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Transport Infrastructure Ireland

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Specification for Road Works Series 300 - Fencing and Environmental Barriers (including Erratum No. 1, dated March 2011)

CC-SPW-00300

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About TII

Transport Infrastructure Ireland (TII) is responsible for managing and improving the country's national road and light rail networks.

About TII Publications

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Document Attributes

Each document within TII Publications has a range of attributes associated with it, which allows for efficient access and retrieval of the document from the website. These attributes are also contained on the inside cover of each current document, for reference. For migration of documents from the NRA and RPA to the new system, each current document was assigned with new outer front and rear covers. Apart from the covers, and inside cover pages, the documents contain the same information as previously within the NRA or RPA systems, including historical references such as those contained within NRA DMRB and NRA MCDRW.

Document Attributes

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NRA MCDRW prior to the launch of TII Publications, the NRA document reference used previously is listed above under 'historical reference'. The TII Publication Number also shown above now supersedes this historical reference. All historical references within this document are deemed to be replaced by the TII Publication Number. For the equivalent TII Publication Number for all other historical references contained within this document, please refer to the TII Publications website.

National Roads Authority

Manual of Contract Documents for Road Works (NRA MCDRW)

ERRATUM No. 1 (March 2011) to NRA Specification for Road Works Series 300 – Fencing and Environmental Barriers Dated January 2009

The NRA Specification for Road Works (NRA MCDRW), Series 300 – Fencing and Environmental Barriers, dated January 2009 is amended as follows:-

1. Page 6, Clause 310.28
In the fifth paragraph delete “NRA DMRB BD 37” and replace with “Eurocodes and the relevant National Annex”.
2. This Erratum shall be implemented forthwith.
3. All technical enquiries or comments on this Erratum or the NRA Series 300 should be sent in writing to:

Specifications Section
National Roads Authority
St. Martins House
Waterloo Road
Dublin 4

Instructions For Use

The following version of the Manual of Contract Documents for Road Works (NRA MCDRW) incorporates the above changes.

FENCING AND ENVIRONMENTAL NOISE BARRIERS

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Fencing and Environmental Noise Barriers

301 General

- 1 Temporary fences and permanent fences shall comply with this Series.

302 Requirements for Temporary and Permanent Fences

- 1 As soon as the Contractor is in possession of any part of the Site he shall immediately erect fencing on the boundaries of the land as shown on the drawings in the Contract. In places where permanent fencing cannot be erected immediately or where none is required, the Contractor shall erect, and when and where required re-erect and maintain, temporary fencing and subsequently take down and remove as necessary. The type of temporary fencing shall be chosen by the Contractor, unless otherwise described in Appendix 3/1, and may be selected from the standard types for road works shown in the NRA Road Construction Details listed in Appendix 3/2, taking into account the usage of the adjoining land. Unless otherwise described in Appendix 3/1, the Contractor shall not use barbed wire in areas accessible to the general public. Access shall be made in temporary fencing as necessary for the use of the occupiers of adjacent lands.
- 2 Temporary fencing shall remain in position either until it is replaced by permanent fencing or until its removal on completion of the Works, unless otherwise described in Appendix 3/1.
- 3 When concrete for post footings is required, it shall comply with Clause 2602.

303 Temporary Fencing

- 1 Temporary fencing shall be appropriate to the usage of the adjoining land and, unless otherwise described in Appendix 3/1, may be selected from the types included in the NRA Road Construction Details listed in Appendix 3/2 .
- 2 Should temporary fencing be removed temporarily for the execution of any part of the Works it shall be reinstated as soon as possible and in the meantime, the gap in the fencing shall be patrolled so that no unauthorised entry on to adjoining land takes

place and no stock escapes from the adjoining land.

- 3 Unless otherwise described in Appendix 3/1, timber for temporary fencing need not have preservation treatment.

304 Timber Quality

- 1 Timber for use in permanent Works shall be one of the species referred to in Clause 4.1.1 and Table 1 of IS 435-1: 2005.
- 2 Timber for permanent Works shall be of appropriate natural durability or treated with wood preserve in compliance with Clause 311. Appendix B.1.5 of IS 435-1:2005. It shall be referred to where natural durability is used as the criteria to achieve the desired service life.
- 3 Timber for use in permanent Works shall comply with the grading requirements in Clause 4.1.2 and Table 2 of IS 435-1 :2005.
- 4 Unless otherwise described in Appendix 3/1, timber for permanent fencing shall comply with IS 435-1: 2005. Field gates and posts, stiles, bridle gates and kissing gates shall comply with Clause 308.
- 5 Timber and testing of timber for use in permanent Works shall comply with the requirements of IS 435-1: 2005 and Clause 105.
- 6 Timber for use in permanent Works shall not be jointed.
- 7 Timber for permanent Works shall be obtained from a sustainable source. The supplier shall supply evidence in the form of appropriate chain of custody certificates.
- 8 A satisfactory factory quality control scheme shall be required to ensure that all timber used for permanent fencing and for timber Environmental Noise Barriers meets the requirements of this Specification. The quality control scheme should reflect the nature of the raw material, the production process and the features associated with fencing production; in particular the specific requirements of Clause 311 Preservation of Timber.

