



THE HIGHWAYS AGENCY

BD 9/81



THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT



THE WELSH OFFICE  
Y SWYDDFA GYMREIG



THE DEPARTMENT OF  
THE ENVIRONMENT FOR NORTHERN IRELAND

# Implementation of BS 5400: Part 10: 1980 - Code of Practice for Fatigue

**Summary:** This Departmental Standard covers the implementation of BS 5400: Part 10 for the fatigue assessment of Highway bridges.

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

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**BD 9/81**

**IMPLEMENTATION OF BS 5400:  
PART 10: 1980 - CODE OF PRACTICE  
FOR FATIGUE**

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# **1. SCOPE**

1.1 This Departmental Standard covers the implementation of BS 5400: Part 10 (Fatigue) for use in the fatigue assessment of highway bridges. It sets out the Department's requirements as far as certain aspects of the design criteria are concerned. It does not cover the fatigue assessment of aluminium, wrought iron or cast iron members, nor steel wires and cables.

1.2 A list of corrections for minor textual errors in the British Standard is included at Appendix 1 of this Departmental Standard.

1.3 Advice concerning the use of BS 5400: Part 10 is given in the complementary Advice Note BA /81.

## **2. IMPLEMENTATION**

2.1 The fatigue assessment of bridges belonging to the Department of Transport will henceforth be carried out in accordance with the procedures set out in BS 5400: Part 10 as amended by this Departmental Standard.

2.2 This part of this British Standard will supersede Technical Memorandum BE 16 and those parts of the Interim Design and Workmanship Rules for Steel Box Girder Bridges that deal with fatigue.

## 3. DEPARTMENTAL REQUIREMENTS

### 3.1 Standard Design Criteria

Highway bridges shall normally be assessed for the standard design life of 120 years (4.1) using the standard loading (7.2.2) and the annual flow of commercial vehicles given in Table 1 of BS 5400: Part 10. However, in certain cases it may be appropriate to use a non-standard design life, a non-standard load spectrum or non-standard vehicle flows. Such cases might well include:

- i. temporary structures, if these are subject to weight restrictions, limited life or local traffic flows substantially different from standard flows
- ii. accommodation bridges where the vehicle flows and weights depend upon a particular usage eg access to a farm or factory.

In such cases though, it should be borne in mind that the usage of a particular structure may well change during its design life. In all cases the use of non-standard criteria shall be dealt with in accordance with the procedures given in the Departmental Standard BD 2/79.

### 3.2 Stress Ranges (6.1)

It should be noted that from a fatigue point of view compressive loading on a welded detail is assumed to be just as damaging as tensile loading. Therefore full account must be taken of compressive stresses when calculating the effective stress range for a welded detail.

### 3.3 Design $\sigma_r$ - N Relationship (11,2 and A,3)

The fatigue life of any detail must always be based on the 2.3% probability of failure criterion as used to obtain the design curves in Figure 14. This criterion is also implicit in the damage charts in Figure 10 and the limiting stress ranges in Figure 8.

\* The numbers in brackets are the relevant clause nos. in BS 5400: Part 10

## 4. REFERENCES

4.1 The following documents are referred to in this Departmental Standard:

1. BS 5400: Part 10: 1980 Steel, concrete and composite bridges, Part 10. Code of Practice for Fatigue.
2. Departmental Advice Note BA: The Use of BS 5400: Part 10, Code of Practice for Fatigue.
3. Departmental Standard BD 2/29: Technical Approval of Highway Structures or Trunk Roads (including Motorways), Part 1. General Procedures.
4. Technical Memorandum (Bridges) BE/16: Provisional Fatigue Requirements for Steel Bridges.
5. Inquiry into the Basis of Design and Method of Erection of Steel Box Girder Bridges: Interim Design and Workmanship Rules, Parts I, II, III and IV (HMSO)

## 5. ENQUIRIES

Technical enquiries arising from the application of this Departmental Standard to a particular project should be addressed to the appropriate Technical Approval Authority.

All other technical enquiries or comments should be addressed to:-

Assistant Chief Engineer  
Bridges Engineering Design Standards Division  
Department of Transport  
St Christopher House  
Southwark Street  
LONDON SE1 0TE

All enquiries concerning the distribution of this Departmental Standard should be addressed to:

Administration of Road Construction 1  
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# CORRECTIONS TO BS 5400: PART 10: 1980

Page Number

4	5.1.2.2	Paragraph 1, Lines 6, 7 and 8 Delete statement within brackets.
5	6.2.1	Figure 1 Delete "M <sup>1</sup> ,P <sup>1</sup> ", insert "M <sub>1</sub> ,P <sub>1</sub> ".
5	6.3	Figure 2 Delete " $\sigma_N, \sigma_t$ ", on axis, insert " $\sigma_n \sigma_t$ ".
8	7.2.5	Paragraph 1, Line 9 Delete "127 <sub>r</sub> ", insert "127r".
17	8.3.2	Figure 11 Insert bold line on graph for K <sub>F</sub> 1.2.2 from L = 1 to L = 2.5.
20	9.2.4	Paragraph 1, Line 8 Delete "at", insert "of".
21	11.2	Figure 14 Insert "of" after "summary" in title.
22	11.2	Paragraph 1, Line 4 Delete "16", insert "14".
25	B1	Paragraph 1, Line 6 Delete "of the graph".
25	Appendix C	Title, Line 1 Delete ";".
30	D.2.2	Paragraph 1, Line 1 Delete "These", insert "To".
32	D.3.3	Paragraph 1, Line 3 Delete "(see also figure 1)".
36	E.1	Figure 19, NOTE Line 2 Delete "F,", insert ", F".
45	H.4.1	Figure 26, NOTE The note does not refer specifically to Figure 26 but should be included as part of the general text of H.4.1.
45	H.4.3	Sub-clause 1, Type 3.1, Line 6 Delete "5.1.2.5", insert "5.1.2.4".
46	H.4.3	Sub-clause 9, Types 3.7 and 3.8, Paragraph 2, Line 7 Delete "lameller", insert "lamellar".



**Appendix 1**

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49,51,53	H.1.1	Tables 17(a), 17(b) and 17(c) Delete "†" Important features that change significantly from one type of another .". Delete "†" where it occurs attached to class letters in the tables.
49	H.1.1	Table 17(a), Type 1.12, Special design stress parameter Delete "7.5", insert "6.5".
51	H.1.1	Table 17(b), Type 2.12, Manufacturing Requirement Delete "plus", insert "g".
53	H.1.1	Table 17 (c), Type 3.3 and 3.4, Dimensional requirements Delete "(see footnote)".
53	H.1.1	Table 17(c) Types 3.1 to 3.6, Manufacturing requirements Delete "weld and ground", insert "weld ends ground".