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**VOLUME 4 GEOTECHNICS AND  
DRAINAGE**  
**SECTION 2 DRAINAGE**

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**PART 5**

**HA 104/09**

**CHAMBER TOPS AND GULLY TOPS  
FOR ROAD DRAINAGE AND SERVICES:  
INSTALLATION AND MAINTENANCE**

**SUMMARY**

This Advice Note sets out procedures and defines materials which will provide the best possible performance of road chamber top and gully top installations in trunk roads and motorways. Its recommendations may be applied to other roads and traffic conditions, as appropriate.

This document supersedes advice given in Preferred Method 7, and complements all relevant guidance and standards provided in MCHW and DMRB.

**INSTRUCTIONS FOR USE**

This is a new Advice Note to be incorporated into the Manual.

1. Remove existing Contents sheet for Volume 4 and insert new Contents sheet for Volume 4 dated November 2009.
2. Insert HA 104/09 into Volume 4, Section 2.
3. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.

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LLYWODRAETH CYNULLIAD CYMRU****THE DEPARTMENT FOR REGIONAL DEVELOPMENT  
NORTHERN IRELAND**

# **Chamber Tops and Gully Tops for Road Drainage and Services: Installation and Maintenance**

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This Advice Note sets out procedures and defines materials which will provide the best possible performance of road chamber top and gully top installations in trunk roads and motorways. Its recommendations may be applied to other roads and traffic conditions, as appropriate.

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**Contents**

Chapter

1. Introduction and Scope
2. Definitions
3. Design Considerations for Chamber Tops and Gully Tops
4. Design Requirements: Chamber Tops
5. Design Requirements: Gully Tops
6. Bedding Materials
7. Packing Materials
8. New Works Installations
9. Reinstatement Works
10. Specification Requirements
11. References
12. Enquiries

Annex A      Specification Requirements

# 1. INTRODUCTION AND SCOPE

1.1 Guidance on chamber tops, gully tops and their bedding requirements is set out in the Manual of Contract Documents for Highway Works (MCHW) 1, 2 and 3 and other documents of the Design Manual for Roads and Bridges (DMRB) Volumes 4 and 7. Location of chambers in carriageways, hard strips, hard shoulders and central reservation crossovers of trunk roads and motorways should not normally be permitted. However, this may occur in some circumstances, and in non-trunk road situations may be inevitable. Guidance on recommended procedures for installation prior to this Advice Note was set out in ‘Preferred Method 7 – Adjustment of Street Ironwork, Cornwall County Council, 1985, developed by the Department of Transport Standing Committee on Highway Maintenance’.

1.2 The premature failure of chamber top and gully top installations has been shown to be a major contributory factor to the annual maintenance budget of UK roads. These failures are not usually of the frame and cover itself but of the supporting system and the pavement surface, generally flexible, immediately adjacent to the installation. Rocking of the frame and cover in failed installations can occur under traffic, causing noise pollution and potential hazard to vehicles.

1.3 Recent research has highlighted and confirmed that premature failure in the bedding material is one of the main factors contributing to poor performance of chamber top and gully top installations. It has been shown that conventional materials, procedures and material specifications have become superseded by more recent developments, and results of the research have led to an improved specification for the bedding material and improved frame and cover designs.

1.4 This Advice Note sets out procedures and advises on materials which will provide the best possible performance of road chamber top and gully top installations in trunk roads and motorways. Its recommendations may be applied to other roads and traffic conditions, as appropriate.

1.5 This Document supersedes advice given in Preferred Method 7, and complements all relevant guidance and standards provided in MCHW and DMRB.

## 2. DEFINITIONS

### 2.1 ‘Work Area’

The space necessary to carry out the work safely.

### 2.2 ‘Mechanical Lifting Device’

Equipment capable of lifting and lowering the frame vertically and moving it away from the chamber opening.

### 2.3 ‘Temporary Frame Support Device’

Adjustable mechanical device used to support the frame at a pre-determined level until the bedding has reached the required strength.

### 2.4 ‘Adjusting Course’

A course of non-standard thickness necessary to bring the frame supporting structure to the correct bedding surface level.

### 2.5 ‘Bedding Surface’

Upper level of the frame supporting structure upon which the frame bedding material is placed.

### 2.6 ‘Bedding Depth’

Distance between the underside of the frame and the bedding surface.

### 2.7 ‘Bedding Material’

Mortar bound by cement or other synthetic materials.

