AN INVESTIGATION OF CONSTRUCTION WASTE MADE
IN MAINLAND CHINA

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Abstract: Various types of construction wastes are generated during construction activities. The expansion of construction wastes not only represents an enormous dissipation of resources but also results in serious environmental pollution, thus creating negative effects to the sustainable development of environmental industry and society. With the developing of economy and industry, the waste problems are much more serious these year than in past; therefore, waste management had been a pressed issue from the government in order to protect the environment. This paper analyses the production and sources of construction wastes produced on site through data obtained from a series detailed questionnaire survey and structured interviews conducted in Shenzhen and Hong Kong. According to the survey, concrete and cement, brick, timber, tile, steel and aluminum waste are the main wastes produced on construction sites. And the sources of these wastes vary from one another, what’s more, human behavior can serious affect the amount of the waste. At the end of this paper, some suggestions such as improving legislation, involving environment consideration in design stage, including on-site waste management in the tendering report, are given to improve the present situation.

Keywords: construction waste; composition of construction waste; waste minimization management; Shenzhen; Hong Kong

1 Introduction

Construction waste is a serious environmental problem in many large cities. In Hong Kong, an average of 7030 tons of construction and demolition (C&D) waste were disposed of at landfills everyday in 1998, representing about 42% of total waste intake at landfills, and most of which can be reclaimed; and in 1999, there were 7890 tons of C&D waste disposed of at landfills every day, representing about 44% of total waste intake at landfills [EPD]. And in Mainland China, the tangible data were not collected. However, according to Lu, construction waste is made up of nearly 40 percent of the overall solid waste.

Contrasted to the percentage in other advanced countries, for example, C&D debris makes up only 12% of the waste received at Metro Park East Sanitary Landfill of Iowa State in the United States [MWA], the quantity of C&D waste in Mainland China and Hong Kong is much higher. As there are highly increasing demands on house buildings and the rebuilding of the old cities will inevitably worsen the environment without waste management.

There have been many research efforts for construction waste control in Hong Kong. For example, a study that investigated construction waste generated from public housing projects in Hong Kong was conducted in 1992 [Cheung]. Methods for construction waste minimization in Hong Kong were also discussed [C.S. Poon, Zhen Chen, Vivian W.Y. Tam]. These waste minimization methods emphasize the use of modern technologies in building construction, such as precast concrete, steel form and scaffold, drywall partition panel, etc. And some other management efforts are also discussed, such as controlling construction wastes by implementing governmental functions. (L.Y. Shen) In Mainland China, however, the research work is just taken out.

Previous practice and studies have established a set of waste prevention strategies. These strategies mainly including technique methods and managements, such as efficient purchase and ordering of materials; efficient timing and delivery; efficient storage; and the use of materials to minimize loss, maximize reuse, prevent undoing and redoing, and reduce packaging waste, using prefabrication to reduce the generation of the construction waste etc. (B.K. Fishbein, Chun et al., 1997; Faniran and Caban, 1998; Graham and Smithers,
However, these strategies are not suitable for China, for the construction methods, structural types, building materials, the management techniques, proficiency of construction workers and the compulsive requests etc. are much different.

Construction waste according to its name, is the waste produced by the construction period, including building waste——the waste produced during construct a new structure, and demolition waste——the waste produced during removing, rebuilding or demolishing the old building(s). This paper mainly focuses on building waste——the waste produced on site.

Construction activities are generating various types of construction waste, including soil, sludge (surplus materials and abandon materials, etc), etc., which is also included variable recyclable materials, such as steel and timber waste. The proportion of recyclable waste to some research made in developed countries, is up to 95%, namely, only five percent of the overall waste is unrecyclable. Construction activities convinced nearly 40 percent of the natural resources and used 40 percent of energy (Wu, 2004), but wasted around 30 billion yuan (1$=8.0273yuan) from the productions of solid wastes and by not recycling materials (China Government, 2004). To save the energy and resources, the solid waste management, including construction waste management, is a necessary procedure.

