

**BRITISH STANDARD CODE OF PRACTICE
CP 114: 1969**

**THE STRUCTURAL USE OF
REINFORCED CONCRETE
IN BUILDINGS**

**Incorporating amendments issued August 1973 (AMD 1241),
August 1974 (AMD 1552), March 1976 (AMD 1923)
and July 1977 (AMD 2304)**

**THE COUNCIL FOR CODES OF PRACTICE
BRITISH STANDARDS INSTITUTION
British Standards House, 2 Park Street, London, W.1**

CP 114 has been prepared by a Committee convened by the Codes of Practice Committee for Building. Having been endorsed by the Council for Codes of Practice, it was published under the authority of the Executive Board on 16th January, 1969.

SBN: 580 00469 4

First published, April, 1948.

First revision, June, 1957.

Reset and reprinted, February, 1965.

Published in metric form as Part 2, January, 1969.

This Code incorporates the amendments to CP114 issued in February, 1965 (PD 5463) and May, 1967 (PD 6151).

This Code of Practice makes reference to the following British Standards and British Standard Codes of Practice:

- B.S. 12. Portland cement (ordinary and rapid hardening).
- B.S. 146. Portland-blastfurnace cement.
- B.S. 449. The use of structural steel in building.
- B.S. 648. Schedule of weights of building materials.
- B.S. 693. General requirements for oxy-acetylene welding of mild steel.
- B.S. 785. Rolled steel bars and hard drawn steel wire for concrete reinforcement.
- B.S. 812. Methods for sampling and testing of mineral aggregates, sands and fillers.
- B.S. 877. Foamed blastfurnace slag for concrete aggregate.
- B.S. 882. Concrete aggregates from natural sources.
- B.S. 1014. Pigments for Portland cement and Portland cement products.
- B.S. 1047. Air-cooled blastfurnace slag coarse aggregate for concrete.
- B.S. 1200. Building sands from natural sources.
- B.S. 1370. Low heat Portland cement.
- B.S. 1881. Methods of testing concrete.
- B.S. 3148. Tests for water for making concrete.
- B.S. 3763. International systems (SI) units.

*As added
July, 1977*

- B.S. 3892. Pulverized-fuel ash for use in concrete. *As added July, 1977*
B.S. 3921. Clay bricks and blocks.
B.S. 4027. Sulphate-resisting Portland cement. *As added July, 1977*
B.S. 4248. Supersulphated cement.
B.S. 4449. Hot rolled steel bars for the reinforcement of concrete.
B.S. 4461. Cold worked steel bars for the reinforcement of concrete.
B.S. 4466. Bending dimensions and scheduling of bars for the reinforcement of concrete.
B.S. 4483. Steel fabric for the reinforcement of concrete.
B.S. 5075. Concrete admixtures.
B.S. 5135. Metal-arc welding of carbon and carbon manganese steels.
CP 3. Code of basic data for the design of buildings. Chapter V. Loading. Part 1 Dead and imposed loads. Part 2 Wind loads.
CP 110. The structural use of concrete.
CP 111. Structural recommendations for load-bearing walls.
CP 116. Structural use of precast concrete.
CP 231. Painting.

British Standard Codes of Practice are revised, when necessary, by the issue either of amendment slips or of revised editions. It is important that users ascertain that they are in possession of the latest amendments or editions.

The following B.S.I. reference relates to the work on this Code of Practice:
Committee reference BLC/7

CODE DRAFTING COMMITTEE BLCP/7 THE STRUCTURAL USE OF REINFORCED CONCRETE

(Secretariat: Institution of Structural Engineers)

Dr. D. D. Matthews (*Chairman*)

Representing

Mr. D. H. Orme	<i>Association of Constructional Floor Specialists</i>
Mr. E. O. Measor	<i>Association of Consulting Engineers</i>
Mr. C. A. Tysall	<i>British Rail Board</i>
Mr. J. B. Oldfield } Mr. K. Newman } Mr. J. J. Rendell } Dr. A. M. Burdon } Dr. S. C. C. Bate } Mr. A. W. Hill } Dr. R. E. Rowe }	<i>British Ready-mixed Concrete Association</i>
Mr. R. I. Lancaster	<i>British Standards Institution</i>
Mr. R. B. Hill	<i>British Steel Industry</i>
Mr. E. W. Bunn	<i>Building Research Station</i>
Mr. D. Sheriff	<i>Cement and Concrete Association</i>
Professor A. L. L. Baker	<i>Concrete Steel Reinforcement Association</i>
Mr. Neville Borg	<i>Federation of Civil Engineering Contractors</i>
Mr. G. F. Eley } Mr. J. E. Guest } Dr. D. D. Matthews }	<i>Greater London Council</i>
Mr. H. C. Adams	<i>Incorporated Association of Architects and Surveyors</i>
Mr. F. Boeuf	<i>Institution of Civil Engineers</i>
Mr. G. Isaac	<i>Institution of Municipal Engineers</i>
Mr. J. A. Loe	<i>Institution of Structural Engineers</i>
Mr. Peter J. Lord-Smith	<i>Ministry of Public Building and Works</i>
Mr. D. L. Hollingsworth	<i>Ministry of Transport</i>
Mr. C. V. Blumfield	<i>National Federation of Building Trade Employers</i>
	<i>Road Research Laboratory</i>
	<i>Royal Institute of British Architects</i>
	<i>Royal Institution of Chartered Surveyors</i>
	<i>The Concrete Society</i>

