Stability at last for sign structures

*Simon Morgan, editor and co-author of the new IHIE **Sign Structures Guide**, explains the background to its recent revision and outlines other help available to sign designers navigating the maze of new standards.*

Much thought and effort is devoted to traffic signs as they appear to road users. Their size, position, layout and illumination all need to be right for signs to fulfil their purpose: to be read and understood by intended road users under all conditions. But a sign face cannot be displayed without some physical hardware – the sign plate and its supporting structure – and this aspect of sign design often receives only minimal attention.

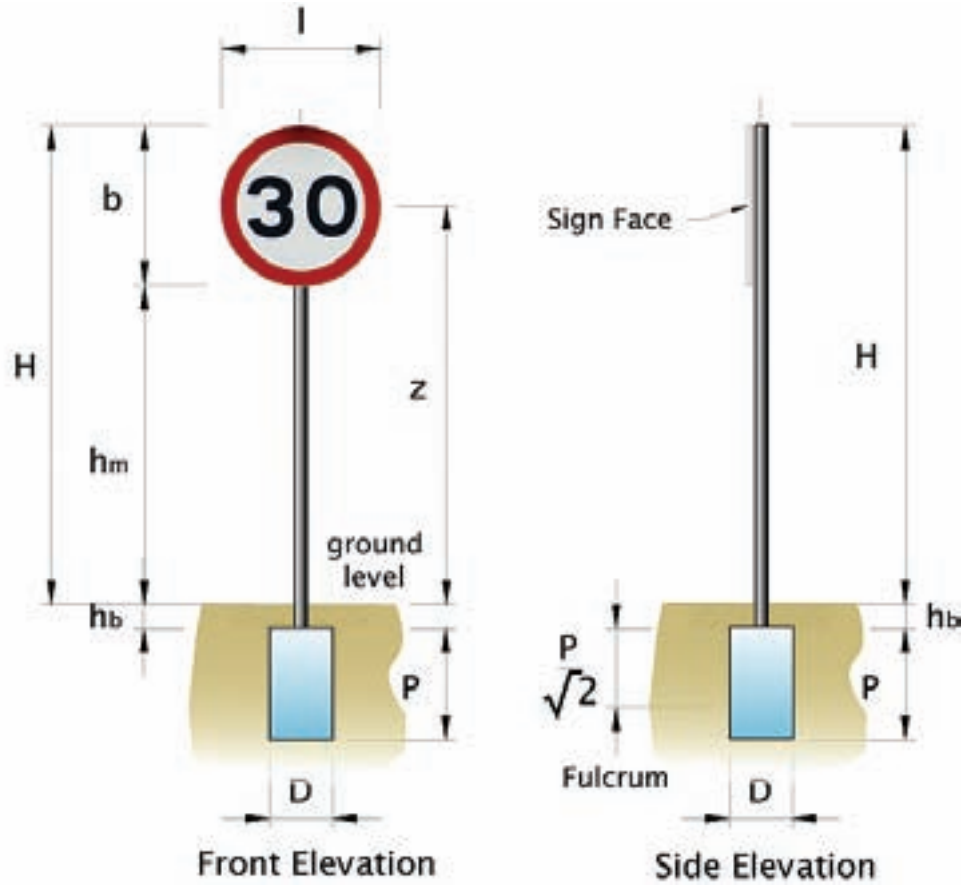
The specification and manufacture of sign hardware has gone through an enormous upheaval over the past few years. This has lead to a lot of uncertainty even amongst those responsible for setting standards, so it is no wonder that those designing and procuring signs have felt confused by the whole process. Apart from one issue still outstanding, the transition is now complete and we can look forward to a period of stability while we get used to the new standards.

The main reasons for the change are the arrival of harmonised European standards (Eurocodes) and the need to consider passive safety, or crash friendliness. The introduction of Eurocodes is causing upheaval in the entire civil and structural engineering profession. Whilst traffic signs are generally very minor structures they still fall within the remit of the new standards. As well as general codes covering wind actions, material properties and design processes, there is a specific standard for traffic signs, EN 12899, which has just been updated. Part 1 of this standard covers permanent signs, and has been published in UK as BS EN 12899-1:2007 with a National Annex appended to help narrow down the many different classes to those commonly used here.