To find some useful measures to relieve the waste problem, the composition and sources of waste producing on site must be understand. So this paper focuses on the following objectives:

i) Examining the production of various types of construction wastes, namely, examining the composition of construction waste.

ii) Investigating the sources and reasons of the generation of construction waste by questionnaire survey with structured interviews and observation of 17 projects.

iii) Some recommendations are given to improve the current situation.

2 Research Methodology

Without compulsory rules and contract requirements (and what’s more, there is no this kind of laws and requirements at present), most projects all mixed the different waste together and send to landfill directly. So a questionnaire was taken out to find out the composition of construction waste and sources of generation.

At this part of research, 110 copies were sent out during June 2003, and 84 were answered, the respondent rate is 76.4%. The responses include government officials (9 copies, 10.7%), Designers (4 copies, 4.8%), Engineers (13 copies, 15.5%) and Contractors (the rest, 69.0%).

The statistical work was done afterwards, and the construction wastes are including concrete and cement, steel and aluminum, tile, timber, glass, package and plastic waste etc.

And an amphi-comparison questionnaire was taken out to see what waste are the main ones generated on-site. This part of research take a rule as follows: type 1 (waste) compared with type 2 by weight, if type 1 is generated more on-site than type 2, then a “√” is given to type 1 in the row of type 1. For example, timber compared with packaging, if timber is generated more than packaging, then a “√” should give to timber.

The copies were sent out to 51 Contractors who deal with the waste during July to August 2003, and 33 copies were answered, the responding rate is 64.7%. The calculation is taken a easy way by given 1 to a “√” and “0” to none. For example, when concrete and cement waste compared with plastic waste, and a “√” is given to concrete and cement waste, then “1” is given to concrete and cement waste and “0” to plastic waste, and so forth. All rows (see table 1) and all copies are calculated respectively (sum i), and the accumulative total (the whole waste) can get from each row (the sum of all copies, sum). Then reorder is used to express which waste is generated more on site and which is less relatively by sum i divides sum.

The generation sources are collected from 17 projects from August 2003 to October 2004 to see if there is any measures to improve the present situation. These projects are all rebar-concrete structures (by material) and arrange from 70 million yuan to 3 billion yuan. And 3 of these projects are required to sort out the different waste and reused (or recycle) them as possible at structural work stage for 3 months (from August to October 2004) to see if sorting out really helps in reducing management and to what extent at present. These 3 projects are 79 million yuan (at basement work), 90 million yuan (at 11 floor) and 0.21 billion yuan (at 21 floor). And the one which begins at basement work is asked to weigh each type of waste generated on-site
once a week. These data were asked to record on site by Contractors and collected once a week by the research team.

### 3 Construction Waste Generated On-Site

The production of construction waste is much different because of the nature of construction materials, design and site management, the structure forms and using function, and the methods for recycling. This paper mainly focuses on concrete structures, the production of construction wastes including concrete and cement, timber, steel and aluminum, block, tile, plastic, glass and packaging materials. Table 1 shows the reorder results of waste generation level (weight-ratio) of construction waste through amphi-comparison made by Contractors on-site and the main reasons for these construction wastes.

#### Table 1: Waste Generation Level and Reasons in the Generation of Construction Wastes

<table>
<thead>
<tr>
<th>Reason</th>
<th>Reorder</th>
<th>Main Generating Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete and Cement</td>
<td>0.21</td>
<td>1. Flow of plastering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Demolished concrete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Over-order</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Opening for hole from walls and chisel for leveling</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Template-leakage</td>
</tr>
<tr>
<td>Block</td>
<td>0.19</td>
<td>1. Obstruct and deformation during working</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Deformation during transportation and delivering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Design-alteration from unqualified quality requirements</td>
</tr>
<tr>
<td>Timber</td>
<td>0.16</td>
<td>1. Attained the periodic of using formwork</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Leftover materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Used wastage from unstandardized design</td>
</tr>
<tr>
<td>Tile</td>
<td>0.13</td>
<td>1. Obstruct and deformation during working</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Deformation during transportation and delivering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Design-alteration from unqualified quality requirements</td>
</tr>
<tr>
<td>Steel and Aluminum</td>
<td>0.13</td>
<td>1. Cutted of steel bars from pile work</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Cutted of steel bars from basement activity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Damages from construction tools, such as handrail, scaffolding, carry, etc.</td>
</tr>
<tr>
<td>Packaging Material</td>
<td>0.09</td>
<td>1. Packaging from cement bags</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Packaging from tile, glass</td>
</tr>
<tr>
<td>Plastic</td>
<td>0.06</td>
<td>1. Packaging from construction materials</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Over supplying of PVC pipe from piping and drainage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Over supply of water proofing materials</td>
</tr>
<tr>
<td>Glass</td>
<td>0.03</td>
<td>1. Deformation during transportation and delivering</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Obstruct and deformation during working</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Used wastage from unstandardized design</td>
</tr>
</tbody>
</table>

