Maintenance of Old Buildings

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The theme of this conference is "Heritage". Are our old buildings a heritage of our past success? I guess you will have a clear idea at the end of our discussion of the topic of "Maintenance of Old Buildings".

Introduction

Old Buildings did not necessarily pose a problem unless they are not properly maintained. We shall call the problematic buildings as "Aged Buildings". Firstly, they are aged because they are old. For the purpose of this discussion and identifying the scale of the problem, there were about 18,000 residential buildings constructed in the past that were over 20 years of age. This accounts for about half of the residential building stock in Hong Kong. Other buildings that were of concern were those old industrial buildings in the old industrial areas of Hong Kong.

Some of the residential buildings could be found in the more prestigious residential area of Hong Kong, which will fall outside of this discussion. Due to the value of these properties, they are normally or likely to be well looked after. If one looks at the ownership pattern of buildings in the older part of the urban areas, one will see one side of the problem. The owners are the less affordable ones. If they are owner-occupied. Most of these buildings were multi-tenanted with plenty of sub-letting. The owners are not in the buildings. They could be someone living overseas. Or it could be that an old "lady" was relying on the proceeds to maintain a living. Many of these buildings are not properly managed. Even if management is provided, there is only the employment of a caretaker. Repairs rather than maintenance was carried out on a response to breakdown basis. There was no "maintenance/ repair fund". Most of the other time was that repairs were carried out as ordered by the Authority under a Repair Order. These become "Aged

Buildings" because they are not maintained.

The general awareness of the necessity and legal liability to maintain their properties by owners was very low. They invariably adopted the attitude of waiting until problems arose. Maintenance and repairs were problems of the future. Even with the recent incident in Mongkok, owners would still think that that was matter of once in a lifetime and similar incident would not have happened to them. People's memory is very short. They need to be constantly reminded of. To solve this problem must not only be by civic education alone. Suitable legislation must be enacted to raise the alertness of owners by putting them under a statutory obligation to manage and maintain.

Many of these buildings were not owner-occupied. Affordable people would have moved out to other areas to live in an improved environment. Leaving behind less affordable whom may not even been able to spare some monies for repair and maintenance works.

There were cases that owners would sub-let their units to obtain a small income to support their living. The introduction of the fire and safety improvement loan scheme could not help.

Even if owners are affordable, they are only willing to spend on their own units internally and neglected the external common areas. Simply they are not statutorily liable to carry out such work.

Inadequacy of the laws and passive role by government

What has the government done to prevent the deterioration of private buildings in the territory? I suppose the bulldozer of economic success has helped solved the problem until recently. The slowing down of the economy has slowed down the redevelopment process. The fall in property price has also contributed to slowing down in the redevelopment of the old areas. As we are unlikely to see the same sort of activities as noted in the eighties and nineties, more 'old' buildings are here to stay.

Grantees of land are implicitly required to maintain their properties. This has never been a line of enforcement by the government as the 'Landlord'.

Section 26 of the Buildings Ordinance provides that

"Where in the opinion of the Building Authority any building has been rendered dangerous or liable to become dangerous by ... dilapidation, ... the Building Authority may by order in writing served on the owner declare such building to be dangerous or liable to become dangerous."

And until more recently in 1992, Section 26A of the Buildings Ordinance was enacted to cover 'dilapidated or defective buildings'. The new provision is:

"Where, on inspection, the Building Authority finds any dilapidation or defect in a building he may by order in writing served on the owner of such building require ... such works as may be specified in the order to be carried out."

This provision is an addition to old provision that the Building Authority could only act on buildings that are dangerous or becoming dangerous. But again this provision is not good enough. The enactment does not help in promoting maintenance of existing buildings. Perhaps, one could argue that the Buildings Ordinance is not the right place to promote maintenance and repair.

Could we look to the Building Management Ordinance to do this job? The answer is, no. The enactment of the Building Management Ordinance was to set a framework for management of existing buildings. In itself, promotion of maintenance responsibility is not the objective.

In conclusion, the government has taken a *lassie faire* attitude towards promoting building management and maintenance responsibility of building owners. This passive and inactive attitude of government has incubated an attitude among owners that there should be no problem should there not be condemnation from government.

Associated Problems

Other problems that are hampering the proper maintenance and repair of buildings are the proliferation of unauthorised building works, uncontrolled installation of advertising signs, division of responsibilities and unfair terms in the Deed of Mutual Covenant. Let's examine each of these factors in more details.

In seminars and workshops of building maintenance in the Districts, owners invariably raised the issue of unauthorised building works that were making their lives difficult. Incorporated and individual were complaining against the attitude of some owners who put up unauthorised structures. As many of the unauthorised structures very put up on the exterior and flat roof of buildings that in many ways hinder the carrying out of repairs and maintenance to the exterior and drainage system of buildings. Many of the components were made inaccessible by the unauthorised structures. They had also given rise to disputes amongst owners. Most of the time even incorporated owners were not able to deal with amicably without resort to the tedious and expensive legal proceedings. In some instances, the inside parts of buildings were altered to such an extent that common areas such as means of escape were affected. This again is a showcase of government's inability to contain the problem.

Abandoned and dilapidated signs have not only posed a safety hazard to the public. They have also made the lives of incorporated owners in effecting repair and maintenance to their buildings. They were also affecting the structural safety of the buildings that they were attached to. Many owners were unwilling to pay for the removal cost of these signs. There were also incidents that under unfair terms in the Deed of Mutual Covenant that the first owners or their assignees retained control of the external wall and thus put signs contrary to the wish of other owners.

The next problem was associated with the division of responsibilities between adjoining owners. Many buildings in Hong Kong would have the service lines of a particular unit buried in the structural elements of another unit that one may not necessarily have access to. Problems arose out these lines would be affecting an owner who did not have control over the area that works were to be carried out.

Beyond Old Buildings

Sooner the newer buildings will catch up. The newer buildings will run into the same dilemma if nothing is done to guarantee their care in maintenance. A new culture in the maintenance and management of our building stock must be introduced until it is too late and expensive to do so. Owners must be put under statute that they must manage and maintain their property properly. Owners of newly occupied buildings must also be asked to contribute towards the future maintenance of the property.

A new legislation for management inspection and planned maintenance is called for.

If buildings are not required to be inspected at the prescribed cycle now to effect inspection and thus maintenance/ repairs to arrest deterioration, the cost of deferred inspection and repairs at old age will be much higher. This risk of breakdown or failure of individual building elements will greatly increase. The society will also have to pay a high social cost because of the danger posed by these deteriorated buildings and the unsightly outlooks of such buildings. The proposed legislation should require that the Government shall, as a reminder, by notice in the Government Gazette at the beginning of each year to publish a list of buildings requiring general appraisal and report to the Building Authority. Owners will have one year to comply with the requirements of the new legislation. I would also appeal to Government to include Registered Professional Surveyors (Building Surveying) as being competent to carry out the General Appraisal. Registered Professional Surveyors in the Building Surveying Division have been uniquely educated, trained and experienced in the care and maintenance of buildings. Their skills consist of the diagnosis of building defects, performance and behaviour of buildings in use, maintenance management, repairs and remedial measures, etc. Moreover, such inspection has always been carried out by staff of the Buildings Department who may not have been APs or RSEs. I believe the success of the scheme depends on the support of the building owners and the availability of suitably qualified professional persons to participate in the implementation of such a scheme.

One of the many of the problems encountered by building owners in instigating repairs

and maintenance to their properties is the lack of power to ensure compliance by all owners. In most of these cases, the majority owners will have no alternative but to abandon their effort and leave it to the Buildings Department to act on their default. In connection with this new legislation, Government must put in place the proper infrastructure to facilitate its smooth implementation. Government should revamp the Building Management Ordinance by the introduction of incentive for formation of Incorporated Owners and the introduction of building professionals in the management and maintenance of private properties. Each development will then have a properly organized Management Corporation consisting of the Incorporated Owners and Management/ Maintenance Professionals or Registered Property Management Companies. Furthermore, it is suggested that developers be asked to contribute 0.75% of the proceeds from property sales for setting up a Maintenance Fund for the properties. This will ensure that the Management will start off with a solid footing. It should, however, been borne in mind that some of the properly managed residential estates would opt not to form I.O.s as the current management structures are such that property values are enhanced. Certain exemption should be introduced.

Government is urged to extend the Improvement Loan scheme to cover grants to the less affordable owners to instigated needed repairs and maintenance to their properties.

The Government is looking into the prohibition of water pipes from being buried in structural elements. In the planning and design of new buildings, developers must ensure that the serviceability of individual owner' property. Common service lines must be easily accessible. Those belong to one owner must not pass through the area of another owner.