A Factory Quality Control System operated by the NSAI to ISO 9001 and made specific to the preservative requirements of IS 435

shall be considered to satisfy the above requirements.

305 Fittings

- 1 Bolts, screws and nuts shall comply with ISO 4016, 4018, and 4034, for ISO 898 property class 4.6 or 4.8 unless otherwise described in Appendix 3/1. Washers shall comply with BS 4320. Nails shall comply with clause 4.4.1 of IS 435: 2005. Bolts washers and nails shall be galvanised to comply with EN ISO 1461 unless they are stainless steel.

306 Permanent Fencing

- 1 Permanent fencing shall comply with IS 435: 2005, this Clause, the NRA Road Construction Details listed in Appendix 3/2 and the additional requirements described in Appendix 3/1. All permanent fencing shall be erected to present a flowing alignment both in plan and elevation following approximately the level of the ground and the Contractor shall trim the ground along the line of the fence. The fencing shall be neatly and effectively joined to existing hedges, fences and to other structures and joined to parapets to comply with the NRA Road Construction Detail listed in Appendix 3/2.
- 2 Fencing for National Roads, shall be timber post and rail fence with four rails complying with IS 435: 2005 and the NRA Road Construction Details listed in Appendix 3/2. Both ends of rails shall be cross cut at right angles to the length of the piece. The timber species and preservation treatment shall comply with Clause 311 and any additional stockproofing required shall be as described in Appendix 3/1. Painting, if required in Appendix 3/1 shall comply with Clause 312.
- 3 Permanent Mammal Resistant Fencing shall comply with IS 435: 2005 and the NRA Road Construction Details listed in Appendix 3/2. This fencing is intended for the containment of all mammals incl. badgers and otters. The timber species and preservation treatment shall comply with Clause 311 and any additional stockproofing required shall be as described in Appendix 3/1. Painting, if required in Appendix 3/1 shall comply with Clause 312.
- 4 Where sidelong ground slopes down towards the fence at a slope greater than 1:4, then the permanent fencing post height shall be increased by a minimum of 250mm and an additional rail added.

307 Permanent Fencing for Accommodation Works

- 1 Permanent fencing shall be provided for accommodation works and shall comply with this Series and the particular requirements described in Appendix 1/15.

308 Gates and Stiles

- 1 Field gates and posts shall comply with BS 3470 and Clauses 304 and 311. They shall be provided to the dimensions shown on the NRA Road Construction Details listed in Appendix 3/2. Painting, if required in Appendix 3/1 shall comply with Clause 312.

Fittings for field gates shall be as shown on the NRA Road Construction Details listed in Appendix 3/2.

- 2 Stiles shall comply with BS 5709 and Clauses 304 and 311. They shall be provided to the dimensions shown on the NRA Road Construction Details listed in Appendix 3/2.
- 3 Where required concrete for post foundations shall comply with Clause 2602.
- 4 Any additional stockproofing required to gates and stiles shall be as described in Appendix 3/1.

309 Removing and Re-erecting Existing Fences and Gates

- 1 Where required in Appendix 2/3 existing fences, gates and stiles, with posts shall be carefully taken down, laid aside, removed or later re-erected in compliance with Clauses 306, 307 and 308 as specified in sub-Clause 201.6.
- 2 Fences, gates, stiles and posts which are to be re-erected shall have any existing paint removed and be prepared and treated to comply with Clause 312.
- 3 Where required in Appendix 2/3 existing fences that are to be disposed of off site,

shall be disposed of in compliance with the Waste Management Acts and Regulations.