### 2.8 ‘Failed Installation’

An installation of a cover and frame which comprises an access point to an underlying chamber upon which the frame is bedded, and which requires attention because of a structural failure or loosening of either the cover, the frame, or the supporting structure of the underlying chamber. Disturbance of the pavement immediately adjacent to the installation is often associated with such failures. An installation may be judged to have failed not only because of an apparent structural failure, but also when rocking has developed under trafficking such that unacceptable consequential noise levels have developed.

### 2.9 ‘Proprietary Packing Material’

Purpose made packing material specifically manufactured to be used, and to be compatible with, the material to be used in bedding the frame of a chamber top or gully top upon the frame supporting structure.

### 2.10 ‘Frame Supporting Structure’

Permanent brick and/or concrete structure which supports the frame and any additional loading.

### 2.11 ‘Depth of Reconstruction’

Depth from the top of the new bedding surface down to the top of the first undisturbed course of the existing frame supporting structure.

### 2.12 ‘Finished Surface Level’

The required levels and crossfall to which the top of the frame and cover is to be set.

### 2.13 ‘Self Setting Fill Material’

Material designed to achieve the required strength without mechanical compaction.

### 2.14 ‘Frame Bearing Area’

The surface of the underside of the frame which rests upon the supporting structure.

### 2.15 ‘Nominal Bearing Pressure’

The bearing pressure calculated by dividing the test load (BS EN 124) by the Frame Bearing Area (see 2.14).

### 3. DESIGN CONSIDERATIONS FOR CHAMBER TOPS AND GULLY TOPS

#### General Requirements

3.1 Chamber tops and gully tops shall be specified in accordance with BS EN 124:1994 ‘Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas – Design Requirements, Type Testing, Marking, Quality Control’. Access covers with clear opening of greater than 1m shall comply with BS 9124:2008 ‘Specification for steel and aluminium access covers systems with over 1m clear opening’.

3.2 The minimum Classification for all chamber tops and gully tops installed in areas of trunk roads and motorways that are likely to be subject to traffic, either directly or indirectly, shall be D400 of BS EN 124.

3.3 The installation of higher category covers and frames such as E600 should be considered in applications where the chamber is located in the wheel path of a motorway, trunk road or other road carrying over 1,500 commercial vehicles per day in each direction. Such proposals should be discussed with the Overseeing Organisation. It should be noted that EN 124 is a minimum performance specification and if there is any doubt, a higher category cover and frame should be selected.

3.4 Where chamber tops are likely to be subject to trafficking, including vehicles, cyclists, pedestrians or equestrians, covers proven to provide an adequate level of skid resistance shall be selected. Measurement of in-service skid resistance potential shall be by means of a Polished Skid Resistance Value (PSRV) in accordance with BS 9124.

Alternatively, direct measurements made on similar covers in similar conditions of use can be used as an indication of expected levels of in-service performance.

An unpolished test value (USRV) will not necessarily indicate the in-service skid or slip resistance of a cover and as such may give rise to safety concerns.

For sites carrying predominantly pedestrian traffic, cyclists or equestrians a value of not less than PSRV 45 for average or low risk sites or PSRV 60 for potentially high risk sites should be specified. The Unpolished Skid Resistance Value (USRV) is not an acceptable alternative.

Site risk is defined by the following:

- (i) Potentially High Risk includes:
  - (a) traffic signals, pedestrian crossings and railway level crossings including 50 m approaches;
  - (b) roundabouts and their exits, including 50 m approaches;
  - (c) bends < 100 m radius where the speed limit > 40 mph (65 km/h), including 50 m approaches;
  - (d) downhill gradients > 10% for more than 50 m (single or dual carriageway);
  - (e) uphill gradients > 10% for more than 50 m (single carriageway only).
- (ii) Average or Low Risk is applied to all other situations on single and dual carriageways:
  - (a) including generally straight sections of carriageway;
  - (b) approaches to and across major/minor road junctions;
  - (c) bends of 100 m radius or greater, at any speed limit;
  - (d) downhill/uphill sections of 10% gradient or less.

#### Certification Requirements

3.5 All chamber tops and gully tops shall be certified by one of the accepted United Kingdom Accreditation Service (UKAS) accredited certification bodies as listed in Appendix B of Volume 1 of the MCHW, or alternative product conformity certification schemes subsequently accepted by the Overseeing Organisation.

