Report on

The History of Quarrying in Hong Kong 1840 - 1940

SW Poon and KY Ma

Introduction

When the Colonial administration reviewed its past after ruling Hong Kong for a century, John Carroll commented as follows:-

"It is foremost a history of commerce."[1]

Commerce, however, did not exist in a vacuum, and was backed up by a strong infrastructure built over the years. The software aspects of commerce, together with the hardware aspects of infrastructure, have both contributed to Hong Kong's success story. This paper focuses on quarrying, one of the hardware aspects of infrastructure as well as one of the earliest export industries in Hong Kong.

The quarrying industry in Hong Kong flourished in the early 1900s, and since then has contributed to a significant number of large-scale infrastructure and building developments. The infrastructure has enabled free trade, and a wide range of other economic and social developments, which has turned Hong Kong into a developed society and an international city today. The quarrying industry is therefore an important milestone in the development of Hong Kong.

This paper gives an overview of the history and development of quarrying in Hong Kong. The period 1840 – 1940 has been selected as the focus of study as many records were lost during the Japanese occupation of Hong Kong from 1940 onwards. With the maturing of the infrastructure, the quarrying industry has diminished and can be said to have completed its mission. As the government has decided to procure stones from Mainland China, the existing quarries in Hong Kong will be phased out by 2015.

In this paper, the early stages of quarrying in Hong Kong will be described; *the system of leasing of quarries through tendering or public auction will be discussed together with the lease conditions and related laws.* This will be followed by a discussion of the development of the quarrying

industry, and the change of construction technology in terms of machinery, use of dynamite for blasting, and new construction materials. In the last part of the paper, the practice of quarrying and the guilds will be described.

Pre-1841

The history of quarrying in Hong Kong can be traced to as early as 1810, when the stonemasons of East Kowloon were persuaded by a member of the Tang family of Kam Tin to cut stones for the construction of a fort in Kowloon at low wages, in order to guard against pirates who were then particularly troublesome in local waters.[2]

Clarke Abel's investigation in 1816 indicated that granite was abundant on Hong Kong Island [3].

James Hayes had the following finding:-

> "30 quarries donated to the restoration of the Hau Wong Temple in Kowloon City in 1822 of which 4 also donated in 1845 for the Shau Kei Wan Hoi Sam Temple indicated some of the quarrymen came from Kowloon ." [4]

W.D. Bernard wrote in June 1841:-

> "At the eastern end of Hong Kong there are capital stone-quarries, which are worked with skill and facility by Chinese labourers …."[5]

A report in 1844 stated:-

> "The stone cutters have been working here for many years before our arrival. The majority of the men are unprincipled. They cannot be considered as domesticated and are in the habit of coming and going according to the state of the trade." [6]

It is evident, therefore, that quarrying existed before the British occupation in 1841.

Early Quarrying Days

According to the census published in May 1841, [7] there were 1,655 masons in Hong Kong, accounting for about 22% of the population of 7,450 people.

The same statistics showed that there were six quarry villages.

The Friends of China wrote on 24 March 1842 that there were one mason shop and 380 mason workers.

The Collinson's Survey of 1843-45 also showed that the coast was marked with quarries all the way from Quarry Bay through Quarry Point to Ah Kung Nam, with a few houses for the quarry workers. There can be no doubt that quarrying was the dominant economic activity of the whole north-east coast of Hong Kong.[8]

George Smith [9] wrote in 1844:-

> "We first landed at a stone quarry, where the Chinese workmen were induced to leave their labour, ……. the dialect they spoke is Hok-ha[10], which differs considerably with the Cantonese generally spoken in those parts."

Thomas Allom[11] described in 1843:-

> "…….there is a valuable export of granite, and a large portion of the natives having long sustained themselves by the profits of hewing [12] this primitive stone. In the structure of the district, the trap-rocks hold the higher position, while the granite is found in huge debris scattered over the level and the lower regions. As there is no necessity for blasting or quarrying, the masses being detached and accessible on every side, it only remains for the labourer to hew or split each bolder into blocks easy of transport to the shore."

It can be concluded from the above records that quarrying continued after the occupation of the British, supporting construction activities in the city.

System of Leasing of Quarries through Tendering or Public Auction

The operation of quarries has been based on a system of leasing from the government through tendering or public auction. It is believed that the first public auction or tendering for lease of quarry farm was in 1844 when the whole of Hong Kong Quarry was leased under one contract. When the British took over Kowloon in 1862, the auction or tendering for stone quarry was held separately for Hong Kong Island and Kowloon.

A tender analysis on the Christmas Eve of 1872 [13] reviewed that there were six companies bidding for the lease. Two out of the six companies or persons had never got a licence, they both bore the surnames of Tsang and Li. The persons or companies that obtained the lease had the same address at 4-6 Shui Tsing Wan. Most tenderers used their own names, and sometimes company names such as Mr. Lee Wing Shing of Fuk Lung Stone Mason Shop, Mr. Tsang I of Tsang On Kee, or Tai-un Shop were used.