From table 1, a conclusion can be drawn that concrete and cement, block, timber, tile and steel and aluminum waste are the main wastes generated on-site. And this result is consistent with the first round of research.

### 4 Sources of Construction Waste

Figures 1 to 5 show the different sources collected from the 17 projects. These figures are using frequency of occurrence to reflect if the given sources happens frequently, for example, in figure 1, source 1 (chisel for leveling) has a frequency of 100% that means this source appeared at all research projects, it also means this source can’t avoid at present in China by using these materials, construction methods and structures etc.

Concrete and Cement: The concrete waste contributes the major proportions with other types of wastes. From the result in Table 1 and Figure 1, the major reasons in the generation of concrete and cement wastes are flow
of plastering, demolished concrete, over-order and template leakage, which included 80–90% of the generation. Since concrete structures are the most popular for resident, commercial or industrial buildings in Shenzhen and Hong Kong construction, what’s more, this waste also can be recycled, so special care is needed to deal with this waste.

Notes:
*Waste Sources: Source 1 - Chisel for leveling; Source 2 - Deformation during transportation and delivering; Source 3 - Template-leaking; Source 4 - Default from pile cap; Source 5 - Over order; Source 6 - Variance between drawing and construction work; Source 7 - Lack of communication between contractors; Source 8 - Actual concrete during on-site concreting; Source 9 - Default from design drawing; Source 10 - Flow of plastering; Source 11 - Opening for hole from walls and chisel for leveling; Source 12 - Poor plastering work; Source 13 - Cleaning of construction tools; Source 14 - Design variation; Source 15 - Default from delivering; and Source 16 - Wasted because of construction machines damage.

For this waste, source 1, 3, 10, 12 and 13 (31.2% of all sources) are appeared at all research projects and are unpreventable at present (see figure 1). Source 5, 6, 7, 8, 9, 14 and 15 (43.8% of all sources) can affected (the amount of waste) by human behavior heavily (human behavior here also includes on-site management, such as ordering materials without careful calculating and management, operating machines careless, cutting materials careless, not protecting materials well, etc.).

Block: The major waste for block is transportation damage and cutovers, which included nearly 80 percent of the overall generation (see Figure 2). Block is a brittle material, which is easy to damage during transportation.

Notes:
*Waste Sources: Source 1 - Defaults of materials; Source 2 - Deformation during transportation and delivering; Source 3 - Cut-corner of construction formwork; Source 4 - Lack of communication between contractors; Source 5 - Over order; Source 6 -
Design variations; Source 7 - Default from design drawing; Source 8 - Default from drainage; and Source 9 - Unqualified quality requirements.

Sources 2 and 3 (22.2% of all sources) appeared in all researching projects and are unpreventable at present. Sources 2, 3, 4, 5, 6, 7, 8 and 9 (88.9% of all sources, see Figure 2) can be affected by human behavior heavily.

Timber: The major generation of timber is wasted timber, and cutovers, these two sources include 22.2%, but generated nearly 80% of this waste. Timber formwork can only be used for several reuse times, concreting structures is not common to adopt other forms of formwork to enhance the reusable time, for example, steel and aluminum; wastage problems are difficult to control.

![Figure 3: Sources and Levels of Timber Waste](image)

Notes:
*Waste Sources: Source 1 - Attained the periodic of using formwork; Source 2 - Default from storage; Source 3 - Cut-corner of construction activity; Source 4 - Default from operations; and Source 5 - Used wastage from unstandardized design.