3.6 Alternative product conformity certification schemes should meet the equivalence requirements contained in Series 100 of the Specification for Highway Works (SHW) (MCHW1). The Overseeing Organisation requires compliance with the following:

- (a) Products should have been designed, developed and manufactured within an BS EN ISO 9001 system that has been assessed by a relevant recognised accredited certification body. In the UK the certification body must be accredited to EN 45011 by UKAS. Certificates issued against BS EN ISO 9001 must include design and development within the scope where appropriate.
- (b) Products should have been type tested by a UKAS accredited or UKAS accepted third party testing organisation that has accreditation to BS EN ISO/IEC 17025 and BS EN 124 within its scope. Assessment must be made by an organisation with accreditation to BS EN ISO/IEC 17021.
- (c) Product conformity certificates to BS EN 124 should have been issued to the manufacturer of the chamber tops or gully tops by a UKAS accredited certification body. The certification body must have both EN 45011 and EN 45012 within its scope.
- (d) The certification process should have been overseen or audited by a single relevant accredited certification body.

## 4. DESIGN REQUIREMENTS: CHAMBER TOPS

4.1 A chamber cover for man-entry purposes should conform with the following minimum clear opening requirements:

- (a) the minimum clear opening for a frame with a rectangular opening should be 600 mm with a diagonal measurement of not less than 700 mm;
- (b) the minimum clear opening for a frame with a circular opening should be a diametric measurement of not less than 700 mm.

4.2 A larger opening may be specified if it is considered appropriate because of considerations of chamber depth or necessary access which may involve the use of personnel wearing breathing apparatus. Guidance on minimum cover dimensions where personnel access is not required is included in BS EN 752-3.

4.3 The frame and cover should be silent and stable when trafficked. Notwithstanding the advice given in paragraph 1.1 the frame should normally be at least 150 mm deep for installations in trunk roads and motorways. The depth of the insertion of the cover within the frame should be not less than 50 mm, or not less than 80 mm if the design relies upon the depth of insertion for security.

4.4 Where couplings, either fixed or loose, are present as a design feature in the casting, then loose couplings should be of steel or spheroidal graphite cast iron (ductile iron). If bolts are used as couplings in chamber covers, they should comply with BS 4190, be of no less than M16 grade and be hexagon headed complete with hexagon nuts. Other types of loose couplings should have a minimum cross-sectional area of 140 mm<sup>2</sup>. Any pins or circlips used as part of the securing device should be of equal cross section or be sufficiently protected to give equivalent performance. Any loose coupling should not be able to vibrate free during its service life. Fixed couplings must be made of the parent metal.

4.5 Vents are not required in chamber tops unless specified.

4.6 Seatings of covers within frames are to be manufactured in such a way as to ensure that stability and quietness are achieved when trafficked without periodic maintenance/replacement of any cushioning

inserts. Sealing of covers within frames is not required unless specified in Appendix 5/1 of the Specification for Highway Works (MCHW 1).

4.7 The frame bearing area should be designed in such a way that:

- (a) the nominal bearing pressure in relation to the test load (BS EN 124) should not exceed 2.1N/mm<sup>2</sup>;
- (b) frames should have an overall minimum bedding width of 50 mm of metal. It is considered desirable to limit the maximum overall bedding width to 120 mm of metal;
- (c) for openings with corners, external corners of the frame should be solid (unless it can be demonstrated to the Overseeing Organisation that the inclusion of holes does not reduce the structural integrity of the system) and may be square, curved or chamfered but at no point should the width be less than the minimum bedding width.

4.8 The bedding flange should have a minimum thickness of 5 mm. Where vertical frame stiffening webs/gussets are provided, they should be located adjacent to seatings. The tops of such triangular webs/gussets should be as permitted in BS 7903.

4.9 Frames weighing more than 15 kg should be provided with suitable lifting holes located to permit a balanced lift and should be marked accordingly.

4.10 Frames should not contain holes within the seating areas of the bedding flanges beneath the cover seatings. Any holes within the bedding area of the frame should be minimal and should not reduce the specified bearing area of the frame.

4.11 Preference should be given to designs which are ergonomic in accordance with the Management of Health and Safety at Work Act to facilitate safe removal of the cover (e.g. keyholes, slots, etc.).

4.12 Notwithstanding the above requirements, the use of alternative support systems to different specifications may be permitted subject to appropriate certification and approval from the Overseeing Organisation.

