

**Construction Industry Council
Committee on Environment and Technology
Task Force on Construction Standards for Infrastructures**

Report on the Findings and Recommendations

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Purpose

This report presents the findings and recommendations of the CIC Task Force on Construction Standards for Infrastructures.

Background

2. For infrastructure projects, the public-sector organisations (including the works departments under DEVB, HD, and MTRC) have well-established specifications and design codes. The requirements for materials and workmanship in these specifications are specified with reference to the standards developed by leading standards bodies (in particular the British Standards). Most of these specifications also embody modifications to the reference standards to suit local conditions.

3. At the 4th Committee meeting held on 26 October 2007, Members considered that a co-ordination mechanism anchored upon CIC should be implemented to facilitate a more concerted approach in the development and improvement of local construction standards. The mechanism would facilitate the pursuit of industry-wide initiatives on construction standards including better alignment of the reference standards and local modifications adopted by the various client organizations so as to avoid unnecessary differences in requirements and lower the cost of compliance. Besides, it would be conducive to the review of the merits of adopting other standards as alternative to or replacement of British Standards so as to better take advantage of the globalization trend in the procurement of construction materials, assessment of the impact of replacement of British Standards by Eurocodes by 2010 on the local construction industry and identification of appropriate measures for coping with the change.

4. For the infrastructure projects, Members proposed to form a Task Force under the Committee to conduct an overall review of local construction standards so as to provide a basis for deliberating on the co-ordination mechanism. The recommendation of setting up a Task Force was endorsed at the 6th CIC meeting held on 15 November 2007.

The Task Force

5. The Task Force on Construction Standards for Infrastructures consists of

members representing the public-sector organisations, professional institutions, contractors associations and other industry stakeholders concerned. The review mainly focuses on specifications for materials and workmanship but also looks at other pertinent aspects of construction standards. The membership and terms of reference are attached at **Annex 1**.

6. Five Task Force meetings have been conducted since March 2008. From the onset, the Task Force recognized the difference in layout and structure of the General Specifications (GS) of different organizations and therefore has used the General Specification for Civil Engineering Works (referred to as UGS) published by CEDD as a base document for identifying a list of materials/subjects against the corresponding sections or clause numbers in other GS for review. The findings are summarized at **Annex 2** and the specifications that have been examined are listed below:-

- (i) General Specification for Civil Engineering Works (2006 Edition) used by CEDD, DSD, HyD and WSD
- (ii) Hong Kong Housing Authority Specification Library (2004 Edition) published by Housing Department
- (iii) Materials and Workmanship Specification for Civil Engineering Works published by MTRC
- (iv) General Specification for Building (2007 Edition) published by ArchSD

7. To make the study manageable, the Task Force has formed the following 6 subgroups and selected 11 major materials/subjects commonly encountered in infrastructure projects for detailed comparison.

- (i) Drainage Works
- (ii) Earthworks
- (iii) Formwork
- (iv) Concrete and Steel Reinforcement
- (v) Piling Works
- (vi) Bridgeworks and Roadworks
 - Carriageway sub-base and bituminous material
 - Concrete carriageway
 - Miscellaneous roadworks
 - Prestressing
 - Bridgeworks

8. Each subgroup was chaired by a Task Force member having knowledge/works experience specifically related to the specifications to be examined. For example, DSD's representative chaired the Drainage Works Subgroup, HyD's representative chaired the Bridge and Roadworks Subgroup, and the Concrete and Steel Reinforcement Subgroup was chaired by a Task Force member who is also a member of the Standing Committee of Concrete Technology (SCCT) maintaining close communication with SCCT. The membership of each subgroup comprised of other Task Force members and nominations from Task Force members covering representatives from government departments, consulting engineers, professional institutions, and contractors. Details of membership of each subgroup are at **Annex 1A**.

General Views and Consensus on Unification and Diversity in Specifications

9. The following are the general views and consensus of the Task Force on the diversification among the existing Specifications.

- (i) Unification of specifications could help save efforts of engineers in preparing specification documents, and of site supervisory staff and contractors in adapting to specifications project by project.
- (ii) It is a client's right to specify works to his requirements. MTRC has given examples of its specific requirements that aim at simplicity of maintenance and stringent demand on water-tightness that are essential for keeping operation of electric trains to a busy schedule.
- (iii) Some diversity in the GS of different organisations exists, some for good reasons, and some as a result of evolution along separate lines or circumstances. For the latter, there may be room for harmonisation.
- (iv) Over-harmonisation of the GS among organizations would result in many project-specific particular specifications (PS) which would defeat the original purpose of the GS. Harmonisation of specifications should not go beyond the extent of practicality.
- (v) On this foundation, the subgroups proceed to examine the current differences, consider the reasons for provisions, and collaboratively identify harmonisation opportunities.

