Development of Steel Design Codes in Thailand

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ABSTRACT

Engineering Institute of Thailand (EIT), the most prominent engineering professional organization in Thailand, is introduced. The code development methodology by EIT is then outlined. Problems and difficulties facing during developing and implementing the design codes are discussed. Direction of EIT's code development is also presented. Development of design codes for steel structures is given for example. Finally some aspects of harmonizing design codes among Asian countries regarding problems, difficulties and possible approaches are discussed.

1 INTRODUCTION

The Engineering Institute of Thailand (EIT) was founded in 1943 under his majesty the King's patronage. Currently, EIT consists of 8 technical committees, which are:

(1) Civil Engineering
(2) Electrical Engineering
(3) Industrial Engineering
(4) Mining, Metallurgy & Petroleum Engineering
(5) Chemical Engineering
(6) Environmental Engineering
(7) Automotive Engineering
(8) Mechanical Engineering

Each technical committee has several subcommittees to cover broader field of industry. With EIT's support and endorsement, there have been a few professional societies that stemmed from EIT's Civil Engineering subcommittees such as Thai Concrete Institute, Traffic and Transportation Engineering Society.

The management of EIT is done through Board of Directors which are elected by its members for a 4-year term. The board shall then appoint a chairman and members for each technical committee and its subcommittees. All members who are working on voluntary basis are the drive of EIT to achieve its goals to:

- Develop design codes
- Promote education, research and practice of engineering profession
- Organize technical conference and workshop for better engineering practice
- Provide technical consultation for members relating to engineering problems
- Promote harmony among domestic organizations
- Collaborate with international organizations

One apparent means to achieve the above policies is through EIT's publications such as design specifications, books, technical reports and proceedings of technical seminar and conferences.

For the Civil Engineering Committee, there are 9 subcommittees:

(1) Steel Structures
(2) Concrete
(3) Wind and Earthquake Engineering
(4) Geotechnical Engineering
(5) Transportation Engineering
(6) Water Resource
(7) Construction Management and Planning
(8) Computational Mechanics
(9) Engineering Ethics and Society Services

EIT's Civil Engineering Committee has developed design codes covering the following topics / subjects / fields:

- Design Loads
- Construction Material
- Steel Structures
- Concrete Structures
- Code of Standard Practice
- Construction Safety
- Inspection and Maintenance

The main emphasis herein is placed on the development of design codes by the Steel Structure subcommittee.

2 EIT'S CODE DEVELOPMENT METHODOLOGY

EIT welcomes comments and suggestion of referral standards from its members. However, the following referral standards are chosen as initial references for design code development in civil engineering.

Materials:

- Thai Industrial Standard (TIS)
- Others: JIS, ASTM, BS, DIN, AS

Design Specifications:

- ACI, AISC, AASHTO, and other American codes
- JSCE, Eurocode

Regarding the adopted referral standards, procedures for developing design codes are summarized below:

(1) Nomination of code for development from subcommittee
(2) Approval of EIT's Board of Director for drafting including content and budgeting
(3) Appointment of permanent committees and drafting/revision committees
(4) Drafting
(5) Public technical hearing
(6) Publish the design code
(7) Arrange seminar and training for engineers

During the process of code development, drafting committees face by a few problems resulting mainly from lack of strong financial support. Drafting committee members are working on voluntary basis, therefore, working schedule can hardly be maintained and a progress is expectedly slow. One of obvious difficulties in implementation of EIT design codes is incomplete arrays of design specifications.

In practice, several design codes may be applied to a design or construction project. Comprehensive design specifications are preferred by practitioners. As a result, EIT design codes are mostly for educational usage not for serious engineering practice. In addition, the codes are used among relatively small number of practicing engineers and thus lack economy of scale for development of non-main stream codes.

To promote the use of EIT design codes among practicing engineers, EIT is aiming to develop the comprehensive design specifications. In addition the EIT design codes must be current and incorporate research results or findings that suit local practices.

3 DEVELOPMENT OF DESIGN CODES FOR STEEL STRUCTURES: A CASE STUDY

In general EIT's design specification is divided into 3 parts, code of standard practice, design manual and supplement. For steel structures, three existing design specifications are chosen for discussion.

(1) **Specification for Structural Steel Buildings: Load Resistance Factor Design: LRFD** (SI unit), based on 2001 AISC's LRFD Code and published in 2002. It is currently used as a reference code for University courses and gaining popularity among practicing engineers.

(2) **Specification for Structural Steel Buildings: Allowable Stress Design: ASD** (Metric unit), based on 1983 AISC's ASD Code and published in 1997. This code was the first design code for steel structures; therefore it has been used as reference code for most engineers.

(3) **Design Specification for Cold-form Steel Sections** (Metric unit), based on a very old version of AISI's Code and published in 1985. This code is relatively unknown and out of date. It urgently needs revision for simplified version to suit the usage for small and secondary structure design (design manual, tables and charts).

The direction of design code development for steel structures is summarized below:

- Needs supplemental standards such as material standard (steel, bolts), welding standard, connection design manuals, standard practice.
- Member design manuals based on TIS steel section
- Connection design manuals
- Revision of load and strength factor to suit local practice
- Codes for design of specific structures (bridges and transmission towers)

Following are design specifications for steel structures, which are under development:

- Manual of steel construction: LRFD
- Manual of steel construction: ASD
- Code of standard practice for steel buildings & bridges
- Specification for structural joints using HS bolts
- Guidelines for welding inspection
- Design of hollow section
- Weathering steel
- Fire resistance for steel structures

4 HARMONIZATION OF DESIGN CODES

Due to the tide of globalization, harmonization of design codes is now a trend. The American Society of Civil Engineering and it affiliations have been probably the world most prominent and influential in development of design codes in Civil Engineering areas. EuroCode, that is resulted from harmonization of design codes in European countries, is now gaining popularity. Asian countries with their leading professional societies such as JSCE and ACECC are now facing this challenging trend. Asia with its largest number of countries and population needs some form of harmonized code to compete with the other two major continentals. Barriers and difficulties in harmonization of design codes in Asian region are as following:

- Language
- Referral standards (e.g. material standards, supplemental standards)
- Other technical issues
    - Philosophy and concepts
    - Loading
    - Geographical differences

There are many probable measures that can lead toward harmonization of design codes. Below shows the measure suggested by this author.

- Direct adoption or partial adoption of design codes among ACECC members
- Promote dialogue among societies during code development
- Exchange of information
- Create a consortium for development

5 CONCLUSION

In the path toward harmonization of design codes, understanding the similarities and differences in code development methodology among all ACECC members is essential. This paper presents code development methodology by Engineering Institute of Thailand, Problems and difficulties facing during developing and implementing the EIT design codes discussed herein are believed to be useful in the process of harmonization of design codes. To achieve the goal, barriers and differences of language, referral standards and other technical issues such as design philosophy and concept, loading and geographical differences must be overcome. An attempt to promote dialogue among societies during code development is encouraged. A consortium may be initiated for harmonization of design codes among ACECC members. To this end, the author encourages the initiation from major Asian engineering professional societies such as JSCE, and ACECC to take on the harmonization of design codes in the Asian region.