Internal service/ pipe ducts were in the past too small for proper maintenance to be carried out. When it came to repairs, new pipes were installed at the exterior and the internal ones were simply abandoned. The authority should encourage the inclusion of serviceable pipeducts by granting gross floor area concessions on such provision. Servicing access should be well considered in the design stage. These will facilitate on-going maintenance without having to resort to the construction of expensive work access or platform.

Conclusion

The above discussion might appear to be fragmented, but as concerned professional, I would now call for the Government to relinquish its former crisis management type role and take a bold and responsive step with great determination to legislate for the proper maintenance of private buildings in Hong Kong and to invest more resources on maintenance as those which had been put into public housing and Government buildings. We envisage that the above suggestions and current related provisions under the Buildings Ordinance should be brought into a new enactment to be known as the Building (Management Inspection and Maintenance) Regulations to be administered by the "Commissioner of Buildings". This will give weight to the issue and the general public a clear indication of the Government's determination to call for building owners to conduct proper maintenance of their buildings.

This competent authority should further embrace all the building activities currently administered by different agencies or departments. Such activities include alteration and addition, licensing of premises for various trades and uses, defective drainage, control and enforcement of unauthorised building works, fire and building safety, etc. These activities are more appropriately and effectively dealt with by one authority.

Only if we act now, we will be able to give our next generations a good heritage that they could inherit and be proud of.

The Development of a Spatial-Grid Evacuation Model for Fire Safety Design in Buildings

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Abstract
Evacuation systems are designed to protect people facing an emergency situation in buildings. The traditional design of escape system in a building normally follows the prescriptive requirements stipulated in fire or building codes. The codes govern the capacity of exit routes. However, mere compliance with prescriptive requirements cannot guarantee a smooth and efficient evacuation process. This is because the people when using the exit routes at the same time may cause congestion in the routes and the movement rate of the evacuees is density dependent. If we can examine the flow pattern of the evacuees, we can identify the critical positions at which measures can be adopted to improve the performance of the evacuation system. Accordingly, a so-called Spatial-Grid Evacuation Model is developed to model the movement pattern of each individual in a complex building. The simulation model can describe the trajectories of each individual and record their paths. It is capable of capturing the drawing information (CAD information) and carry out various simulations to assess the performance of the exit system of a building. It is a tool that can be adopted for fire safety engineering approach.

Keywords: Evacuation Model, CAD Information, Fire Safety

INTRODUCTION

Evacuation is the major component of fire safety design in buildings. A model that can effectively describe the evacuation process in a building is important in studying the safety of the occupants under fire situations. It can provide information in associate with other fire/ smoke models to judge whether the occupants can safely leave the building.

Earlier researchers have studied the escape problems by considering the carrying capacity of the building elements [1-3]. They emphasized on the importance of the width and capacity of exits. This approach obviously cannot explain the interrelationship of different parts of a building as well as between the reactions of the people and the built environment [4-6]. They are in general difficult to provide insight to the dynamic nature of the escape process. With the advancement of digital computer, sophisticated models are developed to describe the escape process [7-15]. Although most of the programs have attempted to precisely model the movement of people especially in handling the crowd transit, few of them are designed to evaluate the movement of each individual occupant with respect to fire situation.

To overcome the shortcoming, a more sophisticated model [the Spatial-Grid Evacuation Model (SGEM)], which takes the spatial geometry of a building (or setting in side a building) and divides the setting into planar grids, is developed with the support of an Emarked Grant for Research, Research Grant Council, Hong Kong Government. In the SGEM, the movement pattern of each notional occupant in the setting is modeled by numerical approach.

The theoretical principles, mathematical derivations and validation are given in other articles [16-17]. This paper describes the general approach and application of the model.

THE GENERAL APPROACH OF THE SGEM

People in fire or other emergency situation will escape from inner rooms, through room doors, to corridor(s) and through lobbies to staircases. They will be presumed to arrive ultimate place of safety step by step. The process can be represented by a network system.

In the model, we divide a building into a series of nodes (a network system) in accordance with the movement of the evacuees. A node is connected to its adjacent node(s) by way of opening(s), transition space(s), corridor(s), etc. The connection of each node can be automatically formed by manipulating a route optimizing process.

In each node, the "people" are described as individuals located on a grid which represents the building (or setting). It is considered that the behaviour of each "person" can be represented by his/ her spatial location and movement velocity vector. The velocity vector of each individual is a function of various environmental influence within the building, such as the influence of other people, the geometry of the paths, etc. The spatial location of each individual can be represented by his/ her relative coordinates in the system. The records of the coordinates at various points of time describe the movement trajectories of the people.

The characteristics of the people can be represented in the Lagrange coordinated system as follows:

$$\begin{aligned} \frac{\partial x(m,t)}{\partial t} &= U \\ \frac{\partial y(m,t)}{\partial t} &= V \end{aligned} \qquad (1)$$

Where,
m is the number of the individual, m=1, 2, 3 ... , N;
x(m,t) and y(m,t) are geometry coordinated of the person whose number is m at the x-direction and y-direction respectively;
U and V are the movement speed of the person at x-direction and y-direction respectively.

Accordingly, the trajectory of an individual can be determined by knowing the person's speed at any time and his/ her respective location. However, the movement speed of a person is complicated which was affected by various factors. For example, people will walk slowly when he encounter a door or a wall, and they will also have to slow down the speed when they meet with the crowd or they may perform other behavioural reaction such as helping a disabled. In order to simplify the computation, we assume that the velocity vectors of the people depend on their respective location, behavioural reaction and the crowd density at which the people move. Hence, the speed of an individual can be expressed by a function of his/ her location and the crowd density at this location.

$$U = f(x, y, N) \tag{2}$$

Where x,y is the coordination of the individual, N is the aggregating number of people in a special domain at the individual's location.

To find out the function of each person, we divide a building into, as many as possible, uniform girds that are shown in Figure 1.

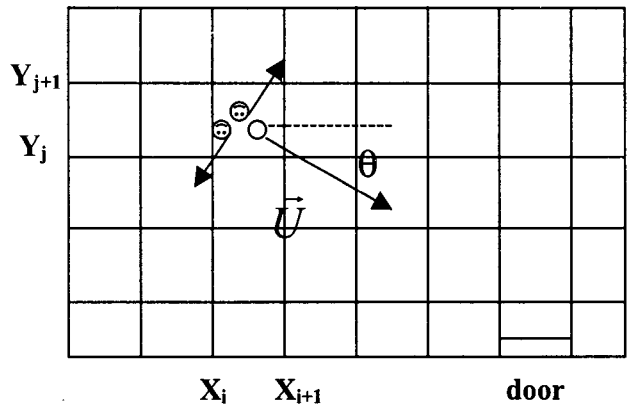


Figure 1: The analysis of an individual's movement in a grid

By calculating, on the basis of a series of velocity equations and logical deduction, and recording the relative position of each individual at each finite time element, the trajectories of the individuals can be presented.

The main features of the SGEM include:

- automatic capturing of the drawing information from CAD files
- automatic recognition of architectural features (e.g. walls, doors, etc.) from prescribed CAD files
- function to introduce behavioural reaction of occupants
- function to model the density dependent crowd flow