10. As regards the proposition of sharing the PS with each other or placing the PS on a public domain, the Task Force has identified the following issues that have to be handled with care before the proposition is taken forward:-

- (i) The issue of the copyright and the liability/obligation on the owners.
- (ii) The PS are drafted with particular technical considerations and assumptions in mind. These may not be apparent in the PS. Other users whose circumstances are different, may use the PS wrongly.
- (iii) A good, conservative decision framework is therefore needed for sharing the use of specifications.
- (iv) While government departments could upload the specifications onto their websites, it would be difficult to persuade the private sectors to follow suit.

The Approach

11. All the subgroups worked independently to examine the relevant sections of different GS using the same two-stage checking as follows:-

- (i) First-Level Checking – To find out if there is any fundamental difference in the approach among the different GS, viz. whether the method specification or end-product specification is adopted.
- (ii) Second-Level Checking – If the same approach is adopted, the subgroup would further check the differences in the following aspects.
 - Definitions
 - Procedures requirements
 - Acceptance criteria
 - Material reference standards
 - Testing and inspection standards

12. It is found that there is no fundamental difference in the approach adopted by each GS and the general observations on the differences and similarities during the second-level checking are summarized at Annex 3A to 3F and para. 13 to 18 below.

Differences and Similarities

13. Concrete and Reinforcement (Annex 3A)

- (i) Differences are observed in various GS. For the differences in the concrete specification, SCCT had obtained the consensus on the way forward of amendments to be made by each GS for government projects. A further step

would be required to reduce the differences of specifications of between Government and MTRC.

- (ii) As regards the difference between the Government's GS and MTRC's GS, MTRC's position is as follows.
 - Testing on 100 mm³ concrete cubes – Follows UGS
 - Use of recycled aggregates on non-major structural elements – Trial
 - Crack width control – Unchange to meet MTRC's operational need
 - Reinforcement – Follows Government's Construction Standard CS2: 1995 – Carbon Steel Bars for the Reinforcement of Concrete.
- (iii) It is noted that the specification on high-quality concrete is project-specific and at present, the technology is not mature enough to enable a unified high-quality-concrete specification to be established. However, it is worth keeping this matter in view.
- (iv) As regards the issue of acceptance criteria of the reinforcement to suit the supply sources, it is noted that SCCT is reviewing CS2 at present. Comments and input from suppliers would be invited and considered during the review.

14. **Drainage Works (Annex 3B)**

- (i) Drainage specifications for infrastructure and building projects are different.
- (ii) HD uses UGS for drainage works in infrastructure projects.
- (iii) MTRC's GS on drainage works is similar to UGS of the previous edition and with amplification in watertightness requirement.
- (iv) ArchSD's GS is mainly on works of building projects, the specification on drainage works is focused on drainage works inside buildings, with less details for public drainage works in general infrastructure projects..
- (v) MTRC has planned to update its specification of drainage works in the near future (before March 2009) and would take into account the recommendation of the Drainage Subgroup.
- (vi) In most of the cases where harmonisation for drainage works in infrastructure is suggested, the recommendation is to adopt the updated UGS (2006 Edition) for civil engineering works.
- (vii) At present, most of the concrete pipes are imported from the Mainland. Any change in material standards has to take into consideration the time and effort needed for the manufacturing base to change to the new standards.

15. **Bridgeworks and Roadworks (Annex 3C)**

- (i) There is no difference in the approach in the specifications.
- (ii) Differences in details between UGS and MTRC's GS exists.
- (iii) Most of the differences are minor and trivial.
- (iv) Suggestions on further actions on addressing the differences are also included in the summary attached at **Annex 3C**.

16. **Earthworks (Annex 3D)**

- (i) ArchSD, HD and MTRC use the UGS as the model for their GS.
- (ii) UGS and MTRC's GS are basically the same.
- (iii) ArchSD's and HD's GS provide more specific details in certain areas while the majority of rest follow UGS.

17. **Formwork (Annex 3E)**

- (i) Having scrutinising the items where different specifications were adopted by different departments/organisations, it was accepted that there were practical reasons for using different specifications for different kinds of structures. No unification was therefore recommended.
- (ii) There has been a suggestion of investigating the new technology to increase the limits on the reuse of plywood. This may be a suitable subject for inclusion as one of practical research subjects to be conducted by the CIC Committee on Environment and Technology.

