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**EUROCODE 4 : DESIGN OF COMPOSITE
STEEL AND CONCRETE STRUCTURES - PART
2 : COMPOSITE BRIDGES**

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EUROPEAN PRESTANDARD

ENV 1994-2 : 1997

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EUROPAISCHE VORNORM

English version

EUROCODE 4: Design of composite steel and concrete structures

Part 2: Composite Bridges

Calcul des structures mixtes acier-béton

Bemessung und Konstruktion von
Verbundtragwerken aus Stahl und Beton

Partie 2: Ponts mixtes

Teil 2: Verbundbrücken

CEN

European Committee for Standardization
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Foreword

rep.

Objectives of the Eurocodes

- (1) The Structural Eurocodes comprise a group of standards for the structural and geotechnical design of buildings and civil engineering works.
- (2) They cover execution and control only to the extent that is necessary to indicate the quality of the construction products, and the standard of the workmanship, needed to comply with the assumptions of the design rules.
- (3) Until the necessary set of harmonised technical specifications for products and for methods of testing their performance is available, some of the Structural Eurocodes cover some of these aspects in informative annexes.

Background to the Eurocode Programme

- (4) The Commission of the European Communities (CEC) initiated the work of establishing a set of harmonised technical rules for the design of building and civil engineering works which would initially serve as an alternative to the different rules in force in the various Member States and would ultimately replace them. These technical rules became known as the 'Structural Eurocodes'.
- (5) In 1990, after consulting their respective Member States, the CEC transferred the work of further development, issue and updating of the Structural Eurocodes to CEN, and the EFTA Secretariat agreed to support the CEN work.
- (6) CEN Technical Committee CEN/TC 250 is responsible for all Structural Eurocodes.

Eurocode programme

- (7) Work is in hand on the following Structural Eurocodes, each generally consisting of a number of parts :

EN 1991	Eurocode 1	Basis of design and actions on structures
EN 1992	Eurocode 2	Design of concrete structures
EN 1993	Eurocode 3	Design of steel structures
EN 1994	Eurocode 4	Design of composite steel and concrete structures
EN 1995	Eurocode 5	Design of timber structures
EN 1996	Eurocode 6	Design of masonry structures
EN 1997	Eurocode 7	Geotechnical design
EN 1998	Eurocode 8	Design of structures for earthquake resistance
EN 1999	Eurocode 9	Design of aluminium alloy structures

- (8) A separate sub-committee has been formed by CEN/TC250 for each of the Eurocodes listed above.
- (9) This Part of ENV 1994 is being published as a European Prestandard (ENV) with an initial life of three years.
- (10) This Prestandard is intended for experimental application and for submission of comments.

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(11) After approximately two years CEN members will be invited to submit formal comments on this Prestandard to be taken into account in determining future action.

(12) Meanwhile feedback and comments on this Prestandard should be sent to the Secretariat of Sub-committee CEN/TC250/SC4 at the following address :

National Standards Authority of Ireland, Glasvenin, Dublin 9, Ireland
Telephone international 353 1 807 38 00
Fax international 353 1 807 38 38

or to your national Standards Organisation.

National Application Documents

(13) In view of the responsibilities of authorities in member countries for safety, health and other matters covered by the essential requirements of the Construction Products Directive (CPD), certain safety elements in this ENV have been assigned indicative values which are identified by □ ("boxed values"). The authorities in each member country are expected to review the "boxed values" and may substitute alternative definitive values for these safety elements for use in national application.

(14) Some of the necessary supporting European or International Standards may not be available by the time this Prestandard is issued. It is therefore anticipated that a National Application document (NAD) giving any mandatory values to be substituted for "boxed" values, referencing compatible supporting Standards and providing guidance on the national application of this Prestandard, will be issued by each member country or its Standards Organisation.

(15) It is intended that this Prestandard will be used in conjunction with the particular NAD valid in the country in which the bridge is to be located.

