NOT FOR SALE
OUTSIDE SINGAPORE

SINGAPORE STANDARD

SS EN 1994-2 : 2011

EN 1994-2 : 2005, IDT

(ICS 91.010.30; 91.080.10; 91.080.40; 93.040)

Eurocode 4 : Design of composite steel and concrete structures –

Part 2 : General rules and rules for bridges

This national standard is the identical implementation of EN 1994-2 : 2005 and is adopted with permission of CEN, Avenue Marnix 17, 1000 Brussels

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National Foreword

This Singapore Standard was prepared by the Technical Committee on Building Structure and Sub-structure under the direction of the Building and Construction Standards Committee.

This SS EN is the identical implementation of EN 1994-2 : 2005 ‘Eurocode 4 : Design of composite steel and concrete structures – Part 2 : General rules and rules for bridges’ (incorporating the CEN Corrigendum, July 2008 denoted by AC> <AC) and is adopted with permission of CEN, Avenue Marnix 17, 1000 Brussels.

Attention is drawn to the following:

– The comma has been used throughout as a decimal marker whereas in Singapore Standards, it is a practice to use a full point on the baseline as the decimal marker.

– The Singapore Standards which implement international or European publications referred to in this document may be found in the SS Electronic Catalogue at: http://www.singaporestandardseshop.sg

The EN gives values with notes indicating where national choices may be made. Where a normative part of the EN allows for national choice to be made, the range and possible choice will be given in the normative text, and a note will qualify it as a Nationally Determined Parameter (NDP). NDPs can be a specific value for a factor, a specific level or class, a particular method or a particular application rule if several are proposed in the EN.

The requirements of this SS EN 1994-2 : 2011 are to be read in conjunction with the Singapore National Annex (NA) to SS EN 1994-2 : 2011 which contains information on the Singapore Nationally Determined Parameters and is published separately.

National choice is allowed in EN 1994-2 through the following clauses:

(1) In the general rules described in the following subsclauses of SS EN 1994-2 : 2011, which come from SS EN 1994-1-1 : 2009:

– 2.4.1.1 (1)	– 2.4.1.2 (5)P	– 6.6.3.1 (1)

(2) In the specific rules for bridges described in the following subclauses of SS EN 1994-2:2011:

– 1.1.3 (3)	– 6.2.2.5 (3)	– 6.8.2 (1)
– 2.4.1.2 (6)P	– 6.3.1 (1)	– 7.4.1 (4)
– 5.4.4 (1)	– 6.6.1.1. (13)	– 7.4.1 (6)
– 6.2.1.5 (9)	– 6.8.1 (3)	– 8.4.3 (3)

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Attention is also drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. SPRING Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards are subject to periodic review to keep abreast of technological changes and new technical developments. The changes in Singapore Standards are documented through the issue of either amendments or revisions.*

2. *Compliance with a Singapore Standard does not exempt users from legal obligations.*

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1994-2

October 2005

ICS 91.010.30; 91.080.10; 91.080.40; 93.040

Supersedes ENV 1994-2:1997
Incorporating corrigendum July 2008

English Version

Eurocode 4 - Design of composite steen and concrete structures - Part 2: General rules and rules for bridges

Eurocode 4 - Calcul des structures mixtes acier-béton - Partie 2: Règles générales et règles pour les ponts

Eurocode 4 - Bemessung und konstruktion von Verbundtragwerken aus Stahl und Beton - Teil 2: Allgemeine Bemessungsregeln und Anwendungsregeln für Brücken

This European Standard was approved by CEN on 7 July 2005.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Ref. No. EN 1994-2:2005: E

Contents

Foreword

This document (EN 1994-2:2005), Eurocode 4: Design of composite steel and concrete structures, Part 2: General rules and rules for bridges, has been prepared on behalf of Technical Committee CEN/TC 250 "Structural Eurocodes", the Secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 2006, and conflicting national standards shall be withdrawn at the latest by March 2010.

This document supersedes ENV 1994-2:1994.

CEN/TC 250 is responsible for all Structural Eurocodes.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Background of the Eurocode programme

In 1975, the Commission of the European Community decided on an action programme in the field of construction, based on article 95 of the Treaty. The objective of the programme was the elimination of technical obstacles to trade and the harmonisation of technical specifications.

Within this action programme, the Commission took the initiative to establish a set of harmonised technical rules for the design of construction works which, in a first stage, would serve as an alternative to the national rules in force in the Member States and, ultimately, would replace them.

For fifteen years, the Commission, with the help of a Steering Committee with Representatives of Member States, conducted the development of the Eurocodes programme, which led to the first generation of European codes in the 1980s.

In 1989, the Commission and the Member States of the EU and EFTA decided, on the basis of an agreement[1] between the Commission and CEN, to transfer the preparation and the publication of the Eurocodes to CEN through a series of Mandates, in order to provide them with a future status of European Standard (EN). This links *de facto* the Eurocodes with the provisions of all the Council's Directives and/or Commission's Decisions dealing with European standards (*e.g.* the Council Directive 89/106/EEC on construction products - CPD - and Council Directives 93/37/EEC, 92/50/EEC and 89/440/EEC on public works and services and equivalent EFTA Directives initiated in pursuit of setting up the internal market).

The Structural Eurocode programme comprises the following standards generally consisting of a number of Parts:

EN 1990	Eurocode :	Basis of Structural Design
EN 1991	Eurocode 1:	Actions on structures
EN 1992	Eurocode 2:	Design of concrete structures

[1] Agreement between the Commission of the European Communities and the European Committee for Standardisation (CEN) concerning the work on EUROCODES for the design of building and civil engineering works (BC/CEN/03/89).

