



# ROCKHOUND NEWSLETTER

## 石犬通訊

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### Dimension Stone

Dimension stone is rock which is cut from a large block of natural stone and 'dressed' into a specific size and shape and used for a variety of purposes such as building blocks, floor and wall tiles, curtain walling, countertops and bathroom wash basins. Stone cut from large blocks was used by the Egyptians to build temples and likewise the Ancient Romans and Greeks used dimension stone to construct buildings, many of which are still standing after thousands of years.

However in recent times the use of natural stone as a building material has diminished and been largely replaced by man-made stone products, such as concrete, brick or asphalt. These artificial materials are preferred because they can be easily shaped and characterized for the desired use.

Dimension stone can be any rock type; the commonest being granite, limestone, marble, quartzite and slate. At the present time, marble is probably the most popular and in international markets is classified according to colour. Colours are white, black, yellow, red, green and others and their ultimate value is linked very closely to their strength, durability and appearance. Beige marble is a 'yellow' marble and is often considered the 'top of the range' marble dimension stone. Marble is a metamorphosed limestone and composed mostly of 'calcium carbonate ( $\text{CaCO}_3$ ).

#### Sources of Dimension Stone

Dimension stone is extracted from an open pit quarry operation which contains massive rock which can be cut into large blocks. Resources are generally estimated in volume ( $\text{m}^3$ ) and the major criteria for choosing a particular rock type is based on aesthetic value and the need for the stone to have chemical and physical properties which are required to meet the specifications of the ultimate end use.

In Hong Kong quarries extract granite to be broken down into small sizes - 'aggregate' - to be used in the manufacture of concrete, asphalt and as a medium in drainage and road pavements. It is not used as dimension stone because it is not sufficiently massive and the colour combination does not have sufficient appeal.

#### Mining

Compared to aggregate quarries which require extensive use of explosives, mining for dimension stone requires more precise and delicate techniques to keep the rock in one piece. Popping blasts together with the use of diamond wire saws, diamond belt saws, burners and other such techniques are used to detach the large blocks from the rock face. This is to prevent damage both externally and to the internal structure of the rock.

The mined out rock is cut into large rectangular prisms and transported off site by truck for finishing, normally

### 規格石材

規格石材是從大塊的天然岩石切割出來，然後削製成不同大小和形狀的石頭，用途廣泛，例如可制成砌塊、地磚、牆磚、帷幕牆、流理面和浴室洗手盆等。古時埃及人就曾利用由大石切割出來的石頭興建廟宇，古羅馬人和希臘人亦以規格石材興建樓房，當中有許多在數千年後的今日仍然屹立不倒。

然而，現今天然石材於建築的應用已大不如前，取而代之的是像混凝土、磚塊和瀝青這些人造石材產品。這些人造石材之所以較受歡迎，是因為它們可塑性高，可隨意用作特定理想用途。

規格石材可以是任何種類的石，最常見的是花崗石、石灰石、大理石、石英岩及板岩，其中又以大理石最受歡迎。大理石在國際市場上以顏色區分，有白、黑、黃、紅、綠等顏色。大理石的價值主要取決於它的硬度、耐用度及外觀，體呈黃色的米黃大理石一直被視為最頂級的大理石規格石材。大理石事實上是變了質的石灰岩，主要由碳酸鈣( $\text{CaCO}_3$ )組成。

#### 規格石材的來源

規格石材是從蘊藏大量巨石的採石場經露天開採出來再切割成體積較小的石塊而成。石材的資源估算量通常都以體積(立方米)為單位，如要選擇某種特別石頭種類的话，主要會以石頭的美學價值和它的化學成份及物理特質是否可達石頭最終用途的要求作為標準。

在香港，開採出來的花崗石會被打碎成細石(或稱「粒料」)用以制成混凝土、瀝青以成為鋪設下水道和道路的物料。它們沒有被用作規格石材，是因為體積不夠大，而且石頭的颜色配搭不夠吸引。



*Egyptian pyramid built with dimension stone*  
古埃及人用規格石材建的金字塔



*Diamond wire saw*  
金剛石線鋸

#### 開採

開採用作粒料的石頭需要在採石場大規模地使用爆破物品，相比之下開採規格石材則講求精準和細心，務求開採出來的石頭能保持完整無缺。定點爆破會配合金剛石線鋸、金剛石鏈鋸、燃器等技術將大石從岩石面分離出來，目的是要避免在開採過程中受損毀石頭的表面和內

