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For discussion

Green Construction
Measures Taken by the Hong Kong Construction Association Members

Purpose

This paper updates Members of the measures taken by the Hong Kong Construction Association (HKCA) members in the area of green construction, in particular the management of rubbish and detritus produced on the construction sites during the construction phase, as well as the management of construction and demolition (C&D) waste in order to minimize the impact on the environment and the public.

Background

2. There is increasing public concern about environmental nuisances at construction sites, particularly related to the construction waste and its disposal (C&D waste), dust and fumes, noise and wastewater pollution. There is a mounting sense in the construction industry that something must be done to enhance environmental performance. In addition, contractors have to deal with the increased enforcement of statutory requirements on environmental performance.

3. Since the 1980's, HKCA has been a major consultation party in the formulation of pollution control legislation concerning the construction industry. In 2001, in the light of increasing public expectations for environmental protection, HKCA and the Environmental Protection Department (EPD) formalized a Partnering Programme targeting issues for the changing environment. To this end, HKCA pledged to help the construction industry minimize environmental nuisances and public complaints, improve the environmental conditions at construction sites, and enhance the industry's environmental performance as therefore its image. A series of action-oriented activities, e.g. environmental seminars and workshops, etc. were jointly organized by the two partners to promote the initiative.

4. In November 2002, HKCA published the "Best Practice Guide for Environmental Protection on Construction Site" with the aim to enhance the

environmental awareness of the construction industry and to provide steps and practical solutions to identify and mitigate environmental problems which are often encountered on construction sites. The publication later has become a common in-house waste management education and training materials that are widely used by contractors.

5. In mid 2005, HKCA was invited by the Advisory Council on the Environment to brief and update the Council on the subject of green construction. After consultation with our member companies, this paper presents a summary report of the initiatives and measures taken by HKCA members in embracing sustainable construction methods. Examples of environmental-friendly practices at construction sites aimed at reducing the negative impact of the construction activities on the general public are also given. A copy of good examples for green construction practiced by HKCA members is at **Annex** for Members' reference.

Present Position

6. In recent years, a substantial amount of environmental protection work has taken place at our members' construction projects. The major goals were environmental-friendly construction methods and resource conservation. The challenges faced by our members including the building codes and regulations, labour costs, time factors, and the lack of other stakeholders' and the public's awareness about the benefits of green construction. Our members, on a 'best endeavor' basis, have overcome some of these problems by utilizing innovative techniques or processes in different levels and various extent. As a result, we have been successful in avoiding or at least minimizing environmental nuisances and, compared to a few years ago, have reduced the negative impact of construction activities. We are much encouraged by some of the projects being completed in an environmental-friendly way and at the same time with proven cost savings. The recent notable drop in successful convictions against our members by EPD is also praise worthy (see **Table 1**).

	2000	**2001**	**2002**	**2003**	**2004**
Government Departments	206	102	90	34	48
Public Organizations (KCRC & MTRC)	21	39	1	0	0
Private Companies	543	334	251	140	97
Total	770	475	342	174	145

Table 1 Conviction Statistics of Construction Industry in 2000-2004
(*Information provided by EPD)*

7. Nevertheless, there is general consensus that we need to continue to work hard to improve the efficiency of our environmental performance.

Waste Management

8. Hong Kong today is deeply concerned by the thought of running out of both reclamation sites and landfill space. According to current trends, our landfills will be full in around 10 years, and the public filling areas will run out shortly. HKCA and its members are very conscious of these problems. In collaboration with the Government and non-public works developers, we have been putting much effort into administrative commitment and the resources necessary to minimize waste generation and also into the reuse and recycling of C&D materials.

9. The best and the first step in enhancing waste reduction is raw material management. The following provide some good examples currently practiced by our members at their construction sites:

(a) Material utilization

Waste management techniques and strategies were used to review and control operations for waste reduction measures and to maximize the utilization of materials, e.g. implement a waste management plan, impose stringent controls to avoid the creation and disposal of material waste, etc. The mishandling of materials, improper operational procedures and material wastage were all greatly reduced.

(b) Reuse and recycling

Reuse and recycling can divert C&D materials from the waste stream back to the construction cycle. To achieve this, prior to work commencing, construction methods and the work programme were carefully designed and detailed to enable work processes to achieve the desired environmental performance. Notable examples such as balancing cut and fill, utilizing reusable items (e.g. metal formworks and hoardings), and the choice of using recycling materials (e.g. concrete, timber, packaging and plastics) are now commonly used by our contractors on their construction projects.

(c) Sorting of C&D material

Procedures were introduced to collect and separate refuse at source. Through a systematic sorting and recycling regime, when comparing with previous projects, a remarkable recovery of the solid waste was

noted and only small percentage was disposed at landfill.

