

Tuen Mun Area 38 Stage 2 Reclamation – A Bold Step in Reuse and Recycling of Construction and Demolition Materials

Reuse of Inert C&D Materials in Reclamation

Tuen Mun Area 38 Stage 2 reclamation may have set a new milestone in the reuse and recycling of construction and demolition (C&D) materials in Hong Kong.

Stretching over an area of 33 hectares, the reclamation basin of the project requires about 3.6 million m³ of fill material to top up its void (see **Figure 1**). Instead of exploiting natural resources (such as using marine sand fill), the project has turned to public fill as its sole source for supply of reclamation fill.



Figure 1 – Aerial photos showing Tuen Mun Area 38 Stage 2 Reclamation

Public fill comprises inert portion of C&D materials which can be reused in reclamation or site formation works resulting land supply for development. The local construction industry generates about 14 million tonnes of construction and demolition (C&D) materials every year, of which about 80% are inert materials, comprising soil, rock, broken concrete, asphalt, brick/tiles, etc. It is a challenge to the Administration to identify sufficient reclamation projects (or public filling areas) to accommodate this huge quantity of public fill generated to avoid being delivered to landfill sites thus depleting the precious landfill capacity.

Located at Tuen Mun, the Stage 2 reclamation provides a convenient public fill outlet in the northwest region of the territory. In addition, the contractor is required to collect public fill from the Quarry Bay and Sai Ying Pun Public Filling Barging Points on the Hong Kong Island where there is a lack of public filling capacity. The latest locations of various public filling facilities are

shown in **Figure 2**. The locations of these facilities are strategically determined with a view to reducing cross-regional traffics by trucks as far as possible.

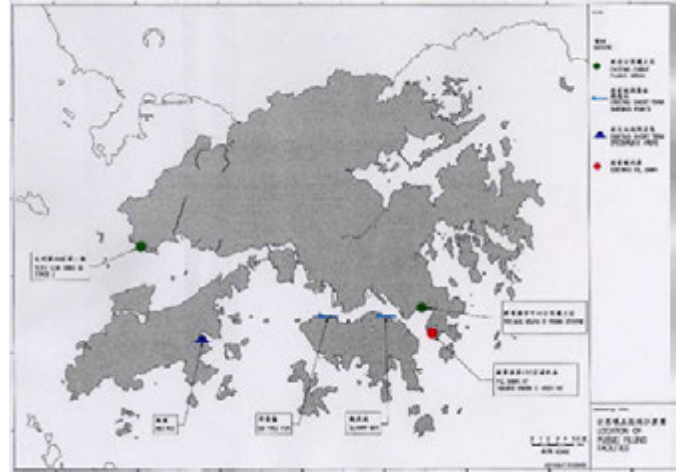


Figure 2 – Location of public filling areas and facilities in Hong Kong

Due to diminishing number and sizes of reclamation projects in Hong Kong, the Tuen Mun Stage 2 reclamation has been filled up at an unexpectedly fast pace since its commencement in September 2001. At its peak, the project received more than 1,400 truck loads of public fill per day from land source and more than 1,700 truck loads per day as collected by barges. Such intake rate was almost 2 times faster than what was planned originally. Being aware of the risk of depleting public filling capacity in Hong Kong and the need of sustainable development, the Administration has identified, amongst the others, “**recycling**” as part of the strategy on management of C&D materials, in addition to “**reduce**” and “**reuse**”.

Setting Up and Operation of the 1st C&D Materials Recycling Facility in Hong Kong

With the recent raised awareness of sustainable development, reclamation is no longer the only solution to accommodate C&D materials and recycling becomes another valuable process that turns the surplus C&D materials into useful products for use in construction works. The hard inert portions, such as concrete, rocks and rubbles, can be sorted out and recycled into aggregates and granular materials for use in civil construction. In doing so, we can salvage the remaining public filling capacity in Hong Kong and reduce the continual exploitation of natural environment or resources for supply of virgin rock products.

Given the infant stage of recycling in Hong Kong and the general lack of cognizance and confidence on recycled products in local construction industry, the Administration has taken the lead to set up and operate the first pilot recycling facility in the Tuen Mun Stage 2 reclamation to treat the inert hard C&D materials received daily (**Figure 3**).



Figure 3 – Panoramic view of C&D material recycling facility at Tuen Mun Area 38

The recycling facility was commissioned in July 2002. The facility was able to recycle broken concrete and rock into various sizes of aggregates and rock fill with a designed output capacity of 1,200 tonnes per day. The facility comprises various components including:

- preliminary sorting part (grizzly for sorting sizeable rock and concrete pieces for recycling);
- preliminary crushing plant (pulverizer for crushing reinforced concrete);
- cleaning measures (magnetic separator for metal removal; air knife for removing dust/paper/wood and pickers for removing residual undesirable materials such as brick and tile pieces);
- crushing components (3-stage crushing by jaw crusher and cone crushers);
- aggregate size-segregating screens; and
- storage chambers (for compartmentalize different days' production for sampling and testing).

A rigorous testing programme is applied to all recycled products. All the recycled aggregates or rock fill so far produced from the pilot plant are of remarkable quality (see summary of test results in **Table 1** below). The test results indicate that the recycled aggregates can fulfill stringent requirements as high as that required in sub-base and concrete production. Up to now, the recycled aggregates and rock fill have been supplied to more than 30 public projects for use in wide variety of civil works. Recently, co-operation has also been made with Correctional Services Department (CSD) and The Hong Kong Polytechnic University (HKPU) for manufacturing paving block and road kerb in the CSD's Tai Lam plant starting from early 2003 with sole use of recycled aggregates.

	Typical Test Results of Recycled Aggregates produced from Recycling Facility at Tuen Mun Area 38					Requirements in WBTC 12/2002
Min. dry particle density (kg/m³)	N/A	2350 - 2550	2450 - 2600	2450 - 2600	2450 - 2600	2000
Max. water absorption (%)	N/A	3.1 - 4.9	1.0 - 4.9	1.4 - 2.6	N/A	10
Max. content of wood and other material less dense than water (%)	N/A	0	0	0	0	0.5
Max. content of other foreign materials (e.g. metals, plastics, clay lumps, asphalt and tar, glass etc.) (%)	N/A	0	0	0	0	1
Max. content of fine (%)	N/A	0 - 0.3	0.1 - 0.7	1.0 - 3.0	N/A	4
Max. content of sand (<4 mm) (%m/m)	N/A	0 - 1	0.5 - 2.0	2.7 - 4.0	N/A	5
Max. content of sulphate (%m/m)	N/A	N/A	<0.1	<0.1	<0.1	1
Flakiness index (%)	N/A	17 - 26	13 - 20	21 - 32	N/A	40
10% Fine Value (kN)	N/A	N/A	110 - 140	N/A	N/A	100
Grading	Pass	Pass	Pass	Pass	N/A	Table 3 of BS 882:1992
Max. content of chloride (by mass of chloride ion) (%)	N/A	N/A	<0.01	<0.01	<0.01	0.05

Table 1 – Typical test results of recycled aggregates

The performance of the recycling facility hinges highly on the steady supply of inert hard C&D materials. The degree of purity is also of concern as it is practically very difficult to extract and recover broken concrete and rock pieces for recycling when they are highly mixed with soil, brick, tiles and other non-recyclable materials. Unlike some overseas countries, selective demolition has not yet been common in local demolition practice. Proactive arrangements have been made with the other government demolition projects (e.g. Demolition of Yuen Long Estate) to en route their demolition materials to Tuen Mun Area 38 and to encourage implementation of basic selective measures before demolition with a view to obtaining “purer” recyclable materials.