



## Introduction

Slot drains combine the surface collection system with the carrier pipe. They are usually considerably less wide than the equivalent open channel drain. When combined with a vertical concrete barrier in the central reserve, the overall width of the central reserve can be minimised and therefore the land-take for the highway may be reduced. The surface profile requires only slight dishing towards the slot and is therefore less hazardous for errant vehicles than for an open channel drain with 1 in 5 transverse surface slopes.

The slip-forming of slot drains eliminates heavy lifting that is required for the placing of precast units. Slip-forming also allows significant lengths of slot drain to be cast in a single working shift.

## Background

Slip-formed slot drain has been constructed in England on the M25 and A1(M) as well as in Scotland.

Whilst having been accepted by the Highways Agency for such schemes, there are no details for the slip-formed slot drain in the “Highway Construction Details” (HCD) <sup>(1)</sup>.

The purpose of this sheet is to provide designers and construction contractors with the necessary information to properly specify and construct the system and to ensure that a uniform approach is adopted nationwide.

## Specification

The “Specification for Highway Works” <sup>(2)</sup> clause 1103 refers to “Freestanding Insitu Concrete Kerbs, Channels and Edge Details”. It is considered that the slot drain is an “Edge Detail” and should therefore comply with the requirements of this clause. This clause refers to BS 5931, which is also applicable.

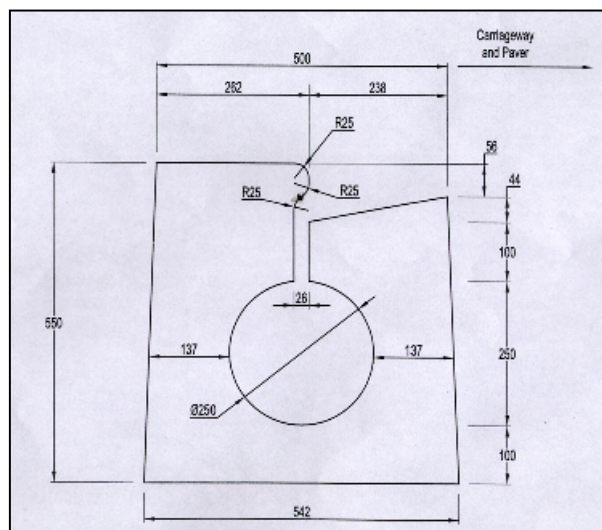
The clause requires the use of C35, air entrained concrete and requires that joints are provided at 5m centres for flexible and continuously reinforced concrete carriageways and to coincide with joints in the highway construction for jointed concrete carriageways.

Clause 517 of the “Specification for Highway Works” <sup>(2)</sup> provides the requirements for “Linear Drainage Channel Systems” and is applicable to slip-formed slot drains.

Sub-clause 517.5 defines the dimensions of the slot. This requires that the maximum width of the slot is 18mm unless “bridging” of the slot is provided at 170mm spacings. For slip-formed slot drains, “bridges” cannot be practically introduced and therefore the slot width is limited to 18mm. This width needs to be verified for adequacy regarding hydraulic capacity.

Where the slot drain has been used adjacent to vertical concrete barriers, in the central reserve, the Highways Agency have accepted a wider slot width of 36mm, without bridges.

In order to overcome the limitations of an 18mm slot width, a profiled slot drain has been developed to incorporate a kerb adjacent to the slot. The profile of the drain illustrated below prevents bicycle wheels and shoe heels from becoming entrapped.





Alternatively, where kerbs are not acceptable, then a double slot solution may be appropriate, where two 18mm wide slots are provided.



The pipe diameter will normally be 150mm or 300mm, but will need to be designed according to the run-off area, the outfall locations and the pipe gradient and characteristics. Sub-clause 517.20 requires that sections of the slot drain, not less than 500mm in length, are load tested. This imposes practical limitations on the size of the section which will normally be limited to a maximum diameter of 450mm.

Slip formed slot drains of up to 450mm diameter for use on highways will not normally be reinforced. Unreinforced concrete sections of the specified strength have been built and have fulfilled the testing criteria of the specification.

## Practical Guidance



- Slot drains should ideally be placed on a cement bound material. However, a properly compacted granular Type 1 material, with a closed surface and treated with a bituminous spray to produce uniform friction under the drain, may be an acceptable alternative.
- The pipe void may be formed using either a disposable or reusable inflatable tube.

## References

- (1) Highways Agency. Manual of contract documents for highway works, Volume 3, Highway construction details.
- (2) Highways Agency. Manual of contract documents for highway works, Volume 1, Specification for Highway Works.

## Acknowledgements

Guidance Sheet S3 is one of a series of guidance notes prepared for use by Britpave members.

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