However, not all construction sites facilitate the sorting of C&D material. The lack of space on small sites for sorting and storage is foiling efforts to control waste in most of the renovation and maintenance projects. Potential ways of improvement are being explored among industry stakeholders.

(d) Orderly disposal

After segregation, inert and non-inert waste should be disposed of at waste disposal facilities. A 'Trip Ticket System' is already in place to ensure proper disposal of C&D materials at designated disposal sites for public works projects. We are fully aware of the need to avoid fly tipping and to strictly follow the practices under the "Trip-Ticket System" recommended by the Works Branch of the Environment, Transport and Works Bureau (ETWB).

The Government will implement the Construction Waste Disposal Charging Scheme by end of this year. HKCA is supportive of the charging scheme and has actively participated in the tripartite working group (formed with representatives from the Government, waste haulers and the construction industry) and has discussed operational issues such as C&D reception facilities, waste checking and record system, billing system, etc.

Environmental-Friendly Practices

10. In addition to the management of raw materials as mentioned above, there are some other innovative construction methodologies and environmental-friendly practices used to reduce waste on projects executed by our members. **Table 2** below showcases some good examples.

Table 2

Innovative Initiative	Environmental-Friendly Practices Adopted
◆ Prefabrication technique to reduce concreting waste, minimize the usage of formwork, and efficient use of resources	• Using of precast concrete elements e.g. beam, plank, staircase, façade, unit bath system, semi precast balcony, etc. • Prefabrication of building services components including E&M ductworks, trunkings and modular building services plant room, etc.

Innovative Initiative	Environmental-Friendly Practices Adopted
	• Using of solid wall systems • Off-site prefabricated structural steelwork
◆ No tropical hardwood	• Using of timber from sustainable sources • Not to use timber material for temporary works
◆ Purchaser's choice for green finishes and fittings	• Using of drywall partition or other proprietary semi-dry fixing internal partition
◆ Minimize material wastage	• Maintaining good housekeeping to improve and provide a safe working environment at project site • Packaging of materials in sizes to suit the application on site • Improving material handling and storage facilities
◆ System formwork and falsework to eliminate the wastage from traditional timber formwork and wastage of concrete placing	• Using of aluminium formwork and large steel wall form, steel modular falsework system, table form, climbing formwork, etc.
◆ Chemical and chemical waste storage to avoid contamination and for chemical waste recycling	• Maintaining chemical and chemical waste storage

Demolition Methods to Reduce Construction Waste

11. HKCA strongly supports exploring green construction methods to reduce demolition waste.

12. Traditional demolition is to destroy the building and bury the results in a landfill. There is no salvage and only limited recycling of materials, wood, and clean rubble. Our members have experienced a new demolition method so-called "Selective Demolition" (SD) which was given a trial run by the Housing Authority. Upon completion, SD resulted facilitating the recovery of 95% of the C&D materials through sorting and salvaging the recyclable components (such as electrical appliances, steel and paper). It has also prevented cross-contamination of the concrete debris occurring from demolition, thus facilitating its re-use as public fill or as recycled aggregates.

Waste Management Plan

13. Contractual requirements for waste management plans (WMP) have been imposed by ETWB since 2001, requiring public works contractors to put in place structured control and monitoring systems to maximize recycling and minimize waste generation.

14. In line with the Government's waste management strategy, major non-public works players such as KCRC, MTRC, Housing Authority, and some private developers also established their own waste management requirements and incorporated requirements of a WMP into their contracts.

15. Our members responded positively to the WMP initiative and have initiated compliance with the requirements to underline their commitment to it.

16. As advised by ETWB, the above approach to non-inert waste generation and to surplus excavated material coming from public building projects has resulted in a significant reduction since the implementation of waste management measures (including the Government's supportive initiative of the "Pay for Environment Scheme") in the early 2000's. We can see that the effectiveness is due to the public sector being actively involved and committing resources to waste-management. On the other hand, the private sector developers have done less, which means that there is room for further improvement if the private sector developers did more on this.

Other Green Construction Examples

17. **Table 3** showcases other construction methodologies and good practices being implemented by HKCA's members to avoid and/or minimize environmental nuisances from dust and fumes, noise and wastewater pollution:

Table 3

Innovative Initiative	Environmental-Friendly Practices Adopted
◆ Environmental Management System	• Establishing a certified management system for the environment, including monitoring, auditing and reporting procedures and setting annual performance targets • Executing environmental planning and assessment prior to construction
◆ Electronic document system	• Establishing and maintaining electronic document system to reduce paper consumption