Source 1 and 3 (40% of all sources) have a “occurrence of frequency” of 100%. Source 2, 3, 4 and 5 (80% of all sources, see Figure 3) can be affected by human behavior heavily.

Tile: The similar result with block is encountered with that in tile. Since tile is a brittle material, and easy to cause damage during transportation, the protections during transportations should be provided in order to reduce these unnecessary wastages.

![Figure 4: Sources and Levels of Tile Waste](image)

Notes:
*Waste Sources: Source 1 - Attained the periodic of using formwork; Source 2 - Default from storage; Source 3 - Cut-corner of construction activity; Source 4 - Default from operations; and Source 5 - Used wastage from unstandardized design.

Source 1 and 2 (40% of all sources) have a relatively high “occurrence of frequency”, and all sources (100%
of all sources, see Figure 4) can be affected by human behavior heavily. The “relatively high” mainly because half of the research projects were still at structural work and including one project which did not select this material.

Steel and Aluminum: The major waste for steel is cutted of steel bars from pile work, cutted of steel bars from basement activity and damages from construction tools, such as handrail, scaffolding, carry, etc., which included 95 percent of the overall generation (see Figure 5).

![Figure 5: Sources and Levels of Steel and Aluminium Waste](image)

Notes:
*Waste Sources: Source 1 - Cutted of steel bards of pile work; Source 2 - Default from construction processes; Source 3 - Default from construction processes; Source 4 - Default from drawing; Source 5 - Cutted of steel scaffoldings; Source 6 - Damages of construction machine; and Source 7 - Upsized steel bars.

Source 2 and 7 (28.6% of all sources) have a “occurrence of frequency” of 100%. Source 2 and 4 (28.6% of all sources, see Figure 5) can be affected by human behavior heavily which is much lower than other types of waste. This mainly because the speciality of this material and its economic property.

From the research, a phenomenon must be noticed, some sources are rarely happened, but it really happened, it would produce a lot of this waste, and some sources happened frequently (for example its occurrence frequency is 100%), it produced relatively less waste.

5 The Reasons of the Generation of Construction Wastes

A serious waste problem encountered for construction organizations discovered from the result survey in Table 1 and Figures 1 to 5. The major reasons of these huge generations of construction wastes come from the lack of management skills, environmental awareness and structural selecting. On waste minimization, legislative requirement is developing in Mainland China. Some of the legislations are lack to discuss in many cities. Normally, the construction organizations only focus on the benefits from economic return. Environmental management is rarely considered. Except some profitable construction materials, particularly steel and timber, other construction wastes are dumped to landfill areas. The research result shows the recycling rates, in which only 14 percent (by volume) or 8 percent (by weight) are recycled on average. This figure is much lower than that in other countries, in which Germany recycled 40 percent of construction waste and Japan recycled at least 56 percent of construction waste.

In the survey, 90 percent of the responses argued that it is not necessary to implement waste management. The construction organizations do not considered “environment” as an essential issue. Only 10 percent of the responses considered waste management are a meaningful activity, by the way, these are the project managers for the construction organizations. From the above, waste management in saving resources, reducing cost and implementing sustainable development are not accepted by the public, which is the major barrier encountered in Mainland China.

The large use of steel and concrete structure in Mainland China and Hong Kong, causes high consuming of construction materials, particularly on block, tile, concrete and cement. From the data obtained from the requested project in Mainland China, the volume and weight percentage of each waste are calculated (see figures 6 and 7).
From figures 6 and 7, concrete, cement and blocks are the major generation, which included 70 percent (by volume) or 77% (by weight) of the construction wastes.

On the other hand, lack of training and technology cause huge generation of construction waste, most sources affected by human behavior (see figures 1 to 5). Some of the surveyed construction organizations adopted out-dated construction technology, which is the major reason in causing waste generation.

Lack of management skills is also one of the reasons in huge waste generation. In the surveyed Shenzhen’s large infrastructure projects, including seventeen contractor and sub-contractors, the major problem comes from multi-layered of construction activities. Naturally, the waste generated on-site of this project is much more than the similar projects. In the interview discussions, the Hong Kong contractors argued that more than seven layers of subcontractor activities are occurred in construction.