When sub-letting was not allowed in the 1890s, it is of great suspicion that collusion amongst tenderers had happened in those days. The exception was when Messrs Butterfield & Swire in 1882, a famous and large British firm, was awarded the lease for Hong Kong Island, which was the only record that a British company had obtained a stone quarry lease in the Colony. This tendering or auction in material was a monopoly for open stone in the quarries. The monopoly was intensified when Mr. Tsang Keng had the licence for stone quarry in Hong Kong and Kowloon from 1886 to 1900, except in 1897 [14] when Mr. Chan A-tong obtained the licence. A table showing the licence holders is illustrated in Table No. 1.

	Lease Sum	**Licence Holder**
1845		Kam Teen Sze
1848	$3,000	Chung Ping
1849	$3,160	Chung Ping
1850	$2,100	
The Stone Quarry was combined with the Salt Broker and Weighter as one lease		
(3 years)		Lo Seen
The Stone Quarry lease was separated from the Salt Broker and Weighter		
1855	$780	Lee Ahsut
1856	$1,300	Yeung Kwei-sow
1871-1885		Chung Yee, Chun Sun Sing, Chang Ying Kee, Tsang Fung, Lee Wo Hop, Tsang I, Li Fuk Lung, Li Wing Shing, Lee A-Tu
1886-1900		Tsang Keng, Chan A Tong

Table No. 1 licence holders from 1845 to 1900

The situation improved in 1902 when the government split the Hong Kong and Kowloon Quarries leasing as individual quarries rather than an area. [15] The length of the lease was extended to five years instead of one year. In 1907, the number of quarries let in Hong Kong Island, Kowloon Peninsula and New Territories reached five, eight and one hundred and one respectively.[16] In 1901, a tender analysis showed that Mr. Tsang Keng could only win 2 out of five sites on Hong Kong Island, and 4 out of 7 sites in Kowloon Peninsula [17]. This splitting technique appeared to be tailor made but in essence the monopolizing of stone quarries vanished after this change.

The leasing of the New Territories quarries was not as straight forward as that of Hong Kong Island and Kowloon. In the initial few years, the registration of land and demarcation of areas were going on, which made collection of Crown Rents very difficult. The government had to adopt the system in entirety left behind by the San-On Magistrate [18]. The Four Hills area was a typical example. The Four Hills, comprised of Ngau Tau Kok, Lei Yue Mun, Cha Kwo Ling and Sai Cho Wan, was the largest quarry in the New Territories and had existed before the British occupation. Lockhart's report in relation to the extension of the Colony disclosed that the San-On Magistrate was collecting a rent of over $2,000 per year from the Four Hills quarry [19].

Lockhart's report also showed that there were 36,070 Hakkas[20] living in the New Territories, who relied on agriculture and quarrying for livelihood. The first year after leasing the New Territories (1899) quarry rent collected by the government was $1,800, which was increased to $3,730 and $3,765 in the second and third years. The rent, when compared with that of $25,525 collected from Hong Kong Island and Kowloon Peninsula quarries, was far less. It was then decided that the rent of the New Territories quarries should be increased to $15,000 in 1903. [21]

On 24 June 1904, a set of rules for granite quarries from Lyeemum to Ngau Tau Kok in Kowloon Bay was gazetted. [22] The headmen of the Four Hills were assigned to collect all revenue owed to government direct from those persons loading stones onto boats. Six-tenths of this money was to go to the district government, and the remaining four-tenths to the Stone Hill

meeting house. The first portion was the tax paid to the local government while the remaining portion was to meet yearly expenses of joss meetings and free schools. The Hong Kong government fixed the Crown Rents for each of the Four Hills, and nominated headmen for each area, and permits were issued to the quarry masters as required. The Crown Rents recorded on 24 June 1904, together with the headmen responsible for payment to the Treasury, were as follows:-

Four Hills	Monthly Crown Rents	Headmen
Ngau Tau Kok	$300	Tam U
Lei Yue Mun	$300	Lau Fat
Cha Kwo Ling	$450	Lu Fung
Sai Cho Wan	$150	Lo Fu
Total	**$1,200 ($14,400/year)**	

The Registrar General had the ultimate power in managing the Four Hills. The quarry master should reside in or near the quarry and pay a royalty of 14% on the value of all stone cut in their quarries to the headmen. The modes of measurement were in accordance with the Quarrymen's Guild of the Four Hills, and any disputes would be referred to the Registrar General. The headmen had the power to stop work should in any quarry the royalty was in arrears, until such royalty was paid. The quarry master as the permit holder could use the pier and wharf free of charge but should use in good order. Other conditions were the same as those stated in the tender of Hong Kong or Kowloon Quarry [23].

It is interesting to note that the Quarrymen's Guild rules were referred to in the regulations. The British did not want to disregard the Chinese customs, so a mixture of the East and West customs was seen in the set of rules. Public auction or tendering for the Four Hills quarries started to appear in the Gazette in 1910, the transition took six years to complete.