CONTENTS

Foreword	Page 11
SECTION ONE: GENERAL	
101. Scope	12
102. Definitions	12
103. Symbols	13
SECTION TWO: MATERIALS, APPLIANCES AND COMPONENTS	
201. Cement	15
202. Aggregates	16
203. Maximum size of coarse aggregates	17
204. Sands for mortar	17
205. Water	17
205A. Admixtures.	17
206. Reinforcement	18
207. Concrete	19
208. Nominal concrete mixes	20
209. Designed concrete mixes	23
210. Durability	28
SECTION THREE: DESIGN CONSIDERATIONS	
SUBSECTION 3A: GENERAL	
301. Basis of design	31
302. Loadings	32
303. Permissible stresses in concrete	32
304. Permissible stresses in reinforcement	34
305. Increases of permissible stresses due solely to wind forces	37
306. Calculation of resistance moments of beams and slabs by the load-factor method	37
307. Cover	40
308. Distance between bars	40
309. Stiffness of members	41
310. Bond and anchorage	42
SUBSECTION 3B: BEAMS AND SLABS	
311. General	45
312. Bending moments	47
313. Bending moments in beams and slabs spanning in one direction	47

*As added
July, 1977*

CONTENTS (continued)

	Page
314. Bending moments in slabs spanning in two directions at right angles with uniformly distributed loads	48
315. Trimming for openings	53
316. Resistance to shear	53
317. Distribution of concentrated loads on slabs	54
318. Bearings for slabs on steel joists	56
319. Floors and roofs of ribbed and hollow block construction	56
320. Floors and roofs of precast construction	58
SUBSECTION 3C: COLUMNS	
321. Reinforcement in columns	58
322. Permissible loads on columns	59
SUBSECTION 3E: WALLS	
339. Reinforced concrete walls	64
SUBSECTION 3F: BASES	
340. Bases for reinforced concrete columns and walls	65
SUBSECTION 3G: STAIRS	
341. Distribution of loading on stairs	66
342. Effective span of stairs	67
SUBSECTION 3H: REINFORCED LIGHTWEIGHT-AGGREGATE CONCRETE	
343. General	68
344. Permissible stresses in reinforced lightweight-aggregate concrete	68
345. Permissible stresses in reinforcement	69
346. Stiffness of members	69
347. Permissible loads on columns	70
348. Reinforced concrete walls	70
349. Modular ratio	70
350. Cover	70
SUBSECTION 3J: RESISTANCE TO FIRE	
351. Fire resistance of reinforced concrete	71

CONTENTS (continued)

	Page
SUBSECTION 3K: RESISTANCE TO CHEMICAL ATTACK	
352. Effects of chemical reagents	71
SUBSECTION 3L: STABILITY	
353. Stability	71
354. Ties	72
SECTION FOUR: WORK OFF SITE	
401. General	73
SECTION FIVE: WORKMANSHIP	
501. Concrete	73
502. Steel	75
503. Formwork	76
504. Fixing blocks	76
SECTION SIX: TESTING AND INSPECTION	
601. Methods of testing concrete	77
602. Field method of determining the necessary adjustment for the bulking of fine aggregate	79
603. Bond tests	80
604. Inspection	82
605. Load testing of structures	82
SECTION SEVEN: MAINTENANCE AND PROTECTION	
701. General	83
TABLES	
1. Proportions and strength requirements for nominal concrete mixes with Portland cement or Portland-blastfurnace cement and with aggregates complying with B.S. 882 or B.S. 1047.	21
3. Transverse strengths of concrete	23
4. Strength requirements for designed concrete mixes	24
5. Standard mixes	30

	Page
6. Permissible stresses for nominal concrete mixes with Portland cement or Portland-blastfurnace cement and with aggregates complying with B.S. 882 or B.S. 1047	32
8. Permissible compressive stresses for designed concrete mixes	34
9. Age factor for permissible compressive stresses in concrete	34
10. Permissible shear and bond stresses for designed concrete mixes	35
11. Permissible stresses in steel reinforcement	36
12. Values of γ for computing moment of resistance based on the strength of the concrete in compression	39
13. Permissible values of span/depth ratio of beams and slabs	41
14. Stress reduction coefficient for slender beams	45
15. Approximate values of bending moments in uniformly loaded beams and slabs continuous over three or more approximately equal spans	48
16. Bending moment coefficients for slabs spanning in two directions at right angles simply supported on four sides	49
17. Bending moment coefficients for rectangular panels supported on four sides with provision for torsion at corners	51
18. Reduction coefficient for loads on long columns	60
19. Effective column length	60
20. Moments in columns	61
23. Stress increase for walls	65
24. Lightweight-aggregate concrete: permissible values of the span/depth ratio of all beams, and of slabs with an imposed load exceeding 3 kN/m ²	69
25. Reduction coefficients for loads on long columns	70

FIGURES

1. Types of hook for mild steel bars	43
2. Division of slab into middle and edge strips	50

CONTENTS (continued)

	Page
3. Diagram showing the load carried by supporting beams	52
4. Effective width of solid slab carrying a concentrated load near an unsupported edge	55
7. Loading on stairs with open wells	66
8. Loading on stairs built into walls	67
9. Effective span for stairs supported at each end by landings spanning parallel with the risers	67

This Code of Practice represents a standard of good practice and therefore takes the form of recommendations. Compliance with it does not confer immunity from relevant legal requirements, including byelaws.

Attention is however drawn to the fact that in certain byelaws, notably those building byelaws based upon one of the models issued for England and Wales and for Northern Ireland, and in the Scottish Building Regulations, compliance with the provisions of certain British Standards or British Standard Codes of Practice, or of specific clauses therein, is 'deemed to satisfy' the requirements of certain of the byelaws in the fields covered by the British Standards and Codes of Practice, or by the specific clauses referred to.