Revision of the NRA’s Drainage Standards

NRA National Roads Conference 2014
Contents of Presentation

- Background.
- Current NRA’s Drainage Standards.
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Revision of the NRA’s Drainage Standards

Background

April 2008 – September 2011: NRA Research Fellowship Programme

- NRA funded Post-Doctoral Research Fellowship to look at the impacts of national road drainage systems on surface and ground water.
- Result: NRA’s drainage standards need to be expanded to promote the use of SuDS and to maximise the environmental benefits achieved from drainage systems.

‘Analysis and development of road drainage systems for different geological environments in Ireland.’ (Dr. William O’Keeffe/Paul Johnston/Dr. Vincent O’Malley)

‘Environmental impact of road drainage on ground water quality’ (Dr. William O’Keeffe/Paul Johnston/Dr. Vincent O’Malley)
Revision of the NRA’s Drainage Standards

Current NRA Drainage Standards

- Volume 4 (Geotechnics and Drainage) and of NRA Design Manual for Roads and Bridges (NRA DMRB):
  - NRA Addendum to UK HD 33/06 *Sub-Surface Drainage Systems for Highways*. 

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Standard HD 33/06 – Surface and Sub-surface Drainage Systems For Highways – superseded HD33/06.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

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

INTRODUCTION

The principle changes from the addendum to HD 33/06 are as follows:

- Reference is included to the following Advice Notes which have been published since the original version of HD 33/06: TA 99, HA 93, HA 94, HA 96, HA 104, HA 108, HA 112, HA 114, HA 115, and HA 216.

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

- In Chapter 3 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- In Chapter 6 Table 6.1 reference to HA 46 has been replaced by reference to HA 47 published in 2003.

- In Chapter 7 reference is now made to HA 196 published in 2004.

- Chapter 8 now requires that the rainfall intensity used in the design of drainage systems be increased by 20% in order to allow for the future effects of climate change.

- Chapter 9 also includes new sections regarding Combined Channel & Pipe Systems and Discharges to Outfalls and Sinkaways.

- 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 33/06 have now been included in Volume 4 of the NRA Manual of Contract Documents for Road Works.
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Current NRA Drainage Standards

• NRA Manual of Contract Documents for Road Works (NRA MCDRW):
  • Volume 1: NRA Specification for Road Works – Series 500 – Drainage and Service Ducts;
  • Volume 2: Note for Guidance on the Specification of Road Works – NG Series 500 – Drainage and Service Ducts;
  • Volume 3: Method of Measurement for Road Works and Notes for Guidance on the Method of Measurement for Road Works; and,
  • Volume 4: Road Construction Details (RCDs).
Revision of the NRA’s Drainage Standards
Future NRA Drainage Standards

Future NRA Drainage Standards

• Revised NRA Design Manual for Roads and Bridges (NRA DMRB)(1 amended and 13 new documents).

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NRA Design Manual for Roads and Bridges ['DMRB']: Volume 4
Draft NRA HD 33/14 Drainage Systems for National Roads [Continued]

• Guidance on the selection of the types of drainage systems for national road projects.
• Use of grassed surface water channels permitted.
• Extended capping as a means of sub-surface drainage.
• Nearside linear drainage channels not permitted.
• 20m³ spillage containment capacity.
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NRA Design Manual for Roads and Bridges ['DMRB']: Volume 4

Draft NRA HD 33/14 Drainage Systems for National Roads

- Over-the-edge drainage permitted where embankment >1.5m.
- ‘Encouragement’ of combined filter drains in cuttings.
- Maximum length of carrier pipe between access chambers is 100m.
- ‘No worsening’ of flow rates up to and including the 1 in 100 year storm.
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NRA DMRB: Volume 4
Draft NRA HD 45/14 Road Drainage and the Water Environment

- Guidance on the assessment and management of impacts on the water environment.
- ‘SuDS should be considered in the first instance over conventional drainage systems.’
- Adoption of the methods laid down in UK HD 45/09 for assessing:
  - impacts of routine runoff on surface waters.
  - pollution risks from accidental spillages.
- Reference to the OPW’s website for information on assessing flood impacts.


<table>
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<th>VULNERABILITY RATING</th>
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<th>RESOURCE PROTECTION Aquifer Category</th>
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<td>R¹ R¹ R¹ R¹ R¹ R¹ R¹ R¹ R¹</td>
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</tbody>
</table>
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NRA DMRB: Volume 4
Draft NRA HA 33/14 Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control

• Guidance on the design of:
  • earthworks drainage,
  • road network drainage,
  • attenuation, and
  • pollution control.
• Design process flowcharts & worked examples.