The difference between public auction and tendering was raised as a secondary issue on the difference between lease and permit by a Land Officer Mr. J Fraser on 3 August 1929.[24] In reply, the Crown solicitor, Mr. Philip Jacks, reckoned that public auction for rental competition proved a nuisance as persons would lose their heads in the heat of the competing

moment and resulting to offer more than the enterprise can afford. As tendering allowed the tenderers more time to plan and think on all risks, the solicitor felt that it was a more rational competition. That is why for public auction, the quarry would normally assign a minimum rent which was usually a few dollars, and if there was no bid, the government could always take back the auction. Another advantage was that public auction usually took less time for commencement of the contract. This system continued up to the Second World War.

Open tendering or auction was seen to be a fair game, but it ended up the lucrative monopoly for stone quarry in the first sixty years of British administration. Some looked at it as the cohesion that made the Chinese collaborate with the British, while others commented it as administering Hong Kong in accordance with Chinese customs. But what the above told us was a Western system imported to a Chinese place and worked in the Chinese way. It is still the usual system used in the construction industry.

Lease Conditions and Related Laws

The contract signed in 1850 indicated that public auction had been held at the Chief Magistrate Office for the license, and two conditions were laid down in the contract. The Surveyor General was delegated the power to prohibit quarrying in areas where public inconvenience, safety or otherwise occurred. Secondly, the farmer of the stone quarry should keep in good order and repair that line of road in the immediate vicinity of the quarry on which stone may be carried, dragged, or otherwise transported, failing which the Surveyor General would hire men and make the necessary repairs, the cost of which to be borne by the farmer. [25]

Separate leases were made for Hong Kong Island and the Kowloon Peninsula after 1862. The contract conditions were increased from two to seven in 1865.[26] The changes were that the farmer should not open any new quarry, and stone already quarried and left on site should not be removed by the new leaser; the charges for stones of different sizes were listed, if sale at a higher rate, the quarry should be resumed and all stacked stone became the property of the Crown; any breach of conditions would lead to termination of the contract. In 1874, a month was granted to the leaser to remove all stones after expiration of the contract, and the term

liquidated damages was introduced to replace termination of contract.[27] In 1897, the contract conditions were increased to 14. The important changes were control usage of dynamite, sub-letting was not allowed, freedom of erecting quarters for the workmen, right of the government to terminate the contract, and opening of new quarry for public works.[28] This set of conditions continued till the Second World War.

Clause 4 of the Summary Offence 1845 restricted rough dressing of stone in the city, which meant that the process had to be carried out in quarries. Ordinance No. 1 of 1848 entitled "An Ordinance to regulate Manufacture and Storage of a certain description of Gun Powder within the Colony of Hong Kong" limited the maximum storage of gun powder to 2 lbs, otherwise the keeper should obtain licence. These two ordinances ruled quarrying for the first thirty years. The Summary Offence 1845 was revised in September 1872, which expressly restricted dressing of granite in the city with the exception of re-construction. This shows re-development in the city was progressing and the law had to revise to suit. At the same time, Ordinance No. 12 of 1872 entitled "An Ordinance to regulate the Manufacture, Importation, Storage and Carriage of Explosive Substances" was enacted to include nitro-glycerine and cartridges, a more powerful blasting material than gun powder, showing the increasing use of blasting. Within a year, the dangerous goods ordinance (No. 8 of 1873) added dynamite, lithofracteur, Horsely's Patent Blasting Powder as dangerous goods in the Ordinance. The control of blasting was entrusted to the *Surveyor General* [29] Works in the 1887 Public Health and Buildings Ordinance. In 1903, the new Public Health and Buildings Ordinance was introduced. The control of blasting fell into the hands of the Director of Public Works under Clause 210 and building nuisance was defined under Clause 229.

The 1903 Ordinance had relaxed city blasting, but limited to two half-hour periods at noon and at 4:30 pm after debating in the Legislative Council. Other details remained intact. The regulations for blasting of stone in quarries were left to be made by the Government in Council. In fact, these regulations were never made, but the quarries blasted as usual. The loop hole in law was discovered by a Land Officer Mr. T.M. Hazlerigg. On 8 January 1931, Mr. Hazlerigg wrote to the Crown Solicitor requesting legal opinion on the Morrison Hill Quarry Blasting Fatal Accident.[30]

After the Crown Solicitor had written to the Director of Public Works, he received the following reply:-

> "The conditions of permit issued by Public Works Department to store dynamite and detonators were issued by Commissioner of Police and worked well in the past. These conditions were reviewed a few years ago and approved no alteration. ….. The followings in the English Quarry Act 1894 do not apply to Hong Kong because Chinese do not know the practices and have their own methods and any interference would cause accidents."

Mr. Hazlerigg felt uncomfortable with the reply and brought up the case again with the Crown Solicitor on the ground of public safety. The exchange of communication dragged on until September 1931 when the Magistrate accepted that Morrison Hill was not a government quarry, and Mr. Hazlerigg closed the file on 14 September after the decision of the Magistrate. When the next Buildings Ordinance came in force in 1935, this loop hole had not been filled.