## 5. DESIGN REQUIREMENTS: GULLY TOPS

5.1 Gully tops shall be to BS EN 124 and in accordance with clauses 3.2 and 3.3 of this document.

5.2 Gully gratings and frames shall be made from suitable material as specified in BS EN 124. Hinged gratings may be either kerb hinged or side hinged appropriate to the direction of traffic flow.

5.3 Nominal widths of gratings and minimum areas of waterway shall be in accordance with BS EN 124 and BS 7903. UK practice is that the minimum area of waterway should be 900 cm<sup>2</sup>. Of the total waterway area, there should be a minimum waterway area of 45 cm<sup>2</sup> between the kerb face of the frame and a parallel line 50 mm distant, and there should be a minimum waterway area of 65 cm<sup>2</sup> between the kerb face of the frame and a parallel line 90 mm distant. The frame should be at least 100 mm deep.

5.4 Kerb-type gully covers and frames, if required, should provide a kerbside water intake and an access cover which, if hinged, should open away from the carriageway i.e towards the kerb. Weir depth, i.e. the distance from the top of the cover to the top of the fixed weir, if any, should be 115 mm (Type 1) or 165 mm (Type 2) as specified. Kerb-type gully covers and frames should be provided with a Type HB (half batter) profile to BS 7263: Part 1, unless otherwise specified. The critical dimensions of kerb-type gully covers and frames taken from BS 7903 are shown in the following table:

### KERB-TYPE GULLY COVERS AND FRAMES

Reference	Type 1	Type 2
Weir Depth (mm)	115	165
Minimum net weir length (mm)	425	425
Minimum rectangular clearway (cm <sup>2</sup> )	250	250
Minimum rectangular clear opening (mm)	400 x 250	400 x 250

**Note:** Weir depth is distance from the top of the cover to the top of fixed weir.

### Weir Length and Waterway

5.5 Interruptions to weir length and cleaning area, produced by debris trap features should not reduce the minima specified within the table.

5.6 Kerb type gully covers and frames should also comply with the following requirements:

- (a) a metal retaining bar, of minimum cross-section 35 mm x 25 mm for use during construction should be provided. It should be supplied loose so as to allow adjustment to suit the required road level;
- (b) the access cover should be provided with either open keyway(s) or a locking mechanism. An opened unit should provide a minimum rectangular clear opening of 400 mm x 250 mm. Where a cover can be readily raised without the use of the key or other tool, a locking mechanism should be provided. Where a hinge is provided this should be at the rear edge of the cover, as viewed from the road. The top shall be self-draining and have a raised pattern conforming with BS EN 124;
- (c) a grid with horizontal bar(s) of a minimum diameter of 12 mm, galvanised in accordance with BS 729 or a minimum of two integrally cast vertical fins should be provided to act as a debris trap across the open mouth of the unit.

## 6. BEDDING MATERIALS

6.1 Chamber tops and gully tops should be bedded upon bedding material which has the following properties:

- (a) the material should be non-shrink. Use of other materials may be considered in consultation with the Overseeing Organisation;
- (b) the material should have a minimum workable life of 15 minutes;
- (c) the compressive strength of the material should exceed  $30\text{N/mm}^2$  in 3 hours;
- (d) the tensile strength of the material should exceed  $5\text{N/mm}^2$  in 3 hours;
- (e) notwithstanding the above requirements, the use of proprietary bedding components to different specifications may be permitted subject to appropriate certification and approval from the Overseeing Organisation.

6.2 This specification is for a rapid-hardening material which could, for example, be achieved by a suitable resin based material. The use of alternative bedding compounds to different specifications is not necessarily precluded where they form part of an alternative proprietary support system which has the approval of the Overseeing Department.

6.3 Bedding materials should be laid strictly in accordance with manufacturers' recommendations. Materials manufactured for use in different temperature conditions must be selected as appropriate to suit site conditions at the time of mixing and application. Thickness of materials must be within the range stipulated by the manufacturer.

6.4 Packing materials described in Chapter 7 of this Advice Note may be incorporated within the bedding material provided that this is in accordance with recommendations of the mortar manufacturer and the requirements of MCHW 1 and 2.

## 7. PACKING MATERIALS

7.1 Packing materials have historically been used, particularly where it has been necessary to raise the finished levels of chamber tops and gully tops, whilst retaining the existing frame supporting structure, e.g. because of pavement overlays or strengthening works.

