The JGS Foundation Design Guideline: Geo-code 21

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1. INTODUCTION

1.1 Background

In view of rapid globalization even in engineering profession, geotechnical design codes have been extensively reviewed in various parts of the world, especially in Europe and the North America, seemingly to arrive at eventually harmonization of the various design codes in the world. Recent trends seem that the final version of the codes are to be rewritten in a format of limit state design, reliability design (ISO2394, Eurocodes etc.) and be founded on the performance based design concept(WTO/TBT etc.).

Observing these trends, JGS (Japanese Geotechnical Society) had started a series of activities as early as in 1997 as a form of research committee entitled "Present and Future of Japanese Foundation Design and Soil Investigation in view of International Harmonization" chaired by Kusakabe.

The committee eventually decided to draft a proto type comprehensive foundation design code that can harmonize all the major foundation design codes in Japan. In proposing the code, it is much contemplated to propose a concept which can harmonize all the major Japanese foundation design codes that have been developed rather separated way due to many historical. A comprehensive design code is the concept we proposed to achieve this aim. By this code, we also intend to dispatch the advanced Japanese foundation design technology to the world by a single voice. It is our aim to draft a code in which all the essence of our foundation design technologies are introduced in a harmonized way so that we would be able to say that all our technical contents in the foundation design is in this code. The code is nicknamed 'Geo-code 21 ver. 1', and is reported, for example, in Honjo and Kusakabe (2002).

The necessity of drafting such a comprehensive foundation design code was recognized by the board of JGS, and a series of code drafting committees have been continued. The first edition of the code is to be completed by April 2004 that would include both Japanese and English version. The drafted part of Geo-code 21 (ver.2) has been translated into English, and attached in the Proceedings of IWS Kamakura 2002.

1.2 Contents of Geo-code 21

Presented in **Table 1** are the contents of Geo-code 21. **Table 2** lists the names of the drafters of each chapter..

Chapter 0 is drafted to propose a comprehensive design code for all civil and building structures. We needed to draft such chapter because there is no such code in Japan. Based on the concept proposed by this Geo-code 21, an attempt was made at JSCE to draft a comprehensive structural design code, ‘code PLATFORM’. This will be shown in Annex A.

In the annex of the code, typical design methods that are used in Japan are introduced in their simplified form in close

Table 1 Table of contents of Geo-code 21

* Keywords: Foundation design, comprehensive design code, limit state design, performance based design
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connection with the main text of the code. One of the intensions of including such annexes to the code is to introduce more concrete design methods to overseas readers.

Table 2 Drafters of Geo-code 21 (include annex)

0. Honjo, Y.
1. Honjo, Y., Matsui, K. and Shirato, M.
2. Tani, K., Suzuki, M. and Ohmori, A.
3. Kobayashi, K. and Maeda, Y.
4. Kikuchi, Y., Shirato, M. and Okumura, F.
5. Ohishi, M.
6. Koseki, J. and Hara, T.

2. PARTICULAR FEATURES OF GEO-CODE 21

Some of the features of Geo-code 21 are summarized as follows.

2.1 Pursuance of an ideal design code: Harmonization of Japanese foundation design codes

Geo-code 21 is drafted pursuing for an ideal foundation design code in Japan. That is to say, the code is aiming at systematizing and harmonizing the major foundation design codes in Japan which have been developed rather independently due to some historical and legal reasons

In proposing such code, it is neither meaningful nor successful to try to develop a code at the same level to the existing major design codes : An advanced concept is definitely required in proposing such a code. We have proposed a concept which we named 'comprehensive design code'.

The aims of this code are as follows:

- To define means to specify the structure performances.
- Unification of terminologies.
- Methods and formats to introduce the safety margin to various limit states in design.
- Standardize characteristic value determination in geotechnical design.

2.2 Foundation design code founded fully on performance based design concept

One of the distinguished features of Geo-code 21 is the introduction of performance based design concept.

It is generally recognized that the performance based design popularized today has at least two origins: One of the sources is a report issued by SEAOC(1995) known as Vision 2000 which proposed the performance matrix. The other source of performance based design is NKB report No.34 (NKB, 1978) now known as Nordic five level system. This idea comes from discussions that to which level building regulation authorities should mandate regulates and from which level specifications should be allowed to free competition. Nordic five level system was followed by many other building regulation authorities of the world and also the concept is in consistent with WTO/TBT agreement of 1995.

There already exist codes that combine these two concepts. ICC Performance Code (ICC, 2000) is one of them, where the performance matrix is employed to explain performance requirements. This idea is also employed in Geo-code 21.

2.3 Diversification and standardization of verification method: Approach A and B

There seems to be two large trends in structural design codes development in the world: One is the diversification or the increase of freedom in the design which has gained momentum from the conclusion of WTO/TBT where use of the performance based specifications on all industrial products has been agreed.

The other trend is the standardization or the unification such as ISO and Eurocodes which attempts to standardize and unify all specifications and codes of a region or the world. It is requited to account for these two trends (i.e. the diversification and the standardization) simultaneously in developing a new code, although these two trends sometimes look contradictional to each other.

In order to account for these two trends at the same time, two different approaches in the verification of structural performance, namely Approach A and B, are proposed in Geo-code 21. Approach A is the fully performance based design approach where designers are only given the performance requirements of the structures; the designers are requested to verify their design, and the results would be checked by authorized organizations. On the other hand, Approach B is verification procedure based on design codes. In Approach B, Geo-code 21 ver.1 is to be used as a code for code writers.

2.4 Limit state design based code

Geo-code 21 is based on ISO2394, General principles on reliability for structures, which is founded on the limit state design and the reliability design concepts. It is presumed in Geo-code 21 that the limit state design is one of the most suitable methods to realize the performance based design. It is also presupposed that Level 1 format, the partial factor format, is to be used in the design verification.

2.5 Standardization of determination of characteristic value of soil parameters

The most important role of design codes is to determine the safety margin (or elements) in the design by balancing uncertainties involved in actions, resistances and calculation models in order to sufficiently satisfy the various performance requirements of a structure during its service life (Ovesen, 1992).

In Geo-code 21, the characteristic value is defined as a mean value of a geotechnical parameter. By doing so, it is preventing for designer to arbitrarily include safety margins in the determination of a characteristic value by taking a conservative value. On the other hand, it is encouraged to introduce the engineering judgments that are most important in geotechnical engineering by certifying the goal (i.e. to estimate the mean value of a geotechnical parameter).

3. CONCLUSION

Due to the limitation of space, only limited aspects of Geo-code 21 are described in this paper. For details, one should see the papers in the reference list.

References

(1) Honjo, Y and O. Kusakabe (2002): Proposal of comprehensive foundation design code: Geo-code 21 ver.2, Proc. IWS Kamakura (ISBN 90 5809 381 6), pp. 95-106.
(2) JGS(2002): The JGS Foundation Design Guideline, Proc. IWS Kamakura (ISBN 90 5809 381 6), pp. 399-457.