The Director of Public Works had clearly stated that the control of blasting was on the storage of dynamite and related accessories such as detonators. The Commissioner of Police was the one to issue such permit to keep the proper storage of dynamite should its quantity exceed the maximum allowed in law. As to the safety precautions within the quarry, it was assumed that such blasting procedures should follow Clause 210 of the Buildings Ordinance. The licence conditions did have blasting control but not on how to use the dangerous materials in a proper manner. What Mr. Hazlerigg raised was how to handle the dangerous materials in a proper way, and what the government concerned was the illegal use of gun powder which would affect the stability of the society, and by controlling the amount of storage of such materials, this could be achieved. The Explosive Substance Ordinance passed on 31 July 1913 not only controlled the storage, but also the consequence of explosion, and persons shall be liable for their acts. The Ordinance could not stop accidents during blasting, as dozens of accidents were recorded each year, and most of the court cases were about storage of dynamite without permit, blasting outside the specified time without permission, warning given and protection set up not in accordance with the Ordinance. All famous contractors had been

prosecuted. It was interesting to note that injurers had often shown a close relationship such as brothers, husband and wife, father and son, mother and son, etc. Workers appeared to come from families, a phenomenon as a result of the tight closed shop rules of the Guilds.

Despite the grey area in the regulations for quarries, the Buildings Ordinance and the lease conditions were the references. Nuisance and blasting were the two major control areas that the government kept an eye on. The ordinances and lease conditions had not affected the quarry practices. In material, the rules and regulations in government quarries were set up according to the customs of the Hakkas from which the regulations of the employer's and employee's guilds were also drawn. The management was that of a typical Chinese style which the British were well aware of and they had stood firm to the principle laid down ninety years ago of administering Hong Kong with Chinese customs. This management orientation helped to explain why blasting accidents had not stopped since the 1870s.

The Quarrying Industry

The Blue Book [31] of the Hong Kong Government reported on the status of the quarrying industry in 1848-1860, as follows:-

> "The revenue for stone quarry licence was around $3,000 from 1846 to 1850. In 1846, the average daily income of workers in Hong Kong was 7 pence, stone cutter's average income was 1 shilling and 41/2 pence which was the highest paid during this period. The number of stone masons in Shou-ke-wan and A-Keong-nam was 75 out of 96 people in the village; in Tai Shek hang, the number of stone cutters was 5 out of 9 people in the village; in Tsut Sze Mui the number of stone cutters was 12 out of 15 people in the village; and in Soo Koan Poon, the number of stone cutters was 2 out of 24 people in the village. Tsut Sze Mui joined the list of quarries in 1847 making a total of seven quarries on the island. In the same year, there were 70 tons of granite stone exported to India. There was export of granite stone to San Franciso and South China in 1851 and 1852. In 1853, it was reported that there was 31.4 tons of granite stone exported to New South Wales and 324 tons to USA. In 1854 and 1855, granite stone was exported to New South Wales and USA, but also to South

China Coast and Siam in as much as 500 tons. The export of granite stone continued in 1856. The number of quarries in Shou-ke-wan and Shek Tong Tsui was increased to 11 and 8 respectively in 1859."

The revenue from stone quarry licence was around 3.2% of government income before 1850. There was an increasing trend in the number of quarries. Many villages near the shore were turned into quarries, as transportation was mainly by sea. Granite probably became the first Hong Kong product exported to other parts of the world. Apart from the local demand and high salaries, the political instability due to the Tai Ping Rebellion in the Pearl River Delta Region and the local and Hakka fighting in Yan Ping and Hoi Ping [32] had attracted many skilled masons and stone cutters to Hong Kong. Within the first ten years of the takeover of Kowloon, the number of quarries in Kowloon had increased from 35 to 73. The number of stone cutters, all Chinese, showed a gradual increase from 418 in 1871 to 3,034 in 1891 except a drop to 454 in 1877. The start of the twentieth century also saw an increase of masons and there were two non-Chinese joining the industry. The Report on the Census of the Colony for 1907 found that 1.2% of people living in Hong Kong were working with granites.[33] Twenty years later, the number of people relying on stone for their livelihood increased to over five thousand, which was 0.87% of the population.[34] Before the Second World War, due to economic decline and the shift of economy to light industry, and with increasing use of machineries and production of aggregates, there was a drop in the number and percentage of people engaged in the industry.[35]

In the 1880s, the construction of the Pokfulam and Tytam Waterworks required a large supply of stones, and the industry reached a peak when Sir Paul Charter successfully pushed the Praya Reclamation Scheme. The reclamation works were divided into seven construction sections. It had called for nearly fifty contracts which took fourteen years to complete. The total quantity of stone consumed, excluding those for concrete blocks and other concrete structures, was 989,908 cu. yards, thus the scale of demand can be envisaged. It was no surprise that Mr. Tsang Keng who controlled all quarries had obtained nearly all the reclamation contracts. Other major works that required stone were the Tai Tam Tuk waterworks and Mongkoktsui Refuge in the 1910s and the Shing Ming Valley waterworks in the 1930s.

