

NRA ADDENDUM TO

HD 33/06

SURFACE AND SUB-SURFACE DRAINAGE SYSTEMS FOR HIGHWAYS

Standard HD 33/06 – Surface and Sub-surface Drainage Systems For Highways – supersedes HD33/96. This Addendum supersedes the NRA Addendum dated December 2000 and its associated Erratum No 1 dated June 2001.

Standard HD 33/06 – Surface and Sub-surface Drainage Systems For Highways – is applicable in Ireland with the following amendments:

INTRODUCTION

The principle changes from the addendum to HD 33/96 are as follows:-

Reference is included to the following Advice Notes which have been published since the original version of HD 33/96: TA 80, HA 83, HA102, HA103, HA 104, HA 105, HA 106, HA 113, HA 118, HA 119, and HA 216.

In particular HA 104 sets out procedures and defines materials which will provide the best possible performance of road chamber top and gully top installations in national roads and motorways.

In Chapter Three a section on Combined Channel & Pipe Systems has been added. Table 3.1 has changed as a result and a new Table 3.2 has been added listing guidance documents. In addition Figures 3.1 and 3.2 now impose mandatory requirements and the use of alternative drainage systems will require a departure from standards.

In Chapter 4 Table 4.1 reference to HA 48 has been replaced by reference to HD 41 published in 2003.

In Chapter 5 reference is now made to HA 106 published in 2004.

Chapter 6 now requires that the rainfall intensities used in the design of drainage systems be increased by 20% in order to allow for the future effects of climate change.

Chapter 6 also includes new sections regarding Combined Channel & Pipe Systems and Discharges to Outfalls and Soakaways .

A new Chapter 7 Control of Pollution and Flooding has been added. This lists systems with the potential for control of pollution or flooding.

All Road Construction Details previously included in NRA Addendum to HD 33/96 have now been included in Volume 4 of the NRA Manual of Contract Documents for Road Works.

GENERAL

1. In several locations:

For: “trunk road”
Read: “national road”;

For: “highway”
Read: “road”;

For: “Overseeing Organisation”
Read: “National Roads Authority”;

For: “TD 9 (DMRB 6.1.1)”
Read: “NRA TD 9 (NRA DMRB 6.1.1)”.

2. In several locations, unless otherwise indicated:

For: “MCHW”
Read: “The NRA Manual of Contract Documents for Road Works”.

For: “MCHW1”
Read: “NRA Specification for Road Works”.

For: “MCHW2”
Read: “NRA Notes for Guidance on the Specification for Road Works”.

For: “MCHW3”
Read: “NRA Road Construction Details”.

SPECIFIC

1. Page 1/1, Paragraph 1.1, line 8
Delete “and appropriate signing for pollution control devices”
2. Page 1/1, Paragraph 1.3:
Delete Paragraph 1.3 and replace with:

“1.3. This Standard should be used forthwith for all schemes for the construction and/or improvement of national roads. The Standard should be applied to the design of schemes already being prepared unless, in the opinion of the National Roads Authority, application would result in significant additional expense or delay progress. In such cases, Design Organisations should confirm the application of this Standard to particular schemes with the National Roads Authority.”

3. Page 1/2, Paragraph 1.7 line 20:
After “HA 216 Road Drainage and the Water Environment (DMRB 11.3.10)”, add “and the NRA Environmental Assessment and Construction Guidelines”

4. Page 1/2, Add new Paragraphs 1.8 to 1.10:

“1.8 Drainage designs shall ensure:

- i. that all drainage systems be accessible for inspection and maintenance,
- ii. that all impermeable and semi impermeable surfaces be adequately drained,
- iii. that drainage systems do not have an adverse impact on existing ecology, surface-water hydrology or groundwater hydrogeology,
- iv. that in the interest of pollution control and containment the road drainage shall, wherever possible, be kept separate from other catchment drainage and
- v. that the road drainage causes no disruption in water supply to landowners/occupiers who obtain their water from wells, boreholes and the like.”