Innovative Initiative	Environmental-Friendly Practices Adopted
	and waste generation
◆ Sub-contractor Management	• Vetting subcontractors at tender and procurement stages for environmental performance • Establishing partnerships to encourage improvement • Offer training to sub-contractors • Performance monitoring of sub-contractors
◆ Air Pollution Control	• Installation of: - Fully enclosed batching plants to avoid leakage of dust - Capture and pump out of exhaust fumes from indoor generators without causing of any significant smell - Fully automatic wheel washing plant - Water spraying system / overhead nozzles for dust suppressor - Enclosed refuse chutes - Completely paved site access roads
◆ Noise Control	• Strictly enforcing access control to prevent the carrying out of construction work during restricted hours • Executing pre-construction planning and review of environmental and social impacts and sensitive receptors • Installation /setting up of: - Silencers for major equipment and plant such as generators, air compressors and jack hammers to reduce noise emission - Temporary noise barriers around major equipment and plant to further reduce the noise pollution • Use of: - Concrete crushers with biting action instead of traditional percussion tools to minimize noise and dust nuisance - Hydraulic piling systems which are proven to be much quieter and environmental-friendly - Self compacting concrete (specifically for used in systemized formwork) for eliminating traditional concrete vibration requirements

Innovative Initiative	Environmental-Friendly Practices Adopted
◆ Waste Pollution Control	• Concrete paving for collecting surface water and less dust • Installing wastewater treatment and wastewater recycling plant, i.e. recycling water can be used for wheel washing, watering and site cleansing • Chemically enhancing wastewater treatment • Installation of temporary site drainage system around site boundary to prevent site water pollution
◆ Plant & Equipment Management	• Implementation of plant management and preventive maintenance programmes to ensure and improve plant performance for noise generation, exhaust emissions and fuel consumption • Deployment of various specialized plant and equipment to minimize environmental impact

Area of Improvement

18. The environmental performance at construction sites is significantly better and the change is palpable. This may sound like a small victory but if all industry stakeholders could work harder and commit more resources on protecting the environment, at least equal to that they have committed in operating their businesses, it would produce an enormous win.

19. Last year, HKCA conducted a survey of its members to seek their views on the priority of environmental initiatives. Overwhelmingly, the survey found that our members believe that environmental-friendly construction must be lead, supported and subsidized by both the public and private sector developers. Contractors on their own, cannot successfully complete environmental-friendly construction without tangible support from them. It is a good sign that the Government will expand the 'Pay for Safety and Environment Scheme' to cover more environmental issues, though we understand that the total sum allowed is not enough to cover all environmental protection works. However, and to the contrary, the majority of private sector projects have done less on this except to be satisfied with bare compliance with environmental legislation.

20. Recent polls have also shown a ground-swell that recognizes the need for education and for the promotion of stakeholders' awareness about sustainable

construction. Environmental management training for construction personnel is considered to becoming more important. However, it is noted that existing training institutes only offer courses to site managerial and supervisory grades. There is no tailor-made course for frontline operatives on site. Meanwhile, construction workers can only receive environmental training through in-house training or site-based training and tool box talks. We are doubtful how effective these in-house or site-based training courses can be and they are likely to vary considerably, depending on capability of trainers, quality of training material, adequacy of monitoring and control and suitability of training venue. As the construction workers are the actual doers of construction activities, their understanding of their environmental management roles and responsibilities and subsequent behavior would inevitably affect the success of environmental protection on site. We recognize that the correct way forward is to enhance formal environmental training for workers in the construction industry.

21. Many of Hong Kong's leading main contractors have already introduced an environmental management system and have attained certification to ISO14001, and more continue to do so. However, on the other hand, the small and medium sized enterprises (SMEs) have little or no knowledge of environmental management systems/ISO14001 and do not expect to do so. Though the environmental requirements of clients are to a large degree absorbed by the main contractors and seldom reach the second or third tier player in the supply chain, there is a strong desire from main contractors for sub-contractors to improve their environmental performance to ensure the necessary standards on site. In view of the sustained need for the SMEs, their awareness is an important initiative in achieving the benefits of green construction and therefore should be raised quickly.

Way Forward

22. The purpose of this paper is to report the current practice of green construction in Hong Kong. A review of current procedures is compared and contrasted with the opinions of our members and the following key points are drawn from the response of our members in order to successfully perform sustainable construction:

- Reform of the relevant environmental legislation should bring greater focus on environmental management, e.g. implementation of Environmental Management Plan (EMP)

- A review of current Hong Kong and international best practice and the enforcement of the existing standards, e.g. ISO14001

- An objective assessment system to help differentiate environmental performance of contractors should be established

- Education and promotion of public and private stakeholders' awareness and understanding in order to enhance environmental construction

- Accomplish greater industry cooperation and partnering

- Regulatory flexibility to encourage trials of new technologies and methodologies

- Support initiatives such as the 'Pay for Environment Scheme' and the administrative system for 'Quality Powered Mechanical Equipment (QPME)' are encouraged

- Encouraging the sharing and exchange of information

23. Green construction requires a coordinated effort from the Government, the private side stakeholders, the general public and the construction industry at large. Policy makers in the construction industry, along with architects and engineers need to work together to find ways to accelerate green construction.

Hong Kong Construction Association
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