TRANSFORMATION OF CAD PLANS

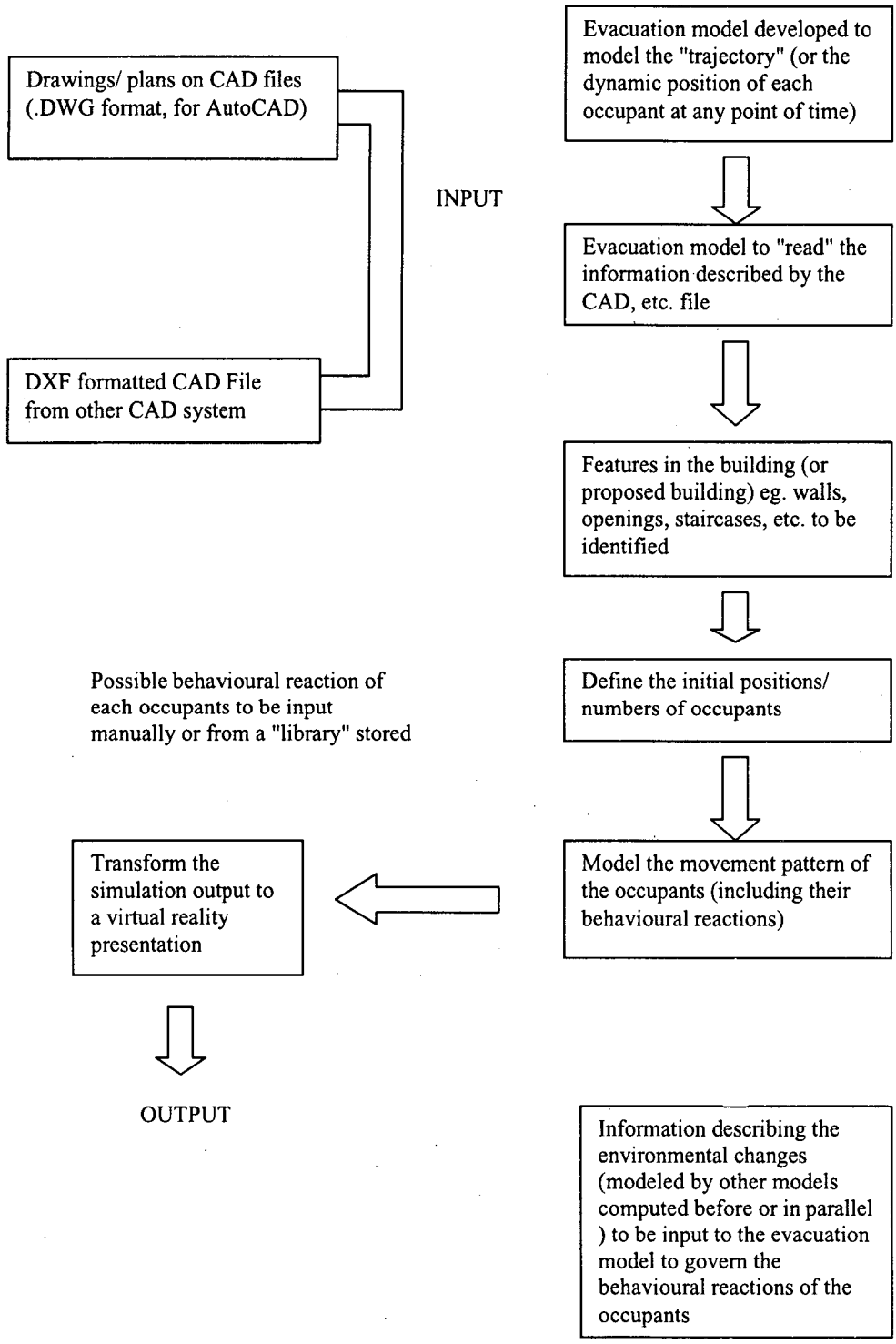
One of the special features of the SGEM is to provide a quasi-automatic transformation process. The transformation process developed is to capture the architectural information originally produced by architects for use in the evacuation model. This approach is based on the graphic theory. It can automatically extract and recognize wall, door and room information from 2D architectural layout CAD files at the early period of design cycle, and then transform formatted data structure for SGEM. This approach has been implemented as an input module of SGEM, it can be easily used and understood by architects and building designers. The information generated by the evacuation model is to describe the dynamic co-ordinates of each occupant of a building at each time point.

To capturing information from architectural plans, there are several problem to solve.

- The original CAD file may have some errors (e.g. matching of lines, such as the gap or extender between two vertexes which should be the same one)
- the presence of redundant information, such as dimensions, text notes and other technical information
- different presentation method (symbols) for the same functional element
- the CAD file is not been organised in the same manner, such as the layer system and symbol name
- correct recognition of logical relationship amongst architectural units and obstacles, especially, in multi-door unit, the determination of the direction of flow to next unit for every door.
- Etc.

The spatial-grid model will be developed to serve as a skeleton of an interactive simulation model to analysis the people's movement and safety under fire scenarios. A brief chart showing the development is shown in Figure 2.

Figure 2: Development of SGE simulation model



APPLICATION

An overview of a simulated evacuation from a shopping arcade is now presented to provide a feel for how the model operates in practice. Figure 3 to 6 show the position of the individuals at 4 different stages during the evacuation scenario. The distribution of the individuals in the shopping arcade is randomly generated. Figure 4 and 5 show the positions of the individuals at 3 different point of time.

The figures illustrate some of the features of the model such as:

- the individuals can automatically recognize the way out
- the "bottle necks" situations at which the rate of crowd flow is reduced
- the trajectory of any individual can be recorded

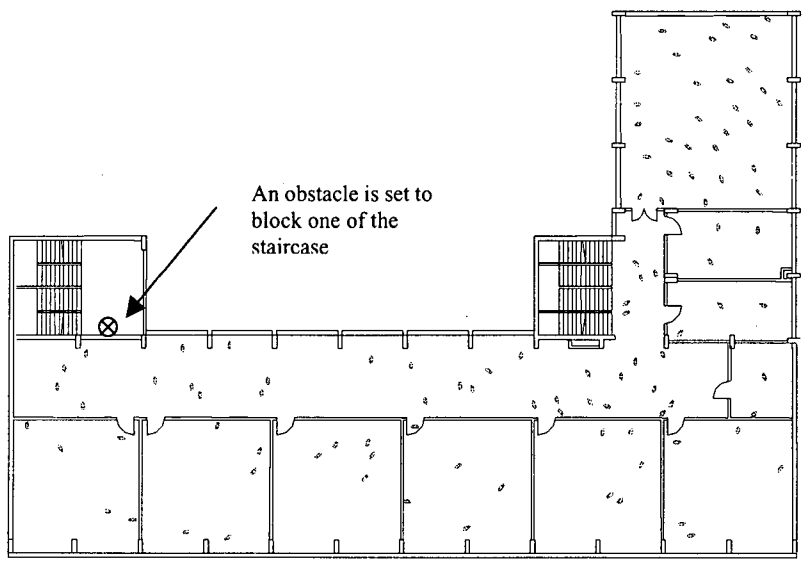


Fig.3: First Stage - the initial distribution of people in the shopping arcade at the t=0

