Common European Foundation Codes

Codes Europeens Communs de Fondations Speciales

M.F.Stocker – *Bauer Spezialtiefbau GmbH, Schrobenhausen, Germany*

ABSTRACT: More than 20 years have passed since experts started to develop a common European code programme for civil engineering structures. Seven codes for the execution of special geotechnical works have been published and introduced. Five more codes will follow in the near future. An extensive code for design in foundation engineering, laboratory- and field tests will be published in two years. The following paper will give some details.

RÉSUMÉ: Plus de 20 années se sont écoulées depuis que des experts ont lancé la mise au point d'un programme commun de codification européenne pour les constructions du génie civil. Sept codes relatifs à l'exécution de travaux géotechniques spéciaux ont été publiés et adoptés. Cinq autres codes vont suivre dans un bref avenir. Un vaste code pour les études dans la technique des fondations, les essais en laboratoire et les essais in situ sera publié dans deux ans. Des détails vous sont donnés dans le document ci-après.

1 INTRODUCTION

Nineteen different nations, nineteen different techniques, nineteen different design methods, climates, geological conditions, experiences with codes and code systems, legal requirements, safety- and environmental rules and, last but not least, nineteen different national feelings and reservations!

Would it be possible to set up a common and uniform code system for western Europe? The nineteen nations are either members of EU, EFTA and/or CEN.

When in the seventies of the past century the western European nations decided to unify the various nations not only on a political but also on an economic basis, it became evident and necessary to think about common technical rules in order to guarantee and enable a common and fair competition. This means: common design rules, common execution-, safety-, quality- and environmental standards.

The European code programme for civil engineering construction comprises:

Technical Committee TC 250

EN 1990: Basis of design for structural Eurocodes
EN 1991: Actions
EN 1992: Concrete structures
EN 1993: Steel structures
EN 1994: Mixed steel-concrete structures
EN 1995: Timber structures
EN 1996: Masonry
EN 1997: Geotechnical design
EN 1998: Seismic actions
EN 1999: Design of aluminium alloy structures

Technical Committee TC 288

ENs Execution of special geotechnical works.

2 GEOTECHNICAL DESIGN CODES

The geotechnical design project is divided into three parts: Geotechnical Design (part 1), Laboratory Tests (part 2) and Field Tests (part 3).

The working group "Geotechnical Design" started in the beginning of the eighties of the past century with the aim to establish common rules for geotechnical design methods and problems. The group consisted of seven specialists, most of them coming from universities. The progress of the work was annually reported to the delegates of the nineteen European nations.

The code for geotechnical design as "final draft" is almost finished. The present time-schedule is shown in table 1.

Table 1. Schedule for the preparation of EN 1997-1 Eurocode 7 Part 1 Geotechnical design General Rules

Document available for formal vote, incl. Translation	01.06.2001
Formal vote	01.12.2002
Finalisation and publication in 3 languages (CEN/CS)	01.06.2004
Publication as national standard (...-EN 1997-1)	01.10.2004
Co-existence period	3 years
Withdrawal national standard	01.10.2007

The codes on laboratory- and field tests are almost finished, too, and will be published together with part 1.

When the code will be published in its final form, more than twenty years of work will have passed. This is a very long time. It has to be emphasized, however, that the structural experts had set themselves a very high goal, namely to do the design with partial factors of safety. This has been a rather new and brave way of thinking, considering the fact that the design is already difficult for steel structures with exact material properties, but even much more complicated for materials like soil.

It has also to be kept in mind that the design according to EN 1997 should lead at least to the same economic results as obtained with the various present national design methods. In addition, it should be regarded that it is much harder to agree in theories than in practical problems.

It would lead too far to describe the code in detail. The system is based on a limit design method with partial factors of safety onto actions and resistances. But one fact should be mentioned shortly. The specialists of the working group and also the 19 official national experts have unfortunately not been able to agree on one common basic design procedure. Instead of one,

three different design methods are allowed. The results, of course, will not be identical. Therefore the partial factors will have to be adjusted for each method. In addition special model factors may be used. This does not completely agree with the original goal of producing only one common method of design.

European and practical thinking may hopefully lead to one common design procedure in the future.