“1.9 Sections of this document which form part of the standards the National Roads Authority expects in design are highlighted by being contained in boxes. These are the sections with which the Design Organisation must comply or must have agreed a suitable Departure from Standards with the National Roads Authority. The remainder of the document contains advice and enlargement which is commended to Design Organisations for their consideration.

1.10 In exceptional situations, the National Roads Authority may be prepared to agree to a Departure from Standards where the standard is not realistically achievable. Design Organisations faced by such situations and wishing to consider pursuing this course shall discuss any such option at an early stage in design with the National Roads Authority. Proposals to adopt Departures from Standard must be submitted by the Design Organisation to the National Roads Authority and formal approval received BEFORE incorporation into a design layout.”

5. Pg 2/1, paragraph 2.3 after “further guidance.” Insert:-

“Where the longitudinal gradient of the carriageway is less than 0.5% a drainage system which provides a continuous take-off of water from the carriageway shall be provided e.g. filter drains, drainage channels, etc.”

6. Page 2/2, Paragraph 2.8 line 3

Delete “This is....6.2.”

Insert

“The maximum permissible flow width (in a 1 in 5 year storm) shall be as follows:-

roads with hardshoulder widths of 2.5 metres or greater:	1.5 metres
roads with no hardshoulders or with hardshoulder widths of less than 2.5 metres:	0.75 metres
urban situations where pedestrians or cyclists are present:	0.5 metres

Gully spacing shall be as follows:-

maximum spacing:	50 metres
spacing at sags (over a minimum length of 15 metres either side of a low point):	5 metres with double gully at sag point

“Notwithstanding the other provisions of this paragraph the flow width shall not exceed the width of the hardshoulder or hardstrip (where provided) at the relevant locations.”

“The average rainfall intensity shall be determined from the paper entitled Flood Estimation following the Flood Studies Report by Cunnane, C and Lynn, M.A (1975) (available from the Institute of Engineers of Ireland), but a minimum value of 50 millimetres per hour shall be used.”

7. Page 2/2, Insert new title after paragraph 2.10

“Position of Drainage in Central Reserve and Near Side Hard Shoulders/Hard Strip”

8. Page 2/2, Insert new paragraph 2.11

“In the central reserve drainage channels and gullies shall be offset a minimum of 500mm from the traffic lane. Drainage channels shall not encroach into the near side hard shoulder/hard strip.”

9. Page 3/1, Paragraph 3.3, line 5:

Delete “Recommended.....and 3.2” and replace with;

“Permissible design options are defined in Figures 3.1 & 3.2.”

line 10;

Delete “Advice on.....HA 107 (DMRB 4.2), and” and replace with “Guidance on the crossing of watercourses is given in the NRA “Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes”

10. Page 3/2, Paragraph 3.9, line 5:

Delete third sentence “They are . . . HA 39 (DMRB 4.2).” and replace with: “Their usage is described in HA 39 (DMRB 4.2).”

11. Page 3/2, Paragraph 3.14
Delete last sentence.
12. Page 3/3, Paragraph 3.18, line 2:
For: "MCHW 3 B13"
Read: "NRA Road Construction Detail RCD/500/29".
After "...free drainage." Add:
"Over the edge drainage is not compatible where noise mitigation barriers/bunds are required."
13. Page 3/3, Paragraph 3.19
Delete entire paragraph
14. Page 3/3 Add new paragraph 3.23:

"Combined Filter Drains & Filter Drains

3.23 Measures shall be taken in the execution and completion of the Works to avoid stone scatter. See paragraph 4.14 and RCD/500/1 for typical details."