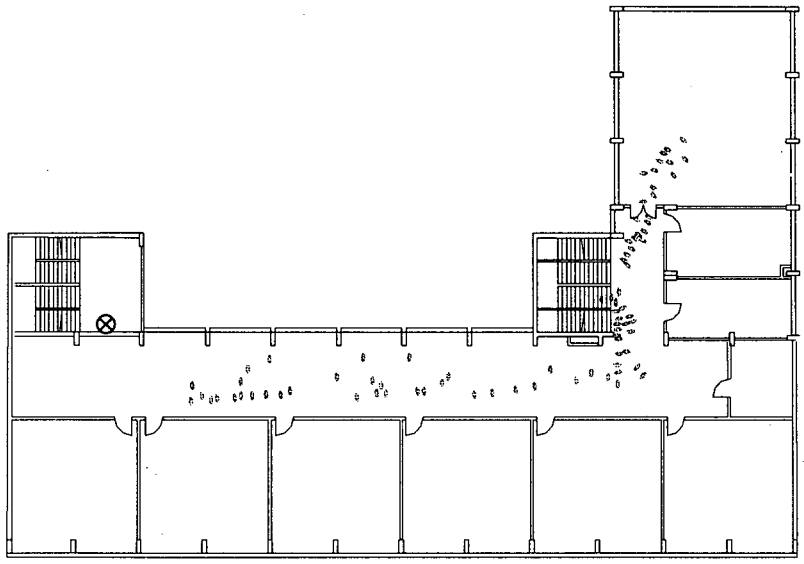


Fig.4: Second Stage at T= 13.3 sec

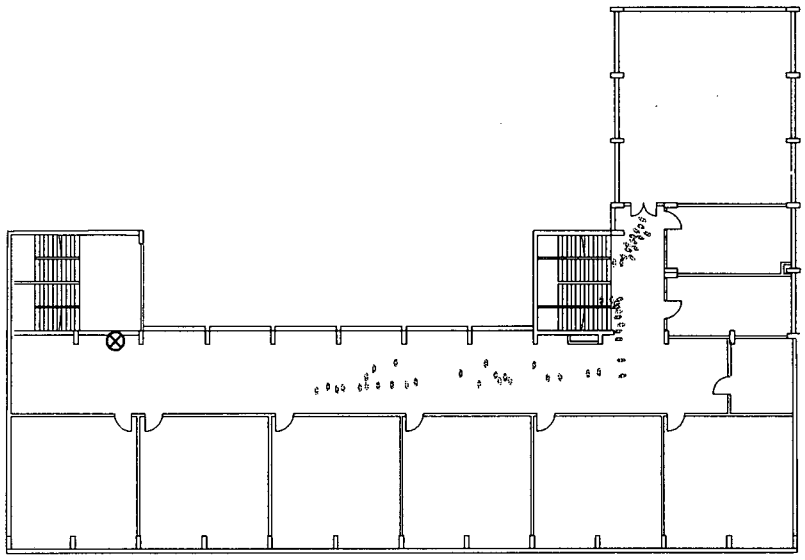


Fig.5: Third Stage at T=22 sec

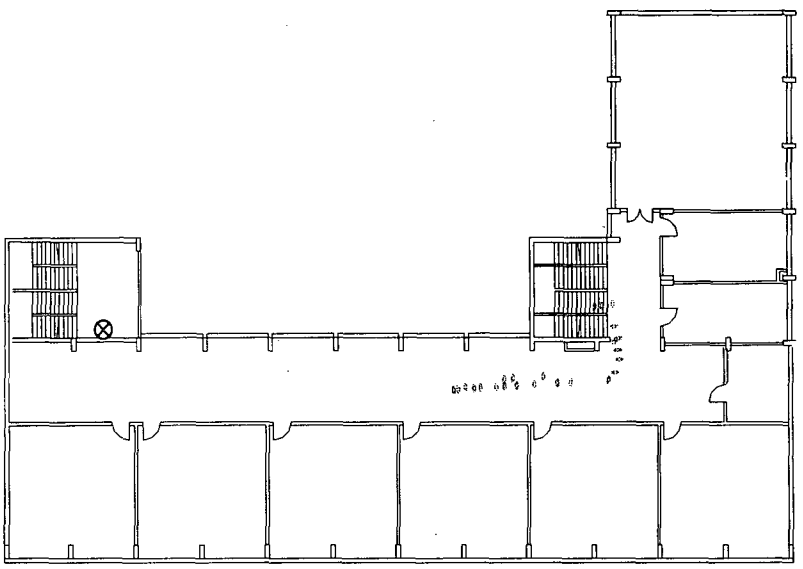


Fig.6: Fourth Stage at T=33.3 sec

CONCLUDING REMARKS

The SGEM described in this article can be used to predict the movement trajectory of each individual in a complex building during evacuation. The basic principle is that it takes the geometry of a building and divides the setting into planar grids. Each grid holds its own configuration, such as the location to the near exit and the crowd density at any time which can decide the movement speed and direction of the person who enters into the grid. When the speed and direction of each occupant can be determined at anytime, the trajectory will be recorded and the evacuation pattern will be solved. As the location and speed of each occupant are recorded individually at each point of time, the model can be used to predict the movement behavior of the occupants. The computation is realized by a program written in C++. It is a tool that can be adopted by building designer to analysis the efficiency of various escape system design for a proposed building or by building management to analysis the efficiency of different escape policies.

FUTURE DEVELOPMENT

During the development of the SGEM, various modelling techniques have been explored. The model can automatically recognize the information from CAD files. Thus, by further developing such technique, it can capture the information such as the gross floor area, usable floor area, dimensions of various elements, etc. for:

- plan checking, in particular for checking the compliance with various statutory requirements
- computing the quantities of various major building elements
- dimensional matching/ co-ordination

The model can also be modified to predict the movement of the individuals under normal situations. Thus, it can be adopted for:

- pedestrian flow analysis
- architectural legibility analysis (the wayfinding pattern of the users in a large complex setting)

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Monitoring Survey for the Preservation of Our Heritage - Lei Cheng Uk Han Tomb

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Abstract

With the rapid development of Hong Kong, our heritage is jeopardized by many development projects of "higher" economical return. During the past two decades, the Survey Division of Civil Engineering Department has been providing technical assistance to other Government departments in preserving historical interests. To name a few are the terrestrial photogrammetry of the then Murray House[1] at Garden Road in 1982 and the recent monitoring survey at Lei Cheng Uk Han Tomb.

This paper discusses the methods and technologies used to measure the differential movement of the Lei Cheng Uk Han Tomb and how the tomb chamber walls are mapped under a confined environment.

Introduction

The Lei Cheng Uk Han Tomb was discovered in 1955 during the course of development of the former Lei Cheng Uk Resettlement Estate. The tomb is so far the only instance of Eastern Han Tomb found in the territory. Due to its historical significance, it was formally declared as a gazetted monument in 1988. To ensure its preservation, the Survey Division of Civil Engineering Department was requested by the Hong Kong Museum of History (HKMH) to monitor the structural movement of the tomb, and to take comprehensive close range photography to record the incised patterns and cracks of the wall bricks.

Archeological Setting

The tomb resembles in many respects the structure of the other Eastern Han (AD 25 to AD 220) tombs discovered elsewhere in South China. For instance, the cross-

[1] In 1982, terrestrial photogrammetry was conducted to record the facade of the then Murray House at Garden Road, Central, prior to its demolition and relocation to a new suitable site.

shaped tomb chambers, the patterns and inscriptions like "大吉番禺[2]" on some of the tomb bricks. The cross-shaped brick tomb consists of four chambers, namely front, rear, left, right chambers and an entrance hall (Figure 1). The front chamber has a square base and a domed vault, while the left, right and the rear chambers have rectangular bases and barrel vaults. The major part of the entrance was however found destroyed when discovered. This has made the portraying of the original outlook very difficult.

The interior part of the tomb was kept open to public till mid 80's. Due to weathering and lack of proper preservation over the past several decades, differential deformation occurred in many parts the tomb, in particular the vaults and the brick walls. To slow down the speed of deterioration, the tomb is now sealed under temperature and humidity controlled environment. In this regard, a glass window pane is installed at the entrance hall to separate the interior part of the tomb from outside.

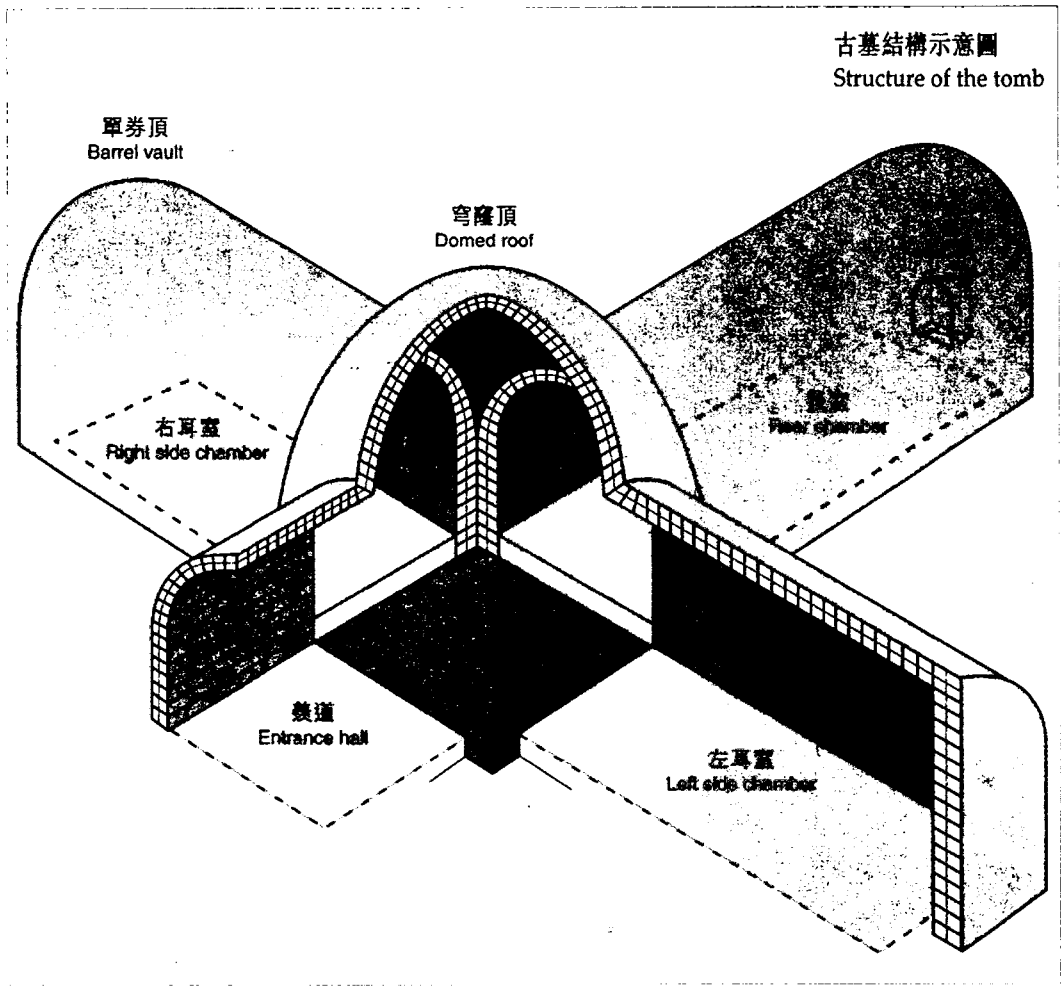

Figure 1: Structure of the tomb (by Courtesy of HKMH)

[2] According to the historical records, "番禺" referred to the name of the country to which Hong Kong belonged during the Han dynasty.