7.2 MCHW contains directives which are pertinent to both new and replaced installations, and which limit thicknesses of the bedding material such that by adjustment of the supporting structure packing materials are not necessary. This remains the intention, but if the use of packing materials is permitted in MCHW 1, Appendix 5/1, such materials should be proprietary and purpose-made of suitable materials. It should be ensured that they are compatible with the bedding material which it is intended to use. The use of materials such as quarry tiles and slates as packing materials is not permitted.

## 8. NEW WORKS INSTALLATIONS

8.1 The frame supporting structure will be as specified by MCHW 1, 2 and 3, and the bedding surface will be consequentially set such that the use of packing materials within the bedding material is not necessary. The bedding depth will be within the limits permitted in MCHW and characteristics of the bedding material will be as specified in Chapter 6 of this document. The bedding material should be appropriate to suit site conditions.

8.2 It is necessary that operatives should be trained by an appropriate training body (to be agreed with the Overseeing Organisation) in the techniques necessary to achieve the standard required by a performance specification.

### Mixing and Placing the Bedding Layer

8.3 Mechanical mixing of the materials is preferred, although manual mixing is permitted. The maximum quantity to be mixed by each method should not exceed 50 kg and 25 kg respectively. In cases where cementitious materials are used the manufacturer's recommended water content must be used.

8.4 The bedding material must be placed on the chamber immediately after mixing. It should be placed at a depth approximately 5 mm greater than the required bedding thickness and spread across the full width of the chamber wall. Deep trowel marks in the bedding should be filled and the surface of the bedding floated to an approximately even finish.

### Thermo-Setting Polymer Resin Materials

8.5 There are a number of issues which must be borne in mind when working with thermo-setting polymer resin materials:

- (a) Care is required in their safe handling. Harmful vapours may be produced during mixing and the use of gloves, goggles and barrier creams is recommended by manufacturers. Some products are available in different grades to suit different temperature conditions in order to provide the necessary time of initial set, and such products should be selected accordingly.

- (b) They remain at the same level of workability prior to setting, but the set is usually very rapid and early strengths develop quickly. Bedding of the frame must take place promptly after placement of the bedding material.
- (c) They form a strong bond with contiguous materials, but the bond may be severely impaired if the surfaces are not kept clean and dry. Site conditions may dictate the need to take extra precautionary measures in keeping the surfaces clean and dry. Tools must be cleaned before the material sets. More importantly, frames which have been bedded on polyester resin which has set may not be separable from the resin. Removal of frames in such situations will also damage the frame supporting structure.
- (d) Once set, the material becomes inert, and is not a toxic waste.
- (e) Unmixed material must be mixed and disposed of with care according to Control of Substances Hazardous to Health Regulations (COSHH) Regulations, and strictly in accordance with the manufacturers' recommendations.

### Placing of Frames and Covers

8.6 The frame should be lowered onto the bedding as soon as possible, preferably using a mechanical lifting device rather than by solely manual means, in accordance with Health and Safety requirements.

8.7 The frame must be placed on the bedding so that all webs of the frame are fully supported by the frame supporting structure. The webs must not overhang the internal faces of the frame supporting structure. There must be no voids in the bedding beneath the frame. Special care must be taken in the vicinity of the cover seatings.

8.8 The frame must be carefully tamped down to the required level and slope. This can be achieved to the Specification requirements by placing a straight edge over the frame webs and surrounding carriageway or other level control points as appropriate.

8.9 Any holes within the frame must be infilled with bedding material and the flanges of the frame enveloped by a minimum thickness of 10 mm of the same material. A greater thickness may be applied provided that sufficient depth is left available for placement of any surfacing layers. Such application can be an effective use of any surplus material from the main bedding mix.

8.10 Exposed surfaces of the bedding around the outside of the frame must be floated to fill any voids and remove any loose fragments, and the exposed surface of the bedding material inside the chamber must be pointed to a smooth finish.

8.11 The cover should be placed in the frame by a mechanical lifting device, or lifting keys with long shanks, after the bedding material has sufficiently set.

#### **Placement of Cover Surround Materials**

8.12 No surround material must be placed in contact with the frame until the bedding has achieved sufficient tensile and compressive strength. If the surround is of pavement materials, provision and placement must be in accordance with MCHW 1 and 2 and DMRB Volume 7.

