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Transport Infrastructure Ireland

TII Publications



Notes for Guidance on the Specification for Road Works Series NG 300 - Fencing and Environmental Noise Barriers

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NRA DMRB and MCDRW References

For all documents that existed within the NRA DMRB or the NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

FENCING AND ENVIRONMENTAL NOISE BARRIERS

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Fencing and Environmental Noise Barriers

NG 301 Not Used

NG 302 Requirements for Temporary and Permanent Fences

- 1 Clause 302 sets out the action to be taken by the Contractor, drawing particular attention to the requirements for temporary fencing in all situations where he does not provide permanent fencing immediately.
- 2 There may be specific temporary fencing requirements for a particular location during the construction period, e.g. to isolate a semi-permanent diversion of a public right of way or a Statutory Undertaker's works or apparatus. Such fencing should be shown on the drawings. The Contractor is obliged to provide at his own cost all temporary fences required for safety and security as a result of his particular method of working, and maintain such temporary fencing during the period of the Works.

NG 303 Temporary Fencing

- 1 A range of fencing has been included which will cover the majority of situations arising where permanent fencing is not required or immediately erected.
- 2 The majority of fencing types have been selected from the range in IS. 435 and BS 1722 and are of a quality which will provide a fence strong enough to protect property and be economical in repetitive use when the need arises. The high standard should encourage the immediate provision of permanent fencing, although this is not always practical because of the possibility of damage to the permanent fencing during the progress of the Works.
- 3 The height of the fence in the range selected may have to be increased or, it may be considered excessive for the use it has to perform. Any further requirements or relaxation should be described on the drawings.

NG 304 Timber Quality

- 1 The requirements for timber for use in the permanent Works are given in IS 435 ; this document should be consulted if further information is required.

NG 306 Permanent Fencing

- 1 The type of fence used should be sufficient to meet all environmental, road safety and amenity factors and the chosen design, which should be decided after consultation with the Employer, should fit visually into each distinctive stretch of country, each situation having its appropriate type of fence. Wherever a change of fence type is made, the transition point should be carefully selected to coincide with a convenient feature which will give a logical reason for the change in fence design.
- 2 Where additional stockproofing is required the provision of an additional rail or mesh or additional plain or barbed wire should be considered. The views of the landowner should be considered before deciding on the use and position of barbed wire. If, for instance horses are being contained it may not be satisfactory to fix barbed wire at a low level.
- 3 When the ground is uneven under the line of the fence it is suggested that the ground be trimmed, particularly if the fence is desired to be stockproof, and that this requirement be included in Appendix 3/1.
- 4 The drawings should show where fencing is required, and the position, length and height for each type of fence. Appendix 3/1 should include any further details required.
- 5 Fencing for all roads, unless otherwise described in Appendix 3/1, shall be constructed with the rail on the field side of the post.
- 6 The compiler should state in Appendix 3/1 if concrete surround is required to the base of fence posts of timber post and rail fences. The NRA Road Construction Details refer.

NG 307 Permanent Fencing for Accommodation Works

- 1 Landowners should be encouraged to agree to a type of fencing for boundaries from those contained in the NRA Road Construction Details, which, if it has to contain stock must be adequate for the purpose. Agreed requirements should be described in Appendix 1/15, or shown on the drawings.

NG 308 Gates and Stiles

- 1 The location and details of construction of gates and stiles should be shown on the drawings. Reference should be made to the NRA Road Construction Details wherever possible.

NG 309 Removing and Re-erecting Existing Fences and Gates

- 1 The requirements for the disposal of existing timber fences are given in the Waste Management Acts, 1996-2005 and should be consulted if further information is required. Copper Chrome Arsenic and Creosote treated fences are classified as hazardous according to the EU regulations and should be disposed of using a Waste Collector that has the appropriate Waste Collection Permit allowing the transportation of hazardous materials.
- 2 The Environmental Protection Agency should be contacted for further clarification on the disposal of waste timber.

NG 310 Environmental Noise Barriers

General

- 1 Environmental barriers shall be designed to meet the requirements of I.S. EN 1793 and I.S. EN 1794 and in general shall follow best practice principles outlined in the UK Highways Agency Advice Note HA 65. The drawings should show methods of fixing barriers to structures, which ensure that gaps below the bottom edge of the barrier are avoided. Where it is proposed to attach an environmental barrier to a road bridge parapet, only those combinations which have

been satisfactorily tested under vehicle impact should be used.