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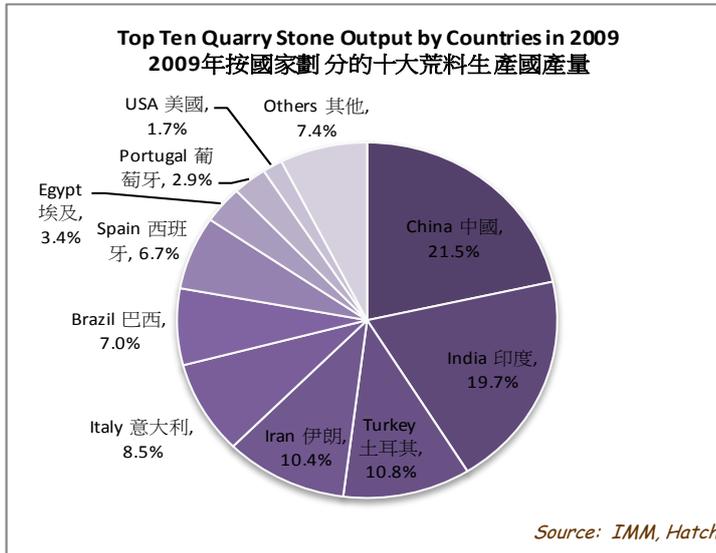
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one block per truck. Typically in a dimension stone producing quarry only about 30% - 40% of the rocks is massive enough to be used as dimension stone. This percentage is referred to as the block rate.

China is now the largest dimension stone producing country. Brazil, India, Iran, Italy, Spain and Turkey are also major dimension stone producers.

### Finishing

Normally the quarry operator will sell the block 'ex-works' which means the buyer will be responsible for collecting the block. At the 'finishing' plant the block will then be cut into shapes and sizes that are required for its ultimate end use. For tiles and curtain walling, the block is cut into large slices and then reduced further to specific sizes before finishing. The finishing depends on the rock's nature and its end use. The common finishes are polished, which is a reflective finish, and honed, which is a satin-like finish. Some of the texture finishes are shown in the figures below:



Source: IMM, Hatch

部結構。

石頭在開採出來之後會被切割成一個個大長方體，繼而以貨車運走進行最後表面加工工序，通常一輛貨車每次會運送一塊大石。基本上在生產規格石材的採石場中，只有 30%至 40%開採得到的石頭才大得足以用作規格石材。這個百分比稱為荒料率。

目前中國是全球最大規格石材生產國，其他主要生產國還有巴西、印度、伊朗、意大利、西班牙和土耳其。

### 表面加工

通常採石場營運者都會在現場售出石材，因此運送石材的責任就落在買家身上。石材運到「表面加工」工場後會按石材最終用途而切割成不同形狀和大小。要製成磚瓦和帷幕牆，那麼石材就會被切成一塊塊大的石板，再在表面加工前進一步切小成特定大小，至於如何加工石材表面，則視乎石材的質地和其最終用途。常見的表面加工方法分別為拋光和打磨，造出鏡面和近似緞面效果。下圖顯示的是其中一些表面加工出

來的質地樣式：



After the finishing, sometimes resin is used to fill in the micro cracks and surface imperfections. Finishes can also be protected by nano coatings which are applied to surfaces.

### Marketing and Applications

Chemical and physical properties of the dimension stone can limit its application. For example, limestone, which reacts with acid, will not be long lasting if used outdoor as roofing or flooring. This is because rainfall in polluted environments contains small amounts of acid. Equally sandstones would not be good as floor tiles in a heavily trafficked situation because sand particles in the rock will be loosened by abrasion. In addition to tiles and curtain walling, dimension stone can be used to make countertops, bathroom vanities, as monuments amongst many others.

While the chemical and physical properties are defined by the nature of the rock type, the aesthetic value of a dimension stone is established through marketing strategies. Since dimension stones are mostly used as dressing: color and pattern heavily impact the marketability. The stones are also marketed with brand names. Marble from one source in Iran is called 'Royal Batticino' whilst one brand from Italy is called Bianco Teseo. In a recent project carried out by Rockhound the marble was called 'Frame Rose' because of the pink tint to the rock.

