

By post and by email at hwklam@cedd.gov.hk

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Dear Ir LAM

Proposed Acceptance Systems for Flexible Barrier Products in Hong Kong

Thank you for inviting the Institution to provide views on the captioned subject. We are pleased to provide herewith our views and suggestions on the subject matters for your consideration.

Thank you for your attention.

Yours sincerely



Monica YUEN (Mrs)
Chief Executive & Secretary
The Hong Kong Institution of Engineers

Enc

MY/ML

Enclosure

**Views from the Hong Kong Institution of Engineers on
Proposed Acceptance Systems for Flexible Barrier Products in Hong Kong**

The Hong Kong Institution of Engineers (HKIE) supports the initiative to review local and overseas practice in acceptance of flexible barriers products for resisting rockfalls and/or landslide debris, and in general welcomes the introduction of the proposed Acceptance Systems for flexible barrier products in Hong Kong. The adoption of new and proven technology for flexible barriers design and construction could drive Hong Kong to be a science and technology-based city and facilitate Hong Kong engineers to play a lead in relevant projects. With regard to the Consultation Paper, the HKIE would like to put forth our views and comments in the ensuing paragraphs for consideration.

Proposed Acceptance System A (i.e. for Energy-rated Flexible Barriers)

Requirement of Full-scale Rockfall Testing

2. The proposed Acceptance System A requiring the design of energy-rating of the barriers to be verified by a full-scale rockfall test so as to tie in with the international practice is supported. To specify the requirement, it is suggested to clarify whether the test is project-based or product-based.

3. It is noted that the full-scale rockfall test shall be supervised and certified by an independent and internationally-recognised party acceptable to the Geotechnical Engineering Office (GEO), e.g. Technical Assessment Body (TAB). The HKIE suggests that the TAB should be specified, and should comprise not just the TAB as defined by the European Union (EU)¹ but also other appropriate qualified laboratories in other regions with consideration of the conditions and requirements of the Hong Kong local market.

4. Some high standing laboratories in the mainland China are capable to carry out the full-scale rockfall test with qualified and experienced professional personnel. The Government may take reference to the arrangement of the Hong Kong Laboratory Accreditation Scheme as well as the existing requirements for the full-scale curtain wall test, which have been successfully practised over the past two decades and demonstrated the TAB spirit of having a qualified laboratory and experienced personnel.

5. To facilitate the arrangement of local supervision and certification of the full-scale rockfall test, the GEO is also suggested to maintain a publicised inventory of those acceptable bodies on the Civil Engineering and Development Department's website before the implementation of the proposed Acceptance System A.

¹ The TAB as defined by the EU refers to the statutory requirements set out in Article 30 of Regulation (EU) No. 305/2011 (EU, 2011), which is a body pursuing of general European interest within the meaning of Article 162 of Commission Regulation No. 2342/2002.

Requirement for a Quality Assurance Scheme

6. Under the proposed Acceptance System A, the flexible barrier products shall bear a product certification system (e.g. CE Mark or equivalent) acceptable to the CEO. Given that most of the energy-rated rockfall barriers installed in Hong Kong are produced by manufacturers in the EU, the HKIE supports the proposal to adopt such a mandatory requirement to be in line with other EU counterparts. Nevertheless, it would be worthwhile to explore other certification bodies, such as the ISO, to enable non-European manufacturers to be included in supplying these barriers in future.

7. The proposal to omit the tensile tests and coating thickness tests for principal nets and wire ropes of the barriers in Level A Compliance Test when compared with Level B Compliance Test (in Attachments 2 and 3) is accepted, as long as the concerned components of the barriers are with product certification.

Proposed Acceptance System B (i.e. for Landslide Debris-resisting Flexible Barriers designed using Force Approach)

8. Under the proposed Acceptance System B, it is noted that the computer programme adopted for modelling the debris-barrier interaction shall be validated by the large-scale debris impact test acceptable to the GEO. The HKIE suggests that the acceptable arrangement of the prototype for the large-scale debris impact test should be clearly defined with examples to be given (e.g. scale). The GEO is suggested to also consider acceptance of the use of pre-accepted computer programs for such modelling without the need to carry out a large-scale debris impact test.

9. It is noted that some specialist suppliers/ manufacturers of those commercially-available flexible barriers may have already carried out extensive researches using sophisticated computer programme with full-scale tests for their products which may also be relevant to the condition in Hong Kong. Where justifiable, the GEO may consider incorporating flexibility in the acceptance system to review or waive the requirements of the large-scale debris impact test for such cases.

10. The use of an analysis approach to design a flexible barrier system by the force method is supported. More specifically, the flexible barrier system requires using “large deflection” analysis instead of the conventional linear small deflection analysis since forces in cables and brake elements vary considerably with change in geometry and their lengths. This type of large deflection analysis has been applied safely for the design of cable systems, including cable glass and membrane structural systems used decades ago in Hong Kong Cyberport and Science Park.

11. Both the force and the energy approaches can be checked by large deflection analysis with products’ energy levels verified by tests. We consider that the large deflection analysis method for the force approach can also be applied to the energy approach because computationally the energy level of a flexible barrier can be equated to its strain energy under an assumed load patterns and the method has been published and discussed through series of relevant seminars.

12. Moreover, the HKIE suggests to specify the requirement of the foundations for end supports (e.g. concrete pad for individual post) for flexible barriers designed with

the energy approach and to also clarify clearly the requirement and qualification for the competent structural engineer.

Other Recommendations

Overview of Current GEO's Requirements on Flexible Barriers

13. At present, one of the GEO's requirements in accepting flexible barriers for both government and private projects is to follow a Quality Management System standard ISO 9001:2008 for the suppliers. Following the replacement of ISO 9001:2008 by ISO 9001:2015 in September 2018 for a three years' transition period, the requirement should be reviewed and updated accordingly.

14. The HKIE also notes that the full-scale rockfall test shall follow a particular testing requirement with a residual height classification of Category A for Landslip Prevention and Mitigation projects only. The GEO is suggested to clarify whether there is another separate acceptance approach and testing requirement for non-Landslip Prevention and Mitigation projects.

Product Certification Requirements

15. For the product certification requirements, the HKIE suggests that reference should be taken to different practices in different regions, for examples CE Mark in the EU, UL Mark in North America, CCC Mark in China and JIS Mark in Japan. However, as the Certification Bodies of CE Mark are required to do assessments mainly on the health, safety and environmental protection requirements in the EU, other quality assurance or product certification schemes (e.g. Product Conformity Certification Scheme for Cement Products, etc.) should still be considered and applied as appropriate.

16. Locally, there are various product certification schemes available for building products, for example the Product Conformity Certification Scheme for passive fire protection products. We suggest that the Product Conformity Certification Scheme for falling rock barrier systems owned by the Hong Kong Institute of Steel Construction can be considered as an acceptable product certification for the flexible barrier products. Alternatively, the Government may consider establishing a suitable product conformity certification scheme for flexible barrier products in accordance with ISO/IEC 17067:2013 and with reference to other current similar schemes². Accreditation of such a certification scheme from the Hong Kong Accreditation Service (HKAS) could be sought for better recognition.

² List of Building Products requiring Product Certification (as at 4 May 2018)
[https://www.housingauthority.gov.hk/en/common/pdf/business-partnerships/resources/construction-product-certification/BldgProductRequiringProdCert\(20180504\)_EngW3C.pdf](https://www.housingauthority.gov.hk/en/common/pdf/business-partnerships/resources/construction-product-certification/BldgProductRequiringProdCert(20180504)_EngW3C.pdf)