18. **Comparison of Piling Works (Annex 3F)**

- (i) Specifications on piling works differ widely among the different GS.
- (ii) The Task Force concentrates on construction-related requirements among different GS for various pile types.
- (iii) Some suggestions for harmonisation related to design, construction and testing practices on piling have been formulated in **Annex 3F** for the consideration of CIC.
- (iv) Piling Works Subgroup members reached consensus on the following.

Design Requirements

- Individual departments/organizations should be free to specify their own design requirements.

Design Standard

- Most of BD's Code of Practice for Foundations could be followed as design standards.
- There is limited room for unifying the remaining differences in standards not covered by the Code of Practice.

Material Specifications

- Individual departments/organizations should use the harmonised GS on material specifications of concrete, steel, reinforcement and cement grout for piling.
 - MTRC/HKCA have worked out a specification for bentonite which is recommended to be adopted by other parties. Recommendation is included in **Annex 3F**.
- (v) It is noted that BD has recently set up a Technical Committee on Code of Practice for Foundations to keep under review the use of the Code and collect views and comments from industry regarding its use, which is expected to achieve further harmonisation in practice of foundations in Hong Kong.

Other Pertinent Aspects of Construction Standards on Infrastructure

19. In response to the suggestion by a Task Force Member, the standard drawings related to infrastructures have also been reviewed and the findings are summarized as follows:-

- (i) There is not much duplication of the details in the standard drawings of ArchSD, HyD, DSD, CEDD, WSD and MTRC except for some minor details of common items such as signboard and hoarding used in the temporary works.
- (ii) At present, the standard drawings of works departments are all accessible to the public on the websites.

20. As part of the review of construction standards, the findings of the stocktaking exercise on the institutional arrangement, the state and the plans in works departments in respect of introduction, updating and maintenance of various types of construction standards have also been circulated to the Task Force Members. Summary of the stocktaking exercise is attached at **Annex 4**.

21. The construction standards currently used can be broadly classified into 3 main groups. They are Design Codes, Specifications, and Standards of materials and

procedures. Specification describes characteristics of basic materials and products to be used and the works components constructed from them, and/or the process of construction. Description of characteristics is frequently by reference to material standards and test standards. They are specified mostly with reference to the standards developed by leading standards bodies. Most of the standards are overseas standards and majority of them are British Standards. The local standards such as CS1 and CS2 for concrete and reinforcement respectively and some geotechnical standards are also written specifically to suit local geology and circumstances. The migration of British Standards to Eurocodes by 2010 involves mainly the design codes for buildings and civil engineering structures and the associated reference standards. The other British Standards would still be in force, reviewed and maintained by BSI. The existing mechanism in updating and reviewing the changes in the reference standards in the specifications can be continued. In considering the adoption of standards of materials and procedures including but not limited to British Standards or BS ENs, it is necessary to consider the criteria as following.

- (i) The standard must meet the functional requirement of the project.
- (ii) Ready availability of the standard documents.
- (iii) Open and competitive supply sources for materials to the standard.
- (iv) The testing system and quality assurance system is capable of supporting the standard.
- (v) Well conceived programme for introduction of new standards to gain experience and resolve practical problems.

22. As regards the migration of design codes on infrastructure from British Standards to Eurocodes, a Working Group under the Task Force on Construction Standard for Public Works Project with representatives from the Government's works departments and other stakeholders in the construction industry has been set up to study its implications and gain information and knowledge for a decision on adopting Eurocodes. A study report would be available in early 2009.

Conclusion

23. The HKSARG is the prime proponent of infrastructure projects. Most of these projects are implemented by the works group of departments. A fair proportion of the remainder are railway projects subvented to the MTRC. Housing Department generally adopts UGS in carrying out infrastructure projects and very occasionally carries out infrastructure projects to its own standards.

24. The Task Force has compared the specifications of the above project organizations and found them to be similar. Except for the specifications on Piling, there are no fundamental differences among the construction specifications for infrastructures.

25. The Task Force has highlighted the potential areas of harmonisation of the specification for the project organizations to consider in future. However, the Task Force has decided against a unified specification because each project organization should have its own freedom to specify the materials and workmanship standards that suit its technical and operational requirements. Any harmonisation effort should aim to remove differences that were there by chance instead of choice.

Way Forward

26. The project organizations should consider the areas of harmonisation of the specifications highlighted by this Task Force.

27. The project organizations could benefit from setting up a network platform to share views on changes to the general specifications and design standards so that a coordinated effort can be taken where appropriate. Representatives of the other sectors of the construction industry could be invited to this platform for the project organizations to benefit from a wider knowledge base.

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