Survey Requirements

The HKMH mentioned that preservation of the tomb was very difficult since no survey or measured drawings had been taken before. A systematic and comprehensive survey is therefore most essential to enable accurate assessment to the physical conditions and stability of the tomb, as well as to modify the existing conservation method.

The ultimate goal of the survey is to help preserving the tomb by means of collecting analytical and quantifiable information in relation to the deformation. So, the primary consideration in the operation is therefore not to induce any additional damage to the heritage. In summary, the HKMH has the following survey requirements:

(a) Deformation measurement accuracy of the tomb structure to $\pm$2~3 mm;
(b) All personnel and equipment working inside the tomb must be well protected against the damage of the floor; and
(c) No drilling or any other kinds of damages that may occur during the installation of the monitoring marks are allowed.

Site Constraints

The above requirements have imposed considerable constraints in placement of control stations and monitoring targets. Besides, the confined space (3.6mL x 1.4mW x 1.5mH) inside the tomb chamber also imposes further difficulties in survey operation. For instance, the low headroom inside the chamber does not allow a man of average height to stand straight comfortably. Illumination is insufficient and sighting distance is so short that the theodolite can hardly focus on and measurement can hardly be taken. This is particularly critical when sighting the dome roof at near-zenith angle. Furthermore, the glass window pane at the entrance hall also restrained the monitoring stations from connecting to the survey network outside directly.

Survey Design

Preliminary site investigation revealed that gravity and external soil pressure are the major causes of deformation. The direction of movement is generally downward in the vaults part and inward in the sidewall. To detect the movement more effectively, the resultant settlement is resolved into three components parallel to the axes of the cross-shaped chambers. Monitoring marks are placed to enclose the suspected settling portions of the tomb (Figure 2). 3-D spatial intersection method is adopted to measure the corresponding changes in direction, vertical angle and distance. The raw data is

then input into the Star*Net[3] adjustment software to compute the final co-ordinates.

Instrumentation

In selecting the most appropriate equipment to carry out the assignment, various types of measuring equipment have been critically examined after taking account of their accuracy achievement and ease in operation. The Leica TCA1800 total station which is direct reading to 1 second and gives co-axial measured distance to $\pm$1mm+2ppm is finally adopted in this survey. TCA1800 is one of the most accurate total station equipped in the Survey Division. Its co-axial distance measurement design has the merit of no eccentricity correction over other traditional theodolite plus EDM combinations. In this case, the said correction is significant since most of the object distances fall within 5 metres.

Control Stations

As HKMH does not allow drilling or any other kinds of damage to the tomb, special attention has been paid in the selection of control stations. Subsequent to repeated investigation and testing, a force-centering system (Plate 1) is designed to eliminate the instrumental centering error. The system comprises a 0.5m high tailor-made rigid tripod and two steel bars firmly mounted on the ventilation shaft. This whole set up together with the pillar plate and TCA1800 serve as the base station for subsequent monitoring observations.

[3] Star*Net is the licensed software of StarPlus Software, INC. to handle the position adjustment in Survey Division, Civil Engineering Department.

Plate 1: Monitoring observation inside the tomb

Monitoring marks

The traditional mini-prism is considered not feasible as the anchorage of the prism will inevitably damage the wall face and the prism weight (39g each) will induce additional loading to the wall. Despite the reflector-less total station has no mounting problem, it is ruled out because of its relative low accuracy (±10mm) achievement. To solve the problem, 78 nos. light-weight Nikon 20mmx20mm retro-reflector tapes are mounted on supporting aluminum plates (3g each) are stuck around some critical points on the wall face (Figure 2). However, there are two drawbacks in here. Firstly, the Automatic Tracking Recognition (ATR[4]) mode of TCA1800 does not function properly with the retro-tape that makes the tedious target bisection process unavoidable. Secondly, testing revealed that TCA1800 will give rise an error of ± 3~4cm when the measured distance is shorter than 2.5 meters. For high precision work like this, a corrective short-range lens has to be applied on the telescope to modulate the measuring signal.

[4] ATR – The optional function of Leica TCA1800 Total Station which permits automatic angle and distance measurements to normal prisms and reduce the tedium of precise visual sighting to prisms. (Leica, User Manual TPS – System 1000)

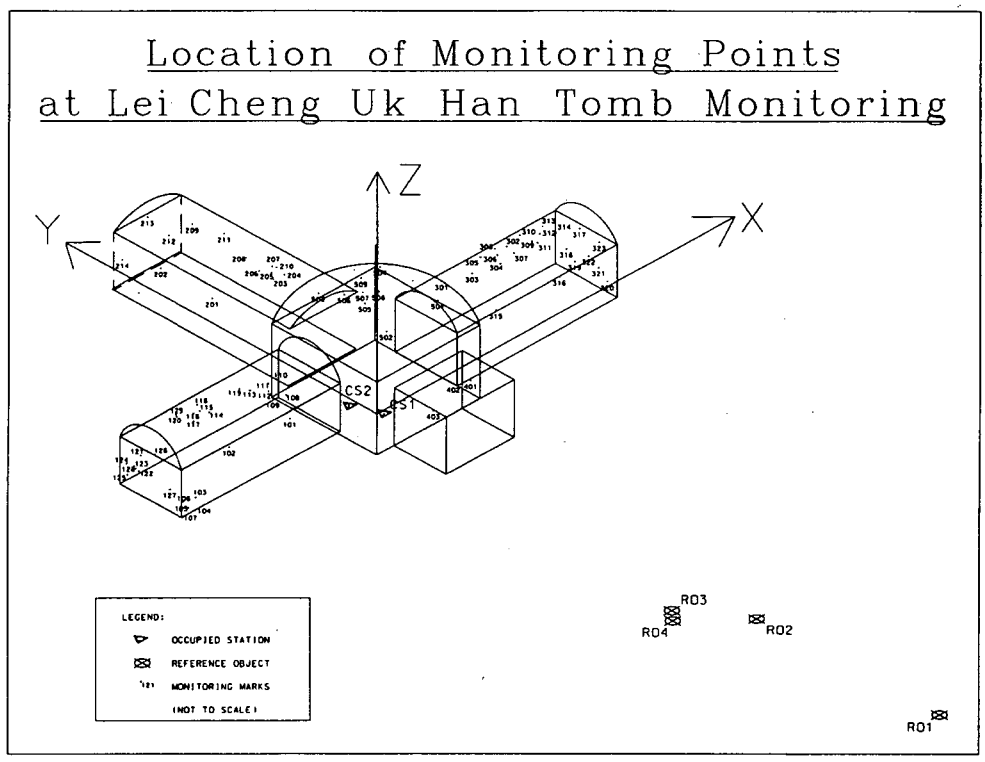

Figure 2 : Location of monitoring points

Pre-analysis of Survey Network

Pre-analysis is the process to predict the accuracy of the end-result prior to actual survey. During the network design process, it is important to examine whether the presumptions made, instrumentation used and the observation procedures adopted are appropriate to achieve the required standard. If not, the accuracy requirements should be reviewed or alternatively, the elements of the observation matrix are re-defined. The pre-analysis process (Figure 3) is repeated until the final product accuracy is well within the expectation.

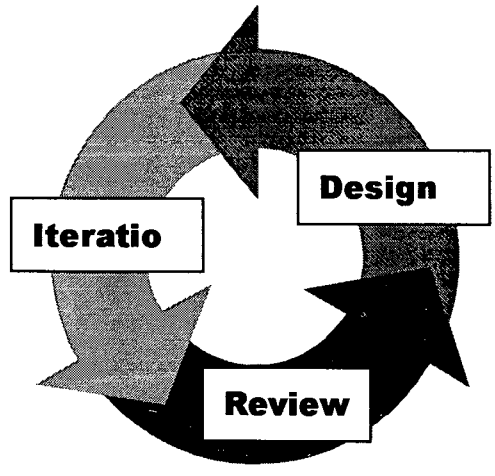

Figure 3: Pre-analysis Cycle

In the pre-analysis process, a simulated model of the tomb is set up. Since the two control stations S1 and S2 are force-centered, no centering error is arisen in this respect. The five target points on each of the front, left and right chambers represent some typical position on the tomb wall. After a series of iterations and reviews, the following default instrumental standard errors and respective observation errors are input into the Star*Net pre-analysis program to produce an error ellipse with semi-major axis smaller than 3mm at 95% confidence level:

- Distance measurement accuracy : $\pm$1mm + 2ppm
- Angular measurement accuracy : $\pm$1"
- Centering error of the instrument/reference object (forced centered) : 0mm
- Centering error of the monitoring marks (forced centered) : 0mm

In the real situation, a local coordinate system is adopted with the arbitrary values 1000m(X),1000m(Y) and 100m(Z) assigned to the control station CS2 (Figure 2). Two Omni mini prisms and two retro-tapes (RO1 to RO4) are installed permanently outside the tomb to serve as the reference objects to monitor the stability of the two control stations inside.