The aspect that has proved most problematic is the choice of wind load. There is no doubt that some parts of the UK regularly experience much stronger winds than others, and to design all signs to withstand the worst situation would be very wasteful. The Highways Agency took a lead on this and commissioned research that has formed the basis of the deliberations of the BSI committee responsible for the UK Annex. The result is a table of ten different basic wind loads varying from 1.0 to 2.0 kN/m^2. These values are not directly comparable with the single pressure previously used because they are multiplied by a safety factor and a force coefficient to arrive at the design pressure. The choice of wind load depends upon the part of the UK, the overall height of the sign, the proximity to the coast and, in some cases, the height of the centroid of the sign.

However, designers should not necessarily select wind loads from the BS EN 12899-1 National Annex. These values remain somewhat conservative as they apply to large parts of the coun-

Above: the new IHIE guide. Below: an example structure from the guide.



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try and at an altitude of up to 250 m. The Annex suggests that highway authorities should obtain an assessment of the highest wind load likely to apply on any road in their area. That value will often be lower and thus result in more economical (and more crash friendly) sign supports.

To help explain these new standards and procedures, the Highways Agency encouraged the Institute of Highway Incorporated Engineers to produce a *Sign Structures Guide*, a new edition of which has just been published to cover the 2007 versions of BS EN 12899 and BS EN 12767. This 32-page booklet is available free of charge from IHIE on receipt of an A4 stamped addressed envelope (£1.50 postage for UK), or it can be downloaded from their website at: www.ihie.org.uk/gateway/traffic/resources-1 For copyright reasons the web version omits the table of wind loads from the National Annex, but the IHIE is able to email a complete version in response to individual enquiries. The Guide also explains and provides worked examples for the two most common types of sign foundation: a simple spread footing, and the generally more economical planted foundation described in the Highways Agency's *Design of Minor Structures* standard, BD 94/07.

Even with the help of the IHIE Guide, it would be far too time consuming to undertake calculations from first principles for every individual sign. In practice sign designers will use computer software. Most of the available systems are still based upon earlier standards, but SignLoad from Buchanan Computing has been kept up to date and conforms fully with the advice in the latest IHIE Guide and the BS EN 12899 National Annex. Its also provides for standard TS4 used in the Republic of Ireland. The version for designing steel supports for traffic signs is available to authorities and consultants free of charge on request. The Professional version adds foundation design, passively safe products, sign face stiffening and spreadsheet export. Buchanan Computing runs a regular training course on sign structure design and passive safety issues.

Increasing recognition of the importance of passive safety has been another recent influence on sign structure design. A Highways Agency standard that recommended crash friendly supports for all unprotected signs close to 50 mph or faster roads has now been replaced by the National Annex to BS EN 12767:2007. Passive safety is now a consideration for all roads, although the greatest justification for spending money on it will still be on faster roads. But on any road, a more slender support is a safer support, provided it is structurally adequate. Going up a size of support 'just in case' or 'because that's what we stock' is now clearly seen to make a sign less safe, because by far the greatest danger that a sign poses is that someone will crash their vehicle into it. Whilst the excellent Lattix, Jerol and 3M supports sold specifically for their passive safety properties will continue to be used for larger signs, smaller steel sections (89 mm diameter, 3.2 mm wall thickness or less) are also passively safe and can help to achieve the same standards on slower roads and for smaller signs. The free software mentioned above includes a check for compliance with the passive safety requirements of BS EN 12767.

The one outstanding issue is CE marking of traffic signs. The 2007 version of EN 12899 provides for this to be introduced throughout Europe by September 2009. However, UK, Ireland and Sweden currently have an opt-out from implementing CE marking for construction products. This means that, for the present, it is up to the procuring authority whether to require CE marking or not. Since there are still a number of anomalies in the process, strict compliance with which would make signs more expensive for no discernible benefit, specifiers are recommended to avoid all reference to CE marking. This issue is causing considerable disquiet and uncertainty amongst sign manufacturers, but unless the rules change, it need not be an issue for sign designers.

Whilst sign structure design has become significantly more complicated, there is help available in the form of the new IHIE Guide and compatible software. We should welcome the opportunity this more detailed design process brings to use smaller support sections wherever possible to make our roadsides safer, whilst at the same time saving public money.

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