

The provision of new sign structures can prove more economic than re-use of existing ones

Summary

A pedestrian was fatally injured when a sign support, that had recently had a replacement sign of significantly larger area attached, failed in high winds. ARTSM members are often asked to provide signs for installation on existing sign structures. Whilst this appears to be a cost saving, in reality the uncertainty about the existing structure, not least corrosion as well as basic properties such as wall thickness, mean this practice is at best a false economy, and dangerous at worst.

The Incident

In the Confidential Reporting on Structural Safety (CROSS) newsletter No 52 issued in October 2018 by Structural-Safety.org, report 793 was concerned about the failure of a street sign support that led to the death of a pedestrian who was walking past it when it failed during high winds in 2015.

<https://www.structural-safety.org/publications/view-report/?report=10919>

The sign was located adjacent to a public footpath and highway. The support was a single steel hollow square section post. A plastic box sign measuring 1,200mm wide by 1,800mm high (2.16 m²) was attached to another steel plate, which was then bolted to the rectangular support plate. The box sign had been in place for two months and, crucially, had replaced a sign that had measured 1,009mm wide by 725mm high (0.73m²). The age of the post was not known.

The incident occurred during a named storm force event. During the event, a gust wind speed was measured at 68 mph (30.4 m/s) some 17 miles away from the sign. The exact wind speed at the sign location is not known. On the morning of the incident, a pedestrian was walking past the sign when the support post broke apart, striking and fatally injuring the passer-by.



A metallurgical examination was carried out on the support post which had fractured approximately 2,600mm above ground level at one of the transverse weld sections. The transverse butt weld at the fracture location exhibited regions of incomplete weld penetration through the post wall and internal corrosion. A fatigue crack was present in the full-length U-channel adjacent to the butt weld and had initiated at the unfused edge of the transversely welded channel. The unfused areas would have raised the local stresses in the post, reducing resistance to fatigue crack initiation, propagation and an increased susceptibility to failure.

The larger sign increased the forces acting upon the post and were a contributory factor in the post failure, but in fact, calculations indicate that the support post would not have structurally failed with the larger sign had the support been free from defects and corrosion.

There a number of points to consider from this:

- Was the existing support, for which a larger sign was proposed, inspected to determine all the relevant properties, such as the post's wall thickness, foundation dimensions and soil type?
- Was the condition of the support to be re-used properly assessed?
- If the sign was to be supplied without supports, was the sign supplier provided with information on the location, number and spacing of existing supports and required sign mounting height to be able to design the sign plate properly. This information often highlights the need for a new structure at an early stage in the project.
- In this case it appears that a non-standard, fabricated steel post was involved. Where was the item procured from? Is there a proper audit trail accompanying the sign installation under the Construction Products Regulation for products to which one or more harmonised European Standards (and Eurocodes) apply?

It is impossible to overstress the importance of inspection and maintenance of all assets, including those that are ubiquitous and seemingly low risk. It is acknowledged that the incomplete weld and internal corrosion in this case are unlikely to be obvious as part of any inspection, and this in itself presents a problem for those who are charged with maintaining this kind of infrastructure. This tragic event highlights the need to properly assess the

condition and suitability of elements that may be affected, especially when alterations are made such as the addition of a new, larger sign.

The manufacturer of the new sign will need all the relevant information about the existing structure and its location such as post spacing and expected wind load. They need to ensure the sign plate has sufficient channel to ensure it meets relevant classes for stiffness in its intended location and mounting.

The sign installer will be asked to provide a guarantee of quality so when asked to install a sign on an existing structure, basic information such as wall thickness of the support is absolutely required. The case reported above also strongly highlights the need for a thorough investigation of the level of corrosion in all supports and any welded joints. For complete confidence, a thorough investigation of the foundation dimensions, concrete grade and ground conditions should ideally be obtained. The foundation might need to be fully exposed to allow for this.

It seems that much of the fault lay in this case, as shown by the metallurgical examination, in the manufacture of the post. However, it is not known what process was undertaken to assess the suitability of the structure for the larger, replacement box sign. A lack of knowledge about the structural and performance properties of the existing support, before the significantly larger sign was erected, would also be where much of the fault lay.

Conclusion

An important discussion point arising from this case is about what happens when an existing structure is proposed to be used for a new sign.

The sign contractor will be expected to provide some form of guarantee of quality, so will have to be very sure that all relevant properties have been accurately determined to give confidence that they can price correctly, and that guarantee provided.

The Association recommends that installers clearly set out the need for a complete assessment of the existing structure from a safety perspective. They should offer to supply a price for two options. One quoted option should be the cost for the installer to carry out a full site, structural and ground investigation; with a second option for designing and building a complete new structure (with a price for the removal of the old). It is likely that, since at least some structures fully investigated would prove unsuitable, the latter would in most cases be cheaper overall. This will discourage the re-use of old sign supports, which as this case demonstrated, may prove not to be sufficiently safe and a false economy.

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Executive Committee
August 2019

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