15. Page 3/4, Table 3.1:
Delete column referring to "Grassed Surface Water Channels"
16. Pages 3/5 and 3/6, Figures 3.1 and 3.2:
Delete Figures 3.1 and 3.2 and replace them with revised Figures 3.1 and 3.2.
17. Page 3/7
Delete Table 3.2 and replace with revised Table 3.2
18. Page 4/1, Paragraph 4.1, line 4:
Delete "(see HD 25, DMRB 7.2)" and replace with "(NRA DMRB Volume 7 Section 2)"
19. Page 4/1, Paragraph 4.2, line 6:
Delete third sentence "This can ... MCHW3" and replace with:
"This can be achieved on embankments by extension of the capping layer to the full width of embankment as illustrated in the NRA Road Construction Details, or by provision of fin or narrow filter drains as illustrated in the NRA Road Construction Details."
20. Page 4/1, Paragraph 4.3, line 14:
Delete "HD 25 (DMRB 7.2) and"
21. Page 4/1, Paragraph 4.4
Delete entire paragraph
22. Page 4/1, Paragraph 4.6, line 1:
Delete "The minimum depththe lower of those two depths." and replace with:

"The minimum depth of installation of fin and narrow filter drains shall be DN + 50mm to invert beneath sub-formation level, or 600mm to invert beneath formation level: these levels being defined in the 600 series of the NRA Specification for Road Works. Where there is no capping layer, the drains should be laid to the lower of those two depths."

23. Page 4/1, Paragraph 4.6, line 13:

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- Delete “shown in the MCHW3”
24. Page 4/2, Paragraph 4.9, line 4:
For: “the B-Series Drawings of MCHW3”
Read: “the NRA Road Construction Details”
25. Page 4/2, Paragraph 4.11, line 3:
For: “para 1.7”
Read: “para 1.6”.
26. Page 4/3, Paragraph 4.13, line 10:
For: “MCHW3 F18.”
Read: “the NRA Road Construction Details.”
27. Page 4/3, Paragraph 4.14, line 7:
For: “3.3m”
Read: “2.5m or more”.
28. Page 4/3, Paragraph 4.14 :
Delete: “i) spraying of the top surface of exposed filter material with bitumen.”
29. Page 4/3, Paragraph 4.14,
After “ ii) The use of...filter material” add “in conjunction with the use of angular material in the top 150mm of the trench”
30. Page 4/3, Paragraph 4.14 :
Delete: “iii) incorporation of lightweight....MCHW 3 B15:”
31. Page 4/3, Paragraph 4.14 :
Delete: “iv) possible usage of bitumen bonded filter material in the top 200mm of the trench:”
32. Page 4/5, Table 4.1:
Delete Table 4.1.
33. Pg 5/1, paragraph 5.4, last sentence:
Delete “and HA 107.....culvert design.”
34. Page 6/1, Paragraph 6.1
Line 2, replace “five” with “six”

Add section vi) “Specify appropriate chambers and covers.”
35. Page 6/1, Paragraph 6.2, line 6:
After “covers” insert new paragraph:
“Transverse sealed carrier drains, crossing beneath the carriageway, shall be designed to accommodate a fifty-year storm in-bore without surcharge.”
36. Pg 6/1, paragraph 6.3, 3rd paragraph:
Delete “to a width of 1.5m.....case of hard strip.” Replace with “in accordance with 2.8.”

5th paragraph, line 4:
Delete “The rainfall intensities.....storm by 20%” and replace with “The rainfall intensities used in the design of drainage systems must be increased by 20% in order to allow for the future effects of climate change.”

5th paragraph, after line 7 add

“The M5-2D, M5-60 and r values can be obtained directly from Met Eireann or estimated from the maps included in the Flood Studies Report, CEH (1975).”

37. Page 6/1, Paragraph 6.4, line 9
Delete line 9 to line 16 and replace with:

“This is especially important for longitudinal sags in cuttings, where an overflow pipe shall be installed between the low point on the road and the outfall. This should be designed for a design storm return period of 50 years and should bypass the downstream treatment/attenuation device and will come into operation once the normal service pipe becomes surcharged.”