Observation Scheme and results

After installing the 2 force-centering bars, 78 monitoring marks and 4 reference objects, sufficient time lapse is allowed to let the marks become stable. The arithmetic means of two sets of reading taken at different days are adopted as the initial reference values. Up till now, three sets of observations have been taken and it shows that no apparent movement of the tomb wall is recorded since October 1999. The maximum magnitude recorded (Table 1) are well within the $\pm$3mm accuracy limit and hence be considered as noise of survey operation. The HKMH is informed of the survey results in the form of table showing the relative movement of the monitoring marks. The observation programme is now scheduled to be carried out on monthly intervals for the first half-year and thereafter on quarter-yearly intervals.

Chamber	Dome Vault			Left Wall			Right Wall			Back Wall		
(mm)	dx	dy	Dz	dx	dy	dz	dx	dy	dz	dx	dy	dz
Front	+1	-2	+2	-	-	-	-	-	-	-	-	-
Left	-2	-1	0	-1	-1	0	-1	-1	0	-2	-1	0
Right	+1	-1	0	+1	-1	0	+1	-1	0	+1	-1	0
Rear	0	+1	+1	0	+1	0	+1	+1	0	0	-1	0
Entrance	0	-2	0	+1	-3	+1	0	-3	0	-	-	-

Table 1 : Maximum deformation value recorded

Close Range Photogrammetry

The HKMH expressed that preservation of the tomb had been made very difficult since there was no detailed drawing on the interior of the tomb. So other than the routine monitoring of the tomb structure, the HKMH also requested the Survey Division to conduct a close range photogrammetry survey to record the pattern and inscriptions on the wall bricks of the tomb.

Plate 2 : Close range photography inside the tomb

Planning

The Hasselblad MK70 metric camera equipped with the MKWSWA Biagon 38 super-wide angle lens was used to capture the interior wall face. As the rule of thumb in photogrammetry, sufficient overlapping of the adjacent photographs is essential to form stereo pairs. For this reason, the camera positions have to be carefully planned beforehand (Figure 4):

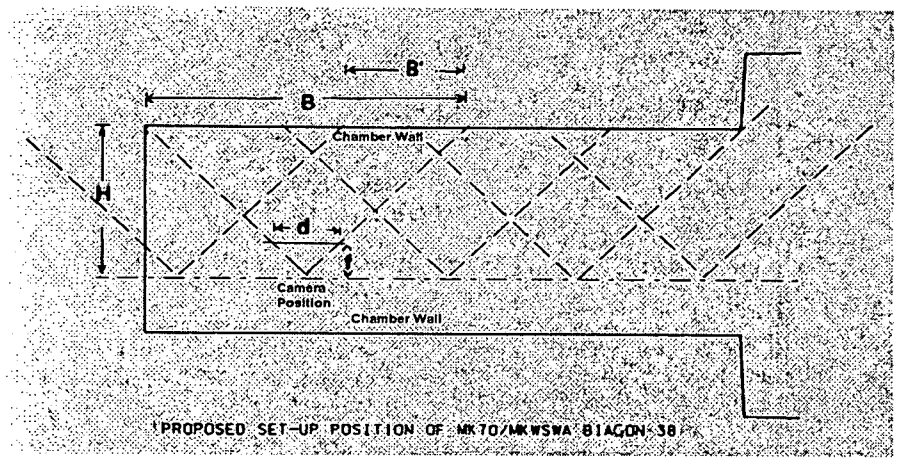

Figure 4: Proposed set-up of Camera Position

$B/H = d/f$ where, B = wall coverage

$B = 1.00 \times 0.053 / 0.038$ H = Camera distance from wall, 1.00m

$= 1.395$ d = film format, 53mm x 53mm

f = lens focal length, 38mm

For a 70% overlapping, the effective ground coverage will be:

$B' = 1.395 \times 0.3$

$= 0.418$

Hence, the minimum number (N) of photographs required to cover one side of the left chamber of 3.62m long is:

$N = 3.62/0.418$

$= 9$

To capture the barrel vaults of the left, right and rear chambers, the camera is tilted by 45° upward to record the domed vault.

Chamber	Section Nos.	Separation /mm	Camera Position /Nos. (a)	Fore/Aft /Nos. (b)	Tilted /Nos. (c)	End Wall /Nos. (d)	Total No. Camera Position	Total Exposure Nos.
Front	-	415/450	8	2	1	-	16	16
Left	9	440	9	2	2	2	20	38
Right	9	450	9	2	2	2	20	38
Rear	9	490	9	2	2	2	20	38
Grand Total							76	130

Note: (1) Total no. of camera position = (a) x (b) + (d)

(2) Total exposure number = (a) x (b) x (c) + (d)

Table 2 : Planning of Camera/Exposure Location

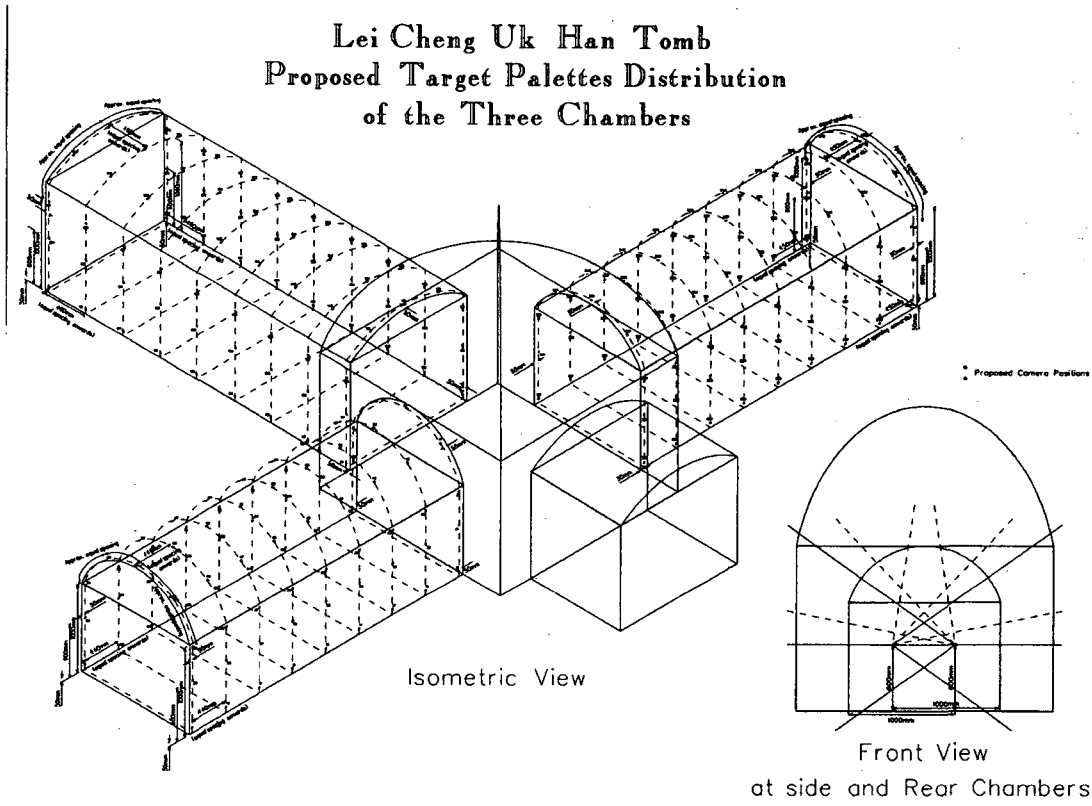

Figure 5 : Location of target palettes

Photo Capturing

As these photographs need to be tied up together to form a rectified photo-mosaic, target palettes are stuck at some pre-defined positions of the wall face to serve as the tie points (Figure 5) for the stereo pairs. In capturing the details on the curve surface of the domed vault, the object distance varies significantly that the depth of field question should be critically addressed. To ensure the sharpness of every single detail on the photograph, a small aperture value is recommended to achieve the greatest depth of field. For instance, with a exposure value (Ev) of 6 at film speed ISO400 and the aperture value (Av) of f/16, the exposure time value (Tv) should therefore be 1 second.

$$Ev = Av + Tv = Lv + Sv \,, \quad \text{where} \quad \begin{aligned} Ev &= \text{Exposure value} \\ Av &= \text{aperture value} \\ Tv &= \text{exposure time value} \\ Lv &= \text{light value} \\ Sv &= \text{Film speed value} \end{aligned}$$

During actual photography operation, the bracketing technique of ± 1Ev on each standard exposure has been applied to ensure that the best photo performance is

captured. As the result, there are altogether 400 exposed photographs sent to the Photogrammetric and Air Survey Unit of Lands Department to prepare the rectified photo-mosaic as shown in Plate 3b.

