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

PART 1

BD 24/92

THE DESIGN OF CONCRETE HIGHWAY BRIDGES AND STRUCTURES USE OF BS 5400 : PART 4 : 1990

INTRODUCTION

This Departmental Standard covers the use of BS 5400: Part 4: 1990 for the design of concrete highway bridges and other structures on motorways and other trunk roads.

INSTRUCTIONS FOR USE

1. Remove existing contents pages for Volume 1.
2. Remove BD 24/84, which is superseded by BD 24/92, and archive as appropriate.
3. Insert new contents pages for Volume 1, dated December 1992.
4. Insert BD 24/92 into Volume 1, Section 3.
5. Archive this sheet as appropriate.

THE HIGHWAYS AGENCY **BD 24/92**

THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT

THE WELSH OFFICE
Y SWYDDFA GYMREIG

THE DEPARTMENT OF
THE ENVIRONMENT FOR NORTHERN IRELAND

The Design of Concrete Highway Bridges and Structures Use of BS 5400: Part 4: 1990

Summary: This Departmental Standard covers the use of BS 5400: Part 4: 1990, for the design of concrete highway bridges and other structures on motorways and other trunk roads.

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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USE OF BS 5400: PART 4: 1990

Contents

1. INTRODUCTION

General

1.1 The purpose of this Standard is to implement the latest edition of BS 5400: Part 4 which introduces a number of technical changes including the amendments contained in Appendix A of BD 24/84, Design of Concrete Bridges, Use of BS 5400: Part 4: 1984 (DMRB 1.3). The 1984 edition of BS 5400: Part 4 has been withdrawn.

1.2 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 Community 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.

Scope

1.3 This Standard covers the use of BS 5400: Part 4: 1990, for the design of structural concrete in bridges and other highway structures. It sets out the Overseeing Department's particular requirements where these differ from, or are more comprehensive than, those given in the British Standard.

Implementation

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

2. USE OF THE BRITISH STANDARD

General

2.1 The design of all concrete bridges and other highway structures which are the responsibility of the Overseeing Department shall be carried out in accordance with BS 5400: Part 4: 1990 as amended by this Standard. Where reference is made to any Part of BS 5400, this shall be taken as a reference to that Part as implemented by the Overseeing Department.

2.2 The assessment of existing bridges should be carried out in accordance with BD 44, the Assessment of Concrete Highway Bridges and Structures (DMRB 3.4).

2.3 The amendments to BS 5400: Part 4 which are necessary to meet the Overseeing Department's requirements are given in Annex A to this Standard. The amendments are listed under the relevant clause numbers of BS 5400: Part 4.

2.4 BS 5400: Part 4 as amended by this Departmental Standard supersedes the following:-

BD 24/84: Design of Concrete Bridges. Use of BS 5400: Part 4: 1984 (DMRB 1.3).

BE 1/73: Reinforced Concrete for Highway Structures (First Revision 9/8/73) (DMRB 2.3).

However, the relevant parts of BE 1/73 shall continue to be used for the design of buried pipes and culverts, except box type structures, and sign/signal gantries, pending the issue of Standards for these structures.

Additional Requirements

2.5 The clauses in BS 5400: Part 4: 1990 that are expressed in the form of recommendations using the word "should" are to be considered as mandatory.

2.6 Where reference is made in Part 4 to the relevant or appropriate "Bridge Authority", this shall be taken to be the Technical Approval Authority.

2.7 For the serviceability limit state requirements of prestressed concrete members given in clause 4.2.2 of Part 4:-

a. The following shall be considered to be lightly trafficked structures:

i. accommodation bridges;

ii. bridleway bridges;

iii. foot/cycle track bridges.

b. All members shall be checked as being in Class 2 for load combinations 2 to 5.

3. REFERENCES

The following documents are referred to in this Departmental Standard.

1. BS 5400: Steel, concrete and composite bridges: Part 4: 1990. Code of Practice for design of concrete bridges.

2. Design Manual for Roads and Bridges

Volume 1 Highway Structures: Approval Procedures and General Design

Section 3 General Design

BD 37/88 Loads for Highway Bridges (DMRB 1.3)

Volume 2 Highway Structures: Design (Substructures and Special Structures), Materials

Section 3 Materials and Components

BE 1/73 Reinforced Concrete for Highway Structures (DMRB 2.3)

Volume 3 Highway Structures: Inspection and Maintenance

Section 4 Assessment

BD 44/90 The Assessment of Concrete Highway Bridges and Structures (DMRB 3.4)

3. Manual of Contract Documents for Highway Works

Volume 1 Specification for Highway Works (MCHW 1)

4. ENQUIRIES

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

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AMENDMENTS TO BS 5400: PART 4: 1990

The following is a list of amendments necessary to meet the Overseeing Department's requirements:

Page 3 Contents, figure 5. Delete "stress".

Page 10 Clause 4.2.2. Delete "Where type HB loading is to be taken into account, only 25 units should be considered" and substitute "Live loading should generally comprise Type HA only. However, for transverse cantilever slabs, transversly and two-way spanning slabs and central reserves, the loading shall be in accordance with the composite version of BS 5400: Part 2 Clause 6.4.3 (Appendix A of BD 37/88 (DMRB 1.3)) except that only 30 units of HB loading shall be considered in any notional lane."

Page 12 Clause 4.7. Delete last paragraph beginning "For unwelded reinforcing bars", and substitute, "For unwelded reinforcing bars, the stress range under load combinations 1 to 5 for the serviceability limit state should be limited to 155 N/mm² for bars up to 16 mm diameter and to 120 N/mm² for bars exceeding 16 mm diameter".

Page 16 Table 6. Cold reduced steel wire, characteristic strength: delete "485" and substitute "460".

Page 17 Clause 5.3.2.2. Delete clause.

Page 18 Clause 5.3.3.2. Last paragraph: delete "bonding" and substitute "bending".

Page 24 Clause 5.5.3.3. Delete clause.

Page 31 Clause 5.8.6.6. First paragraph, (e): add "(See 7.3.2.3)". Third paragraph: delete "in (c) and (d)" and substitute, "in (c), (d) and (e)".

Page 38 Clause 6.3.3.2. Delete clause.

Page 48 Clause 7.3.2.1 (d). Delete "threading of bars" and substitute "parallel threading of bars and tapered threads".

Clause 7.3.2.3 (a). Delete "The" and substitute "Parallel".

Before paragraph beginning "Where there is a risk" add "(d) Taper threaded bars may be joined by the use of internally taper threaded couplers".

Delete last paragraph beginning "The structural design of special threaded connections", and substitute, "The structural design of threaded connections should be based on tests in accordance with 5.8.6.6, including behaviour under fatigue conditions where relevant. Where tests have shown the strength of the threaded connection to be greater than or equal to the characteristic strength of the parent bars, the strength of the joint may be based on the specified characteristic strength of the joined bars divided by the appropriate γ_m factor".

Page 52 page 52. In the definition of n_w delete "load per unit load" and substitute "load per unit length".