

## **Suggested ways to effectively manage**

### **Testing and Certification of Materials in Construction Industry**

#### **1. Background**

- 1.1 Testing and certification services has been earmarked in the Chief Executive's Policy Address in Oct 2009 as one of the six pillar industries for propelling Hong Kong towards a knowledge based economy. Construction industry has been identified as one of the industry where testing and certification should be further developed so as to enhance the overall quality standards of construction materials.
- 1.2 Since the launching of this policy, the Innovation and Technology Commission (ITC) has been taking the lead to promote related initiatives in various fronts, with the support of government departments and private enterprises.
- 1.3 On the other hand, with the construction going ahead for a lot of mega infrastructure and building projects in Hong Kong, the Hong Kong Institution of Engineers Materials Division sees the possibility of further enhancing the management of testing and certification for construction materials. We would like to suggest ways for the consideration of the government in this respect.

#### **2. Construction Materials**

- 2.1 Construction materials used in the construction industry can be divided into two categories:
  - a) Structural materials – materials like reinforced concrete, structural steel, etc. These materials contribute to the structural skeleton of the buildings, bridges, large span roof structures, etc. and support the safe accommodation of occupants or users. The quality of the structural materials is crucial as any failure may endanger human lives.

b) Architectural materials – materials like tiles, paint, windows, doors, water cistern (WC), pipes, gates, etc. These materials are basically functional, serving as kind of furniture, and providing the basic needs and/or enhancing quality living environment.

### **3. Public Perception of Construction Materials**

3.1 In the past decades when many of the older buildings constructed in the 60's and 70's started to deteriorate, with concrete spalling and corrosion of reinforcement, the public attention was focussed onto the conditions of these buildings. As time passed by and majority of these buildings were demolished and redeveloped, particularly the public housing, the degree and extent of these problematic buildings have diminished. The introduction of extensive precast construction in public housing has also substantially improved the workmanship of construction and prevent the recurrence of structural materials deterioration in buildings for the past two decades.

3.2 In recent years, because the quality of living has been gradually upgraded, the public are now looking up to better quality architectural materials, including windows, pipes, door, gates, etc., which require least maintenance and fit for the purpose, not to mention that these materials should not affect the health of the occupants.

3.3 With this change of quality living culture, which is well understandable for modern living in a cosmopolitan city like Hong Kong, the construction industry has to be upgraded to meet this challenge.

### **4. Testing and Certification of Structural Materials**

4.1 Structural materials continue to be the materials of great importance to the safety and sustainability of building and infrastructure. Over the years, the quality assurance system has been very mature.

- 4.2 For materials delivered to site for construction, like reinforcement, structural steel, etc., test samples are taken immediately to the laboratory and materials failing the tests are rejected and will not be installed. For ready mix concrete delivered to site, concrete cube samples are immediately prepared and their strength are tested after 28 days. Should the concrete strength fail the test requirement, the concerned cast of concrete will be demolished and recast.
- 4.3 For site supervision on the quality workmanship of structural construction, all government projects deployed full time qualified resident engineer to manage the testing and inspection of structural works. Nevertheless, for private developers, the practice is to have qualified structural engineers paying frequent visits to sites instead of stationing on site full time.

## **5. Testing and Certification of Architectural Materials**

- 5.1 Architectural materials, like tiles, water cisterns, etc. are not strength control, but more dependent on the quality production which gives a good visual image and at the same time can be durable for a relatively longer service life. Therefore, control of these materials should go upstream to the factory manufacture under a stringent scrutiny on the production process. The process can be physical assembly of component parts, like windows and doors, or can be chemical mixing and moulding like water cistern, washing basins, tiles, etc. It is less effective, if not impractical, to only check on the materials and components upon delivery to site.
- 5.2 Certification therefore comes into place for control on architectural materials. Product certification is the name given to the system, which has been practised for a few years in all public housing projects. The principle is for independent auditors to go up to the factories at regular intervals to check on the process control and at the same time take samples of raw materials and products to accredited laboratories for testing. In parallel, the Hong Kong Accreditation Service under ITC will accompany the independent auditors for the audits, to assure the performance of the auditors.

Only when the process control and the test samples satisfy the requirements will the factory be granted a product certificate.

5.3 The Hong Kong Housing Authority will only accept contractors to propose architectural products with product certificates. The merit of this approach is to continuously monitor the performance of the factories and hence the quality of the products.

5.4 Product certification is a new initiative adopted by the Hong Kong Housing Authority and has yet been practised in other government Departments and in private sector. Currently, the latter are still relying on test certificates and product track records for acceptance.

## **6. Quality Management Personnel**

6.1 From a broader perspective, given the aforesaid prevailing quality system in place, the quality of construction materials can in fact be further enhanced through a more holistic quality management approach. The essence is to put the right people to manage the system.

6.2 Good quality materials should start at the design stage when the construction materials are specified. For the architectural materials in particular, with the uprising variety of materials produced in Mainland China in recent years, it may be appropriate for a quality professional in the design office to look after the selection of quality products. This would avoid choosing the inappropriate materials for tender and then change them during the construction stage.

6.3 During the construction stage, the quality professional could also be responsible for overseeing the testing, approving product certification or checking test certificates prior to installation. Currently, majority of these tasks are delegated to the site supervisors who may not be competent and knowledgeable on the materials characteristics, laboratory testing methods and product performance from respective factories.

6.4 In respect of independent auditors, it is also necessary for the auditors

to have the technical understanding and experience of the production process. Auditors with relevant engineering training are deemed prerequisite.

## **7. Recommendations**

7.1 Based on the aforesaid discussion, the Hong Kong Institution of Engineers Materials Division would like to suggest the government to consider the following:-

- a) To promote and extend the adoption of product certification to other government departments and to private developers so as to have a more effective upstream control on the production processes in factories;
- b) To promote the provision of quality professionals in government works departments and consultants to oversee the testing and certification in construction contracts;
- c) To promote the industry to train up qualified auditors conversant with the production processes of construction materials to participate in independent third party audits.

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