Lack of the push from recycling market is also one of the reasons in waste generation. The low landfilling costs (only two to five yuan per ton) causes the unbalance between the recycling cost and landfilling cost. Furthermore, high initial cost in implementing recycling technology and low awareness in environmental management burden the implementation of waste management in construction organizations.

Lack of supervisions exists in Mainland China. The government, project management and contractor both lack to discuss the importance on on-site supervisions. Poor workmanship causes serious waste problem under non-supervision.

6 Conclusion and Suggestions

In the current status in Mainland China and Hong Kong, construction waste included 30 to 40 percent on the total solid waste generation, about 500 to 600 tons per 10 thousand m3 in the construction processes. A total of 40 million tons are generated every year (Lu, 1999). To improve the poor situation, construction waste management is the necessary procedures in order to reduce the waste generation.

Legislative Enforcement

Improving the legislative enforcement and build up comprehensive environmental law are necessary in Mainland China and Hong Kong. A strong awareness on waste management and recycling is already built up in Europe and Japan. Landfill charging cost is competitive to the investment cost for recycling of around EUR$30 per ton, which is also targeted 70 percent of recycling rate (PSN, 2002). In the Japan’s Recycling Law, “zero pollutant” is set up in order to enhance the recycling market (Xue, 2001). Hong Kong issued Waste Disposal Ordinance and Waste Reduction Framework Plan (WRFP) in 1980 and 1998 respectively in order to reduce 84% of construction waste. A survey is conducted for investigating the effectiveness of implementing Waste Reduction Framework Plan, 75 responses are used for analysis. In Figure 8, seventy-four percent of responses argued that the Waste Reduction Framework Plan is extremely effective and significantly effective (Tam et al., 2003), which explained that the government schemes is recognized by the public.
Therefore, the development of recycling and waste management should be implementing in the experience gained from other countries and cities. Furthermore, the limit should be set for controlling the waste generation and emission of pollutants. Educating the construction practitioners with a higher standard in management and technical based is necessary to consider in the future.

**Figure 8 Survey on the Meaning for Waste Reduction Framework Plan (WRFP)**

**Involving Environment in Design Stage**
Involving environmental protection in the design stage and implementing waste minimization’s design are necessary. From the survey, variation in design causes is the reasons on the huge generation of construction wastes. From the results collected in the 17 projects in Figures 1 and 5, nearly all projects encountered the difficulty in the variations of design; thus it is necessary to investigate the marketing situation, forecast the design consideration before investment, improve the quality of design and reduce the variations of design. At the same time, the design process should be considering the strategies in minimizing construction wastes, including the adoption of prefabrication and modular design, use of durable construction materials, etc. On the other hand, it can be learnt from the promotions of innovative technology from Hong Kong construction. They adopted low waste construction technology during design processes, including using drywall instead of traditional structural walls, prefabricated slab instead of on-site plastering and off-site prefabricated building services system. In adopting the above waste minimizing system, material wastage can highly be reduced. Table 2 shows the wastage level reduced after adoption of prefabrication in a recent survey from Hong Kong’s study (Tam et al., 2003).

**Table 2: Wastage level between conventional construction and prefabrication**

<table>
<thead>
<tr>
<th>Types</th>
<th>Material Wastage</th>
<th>Waste Reduction (C=A-B)</th>
<th>Reduced Percentage (C/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Conventional Construction (A)</td>
<td>Prefabrication (B)</td>
<td></td>
</tr>
<tr>
<td>Concrete</td>
<td>3.78</td>
<td>1.0</td>
<td>2.78</td>
</tr>
<tr>
<td>Steel</td>
<td>4.33</td>
<td>1.0</td>
<td>3.33</td>
</tr>
<tr>
<td>Plastic</td>
<td>6.83</td>
<td>0.0</td>
<td>6.83</td>
</tr>
<tr>
<td>Tile</td>
<td>7.2</td>
<td>3.0</td>
<td>4.2</td>
</tr>
</tbody>
</table>

**Tendering Report**
Tenderers are required to consider the environment and waste minimization system into their tendering report, such as techniques applied to avoid the generation of construction waste, the construction methods and materials selecting, the plan of reuse of these wastes on-site and methods to deal with the not reused wastes, etc. The estimation of the construction cost should be including the design processes and experiments from project managers. It is also necessary to assess the waste management system in the tendering stage and
include waste minimization system as one of the project objectives. According to the Architectural Service Department (ASD) from the Hong Kong Special Administration Region, waste minimization with recording should be provided with tendering document in the supervision from the ASD’s employees. In addition, it is encouraged to adopt low-waste construction technology during construction processes, including concreting machines, drywall. Those receive great benefits to the environment (Tam et al., 2003).