310 Environmental Noise Barriers

General

- 1 Environmental Noise Barriers shall be provided in accordance with Appendix 3/1 and the drawings in the Contract and shall consist of materials and be erected to standards described in the following sub-Clauses.
- 2 Environmental Noise Barriers shall achieve the performance criteria set out in the Contract Documents in accordance with I.S. EN 1793-1, I.S. EN 1793-2, I.S. EN 1793-3, I.S. EN 1794-1 and I.S. EN 1794-2 following the specifications outlined in I.S. EN 14388, this Clause, and any additional requirements described in Appendix 3/1.
- 3 Environmental Noise Barriers are to be manufactured in a factory, where the barrier was developed and the factory shall be accredited to ISO 9001 for the manufacture of the specific noise barrier panel or components. No on-site assemblies of Environmental Noise Barrier panels are permitted.
- 4 Where the Environmental Noise Barrier is combined with a safety barrier, the safety fence shall comply with Series 400, NRA TD 19 and IS EN 1317.
- 5 Environmental Noise Barriers shall be subject to and comply with NRA BD2 "Technical Acceptance of Structures".
- 6 Environmental Noise Barriers are to be designed to achieve a desired service life of 30 years.
- 7 Where the Environmental Noise Barrier is to be erected on an earthwork environmental bund, the bund shall comply with Clause 619.
- 8 Where an Environmental Noise Barrier is erected on ground or any other surface which follows the longitudinal profile of the adjacent road or on existing ground or earthwork environmental bund which has a gradient of not greater than 1 in 50 along the line of the barrier, the top of the barrier shall follow a flowing vertical alignment. Where the earthwork environmental bund or original ground has a slope exceeding 1 in 50, the top of the barrier may be stepped, where permitted in Appendix 3/1. The minimum height of the barrier and the maximum step increments where steps are permitted, shall be as specified in Appendix 3/1. Where necessary the ground shall be excavated or filled and compacted in compliance with the appropriate Clauses in Series 600. Any excavation required shall not affect the minimum height

of the barrier as shown in Appendix 3/1. The gravel board or bottom edge of the barrier shall be buried to a depth of at least 50 mm.

- 9 Where an Environmental Noise Barrier has been installed on the top of a fill slope, over the edge drainage will not be permitted.

Tolerances

- 10 Tolerances shall be as follows:

- (i) An Environmental Noise Barrier shall be erected along a line or smooth curve as indicated on the drawings in the Contract within a tolerance of ± 75 mm normal to the plane of the barrier; in addition, the horizontal deviation from the required positions at adjacent panels or posts shall not vary by more than ± 15 mm.
- (ii) The top edge of the barrier shall be at the specified height above the road surface, existing ground or finished ground level of the earthwork environmental bund within a tolerance of ± 50 mm and the deviation from the required levels at adjacent panels or posts shall not vary by more than ± 15 mm.
- (ii) Barriers shall be vertical unless otherwise stated in Appendix 3/1

Vandal Resistance

- 11 Environmental Noise Barriers are required to be vandal resistant. Vandal resistant Environmental Noise Barriers shall be constructed out of break-resistant panels that cannot be penetrated by hand held tools e.g. sharp knife, sledgehammer etc. Where applicable the Environmental Noise Barriers shall contain tamperproof screws.

Protection against damage to the insulation of absorptive Environmental Noise Barriers shall be provided. Where a steel mesh is used, this shall comply with Clause 310.18

Any Environmental Noise Barrier vandalised within the first 5 years of installation shall be replaced by a length equal to the original unbroken total length of barrier involved. The cost of the replacement barrier and any necessary jointing/termination shall be at the Contractor's own cost. An Environmental Noise Barrier shall be deemed vandalised if it has been damaged in such a way that its integrity to perform as a noise attenuating device has been compromised

e.g. a hole in the barrier, absorptive material has been removed etc.

Aesthetics Requirements

- 12 Where there are particular aesthetic or graffiti resistant requirements for Environmental Noise Barriers, these shall be listed in Appendix 3/1.

Aesthetics Approval

- 13 Drawings demonstrating compliance with the aesthetics requirements listed in Appendix 3/1 shall be submitted to the Employer's Representative.

Timber

- 14 Timber for Environmental Noise Barriers shall be of appropriate natural durability or treated with wood preserve in compliance with Clause 311. Appendix B.1.5 of IS 435-1:2005 shall be referred to where natural durability is used as the criteria to achieve the 30 year desired service life.

- 15 Timber surfaces shall be sawn unless otherwise stated in Appendix 3/1.

Fittings

- 16 Fittings shall comply with Clause 305 unless otherwise stated in Appendix 3/1. Nails, staples and screws in timber shall be austenitic stainless steel grade 302 or 304.

Concrete

- 17 Reinforced concrete components shall comply with the requirements of Annex A of BS 1722: Part 2.

Combination of Timber and Concrete

- 18 Timber cladding used to screen concrete panel barriers shall comply with BS 1722: Part 5 and Clause 304.