## 9. REINSTATEMENT WORKS

### General

9.1 Reinstatement of failed chamber top and gully grating installations, or necessary raising because of pavement reconstruction or overlays, includes the requirements set out in Chapter 8, but is subject to the following additional considerations:

- (a) It is likely that all work, from removal of the unit(s) to completion of reinstatement, will have to be carried out against strict time constraints in order that a partial or complete road closure can be lifted and the road reopened to traffic.
- (b) The frame supporting structure may have deteriorated, may not meet requirements, or may be damaged during removal of the unit and/or any surrounding pavement material.
- (c) It may not be a realistic proposition, because of time constraints, to limit the thickness of bedding material to the range permitted within MCHW 1, 2 and 3.
- (d) It may not be possible, because of constraints, to reinstate pavement surround materials in the layered construction preferred in DMRB Volume 7.
- (e) Re-use of frames and covers should require the approval of the Overseeing Organisation.
- (f) Any of the above considerations may warrant a departure from the standard and will, therefore, need the approval of the Overseeing Organisation.

9.2 The following supplementary recommendations are comprehensive in that they apply to installations located in pavement constructions such as carriageways, hard shoulders, hard strips, and possibly central reservations. This will always be the case with gully gratings, although chamber tops may not be located within paved areas of the highway. The recommended procedures should be amended to suit specific site requirements.

### Removal of Existing Installation

9.3 Ensure that any traffic management is carried out in accordance with Chapter 8 of the Traffic Signs Manual. In Northern Ireland on roads other than Motorways and Dual Carriageways with hardshoulders, Traffic Management is carried out in accordance with the Code of Practice for Safety at Street Works and Road Works. Times likely to cause least disruption to traffic are night times, Sundays or between 10am and 3pm during weekdays. Prior to examining and determining remedial work on a failed installation, it should be established whether or not a reinstatement to its original full standard is a necessity. It may, for example, be possible to accept a reduced standard of reinstatement such as provision of a non-personnel standard of access, or even in extreme cases of a slabbing-over of the chamber if sufficient consequential benefits such as reduced traffic disruption or future reduced maintenance are likely to be a consequence.

9.4 Ease the cover using a mechanical lifting device if necessary, but do not remove it from the frame at this stage. Cover hinge bolts should not be removed.

9.5 Mark the position of cuts to be made through pavement layers in order to enable removal of the frame. These cuts should be located at a minimum distance of 200 mm away from the estimated outside edges of the frame. If any cracks or signs of failure in the pavement materials extend beyond this distance, the cut positions should be adjusted such that they are at least 50 mm beyond the extent of any such cracking.

9.6 Cut through the full depth of any bound layers of pavement construction around the frame with a circular saw or similar apparatus. Remove material between the position of the cut and the frame to reveal the frame and the full width of the chamber wall along all edges.

9.7 Extract the cover(s) using a mechanical lifting device or lifting keys with long shanks. The handles of such keys should be at approximately waist height in order to reduce the risk of injury. The Manual Handling Operations Regulations 1992 must be observed.

9.8 Lift the frame to reveal the bedding material beneath. This should involve at least two people and be in accordance with Health and Safety Executive (HSE) 'Manual Handling, Guidance on Regulations'.

### **Re-use of Existing or Provision of New Cover and Frame**

9.9 Examine the cover and frame to assess whether it is of adequate specification for re-use, and if so, whether it is in a sufficiently fit condition. If either cover or frame is unfit for re-use, the complete unit must be replaced. A frame which has been previously bedded on a polyester resin material will be clearly unfit. A sharp hammer tap will usually be sufficient to remove any cementitious bedding material which may still adhere to the underside of a frame. All old bedding material, loose paint, rust and other debris should be cleaned off the whole of the frame using a wire brush and scraper. The use of new covers in old frames should be avoided.

### **Frame Supporting Structure**

9.10 The frame supporting structure should be inspected for structural integrity. Dependent upon the availability of specially trained and equipped staff and e.g. the age of the structure, it may be beneficial to inspect both the cover slab and also the underlying chamber at the same time.

9.11 All old bedding material must be carefully removed. For safety reasons, this work should be carried out from road surface level unless operatives can stand on the base of the chamber with heads well above ground level. Care must be taken to avoid dropping loose materials into the shaft as this can result in pipe blockages or damage to apparatus, pipes or cables.

9.12 Operatives entering manholes should ensure that they act in accordance with the Management of Health and Safety at Work Regulations 1999 and the Confined Spaces Regulations 1997. Particular care must be taken to avoid damaging any apparatus, pipes or cables when standing, entering or leaving.