N21 Castleisland Bypass: Example of an attenuation pond.
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NRA DMRB: Volume 4
Draft NRA HD 119/14 Grassed Surface Water Channels for Road Runoff

- Information on the hydraulic and structural design of grassed surface water channel for road drainage.
- Lined GSWCs not permitted.
- More onerous requirements in relation to sub-soil in Series 500 of the Spec.
- May only be used in cuttings and in embankments < 1.5m in height.
NRA DMRB: Volume 4

Draft NRA HD 40/14 Determination of Pipe and Bedding Combinations for Drainage Works

- Description of the method of selecting suitable combinations of drainage pipes and bedding types to meet given loading requirements.
- UK HA 40 to be used ‘except that all pipes under carriageway shall be encased in concrete.’ NRA Addendum to HD 33/06.
- ‘Type Z is for use with any type of pipe for permanent protection against mechanical damage.’ Draft NRA HD 40/14.
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NRA DMRB: Volume 4
Draft NRA HD 106/14 Drainage of Runoff from Natural Catchments

- Design information aimed at minimising the flooding problems associated with runoff from road-adjacent catchments.
- Details methods for:
  - Estimating runoff from natural catchments; and,
  - Determining suitable earthworks drainage.

Extract from UK HA 106/04.
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NRA DMRB: Volume 4
Draft NRA HD 107/14 Design of Outfall and Culvert Details

• Guidance on:
  • Detailing of outfall structures to road drainage systems; and,
  • Design of culverts including scour, but excluding hydraulic design.
• Matters regulated by Section 50 of the Arterial Drainage Act, 1945, are not covered in this standard.
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NRA DMRB: Volume 4

**Draft** NRA HD 78/14 *Design of Outfalls for Surface Water Channels*
- Information on suitable outlet layouts for different types of surface water channels and provides methods for designing each type according to the flow rate in the channel.

**Draft** NRA HD 37/14 *Hydraulic Design of Road-Edge Surface Water Channels*
- Description of the method of determining the length of road between outlets that can be drained by a given size of surface water channel constructed along the edge of the road.

**Draft** NRA HD 102/14 *Spacing of Road Gullies*
- Design information for determining the length of road between gullies.

M3 Clonee to Kells: Concrete surface water channel and outlet.
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NRA DMRB: Volume 4
Draft NRA HD 103/14 Vegetated Drainage Systems for Road Runoff
• Guidance on how vegetated drainage systems may be used to convey, store and treat road runoff.

Draft NRA HD 118/14 Design of Soakaways
• Guidance on how soakaways shall be incorporated into systems used to treat and store runoff prior to discharging to ground.

Draft NRA HD 83/14 Safety Aspects of Road Edge Drainage Features
• Guidance on safety aspects of road edge drainage features.
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NRA DMRB: Volume 4
Draft NRA HD 39/14 *Edge of Pavement Details*

- Guidance on the use of the various types of edge pavement details.
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- **Draft** NRA Manual of Contract Documents for Road Works (NRA MCDRW):
  - **Draft Volume 1**: NRA Specification for Road Works – Series 500 – Drainage and Service Ducts
    - Improved layout, organisation and cross-referencing;
    - Inclusion of lightweight aggregate as bedding and filter material.
    - Specification for:
      - geosynthetic clay liners and impermeable membranes.
      - petrol interceptors.
      - rock armour.

‘Rock armour’ training works.

Use of Geosynthetic clay liners on M17 Gort to Crusheen.

Petrol/Oil interceptor on M6 Galway to Ballinasloe.
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- NRA Manual of Contract Documents for Road Works (NRA MCDRW):
  - Draft Volume 3: Method of Measurement for Road Works and Notes for Guidance on the Method of Measurement for Road Works
Revision of the NRA’s Drainage Standards
Future NRA Drainage Standards

- NRA MCDRW:
  - Draft Volume 4: Road Construction Details (RCDs)
    - Complete revision, e.g. cross-referencing, and multiple amendments.
    - New RCDs illustrating ‘Road Drainage Typical Sections,’ e.g. for grassed surface water channels.
    - New RCD illustrating ‘rock armour scour protection.’

N22 Tralee Bypass: Grassed Surface Water Channel.
Revision of the NRA’s Drainage Standards

Future NRA Drainage Standards

- **Draft** Volume 4: Road Construction Details (RCDs)
  - Significant revisions to RCDs for ‘Access Chambers,’ including:
    - Reductions in plan areas;
    - Removal of steps, handholds and ladders to encourage:
      - working from surface; and,
      - entry in accordance with health and safety legislation, e.g. accompanied manhole entry via tripod and winch.
    - Concrete apron added around covers to prevent damage to landscape machinery during maintenance.

M3 Clonee to Kells: Manhole.

Accompanied manhole entry with tripod and winch.
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Future NRA Drainage Standards

- **Draft Volume 4: Road Construction Details (RCDs)**
  - RCD/500/19, 20 & 21 to be replaced by new RCD/500/53;
  - Reinforced Concrete (insitu or pre-cast) headwalls now required;
  - Rendered concrete blockwork headwalls (pipes <300mm) only exception; and,
  - Rock armour/gabions headwalls prohibited.
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Conclusion

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**Revision of the NRA’s Drainage Standards**

**List of Stakeholders**

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