38. Page 6/2, Paragraph 6.10, line 5:
Delete “cross sections are illustrated in the MCHW 3 B Series Drawings”

39. Page 6/2, Paragraph 6.11, line 3:
Delete second sentence “This is ... trunk roads.”

40. Page 6/3, Paragraph 6.17:
Delete paragraph

41. Page 6/4, Paragraph 6.22, after line 12 add

“Minimum pipe diameter shall be 225 millimetres except for gully connections which may be a minimum of 150 millimetres in diameter. Manhole spacings shall be a maximum of 90m.
Pipe (including combined kerb and drainage blocks, manufactured linear drainage channels and in situ concrete linear drainage channels) flow velocities shall not be less than 0.75 metres per second at any point or greater than 2.5 metres per second at discharge points. Minimum self-cleansing velocities for combined systems shall comply with HA 113.”

42. Page 6/4 Paragraph 6.23 after line 9 add:

“Combinations of pipes and bedding for surface water drains and filter drains used in the Design shall be determined using HA 40 of the UK DMRB, (see RCD/500/2 for bedding types) except that all pipes under carriageways shall be encased in concrete.”

43. Page 6/5, Paragraph 6.25 line 3:
Delete “a British Board ofCertificate” and replace with “an Irish Agreement Board Roads and Bridges Certificate or equivalent”. Delete “Roads and bridges (BBA R&B).”

Line 6:

Delete “BBA R&B” and replace with “Agrément”

44. Page 6/5, Paragraph 6.26, line 3:
Delete: “It also requires.....(MCHW5.9). and replace with:
“MCDRW requires that unless otherwise required in Appendix 29/1, all carrier, foul and filter drains shall be surveyed by Closed Circuit Television (CCTV) in accordance with the relevant requirements of Series 2900.”

45. Page 6/5, Paragraph 6.27, line 8;

Delete “Advice on.....HA 107 (DMRB 4.2)”

Add at end of the paragraph “Where the drainage system outfalls to a watercourse the final outfall (after any attenuation or treatment measures) should be set above the 1 in 5 year flood level of the watercourse. This is in order to allow the outfall discharge under freeflow conditions in the 1 in 5 year flood event.”

46. Pg 6/5, Add new paragraph 6.30

“All chambers and covers shall comply with the NRA Specification for Road Works.”

47. Pg 6/5, Add new paragraph 6.31

“Safety Precautions require that chamber covers have a minimum opening of 600mm diameter where personnel may be required to enter completely. In carriageways, hard shoulders and verges, chamber covers, frames and gratings should be Class D400. All covers located in the Road Pavement are to be lockable.”

48. Page 7/1, Paragraph 7.1, line 1 delete “Whilst the primary....in the catchment.” And replace with:

Whilst the primary aims of drainage systems are to provide rapid removal of surface water from the road surface and to provide effective sub-grade drainage, the systems shall include measures to minimise the risk of accidental spillages causing pollution and shall provide for significant removal of suspended solids and other contaminants.

Page 7/1, Paragraph 7.1, line 7:

Delete “these risks”. Replace with “pollution and flooding”

Page 7/1, Paragraph 7.1, line8:

Add after “HA 216 (DMRB 11.3.10)”, “and NRA Environmental Assessment Guidelines”.

Page 7/1, Paragraph 7.1

Add at end of the paragraph, “It is important that the issue of treating road runoff to avoid pollution of aquifers and watercourses is addressed at preliminary design stage to ensure that sufficient land is made available for swales & ponds. In areas where groundwater vulnerability is defined as high or extreme using the Groundwater Protection Schemes Guidelines (DELG/EPA/GSI, 1999) consideration should be given to the provision of a sealed drainage system. Alternative systems such as SUDS may also be considered provided adequate protection is afforded to the underlying aquifer. For further information reference should be made to Groundwater Protection Schemes Guidelines, GSI mapping and NRA Environmental Guidelines”

49. Page 7/2, Paragraph 7/16 Add at end of para:

“The Design for any petrol / oil interceptor shall conform with the recommendations of CIRIA Report 142 “Control of Pollution from Highway Drainage Discharges” and shall be as a minimum Class 2 Bypass Interceptors to IS EN 858-1.”

