
NRA ADDENDUM TO

BD 57/95

DESIGN FOR DURABILITY

Standard BD 57/95 - Design for Durability - is applicable in Ireland with the following amendments:

1. This is an interim addendum, for use pending a comprehensive review of BD 57 and BA 57.
2. At several locations:

For: "Overseeing Organisation"
Read: "National Roads Authority";

For: "highway"
Read: "road".
3. Page 1/1, Paragraph 1.2:
For: "BA 57 shall be applied to all bridge designs."
Read: "BA 57 should be taken into consideration."
4. Page 1/1, Paragraph 1.3, line 3:
For: "Specification for Highway Works (MCHW 1)"
Read: "NRA Specification for Road Works".
5. Page 1/1, Paragraph 1.5, line 2:
Delete Paragraphs 1.5 and 1.6 and replace with:
"Scope

1.5 The requirements of this Standard apply to the design of all bridges including retaining walls and abutments, on schemes funded by the National Roads Authority. They are not applicable to pipe bridges or sign and signal gantries.

Implementation

1.6 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.”

6. Page 1/1, Paragraph 1.7:
After Paragraph 1.7, insert new Paragraph 1.8:
“1.8 It is the responsibility of the Design Organisation to prepare designs which will be durable. This applies both in the overall concept and in the details of the design. Designs shall either comply with the requirements of this Standard, or contain alternative provisions which will ensure equivalent durability.”
7. Page 2/2, Paragraph 2.10:
Delete Paragraph 2.10.
8. Page 2/2, Paragraph 2.11, line 4:
For: “included in the Approval in Principle (AIP).”
Read: “included in the application for Preliminary Approval (see NRA BD 2).”
9. Page 4/1, Section 4, reference 3:
Delete text and replace with:
“3. **NRA Manual of Contract Documents for Road Works**

Volume 1: Specification for Road Works.”
10. Page 5/1, Section 5:
Delete text and replace with:
“5.1 All technical enquiries or comments on this Standard should be sent in writing to:

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



.....
E O’CONNOR
Head of Project Management and
Engineering

1.3.7.



THE HIGHWAYS AGENCY

BD 57/95



THE SCOTTISH OFFICE INDUSTRY DEPARTMENT



THE WELSH OFFICE
Y SWYDDFA GYMREIG



THE DEPARTMENT OF THE ENVIRONMENT FOR
NORTHERN IRELAND

Design for Durability

Summary: This Standard gives the requirements for the design of bridges in order to improve their durability.

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This Standard provides specification requirements for use in public purchasing contracts. It does not lay down legislative requirements for products and materials used in highway construction in the United Kingdom.

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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VOLUME 1	HIGHWAY STRUCTURES: APPROVAL PROCEDURES AND GENERAL DESIGN
SECTION 3	GENERAL DESIGN

PART 7

BD 57/95

DESIGN FOR DURABILITY

Contents

Chapter

1. Introduction
2. Improved Durability - The Conceptual Stage
3. Detailed Requirements
4. References
5. Enquiries



1. INTRODUCTION

1.1 It has been found that the durability of many bridges in the Overseeing Organisations' stock has been limited by decisions made at the design stage in relation to the bridge configuration and the choice of details. These decisions were often limited to a design philosophy in which minimizing the initial capital cost was paramount. The Overseeing Organisations are keen to promote the concept of design for durability, thereby shifting the emphasis to a lowest whole-life cost design philosophy.

1.2 This Standard is to be read in conjunction with BA 57 (DMRB 1.3.8), which gives further advice and background information on the topics covered herein. Wherever practicable, the recommendations of BA 57 shall be applied to all bridge designs.

1.3 Where this Standard is applied for the design of precast concrete elements which are procured through a contract incorporating the Specification for Highway Works (MCHW 1), products conforming to equivalent standards and specifications of other member States of the European Economic Area will be acceptable in accordance with the terms of the 104 and 105 Series of Clauses of that Specification. Any contract for the procurement of precast concrete elements which does not include these Clauses must contain a suitable clause of mutual recognition having the same effect regarding which advice should be sought.

Purpose

1.4 The purpose of this Standard is to give requirements which, when used in conjunction with the existing framework of the Overseeing Organisations' design Standards for highway structures, will improve the durability and minimize the whole-life costs of new highway structures.

Scope

1.5 The requirements of this Standard apply to the design of all the Overseeing Organisations' bridges including their retaining walls and abutments. It is not applicable to footbridges, pipe bridges and sign and signal gantries.

Implementation

1.6 This standard is to be implemented forthwith for all schemes currently being prepared provided that, in the opinion of the Overseeing Organisation, this would not result in significant additional expense or delay progress. Design Organisations should confirm its application to particular schemes with the Overseeing Organisation.

Enforcement

1.7 Where reference is made in this Standard to "adequate" or "suitable" provisions, the Overseeing Organisations shall determine whether the requirements of this Standard have been met. In this regard the decision of the Overseeing Organisations is final.

2. IMPROVED DURABILITY - THE CONCEPTUAL STAGE

Structural Continuity

2.1 Continuous structures have proved to be more durable than structures with simply supported decks, primarily because deck joints have allowed salty water to leak through to piers and abutments. In principle all bridges shall therefore be designed as continuous over intermediate supports unless special circumstances exist. Such continuity may be either full continuity of the whole deck structure or partial continuity of usually the deck slab alone.