Steel

- 19 Steel posts and Environmental Noise Barrier members shall comply with the requirements in Series 1800 and shall:

- (i) Be hot dip galvanized to comply with Clause 1909, and either be:
 - (a) painted with the flowing paint system to comply with Series 1900,
 - 1 coat of item 155
 - 2 coats of item 14
 - 2 coats of item 35 or Item 50

to achieve a minimum total dry film thickness of 200 microns, or

- (b) plastic coated to comply with Clause 2604;
- (ii) have improved atmospheric corrosion resistance complying with Clauses 1801 and 1803.

Brickwork

- 20 Brickwork shall comply with Series 2400. Other Materials

- 21 Other materials, or combination of materials, shall comply with I.S. EN 1793 and I.S. EN 1794, this Clause, and any additional requirements described in Appendix 3/1. Material used shall have a desired service life of 30 years.

Design Requirements

- 22 The Contractor shall submit documented evidence demonstrating how the barriers meet the specified standards and the documentation shall clearly indicate the absorptive performance where such barrier type is used and airborne sound insulation categories of the constructed barriers as outlined in I.S. EN 1793-1:1998, I.S. EN 1793-2:1998.

Where absorptive barriers are used, they must have a minimum absorption index of A3 in accordance with I.S. EN 1793: Part 1 and all barriers must have a minimum insulation performance of B3 in accordance with I.S. EN 1793: Part 2.

The following shall also be taken into account :

- (i) The Contractor shall when required in Appendix 3/1, erect 2 sample panels of barrier not less than 6 weeks before starting construction. One section shall show the horizontal elevation, the other a sloping elevation. Spacing of barrier posts shall be as described in Appendix 3/1. When Appendix 3/1 requires a safety barrier to be attached to the Environmental Noise Barrier, the safety barrier shall be supplied and fixed to the sample panels of the Environmental Noise Barrier. The sample panels shall be used as the standard, which must be maintained throughout the Contract.
- (ii) The Contractor shall provide working drawings of the barrier arrangements and details of fabrication.
- (iii) The Contractor shall submit the following to the Employer's

Representative:

- (a) Where Appendix 3/1 requires compliance with the particular noise design commitments including where appropriate the Environmental Impact Statement, Schedule of Commitments, and any modifications and conditions imposed by An Bord Pleanála, documented, evidence demonstrating compliance.
- (b) Details of materials and components used in the barrier, including vandal and graffiti resistance,
- (c) Details of gates and methods of fixing where applicable.
- (d) Details of fixing to adjoining structures and parapets where applicable.
- (iv) Fixings shall be fitted so that bolts either do not protrude on the traffic side, or only do so with a coach bolt head, a cup square head, or with a dome headed nut.
- (v) Fixings and fastenings used shall be designed to prevent wilful damage. The design and materials used shall also enable damaged components to be replaced.
- (vi) Stepping of panels shall only be permitted as specified in Appendix 3/1 to be compatible with aesthetic requirements.
- (vii) The design shall be such that movement due to change in moisture content, thermal effects or weathering will not reduce the acoustic attenuation of the barrier.
- (viii) All joints shall be sufficiently masked by cover strips or rebated to ensure acoustic integrity.
- (ix) The design shall ensure that all members of the barrier can drain freely and do not allow water to stand on their surfaces or within joints.
- (x) Where access gates are required in Appendix 3/1, their design shall be such that they blend unobtrusively into the barrier. They shall open away from the nearest carriageway and leave no gap

when closed. The gates shall be self-closing by the provision of a heavy-duty spring and be secured as described in Appendix 3/1. In barriers up to and including 2.00 m high the top edge of the gate shall be at the specified height of the barrier. Gates in barriers over 2.00 m high shall be 2.00 m high and provided with a header panel to align with the top of the barrier. Where a gate is not to be provided, but a gap is to be left for access as described in Appendix 3/1, a length of barrier shall be erected behind the gap or an overlap provided sufficient to maintain the acoustic performance of the barrier.

- (xi) When timber is used in the barrier fixings shall be such as to allow timber movement due to change in moisture content to be accommodated without inducing splitting.

Testing of Acoustic Performance

- 23** The complete form of construction proposed for an Environmental Noise Barrier shall have been tested at a laboratory that has been accredited to undertake acoustic testing in accordance with IS EN 1793.

Insulation Requirements

- 24** The overall performance characteristic DL_R (Single number rating of airborne sound insulation performance expressed as a difference of A-weighted sound pressure levels, in decibels) determined in accordance with IS EN 1793 : Part 2 and shall meet a minimum insulation performance of B3, unless otherwise stated in Appendix 3/1.