The income of stone cutters was very high in the early days up to 1854 when their income was already 30 shillings.[36] But due to the influx of skilled stone cutters from the mainland, change of products and increased use of machinery, the income had dropped to one of the lowest. Products of large granite were no longer exported.[37] All stone masons were Chinese until the beginning of the twentieth century; in 1937, Mr. Vannini Augusto declared himself formally as a stone mason.[38]

Change of Construction Technology

The development of the quarrying industry over the years has seen advancements in the use of machinery, the use of dynamite for blasting rocks, and the use of new construction materials.

Machinery

Edward Aldrich, Royal Engineer in Hong Kong, wrote about the erection of the Ordinance Building (now Murray Building) in 1846 [39]:-

> "… Chinese are very ignorant of the value of machinery, and are very averse to its use. …… There has been no difficulty in inducing the Chinese to handle a truck and devil's carriage for the transport of large stones and timber. When first applied, a Chinaman fell from the shaft, and the wheel passing over his body, crushed him to death. ….. Superstitious and deterred them from touching it again for several months. …… 462 large granite columns were carried by manual labour, 36 men carried 38.5 cwt. for half a mile in position."

It can be seen that the use of truck and devil's carriage by Hong Kong workers in transportation had started in 1846.

The use of boilers, air compressors and drilling machines by local workmen was trained by seven British miners from England in the Tytam Waterworks. The project also used concrete mixers which were brought from Kowloon Dock Company where sand, stone and cement were fed by worms.[40]

With the supply of electricity after 1890, more and more machinery have

been used in construction activities.

Starting from 1917, an item on Government Quarry Plants was opened up in the Public Works Finance Committee up to the Second World War. Plants and equipment included locomotives, track (35-lb. rails, 30-lb. rails, and 12-lb. rails), Decauville Wagon and wheels, axles, axle box for side tipping wagons, dryer and spiral mixer, pipe line laid from the compressor plant to enable mechanical drills being used in quarry face.

Use of Dynamite for Blasting Rocks

It is well known that China invented Black Powder (Gun Powder) a long long time ago. Sulphur, charcoal and potassium nitrate were mixed to form gun powder, a low explosive due to its slow decomposition rate and thus low brisance. It is believed that this explosive was used for secondary blasting in the early days.

On 24 February 1880, experiments with dynamite were carried out on Stone Cutter's Island.[41] In one of the experiments, 5 lbs. of dynamite were used to blast a boulder of granite, with the result that the boulder became rock pieces. In 1881, the advantage of using dynamite over gun powder was published in China Mail.[42] The use of Nobel dynamite for primary blasting and the use of machineries for rock crushing and conveying started at the Tytam Waterworks. The crimes of stealing dynamite, illegal carrying of dynamite, using dynamite illegally and storing dynamite without licences were common from 1883 to 1890. From 1895 to 1897, there were cases of smuggling dynamite. All these news indicated that the use of dynamite was prevailing in Hong Kong.

The redesign of the Tytam Dam and the Praya Reclamation Scheme called for the use of concrete in lieu of masonry. As to the quarries, many of the loose granites had been removed from the existing quarries leaving behind the harder materials, so a more powerful blasting agent was required for primary blasting and gun powder remained in use for secondary blasting due to its lower cost and easy production. On the whole, quarrying was still labour intensive, particularly in the building industry where delicate polishing was required.

New Construction Materials

The setting up of the Green Island Cement Company in 1889 marked a sharp change in the local construction industry. Concrete floors and roads were seen in government buildings and road projects. The demand of aggregates for concrete had increased the production in quarries.

1915 was a special year for stone quarrying. The government decided to run its own quarry for the production of materials for buildings and roads. The Director of Public Works said in his annual 1915 report that Tsat Tze Mui was chosen to be a Government Quarry aiming to obtain the requisite grades of stone required for producing artificial asphalt in certain roads subject to heavy traffic. It would also produce concrete blocks which would replace granite dressings in various parts of a building,[43] The pilings for Queen's Pier were moulded at the Tsat Tze Mui Quarry. The government ordered plant and equipment from Britain to enhance the production rate and quality of such materials.

1915 also saw the first time a reinforced concrete building was erected by the government. Sang Lee & Company was the contractor for the Gaol Extension Project. [44] It took exactly three months to set up the formwork and reinforcements, and government engineers had supervised the construction with special care. Three years later, the first private reinforced concrete buildings built by the Hong Kong & Kowloon Wharf Godown Co. and Ocean Steamship Co. were completed.[45] In 1918 four large reinforced concrete stands in the Jockey Club had started work.[46] The use of reinforced concrete had a significant effect on quarry products as aggregates were needed.