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 structures

Eurocode standards recognise the responsibility of regulatory authorities in each Member State and have safeguarded their right to determine values related to regulatory safety matters at national level where these continue to vary from State to State.

Status and field of application of Eurocodes

The Member States of the EU and EFTA recognise that Eurocodes serve as reference documents for the following purposes:

– as a means to prove compliance of building and civil engineering works with the essential requirements of Council Directive 89/106/EEC, particularly Essential Requirement N°1 – Mechanical resistance and stability – and Essential Requirement N°2 – Safety in case of fire ;

– as a basis for specifying contracts for construction works and related engineering services ;

– as a framework for drawing up harmonised technical specifications for construction products (ENs and ETAs)

The Eurocodes, as far as they concern the construction works themselves, have a direct relationship with the Interpretative Documents[2] referred to in Article 12 of the CPD, although they are of a different nature from harmonised product standards[3]. Therefore, technical aspects arising from the Eurocodes work need to be adequately considered by CEN Technical Committees and/or EOTA Working Groups working on product standards with a view to achieving full compatibility of these technical specifications with the Eurocodes.

The Eurocode standards provide common structural design rules for everyday use for the design of whole structures and component products of both a traditional and an innovative nature. Unusual forms of construction or design conditions are not specifically covered and additional expert consideration will be required by the designer in such cases.

National Standards implementing Eurocodes

The National Standards implementing Eurocodes will comprise the full text of the Eurocode (including any annexes), as published by CEN, which may be preceded by a National title page and National foreword, and may be followed by a National annex.

[2] According to Art. 3.3 of the CPD, the essential requirements (ERs) shall be given concrete form in interpretative documents for the creation of the necessary links between the essential requirements and the mandates for harmonised ENs and ETAGs/ETAs.

[3] According to Art. 12 of the CPD the interpretative documents shall :

a) give concrete form to the essential requirements by harmonising the terminology and the technical bases and indicating classes or levels for each requirement where necessary ;

b) indicate methods of correlating these classes or levels of requirement with the technical specifications, *e.g.* methods of calculation and of proof, technical rules for project design, etc. ;

c) serve as a reference for the establishment of harmonised standards and guidelines for European technical approvals.

The Eurocodes, *de facto*, play a similar role in the field of the ER 1 and a part of ER 2.

The National annex may only contain information on those parameters which are left open in the Eurocode for national choice, known as Nationally Determined Parameters, to be used for the design of buildings and civil engineering works to be constructed in the country concerned, *i.e.*:

- values and/or classes where alternatives are given in the Eurocode,
- values to be used where a symbol only is given in the Eurocode,
- country specific data (geographical, climatic, etc.), e.g. snow map,
- the procedure to be used, where alternative procedures are given in the Eurocode.

It may also contain

- decisions on the use of informative annexes, and
- references to non-contradictory complementary information to assist the user to apply the Eurocode.

Links between Eurocodes and harmonised technical specifications (ENs and ETAs) for products

There is a need for consistency between the harmonised technical specifications for construction products and the technical rules for works[4]. Furthermore, all the information accompanying the CE Marking of the construction products which refer to Eurocodes shall clearly mention which Nationally Determined Parameters have been taken into account.

Additional information specific to EN 1994-2

EN 1994-2 describes the Principles and requirements for safety, serviceability and durability of composite steel and concrete structures, together with specific provisions for bridges. It is based on the limit state concept used in conjunction with a partial factor method.

EN 1994-2 is intended for use by:

– committees drafting other standards for structural design and related product, testing and execution standards ;
– clients (e.g. for the formulation of their specific requirements on reliability levels and durability);
– designers and constructors ;
– relevant authorities.

EN 1994-2 contains the general rules from EN 1994-1-1 and specific rules for the design of composite steel and concrete bridges or composite members of bridges.

EN 1994-2 is intended to be used with EN 1990, the relevant parts of EN 1991, EN 1993 for the design of steel structures and EN 1992 for the design of concrete structures.

Numerical values for partial factors and other reliability parameters are recommended as basic values that provide an acceptable level of reliability. They have been selected assuming that an appropriate level of workmanship and of quality management applies. When EN 1994-2 is used as a base document by other CEN/TCs the same values need to be taken.

[4] see Art.3.3 and Art.12 of the CPD, as well as clauses 4.2, 4.3.1, 4.3.2 and 5.2 of ID 1.

National Annex for EN 1994-2

This standard gives alternative procedures, values and recommendations for classes with notes indicating where national choices may have to be made. Therefore, the National Standard implementing EN 1994-2 should have a National annex containing all Nationally Determined Parameters to be used for the design of bridges to be constructed in the relevant country.

National choice is allowed in the general rules coming from EN 1994-1-1: 2004 through the following clauses:

- 2.4.1.1(1)
- AC1) - 2.4.1.2(5)P (AC1
- 6.6.3.1(1)

National choice is allowed for the specific rules for bridges through the following clauses:

1.1.3(3)
AC1) 2.4.1.2(6)P (AC1
5.4.4(1)
6.2.1.5(9)
6.2.2.5(3)
6.3.1(1)
6.6.1.1(13)
6.8.1(3)
6.8.2(1)
7.4.1(4)
7.4.1(6)
8.4.3(3)