

# Concrete Step Barrier Design Guidance

## CSB: Installation Best Practice

DRAWINGS CSB/002 CSB/1000

### Introduction

Until implementation of the Sector Accreditation Scheme, the minimum quality standard for the Design Organisation and the CSB installer is third party certification to ISO 9001<sup>1</sup> by a UKAS or equivalent national accreditation body.

The installer must be approved by Britpave and hold a Britpave licence. Design and construction outside the specification and design provided in the current Britpave drawings will result in a system which does not conform to BS EN 1317<sup>2</sup>. The Britpave installer licensing scheme will require, as a minimum:

- Initial entry fee to join scheme
- Annual membership fee
- Levy based on quantity of barrier installed

This data sheet highlights some of the design and construction issues which are key to achieving a high quality CSB installation.

### Guidance Notes

To achieve high quality construction of CSB the following are recommended:

- Construct a trial section;
- Ensure regularity, continuity and consistency of concrete supply;
- Maintain continuous even rate of paving;
- Use 3D control.

Buildability of CSB should be one of the key factors in determining the construction method; factors such as length of continuous CSB and availability of deliverable materials will be critical in determining the production rate using a slipform paver.



Figure 1 Typical configuration of paver and concrete supply chain

### Site Access and Working Space

Normally two lanes on one side of the barrier and 1 m width on the other side of the barrier is required for paving, construction traffic and after paving operations such as finishing and drainage.

To effectively manage traffic and minimise disruption of traffic flow hard shoulders may be used as shown in Figure 1.

### Slipform Paving Process

Typically a three or four tracked prime mover is used, to which the slipform paving mould is attached.

Most slipform pavers allow the mould to be mounted on either the left or right side or in some cases under the chassis. Ideally construction should progress in the same direction as concrete supply deliveries, a typical machine arrangement is shown in Figure 1.

Foundations and drainage works should be finished before CSB installation takes place (Figure 2). For details of the foundation see [Data Sheet DS/CSB/ 504](#).

The keys to successful and accurate slipform paving are:

- The careful control of the laying speed of the machine;
- Degree of consolidation,
- Rate of supply of ready mixed concrete,
- Control of specific consistence of the ready mixed concrete,
- Machine operator and paving team skill.

The machine operator controls the laying speed of the machine and the degree of consolidation of the concrete. The frequency of vibration of each poker is individually controlled and monitored through a computerised hydraulic



Figure 2 Barrier construction

system.

### Concrete Production and Supply

The principle requirements of concrete supply for CSB paving are the same as for any in-situ paving operation. Sufficient quantities of consistent material must be delivered at a constant rate. The effects of failing to meet these criteria may influence the finished product.

The concrete mix is critical with a good relationship and understanding between slipform contractor and concrete supplier essential. The basic mix for barrier concrete is class C28/35 with air entrainment. Concrete design mix and compliance testing are detailed in the specification. Aggregate selection is important as the natural interlock of crushed angular stone enhances barrier performance. However concrete flow should not be compromised.

### Reinforcement

Two strands of either continuous steel cable or lapped H20 reinforcement bar are incorporated in the Step Barrier. Reinforcement is deployed in advance along the line of the barrier; it is picked up and fed through the front of the mould. Reinforcement options, connections and required compliance certification are detailed in the specification.

### Transitions

Most transitions and terminals are formed after the adjacent barrier has been slipformed. Design guidance on transitions and terminals can be found on [Data Sheet DS/CSB/508](#). Specific formwork is required and in-situ casting is carried out using traditional methods (Figure 3).

For emergency and maintenance access (Figure 4) a crossing point is required refer to [Data Sheet DS/CSB/513](#). The end of the concrete barrier should be finished to the required tolerance to enable connection to the SSB unit.



Figure 3  
In-situ casting at bifurcation



Figure 4  
Emergency crossing point

### Finishing

CSB should require little finishing work. Minor blemishes should be made good with hand tools and a spray-on cure compound.

Crack control cuts should be sawn as soon as practicably possible into the hardened barrier at 3 m centres (Figure 5) to limit the formation of cracks. These random cuts do not require sealing. For further guidance see [Data Sheet DS/](#)



Figure 5  
Saw-cutting CSB

[CSB/518](#).

<sup>1</sup> ISO 9001 Certification

<sup>2</sup> BS EN 1317-2: Road Restraint Systems Performance classes, impact test acceptance criteria and test methods for safety barriers