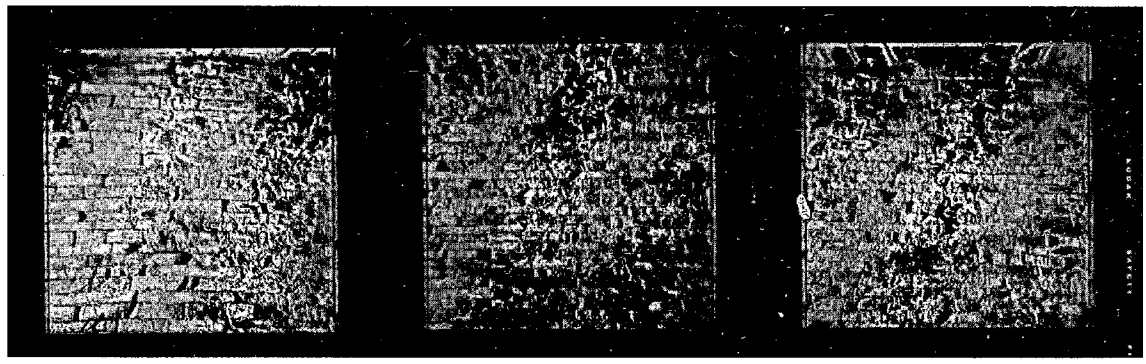

Plate 3a: Photographs forming stereo pairs

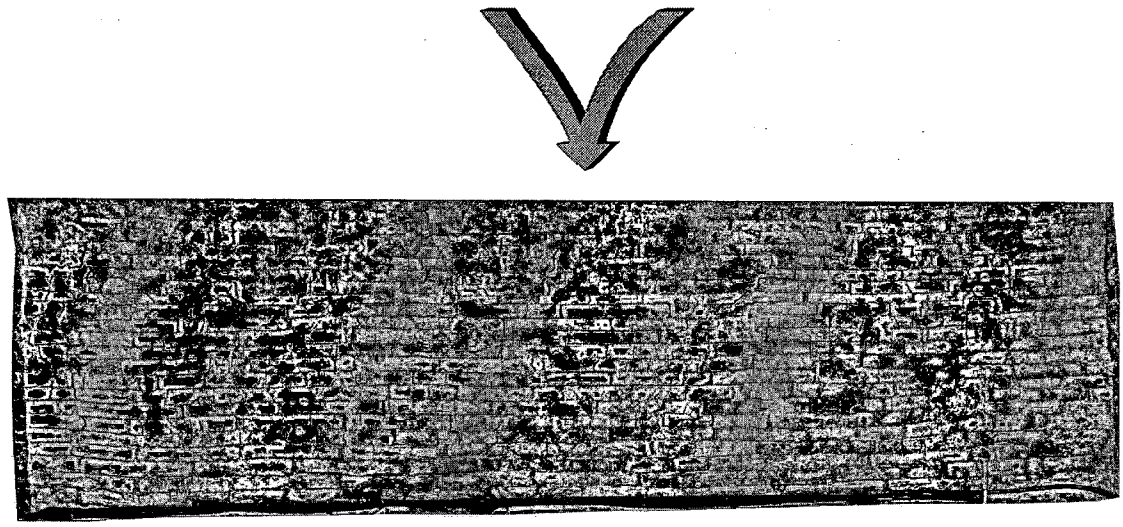

Plate 3b: Rectified photo-mosaic of tomb wall

Conclusions

This monitoring survey has set up a mechanism to check the structural conditions of the tomb in quantifiable terms. The survey accuracy conforms to that predicted in the network pre-analysis. Manual bisection to the target points is necessary since the ATR mode of the TCA1800 does not function well with the retro-tape reflectors. Nevertheless, the methodology is proven to be effective for the job on the whole. The observation results of the past three months revealed that the settlement of the tomb wall is not apparent since October 1999. The monitoring survey of the tomb will continue and the settlement is closely monitored especially in the forthcoming rainy season.

The terrestrial photogrammetry provides a new perspective to study the pattern and

inscriptions of the wall bricks. This method has the advantage over other traditional mapping means in the way that the metric photographs are rich in semantic which can be evaluated at any time with high repeatability. Subsequent to the production of the rectified photo-mosaic for the four tomb chambers, Photogrammetric and Air Survey Unit of the Lands Department is studying the application to create a 3-D model of the tomb based on the data collected in this exercise.

Unlike the heritage itself which we try to keep it unchanged, the technology used to monitor its deformation is on the contrary, dynamic and ever improving. In this context, the Survey Division of Civil Engineering Department will continue to explore and investigate some other more effective means to achieve the objectives in the future.

Acknowledgments

Special thanks are extended to the colleagues of Photogrammetric and Air Survey Unit, Lands Department in providing assistance to process the photographs and the subsequent photo-mosaic work.

Biography

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TAM Hoi-cheung, ARICS

Mr. TAM was elected as ARICS in 1997. Since then, he has been working in Civil Engineering Department until 1999. He is now the Land Surveyor of District Survey Office/North, Lands Department, Government of the HKSAR.

Hilary Cordell
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Inadequate Deeds of Mutual Covenant and the need for further reform of the Building Management Ordinance

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Craftsmanship in conservation. **Dr. Trevor J. Holmes.**

Most surveyors here in Hong Kong are familiar with modern and colonial buildings so I will consentrate on Chinese traditional buildings, if I may.

Because China is so large and diverse in climate, religion, social habit, diet, language, artistic aspiration and building technique we would be advised to limit our travels to the small area around us in Hong Kong. These are the buildings here that I know best.

To an Englishman, traditional Chinese buildings are very strange, uniformly built of a drab green-grey brick with peculiar roof structures. Brickwork is poor, yet all buildings had cavity walls as early as the seventeenth century, they appeared only after World War two in Britain. Whereas Chinese carpentry is excellent, and woodcarving unsurpassed. Such wonderful art lavished on such poorly assembled structures.

In Hong Kong there are no buildings dating from before the Ch'ing Dynasty, with the underground exception of the Han Dynasty tomb at Lei Cheng Uk. This is due to the infamous "Evacuation". In 1661 the coastal water had not yet been pacified and it was proposed that the people of the coast should be moved away 'out of danger'. In March and April of 1662, the Grand Commissioner set up a new boundary along the coast and two-thirds of the county area was evacuated. All land within fifty li (15 miles) of the coast was included. The smuggling of silver, piracy and support for the deposed Ming regime, which was strong in the south, was ruthlessly suppressed. There were many deaths, which were accompanied by the destruction of all buildings cleared beyond a simple rope laid on the land.

Before the end of the Ming Dynasty the population was increasing, but the high rate of increase in the population began with the long period of internal peace from about 1700 A.D. From that time onward, all Chinese wars were fought at so great a distance from China proper that the population was not affected. Moreover, in the seventeenth and eighteenth centuries the government saw to the maintenance of river dykes so that the worst inundations were prevented. Thus there were not so many of the floods which had cost the lives of many millions of people in China. This demographic expansion had no parallel in other countries. While the population of Europe rose from 144 million in 1750 to 193 million in 1800, in China the numbers rose more dramatically from 100 million in 1662 to 414 million in 18500 i.e. four times. Europe's increase was accommodated by the agricultural and industrial revolutions. China was a culture with greater problems, which learned to cope by using their time, honoured traditional methods. As the population increased it needed feeding and housing. In 1578 there were sixty-six mou of land per family of the total population. Economists consider 100 mou ideal if eighty percent of the population are

producers. By 1729 there were only thirty-five mou per family, roughly half. Marginal land that had traditionally been used for the growing of materials for building, i.e. trees, suffered in consequence, as the extra land that was cleared for food was not available for growing trees, and timber production decreased as the population increased.

The ever-decreasing woodland and subsequent shortage of timber resulted in a fundamental change in Chinese architecture. The timber tradition that had existed from the earliest times could no longer be provided with its raw material. Rammed earth and brickwork was to become the answer, and although wood was needed to fire the kilns it could be found in brushwood and inferior quality lumber. Hong Kong had to be gradually rebuilt with new materials.