The Practice of Quarrying

People working in the quarry were local Chinese who had set up their own way of management and rules. Their houses were their homes and the quarry was their society. Besides masons, the other profession found was blacksmiths who had to take the routine repair of the sharp cutter, hammer and spade. As all dressing must be done in the quarry, the stone polisher was the skilled artisan living in the quarry. A small independent society was thus formed in the early days.

Quarrymen had to bring their tools to work. The major ones included sharp cutter, hammer, spade, maul, chisel, wedges, and rattan baskets. There was a fixed time for blasting, the announcement was normally done by hitting a copper pan called “gong” which could produce a sharp sound to alert people, not only for safety, but also for collecting large stones to produce stones of different sizes. Stone cutters were grouped outside the restricted area waiting to obtain the best size of stones for cutting. When the blasting was completed, stone cutters would run as fast as they could to identify their stones. They used a small red brick to mark a sign on the stones which they would cut. Obviously there were quarrels most of the time. As the rule was based on “first come first served”, the quarry master would not involve unless there were arguments causing blood. Quarry masters were delegated the power to maintain order and stability under the quarry lease.

After identifying their boulders, stone cutters had to use the cutter and hammer to chop the stones into smaller pieces. Others would polish the stones to the required standard. There was no safety protection except a thin glove made from used cloth. All suitable sizes of stone were placed in a rattan basket and weighed by the quarry master to assess the payment. Sometimes there were disputes, and these were normally settled in the temple. The thickness of stone products normally varied from 3” to 2’, with sizes from 1’6” by 9” to 6’ by 2’. The small piece of 1’6”by9”by6” was around 4 cents, and the largest piece of 6’by2’by2’ was $7 20 cents in 1865. There were other specifically made structural stones used as stanchions in buildings, but that was on a special order.[47]

Stone cutting was found to be of five types by Lo [48], as shown in the following table.

Stone block	A virgin piece of granite from the quarry. Normally used for base in roads or reclamation.
Dressing	The granite was polished to have a smooth and regular face. Normally produced in the form of stanchion, facing, or lion shape, and used in building structures or decorations.
Curbing	The granite was cut to a rectangular shape.

	Normally used in buildings, retaining walls and foundations.
Graving	Names were carved on the granite. Used as related accessories for tombs.
Grinding	The granite was grinded into small pieces. Normally used for roads and aggregates.

Of the five types, Block, Dressing, Curbing, and Graving were common during this period. As concrete was not yet used locally before the end of the nineteenth century, aggregates were not common production in the early days.

Two major changes in the twentieth century were production of aggregates and use of dynamites. The machinery used for transportation and crushing were only used in special quarries, of which the government could purchase from England. The use of rubber instead of cloth for protecting the fingers was a step forward. However, accidents were common. Lack of precaution shields and keeping dynamite without permits were common charges to stone masons and contractors. Henry Blake had also written vividly on the Chinese stone-cutting techniques.[49] And the practice of quarrying before the Second World War can be summarized below.

As all the outcrops of the granite had been quarried in the past years, the general nature was that good grade granite laid about fifty feet below the surface, this layer of surface subsoil was decomposed granite. The other geological structure that made blasting necessary was that the rocks were not disintegrated by river erosion.

The overburden was normally composed of either sedimentary deposits or decomposed rock; and the thickness ranged from twenty to forty feet. The usual practice in other places was that a road was constructed to the top of the quarry, and overburden was removed and carried away through the road. But in Hong Kong, the practice was to shovel the soil down the rock face to be carried away by trucks from the foot of the quarry. It is obvious that this was very labour intensive. The disadvantages were safety of the workers and contamination of the rock caused by the soil rolling down. The reasons for using this method were small scale of the quarry and steep hillsides which made the construction of a road to the top very difficult.

Compressed air drilling machines driven by Diesel engine or electricity were used after the successful application in Tytam Waterworks. The power was increased to 100 lb./sq.in. The drilling rods were of two types. One was made of hard steel and a four-edged cross bit was forged at the tip, which was normally used for the first one and half feet drilling before the tip was worn out. The second rod was of a slightly smaller bit as the tip would be worn out gradually during drilling, which made the hole smaller and smaller. Sometimes, six to seven rods may be necessary for deeper holes. It was only the government projects which could afford using tungsten carbide or carborundum bit which was detachable and more durable but surely more expensive.

The alignment of drilling was important, usually boards were used to support the drilling machine and a special carriage may be required to hold the drilling machine in position. The chips and dust created while drilling would be blown away by blasting air into the hole through a vent in the drilling rod.

The spacing of drilling holes required experience and expertise, but the aim was to blast as much rock as possible with the least labour and explosives. The normal practice was to split a sheet of rock at a time. The rocks would be divided into each step of thirty to fifty feet high. A set of holes would be from the top and then another set at the bottom, so that when the rock came out it would leave a similar vertical face behind for the next blasting. Although the direction of blasting was the same as the dip of the joints, there may still be some overhangs.

