

Steel deck plate for footbridges

No. 2.10

Scope

The purpose of this note is to give guidance on the minimum steel deck plate thickness to be used for a footbridge and the span of the deck plate panels between stiffeners and other supporting members. The strength of the deck plate is not discussed. Other aspects of steel footbridge design are given in other References 1 and 2.

The Note records a consensus view of what thickness of deck plate is required, based on data collected from a number of bridges and discussions with their designers.

Form of construction

A steel deck plate for a footbridge is usually a welded integral part of the bridge deck and it can be quite thin (typically 6 mm or 8 mm). It is usually supported at the edges by the main structural members and transversely by crossbeams and stiffeners, sometimes in conjunction with longitudinal stiffening to limit the span of the plate.

The plate is usually surfaced with a 3 mm thickness of an extended tar epoxy, with a grit finish. The surfacing is laid directly onto blast cleaned bare steel and it acts as corrosion protection, waterproofing and wearing surface, all in one. There are widely used proprietary products for this surfacing which are hard wearing, economic and light.

However, the thinness of the surfacing leads to two consequences:

- The surfacing does not contribute significantly to the out-of-plane stiffness of the plate.
- The surfacing is too thin to provide a regulating course to correct any noticeable dishing of the deck plate due to weld distortion.

Design basis

A deck plate can be thick enough to carry the loads applied and yet it can feel too flexible under foot. The problems that can occur when the plate is too thin are:-

- A feeling of flimsiness.
- Ponding water
- Visible dishing.

Visible dishing and ponding in areas where the dishing is less noticeable but still present is due to distortions caused by weld shrinkage.

Of the above three aspects, ponding of water is most often quoted as provoking adverse comment from clients. The problem is aggravated when ponded water freezes.

The designers of proprietary footbridges generally use 6 mm deck plates, typically supported at 500 mm centres, although spans of up to 700 mm are not unusual. These arrangements are generally found to be satisfactory in relation to the three potential problems mentioned above.

A review of recent 'bespoke' footbridges found that most designers had chosen 8 mm deck plates, typically spanning 700 mm to 800 mm. These arrangements were also generally considered satisfactory.

Guidelines and design rules.

This topic has not been covered by design standards in the past. In EN 1993-2 it is only covered for footbridges which are also subject to loads from maintenance vehicles, although it is not clear what maintenance vehicle has been allowed for. The UK NA to EN 1993-2 also covers footbridges without maintenance vehicles. It gives three requirements.

- Plate thickness ≥ 6 mm.
- Span/plate thickness ≤ 92
- Span ≤ 900 mm.

The first two are a redrafting of the guidelines given in earlier editions of this note. The span limit is in line with the span limits for other loads given in EN 1993-2:2006.

To the above requirements can be added the following additional guidelines:

- With good drainage falls (e.g. 4% or more), slightly longer spans than the above will also be satisfactory
- Weld sizes should be kept to a minimum to limit distortion (leg length not more than 2/3 the plate thickness)

Guidance Note

No. 2.10

- Intermittent welding should not be considered (except inside box girders) because it is more prone to corrosion

References

For further guidance on the design of steel footbridges, see:

1. The design of steel footbridges, Corus Construction & Industrial, 2005.
2. Bridged in Steel 5, Gablecross cycleway and footbridge, Swindon, British Steel, 1987.
3. EN 1993-2:2006, Eurocode 3, Design of steel structures. Steel bridges.