9.13 If the previous bedding material was a polyester resin type it will be necessary to remove the underlying top course of the frame supporting structure and rebuild the structure as necessary to suit the depth of reconstruction. The supporting structure must be of adequate size and strength to support the frame, cover and expected loading. The surface of the supporting structure must have adequate strength to resist the imposed loading. If the structure is brickwork, all joints must be full and pointed. All inadequate or unsound portions of the structure must be removed and newly exposed surfaces cleaned and prepared for reconstruction.

9.14 Reconstruction must be undertaken in accordance with the requirements of MCHW 1, 2 and 3. The bedding surface must permit a bedding thickness of between 10 mm and 75 mm. If rebuilding involves more than one course of brickwork or precast concrete cover frame seating ring, an adjusting course may still be necessary consequential to a revised finished surface level.

9.15 Frame supporting structure reconstruction must be in Class B Engineering bricks or precast cover frame seating rings, laid with a proprietary cementitious mortar which will develop a compressive strength of not less than 20N/mm<sup>2</sup> prior to trafficking, and has a workable life of between 1 and 2 hours. Brickwork corbels must be constructed in bricks without holes or frogs.

### **Re-bedding of Covers/Gully Gratings**

9.16 The depth of reconstruction must be measured, bearing in mind that this may vary at different parts of the frame where the installation is within the camber of a road pavement. The bedding material must be in accordance with the Specification of Chapter 7, and compatible with the required thickness of application. Mixing and placing must be as described in Chapter 8.

9.17 Bedding layers greater than 50 mm thick should be laid in two stages. The first layer should be no thicker than 40 mm and must be covered with a proprietary packing material whilst the mortar is workable. Uniform contact between materials is necessary in a composite bedding layer, and the proprietary packing material should be tamped down to ensure even contact with the bedding. Placing of frame and cover should be as set out in Chapter 8.

### **Reinstatement of Surrounding Flexible Carriageway**

9.18 The cover should be placed in the frame, preferably using a mechanical lifting device, and reinstatement should then be undertaken as set out in Chapter 3 of HD 31 'Maintenance of Bituminous Roads' (DMRB 7.4), but subject to the following additional requirements:

- (a) the cover and frame should not be exposed to any load or disturbance until the bedding material has attained sufficient strength;
- (b) care must be taken to avoid contact between any compaction device and the frame or cover in order to avoid damaging the frame or cover or the bedding layer;

- (c) if the foot or plate of mechanical compaction equipment will not fit between the frame and the sides of the excavation at all levels, a self-setting fill material should be used, which is compatible with the bedding material;
- (d) self-setting fill material should be placed no higher than 40mm beneath the finished surface level, in order to allow placement and thorough compaction of a permanent wearing course. Some materials may require the use of a bonding agent;
- (e) after installation the frame and cover should be flush with the road surface;
- (f) the joint between the reinstated and existing materials should be sealed with bituminous material.

#### **Reinstatement of Surrounding Rigid Carriageway**

9.19 The cover should be placed in the frame, and reinstatement should then be undertaken as far as possible in accordance with Chapter 4 of HD 32/94 ‘Maintenance of Concrete Roads’, subject to the following considerations:

- (a) where possible a waterproof membrane should be reinstated;
- (b) the installation should not be exposed to any load or disturbance until the bedding material has attained sufficient strength;
- (c) concrete should be placed and compacted to the required level, with any reinforcement at the appropriate position. There should be no adverse reaction between the concrete and the bedding material, and the surface of the concrete should be textured as required;
- (d) if a preformed joint filler has been used, the groove should be sealed in accordance with the sealant manufacturer’s instructions;
- (e) after installation the frame and cover should be flush with the road surface.

## **10. SPECIFICATION REQUIREMENTS**

10.1 Both the SHW (MCHW 1) and HCD (MCHW 3) require Contract specific information to be provided by the Designer. As a guide, Appendix A lists the information that the Designer is required to provide and where it should be shown in the Contract Documents.

## 11. REFERENCES AND BIBLIOGRAPHY

### 1. Manual of Contract Documents for Highway Works (MCHW)

Specification for Highway Works (SHW) (MCHW 1).

Notes for Guidance on the Specification for Highway Works (NGSHW) (MCHW 2).

Highway Construction Details (HCD) MCHW 3).

Method of Measurement for Highway Works (MMHW) (MCHW 4).

