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BSI Group
389 Chiswick High Road
London, W4 4AL
United Kingdom

T: +44 20 845 086 9001
F: +44 20 8996 7400
cservices@bsigroup.com

British Standards Limited
Registered in England no: 07864997
Registered address: 389 Chiswick High Road

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Steel, concrete and composite bridges

Part 4. Code of practice for design of concrete bridges

Ponts en acier, ponts en béton, ponts mixtes
Partie 4. Règles pour le calcul des ponts en béton

Brücken aus Stahl, Beton und Verbundbau
Teil 4. Richtlinie für den Entwurf und die Bemessung von Stahlbetonbrücken

British Standards Institution

Gr 8

Contents

Tables

Appendices

Figures

Foreword

BS 5400 is a document combining codes of practice to cover the design and construction of steel, concrete and composite bridges and specifications for the loads, materials and workmanship. It comprises the following :

Part 1 General statement
Part 2 Specification for loads
Part 3* Code of practice for design of steel bridges
Part 4 Code of practice for design of concrete bridges
Part 5* Code of practice for design of composite bridges
Part 6 Specification for materials and workmanship. Steel
Part 7 Specification for materials and workmanship. Concrete, reinforcement and prestressing tendons
Part 8 Recommendations for materials and workmanship. Concrete, reinforcement and prestressing tendons
Part 9* Code of practice for bearings
Part 10* Code of practice for fatigue

*In course of preparation

British Standard

Steel, concrete and composite bridges

Part 4. Code of practice for design of concrete bridges

1. Scope

This Part of this British Standard deals with the design of concrete bridges. It contains much in common with CP 110 'The structural use of concrete'.

After stating the objectives and requirements of design, particular requirements are given for reinforced concrete, prestressed concrete and composite concrete construction.

Structural elements included are beams, slabs, columns and walls, bases, tension members and connections between precast concrete members.

2. References

The titles of the standards publications referred to in this Part of this British Standard are listed on the inside back cover.

3. Definitions and symbols

3.1 Definitions. For definitions see Part 1. For the sake of clarity the factors which together comprise the partial safety factor for loads are restated as follows.

design loads are the loads obtained by multiplying the characteristic loads by γ_f, the partial safety factor for loads. γ_f is a function of three individual factors, γ_{f1}, γ_{f2} and γ_{f3}, which take account of the following.

- γ_{f1} possible unusual increases in load beyond those considered in deriving the characteristic load;
- γ_{f2} reduced probability that, with combinations of load, the individual loads would all be at their characteristic values;
- γ_{f3} inaccurate assessment of effects of loading, unforeseen stress redistribution in structure, variation in dimensional accuracy achieved in construction and the importance of the limit state being considered.

The relevant values of the function γ_{fL} $(=\gamma_{f1}.\gamma_{f2})$ are given in Part 2.

The values of γ_{f3} are given in clause **5.**

3.2 Symbols. The symbols in this Part of this standard are as follows.

A_c	Area of concrete
A_{cf}	Area of effective concrete flange
A_o	Area enclosed by the median wall line
A_{ps}	Area of prestressing tendons
A'_s	Area of compression reinforcement
A'_{s1}	Area of compression reinforcement in the more highly compressed face
A_s	Area of tension reinforcement
A_{s2}	Area of reinforcement in other face
A_{sc}	Area of longitudinal reinforcement (for columns)
A_{sL}	Cross-sectional area of longitudinal reinforcement provided for torsion
A_{sv}	Cross-sectional area of the two legs of a link
A_t	Area of transverse reinforcement
a	Deflection
a'	Distance from compression face to point at which the crack width is being calculated
a_b	Distance between bars
a_{cent}	Distance of the centroid of the concrete flange from the centroid of the composite section
a_{cr}	Distance from the point (crack) considered to the surface of nearest longitudinal bar
a_s	Distance of the centroid of the steel from the centroid of the net concrete section
b	Width of section
b_c	Breadth of compression face
b_e	Width of contact surface (between in situ and precast components)
b_t	Breadth of section at level of tension reinforcement
b_w	Breadth of web or rib of a member
C	Torsional constant
c_{min}	Minimum cover to tension steel
D_c	Density of concrete at time of test
d	Effective depth of tension reinforcement
d'	Depth to compression reinforcement
d_c	Depth of concrete in compression
d_o	Depth to additional reinforcement to resist horizontal loading
d_t	Effective depth in shear
d_2	Depth to reinforcement
E_c	Static secant modulus of elasticity of concrete
E_{cf}	Modulus of elasticity of flange concrete
E_{cq}	Dynamic tangent modulus of elasticity of concrete
E_s	Modulus of elasticity of steel
e	Base of Napierian logarithms
e	Eccentricity
e_a	Additional eccentricity due to deflections in walls
e_x	Resultant eccentricity of load at right angles to plane of wall
e_{x1}	Resultant eccentricity calculated at top of wall
e_{x2}	Resultant eccentricity calculated at bottom of wall
F_{bst}	Tensile bursting force
F_{bt}	Tensile force due to ultimate loads in a bar or group of bars
F_h	Maximum horizontal ultimate load
F_v	Maximum vertical ultimate load
f_{bs}	Bond stress
f_{cav}	Average compressive stress in the flexural compressive zone
f_{ci}	Concrete strength at (initial) transfer
f_{cj}	Stress in concrete at application of an increment of stress at time j