有時在完成表面加工後，會用樹脂填補石材本身的細微裂縫和表面瑕疵。納米塗層亦可保護加工後的石材表面。

### 市場營銷及應用

規格石材的應用層面可能會受其化學成份及物理特質限制，例如一遇酸即產生作用的石灰石，當用成戶外屋頂或地板的材料時便不耐用，因為受環境污染的雨水帶略酸性。同樣地，沙岩亦不適合用於鋪設任何交通繁忙的路面，因為磨蝕會令石裡的砂粒變得鬆散。除了瓦磚和帷幕牆，規格石材亦可製成廚房流理檯、浴室潔具的物料，甚或用以製成紀念碑等。

不同岩石種類有不同特性，它們的化學成份及物理特質也自然不同。至於規格石材美學價值的高低，則是由行銷策略決定。由於規格石材主要用於裝飾，因此其顏色及花紋將影響其市場價值。策略上還會以品牌推銷石材，例如從伊朗進口的大理石叫 Royal Batticino，而意大利的其中一個大理石品牌則名 Bianco Teseo。最近石犬承辦的一個項目中的大理石叫 Frame Rose，就是因為石身的粉紅色調而得名。

In China, dimension stone fairs are held in Shanghai, Xiamen and Yunfu every year. The objective is for quarry owners to understand the market's needs and for them to establish the marketability of their product.

中國每年都會在上海、廈門和雲浮舉行規格石材商展，目的是讓採石場主了解市場需求，從而為他們的產品制定合適營銷策略。



### True Story

Although aesthetic value is one of the main concerns in design, one must also consider the practicality of choosing the material. One example comes from Hong Kong. When the Chek Lap Kok Hong Kong International Airport opened in 1998, the polished black marble, which was used in the departure hall as flooring, was considered too reflective resulting in distress to women wearing skirts. As a result, the marble floor had to be scrubbed to reduce its reflectiveness.

### 真實個案

雖然美學價值是設計的主要考慮之一，但在選料的時候亦應考慮實用性，其中一個例子便發生在香港：當赤臘角國際機場於1998年啟用時，因用作鋪設離境大堂的拋光黑大理石地磚過度反光，而為穿著裙子的女士詬病。機場最後要重新打磨地磚以降低反光度。

### Green Building

The use of dimension stone as a construction material is more environmental friendly compared to man-made materials because the production of synthetic materials are energy intensive. Quarries may temporarily disfigure the landscape but this can be resolved with a good closure plan. Dust control can also be mitigated with good practice. No direct greenhouse gas is created and no toxic materials are used in the processing. Most of the water used in mining and processing can be reused.

The remaining 60% to 70% of rock that is not quarried for dimension stone production, can be used for a variety of purposes. In one Rockhound project the clay material collected on site from cutting was used to make ceramics whilst the rock fragments were crushed down to be used as aggregate in road pavements. Dimension stone can also be salvaged on demolition to be used in new construction or paving as it is a natural stone.

### 綠色建築

規格石材是比人造石材更加環保的建築材料，因為人造石材的製造過程極度耗能。雖然採石場在開採規格石材期間會破壞地貌，但影響只屬短暫，而且只要有好的關閉計劃，問題就可解決。另外，良好的控塵措施亦可減低污染，再者加工的過程並不會直接排放任何溫室氣體或有毒物質，而大部份開採和加工時所用的水亦可循環再用。

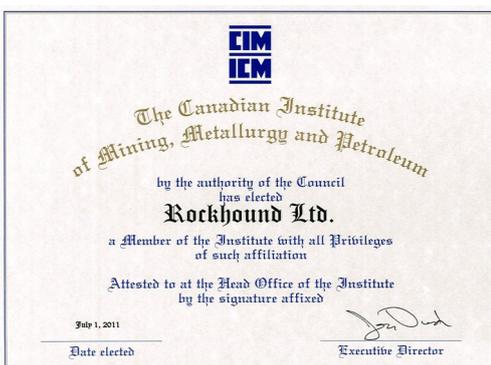
餘下的 60%至 70%不能用於規格石材的會被用於其他方面。過去就曾有石犬的項目把現場切割得來的黏土用於製陶，而碎石則再壓成更細碎的粒料用於鋪路。基於規格石材是天然的緣故，在拆卸大廈時，被棄置的規格石材仍可以重新用於新的建設或鋪路工程之上。



Zhangjiaba Mine

張家壩礦

Source: China Kingstone



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Source: China Kingstone

## HK Listed Company Related to Dimension Stone Business

Although there are many listed companies related to the construction materials business, there are not many of who mine dimension stone. China Kingstone Mining Holdings Limited (1380) and Prosperity International Holdings (H.K.) Limited (0803) are two of them.

