongoing maintenance costs are key factors in a highway authorities' assessment. With the beacon's all-LED design, and the introduction of light-sensitive dimming for the first time, significant savings could be made. They reduced energy consumption by 75%.

The fully variable dimming map ensures the beacon is always producing the correct level of output to maintain excellent contrast without wasting energy. The beacons are the first which do not require cowls or shields.

'flows are not so heavy, or at times of day when they are not so heavy,' explains Calder. 'In these circumstances, many pedestrians will either not register a ped-demand or not wait for it to come up, and then cross on pedestrian red.'

'Of course, this means any oncoming driver sees a vehicular green when a pedestrian enters the carriageway – not a good combination. Driver surprise, or aggression, or just the expectation that the pedestrian will leap out of the way, can result in increased risk of collision,' he says.

Calder reckons that, where approach speeds are sufficiently low, zebras are a much

## road safety



**Beacon of hope: Seeing is believing for the two belisha beacons on this crossing (above); light output test results (right), showing the contrast ratio**

more civilised crossing, encouraging eye contact and giving pedestrians a right-to-stop traffic in order to cross. 'However, it appears that many members of the public do not fully understand this, and can be concerned by the proposal to replace a poorly-performing pelican with a zebra,' he says, adding: 'The high conspicuity zebrite beacon is one way of helping overcome this concern.'

It is now 16 months since the replacement crossing was installed on this site and, although it is still early days for a true assessment, there

**Beacon Light Output Test Results – Part 2.**

**Outdoor testing**

State	Zebrite Belisha Beacon Globe and Halo – cd/m <sup>2</sup>	60W Tungsten / Hi-glow beacon – cd/m <sup>2</sup>
ON	1400	700
OFF	450	650

\* Test conducted using a calibrated light meter at a distance of 30 metres. The measurements were taken along a horizontal plane level with the centre of each beacon. The ambient light level at the time of the test was 400 cd/m<sup>2</sup>.

**Contrast**

State	Zebrite Belisha Beacon Globe and Ring	60W Tungsten / Hi-glow beacon
ON	2.5	0.75
OFF	0.125	0.625
Ratio between On and Off contrast where 1.0 is equal to no change in light output.		
	<b>20.0</b>	<b>1.2</b>

Tested by: W. McKay, Head of Research and Development, Westcotec Ltd - August 2006

have been no personal injury accidents since installation, compared with five in the previous five years.

It seems traffic safety engineers now have an effective tool that can improve existing zebra crossings as well as permeability of our town centres by replacing appropriate traffic light-controlled crossings with enhanced zebras. With a 'nip and tuck', belisha beacons look set to continue their long career.

• **Tim Jarvis** is the managing director of Zebrite.