The blasting experience gained in the Tytam Waterworks was invaluable, the use of Nobel dynamite and machineries had showed a great step forward in the construction industry. The type and amount of explosives used were dependent upon the nature of rock, spacing of the hole, length and diameter of the hole. Though the use of gelignite together with black powder was not as effective as Nobel's dynamite in the Tytam Waterworks, yet the common usage in quarry was black powder mixed with 68% of gelignite. The ignition was improved by using electric ignition or safety fuse instead of joss-stick. For small scale work, safety fuse was commonly used.

Secondary blasting was inevitable to produce graded aggregates. One method was called pop shooting and a hole was drilled to two thirds the depth of the rock and blasted with safety fuse and detonator. The other was called plastic shooting which put the explosive on the surface of the rock, covered with soil and blasted. The second method was not common in Hong Kong as it required four times the amount of explosives than the first one.

Transportation methods varied among quarries. Primitive machinery such as tip wagons running on rails was used to carry rocks to the crushing plant where aggregates were produced. Trolleys or trucks and cranes were used to minimize labour costs. A practice of the local store which used a wire to transfer the cash carriers was put into a larger scale in some quarries. In the Shing Mum Water Scheme, materials were brought down to the works in dump-buckets suspended from an overhead cableway spanning across the valley, which was a concept borrowed from the local store. Locomotives, derricks, lorries, and belt conveyor were also seen in the captioned project.

The Guilds

The Stone Cutter Guilds in Canton (Guangzhou) in the middle of the nineteenth century was a much disciplined organization and the influx of masons from the mainland also brought in this culture. Though there was no detailed record of mason guilds during this period, but from what England and Rear noted in 1857 [50], the Hong Kong government had made the following instruction:-

> "Whereas, according to law in England, every tradesmen is at liberty to perform his work at whatever rate of remuneration it seems good to himself to accept, and all combinations for the control of such liberty are illegal: this is therefore to give notice that any persons found to be interfering as above with the freedom of trade will be prosecuted by Government."

Ting [51] judged that there were mason guilds during this time as the government had instructed that employee salaries should be freely negotiable and any interference would be a crime, and the influx of

mainland masons would certainly bring along their cultures.

With the booming construction industry, guilds were formally set up. The mason guilds were formally established in Hong Kong as a branch of the Canton Mason Guild Headquarters in the late nineteenth century. There were two guilds, one for employers and the other for employees. The employers' guild was known as Ton Ka Hong (東家行) and was also known as Wing Shing Tong (永勝堂). The employees' guild was known as Sze Ka Hong (西家行). Both were branches of the Canton Mason Guild.

The rules for the employees' guild in 1899 [52] included foods and festival provision, fees, wages and medical benefits, and the working rules. As Chinese believed there was a God for the trade, so celebrating the monthly and yearly festivals was mandatory in the rules. The working rules strictly maintained closed-shop business and any one deviating from the rules would be expelled and could not join the trade again in his whole life.

The rules for the employers' guild in 1892 [53] included training of artisans, new comer treatment, and working rules. The training of artisans was a mentor model. It was unlikely that new comers could join the guild if there was no relationship with existing members. There was also strict suppression of partnering with people outside the trade. As to the working rules, members could not take over business from those who were already in the market and a harmonious relationship should be maintained with the employees' guild. Of course, there were rules for celebration of festivals.

In general, the relationship between the two guilds was good. There was only one incident in this period that the employees protested against their masters for supplying inferior rice for their food in 1889. [54] Despite some minor strikes from 1889 to 1913 and the general strikes in 1921 and 1925, the guilds did not rely on strikes to gain collective forces as their close-shop regulations had already united masons both in Canton and Hong Kong.

Conclusions

The practice of quarrying in Hong Kong can be roughly classified into three periods for the first hundred years. It has been led by government

policy all the way through but with diminishing influence. It was greatly affected by the special large projects committed by the government, when machinery and technology were brought in during the second period. It maintained its labour intensive characteristic before the Second World War, which laid a firm foundation for the post war development. The improvement of technology such as the invention of rubber, electricity, dynamite, the use of concrete and reinforced concrete construction, and the use of tar for road works made the stone products change from massive products to aggregates. Local made granite was one of the earliest products that Hong Kong exported to other parts of the world.

The quarrying business was dominated by local Chinese and there were few occasions of exception in the industry. Chinese customs were fused into the British administration and technology in the practice of quarrying during the hundred years. This echoed what R.A.C. North said in 1941: a meeting place for two great and ancient civilizations. [55]

Acknowledgement

This Report of the project "The history of quarrying in Hong Kong 1840 – 1940" is supported by the Lord Wilson Heritage Trust.