50. Page 7/3, paragraph 7.19

Delete line 17

51. Page 7/4

Delete paragraphs 7.26 to 7.30

52. Page 7/4

Insert new Section titled “General Attenuation Design”

53. Page 7/4, Insert new paragraph 7.31
“Consultation with relevant authorities (e.g. local authorities, the OPW, Regional Fisheries Boards, etc) must be carried out prior to design of attenuation so that their requirements can be incorporated into the design.

Where possible Attenuation may be combined with pollution control and water quality improvement measures. A minimum spill containment volume of 50m³ shall be provided at all outfall locations from National Roads. Treatment Volumes for water quality improvement should be calculated with reference to CIRIA Report 142 – Control of Pollution from Highway Drainage Discharges.

Where attenuation is provided by means of an attenuation pond a minimum freeboard of 500mm shall be provided between the maximum water level in the pond and the top level of the pond or pond protection bund. Where attenuation ponds are located in areas liable to flooding, e.g. the floodplains of watercourses, an assessment of the impact of the pond on the hydraulic regime of the watercourse shall be undertaken and the pond banded to a level 500mm above the adjacent 1 in 100 year flood level.

The NRA Notes for Guidance contain guidance on the preparation of a schedule for attenuation ponds and may be of use to designers considering the issues which need to be taken into account as part of attenuation design”

54. Pages 8/1 & 8/2
Delete Chapter 8

55. Page 9/1:
Insert after Highway Construction Details (MCHW 3):
“**National Road Authority Documents**

NRA Manual of Contract Documents for Road Works:

Volume 1: Specification for Road Works.

Volume 2: Notes for Guidance on the Specification for Road Works.

Volume 4: Road Construction Details.

NRA Environmental Assessment Guidelines

Miscellaneous

Civil Engineering Specification for the Water Industry:

Sewers for Adoption.”

56. Page 10/1, Chapter 10:
Delete text and replace with:

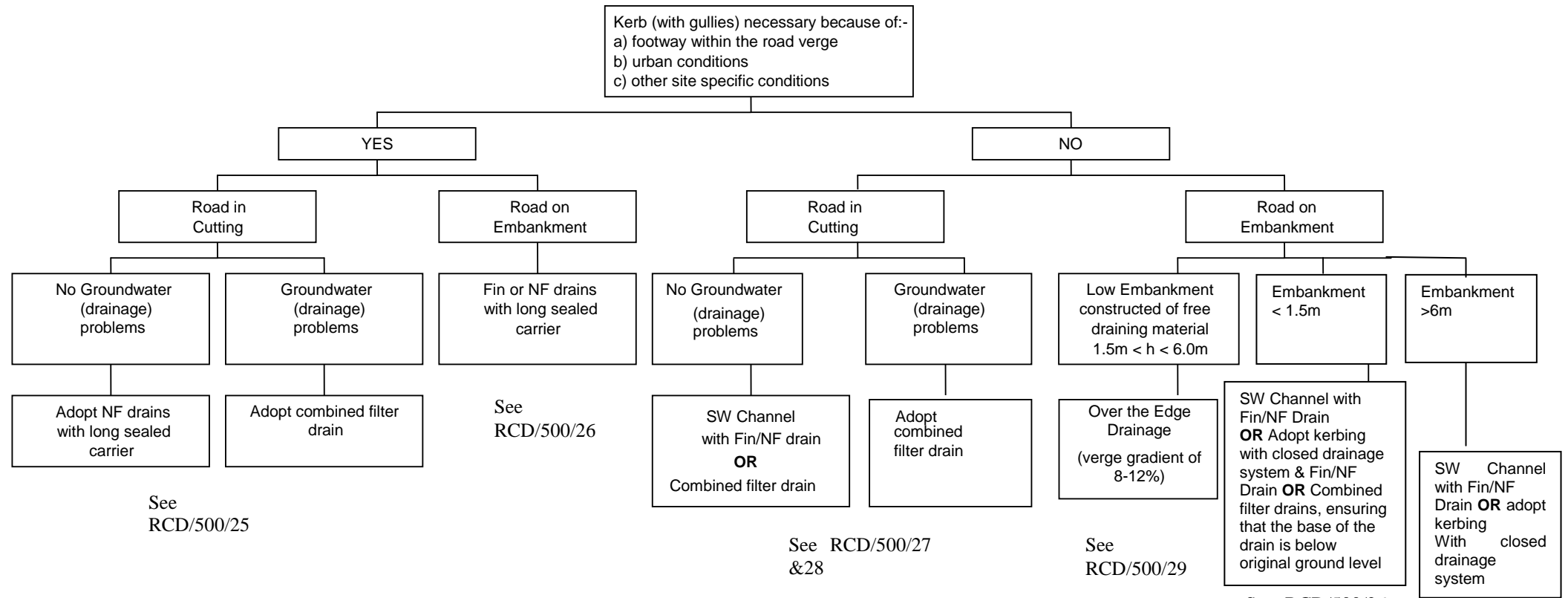
“10.1 All technical enquiries or comments on this Standard should be sent in writing to:

Head of Engineering Operations
National Roads Authority
St Martin’s House
Waterloo Road
Dublin 4”

.....



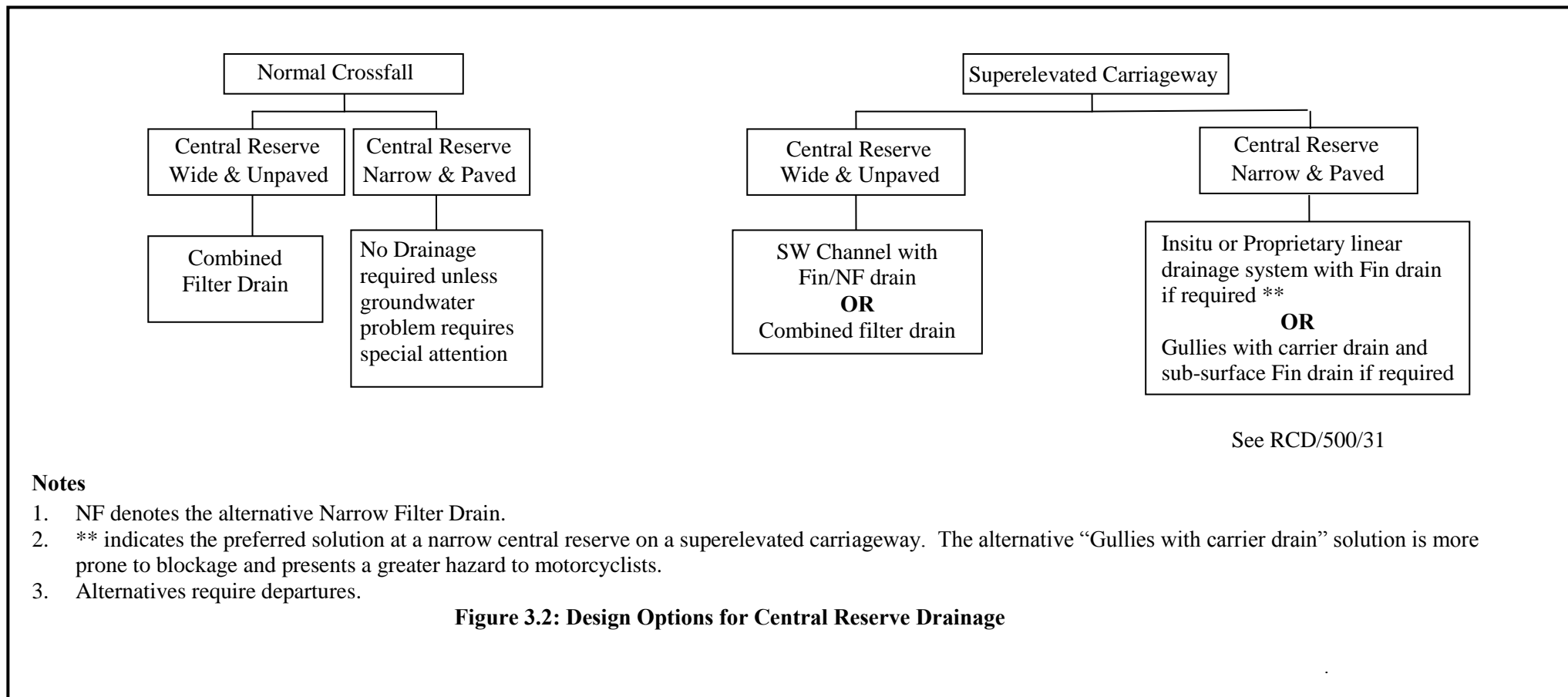
E O’CONNOR
Head of Engineering Operations