2.2 There are serious inspection construction and maintenance problems associated with in-span discontinuities, generally referred to as half-joints. They shall therefore not be provided in bridge decks unless the agreement of the Overseeing Organisation is obtained.

2.3 In principle bridges with lengths not exceeding 60m and skews not exceeding 30° shall in addition be designed as integral bridges, with abutments connected directly to the bridge deck without movement joints for expansion or contraction of the deck. Where the designer considers that either this form of construction, known as integral construction, or a continuous structure is not appropriate, for instance where large differential settlements are anticipated or where an exceptionally high end restraint could result in unacceptable stress or deformation in the deck, articulated construction may be used with the agreement of the Overseeing Organisation.

2.4 Where clearance considerations permit, structures of the buried type shall be considered for all bridges. It should be noted that for longer bridges, the cost penalties of the use of buried structures may exceed their benefits. In doubtful cases, the Overseeing Organisation shall adjudicate whether normal or buried construction is preferable.

Plain Concrete

2.5 When designing concrete structures, consideration shall be given to all possible means of reducing or eliminating the use of corrodable reinforcement. This includes the use of plain

(mass) concrete for abutments, wing walls and retaining walls, and the use of arch structures where ground conditions permit. Where the benefits of using plain concrete are marginal the Overseeing Organisation shall adjudicate whether plain or reinforced concrete shall be used.

2.6 The requirements of BS 5400: Part 4, Clause 7.5.9, and of BD28 (DMRB 1.8), need not apply to plain concrete structures, provided that they are suitably clad or treated to conceal thermally-induced cracking. The fixings of any cladding elements shall be made using non-corrosive materials.

Access

2.7 Adequate provision for access shall be made for the following purposes:-

- a) cleaning and painting
- b) maintenance
- c) jacking, removal/replacement of bearings
- d) inspection of closed cell and box members.

In providing such access, all the requirements of the Health and Safety legislation and other relevant requirements shall be fully observed; provision for access in excess of the minimum requirements shall be adopted wherever possible.

2.8 Public use of any of the access facilities provided for bridge inspection and maintenance shall be prevented by the provision of suitable barriers, covers etc. Colonisation of accessible areas by plants, animals and birds shall be discouraged by suitable measures. This does not affect the possible specific provision of bird boxes etc for nature conservation and related purposes, but such provision shall be consistent with the need to keep all access areas clean and free of debris.

2.9 Abutment galleries shall be provided below all bridge deck expansion and rotational joints. The width and headroom clearance of galleries shall preferably be at least 1000 x 1800 mm respectively, and shall never be less than 800 x 1500 mm. All abutment galleries shall be provided with adequate permanent ventilation to the outside atmosphere, and an adequate level of natural illumination, usually via the ventilation

openings.

Grouted Duct Post-tensioning

2.10 Grouted duct post-tensioned prestressing shall not be used in the design of any type of highway structure, either for primary or secondary purposes, until further notice.

Proprietary Manufactured Structures

2.11 When a proprietary manufactured structure is to be provided by the Contractor, the maintenance policy for the structure shall be included in the Approval in Principle form, (AIP).

3. DETAILED REQUIREMENTS

Reinforcement Cover

3.1 In designing cast in-situ concrete members, the cover to reinforcement used in design and indicated on the drawings, shall be the nominal cover derived from BS 5400: Part 4 Table 13, increased by 10mm.

External Prestressing

3.2 Post-tensioned structures using external or unbonded tendons shall be detailed such that inspection of all individual tendons and their eventual replacement is possible without restricting traffic on the highway.

Drainage and Waterproofing

3.3 Systems for the drainage of surface water from bridges shall be so detailed that water is not allowed to fall freely from the bridge deck. Closed drainage systems with facilities for rodding and other necessary maintenance shall be used. Drainage systems shall be sufficiently robust to withstand damage during cleaning, and shall be resistant to all commonly occurring chemical spillage. Drainage details which are integral with the structure should be avoided where possible. Downpipes cast into piers should not be used. Drainage waters from bridge decks shall never be discharged into the drainage layers behind abutments.

3.4 Access openings on bridges shall be provided with adequately sealed and properly drained hatches or covers where necessary. Adequate ventilation and drainage holes shall be provided to all closed cell or box sections. In closed sections where access for inspection is provided, adequate provision for artificial lighting shall be made, preferably with some minimum provision for illumination by natural light.

4. REFERENCES

1 **British Standards**

BS 5400: Part 4: 1990. British Standard Code of Practice for the Design of Concrete Bridges. BSI.

2 **The Design Manual for Road and Bridges (DMRB)**

BD 28 (DMRB 1.3), Early Thermal Cracking of Concrete.

BA 57 (DMRB 1.3.8), Design for Durability.

3 **Manual of Contract Documents for Highway Works. (MCHW)**

Volume 1: Specification for Highway Works, (MCHW 1).

5. ENQUIRIES

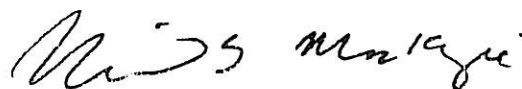
All technical enquiries or comments on this Standard should be sent in writing as appropriate to:

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