References

1. Carroll, John, M, Edge of Empires: Chinese Elites and British Colonials in Hong Kong (Hong Kong: Hong Kong University Press, 2007) p. 166.
2. Hayes, James, The Hong Kong region, 1850-1910: institutions and leadership in town and countryside (Hamden: Archon Books, 1977), p.152.
3. Abel, Clarke, Narrative of a Journey in the interior of China (New York: Arno Press, 1971), pp.61-62.
4. Hayes, James, 'Hong Kong Island before 1841", Journal of Hong Kong Branch Royal Asiatic Society, 24 (1984), p. 118.
5. Bernard, W.D., Narrative of the voyages and services of the Nemesis, from 1840 to 1843 (San Francisco: Chinese Materials Center, 1974), p. 201.
6. Endacott, George B., Government and people in Hong Kong 1841-1962 A constitutional history (Hong Kong: Hong Kong University Press, 1964), pp.96-97.

7. Chinese Repository (May 1841), pp.287-289.
8. Hayes, 'Hong Kong', JHKBRAS, p.118, quoted from HKMM-0412-01 to 04, Collinson, Thomas, Bernard, Ordinance Map of Hong Kong, 1845.
9. Smith, George, A narrative of an exploratory visit to each of the consular cities of China, and to the islands of Hong Kong and Chusan, in behalf of the Church Missionary Society, in the years 1844, 1845, 1846 (London: Seeley, 1847), p.74.
10. Hok-ha, also known as Hakka, is a Cantonese dialect.
11. Allom, Thomas, China, in a series of views, displaying the scenery, architecture, and social habits of that ancient empire (London: Fisher, 1843), pp.18-19.
12. hewing means cutting
13. Hong Kong Public Records Office, HKRS149-2-142.
14. Hong Kong Public Records Office, HKRS149-2-1795
15. Hong Kong Government, Report of the Director of Public Works for the year 1902, paragraph 10, 1903.
16. Hong Kong Government, Report of the Director of Public Works for the year 1907, 1908.
17. Hong Kong Public Records Office, HKRS58-1-17-32.
18. The Chinese Government ruling the New Territories
19. Hong Kong Government, Report by Mr. Stewart Lockhart on the extension of the Colony of Hong Kong, 8 October 1898, Appendix No. 6.
20. The Hakkas are one of the earliest settlers in Hong Kong. The Hakka people are a subgroup of Chinese based in southern China and speak the Hakka language
21. Hong Kong Government, Report of the Director of Public Works for the year 1903, 1904.
22. Hong Kong Government Gazettee, No. 458, 24 June 1904.
23. Hong Kong Government Gazettee, No. 687, 13 October 1905.
24. Hong Kong Public Records Office, HKRS58-1-72-28.
25. Hong Kong Public Records Office, HKRS149-2-142.
26. Hong Kong Public Records Office, HKRS149-2-420.
27. Hong Kong Public Records Office, HKRS149-2-724.
28. Hong Kong Public Records Office, HKRS149-2-1855.
29. The Director of Public Works was called the Surveyor General before 1892.

30. Hong Kong Public Records Office, HKRS58-1-137-32.
31. Hong Kong Government, Blue Book, 1848-1860.
32. Guangdong province, Southern China
33. Hong Kong Government, Report on the Census of the Colony for 1901.
34. Hong Kong Government, Report on the Census of the Colony for 1921.
35. Hong Kong Government, Report on the Census of the Colony for 1931.
36. Xia er quan zhen (June 1854)
37. Hong Kong Public Records Office, HKRS58-1-148.
38. Hong Kong Government Gazette, Jurors List for 1937, p.70.
39. Aldrich, Edward, Papers on subjects connected with the duties of the Corps of Royal Engineers, 1846.
40. For details of concreting, see Orange, James, 'Tytam Water-works, Hong Kong', Institution of Civil Engineers Minutes of Meeting, 100, (1890), Paper 2429, pp.253-254.
41. China Mail (25 February 1880), p.3.
42. China Mail (11August 1881), p.8.
43. Hong Kong Government, Report of the Director of Public Works for the year 1915, 1916.
44. Hong Kong Government, Report of the Director of Public Works for the year 1915
45. Hong Kong Government, Report of the Director of Public Works for the year 1918
46. Hong Kong Government, Report of the Director of Public Works for the year 1918
47. Hong Kong Public Records Office, HKRS149-2-420.
48. Lo, Hsiang-lin, Xianggang zhi da shi shi ji ji qi wen hua yi yi (S.I.: s.n., 1954).
49. Blake, Henry, A, China (London: Adam and Charles Black, 1909), p.122.
50. England, Joseph, & Rear, John, China Labour under British Rule (Hong Kong: Oxford University Press, 1975), pp.74 & 107.
51. Ting, Sun Pao, Joseph, 'Early Chinese Community in Hong Kong 1841-1870' (Ph D thesis, Hong Kong University, September 1988), pp.328 -335.
52. Clementi, Cecil, 'Information concerning the Guilds of Masons, Bricklayers, Shipbuilders, Carpenters and Contractors', in Miscellaneous Papers 1902-1911, Phodes House library, Oxford.
53. Clementi, 'Information'.

54. Faure, David, Society (Hong Kong: Hong Kong University Press, 1997), Table 2.2.
55. Norton, R.A.C., ‘Hundreds years of growth’, p.21.

--END--