On-Site Management Systems
Enhancing the on-site management system is one of the recommendations. Reuse of the construction materials can effectively minimize the waste generation in the construction processes.
(1) Implementing the responsibilities on waste management with clear directions and adequate supervision to each employee, including technical staff and frontline staff is suggested. Furthermore, reward scheme can be encourage the employees in waste minimization, such as proposing some useful technique methods which helps in reducing the generation of waste, penalize those employees who with lower environmental awareness, for example, cut materials careless, place materials on site without any protection etc.
(2) Educating the frontline staff with higher quality is the necessary step in improving the awareness to the environment. During the research, most supervisors and Contractor managers argued that most workers (the estimated rate is nearly 70% of all the workers) are trained or educated less than a week. And what’s more, some workers are employed without any training at all. The proficiency and environmental awareness of the operating workers, exactly have a direct effect on waste generation. So training schemes should be provided for all levels of employees with the objectives on improving the overall environment.
(3) Adopting innovative technology in order to change the design with standard in waste minimization is recommended. During the survey, we found some contractors in Shenzhen have succeed in reducing the plastering work, which can enhance the hardening period, performance from leveling on the concrete structure, reduced the plasterwork efficiency in reducing the generation of construction waste, improved the quality of the project.
(4) Sorting and separation of construction waste should be implementing for each construction and demolition sites. This can improve the recycling rates, improve the management support, reduce the waste generation, improve the economy and benefits to the public. One of the seven-storey construction project in Shanghai, they separated the construction waste in structural process and mixed the useable wastes with sand in suitable proportion for cement replacement is adopted. A total of 480 tons of construction waste is recycled and saved 14.4 thousand yuan on material and 3.36 thousand yuan for deposal, the net income was more than 1.24 thousand yuan. Furthermore, a high-storey structural project had recycled more than 840 tons in Beijing for concrete applications in more than 30,000m3 and saved of around 35 thousand yuan. Therefore, economic benefits can be achieved in sorting and separation of construction waste (Lu, 1999). From the three sorting out waste projects in Shenzhen, the recycling rate improved from 14 percent to 24 percent (in volume) or from 8 percent to 29 percent (in weight).
(5) Improving the communication with the construction organizations can effectively reduce the conflict between parties (L.Y, 2003), especially those with several layers of Contractors. Most Sub-Contractors argue that they don’t change information with other Sub-Contractors voluntary. However, this phenomenon sometimes caused unnecessary generation of waste. For example, the project with 17 Contractors mentioned above, with frequent variation in design drawings, the structural Contractor not communicate with other Contractors with the changing of dimension of holes for equipments and the dimension of concrete wall, other Contractors have to cut their materials to suit the reserved holes or reorder their materials (if having enough time), thus generated some unnecessary wastes on site.
Increase the landfill charge should be implementing at the same time in balance the economy affairs in sorting and separating system. In the encouragement from the construction waste recycling, the waste generation can greatly be reduced and it would accelerate the industrialization of disposition of construction waste.
In conclusion, the huge consuming of resources and high population, waste minimization is pressing hard in the Mainland China and Hong Kong. It can help save the construction materials, speed and realize the industrialization of construction waste, prolong the landfilling life and save resources. It found that the major
reasons of huge amounts of wastage are lack of management skills and environmental awareness in the construction. Training and education, and supervision can improve the poor workmanship and reduce wastage generation. It is necessary to improve the current unaccepted situations by legislative enforcement, involving environment in design stage, tendering report, and on-site management system. Therefore, sustainable development is necessary to implement in Mainland China and Hong Kong.

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