- 2 The drawings should show the position and height of the barrier and where applicable the position of gates, the fittings required and the proposals for treatment at gaps to maintain the acoustic attenuation. The length and position of barriers behind any gap should ensure that there is adequate deviation of the noise path from the carriageway to any property being protected by the barrier. It should be noted that additional width may be required on embankments to install panels behind the general fence line where gaps are required.

- 3 Gates or gaps should be provided at about 200m intervals to provide access for the maintenance of both the barrier and any planting behind the barrier. Where possible these

access points should be located to provide access to any traffic control and communications equipment and be designed in accordance to Annex D of I.S. EN 1794-2: 2003.

- 4 The criteria for the provision of safety barrier, clearzone and clearance required behind it for the various categories of safety barrier are contained in NRA TD 19 of the NRA DMRB and in IS EN 1317.

- 5 Where the design of environmental barriers is to be provided to the Contractor, the details of the complete installation, including foundations, should be shown on the drawings.

- 6 Where the Contractor is required to design environmental barriers, inter alia, the following information should be included in Appendix 3/1.

(i) Criteria for Design. These should be based on the Environmental Impact Statement, Schedule of Commitments, and any modifications and conditions imposed by An Bord Pleanála shall be designed and approved by the Designer as advised by an acoustic specialist taking account of site specific characteristics.

(ii) Materials and finishes that will be acceptable in the barrier:

- (a) In addition to aesthetic considerations, materials should be suitable for the location eg. Factors such as risk of recurring vandalism or fire hazards should be considered.
 - (b) It is recommended that a galvanized coating and paint system is used for steel members. Improved atmospheric corrosion resistant steel should be excluded where the barrier is adjacent to the carriageway and likely to be affected by salt spray. NRA Design Manual for Roads and Bridges Vol 2 BD 7 should be referred to for specific requirements regarding its use.
- (iii) Design Features. Specific design features required, eg:
- (a) Where steps between panels are permitted, what limitations in size or regularity are needed to ensure that the visual impact of the aesthetic design is not disrupted.
 - (b) Is a sawn finish for timber satisfactory or should it be planed.
 - (c) What are the aesthetic requirements (eg. colour scheme, texture of finish).

7 If sample panels are required for approval the Contractor should supply them 6 weeks prior to mass production.

8 The following are some of the points which should be considered when the Designer's design is checked:

- (i) The calculations for wind load and acoustic performance.
- (ii) The quality of the materials proposed to be incorporated in the barrier, particularly those, if any, that are not included in the Specification.
- (iii) That the structural grades of materials used are in accordance with those quoted in the calculations.
- (iv) Workmanship, particularly the method of fixing. For timber, the nails should be of sufficient length to penetrate the

rails by not less than 30 mm and in such a manner that nails do not pass through more than one board.

- (v) That the acoustic properties are maintained by the avoidance of gaps, including gaps due to shrinkage or thermal movement.
- (vi) Easy replacement of parts following accidental or wilful damage.
- (vii) Security of components and nature of materials used to discourage wilful damage.
- (viii) Acoustic screens up to 3 m high are to be treated as Category 0 structures; higher screens (barriers) are to be treated as Category 1 in accordance with NRA BD 2.

Aesthetic Approval

9 Wherever possible Appendix 3/1 should include aesthetic factors which the Contractor will need to take into account when formulating his design. This design should be submitted to the Employer's Representative for aesthetic review and comments provided in accordance with the Contract.

Post Foundation Test

10 Testing should be carried out at any barrier location where there is doubt about the resistance of the embedment material. The number and position of tests and the required performance criteria should be stated in Appendix 3/1. Care should be taken to ensure that design assumptions and the required frequency of tests are fully described to enable the Contractor to make adequate provision for testing. Testing should not be carried out when the ground is frozen.

11 Details of foundations should be shown on the drawings.

Acoustic Performance

12 All environmental noise barriers shall have a minimum insulation performance of B3 as classified in I.S. EN 1793 Part 2.

13 All absorptive barriers shall have a minimum absorptive index of A3 as classified in I.S. EN 1793 Part 1.

- 14 The weightings for the range of frequencies covered by the standard are representative of urban conditions; this slightly accentuates performance at lower frequencies where there is most variation between the absorptive materials used in proprietary systems.

Mechanical Performance

- 15 Mechanical performance and stability of complete barrier systems shall be specified in accordance with IS EN 1794-1. This provides harmonised methods of indicating resistance to the following factors: wind loads, other applied (static) loads, self weight, impact of stones, impact of vehicles, snow expelled by snow ploughs.

