SPECIFICATION OF WIND ACTIONS IN EN 1991-1-4

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1. Introduction

1.1 Development of Eurocodes

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 harmonized 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 the CEN.
These standards are based on the Council Directive 89/106/EEC "The Construction Products Directive" and its Interpretative Documents ID1 and ID2. The development of the Eurocodes has proceeded since then. First, a series of ENV – documents has been produced, which are now followed by EN – documents. The ENV documents have been in use, together with National Application Documents (NAD). Where the status of the ENV documents, together with the NAD's was to serve as alternative of the current national standards, the EN documents are meant to replace all national standards. On April 1st, 2010, all national standards in all CEN countries should be replaced by the Eurocode. All Eurocodes, however, include a National Annex, to specify values for which the Eurocode leaves national choice open. Without National Annex, and without translation in the official language of the country considered, the EN's can not be used.

1.2 Overview of Eurocodes

The Eurocode series consists of 10 series of documents: EN 1990 to EN 1999:

EN 1990 'Basis of Design' specifies the general principles for classification of actions on structures including environmental impacts and their modelling in verification of structural reliability [1]. In particular EN 1990 [1] defines characteristic, representative and design values used in design calculation.
EN 1991 'Actions on Structures' specifies the characteristic values of the actions on structures. EN 1991 is divided in a number of volumes, each specifying a specific action. The wind loading is specified in EN 1991-1-4.
EN 1992: Design of concrete structures
EN 1993: Design of steel structures
EN 1994: Design of composite steel and concrete structures

EN 1995: Design of timber structures
EN 1996: Design of masonry structures
EN 1997: Geotechnical design
EN 1998: Design of structures for earthquake resistance
EN 1999: Design of aluminium alloy structures

1.3 Development of EN 1991-1-4

The Eurocode 'actions on structures; Wind Actions', EN 1991-1-4, which is accepted by CEN in 2004, has been developed in two stages, as described before. In 1995, ENV 1991-2-4 had been published, which had been written by a Project Team, consisting of six members of different European countries. The ENV was in place until the final EN 1991-1-4 was accepted, in 2004. The function of the ENV was twofold:
1: During a period of two years, the member states, often represented by a national mirror committee, collected comments on the standard, and sent these to CEN. CEN collected these comments, which formed the basis of the work of the Project team of EN 1991-1-4.
2: The national normalization institutes drafted a National Application Document, together with ENV 1991-2-4 being an alternative to the current national standard on wind loading. This enables the users in the individual countries to get used with the Eurocode system.

After the comment-period has ended, CEN established a new Project team, to convert the ENV 1991-2-4 into the EN 1991-1-4. This Project team consisted of three members of the former PT, and three new members. The basis of the work of this project team was the ENV and the comments by the CEN members. The Project Team was not allowed to bring in new material, other than suggested in these comments. This whole process was monitored by the sol-called National Technical Contacts (NTC's), and by the CEN TC 250, under which responsibility the Eurocodes are drafted.

In 2004, EN 1991-1-4 was accepted in its final form. Official English, German and French translations are now available. To use this document, every country should have its own translation ready, together with a National Annex, specifying national choices where needed. In EN 1991-1-4, a total of xx clauses allow national choice.

2 Wind loading in EN 1991-1-4

2.1 General

EN 1991-1-4 specifies natural wind actions for the structural design of building and civil engineering works for each of the loaded areas under consideration. This includes the whole structure or parts of the structure or elements attached to the structure, e. g. components, cladding units and their fixings, safety and noise barriers. This paper and the lecture leads the reader through the code, giving additional background information where needed. To become familiar with the Eurocode, application of the rules in cases is the best training. During the series, cases are given which are described shortly.

2.2 Field of application

The field of application of EN 1991-1-4 is limited to buildings and civil engineering works with heights up to 200 m and bridges having no span greater than 200 m, provided that they satisfy the criteria for dynamic response. EN 1991-1-4 does not give guidance on local thermal effects on the characteristic wind, e.g. strong arctic thermal surface inversion or funnelling or tornadoes. It does also not give guidance on the following aspects: