SUPPORT ON ENVIRONMENTAL MANAGEMENT INFORMATION AND ISO14001 ENVIRONMENTAL MANAGEMENT SYSTEMS

FOR

SMALL AND MEDIUM ENTERPRISES IN THE ELECTRICAL / ELECTRONIC AND CONSTRUCTION SECTORS IN HONG KONG

(Tender Ref. UA 03-019)

Environmental Protection Department
HKSAR Government

REVIEW REPORT

SUPPLY CHAIN PRESSURES FOR ENVIRONMENTAL MANAGEMENT AND EMS IN THE CONSTRUCTION SECTOR

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CONTENTS

LIST OF ABBREVIATIONS

APCO	*Air Pollution Control Ordinance*
ArchSD	*Architectural Services Department*
BD	*Buildings Department*
BEC	*Business Environment Council*
CED	*Civil Engineering Department*
CII HK	*Construction Industry Institute, Hong Kong*
CIRC	*Construction Industry Review Committee*
CITA	*Construction Industry Training Authority*
CityU	*City University of Hong Kong*
CIWEM	*Chartered Institute of Water & Environmental Management*
CIWRTF	*Construction Industry Waste Reduction Task Force*
EIA	*Environmental Impact Assessment*
EIAO	*Environmental Impact Assessment Ordinance*
EM&A	*Environmental Monitoring and Auditing*
EMP	*Environmental Management Plan*
EMS	*Environmental Management System*
EMSD	*Electrical and Mechanical Services Department*
EPD	*Environmental Protection Department*
ETWB	*Environment, Transport and Works Bureau*
HK-BEAM	*Hong Kong Building Environmental Assessment Method*
HKCA	*Hong Kong Construction Association*
HKHA	*Hong Kong Housing Authority*
HKIE	*Hong Kong Institution of Engineers*
HKIEIA	*Hong Kong Institute of Environmental Impact Assessment*
HKPC	*Hong Kong Productivity Council*
HKUST	*Hong Kong University of Science & Technology*
HSE	*Health, Safety and Environment*
ISO	*International Organization for Standardization*
NCO	*Noise Control Ordinance*
NGO	*Non-Government Organization*
OLPO	*Ozone Layer Protection Ordinance*
PCICB	*Provisional Construction Industry Coordination Board*
PFSS	*Pay for Safety Scheme*
PNAP	*Practice Note for Authorized Persons & Registered Structural Engineers*
PolyU	*Hong Kong Polytechnic University*
ProPECC	*Practice Notes for Professional Persons*
SCP	*Supply Chain Pressure*
SMEs	*Small and Medium Enterprises*
SUCCESS	*Support and Consultation Centre for SMEs (TID)*
TCs	*Technical Circulars*
TID	*Trade and Industry Department*
UHK	*University of Hong Kong*
WDO	*Waste Disposal Ordinance*
WMP	*Waste Management Plan*
WPCO	*Water Pollution Control Ordinance*

EXECUTIVE SUMMARY

BACKGROUND

Small and medium sized enterprises (SMEs) in Hong Kong's construction sector are collectively a major part of the economy ranking high in terms of number of establishments, contribution to gross domestic product, and size of employment. Construction sector SMEs, however, also account for substantial environmental concerns, such as air, water and noise pollution, energy consumption, waste generation and chemical waste production, compared to other sectors.

This *Review Report* has been compiled by the Business Environment Council Ltd for the Environmental Protection Department (EPD) through internet research, literature reviews and questionnaire surveys of stakeholder organizations to identify:

- latest trends in supply chain pressure for environmental management and EMS in the construction sector;
- specific environmental requirements of key client organizations, contractors and authorities (government works and related departments, private developers, utility companies, and main contractors); and
- organizations providing tailored support to local SME construction enterprises.

Findings are summarised as follows.

CONSTRUCTION SECTOR CHARACTERISTICS

The construction industry in Hong Kong is characterised by its large number of sub-contractors with numerous specialist operators, often using short-term labour, typically supporting larger main contractors. The industry is highly competitive and works to tight deadlines. Completion on time is a high priority, whilst resources such as space on site for recycling remain limited. However, there are sources of supply chain pressure for environmental improvement and these can be classified into a hierarchy of four levels:

Level 1	from stakeholders such as the *Construction Industry Review Committee (CIRC)* and *Provisional Construction Industry Coordination Board (PCICB)*
Level 2	from policies, legislation and regulations promulgated by Government, and specific requirements set out in various *technical circulars*
Level 3	from the *requirements of public and private sector clients* made up from their main contractors and suppliers
Level 4	from the *requirements of main contractors* made up from their sub-contractors, sub-sub-contractors and suppliers

Level 1 (CIRC and PCICB directives) in particular is seen as the over-riding catalyst and framework for environmental improvement throughout the construction industry, being manifested at least in public projects through *Level 2* (Technical Circulars).

ENVIRONMENTAL DRIVERS FROM THE CIRC AND PCICB

The CIRC report *Construct for Excellence* (January 2001) set out 109 recommendations recognised by industry as the authoritative roadmap towards a modern, safe, innovative, efficient and client-oriented construction industry. Seventeen of these specifically addressed the environment. Progress on these environmentally-related recommendations,

as reported by the PCICB[1], is having and will have further impacts on construction enterprises working on public sector projects. These recommendations are observed to have direct impacts on main contractors and they may also indirectly affect sub-contractors through the supply chain. CIRC recommendations outcomes to date include:

- ***for public works projects***: introduction of a *marking scheme to assess contractor environmental performance*; new *procedures for regulatory actions* against contractors with environmental convictions; Environment, Transport and Works Bureau (ETWB) Technical Circulars on *site tidiness / cleanliness* and measures for *pay-for-waste-management* (target setting, monitoring, control, on-site sorting); and contract requirements for *dedicated personnel* for waste management.
- ***for public housing projects***: requirements for contractors to submit an Environmental Management Plan (EMP) for demolition, piling, building and civil works; requirements to employ dedicated personnel for their EMPs; introduction of an integrated pay for environment, safety and hygiene scheme; and inclusion of contractor environmental performance in the Hong Kong Housing Authority *Contractors Premier League*.

In addition, public works and housing project specifications have been revised to facilitate use of recycled materials as hardcore in foundations, sub-base in road pavement and concrete in technically less demanding works (ETWB has identified some 100 projects).

Whilst these requirements so far affect mainly public sector projects, it is widely anticipated that they will in time begin to feature in private sector projects (examples are already evident, described further below), and will eventually filter down to SME sub-contractors and sub-sub-contractors. Although there is no recommendation to mandate ISO14001 in the construction sector, the CIRC report (para 8.50) encourages its voluntary adoption, with mandatory certification "*preferably considered at a later stage when the construction industry has acquired more expertise in tackling the environmental challenge*".

ENVIRONMENTAL LEGISLATION AND REGULATIONS

The key supply chain pressure facing all construction related companies is compliance with legislative and regulatory requirements. Construction companies in particular have financial reasons for avoiding environmental convictions since these are considered when tendering for government contracts. Environmental legislation in Hong Kong consists of:

- *environmental ordinances and regulations* – the *Air Pollution Control Ordinance* (APCO), *Ozone Layer Protection Ordinance* (OLPO), *Noise Control Ordinance* (NCO), *Water Pollution Control Ordinance* (WPCO), *Waste Disposal Ordinance* (WDO), *Environmental Impact Assessment Ordinance* (EIAO); and

- *environmentally-related ordinances and regulations* – the *Factories and Industrial Undertakings Ordinance*, *Occupational Safety and Health Ordinance*, *Dangerous Goods Ordinance*, *Antiquities and Monuments Ordinance*, *Public Health and Municipal Services Ordinance*, and others.

New legislation and amendments are regularly introduced. On 2nd July 2004, the Legislative Council passed a Bill to implement a construction waste disposal charging scheme that will provide further supply chain pressure for environmental protection.

[1] PCICB Paper No 114 *Progress Report on Implementation of Recommendations of the Construction Industry Review Committee* (July 2004)

In addition to statutory requirements, construction companies also face various *Codes of Practice, Technical Memoranda, Guidance Notes*, *Practice Notes for Professional Persons, Practice Notes for Authorized Persons and Registered Structural Engineers* and *Technical Circulars* that address environmental matters related to construction sites.

Clearly for any company to be assured of compliance with relevant legislation and codes, a systematic process is required to identify, understand and keep up to date with the many requirements in place. This is a fundamental element and benefit of the ISO14001 EMS.

GOVERNMENT TECHNICAL CIRCULARS

ETWB *Technical Circulars* (TCs) are the key means of implementing policies and procedures relating to construction sites. Some 46 current TCs (issued from 1988 to date) include explicit requirements for environmental protection. New TCs since 2002, in addition to specifying the management of environmental impacts (e.g. ecological protection, waste minimisation, etc), are increasingly exerting a strong influence on the behaviour of contractors in several areas, particularly by:

- including environmental criteria in the *Management of Sub-contractors by Contractors* (TC 47/2002);
- evaluating environmental performance in the *Contractors' Performance Index System* (TC 24/2002);
- integrating environmental factors within T*ender Evaluation* for Works Contracts (TC 08/2004); and
- introducing *management systems and staged payments* for waste management (TCs 14/2003 and 15/2003).

TC 14/2003 (*Role of Departmental Safety and Environmental Advisor on HSE Protection on Construction Sites*) gives an insight into future developments, stating in *Section 1* that:

> *"The objective to revise and extend the duties of Departmental Safety Advisor is to enhance the communication and management on environmental performance of contractors on construction sites so that the established framework for the* ***safety management system and the Pay for Safety Scheme can be extended for applying to environmental protection****."*

Such requirements, although non-statutory, create strong drivers to the second and third tier players of the supply chain to move towards improved environmental management.

CLIENT REQUIREMENTS – PUBLIC WORKS AND RELATED DEPARTMENTS

Environmental supply chain requirements of public works and related departments include:

- adoption of environmental management practices on site to minimize adverse impacts caused by the construction activities, including trip ticket systems, waste management plans, pay for site cleanliness, environmental monitoring and independent environmental checking;
- encouragement in contract documents and specifications to use less environmentally damaging building materials and construction technologies new to Hong Kong such as prefabrication, left-in formworks and slip form construction;
- requirements for satisfactory contractor environmental performance in terms of compliance and mitigation of noise, water, air and waste problems both in the past (for tender evaluation) and during current projects.

Contracts for public buildings also increasingly include requirements for environmental assessments using the *Hong Kong Building Environmental Assessment Method* (HK-BEAM)[2]. Only the EPD at present requires the implementation of an ISO14001 EMS for the design, build and operation of waste management facilities since 2000 (environmental monitoring is also specified, with a portion of the contract sum allotted for compliance with environmental requirements).

CLIENT REQUIREMENTS – PRIVATE DEVELOPERS AND UTILITY COMPANIES

Environmental requirements of private developers and utility companies include:

- environmental requirements in tender specifications, in most cases focusing on compliance with regulatory requirements;
- design and construction guidelines requiring or encouraging best environmental practices such as the use of more environmentally-friendly materials and the recycling of reusable waste materials; and
- more stringent requirements, such as the adoption of an *Environmental Management Plan* and *Environmental Monitoring and Auditing* are also required for projects designated under the *Environmental Impact Assessment Ordinance*.

More recently, requirements for *Waste Management Plans*, *Environmental Management Plans*, and employment of an independent environmental checker have been introduced in isolated and individual private sector projects. Private developers have also been keen to explore construction technologies new to Hong Kong such as prefabrication, left-in formworks and slip form construction. A large number of private developers also require their construction projects to be assessed against and certified under HK-BEAM.

CLIENT REQUIREMENTS – MAIN CONTRACTORS

Many of Hong Kong's leading main contractors have already obtained certification to ISO14001, and more continue to do so. Unlike other industries in which global partners and customers have demanded ISO14001 certification, its adoption in the construction industry has arisen on a purely voluntary basis.

Under a typical mode of operation in construction sector: Client/Designer – Main Contractors - Main contactors – Sub-contractors (service providers/materials suppliers), the main contractors play an important role in communicating the environmental requirements from the clients to their sub-contractors. Main contractors generally issue environmental guidelines to their sub-contractors that specify compliance with statutory and client requirements. Most main contractors appear to take full control of the construction project and site operation, with sub-contractors found to play minor roles in environmental protection (such as participation in training and education programmes), as they may simply supply labour and equipment to the main contractors without direct involvement in environmental management in construction projects.

As such the environmental requirements of clients are to a large degree absorbed by the main contractors and seldom reach the second or third tier players of the supply chain. Little significant or direct pressure appears to be directed to sub-contractors or sub-sub contractors other than requirements arising from the main contractors' adoption of an EMS, whether or not this is certified to ISO14001. However there is a strong desire from main

[2] HK-BEAM has to date been adopted by 95 major developments, approximately 30% of which have been commissioned by public sector clients.

contractors for sub-contractors to improve their environmental performance and ensure the necessary standards on site.

SOURCES OF ENVIRONMENTAL SUPPORT

The environmental supply chain requirements of local client organisations can be broadly categorised into five main areas:

SCP 1	Compliance with statutory environmental obligations (including the *Air Pollution*, *Water Pollution*, *Waste Disposal*, *Noise Control* ordinances, etc)
SCP 2	Implementation of *waste and environmental management plans* (WMP and EMP respectively) and/or an ISO14001 certified EMS
SCP 3	Implementation of *best practices for design and construction* stipulated in tender specifications and supplementary guidelines and handbooks, etc
SCP 4	*Environmental Monitoring and Auditing*, environmental checkers, performance tracking of site practices, suppliers and sub-contractors
SCP 5	Use of innovative techniques and technologies in design and construction such as life-cycle assessment and HK-BEAM performance benchmarking

Nineteen professional and academic institutions in Hong Kong have been identified that can offer expert advice and technical assistance, tailored to the specific needs of individual construction SMEs, on local environmental requirements, ISO14001 EMS, and pollution control measures:

Government related organisations	• Construction Industry Training Authority • Construction Industry Waste Reduction Task Force • Environmental Protection Department • Environment, Transport & Works Bureau • Hong Kong Productivity Council • Provisional Construction Industry Co-ordination Board • Trade & Industry Department (Support & Consultation Centre for SMEs)
Non-government / trade associations	• Business Environment Council • Chartered Institute of Water & Environmental Management (HK Branch) • Civic Exchange • Construction Industry Institute, Hong Kong • Hong Kong Construction Association • Hong Kong Institution of Engineers • Hong Kong Institute of Environmental Impact Assessment
Academic Institutions	• Chinese University of Hong Kong (Department of Architecture) • City University of Hong Kong (Professional Services Limited) • Hong Kong Polytechnic University, Department of Civil & Structural Engineering**,** Department of Building Services Engineering, Department of Land Surveying and Geo-Informatics, and Department of Building and Real Estate • Hong Kong University of Science & Technology, Department of Chemical Engineering, and Department of Civil Engineering • University of Hong Kong, Department of Architecture, Department of Mechanical Engineering and Department of Real Estate and Construction

The services offered by these organisations are highly diversified, depending upon their nature, mandate and scale, and include for example the provision of general information, ISO14001 mentorship, tailor-made training, best environmental practice guides, and pollution control technologies.

In addition, over 80 local consultancies provide construction related services in areas including environmental auditing, pollution control, impact assessments, analytical and laboratory services, training and strategy, and ISO14001 EMS development.

1. INTRODUCTION

1.1 BACKGROUND TO THE SUPPORT PROGRAMME

Companies worldwide are facing increasing pressure to provide their goods and services in an environmentally responsible manner. The risks of not doing so include loss of business and market share through damage to company image, the inability to comply with legislation in local or export markets, and falling behind customer or buyer requirements. To effectively control the environmental impacts resulted from the operation of a company, the introduction of environmental management is a frequently used tool. Environmental management also brings a range of potential benefits including cost savings through increased process efficiency, legal compliance and reduced waste, improved staff quality, and improved company reputation.

Small and medium enterprises (SMEs) face the same potential risks and benefits. In 2001 the Environmental Protection Department (EPD) has completed extensive research into environmental management system (EMS) adoption by SMEs[3] to:

1. identify the market threats and opportunities to local SMEs resulting from international trends in the adoption of ISO14001 EMS, and investigate the status of ISO14001 adoption by SMEs in Hong Kong;
2. prioritise the *Major Industry Groups* (MIGs) of local SMEs (in both the service and manufacturing sectors) which are most at risk or have most to gain from these trends, taking into account social, economic and environmental factors; and
3. examine the barriers to EMS through detailed case studies in the priority industries, and hence design a support programme to help local SMEs in the selected sectors.

The research revealed growing trends in the introduction of environmental requirements into the supply chain across many sectors. These included national and international legislation, and policy and procurement requirements from buyer and client organizations, both of which would in time exclude suppliers that did not comply. Despite this, fewer than 20% of local SMEs recognised the need to or benefits of implementing an EMS, or perceived any potential opportunity loss from not embracing ISO14001.

The electrical / electronic sector (from manufacturing industry) and the construction sector (from the service industry) were identified as the high priority SME sectors. This is because collectively they ranked highest in terms of the number of establishments, contribution to gross domestic product, size of employment, and environmental problems (energy consumption, waste generation, complaints and convictions, etc) in Hong Kong. They also faced the greatest supply chain pressures for environmental protection.

As a follow-up of these findings, the Business Environment Council (BEC) was commissioned by the EPD in October 2003 to provide support on *Environmental Management Information and ISO14001 EMS* for Hong Kong SMEs in (A) the electrical and electronic sector and (B) the construction sector.

1.2 OBJECTIVES OF THE SUPPORT PROGRAMME

This review report forms part of the support programme for **Hong Kong SMEs in the construction sector**. A separate review report has also been produced for SMEs in the

[3] *Study on Small & Medium Enterprises (SMEs) in ISO14001 Environmental Management System (EMS) Implementation*, led by the Business Environment Council

electrical and electronic sector (*Supply Chain Pressures for Environmental Management and EMS in the Electrical and Electronic Sector*, August 2004).

The key objectives of the support programme is to help SMEs in the local construction sector to (i) prepare for future supply chain pressures towards ISO14001 EMS, (ii) improve their environmental performance, and (iii) stay competitive in an increasingly environmentally-conscious business marketplace. The support is being provided through three elements, all of which are provided in English and Chinese:

1. An update on the *supply chain pressures for environmental management and EMS in the construction sector* ("*Task 1B*", presented in this report);

2. Easy to use *Generic ISO 14001 EMS Templates*, *User Manual* and *Practical Examples* ("*Task 2B*"), which an SME can use to develop its own ISO14001 EMS, *Environmental Management Plan* (EMP) and *Waste Management Plan* (WMP); and

3. An *Environmental Management Information and ISO14001 EMS Support* website for construction sector SMEs ("*Task 3B*"), from which the Generic ISO 14001 EMS Templates, user manual, practical examples and contents of this report can be obtained.

This *Review Report* presents the findings from research into the supply chain pressures for environmental management and EMS facing Hong Kong SMEs in the construction sector (*Task 1B*).

1.3 THE STRUCTURE OF THIS REVIEW REPORT

The remainder of this *Review Report* is structured as follows:

Section 2 provides an analysis of current trends in supply chain pressure for environmental management and EMS in the local construction sector.

Section 3 presents a list of local government agencies and private corporations that have imposed supply chain pressure in environmental management and EMS to their suppliers and contractors in the construction sector, with a detailed description of their requirements.

Section 4 identifies the contact details of professional and academic institutions in Hong Kong that can offer tailor-made expert advice and technical assistance to construction sector SMEs on local environmental requirements, ISO14001 EMS, and pollution control measures to suit the specific needs of individual enterprises.

Information in this report has been gathered through extensive web-based and literature research, including reviews of environmental reports produced by public[4] and private sector clients and contractors, trade publications and Government circulars. Questionnaire surveys of local construction-related organizations including public and private sector clients, government departments, and trade associations have also been undertaken. Information sources are provided throughout the report and compiled in *Appendix A*.

[4] The Chief Executive of the Hong Kong SAR in his 1998 Policy Address required controlling officers within Government to publish environmental reports starting from the 1999/2000 financial year.

2. SUPPLY CHAIN PRESSURES FOR ENVIRONMENTAL PROTECTION

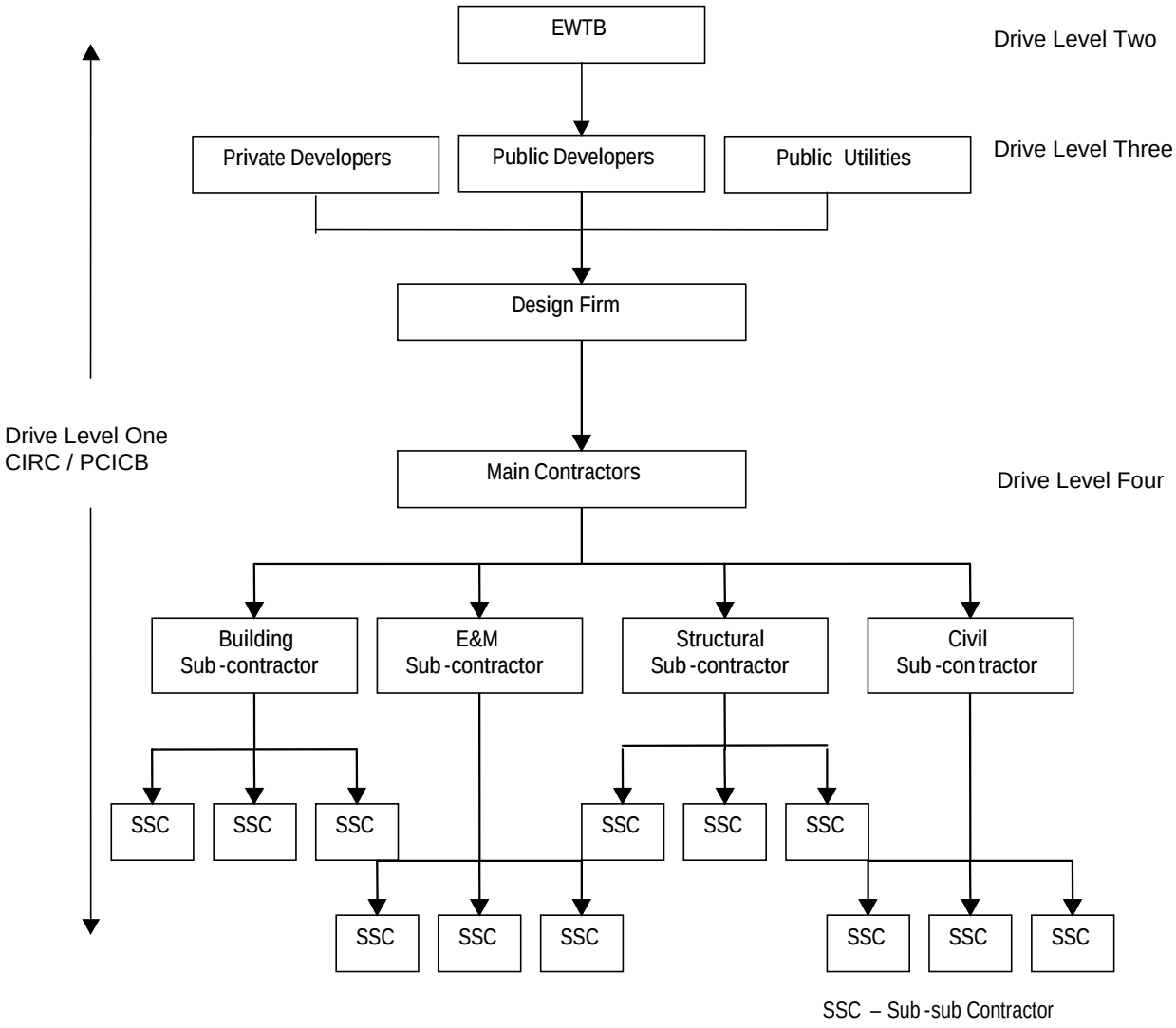
This section provides an analysis of current trends in supply chain pressure for environmental management and EMS.

2.1 CONSTRUCTION SECTOR CHARACTERISTICS

SMEs in Hong Kong's construction sector are collectively a major part of the economy, ranking high in terms of the number of establishments, contribution to gross domestic product, and size of employment. Construction sector SMEs, however, also account for substantial environmental concerns, such as air, water and noise pollution, energy consumption, waste generation and chemical waste production, compared to other sectors.

The construction industry in Hong Kong is also characterised by its large number of sub-contractors. Numerous specialist operators, often using short-term labour, typically support the larger main contractors (as illustrated in *Figure 2.1a*). The industry is highly competitive and works to tight deadlines. Completion on time is a high priority, whilst resources such as space on site for the recycling of materials remain limited.

Figure 2.1a Typical Supply Chain of a Local Construction Project

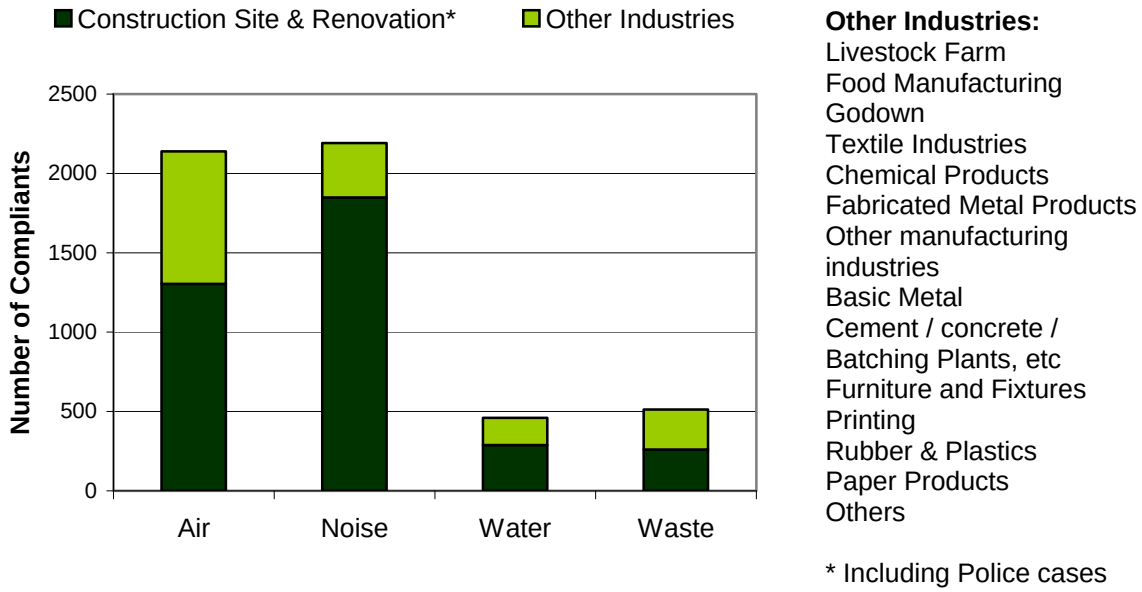


Construction activities have resulted in on-site and off-site environmental and amenity impacts that affect the community and the wider environment. These impacts, particularly

noise, dust, water and waste arising, have been subjected to close legislative control. Despite these efforts, the construction sector consistently attracts more prosecutions for violation of environmental legislation than any other industry.

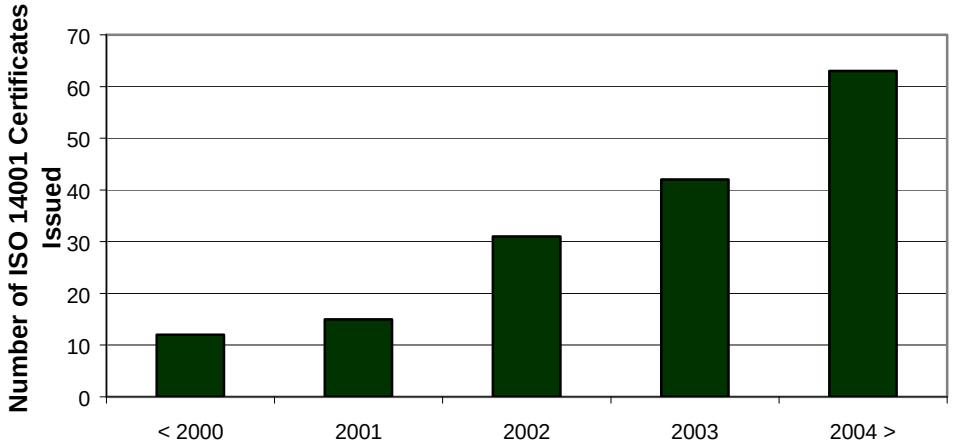
Figure 2.1b below presents the statistics on pollution complaints by different types of trade from January to December 2003 (from the EPD Report Environment Hong Kong 2004, Chapter 9 Enforcement, 9.1 Resource Materials). Construction sites accounted for 69.7% of industrial related complaints during this period.

Figure 2.1b Pollution Complaints by Different Types of Trade (2003)



In response to such concerns, the construction industry faces ever-increasing expectations towards environmental compliance and improved performance. Many main contractors and larger construction companies in Hong Kong have already implemented an EMS that has been certified to ISO14001 in response to this, as shown in *Figure 2.1c*. Unlike other industries in Hong Kong, in which global partners and customers have demanded ISO14001 certification, ISO14001 adoption in the construction industry has been implemented on a purely voluntary basis.

Figure 2.1c Number of ISO14001 Certificates issued for the Construction Sector



Source: EPD web site under Environmental Management Tools "Directory of ISO 14001 certified companies in Hong Kong" at http://www.epd.gov.hk/epd/english/how_help/tools_ems/iso14001.html

Supply chain pressures for improved environmental performance in the construction sector can be classified into the following four levels, which are described further in the following sections:

Level 1	from stakeholders such as the *Construction Industry Review Committee (CIRC)* and *Provisional Construction Industry Coordination Board (PCICB)*
Level 2	from policies, legislation and regulations promulgated by Government, and specific requirements set out in various *technical circulars*
Level 3	from the *requirements of public and private sector clients* made of their main contractors and suppliers
Level 4	from the *requirements of main contractors* made of their sub-contractors, sub-sub-contractors and suppliers

2.2 INDUSTRY STAKEHOLDERS (CIRC AND PCICB)

The *Construction Industry Review Committee* (CIRC) was established in 2000 to catalyse enhancements in quality, efficiency, productivity, customer satisfaction, site safety and environmental performance in the construction industry. The CIRC report *Construct for Excellence* (January 2001) sets out 109 recommendations recognised by industry as the authoritative roadmap towards a modern, safe, innovative, efficient and client-oriented construction industry.

Seventeen of these recommendations (numbered 89 to 105) specifically addressed the protection of the environment[5] by the means listed in *Table 2.2a*. These recommendations are observed to have direct impacts on main contractors and they may also indirectly affect sub-contractors through the supply chain.

Table 2.2a CIRC Recommendations for an Environmentally Responsible Construction Industry

Core Recommendation	No.
develop a *coherent policy framework* with public support for sustainable construction	89
encourage *lifecycle costing* (develop tools, databases, performance based specifications)	90, 91
strengthen *defects liability warranty* for new buildings	92
encourage green design (exempt or increase floor areas, modify existing leases)	93(a)*
encourage *green designs in housing developments*	94*
joint development of *industry tools and databases*	95
promote energy efficiency (develop tools to analyse design and life cycle energy)	96
appropriately *weigh environmental requirements* in tender & performance assessments	97 (a)*
consider *separate contract accounts* for environmental compliance	97 (b)
encourage the designation of *dedicated environmental personnel* on site	97 (c)*
assess cumulative *impacts of environmental legislation* on the construction industry	98*
develop a *service and partnership culture* to improve environmental performance of industry	99*
support *charges for waste disposal* to encourage waste minimisation	100
identify *sites to handle* construction and demolition materials, public fill and recyclables	101

[5] Source: Construction Industry Review Committee (CIRC) Report "*Construct for Excellence*" (January 2001)

Core Recommendation	No.
revise general specifications to *encourage wider use of recycled materials*	102*
encourage *more durable and better-managed* buildings	103
consider *incentive schemes to* promote construction of environmentally friendly buildings	104
implement a *common building environmental assessment scheme* with incentives	105

* Recommendations substantially implemented by Government and further improvements will be ongoing.

The *Provisional Construction Industry Co-ordination Board* (PCICB) was established in September 2001 to spearhead industry reforms recommended in the CIRC report, in part through the formation of six working groups. Progress on the environmentally-related CIRC recommendations, as reported in *PCICB Paper No 114 (July 2004)* [6], are summarised in *Appendix B*. Recommendations with a direct impact on construction contractors include:

- for public housing projects, contractors are required to submit an EMP for piling, demolition, building and civil contracts. Hong Kong Housing Authority (HKHA) also assigns a weight to environmental issues assessing contractors for accession to its *Contractors Premier League*. For public works, a standard marking scheme to assess the contractors' environmental performance and procedures for regulatory actions against contractors with environmental convictions were introduced in June 2002 and April 2003 respectively (recommendation 97a);

- The Environment, Transport and Works Bureau (ETWB) has introduced, in 2002, additional site tidiness / cleanliness requirements and in 2003 specific measures on target setting, monitoring, control, on-site sorting and pay-for-waste-management. An integrated pay-for-safety, environment and hygiene scheme was introduced in public housing projects in October 2003 (recommendation 97b);

- For public works, the appointment of dedicated personnel has been specified as part of the contract requirements for waste management since mid-2003. For public housing projects, contractors are required to employ dedicated personnel under their Environmental Management Plans (recommendation 97c);

- Specifications for public works and public housing projects have been revised to facilitate use of recycled materials as hardcore in foundations, sub-base in road pavement and concrete in technically less demanding works. ETWB has identified some 100 projects for using recycled aggregates in both permanent and temporary works (recommendation 102).

All of these developments relate directly to the management practices of construction contractors, whether or not they adopt an EMS that conforms or is certified to ISO14001. Specific to EMS, the CIRC report in (para 8.50) encourages the voluntary adoption of ISO14001 by committed industry participants, with mandatory ISO14001 certification "*preferably considered at a later stage when the construction industry has acquired more expertise in tackling the environmental challenge*".

2.3 ENVIRONMENTAL LEGISLATION AND CODES OF PRACTICE

Clearly a key supply chain pressure facing in all construction related companies and contractors no matter their size is compliance with legislative and regulatory environmental requirements. Companies have financial reasons for avoiding environmental convictions;

[6] *Progress Report on Implementation of Recommendations of the Construction Industry Review Committee* (July 2004), accessible from the PCICB website www.pcicb.gov.hk

particularly for the construction industry because prosecutions lead to points will be deducted when tendering for government works contracts (described further in *Section 2.4* below). A list of current ordinances and regulations is provided in Appendix C[7]. These consist of:

- *environmental ordinances and regulations* – the *Air Pollution Control Ordinance* (APCO), *Ozone Layer Protection Ordinance* (OLPO), *Noise Control Ordinance* (NCO), *Water Pollution Control Ordinance* (WPCO), *Waste Disposal Ordinance* (WDO), *Environmental Impact Assessment Ordinance* (EIAO); and

- *environmentally-related ordinances and regulations* – the *Factories and Industrial Undertakings Ordinance*, *Occupational Safety and Health Ordinance*, *Dangerous Goods Ordinance*, *Antiquities and Monuments Ordinance*, *Public Health and Municipal Services Ordinance*, and others.

New legislation and amendments are being introduced on a regular basis. In July 2004 the Legislative Council passed a Bill for the implementation of a construction waste disposal charging scheme in line with the polluter-pays principle. This will provide further supply chain pressure for environmental protection, particularly waste reduction, in construction.

Appendix C also identifies numerous other standards relating to environmental protection, as are often included by companies in their *Register of Legal and Other Requirements* of their ISO14001 EMS. These other standards include:

- *Codes of Practice* (issued for example by EPD and the Electrical and Mechanical Services Department, EMSD);
- *Technical Memoranda* and *Guidance Notes* (mainly issued by EPD);
- *ProPECC PN Practice Notes for Professional Persons* (issued by EPD);
- *PNAP Practice Note for Authorized Persons and Registered Structural Engineers* (issued by the Buildings Department, BD); and
- *Technical Circulars*, TCs (issued by ETWB and its predecessors).

Clearly for any company to be assured of compliance with relevant legislation and codes, a systematic process is required to identify, understand and keep up to date with the many requirements in place. This is a fundamental element (and benefit) of an ISO14001 EMS.

ETWB *Technical Circulars*, being the key means of implementing policies and procedures relating to construction sites, are isolated for further discussion in *Section 2.4*.

2.4 GOVERNMENT TECHNICAL CIRCULARS

ETWB *Technical Circulars* (TCs) are the key means of implementing policies and procedures relating to construction sites. At present some 46 current TCs (issued from 1988 to date) include explicit requirements for environmental protection[8]. These are presented in *Appendix D* in a matrix format that identifies their broad area of environmental coverage relating to:

- Contract (and Tender) Evaluation and Payments;

[7] Each of these requirements is described on the *Environmental Information and EMS Support Website* and in the *Register of Legal and Other Requirements Register* for the *Practical ISO14001 Example for the Construction Sector*. Hence in the interest of brevity their descriptions are not included in this review report.

[8] Source: ETWB website www.etwb.gov.hk and TC (Works) No. 1/2004 *Retention of Technical Circulars*

- Site Cleanliness and Environmental Hygiene;
- Air / Noise Pollution Control;
- Ecological / Visual Impacts;
- Water Pollution Control (and Protection of the Harbour);
- Waste Management;
- Environmental Impact Assessment (EIA) Ordinance; and
- Environmental Offences.

Seventeen TCs with environmental requirements related to common construction activities have been issued since 2002 as identified in *Table 2.4a*.

Table 2.4a Environmentally-related Technical Circulars for Common Construction Activities Issued Since 2002

TC Ref	Area of Environmental Focus
08/2004	Tender Evaluation of Works Contracts
22/2003	Additional Measures to Improve Site Cleanliness and Control Mosquito Breeding on Construction Sites
15/2003	Waste Management on Construction Sites
14/2003	Role of Departmental Safety & Environmental Advisor on Health, Safety and Environmental Protection on Construction Sites
13/2003	Guidelines and Procedures for Environmental Impact Assessment of Government Projects and Proposals
02/2003	Regulating Action where a Serious Incident has or Site Safety or Environmental Offences have occurred on a Construction Site
47/2002	Management of Sub-Contractors by Contractors
34/2002	Management of Dredged/Excavated Sediment
33/2002	Management of Construction and Demolition Material Including Rock
24/2002	Contractors' Performance Index System
21/2002	Trip-ticket System for Disposal of Construction & Demolition Material
14/2002	Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation
12/2002	Specifications Facilitating the Use of Recycled Aggregates
11/2002	Control of Site Crushers
07/2002	Tree Planting in Public Works
06/2002A	Enhanced Specification for Site Cleanliness and Tidiness
06/2002	Enhanced Specification for Site Cleanliness and Tidiness

The influence of these TC can be grouped into three broad but important areas:

- Requirements for contractors to *manage general environmental impacts* (TCs 13/2003) *and specific environmental issues on site*, e.g. site cleanliness and hygiene (TCs 22/2003, 06/2002 and 06/2002A), materials and waste (TCs 15/2003, 34/2002, 33/2002, 21/2002, 11/2002 and 12/2002), and ecology and landscaping (TCs 14/2002 and 7/2002);

- Requirements to *evaluate the environmental merits of project tenders* (TC 08/2004), *contractor performance* (TC 24/2002), and the *contractors' management of their sub-contractors* (TC 47/2002); and

- Requirements for *management systems and staged payments* for environmental protection, e.g. *Waste Management on Construction Sites* (TC 15/2003) and *Role of Departmental Safety & Environmental Advisor on Health, Safety and Environmental Protection on Construction Sites* (TC 14/2003), setting requirements for a waste management system and the "Pay for Safety" scheme respectively.

Section 1 of TC 14/2003 (*Role of Departmental Safety & Environmental Advisor on Health, Safety and Environmental Protection on Construction Sites*) gives an insight into future intentions for EMS and a "Pay for the Environment" scheme in the construction industry, stating that:

> *"The objective to revise and extend the duties of Departmental Safety Advisor (DSA) is to enhance the communication and management on environmental performance of contractors on construction sites so that the established framework for the* ***safety management system and the Pay for Safety Scheme (PFSS) can be extended for applying to environmental protection****."*

Such environmental requirements, although non-statutory, create strong drivers to the second and third tier players of the supply chain to move towards improved environmental management and performance. It is evident that an increasing number of construction companies are addressing these requirements in a company-wide and systematic manner through the development and implementation of an EMS.

3. CLIENT REQUIREMENTS FOR ENVIRONMENTAL PROTECTION

This section identifies local government agencies and private corporations that have imposed supply chain pressure in environmental management and EMS to their suppliers and contractors in the construction sector, and provides a description of their requirements. Information is based upon recent surveys of sixteen relevant government bureaux and departments, utility companies, prominent private sector property developers and main contractors.

3.1 TYPES OF SUPPLY CHAIN PRESSURE

Nine of the twelve respondents indicated that they imposed various degrees of environmental supply chain pressures (SCP) to their suppliers and contractors. The nature of these requirements can be broadly categorised into five main areas:

SCP 1	Compliance with statutory environmental obligations (including the *Air Pollution*, *Water Pollution*, *Waste Disposal*, *Noise Control* ordinances, etc)
SCP 2	Implementation of *waste and environmental management plans* (WMP and EMP respectively) and/or an ISO14001 certified EMS
SCP 3	Implementation of *best practices for design and construction* stipulated in tender specifications and supplementary guidelines and handbooks, etc
SCP 4	*Environmental Monitoring and Auditing*, environmental checkers, performance tracking of site practices, suppliers and sub-contractors
SCP 5	Use of innovative techniques and technologies in design and construction such as life-cycle assessment and HK-BEAM performance benchmarking

Responses from the surveys are presented in *Appendix E*, illustrating the specific requirements from individual organisations. The distribution of supply chain requirements across the organisations surveyed is illustrated in *Table 3.1a* below.

Table 3.1a Areas of Supply Chain Requirements for Environmental Protection Across Surveyed Organisations

	SCP 1	SCP 2	SCP 3	SCP 4	SCP 5
Government Departments					
Architectural Services Department	✓	✓	✓	✓	✓
Buildings Department	✓	✓	✓	✓	✓
Environmental Protection Department	✓	✓		✓	
Utility Companies					
CLP Power HK Ltd	✓	✓	✓		
The Hong Kong and China Gas Company Ltd	✓		✓	✓	✓
Private Developers					
Hongkong Land Ltd	✓	✓	✓	✓	✓
Swire Properties Management Ltd	✓	✓	✓	✓	✓
Main Contractors					
China State Construction Engineering (H.K.) Ltd	✓		✓	✓	
Gammon Construction Ltd	✓		✓	✓	

The over-riding supply chain requirement is in compliance with environmental legislation. Other areas are applied in differing degrees as follows.

3.2 PUBLIC WORKS AND RELATED DEPARTMENTS

Government works and building related departments implement extensive requirements for contractors to adopt environmental measures both in the design and construction of public works projects. Typically, contractors and suppliers are required or otherwise encouraged to use environmentally-friendly building materials and energy efficient building services installations in design through contract documents and specifications. Construction technologies, such as prefabrications, left-in formworks, slip form construction, are also increasingly encouraged. Most departments require the adoption of construction site environmental management to minimize adverse environmental impacts caused by the construction activities. Apart from complying with all relevant environmental legislations and bylaws, other control measures such as "trip ticket system", "waste management plan", "pay for site cleanliness' scheme" etc. are required by contractors.

It was also observed that these departments perceived the management of contractors' environmental performance, such as managing on-site environmental issues, promoting and monitoring environmental best practices and good management at construction site, as an important mission and consideration of their department. Most require main contractors to have satisfactory environmental performance, including the adequacy of avoidance measures against noise, water, air and waste pollution and compliance with environmental enactments, both in the past (for tender evaluation) and during the project. An increasing number of contracts for public buildings include requirements for contractors to conduct environmental assessments of projects using the *Hong Kong Building Environmental Assessment Method* (HK-BEAM)[9].

Only the EPD at present requires the implementation of an ISO14001 compliant EMS for the design, building and the operation of waste management facilities. Contractors have been required to implement, from the commencement of the works, an EMS compliant ISO14001 since 2000 and to be certified within a specified period. Contractors are also required to carry out environmental monitoring, with a portion of the contract sum allotted for compliance with environmental performance requirements.

3.3 PRIVATE DEVELOPERS AND UTILITY COMPANIES

Surveys have revealed that private developers usually specify environmental requirements in their tender specifications as the first line of environmental control to their contractors. Most also issue environmental or design guidelines to their main contractors requiring the adoption of various best practices, in most cases focusing on compliance with regulatory requirements for air, water, noise and waste management. More recently, some private developers have begun to introduce requirements for the implementation of a waste management plan, environmental management plan, and employment of an independent environmental checker on site. A large number of private developers also require their construction projects to be assessed against and certified under HK-BEAM.

Surveys revealed that utility companies also request their building contractors, for projects such as including transfer stations, transformer stations and piping network projects, to comply with all relevant environmental legislation. Environmental requirements are included in tender documents and specifications for special conditions such as asbestos abatement. Utility companies such as The Hong Kong & China Gas Co. Ltd also reported that they advise their sub-contractors and suppliers to use more environmentally-friendly

[9] HK-BEAM is the voluntary scheme to measure, improve and label the environmental performance of buildings in Hong Kong. Implemented by the *HK-BEAM Society*, a not-for-profit and member based organisation (see www.hk-beam.org.hk), HK-BEAM has to date been adopted by 95 major developments, approximately 30% of which have been commissioned by public sector clients.

materials and require the minimisation of waste generation through the collection of reusable waste materials for recycling. More stringent environmental requirements such as the implementation of Environmental Management Plan (EMP) are also imposed on certain projects such as designated projects (e.g. as marine cable works contractors).

3.4 MAIN CONTRACTORS

Under a typical mode of operation in construction sector: Client/Designer – Main Contractors - Main contactors – Sub-contractors (service providers/materials suppliers), the main contractors play an important role in communicating the environmental requirements from the clients to their sub-contractors. Main contractors generally issue environmental guidelines to their sub-contractors as the basis of their environmental requirements. These specify the environmental best practices that should be followed and adopted by their sub-contractors at their construction sites, mainly focusing on statutory requirements related to air, water, noise and waste management or the environmental considerations requested by clients such as government bureaux, departments and private developers.

Most main contractors appear to take full control of the construction project and site operation, with sub-contractors found to play minor roles in environmental protection (such as participation in training and education programmes), as they may simply supply labour and equipment to the main contractors without direct involvement in environmental management in construction projects. As such the environmental requirements of clients are to a large degree absorbed by the main contractors and seldom reach the second or third tiers players of the supply chain. No instances of main contractors requiring their sub-contractors to implement and EMS were observed, however a strong desire was evident for sub-contractors to improve their environmental performance and ensure the necessary environmental standards on site.

4. SOURCES OF ENVIRONMENTAL SUPPORT

This section presents the professional and academic institutions in Hong Kong that can offer expert advice and technical assistance, tailored to the specific needs of individual construction sector SMEs, on local environmental requirements, ISO14001 EMS, and pollution control measures.

Nineteen such organisations have been identified and as listed in *Table 4.1a* below. These consist of Government related organisations (departments, bureaux, statutory bodies and committees), non-government organizations (NGOs), trade associations, and academic institutions. Due to differences in the nature, size and mission of these organizations, the kinds of support that they offer is diverse. However, their services can be classified into 10 main groups given as follows:

Specific ISO14001 EMS services	1	Free advisory services
	2	Training programmes
	3	Consulting services
	4	Mentoring programmes
General environmental information	5	Construction related environmental information centres
	6	Construction best practice information
	7	Construction waste management competence building
Training, technology, business advice	8	Environmental training (excluding ISO14001-related)
	9	Pollution control technologies
	10	SME business management / environmental advice

Table 4.1a Support Organisations and Their Scope of Services

Government Related Organisations	1	2	3	4	5	6	7	8	9	10
Construction Industry Training Authority					✓	✓		✓		
Construction Industry Waste Reduction Task Force					✓		✓			
Environmental Protection Department	✓				✓	✓	✓	✓	✓	✓
Environment, Transport & Works Bureau					✓					
Hong Kong Productivity Council	✓	✓	✓	✓	✓	✓		✓	✓	✓
Provisional Construction Industry Co-ordination Board					✓					
Trade and Industry Department	✓				✓	✓			✓	✓*

Note: * Trade Industry Department Support and Consultation Centre for SMEs (SUCCESS)

NGOs & Trade Associations	1	2	3	4	5	6	7	8	9	10
Business Environment Council	✓	✓	✓	✓	✓	✓	✓	✓		✓
Chartered Institute of Water & Environmental Management (Hong Kong Branch)					✓					
Civic Exchange					✓					

NGOs & Trade Associations	1	2	3	4	5	6	7	8	9	10
Construction Industry Institute, Hong Kong					✓					
Hong Kong Construction Association					✓	✓	✓	✓	✓	
Hong Kong Institution of Engineers					✓					
Hong Kong Institute of Environmental Impact Assessment					✓					

Academic Institutions	1	2	3	4	5	6	7	8	9	10
Chinese University of Hong Kong Department of Architecture						✓			✓	
City University of Hong Kong Professional Services Limited					✓					
Hong Kong Polytechnic University Department of Civil & Structural Engineering Department of Building Services Engineering Department of Land Surveying and Geo-Informatics Department of Building and Real Estate					✓	✓	✓			
HK University of Science & Technology Department of Chemical Engineering Department of Civil Engineering									✓	
University of Hong Kong Department of Architecture Department of Real Estate & Construction Department of Mechanical Engineering					✓					

Contact details (including address, homepage, telephone and fax numbers) for each of these organisations are provided in *Appendix F*.

In addition to these organisations, over 80 local environmental consultancies in Hong Kong regularly provide services to the construction sector, addressing areas such as pollution control (air, water, noise, waste, etc), impact assessments and auditing, analytical and laboratory services, training and strategy, and ISO14001 EMS development and implementation. Contact details of 87 such consultancies, and a summary of their core services, are provided in *Appendix G* (from the EPD *Directory of Environmental Consultants*, July 2004).

5. CONCLUSIONS

SMEs in Hong Kong's construction sector are collectively a major part of the economy ranking high in terms of number of establishments, contribution to gross domestic product, and size of employment. Construction sector SMEs however also account for substantial environmental concerns, such as air, water and noise pollution, energy consumption, waste generation and chemical waste production compared to other sectors.

The construction industry in Hong Kong is also characterised by its large number of sub-contractors. Numerous specialist operators, often using short-term labour, typically support the larger main contractors. The industry is highly competitive and works to tight deadlines. Completion on time is a high priority, whilst resources such as space on site for recycling remain limited.

This *Review Report* has been compiled through internet research, literature reviews and questionnaire surveys of stakeholder organizations to identify:

- latest trends in supply chain pressure for environmental management and EMS in the construction sector;
- specific environmental requirements of key client organizations, contractors and authorities; and
- local organizations that can provide tailored support to local SME construction enterprises.

Findings are summarised as follows.

5.1 SUPPLY CHAIN PRESSURES FOR ENVIRONMENTAL MANAGEMENT & EMS

Construction sites accounted for 69.7% of industrial related complaints during 2003. In response to such concerns over previous years the construction industry faces ever-increasing expectations towards compliance and improved performance. The sources of these supply chain pressures can be classified into a hierarchy of four levels:

Level 1	from stakeholders such as the *Construction Industry Review Committee (CIRC)* and *Provisional Construction Industry Coordination Board (PCICB)*
Level 2	from policies, legislation and regulations promulgated by Government, and specific requirements set out in various *technical circulars*
Level 3	from the *requirements of public and private sector clients* made up from their main contractors and suppliers
Level 4	from the *requirements of main contractors* made up from their sub-contractors, sub-sub-contractors and suppliers

Level 1 (CIRC and PCICB directives) in particular is seen as the over-riding catalyst and framework for environmental improvement throughout the construction industry, being manifested at least in public projects through *Level 2* (Technical Circulars).

5.1.1 The CIRC and PCICB

The CIRC report *Construct for Excellence* (January 2001) set out 109 recommendations recognised by industry as the authoritative roadmap towards a modern, safe, innovative, efficient and client-oriented construction industry. Seventeen of these specifically

addressed the environment. Progress on these environmentally related recommendations, as reported by the PCICB[10], is having and will have further impacts on construction enterprises working on public sector projects. These recommendations are observed to have direct impacts on main contractors and they may also indirectly affect sub-contractors through the supply chain. CIRC recommendations outcomes to date include:

- ***for public works projects***: introduction of a *marking scheme to assess contractor environmental performance*; new *procedures for regulatory actions* against contractors with environmental convictions; ETWB Technical Circulars on *site tidiness / cleanliness* and specific measures for *pay-for-waste-management* (target setting, monitoring, control and on-site sorting); and contract requirements for *dedicated personnel* for waste management.
- ***for public housing projects***: requirements for contractors to submit an EMP (for demolition, piling, building and civil works); requirements to employ dedicated personnel for their EMPs; introduction of an integrated pay for environment, safety and hygiene scheme; and inclusion of contractor environmental performance in the HKHA *Contractors Premier League*.

In addition, public works and housing project specifications have been revised to facilitate use of recycled materials as hardcore in foundations, sub-base in road pavement and concrete in technically less demanding works (ETWB has identified some 100 projects).

Whilst these requirements so far affect mainly public sector projects, it is widely anticipated that they will in time begin to feature in private sector projects (examples are already evident, described further below), and will eventually filter down to SME sub-contractors and sub-sub-contractors. Although there is no recommendation to mandate ISO14001 in the construction sector, the CIRC report (para 8.50) encourages its voluntary adoption, with mandatory certification "*preferably considered at a later stage when the construction industry has acquired more expertise in tackling the environmental challenge*".

5.1.2 Environmental Legislation and Regulations

The key supply chain pressure facing all construction related companies is compliance with legislative and regulatory requirements. Construction companies in particular have financial reasons for avoiding environmental convictions since these are considered when tendering for government contracts. Environmental legislation in Hong Kong consists of:

- *environmental ordinances and regulations* – the *Air Pollution Control Ordinance* (APCO), *Ozone Layer Protection Ordinance* (OLPO), *Noise Control Ordinance* (NCO), *Water Pollution Control Ordinance* (WPCO), *Waste Disposal Ordinance* (WDO), *Environmental Impact Assessment Ordinance* (EIAO); and

- *environmentally-related ordinances and regulations* – the *Factories and Industrial Undertakings Ordinance*, *Occupational Safety and Health Ordinance*, *Dangerous Goods Ordinance*, *Antiquities and Monuments Ordinance*, *Public Health and Municipal Services Ordinance*, and others.

New legislation and amendments are being introduced on a regular basis. In July 2004 the Legislative Council passed a Bill to implement a construction waste disposal charging scheme that will provide further supply chain pressure for environmental protection.

[10] PCICB Paper No 114 *Progress Report on Implementation of Recommendations of the Construction Industry Review Committee* (July 2004)

In addition to statutory requirements, construction companies face numerous other including *Codes of Practice* (issued for example by EPD and EMSD), *Technical Memoranda* and *Guidance Notes* (mainly issued by EPD), "ProPECC PN" *Practice Notes for Professional Persons* (issued by EPD), "PNAP" *Practice Notes for Authorized Persons and Registered Structural Engineers* (issued by BD) and *Technical Circulars*, TCs (issued by ETWB and its predecessors). Clearly for any company to be assured of compliance with relevant legislation and codes, a systematic process is required to identify, understand and keep up to date with the many requirements in place. This is a fundamental element (and benefit) of an ISO14001 EMS.

5.1.3 Government Technical Circulars

ETWB *Technical Circulars* (TCs) are the key means of implementing policies and procedures relating to construction sites. Some 46 current TCs (issued from 1988 to date) include explicit requirements for environmental protection. New TCs since 2002, in addition to specifying the management of environmental impacts (e.g. ecological protection, waste minimisation, etc), are increasingly exerting a strong influence on the behaviour of contractors in several areas, particularly by:

- including environmental criteria in the *Management of Sub-contractors by Contractors* (TC 47/2002);
- evaluating environmental performance in the *Contractors' Performance Index System* (TC 24/2002);
- integrating environmental factors within *Tender Evaluation of Works Contracts* for works contracts (TC 08/2004); and
- introducing *management systems and staged payments* for waste management (TCs 14/2003 and 15/2003).

TC 14/2003 (*Role of Departmental Safety & Environmental Advisor on Health, Safety and Environmental Protection on Construction Sites*) gives an insight into future developments, stating in *Section 1* that:

> *"The objective to revise and extend the duties of Departmental Safety Advisor is to enhance the communication and management on environmental performance of contractors on construction sites so that the established framework for the* ***safety management system and the Pay for Safety Scheme can be extended for applying to environmental protection****."*

Such requirements, although non-statutory, create strong drivers to the second and third tiers players of the supply chain to move towards improved environmental management.

5.2 CLIENT REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT AND EMS

The environmental supply chain requirements of the local client organisations included in the survey can be broadly categorised into five main areas:

SCP 1	Compliance with statutory environmental obligations (including the *Air Pollution*, *Water Pollution*, *Waste Disposal*, *Noise Control* ordinances, etc)
SCP 2	Implementation of *waste and environmental management plans* (WMP and EMP respectively) and/or an ISO14001 certified EMS
SCP 3	Implementation of *best practices for design and construction* stipulated in tender specifications and supplementary guidelines and handbooks, etc

SCP 4	*Environmental Monitoring and Auditing*, environmental checkers, performance tracking of site practices, suppliers and sub-contractors
SCP 5	Use of innovative techniques and technologies in design and construction such as life-cycle assessment and HK-BEAM performance benchmarking

The over-riding supply chain requirement is in compliance with environmental legislation. Other areas are applied in differing degrees as follows.

5.2.1 Public Works and Related Departments

Environmental supply chain requirements of public works and building related departments were identified to include:

- adoption of environmental management practices on site to minimize adverse impacts caused by the construction activities, including trip ticket systems, waste management plans, pay for site cleanliness, environmental monitoring and independent environmental checking;
- encouragement in contract documents and specifications to use less environmentally damaging building materials and construction technologies new to Hong Kong such as prefabrication, left-in formworks and slip form construction;
- requirements for satisfactory contractor environmental performance in terms of compliance and mitigation of noise, water, air and waste problems both in the past (for tender evaluation) and during current projects.

Contracts for public buildings also increasingly include requirements for environmental assessments using (HK-BEAM)[11]. Only the EPD at present requires the implementation of an ISO14001 EMS, and this for the design, build and operation of waste management facilities since 2000 (environmental monitoring is also specified, with a portion of the Contract Sum allotted for compliance with environmental performance requirements).

5.2.2 Private Developers and Utility Companies

Environmental supply chain requirements of private developers and utility companies were identified to include:

- environmental requirements in tender specifications, in most cases focusing on compliance with regulatory requirements;
- design and construction guidelines requiring or encouraging best environmental practices such as the use of more environmentally-friendly materials and the recycling of reusable waste materials; and
- more stringent requirements, such as the adoption of an *Environmental Management Plan* and *Environmental Monitoring and Auditing* are also required for projects designated under the *EIA Ordinance*.

More recently, requirements for *Waste Management Plans*, *Environmental Management Plans*, and employment of an independent environmental checker have been introduced in isolated and individual private sector projects. Private developers have also been keen to explore construction technologies new to Hong Kong such as prefabrication, left-in

[11] HK-BEAM has to date been adopted by 95 major developments, approximately 30% of which have been commissioned by public sector clients.

formworks and slip form construction. A large number of private developers also require their construction projects to be assessed against and certified under HK-BEAM.

5.2.3 Main Contractors and Larger Construction Companies

Many main contractors and larger construction companies in Hong Kong have already obtained certification to ISO14001, and more continue to do so. Unlike other industries in Hong Kong, in which global partners and customers have demanded ISO14001 certification, its adoption in the construction industry has arisen on a purely voluntary basis.

Under a typical mode of operation in construction sector: Client/Designer – Main Contractors - Main contactors – Sub-contractors (service providers/materials suppliers), the main contractors play an important role in communicating the environmental requirements from the clients to their sub-contractors. Main contractors generally issue environmental guidelines to their sub-contractors that specify compliance with statutory and client requirements. Most main contractors appear to take full control of the construction project and site operation, with sub-contractors found to play minor roles in environmental protection (such as participation in training and education programmes), as they may simply supply labour and equipment to the main contractors without direct involvement in environmental management in construction projects. As such the environmental requirements of clients are to a large degree absorbed by the main contractors and seldom reach the second or third tier players of the supply chain. Little significant or direct pressure appears to be directed to sub-contractors or sub-sub contractors other than requirements arising from the main contractors' adoption of an EMS, whether or not this is certified to ISO14001. However, there is a strong desire from main contractors for sub-contractors to improve their environmental performance and ensure the necessary standards on site.

5.3 SOURCES OF ENVIRONMENTAL SUPPORT

Nineteen professional and academic institutions in Hong Kong have been identified that can offer expert advice and technical assistance, tailored to the specific needs of individual construction SMEs, on local environmental requirements, ISO14001 EMS, and pollution control measures:

Government related organisations	• Construction Industry Training Authority • Construction Industry Waste Reduction Task Force • Environmental Protection Department • Environment, Transport & Works Bureau • Hong Kong Productivity Council • Provisional Construction Industry Co-ordination Board • Trade & Industry Department (Support & Consultation Centre for SMEs)
Non-government / trade associations	• Business Environment Council • Chartered Institute of Water & Environmental Management (HK Branch) • Civic Exchange • Construction Industry Institute, Hong Kong • Hong Kong Construction Association • Hong Kong Institution of Engineers • Hong Kong Institute of Environmental Impact Assessment
Academic Institutions	• Chinese University of Hong Kong (Department of Architecture) • City University of Hong Kong (Professional Services Limited) • Hong Kong Polytechnic University (Department of Civil & Structural Engineering, Department of Building Services Engineering, Department of Land Surveying and Geo-Informatics, and Department of Building and Real Estate)

- Hong Kong University of Science & Technology (Department of Chemical Engineering, and Department of Civil Engineering)
- University of Hong Kong (Department of Architecture, Department of Mechanical Engineering and Department of Real Estate and Construction)

The services offered by these organisations are highly diversified, depending upon their nature, mandate and scale, and include for example the provision of general information, ISO14001 mentorship, tailor-made training, best environmental practice guides, and pollution control technologies.

In addition, over 80 local consultancies provide construction related services in areas including environmental auditing, pollution control, impact assessments, analytical and laboratory services, training and strategy, and ISO14001 EMS development.

APPENDIX A – INFORMATION SOURCES USED IN COMPILING THIS REVIEW REPORT

LITERATURE REVIEW	
Public Sector Organisations	• *2002 Environmental/Health/Safety Report* – Architectural Services Department • *2002 Environmental Report* – Buildings Department • *2002 Environmental Report* – Civil Engineering Department • *2002 Environmental Report* – Drainage Services Department • *2002 Environmental Report* – Environmental Protection Department • *2002 Environmental Report* – Environment, Transport and Works Bureau • *2001/2002 Environmental Report* – Hong Kong Housing Authority • various *Technical Circulars* issued by the Environment, Transport and Works Bureau and its predecessors (listed in *Appendix C*) • (*Environmental Reports* for the Housing, Planning & Lands Bureau and Highways Department were unavailable at the time of the review)
Utility Companies	• *2003 EHS Interim Review* – CLP Holdings Limited • *2002 Health, Safety and Environment Report* – Hong Kong and China Gas Company Ltd
Private Sector Client Organisations	• *2002 Annual Report* – Cheung Kong Infrastructure Holdings Limited (Infrastructure Materials and Infrastructure-related Businesses, pp 20-21) • *2001 Environmental Report* – China State Construction Engineering (H.K.) Ltd. • *2002 Health, Safety and Environment Report* – Gammon Construction Ltd • *2002 Sustainability Report* – MTR Corporation Limited • *2002 Annual Report* – New World Development (Environment, Community Involvement, Employee Care, Investor Outreach, pp 30) • *2002 Annual Report* – Sun Hung Kai Properties Ltd (Review of Operations - Environmental Protection and Promotion, pp 68) • *2002 Annual Report* – Swire Pacific (Environmental & Social Responsibility, pp 41)
Other Publications	• *Construct for Excellence* – Report of the Construction Industry Review Committee, January 2001 • *Best Practice Guide: Environment* – Hong Kong Construction Association Ltd, 2002
WEBSITE REVIEWS	
Government Organisations	• Architectural Services Department (Arch SD) www.archsd.gov.hk • Buildings Department (BD) www.bd.gov.hk • Drainage Services Department (DSD) www.dsd.gov.hk • Environmental Protection Department (EPD) www.epd.gov.hk • Environment, Transport and Works Bureau (ETWB) www.etwb.gov.hk • Hong Kong Housing Authority (HKHA) www.housingauthority.gov.hk • Housing, Planning and Lands Bureau (HPLB) www.hplb.gov.hk • Trade Industry Department (TID) www.tid.gov.hk • Waste Reduction www.wastereduction.gov.hk
Private Corporations	• China State Construction Engineering (H.K.) Ltd www.cscechk.com/main_e.htm • CLP Holdings Limited www.clpgroup.com • Gammon Construction Ltd www.gammonconstruction.com • Hong Kong and China Gas Company Ltd www.towngas.com • Hongkong Land www.hkland.com • Swire Properties Limited www.swireproperties.com

APPENDIX A – INFORMATION SOURCES USED IN COMPILING THIS REVIEW REPORT

Other Websites	• Business Environment Council (BEC) www.bec.org.hk • HK-BEAM Society www.hk-beam.org.hk • Hong Kong Construction Association (HKCA) www.hkca.com.hk • Hong Kong Housing Society (HKHS) www.hkhs.com • Hong Kong Polytechnic University, Department of Civil & Structural Engineering www.cse.polyu.edu.hk & www.cse.polyu.edu.hk/~cecspoon/lwbt • Hong Kong Productivity Council (HKPC) www.hkpc.org • Support and Consultation Centre for SMEs (SUCCESS) www.success.tid.gov.hk • Websites of the supporting organisations identified in *Appendix E*
QUESTIONNAIRE SURVEYS	
The survey sought to identify the supply chain environmental pressures or requirements imposed by industry stakeholder organisations, principally government works and buildings related departments, utility companies, private developers and main contractors.	
Government Bureaux & Departments	• Architectural Services Department • Buildings Department • Housing Department • Environmental Protection Department • Environment, Transport and Works Bureau • Housing, Planning and Lands Bureau
Private Corporations	• China State Construction Engineering (H.K.) Ltd • CLP Power HK Ltd • Gammon Construction Ltd • Henderson Land Development Co. Ltd • Hong Kong and China Gas Company Ltd • Hongkong Land Ltd • Sun Hung Kai Properties Ltd • Swire Properties Management Ltd
Trade Associations	• Hong Kong Construction Association • Real Estates Developers Association Of Hong Kong

APPENDIX B – PROGRESS WITH ENVIRONMENTALLY-RELATED RECOMMENDATIONS OF THE CONSTRUCTION INDUSTRY REVIEW COMMITTEE

Source: PCICB Paper No. 114 *Progress Report on Implementation of Recommendations of the Construction Industry Review Committee* (July 2004), available from the PCICB website www.pcicb.gov.hk

The *Construction Industry Review Committee* report *Construct for Excellence* (January 2001) identified room for improvement in the construction industry in terms of quality, efficiency, productivity, site safety, environmental sustainability and customer satisfaction. The report recommended that thorough consideration be given to all relevant factors, such as, compliance to environmental legislation, consideration to adopt ISO14001 EMS, life-cycle costing, greener and more energy efficient designs, and also end-user education to create market demand for environmentally friendly construction to facilitate downstream activities. Findings in the executive summary specific to environmental protection were:

> Paragraph 32. *The construction industry is among the worst polluters. To improve the environmental performance of local construction and to improve the quality of life for the community, we should widely promote the concept of sustainable construction with an emphasis on life-cycle benefits rather than short-term efficiency. We urge major clients to take a lead in practising the concept of life-cycle costing, which refers to the systematic evaluation of all relevant costs associated with the acquisition and ownership of a built structure. The proposals recently put forward by the Task Force on Building Safety and Preventive Maintenance on defect liability warranty will help to promote more durable and maintainable buildings and have our support.*
>
> Paragraph 33. *To encourage the industry to adopt greener and more energy efficient designs, we need a supportive regulatory framework, market demand as well as access to information on the environmental performance of different construction technologies and materials. We support the Buildings Department's initiatives to promote excellence in the environmental performance of the construction industry, and recommend the provision of incentives to create market momentum in the construction of green buildings and upgrading of existing buildings. Education of the end-users is important to create market demand for environmentally friendly construction. Major developers, including the Housing Authority, can lead the market by using green designs in their developments. We also look to regulators, industry stakeholders and the local research community to build up a knowledge base for industry participants with the necessary guidelines, design tools and databases.*
>
> Paragraph 34. *We need to motivate the industry to comply with the regulatory requirements by making environmental performance a factor for consideration in tender evaluation and ongoing performance assessment. Contractors should be encouraged to employ dedicated personnel on site to assist line managers in managing the environmental aspects of construction activities. We also urge the Government to conduct a regulatory impact assessment on the cumulative impact of environmental legislation on the construction industry vis-à-vis the community.*
>
> Paragraph 35. *We support the Government's efforts in addressing the problem of construction waste management. In addition, we recommend the wider use of recycled materials and modern construction methods (such as use of system formwork and prefabrication) to reduce construction waste. The Government should also identify suitable sites for off-site sorting facilities, "fill" banks and recycling or prefabrication facilities. Incentives should be provided to encourage the upgrading of existing buildings and urban renewal through private initiatives. Environmental assessment schemes and environmental management systems provide a systematic basis for tackling various environmental issues arising from construction. We support their wider adoption within the industry on a voluntary basis.*

Progress with specific recommendations is tabulated below.

APPENDIX B – PROGRESS WITH ENVIRONMENTALLY-RELATED RECOMMENDATIONS OF THE CONSTRUCTION INDUSTRY REVIEW COMMITTEE (CIRC)

Source: PCICB Paper 114 *Progress Report on Implementation of Recommendations of the CIRC* (July 2004), available from the PCICB website www.pcicb.gov.hk

Recommendation, Implementing Parties, Timeframe (from Jan 01)		Position at November 2003
89	*Coherent policy framework for integrating sustainable construction into sustainable development* Government, within 2 years	A consultancy study commenced in April 2003 to review the current responsibilities among policy bureaux and departments and propose options for a policy framework of sustainable construction by mid-2004 for further consideration.
90	*Taking the lead in practicing lifecycle costing* Public sector major private sector clients Start within 1 year	For public housing projects, HA has commissioned a consultancy study to develop tools for the selection of building materials and components based on their life-cycle cost and environmental performance. For public works projects, EMSD has commissioned a consultancy study to develop design tools for life-cycle costing, whilst ETWB is preparing a reference guide on application of life-cycle costing in evaluating procurement options.
91	*Develop life cycle costing resources* ETWB, major clients, professional institutions, researchers, Start within 2 years	After collating information from relevant professional bodies and academic institutions, ETWB has identified a number of areas on life-cycle costing models and tools that call for additional research work.
92	*Strengthening defects liability warranty for new buildings* BD, REDA and developers Within 3 years (subject to enactment of legislation)	The Law Reform Commission has stated in its report on "Local Completed Residential Properties" that there is no compelling reason to lengthen the current 12 month defect liability period. However property sale brochures should state the start date and duration of the defects liability period to encourage developers to ensure the provision of defects liability warranties. BD is exploring with REDA a voluntary scheme managed by industry.
93(a)*	*Encouraging green designs – floor area exemptions for green features and facilities* HPLB, BD, Lands D and Plan D, ongoing action	BD, Lands D and Plan D issued a Joint Practice Note (JPN1) in 2001 to provide incentives for green features in new buildings and the adoption of green construction methods. A second Joint Practice Note (JPN2) to encourage more green features was subsequently issued in February 2002.
93(b)	*Encourage green designs – additional gross floor area to offset extra costs of green construction methods and materials* HPLB, BD, Lands D and Plan D, within 1 year	The incentives under item 93(a) have provided an initial impetus and industry responding favourably with green features beyond the scope of JPN1 and JPN2. As part of a holistic approach, BD has commissioned a consultancy study on the comprehensive environmental performance assessment scheme for buildings.
93(c)	*Encourage green designs – waiving premium for modifying existing leases to provide green features* HPLB, BD, Lands D and Plan D, within 1 year	See items 93(a) & (b). In addition, the current land administration policy requires premium to be charged if there is an increase in land value obtained through a lease modification.
94*	*Wider use of green designs in housing estates* HA, REDA and other major clients, within 1 year	The green design approach has been adopted in new public housing projects.

APPENDIX B – PROGRESS WITH ENVIRONMENTALLY-RELATED RECOMMENDATIONS OF THE CONSTRUCTION INDUSTRY REVIEW COMMITTEE (CIRC)

Source: PCICB Paper 114 *Progress Report on Implementation of Recommendations of the CIRC* (July 2004), available from the PCICB website www.pcicb.gov.hk

Recommendation, Implementing Parties, Timeframe (from Jan 01)		Position at November 2003
96	*Promoting public awareness of energy efficiency, provide guidelines to assess life-cycle energy costs* EMSD, BD, industry co-ordinator and researchers Start within 2 years	EMSD has commissioned a consultancy study for completion in late-2004 to develop tools and guidelines to assess the energy efficiency of building design.
97(a)*	*Abating environmental nuisance during construction – giving weight to environmental performance in assessing tenders and performance of contractors* All clients, start within 1 year	For public housing projects, contractors are already required to submit an EMP for demolition, piling, building and civil contracts. HA also assigns an appropriate weight to environmental issues in the accession to its Premier League of Contractors. For public works projects, a standard marking scheme including the assessment of contractors' environmental performance was introduced in June 2002. Procedures for regulatory actions against contractors with environmental convictions were introduced in April 2003.
97(b)	*Abating environmental nuisance during construction - Separate contract accounts for pollution prevention and control measures* All clients, start within 1 year	ETWB introduced in March 2002 site tidiness / cleanliness requirements and specific measures on target setting, monitoring, control, on-site sorting and pay-for-waste-management in mid-2003, with enhanced contract requirements on environmental nuisance abatement. An integrated pay for safety, environment and hygiene scheme was introduced in public housing projects in October 2003.
97(c)*	*Abating environmental nuisance during construction – encouraging contractors to employ dedicated environmental personnel onsite* All clients, start within 1 year	For public works, the appointment of dedicated personnel has been specified as part of contract requirements for waste management since mid-2003. For public housing projects, contractors are required to employ dedicated personnel under their Environmental Management Plans.
98*	*Assessment of cumulative impacts of the environmental legislation on the construction industry* ETWB and EPD, start within 1 year	EPD has enhanced the business friendliness of its operations following a BSPU consultancy study and made a presentation to PCICB in October 2003 on key initiatives to reduce the regulatory impact on the construction industry.
99*	*Promotion of partnership between the construction industry and the EPD* EPD, ongoing action	EPD has continued to strengthen partnership with the construction industry through handbooks, training packs, seminars and workshops. Two websites with information on green working practices and environmentally friendly construction equipment were completed in April 2003.
100	*Charges for waste disposal* ETWB, EPD, as soon as possible	A bill giving effect to the charging scheme for construction and demolition waste was introduced into LegCo in December 2003 and is being scrutinized by a Bills Committee.
101	*Sites for handling construction and demolition materials* ETWB, HPLB, EPD, Lands D, Plan D, start within 1 year	In addition to barging points, a recycling facility and two fill banks has been put in place to cope with increasing waste volumes. ETWB is setting up two sorting facilities to tie in with the construction waste disposal charging scheme in 2005/06.

APPENDIX B – PROGRESS WITH ENVIRONMENTALLY-RELATED RECOMMENDATIONS OF THE CONSTRUCTION INDUSTRY REVIEW COMMITTEE (CIRC)

Source: PCICB Paper 114 *Progress Report on Implementation of Recommendations of the CIRC* (July 2004), available from the PCICB website www.pcicb.gov.hk

Recommendation, Implementing Parties, Timeframe (from Jan 01)		Position at November 2003
102*	*Wider use of recycled materials* Public sector clients Within 2 years	Specifications for public works and public housing projects have been revised to facilitate use of recycled materials as hardcore in foundations, sub-base in road pavement and concrete in technically less demanding works. ETWB has identified some 100 projects for using recycled aggregates in both permanent and temporary works.
103	*Encouraging more durable buildings to minimize the generation of demolition materials* BD, as soon as possible	BD is collecting data on the use of new materials and technologies for building construction in order to compile a new practice note and will carry out a feasibility study on adaptive reuse of existing buildings to minimize maintenance and renovation. A practice note on "Use of Recycled Aggregates in Concrete" was issued in February 2003.
104	*Extending incentives scheme for green features to existing buildings* HPLB, BD, Lands D and Plan D, within 2 years	See item 93. BD will review the effectiveness of JPN1 and JPN2 before considering extending the incentive scheme to cover existing buildings.
105	*Comprehensive environmental assessment scheme for buildings with appropriate incentives* BD and other industry stakeholders, within 3 years	BD has commissioned a consultancy study for completion in late-2004 to devise a comprehensive scheme to assess the environmental performance of buildings in Hong Kong.

* Recommendations substantially implemented by Government and further improvements will be ongoing.

APPENDIX C – LEGISLATION, REGULATIONS AND INDUSTRY STANDARDS

Details of the following ordinances and regulations can be found in the "Bilingual Laws Information System" website of the Department of Justice at www.doj.gov.hk.
For details of the codes of practice, technical memoranda, guidelines, and technical circulars, please visit the websites of the corresponding authorities

Air Pollution Control – Ordinances and Regulations
• *Air Pollution Control Ordinance* (Cap. 311) • *Air Pollution Control (Asbestos) (Administration) Regulation* • *Air Pollution Control (Construction Dust) Regulation* • *Air Pollution Control (Dust and Grit Emission) Regulations* • *Air Pollution Control (Fuel Restriction) Regulations* • *Air Pollution Control (Furnaces, Oven and Chimneys) Installation and Alteration) Regulations* • *Air Pollution Control (Motor Vehicle Fuel) Regulation* • *Air Pollution Control (Open Burning) Regulation* • *Air Pollution Control (Smoke) Regulation*
• *Ozone Layer Protection Ordinance* (Cap. 403) • *Ozone Layer Protection (Controlled Refrigerants) Regulation* • *Ozone Layer Protection (Products Containing Scheduled Substances) (Import Banning) Regulation*
• *Road Traffic Ordinance* (Cap. 374) • *Road Traffic (Construction and Maintenance of Vehicles) Regulations* • *Shipping and Port Control Ordinance* (Cap. 313)

Air Pollution – Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars
• *Code of Practice on Asbestos Control – Preparation of Asbestos Investigation Report, Asbestos Management Plan and Asbestos Abatement Plan* [Source: EPD] • *Code of Practice on Asbestos Control – Asbestos Work Using Full Containment or Mini Containment Method* [Source: EPD] • *Code of Practice for the Prevention of Legionnaires' Disease in Hong Kong* [Source: EMSD]
• *TM Issuing Air Pollution Abatement Notices to Control Air Pollution from Stationary Process* [Source: EPD] • *Guidance notes for management of Indoor Air Quality in office and public places* [Source: EPD]
• ProPECC PN 1/92 *Impingement of Plumes from Boiler Chimneys on Adjacent Buildings* [Source: EPD] • ProPECC PN 4/94 *Air Conditioning Refrigerants – A Time for Change* [Source: EPD] • ProPECC PN 2/96 *Control of Air Pollution in Car Parks* [Source: EPD] • ProPECC PN 2/97 *Handling of Asbestos Containing Materials in Buildings* [Source: EPD] • ProPECC PN 1/98 *Control of Air Pollution in Semi-Confined Public Transport Interchanges* [Source: EPD] • ProPECC PN 1/99 *Control of Radon Concentration in New Buildings* [Source: EPD]
• PNAP 144 *Control of Environmental Nuisance from Construction Sites* [Source: BD] • PNAP 114 *Asbestos* [Source: BD]
• ETWB TC 18/99 *Particular Specification Clause for Vehicles Carrying Dusty Materials* [Source: ETWB]

Noise Control – Ordinances and Regulations

- *Noise Control Ordinance* (Cap. 400);
- *Noise Control (General) Regulations*
- *Noise Control (Construction Work) Regulation*;
- *Noise Control (Construction Work Designated Areas) Notice;*
- *Noise Control (Hand Held Percussive Breakers) Regulations*
- *Noise Control (Air Compressors) Regulations*
- *Noise Control (Motor Vehicles) Regulation*

- *Road Traffic (Construction and Maintenance of Vehicles) Regulation*

- *Factories and Industrial Undertakings Ordinance (Cap. 59)*
- *Factories and Industrial Undertakings (Noise at Work) Regulations*
- *Occupational Safety and Health Ordinance (Cap. 509)*

Noise Pollution – Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- *Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites* [Source: EPD]
- *Technical Memorandum on Noise from Construction Work Other Than Percussive Piling* [Source: EPD]
- *Technical Memorandum on Noise from Construction Work in Designated Areas* [Source: EPD]
- *Technical Memorandum on Noise from Percussive Piling* [Source: EPD]

- ProPECC PN 1/93 *Noise from Construction Activities – Statutory* [Source: EPD]
- ProPECC PN 2/93 *Noise from Construction Activities – Non-statutory* [Source: EPD]
- ProPECC PN 4/93 *Planning and Design Noise Sensitive Developments* [Source: EPD]
- ProPECC PN 1/96 *Use of Quieter Construction Equipment for Road Opening Works during Non-Sociable Hours* [Source: EPD]
- ProPECC PN 1/97 *Streamline Planning of Residential Developments Against Road Traffic Noise* [Source: EPD]

- PNAP 144 *Control of Environmental Nuisance from Construction Sites* [Source: BD]
- PNAP 228 *Noise Annoyance Prevention Design of Pump Room and Ventilation System* [Source: BD]

- ETWB TC No. 11/2002 *Control of Site Crushers* [Source: ETWB]
- ETWB TC No. 6/97 *Prohibition of the Use of Diesel Hammers for Percussive Piling for Government Projects* [Source: ETWB]

Water Pollution Control – Ordinances and Regulations

- *Water Pollution Control Ordinance* (Cap. 358)
- *Water Pollution Control (General) Regulations*
- *Technical Memorandum Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (Cap 358AK)*

- *Shipping and Port Control Ordinance* (Cap. 313)
- *Sewage Services Ordinance (Cap. 463)*
- *Waterworks Ordinance* (Cap.102)
- *Buildings (Demolition Works) Regulations*
- Buildings Ordinance (Cap. 123)
- *Waste Disposal Ordinance* (Cap. 354)
- *Dumping at Sea Ordinance* (Cap. 466)
- *Foreshores and Sea Bed (Reclamations) Ordinance* (Cap. 127)
- *Merchant Shipping (Prevention and Control of Pollution) Ordinance* (Cap. 413)
- *Merchant Shipping (Prevention of Oil Pollution) Regulations*
- *Merchant Shipping (Control of Pollution by Noxious Liquid Substances in Bulk) Regulations*
- *Radiation Ordinance* (Cap. 303)
- *Fisheries Protection Ordinance* (Cap. 171)

Water Pollution – Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- ProPECC PN 1/94 *Construction Site Drainage* [Source: EPD]
- ProPECC PN 3/97 *A Revised Streamlined Approach for vetting of Drainage Plans Referred to EPD for Comments* [Source: EPD]
- PNAP 144 *Control of Environmental Nuisance from Construction Sites* [Source: BD]
- ETWB TC 14/2004 *Maintenance of Stormwater Drainage Systems and Natural Watercourses* [Source: ETWB]
- ETWB TC 32/2003 *Protection of the Harbour* [Source: ETWB]
- ETWB TC 9/2001 *Procedures for Gazetting under the Foreshore and Sea-bed (Reclamations) Ordinance (Chapter 127)* [Source: ETWB]
- ETWB TC 18/1995 *Drainage Impact Assessment Process for Public Sector Project* [Source: ETWB]
- ETWB TC 3/1995 *Control of Wave Reflection in Victoria Harbour* [Source: ETWB]
- ETWB TC 3/1992 *Abatement of Sanitary Nuisance from Defective Drains and Sewers in Private Streets and Service Lanes* [Source: ETWB]

Waste Management – Ordinances and Regulations

- *Waste Disposal Ordinance* (Cap. 354)
- *Waste Disposal (Chemical Waste) (General) Regulation*
- *Waste Disposal (Charges for Disposal of Chemical Waste) Regulation*
- *Waste Disposal (Charges for Disposal of Waste) Regulation*
- *Merchant Shipping (Prevention and Control of Pollution) Ordinance (Cap. 413)*
- *Merchant Shipping (Prevention of Oil Pollution) Regulations*
- *Merchant Shipping (Control of Pollution by Noxious Liquid Substances in Bulk) Regulations*
- *Foreshores and Sea Bed (Reclamations) Ordinance* (Cap. 127)
- *Buildings Ordinance* (Cap. 123)
- *Pesticides Ordinance* (Cap. 133)
- *Town Planning Ordinance* (Cap. 131)
- *Land (Miscellaneous Provisions) Ordinance* (Cap. 28)
- *Radiation Ordinance* (Cap. 303)
- *Dumping At Sea Ordinance* (Cap. 466)
- *Shipping and Port Control Ordinance* (Cap. 313)

Waste – Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- *Code of Practices on the Packaging, Labelling and Storage of Chemical Wastes* [Source: EPD]
- *Code of Practices on the Handling, Transport and Disposal of Asbestos Waste* [Source: EPD]

- *A Guide to the Chemical Waste Control Scheme* [Source: EPD]
- *A Guide to the Registration of Chemical Waste Producers* [Source: EPD]
- ProPECC PN 3/94 *Contaminated Land Assessment and Remediation* [Source: EPD]

- PNAP 144 *Control of Environmental Nuisance from Construction Sites* [Source: BD]
- PNAP 155 *Marine Disposal of Dredged Mud* [Source: BD]
- PNAP 243 *Construction and Demolition Waste* [Source: BD]
- PNAP 252 *Management Framework for Disposal of Dredged/Excavated Sediment* [Source: BD]
- PNAP 275 *Use of Recycled Aggregated in Concrete* [Source: BD]
- PNAP 268 *Resident Supervision and Debris Management System for Demolition Works* [Source: BD]

- ETWB TC 15/2003 *Waste Management on Construction Sites* [Source: ETWB]
- ETWB TC 34/2002 *Management of Dredged/Excavated Sediment* [Source: ETWB]
- ETWB TC 33/2002 *Management of Construction and Demolition Material Including Rock* [Source: ETWB]
- ETWB TC 21/2002 *Trip-ticket System for Disposal of Construction and Demolition Material* [Source: ETWB]
- ETWB TC 6/2002A *Enhanced Specification for Site Cleanliness and Tidiness* [Source: ETWB]
- ETWB TC 12/2000 *Fill Management* [Source: ETWB]
- ETWB TC 3/2000 *Management of Dredged/Excavated Sediment* [Source: ETWB]
- ETWB TC 25/1999 *Incorporation of Information on Construction and Demolition Material* [Source: ETWB]
- *Management in Public Works Subcommittee Papers* [Source: ETWB]
- ETWB TC 4/1998 *Use of Public Fill in Reclamation and Earth Filling Projects* [Source: ETWB]
- ETWB TC 16/1996 *Wet Soil in Public Dumps* [Source: ETWB]
- ETWB TC 2/1993 *Public Dumps* [Source: ETWB]
- ETWB TC 10/1992 *Provision of Refuse Containment Booms in Reclamation Contracts Involving Public Dumping* [Source: ETWB]

Dangerous Goods Management – Ordinances and Regulations

- *Dangerous Goods Ordinance* (Cap. 295)
- *Dangerous Goods (Application & Exemption) Regulations*
- *Dangerous Goods (General) Regulations)*

- *Radiation Ordinance (Cap. 303)*
- Fire Protection Notice No.4 *Dangerous Goods General* [Source: Fire Services Department]

Dangerous Goods Management - Ordinances and Regulations: Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- ProPECC Practice Note PN 2/94 Potentially Hazardous Installations [Source: EPD]

Environmental Impact Assessment (EIA) – Ordinances and Regulations

- *Environmental Impact Assessment Ordinance* (Cap. 499)

EIA – Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- EIAO Guidance Notes (GN1/2002): *EIA Principles* [Source: EPD]
- EIAO Guidance Notes (GN2/2002): *Environmental Study Management Group* [Source: EPD]
- EIAO Guidance Notes (GN3/2002): *Mitigation Measures* [Source: EPD]
- EIAO Guidance Notes (GN4/2002): *Independent Environmental Checker* [Source: EPD]
- EIAO Guidance Notes (GN5/2002): *Implementation Schedule* [Source: EPD]
- EIAO Guidance Notes (GN6/2002): *Ecological Assessment* [Source: EPD]
- EIAO Guidance Notes (GN7/2002): *Ecological Baseline Survey* [Source: EPD]
- EIAO Guidance Notes (GN8/2002): *Landscape and Visual Impact Assessment* [Source: EPD]

- *Technical Memorandum on Environmental Impact Assessment Process* [Source: EPD]

- ETWB TC 13/2003 *Guidelines and Procedures for EIA of Government Projects and Proposals* [Source: ETWB]
- ETWB TC 27/1999 *Environmental Impact Assessment Ordinance Particular Specification Clause* [Source: ETWB]

Resources Use – Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- *Code of Practice for Energy Efficiency of Lift and Escalator Installations* [Source: EMSD]
- *Code of Practice for Energy Efficiency of Electrical Installations* [Source: EMSD]
- *Code of Practice for Energy Efficiency of Air Conditioning Installations* [Source: EMSD]
- *Code of Practice for Energy Efficiency of Lighting Installations* [Source: EMSD]

- PNAP 153 *Tropical Hardwood Timber* [Source: BD]

- ETWB TC 12/2002 *Specifications Facilitating the Use of Recycled Aggregates* [Source: ETWB]
- ETWB TC 19/2001 *Metallic Site Hoardings and Signboards* [Source: ETWB]
- ETWB TC 4/98A *Use of Public Fill in Reclamation and Earth Filling Projects* [Source: ETWB]
- ETWB TC 2/97 *Use of PFA in Concrete Pile Caps and Substructures* [Source: ETWB]
- ETWB TC 14/94 *Use of PFA as General Fill in Reclamations* [Source: ETWB]
- ETWB TC 32/92 *The Use of Tropical Hardwood on Construction Sites* [Source: ETWB]
- ETWB TC 14/90 *The Use of PFA in Structural Concrete* [Source: ETWB]

Other Ordinances and Regulations

- *Country Parks Ordinance* (Cap. 208)
- *Country Parks and Special Areas Regulations*
- *Marine Parks Ordinance* (Cap. 476)
- *Marine Parks and Marine Reserves Regulations*
- *Antiquities and Monuments Ordinance* (Cap. 53)
- *Public Health and Municipal Services Ordinance* (Cap. 132)
- *Summary Offences Ordinance* (Cap. 228)
- *Fixed Penalty (Public Cleanliness Offences) Ordinance (Cap.570)*

Other Codes of Practice, Technical Memoranda, Guidelines, Technical Circulars

- PNAP 267 *Felling, Trimming or Replanting of Trees* [Source: BD]

- LAO PN 8/2002 *Application for Tree Felling or Transplanting for private projects* [Source: Lands Department]

- ETWB TC 08/2004 *Tender Evaluation of Works Contracts* [Source: ETWB]
- ETWB TC 34/2003 *Community Involvement in Greening Works* [Source: ETWB]
- ETWB TC 22/2003 *Additional Measures to Improve Site Cleanliness and Control Mosquito Breeding on Construction Sites* [Source: ETWB]
- ETWB TC 14/2003 *Role of Departmental Safety & Environmental Advisor on HSE Protection* [Source: ETWB]
- ETWB TC 02/2003 *Regulating Action where a Serious Incident has or Site Safety or Environmental Offences have occurred on a Construction Site* [Source: ETWB]
- ETWB TC 47/2002 *Management of Sub-Contractors by Contractors* [Source: ETWB]
- ETWB TC 24/2002 *Contractors' Performance Index System* [Source: ETWB]
- ETWB TC 14/2002 *Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation* [Source: ETWB]
- ETWB TC 07/2002 *Tree Planting in Public Works* [Source: ETWB]
- ETWB TC 4/97 *Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures* [Source: ETWB]
- ETWB TC 25/1993 *Control of Visual Impact of Slopes* [Source: ETWB]
- ETWB TC 28/1992 *Damage of Crops and Property on Agricultural Lands* [Source: ETWB]
- ETWB TC 25/1992 *Allocation of Space for Urban Street Trees* [Source: ETWB]

APPENDIX D – ENVIRONMENTAL REQUIREMENTS EMBRACED BY HONG KONG GOVERNMENT TECHNICAL CIRCULARS RELATING TO CONSTRUCTION

Technical Circular Reference and Title (The full list of Technical Circulars and their downloads is available at the Environment, Transport and Works Bureau website www.etwb.gov.hk)		Contract Payment / Evaluation	Site Cleanliness / Hygiene	Air / Noise Pollution	Ecology	Water Pollution / Harbour Protection	Waste Management	Visual Impacts	EIA Ordinance	Environmental Offences
08/2004	Tender Evaluation of Works Contracts	✓								
34/2003	Community Involvement in Greening Works				✓			✓		
32/2003	Protection of the Harbour					✓				
22/2003	Additional Measures to Improve Site Cleanliness and Control Mosquito Breeding on Construction Sites		✓							
15/2003	Waste Management on Construction Sites	✓					✓			
14/2003	Role of Departmental Safety & Environmental Advisor on Health, Safety and Environmental Protection on Construction Sites	✓								
13/2003	Guidelines and Procedures for Environmental Impact Assessment of Government Projects and Proposals								✓	
02/2003	Regulating Action where a Serious Incident has or Site Safety or Environmental Offences have occurred on a Construction Site									✓
47/2002	Management of Sub-Contractors by Contractors	✓								
34/2002	Management of Dredged/Excavated Sediment					✓	✓			
33/2002	Management of Construction and Demolition Material Including Rock						✓			
24/2002	Contractors' Performance Index System	✓								

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Technical Circular Reference and Title (The full list of Technical Circulars and their downloads is available at the Environment, Transport and Works Bureau website www.etwb.gov.hk)		Contract Payment / Evaluation	Site Cleanliness / Hygiene	Air / Noise Pollution	Ecology	Water Pollution / Harbour Protection	Waste Management	Visual Impacts	EIA Ordinance	Environmental Offences
21/2002	Trip-ticket System for Disposal of Construction & Demolition Material						✓			
14/2002	Management and Maintenance of Natural Vegetation and Landscape Works, and Tree Preservation				✓			✓		
12/2002	Specifications Facilitating the Use of Recycled Aggregates						✓			
11/2002	Control of Site Crushers						✓			
07/2002	Tree Planting in Public Works				✓			✓		
06/2002A	Enhanced Specification for Site Cleanliness and Tidiness		✓							
06/2002	Enhanced Specification for Site Cleanliness and Tidiness		✓							
09/2001	Procedures for Gazetting under the Foreshore and Sea-bed (Reclamations) Ordinance (Chapter 127)					✓				
12/2000	Fill Management						✓			
27/1999	Environmental Impact Assessment Ordinance Particular Specification Clause								✓	
25/1999 (A, C)	Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers						✓			
18/1999	Particular Specification Clause for Vehicles Carrying Dusty Materials			✓						

APPENDIX D – ENVIRONMENTAL REQUIREMENTS EMBRACED BY HONG KONG GOVERNMENT TECHNICAL CIRCULARS RELATING TO CONSTRUCTION

Technical Circular Reference and Title (The full list of Technical Circulars and their downloads is available at the Environment, Transport and Works Bureau website www.etwb.gov.hk)		Contract Payment / Evaluation	Site Cleanliness / Hygiene	Air / Noise Pollution	Ecology	Water Pollution / Harbour Protection	Waste Management	Visual Impacts	EIA Ordinance	Environmental Offences
17/1998	Environmental Impact Assessment Ordinance – Guidance on the Preparation of Briefs for Consultancy Agreements								✓	
04/1998A	Use of Public Fill in Reclamation and Earth Filling Projects						✓			
04/1998	Use of Public Fill in Reclamation and Earth Filling Projects						✓			
06/1997	Prohibition of the Use of Diesel Hammers for Percussive Piling Work for Government Projects			✓						
04/1997	Guidelines for Implementing the Policy on Off-site Ecological Mitigation Measures				✓					
02/1997	Use of PFA in Concrete Pile Caps and Substructures						✓			
16/1996	Wet Soil in Public Dumps						✓			
18/1995	Drainage Impact Assessment Process for Public Sector Project					✓				
03/1995	Control of Wave Reflection in Victoria Harbour					✓				
14/1994	Use of PFA as General Fill in Reclamations						✓			
25/1993	Control of Visual Impact of Slopes				✓			✓		
02/1993B	Public Filling Facilities						✓			

APPENDIX D – ENVIRONMENTAL REQUIREMENTS EMBRACED BY HONG KONG GOVERNMENT TECHNICAL CIRCULARS RELATING TO CONSTRUCTION

Technical Circular Reference and Title (The full list of Technical Circulars and their downloads is available at the Environment, Transport and Works Bureau website www.etwb.gov.hk)		Contract Payment / Evaluation	Site Cleanliness / Hygiene	Air / Noise Pollution	Ecology	Water Pollution / Harbour Protection	Waste Management	Visual Impacts	EIA Ordinance	Environmental Offences
02/1993	Public Dumps						✓			
32/1992	The Use of Tropical Hardwood on Construction Sites						✓			
28/1992	Damage of Crops and Property on Agricultural Lands				✓					
25/1992	Allocation of Space for Urban Street Trees				✓			✓		
10/1992	Provision of Refuse Containment Booms in Reclamation Contracts Involving Public Dumping						✓			
03/1992	Abatement of Sanitary Nuisance from Defective Drains and Sewers in Private Streets and Service Lanes		✓			✓				
14/1990	The Use of PFA in Structural Concrete						✓			
10/1988	Maintenance of stormwater drainage systems and natural stream courses					✓				
	Frequency	**5**	**4**	**2**	**7**	**7**	**18**	**5**	**3**	**1**

APPENDIX E – SURVEY RESPONSES ON ENVIRONMENTAL SUPPLY CHAIN PRESSURE

GOVERNMENT WORKS AND BUILDINGS DEPARTMENTS	
Tender specifications and guidelines require fulfilment of quality and environmental policies, objectives and targets, and are measured in the tender evaluation process.	
Architectural Services Department (ArchSD)	• During project design, ArchSD requires holistic consideration of environmental aspects. A "Project Environmental Design Submission" submitted by the consultant must be approved by the Department's Design Vetting Committee before the proceeding to the next project workstage. • In selected projects, ArchSD requires an environmental assessment such a recognised scheme such as HKBEAM. • ArchSD contract documents and specifications require contractors and suppliers to use environmentally friendly building materials and energy efficient building services installations. Environmental construction technologies such as prefabrications, left-in formworks, slip form construction etc. are also encouraged. • During construction, ArchSD requires contractors to minimize adverse impacts. Apart from compliance with legislation and bylaws, other environmental control measures such as "trip ticket system", "waste management plan", "pay for site cleanliness' scheme are required to be implemented by contractors. • The environmental performance of ArchSD contractors will be assessed in their quarterly contractor's performance report. An adverse report in the "environmental" section would automatically imply an adverse overall report, which would have a negative effect in their tender for public works contracts.
Buildings Department (BD)	• BD requires tenderers to have satisfactory environmental performance records in the past 12 months as from the tender closing date. Besides, the environmental performance of BD Contractors (e.g. adequacy of avoidance measures against noise, water, air and waste pollution, compliance with environmental enactments, etc.) is evaluated in the quarterly performance review. • BD aims to enhance the built environment by formulating policies and green initiatives to encourage sustainable building developments. Major initiatives are: - Modernizing the Buildings Ordinance and allied regulations with a performance-based approach that would facilitate the improvement of environmental performance of buildings and achieve a more rational and economical design; - Promoting environmentally friendly buildings by introducing green initiatives and benchmarking the green buildings. - Joint Practice Notes issued in 2001 and 2002 to provide more incentives in the form of exemption from Gross Floor Area and/or Site Coverage calculations for the provision of green features such as utility platforms, balconies, non-structural prefabricated external walls, communal sky gardens, etc. - A green labelling system applicable to all types of new and existing buildings is under preparation. It is anticipated that such system will entice the industry and building owners to upgrade the environmental performance of their buildings. • Promulgating technical guidelines on building and construction practices in terms of efficiency and waste control. Codes of Practice and Practice Notes have been issued on the use of recycled aggregates in concrete, Precast Concrete Construction and lighting and ventilation requirements for buildings in February, November and December 2003 respectively.
Environmental Protection Department	• The Contractor would be required to submit a Detailed Environmental Assessment for the Facility covering the construction and operation phases. • The Contractor would be required to carry out environmental monitoring and comply with Environmental Performance Requirements. • A portion of the Contract Sum would be allotted for compliance with the Environmental Performance Requirements. • The Contractor would be required to implement, from the date for commencement of the Works, an EMS compliant with ISO14001 starting from 2000 and to accredit this within a period specified in the Contract.

APPENDIX E – SURVEY RESPONSES ON ENVIRONMENTAL SUPPLY CHAIN PRESSURE

UTILITY COMPANIES	
The two public utilities surveyed request their building contractors (including for transfer station, transformer station and piping network construction projects) to follow and comply with their environmental requirements. More stringent requirements, such as the implementation of Environmental Management Plan (EMP), are imposed in certain situations such as designated projects (e.g. as marine cable works contractors).	
CLP Power Hong Kong Ltd	• Require contractors to comply all relevant environmental legislation of Hong Kong; • Specify specific environmental requirements on tender specification on certain contracts, such as asbestos abatement contract, etc; • Issue environmental guidelines/handbook/CD-Rom to all contractors (including sub-station building, cable laying works and other civil projects), mainly focusing on statutory requirements for air, water, noise and waste management; • Some sub-station building project require contractor to comply with local environmental legislation and try to comply with HK-BEAM standards; and • EMP is required for some designated projects.
Hong Kong & China Gas Company Ltd	• Stipulate all the environmental requirements in their tender specifications; • Require sub-contractors to comply with relevant environmental legislation of HK; • Advise sub-contractors and suppliers to use more environmentally friendly materials; and • Require sub-contractors to minimize the production of waste and to collect reusable waste materials for recycling.
PRIVATE DEVELOPERS	
The private developers surveyed issue environmental guidelines to their contractors to illustrate the environmental best practices should be adopted at their premises and construction sites. These requirements mainly focused on the legislative requirements on air, water, noise and waste management. Some private developers also require their construction projects certified to some green building assessment scheme such as HK-BEAM.	
HongKong Land Ltd	• Require building contractors to comply with all relevant environmental legislation of Hong Kong, include an "Environmental Clause" in tender documentation • Some environmental requirements in fitting our guidelines and management regulations. • Currently, there are a total of 7 buildings and 3 new building construction projects undergoing HK-BEAM Assessment.
Swire Properties Ltd	• Project team must follow the SPL design guidelines which include stringent environmental requirements • The construction contractor appointed to be the main contractor on SPL owned development sites is provided with a list of environmental requirements which includes conformance with all relevant environmental legislation, and is required to prepared an environmental management plan, waste management plan and to overtake regular audits. • Currently, there are a total of 8 existing buildings and 6 new building construction projects undergoing HK-BEAM Assessment.
MAIN CONTRACTORS	
Main contractors are mostly certified to ISO14001 and providing best practices environmental guidelines to their sub-contractors that focus mainly on legal compliance.	
China State Construction Co. Ltd	• Issue environmental guidelines to all contractors working in their construction sites and stipulates the requirements on air, water, noise and waste management within their premises.
Gammon Construction Ltd	• Issue environmental guidelines to all contractors working in their construction sites and stipulates the requirements on air, water, noise and waste management within their premises.

APPENDIX F – ORGANISATIONS OFFERING SUPPORT TO CONSTRUCTION SMES

Government Related Organisations	Contact Details
Construction Industry Council CIC Secretariat, Room 2001, 20/F, Alliance Building, 130-136 Connaught Road Central, Hong Kong	http://www.hkcic.org/ Tel: (852) 3571 8716 Fax: (852) 3571 9848 Email: enquiry@hkcic.org
Construction Waste Waste Reduction & Ecopark Group, Environmental Protection Department, 2/F, East Wing, 88 Victoria Road, Kennedy Town, Hong Kong	http://www.epd.gov.hk/epd/misc/cdm/index.htm Tel: (852) 2838 3111 Email: enquiry@epd.gov.hk
Environmental Protection Department 28/F, Southorn Centre, 130 Hennessy Road, Wan Chai, Hong Kong	http://www.epd.gov.hk Tel: (852) 2838 3111 Fax: (852) 2114 0139 Email: enquiry@epd.gov.hk
Development Bureau (Works Branch) (Ex-Environment, Transport and Works Bureau (Work Matters)) 10/F, Murray Building, 3 Garden Road, Central, Hong Kong	http://www.devb-wb.gov.hk Tel: (852) 2848 2111 Fax: (852) 2523 5327 Email: wbenq@devb.gov.hk
Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Yau Yat Chuen, Kowloon Tong, Hong Kong	http://www.hkpc.org Tel: (852) 2788 5678 Fax: (852) 2788 5900
Provisional Construction Industry Co-ordination Board Room 2100, 21/F, Murray Building, 3 Garden Road, Central, Hong Kong	http://www.pcicb.gov.hk/ Tel: (852) 2848 2294 Fax: (852) 2189 7990 Email: enquiry@pcicb.gov.hk
Trade and Industry Department Room 908, Trade and Industry Department Tower, 700 Nathan Road, Kowloon, Hong Kong	http://www.tid.gov.hk Tel: (852) 2392 2922 Fax: (852) 2787 7422 Email: enquiry@tid.gov.hk

NGOs & Trade Associations	Contact Details
Business Environment Council Room 201, 2/F, Jockey Club Environmental Building, 77 Tat Chee Avenue, Kowloon Tong, Hong Kong	http://www.bec.org.hk Tel: (852) 2784 3900 Fax: (852) 2784 6699
Chartered Institute of Water and Environmental Management (CIWEM) Hong Kong Branch P.O. Box 4258, General Post Office, Hong Kong	http://www.ciwem.com/branches/hong_kong/ Tel: (852) 3406 4534 Fax: (852) 2482 5721 Email: norman.cheng@veoliawater.com.hk
Civic Exchange Room 701, Hoseinee House, 69 Wyndham Street, Central, Hong Kong	http://www.civic-exchange.org Tel: (852) 2893 0213 Fax: (852) 3105 9713 Email: cloh@civic-exchange.org
Construction Industry Institute, Hong Kong 2/F, Dragon Centre, 23 Wun Sha Street, Tai Hang, Hong Kong	http://www.ciihk.org.hk Tel: (852) 2839 7866 Fax: (852) 2839 7326 Email: inquiry@ciihk.org.hk

APPENDIX F – ORGANISATIONS OFFERING SUPPORT TO CONSTRUCTION SMES

Hong Kong Construction Association 3/F, 180-182 Hennessy Road, Wanchai, Hong Kong	http://www.hkca.com.hk Tel : (852) 2572 4414 Fax: (852) 2572 7104 Email: admin@hkca.com.hk
Hong Kong Institution of Engineers 9/F, Island Beverley, No 1 Great George Street, Causeway Bay, Hong Kong	http://www.hkie.org.hk Tel : (852) 2895 4446 Fax: (852) 2577 7791 Email: hkie-sec@hkie.org.hk
Hong Kong Institute of Environmental Impact Assessment P.O. Box 28756, Gloucester Road Post Office, Hong Kong	http://www.hkieia.org.hk Tel : (852) 2993 3543 Fax: (852) 2993 7577 Email: webmaster@hkieia.org.hk

Academic Institutions	Contact Details
Chinese University of Hong Kong Department of Architecture Room 514, 5/F Wong Foo Yuan Building, Shatin, N.T., Hong Kong	http://www.arch.cuhk.edu.hk Tel: (852) 2609 6517 Fax: (852) 2603 5267 Email: architecture@cuhk.edu.hk
City University of Hong Kong CityU Professional Services Limited 83 Tat Chee Avenue, Kowloon Tong, Kowloon, Hong Kong	http://www.cps.com.hk Tel: (852) 3442 6241 Fax: (852) 2628 2802 Email: cps@cityu.edu.hk
Hong Kong Polytechnic University Department of Civil and Structural Engineering Hung Hom, Kowloon, Hong Kong	http://www.cse.polyu.edu.hk Tel: (852) 2766 6053 Fax: (852) 2334 6389 Email: cealice@polyu.edu.hk
Hong Kong Polytechnic University Department of Civil and Structural Engineering Low-Waste Building Technologies & Practices Hung Hom, Kowloon, Hong Kong	http://www.cse.polyu.edu.hk/~cecspoon/lwbt/index.html Tel: (852) 2766 6024 Fax: (852) 2334 6389 Email: cecspoon@polyu.edu.hk
Hong Kong Polytechnic University Department of Building Services Engineering Hung Hom, Kowloon, Hong Kong	http://www.bse.polyu.edu.hk/ Tel: (852) 2766 5850 Fax: (852) 2774 6146 Email: becarrie@polyu.edu.hk
Hong Kong Polytechnic University Department of Land Surveying and Geo-Informatics Room HJ702, 1 Yuk Choi Road, Hung Hom, Kowloon, Hong Kong	http://www.lsgi.polyu.edu.hk/ Tel: (852) 2766 5968 Fax: (852) 2330 2994 Email: lsdept@polyu.edu.hk
Hong Kong Polytechnic University Department of Building and Real Estate TU541 , Core T, Hung Hom, Kowloon, Hong Kong	http://www.bre.polyu.edu.hk/ Tel: (852) 2766 5807 Fax: (852) 2764 5131 Email: bspromo@inet.polyu.edu.hk
Hong Kong University of Science and Technology Department of Chemical & Biomolecular Engineering Clear Water Bay, Kowloon, Hong Kong	http://www.ceng.ust.hk Tel: (852) 2358 7130 Fax : (852) 2358 0054 E-mail: cbme@ust.hk

APPENDIX F – ORGANISATIONS OFFERING SUPPORT TO CONSTRUCTION SMES

Hong Kong University of Science and Technology Department of Civil & Environmental Engineering Room 3575, Main Academic Building, Clear Water Bay, Kowloon, Hong Kong	http://www.ce.ust.hk/ Tel: (852) 2358 7154 Fax: (852) 2358 1534 E-mail: civilweb@ust.hk
University of Hong Kong Department of Architecture 3/F, Knowles Building, Pokfulam Road, Hong Kong	http://www.arch.hku.hk/ Tel: (852) 2859 2133 Fax: (852) 2559 6484 E-mail: dept@arch.hku.hk
University of Hong Kong Department of Mechanical Engineering 7/F, Haking Wong Building, Pokfulam Road, Hong Kong	http://www.hku.hk/mech/ Tel: (852) 2859 2635 Fax: (852) 2858 5415 E-mail: mech@hku.hk
University of Hong Kong Department of Real Estate and Construction 5/F, Knowles Building, Pokfulam Road, Hong Kong	http://rec.hku.hk/ Tel: (852) 2859 2128 Fax: (852) 2559 9457 E-mail: reco@hku.hk

APPENDIX G EPD DIRECTORY OF ENVIRONMENTAL CONSULTANTS (FULL LIST)

Please visit EPD website at:

http://www.epd.gov.hk/epd/english/business_job/business_opp/files/full_list.pdf