- 16 General safety and environmental protection features of complete barrier systems may be specified in accordance with IS EN 1794-2. This provides harmonised methods of describing the following aspects of performance: resistance to brush fire, danger of falling debris, environmental advantages and disadvantages of components, dimensions and other requirements for emergency exits, light reflection and transparency.

Employer's Representative's Check list

- 17 The Employer's Representative should satisfy himself of the following matters with regard to the design and construction of Environmental Barriers:-

Acoustic Design –

- i. *Has there been a robust noise study and study of noise mitigation by a competent and qualified acoustician or noise consultant?*
- ii. *Has the study taken into account any variations from the Preliminary Road design in the EIS?*
- iii. *Has a detailed design been undertaken that encompasses noise mitigation as an integral part of the design? E.g. Has the noise barrier been designed in tandem with the drainage and geometric design? Does the noise barrier affect sightlines? Is there sufficient ground behind the barrier to achieve adequate bearing capacity? (Minimum of 1m)*
- iv. *Has a noise model been completed allowing the designers to simulate*

- v. *traffic noise and assess reflections etc. Has a performance specification and IS EN 14388 specification been completed by the designer as specified in series 300.*

Manufacturer Approval

- i. *Is the Manufacturer ISO 9001 accredited for the manufacture of the specific noise barrier panels or components*
- ii. *Is the barrier manufactured under ISO controls in audited premises? No on site fabrication to be allowed.*
- iii. *If timber noise barriers are used, are they from a sustainable source?*

Structural Design:

- i. *Has a full structural design of the noise barrier structure and foundations been done and assessed by the contractor before approval.*
- ii. *Has a sample panel been erected and aesthetic approval been received by the Employer?*
- iii. *Has a competent structural engineer designed the noise barrier structure and foundations*
- iv. *Has a BD 2 report, in accordance with Clause 310.4 of the NRA Specification for Road Works, been submitted to the NRA Structural Section prior to detailed design of the barriers and their foundations?*
- v. *Has the design been based on the provision of adequate site information, setting out information, ground conditions and service information.*
- vi. *Has a verge section showing services, containment barriers and the noise barrier position with provisional foundation been submitted with the structural design?*

Treatment and Durability

- i. *Have the durability requirements of Clause 310.11 been fulfilled.*
- ii. *Has any timber been sawn on site?*
- iii. *Is the barrier suitable for its requirements? E.g. Is it likely to be vandalised or subject to graffiti or fire damage?*

Drainage

- i. *Have Environmental Noise Barriers been installed on the top of a fill slope? What drainage option other than over the edge drainage has been selected?*

NG 311 Preservation of Timber

- 1 The requirements for preservation of timber for use in the Permanent Works are given in IS 435 : Part 1 Appendix A and B and should be consulted if further information is required. Accommodation works fencing should be to the same standard of preservation as Permanent Fencing and fencing that is to be painted should be treated similarly, although not with creosote. Extra supervision is usually essential to obtain the necessary standard required to keep maintenance costs low in the long term.
- 2 Inspection of the timber before preservative treatment is of the utmost importance and arrangements should be made for this to be carried out for each scheme. The extent of permitted defects generally is defined in IS 435 : Part 1 as indicated in Clause 304.
- 3 The treatment specified in IS 435 : Part 1 will generally provide the full required level of penetration in properly seasoned wood. It is necessary to accept the assurance of the treater, embodied in a certificate of treatment which should be provided with each batch. In any other case a quality control agent from the NSAI should be contacted to ensure that all timber destined for the Scheme is inspected.

NG 312 Painting of Timber Fences, Gates, Stiles and Posts

- 1 Appendix 1/15 should contain the details of accommodation works required in the Contract and should include the type and colour of paint required for fencing and gates. If preservation treatment is not required this should also be stated.
- 2 Requirements for the use of water borne acrylic paints or alkyd-acrylic paint instead of oil based paints should be given in Appendix 3/1.

- 3 Paint containing non-toxic constituents shall be specified for use where the painted surfaces are accessible to animals.

NG 313 Concrete Fencing

- 1 Concrete fencing should generally not be used for road side fencing adjacent to carriageways due to safety implications.
- 2 Any additional requirements for concrete fencing or requirements if different from the requirements of Clause 313 should be included in Appendix 3/1.

