

# Concrete Step Barrier Design Guidance

## CSB: Drainage

DRAWINGS CSB/002 CSB/505 CSB/506 CSB/507 CSB/1001 CSB/1005

### APPLICATIONS

- **Central reserve drainage adjacent to CSB**
- **Verge drainage**

### Design Guidance Notes

Where a linear concrete drainage system is provided, this can be constructed directly adjacent to CSB as part of the foundation. See [Data Sheet DS/CSB/504](#) for more information.

Linear drainage systems suitable for construction with CSB include:

- Combined carrier and channel (Figure 1)
- Surface water channel (Figure 2)
- Slot drain (Figure 3)

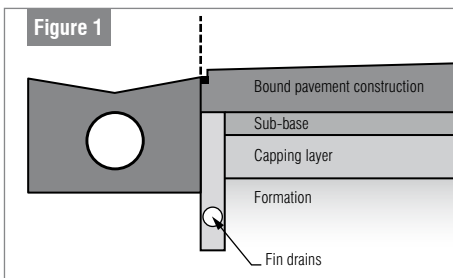


Figure 1 Combined carrier and channel

Installation of French drains directly adjacent to CSB is not permitted; the granular material does not provide sufficient restraint to the barrier. Where French drains are required in the central reserve, the trench must not be within the set-back zone and be at least 0.5 m from the face of the barrier. A typical layout is shown in Figure 4. However, full hardening of the central reserve with a linear concrete drainage system is preferred to reduce the maintenance



Figure 2 Surface water channels

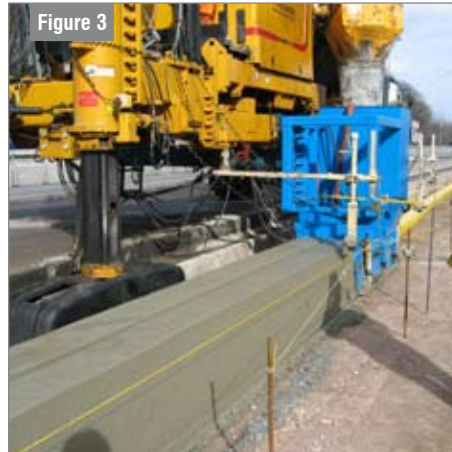


Figure 3 Slot drain

requirements and maximise the performance of the barrier. Under the BS EN 1317<sup>1</sup> test conditions, CSB is constructed with a level surface to the traffic face of the barrier. Designers must ensure that any drainage feature introduced, does not affect the approach conditions to the barrier, such that it would be detrimental to a vehicle on impact, or affect the performance of the barrier.

Installation of CSB in the central reserve blocks the flow of surface water in the same way as a kerb. Where the carriageway is superelevated, provision needs to be made for drainage from the high side; use of weep holes may be considered.



Figure 4 Typical installation with French drain outside set-back zone

<sup>1</sup> BS EN 1317-2: Road Restraint Systems Performance classes, impact test acceptance criteria and test methods for safety barriers

<sup>2</sup> Manual of Contract Documents for Highway Works Volume 1 Specification for Highway Works



Figure 5

CSB with weepholes, The Netherlands

Figure 5 shows a length of CSB with weep holes constructed in the Netherlands and Figure 6 shows weepholes installed to drain the area between dual barriers [Data Sheet \(DS/CSB/506\)](#).



Figure 6

CSB with weepholes in dual barrier

Design of weepholes should consider the maintenance aspects of the system. Care should be taken to ensure that accumulation of debris will not block the weepholes. Gullies are usually installed in combination with other drainage systems in areas where there is large surface water run-off.

The placement of gullies alongside barriers should be carefully considered. Gullies must not butt up against the barrier as would be the case with conventional kerbs. Care must be taken to ensure that the barrier foundations are not undermined and that there is sufficient space between the barrier and the gully to minimise interaction between them.

Figure 7 shows a typical layout for surface water channel and carrier adjacent to WCSB. Note the lighting cable duct is positioned on the opposite side of the barrier to the drain.

### Installation process:

The typical installation process for this system is described below.

- Prepare sub-formation
- Place capping material and compact
- Excavate trench for narrow filter drain
- Construct longitudinal surface water carrier drain and chambers where applicable
- Construct CSB foundation
- Slipform concrete surface water channel
- Construct CSB
- Form gratings at chambers

Precast concrete elements and iron work are best installed after CSB slipforming as they can hinder paving mould travel.

All works should be constructed in accordance with the Britpave Specification ([CSB/002](#)) and Specification for Highway Works (SHW)<sup>2</sup>.

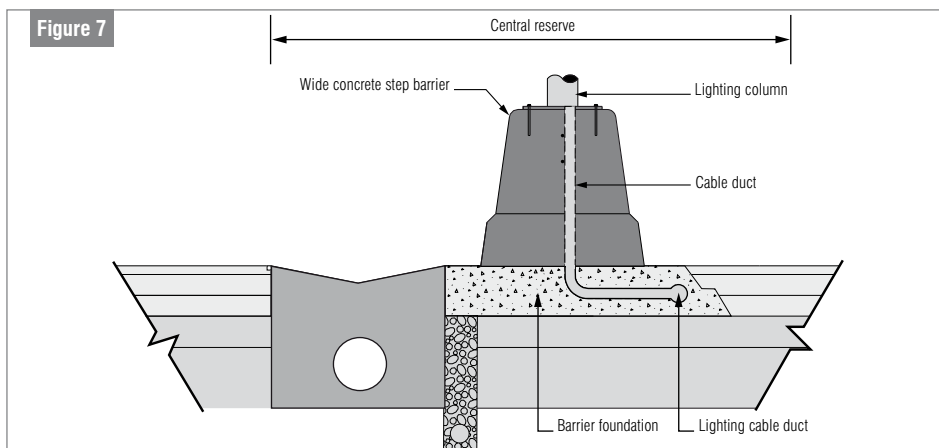


Figure 7

CSB with combined channel and carrier, typical cross section.