### 2. Design Manual for Roads and Bridges (DMRB)

HA 83/99 Safety Aspects of Road Edge Drainage Features (DMRB 4.2).

HD 27/94 Pavement Construction Methods (DMRB 7.2).

HD31/94 Maintenance of Bituminous Roads (DMRB 7.4).

HD32/94 Maintenance of Concrete Roads (DMRB 7.4).

### 3. Trunk Road Maintenance Manual: Volume 2 Routine and Winter Maintenance Code.

4. Brown, C. J. and Brown, S. F., 'The performance of road ironwork installations', Proc. Inst. of Civil Eng., The Municipal Engineer, Vol. 121, 1997, pp 175-185.

5. Brown, S. F. and Brown, C. J., 'Laboratory Facility for Testing Road Ironwork Installations', Transportation Research Record No. 1624, 1998, Transportation Research Board, Washington, D.C., pp 237-245.

6. Brown, S. F. and Brown, C. J., 'The structural characteristics of manhole installations in pavements', Proc. Inst. of Civil Engineers Transport, 1999.

7. Brown, S. F., 'Improving the performance of manhole installations in highways', Highways and Transportation, Vol. 48, No. 4, pp 22-24, Institution of Highways and Transportation, 2001.

8. British Standard Institution 'BS EN 124: 1994 Gully Tops and Manhole Tops for Vehicular and Pedestrian Areas - Design Requirements, Type Testing, Marking, Quality Control'.

9. British Standards Institution 'BS EN ISO 9001: 1994 Quality systems - Model for quality assurance in design, development, production, installation and servicing'.

10. British Standards Institution 'BS 7903: 1997 Guide to Selection and use of gully tops and manhole covers for installation within the highway'.

11. British Standards Institution 'BS 729: 1971 (1994) Specification for hot dip galvanized coatings on iron and steel articles'.

12. British Standards Institution 'BS 4190 : 1967 Specification for ISO metric black hexagon bolts, screws and nuts'.

13. British Standards Institution 'BS EN ISO 9001: 2000 Quality management systems - requirements'.

14. British Standards Institution 'BS 7263 Part 1 : 1994 Precast concrete flags, kerbs, channels, edgings and quadrants'.

15. British Standard Institution 'BS EN 45001 General criteria for the operation of testing laboratories'.

16. British Standard Institution 'BS 9124:2008 : Specification for steel and aluminium access covers systems with over 1m clear opening'.

17. Various 'Preferred Method 7 - Adjustment of Street Ironwork'. Cornwall County Council, 1985.

18. 'New Roads and Streetworks Act 1991 - Specification for the Reinstatement of Openings in Highways', HMSO, 1992.

19. Draft Revised Edition of 'Specification for the Reinstatement of Openings in Highways', August 1998.

20. The Traffic Signs Manual (HMSO, 1991).
21. The Manual Handling Operations Regulations, 1992.
22. The Management of Health and Safety at Work Regulations 1999.
23. The Confined Spaces Regulations 1997.
24. The Control of Substances Hazardous to Health Regulations 1999.
25. Personal Protective Equipment at Work Regulations, 1992.
26. British Standards Institution ‘BS EN 9002: 1994 Quality systems - Model for quality assurance in production, installation and servicing’.
27. British Standards Institution ‘BS EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories’.
28. British Standards Institution ‘BS EN 752-3: 1997 Drain and sewer systems outside buildings’.
29. British Standards Institution ‘BS EN 45011: 1998 General criteria for certification bodies operating product certification’.
30. British Standards Institution ‘BS EN 45012: 1998 General requirements for bodies operating assessment and certification/registration of management systems’.

## **12. ENQUIRIES**

All technical enquiries or comments on this Advice Note should be sent in writing as appropriate to:

Technical Services Director  
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## ANNEX A SPECIFICATION REQUIREMENTS

**Information required to be shown in the Contract by virtue of the 'F' Series Drawings (HCD) (MCHW 3) and the SHW (MCHW 1).**

- (a) Details of chamber covers, gratings and frames [507.9] and details for special duty covers for use in carriageways [507.13]; requirements for minimum waterway area of gratings for catchpits [507.14].
- (b) The classes and sizes of gully gratings [508.4].
- (c) Requirements for gully gratings if different from the requirements of sub-Clause 508.5.
- (d) Requirements for setting existing covers and gratings to level if different from the requirements of sub-Clauses 507.18 and 508.8.