Absorption Requirements

- 25** The performance characteristic DL_a (Single number rating of sound absorption performance expressed as a difference of A-weighted sound pressure levels, in decibels) determined in accordance with IS EN 1793: Part 1 shall meet a minimum absorption performance of A3, unless otherwise stated in Appendix 3/1.

Mechanical Requirements

- 26** The overall mechanical performance and stability, safety and environmental requirements shall meet the minimum requirements as outlined in I.S. EN 1794- Part 1 and I.S. EN 1794-Part 2.
- 27** The complete form of construction proposed for an Environmental Noise Barrier shall have been tested at a laboratory that has been

accredited to undertake mechanical testing in accordance with IS EN 1794.

Post Foundations

28 Noise barriers may be supported on foundations comprising spread/pad footings, driven precast concrete piles, steel piles or bored cast-in-place piles.

Where spread/pad footings are used the barrier should sit directly on the footing.

Where piles and piles caps are used, concrete /concrete composite barriers may sit on the soil. Non –concrete barriers shall sit on a concrete gravel board so that no part of the barrier is in contact with the ground. The gravel board shall be not less than 150 mm deep and shall have a total thickness of not less than 50 mm.

No gaps between barriers and foundations are permitted; therefore no over the edge road drainage is permitted. However localised slots for water discharge are permitted to drain the verge adjacent to the barrier.

Noise barrier foundations shall be designed in accordance with Eurocodes and the relevant National Annex. They shall be checked for both serviceability and ultimate limit states, and designed to limit deflections as detailed below.

Where the barrier foundation is located on disturbed material, such as earth mounds, both initial and long term soil parameters should be used in the design of the foundations.

For serviceability limit state, long term settlement and lateral movement of the barrier due to causes such as embankment consolidation, should be considered together with serviceability loads such as wind. For barriers at the edge of an embankment, foundation design should take into account the likely foundation movement. The total barrier deflection shall not exceed the following limits:

Limiting Structural Deflection of Environmental Noise Barriers

Element and Position	Direction of Deformation	Maximum deflection
Top of Post and Barrier	Horizontal Δx or Δy	1/200 of height
Straightness in Plan	Length of barrier	1/300 of barrier length over 10m
Straightness in elevation	Length of barrier	1/300 of barrier length over 10m

- 29**
- (i) Where stated in Appendix 3/1 the Contractor shall provide test equipment and carry out loading tests on post foundations as described in Appendix 3/1. The results shall be available at least one week prior to installation of the relevant length of fence, unless otherwise stated in Appendix 3/1.
 - (ii) The Contractor shall install foundations for testing after completion of the finished ground.
 - (iii) On completion of loading tests the Contractor shall remove the test posts and foundations and make good the finished ground, unless the posts and foundations have not exhibited failure and can be incorporated into the permanent Works.
 - (iv) The Contractor shall establish and maintain appropriate traffic safety and management measures complying with Clause 117 during installation, loading and removal of the test posts and foundations.

311 Preservation of Timber

- 1** Prior to preservation treatment, the timber quality shall comply with Clause 304.
- 2** In accordance with Clause 4.1.7 and Appendix B of IS. 435: Part 1, the preservation of timber for roadside fencing shall be carried out to achieve a desired service life of 30 years.
 - (i) Unless otherwise specified in Appendix 3/1, the preservative used shall comply with requirements of IS. 435: 2005 and the Biocides Product Directive (98/8/EC)
- 3** Timber required to be subsequently painted with creosote, shall be first primed in compliance with Clause 312.3.

312 Painting of Timber Fences, Gates, Stiles and Posts

General

- 1 Painting shall be carried out in accordance with the recommendations in the Code of Practice BS 6150.
- 2 All timber fabricated into units before delivery to the Site and which is required to be painted shall be primed at the works.

Priming

- 3 Surfaces of wood should be clean and dry before being primed with priming paint to complying with BS 7956:2000 or ready mixed aluminium priming paint complying with BS 4756.

Undercoats and Finishing Coats

- 4 After erection all exposed primed surfaces shall be painted with two coats of undercoat as described in Appendix 3/1.
- 5 One finishing coat of the colour and type described in Appendix 3/1 shall be applied.

313 Concrete Fencing

- 1 Concrete fencing shall comply with IS 252, the NRA Road Construction Details listed in Appendix 3/2 and the additional requirements described in Appendix 3/1.
- 2 Concrete fencing shall not be used for road side fencing adjacent to National Roads.



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