Concrete Step Barrier Design Guidance
Use of CSB and SSB on Bridges

DRAWINGS CSB/2000 CSB/2001 CSB/2002 SSB/002 SSB/225
REPORTS BP/35

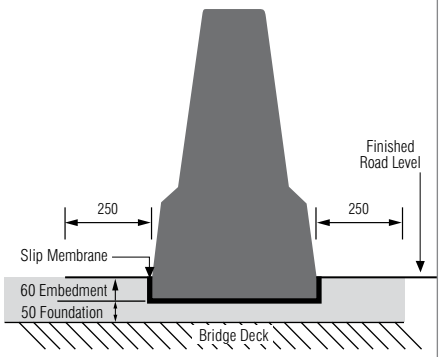
Design Guidance Note

Surface mounted CSB is the preferred Britpave product and should be the default method of installation for most situations (see Data Sheet DS/CSB/522). However, in certain circumstances, such as on bridge decks, Embedded CSB must be used.

A slip membrane (Figure 1) is generally required for CSB on bridges to prevent the build up of significant stresses between the barrier and bridge due to thermal effects. As the barrier is no longer restrained by contact adhesion, it is embedded to provide lateral restaint.

The barrier must be sited on a minimum 50 mm thick foundation base and embedded 60 mm into the road surface. A minimum 250 mm wide hardened strip is required on both sides of the barrier to provide the necessary barrier restraint.

Figure 1



Typical CSB foundation arrangement on bridges

The options for construction of the 50 mm foundation base, restraint and 60 mm embedment are shown in Figures 2a to 2c and can be:

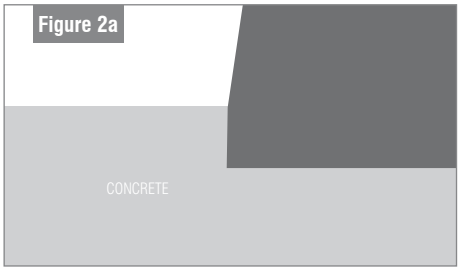
a) foundation concrete (shall be a minimum of PAV1 and conform to the durability requirements of freeze thaw, de-icing salts and ground conditions to BS 8500-2[1]);
b) road base/asphalt surfacing;
c) a combination of (a) and (b) in horizontal layers.

Under certain circumstances the non structural concrete fill on an existing bridge deck can be used to form the channel foundation. The concrete foundation and restraint can be constructed using slipform paving.

Embedment of the barrier can be increased above the specified 60 mm to suit construction or programme demands. However, the step height, profile of the traffic face, and overall height of the barrier above road level must match the standard profile.

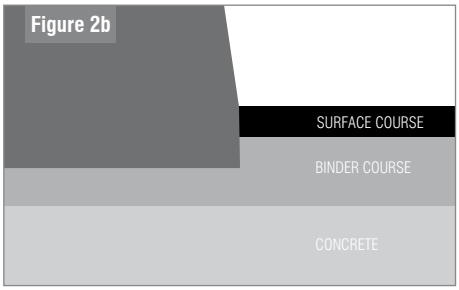
Based on the conditions associated with the original crash tests in France, the minimum length of barrier is assumed to be 60 m. However, analysis has shown a length of 20 m to be capable of withstanding H2 impact forces

Figure 2a



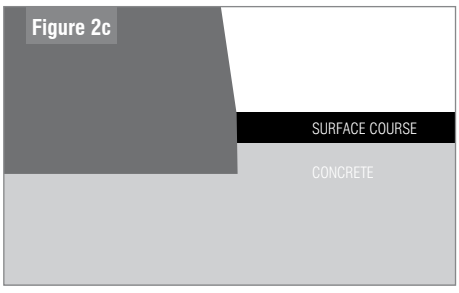
Concrete foundation and restraint

Figure 2b



Asphalt foundation and restraint

Figure 2c



Concrete/asphalt foundation and restraint

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Use of SSB

When the foundation requirement for CSB cannot be met an alternative is to anchor a steel step barrier into the bridge deck.

A suite of drawings are available for the SSB from Britpave. The anchorage into concrete is specified on drawings SSB/002 and SSB/225.

Required modifications to CSB at bridges

Required modifications to the barrier foundation depend on the type of bridge;

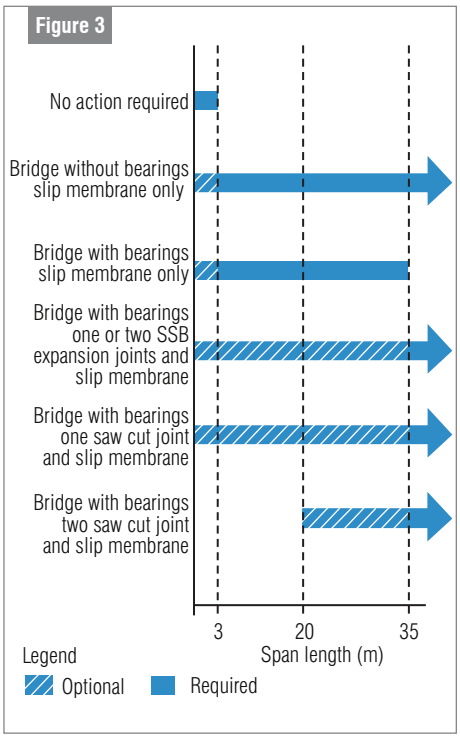
For buried structures, where the cover between the road and structure is at least 100 mm, no modifications are generally required.

For non-buried structures, requirements vary as follows:

- Span < 3 m, no action required
- Bridges without bearings (e.g. integral), slip membrane required.
- Bridges with bearings, of span up to 35 m; slip membrane required.
- Bridges with bearings, of span greater than 35 m; slip membrane required and one or more movement joints (dependent on bridge length).

The above is summarised on Figure 3.

Figure 3



Treatment at bridges

In cases where the skew of the bridge is greater than 15° an additional compressible filler may be required if the barrier foundation is too rigid to allow adequate lateral movement under thermal effects. See drawing CSB/2002.

Where saw cut joints are used, the barrier geometry may need to be altered to ensure it can provide the required torsional strength.

Movement Joints

Where CSB is required to have a movement joint, the following options are available:

- Steel step barrier joint unit (see drawing CSB/2001)
- Saw cut joint

Movement joints in the barrier should be positioned directly above those in the bridge. A plate should be positioned between the barrier foundation and the bridge joint to prevent the ingress of material. It is during extrusion that material is most likely to enter the joint.

Design Summary - CSB

For the design of new structures BD 37/01[2] should be applied. The fundamental principle in the design of new structures is that the impact destruction of a parapet does not cause damage to supporting members. BP/35 provides supplementary guidance for applicable design loads for local effects.

In the case of existing bridges, the recently published IAN97/07[3], Assessment & Upgrading of existing parapets, provides applicable advice not previously covered by standards.

BP/35 provides further detail on all aspects covered on this data sheet and should be referred to in the design of CSB or bridges.

[1] BS 8500-2 Concrete - Complementary British Standard to BS EN 206 - 1 - Part 2: Specification for constituent materials and concrete

[2] BD 37/01 Loads for Highway Bridges

[3] IAN 97/07 Assessment and Upgrading of Existing Parapets

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