Matters specific to this prestandard

(16) The scope of Eurocode 4 is defined in clause 1.1 of ENV 1994-1-1:1992 and the scope of this part of Eurocode 4 is defined in 1.1.2.

(17) Bridges are essentially public works, for which :

- the European Directive 93-37/CEC on Public Procurement is particularly relevant, and
- public authorities have responsibilities as owners.

Within this context this Prestandard has been established with two main objectives :

- to be sufficiently precise and comprehensive for contractual use,
- to be sufficiently flexible to allow the intervening parties fully to exert their technical responsibilities.

(18) Because of the responsibilities of relevant authorities for bridges, it has been anticipated that, for the application of this Part, it will be supplemented by :

- general complementary rules and options to be provided by National Application Documents (NAD - see (14)) and
- complementary and/or modifying specifications for particular projects.

Wherever this Prestandard mentions "unless otherwise specified", it is intended that the relevant authorities (to be identified, if relevant, in the particular NADs) will remain free to intervene at each of these two levels. It is the same where this Prestandard refers to the "client", if the client is not the relevant authority itself.

(19) Concerning the treatment of γ_M for structural steel, 0.5.2 of ENV 1994-1-1:1992 is applicable.

(20) The framework and structure of this Part 2 correspond to ENV 1994-1-1:1992. However, ENV 1994-2:1997 contains Principles and Application Rules which are specific to composite bridges.

(21) Some Principles and Application Rules in ENV 1994-1-1:1992 are modified or replaced. The new provisions are identified by the symbols *mod.* or *rep.*, respectively.

(22) Where a new Principle or Application Rule is added, it is identified by the symbol *add.*

(23) Any clause, subclause, or paragraph of ENV 1994-1-1:1992 that is neither modified or replaced, is applicable. These provisions are not repeated in this ENV 1994-2:1997.

(24) For the application of this Part 2 it is assumed that the intervening parties :

- select from ENV 1991-3:1995 the relevant traffic load models and take the necessary complementary decisions about actions,
- define, with regard to the type of bridge under consideration (see 1.1.2) and the environmental conditions of exposure, the verification criteria for the serviceability limit states.

1. General

1.1 Scope

1.1.2. Scope of ENV 1994-2:1997

rep.

- (1) P ENV 1994-2:1997 gives a general basis for the design of composite bridges.
- (2) P In addition ENV 1994-2:1997 gives a specific basis for the design of composite structures and members for bridges such as road, railway, and pedestrian bridges, and detailed rules for composite bridge structures such as beam and slab bridge decks, box girders, trusses and columns that support bridge decks.
- (3) No application rules are given for the use of unbonded tendons or for cable stayed bridges.
- (4) P For the use of composite slabs in bridges, see 7.1.1.
- (5) P For the use of filler beam decks, see annex K.
- (6) P Provisions for the design of high strength cables, bearings and expansion joints are given in annexes A, B and E of ENV 1993-2:1997.
- (7) P The implicit inclusion of a type of bridge or a form of structure (as defined in 1.4.1(2)) does not imply that all details of its design are covered comprehensively.
- (8) For the execution of steel structures, reference should be made to ENV 1090-5.

1.1.3 Further Parts of ENV 1994

Clause 1.1.3 does not apply.

1.2 Distinction between principles and application rules

- (3) P The principles are identified by the letter P following the paragraph number.
mod.
- (6) In this Part, Application Rules have only a paragraph number, e.g. as this paragraph.
mod.

NOTE : Tables and figures have the same status as the paragraphs to which they relate.

1.3 Assumptions

rep.

- (1) P The assumptions given in clause 1.3(1) of ENV 1992-1-1:1991 and 1993-1-1:1992 are applicable.
- (2) P The design procedures are valid only when the requirements for execution and workmanship given in Section 9 are also complied with.
- (3) P For numerical values identified by □, see Foreword paragraph (13).

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