3 EXECUTION CODES

The programme for the work and the time schedule for the various subjects or techniques are listed in table 2. The work started in 1992 with three code projects. Today 12 projects have been finished or are in work. Right now it is not planed to extend the programme.

Table 2. European Execution Codes for Special Foundations

No.		Start	Drafting Period	Inquiry Period	Formal Vote	Publ. Internat.	Publ. Nat.
EN 1536	Bored Piles	01/92	√	√	16.03.97	02/99	06/99
EN 1538	Diaphragm Walls	04/92	√	√	16.03.97	01/00	07/00
EN 1537	Anchors	04/92	√	√	02.12.97	12/99	12/00
EN 12063	Sheet Piles	04/93	√	√	06.10.98	02/99	05/99
EN 12699	Displacement Piles	03/94	√	√	03.10.00	12/00	02/01
EN 12715	Grouting	03/94	√	√	17.04.00	07/00	10/00
EN 12716	Jet Grouting	03/94	√	√	09.01.01	07/01	12/01
prEN	Micro Piles	07/96	√	05/01	03/03	2003	2003
prEN	Reinforced Soil	09/97		02/02	02/04	2004	2004
prEN	Deep Soil-Mixing	02/00	02/02			2005	2005
prEN	Vertical Drains	04/00	04/02			2005	2005
prEN	Deep Vibration	04/00	04/02			2005	2005

Each project was finished by one working group. There was no money available from "Europe". Therefore the European Federation of Foundation Contractors (EFFC) paid one full-time secretary for each working group. The working group, guided by a chairman, allowed each "European" nation to send one or two experts to participate in the work. The experience has shown that at an average 12 to 14 experts met at each meeting, some of them coming from universities, others from consulting offices or construction companies.

The progress of the work had to be annually reported to the experts of the Technical Committee.

Today seven codes have been published as European codes and should be used by all nineteen European members. The national codes shall be withdrawn according to the European rules.

In the beginning there will certainly be some differences with respect to the depth of standardization among the above execution codes. This derives from the fact that for some techniques already several national codes have existed and in addition a lot of experience with techniques like bored piles or anchors for instance. For other techniques, like jet grouting, hardly any national codes or standards have been available.

According to the CEN requirements each code should be reviewed five years after publication. Thus, it should be no problem to continuously improve the codes according to the increasing experience and knowledge.

The average time from the start of the code project until the final publication was almost 7 years, two and a half of which were spent for drafting the code text. The rest of it was used for periods of national inquiries, commenting, reviewing, inserting proposals if necessary, translations into English, French and German and for administrational purposes.

4 INFORMATION ON SOME CEN-RULES

CEN has developed some very useful tools of how to draft and introduce common codes. Some of these rules should be mentioned here.

(a) The European codes have to be officially translated into English, French and German. All three texts have to be identical. This must be checked by editorial groups. Nevertheless, the code texts must be translated into eleven other European languages. According to experience, this process may lead to several mistakes, especially with respect to the degree of obligation of the rules.
Therefore the CEN rules require to use exactly defined auxiliary verbs in each language for:
- requirement: "shall"
- recommendations: "should"
- permission: "may"
- possibility: "can"

Since these definitions are very important for common codes, a list of the degrees of obligation is added in an appendix to almost every code. This might be useful for the user in case of legal discussions.

(b) The national voting on acception or refusal of the European code is carried out on the basis of a democratic and weighted voting (e. g. UK has got 10 votes, Greece 5 votes and Island 1 vote). Seventy-one percent of the votes have to be positive in order to accept the code.

(c) The national introduction of the European code has to be carried out six months after publication according to CEN rules. This will certainly not always be possible for all nations, since the translation of code texts into other languages mostly takes somewhat more time. In addition some adoptions have to be made to change from the national to the European system.

5 CLOSING REMARKS

A common European market requires common European codes also on the construction market. They are absolutely necessary for a defined safety of the structures, for an adequate quality that may be expected by the client, for a fair competition among the construction companies and for the possibility of supervision by the client.

Research projects carried out recently in Germany to investigate the value of codes have demonstrated that good and common codes improve both the quality and acceptance of products and the economical chances for export and trade. Today we have a common market of nineteen nations, in the future we may have twenty-five or thirty participants.