Notes

1. Consideration should be given to use of SuDS (Sustainable Drainage Systems). These should be designed in accordance with CIRIA C697, Where SuDS are used in areas of embankment they should be located at the toe of the embankment.
2. Fin drain usage indicates usage with road gullies, and should only be permitted if gully connections have no adverse effect on the fin drain.
3. NF denotes the alternative Narrow Filter Drain.
4. Alternative drainage arrangements to those indicated above require an approved departure from standard/aspect not covered by standard. In areas of vulnerable aquifers careful consideration should be given to the type of drainage system to be used. Refer to Paragraph 7/1.

Figure 3.1: Design Options for Verge-side Edge Drainage



MCDRW	NRA DMRB					
Volume 1: Specification	VOL2: HIGHWAY STRUCTURES:DESIGN (SUBSTRUCTURES AND SPECIAL STRUCTURES) MATERIALS	VOL 4: GEOTECHNICS & DRAINAGE	VOL 6: ROAD GEOMETRY			VOL 7: PAVEMENT DESIGN & MAINTENANCE
Volume 2: Notes for Guidance	SECTION 1 : SUBSTRUCTURES		SECTION 1: LINKS	SECTION 2: JUNCTIONS	SECTION3: HIGHWAY FEATURES	SECTION 2: PAVEMENT DESIGN AND CONSTRUCTION
Volume 4 RCD Series 500	NRA Addendum to BD 30: Backfilled Retaining Walls and Bridge Abutments	TA 80: Surface Drainage of Wide Carriageways HA 39: Edge of Pavement Details HA 37: Hydraulic Design of Road-Edge Surface Water Channels HA 40: Determination of Pipe & Bedding Combinations for Drainage Works HA 78: Design of Outfalls for Surface Water Channels HA 83: Safety Aspects of Road-Edge Drainage Features HA 102: Spacing of Road Gullies HA 103: Vegetated Drainage Systems for Highway Runoff HA 105: Sumpless Gullies HA 106: Drainage of Runoff from Natural Catchments HA 113: Combined Channel & Pipe System for Surface Water Drainage HA 118: Design of Soakaways	PART 1 NRA TD9 Road Link Design	NRA Addendum to TD16 Geometric Design of Roundabouts	TA 57: Roadside Features	NRA Addendum to HD 26 Pavement Design HD 27 Pavement Construction Methods

Notes 1. Also see NRA Environmental Guidelines & UK DMRB Vol 11 HA 216.

Table 3.2 Surface & Subsurface Drainage – Guidance Documents