China Kingstone Mining Holdings Limited holds Zhangjiaba quarry mine in Jiangyou City, Sichuan, PRC. It listed through an IPO in March 2011, and it is the first and only listed company with a marble mine. Their major product is beige marble<sup>1</sup> dimension stone with a total resource of 44.9 million m<sup>3</sup> of which 16.5 million m<sup>3</sup> is in measured class according to the JORC Code. The planned capacity is an annual production of 150,000m<sup>3</sup>. It is the largest marble producer in China. Recently, they have signed dimension stone supplying contracts with two real estate development companies in Inner Mongolia amounting to more than RMB 750 million.



Blocks of dimension stone on a quarry site in Zhangjiaba, PRC  
於中國張家界露天採石場的規格石材

Prosperity International Holdings (H.K.) Limited acquired a quarry mine located in Guangxi Province of PRC, in 2008. The project has a resource of 4 million m<sup>3</sup> and is planned to produce about 40,000m<sup>3</sup> per year.

Notes:

1. Geologically speaking, marble is a metamorphosed limestone rock, but commercially in stone industry marble includes unmetamorphosed limestone and dolomite.

Source: China Kingstone Mining Holdings Limited and Prosperity International Holdings (H.K.) Limited

## Quarries in Hong Kong

Despite the small size of Hong Kong, there are several aggregate producing quarries. Back in the 1960s and 1970s, environmental issues were not a big concern and there were quarries operating in HK without a rehabilitation plan. When these closed, scars were left in the landscape.

In the late 1980s, the public and the government started to have more concern in environmental issues; thus, requirements for rehabilitation were included in quarry contracts.

In the past 20 years, rehabilitation has taken place in several quarry location, including Shek O, Turret Hill, Lam Tei, Lamma and Anderson Road.

Recently, Government awarded a consultancy contract (Agreement CE17/2011(GE)) to international engineering consultants, Ove Arup, to develop a strategy for and identify new quarry sites in Hong Kong. Rockhound are sub-consultants to Arup on this study providing specialists quarry and construction material advise.

Source: Quarry Rehabilitation in Hong Kong by T.S.K Lam and K.L. Siu and Ecological and Landscape Rehabilitation of a Quarry Site in Hong Kong by C.Y. Jim

## 中國金石 (01380.HK) 第三季賺2356萬人民幣

21/10/2011 <AA Stocks>

中國金石<01380.HK>公布第三季度，收入1.52億人民幣(下同)；毛利5774萬元，毛利率38%。錄得溢利2356萬元，較上半年增長88.5%。

季內各項成本較第二季度有所增加，主要原因是8月份受四川江油汛影響，當地政府要求所有礦場暫時停產，導致礦山8月份基本處於停工狀態，產量下降，從而造成了第三季度整體的成本增加。

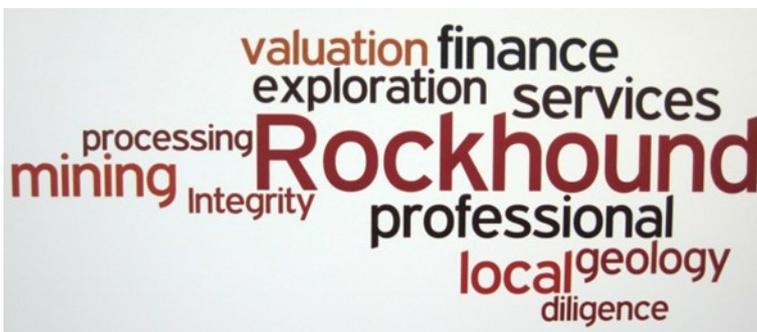
首三季累計收入2.57億元，溢利3606萬元。撇除上市費用及購股權開支，期內溢利9208萬元。



Large circular saw at Zhangjiaba

張家壩的大型圓盤鋸

Source: China Kingstone



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