NG SAMPLE APPENDIX 3/1 : FENCING, GATES AND STILES

[Note to compiler: Include here:]

1. **Wooden Fencing, Gates and Stiles**

- (i) Preservation, Treatment / Painting *[Only included when the compiler wishes to specify the preservative or painting specifically].*
- (ii) Trimming ground to regular level on fence line. *[Location. Only included when necessary.]*
- (iii) Details of additional stockproofing required *[Location and details]*
- (iv) Concrete surround to base of posts *[Location. Included when the compiler wishes to specify concrete footings for post and rail fencing].*
- (v) Requirements for timber if different from the requirements of Clause 304
- (vi) Requirements for permanent fences if different from the requirements of sub-Clause 306.2

2. **Temporary Fencing**

- (i) Requirements for temporary fencing if different from requirements of sub-Clause 302.1 and 303.1
- (ii) Timing of removal of temporary fencing if different from sub-Clause 302.2
- (iii) Requirements for any preservation treatment to temporary fencing *[303.3]*

3. **General**

- (i) Requirements for bolts, screws and nuts if different from the requirements of sub-Clause 305.1
- (ii) Requirements for joining permanent fencing to existing hedges, fences and to other structures if different from the requirements of sub-Clause 306.1
- (iii) Painting or Stock proofing requirements *[306.3, 308.1, 312.4 and 312.5]*

4. **Concrete Fencing**

- (i) Any additional requirements for concrete fencing or requirements if different from the requirements of Clause 313.

5. **Environmental Noise Barriers**

- (i) Schedule of locations, extents, heights and noise performance requirements of barriers to be provided, with cross reference to the drawings *[310.1 and 310.8]* **and/or**
- (ii) Details of all noise design commitments to be achieved by the Contractor including where appropriate by reference to the Environmental Impact Statement, Schedule of Commitments, and any modifications and conditions imposed by An Bord Pleanála. *[310.1 and 310.2]*
- (iii) Any requirements for barriers to be other than vertical *[310.10 (iii)]*
- (iv) Aesthetics or graffiti resistant requirements *[310.12]*
- (v) Any requirements for timber surfaces to be other than sawn *[310.15]*
- (vi) Any particular requirement for fittings *[310.16]*
- (vii) Requirement for post spacing, integration with safety barriers and/or the construction of a sample panel *[310.22]*
- (viii) Details of any stepping of panels where permitted *[3.22 (vi)]*
- (ix) Requirements for gates *[3.22 (x)]*
- (x) Load Testing Requirements *[3.10.29 (i)]*

5. Environmental Noise Barriers

Barrier Specification to I.S. EN 14388

Characteristic	Standard / Method	Required Level	Tested
Sound Absorption	I.S.EN 1793-1:1998	[> A3 where required]	
Airborne Sound Insulation	I.S.EN 1793-2:1998	[B3 minimum]	
Wind and Static Loading	I.S.EN 1794-1	[Pass]	
Self Weight	I.S.EN 1794-1	[Pass]	
Impact of Stones	I.S.EN 1794-1	[Pass]	
Safety in Collision	I.S.EN 1794-1	[Not required]	
Dynamic Load (Snow)	I.S.EN 1794-1	[Not Required]	
Resistance to Brush fire	I.S.EN 1794-2	[Class Required]	
Risk of Falling Debris	I.S.EN 1794-2	[Required on elevated structures]	
Environmental Protection	I.S.EN 1794-2	[Check Preservative]	
Means of Escape	I.S.EN 1794-2	[Check frequency]	
Light Reflectivity	I.S.EN 1794-2	[Required for transparent]	
Transparency	I.S.EN 1794-2	[Required for transparent]	
Combined with Safety Barrier	I.S EN 1317-2	[Performance as per IS EN 1317]	

NG SAMPLE APPENDIX 3/2 : FENCING : NRA ROAD CONSTRUCTION DETAILS

Clause No.	Road Construction Detail Drg. No.
302.1 & 303.1	[List RCD's for acceptable types of temporary fence]
306.1	[List RCD's for acceptable types of permanent fence, and include RCD/300/8 for tie-in to parapets]
306.2	RCD/300/1, 2, 2B
306.3	RCD/300/19
308.1	[List RCD's for gate types required from RCD300/9 to 14]
308.2	[List RCD's for required stile types 1 or 2 from RCD300/15 and 16]
313.1	[List RCD's for acceptable types of concrete fence, RCD300/3, 6, 7 and/or 18]



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