For the practical research of building construction it has been necessary to take some buildings apart. Those that have had this archaeological analysis are; the forts at Fan Lau and Tung Chung. The domestic properties of Tai Fu Tai Mansion at San Tin, Law Uk at Chai Wan, Mr Yau's house at Hoi Pa, Tsuen Wan, and the walled village of Kun Lung at Fanling. The Man Mo Temple at Tai Po, the temple at Pat Heung and recently the Hung Shing Old Temple at Kau Sai Chau were all studied. Of the famous ancestral halls, Kui Shek Hau, Man Lung Fung and Tang Chung Ling all in the Northern New Territories have been dismantled along with the Ching Shu Hin Guest House adjacent to the Kun Ting Study hall at Ping Shan. Techniques of construction were analyzed and reproduced using traditional craftsmen. Thus an insight into their craft techniques could be recorded.

While European architecture underwent a series of dramatic changes, involving basic construction methods with post and lintel, round arches, and pointed arches alternating, there were no such sudden revisions in China, just simple progression and refinement over a period of 5,000 years. Neither has there been any distinction between sacred and secular architecture, and temples, tombs, public buildings and private houses, whether great or small, all follow the same pattern. The impression of stagnation can be attributed to the earlier predominantly wooden construction of the buildings; a technique ill suited to revolutionary developments. There were changes over time in a process not dissimilar to the Neolithic, Bronze and Iron Ages in the West large earth monuments were constructed at similar early dates. Gradually a classical period evolved with the emphasis on spectacular effects, but also on balance and harmony. This phase nearly corresponds to the four centuries 206 B.C. to 220 A.D. of the Han Dynasty and in many respects echoes the buildings of Greece and Rome. A sort of Medaeival period called the Six Dynasties, followed that produced elongated forms in sculpture similar to the Gothic. The T'ang Dynasty (618 to 907 A.D.) rediscovered the classical styles of the Han, equating the new period of

Imperial splendour with the European Renaissance. Certain Sung works (960 to 1279 A.D.), especially those of the Northern Sung, still retained Renaissance traits. The Ming (1368 to 1644) may be described as "Baroque" or better "Pseudo-baroque", simplified in line and enriched by minute carved ornamentation, delicately painted, and consisting of flowers, birds and plants. These decorations change in colours to the Ch'ing Dynasty to produce a "Little Baroque" or a light and fanciful Rococo. These styles do not conform strictly to the dynasties and dates certainly do not correspond with Western equivalents.

Once these, admittedly subtle, differences have been highlighted it becomes easier to detect changes in the development of Chinese architecture. Building regulation book controlled the sizes of timbers and therefore the system of building. Certainly from the Sung Dynasty all Imperial projects were built to this demanding schedule, which was more a method of quantity surveying than building technique, covering sizes of beams, costs of materials, costs of hours of labour and even costs of transport, up stream or down. By the eleventh century methodical management in construction, modular and standardized designs were not new having been used as early as the sixth century, while drafting and construction detailing were handled by specialized artisans in the seventh century. At the beginning of the Ming Dynasty, the city of Peking underwent a major reconstruction. The huge projects undertaken inside the Forbidden City, including the construction of the stupendous groups of palace buildings, totaling eight thousand three hundred and fifty buildings took only four years to complete. There is no doubt that in feudal society, speed such as this in erecting buildings of priority relied on the callous exploitation of peasants through forced conscription and massive mobilization of the labour force. But careful programming and management were also important factors in ensuring rapid implementation. The restrictions placed upon Ch'ing Dynasty builders were many, but they did not deprive craftsmen of all their ingenuity and expression. The Cantonese builder is nothing if not resourceful, circumventing limiting factors both legally, and with not a little glee, sometimes illegally. The geomancer would control the siting, orientation, number of halls and number of columns and even dimensions, with the full co-operation of his client. Hong Kong is far away from Peking, with a vastly over stretched civil service, it was difficult to impose Imperial control, particularly towards the end of the Ch'ing Dynasty. Buildings were therefore used to display a rebellious but natural delight in the arts. The subjects might be simple farming themes or reflections of nature, or they might be complex stories, a mixture of myth and religion lost in time. In each case they are a valuable contribution to the world gallery and must be preserved. Buildings constructed under Imperial rules and prefabrication techniques still remain in the New Territories of Hong Kong .

China's palaces and temples are built on the "jian" principle. The width and depth of a "jian" may vary throughout China as it is regulated by the size of local trees. The "Jian" enforces a discipline, an order on the building by standardizing the timber construction members. These are unwritten rules developed out of pragmatic considerations, which not only traditionally determined proportions but also the position of ornamental details. Using this repertoire of locally standard elements, builders could erect a complex dwelling by following the specification of a "jian" x the size of the house, without the need to resort to drawings, or indeed architects.

Stonework. Cutting stone is hard work, and throughout the history of China there have been easier methods of building available. From the Han Dynasty brick and stone construction was associated with tomb building and therefore death, which was not an association popular with the superstitious Chinese and therefore to be avoided in general buildings. When stone was eventually used in the finest of buildings it was still reserved for very clearly defined parts. The Ming and Ch'ing Tombs are stone structures continuing the tradition that stone should be reserved for funerary architecture.

According to the Hong Kong Government Blue Book (started in 1844) for 1871, there were no less than eighty one quarries in Kowloon, more than the whole of Hong Kong Island.

Generally, the granite and volcanic rocks found in Hong Kong can be excavated quite easily. The earliest stonework still to be found in Hong Kong is the main lower walls of the early forts. Quoinstones were carefully considered with an eye to bonding large stones into each wall face either side of the corner in turn. The traditional method of building such walls was to construct one skin on each side in random rubble work in a lift of about one stone, and ram earth between. The walls are battered to eight degrees and therefore the quoinstones are not cut square. Considerable skill is shown where necessary at quoins, voussoir to entrance arches holes for door supports etc., in very hard granite. Later fort walls (built to repel foreign devils) were constructed in a totally different way from the early ones. Although the interior structure is earth between two skins of stone the outer skins are built from large long stones coursed and carefully bonded, and thus the wall acts differently from random rubble one when under cannon fire.

For very special locations red sandstone of auspicious colour, was traditionally imported from Fukien Province at great expense. Typical locations for this are the main entrance of a walled village, columns both internal and external, drum platforms and wall bases, and door surrounds. It is likely given China's propensity for the movement of itinerant workers, that craftsman from the areas of the quarry were

imported along with the stone. This would explain the high degree of skill displayed. The soft nature of sandstone means that when it is used for wall facing very thin joints may be made, apparently without mortar. Sandstone does not weather well, neither does it withstand loading or pressure and will split.

Brickwork. The Chinese claim that bricks were used as early as the twenty century B.C. for brick enclosures over coffins. In the history of Chinese building, brick found favour very early being well developed by the Ch'in (221-207 B.C.) and Han Dynasties. As early as the second century B.C. earthenware bricks were fired in a reducing atmosphere, which produced a green-grey brick with increased toughness. Oxygen reduction accounts for the grey coloured bricks of which the Great Wall of China is made. The term reduction refers to the exclusion of oxygen from a kiln atmosphere, rendering it dark and smokey. Such firings reduce the quantity of oxygen atoms in iron or copper oxides present in both clays and glazes, and this can change the colour. Firing temperatures can also influence colour.

The art of brickmaking in China had almost been lost over the period of some fifteen hundred years since the Han Dynasty. Brickmaking took a great leap forward during the late Ming and techniques improved dramatically. The colour of all traditional bricks in Hong Kong is green-grey, there are a few exceptions but they are usually the result of defective firing allowing oxygen into the kiln, and are therefore an indication of an early date. Local variations and diversity leads to some confusion but it may be said of Hong Kong that the smaller the brick the later, is a general rule. Later bricks are also more blue/green and more consistent in colour. The texture of later bricks is smoother. There is some confidence that this may be a reliable dating technique. Only about twenty percent of China's dwellings surveyed in the 1930's had walls of fired bricks. One curious feature is that in Cantonese kilns (and possibly elsewhere) the kiln is constructed with a mossy brushwood covering with an earth ring formed around the top into which water is poured, altogether 560 buckets. This has the effect of controlling the temperature and not allowing too high a temperature, as well as cooling more quickly, to produce fine grey bricks. The most common is an extended English Garden Wall bond with between four and fourteen courses of stretchers between header courses. A typical example of cavity work may have one course of headers every seventh or eighth course bridging the cavity. A likely reason for the early development of cavity walls in China is the need for ancestral halls and temples to build high gable walls without the need of buttresses and thus any improvement in the slenderness ratio of the wall is welcome.

Lime. A primitive way of burning lime from shells and coral is still carried on along China's south coast as it has for the past 4,000 years. Pointing involves roughly spreading the mortar in dabs on top of the wall and the next courses pressed onto it.

This results in very little mortar remaining between bricks. This is weak in theory, but is economical and lasts sufficiently well. A final flush pointing with lime mortar merely fills the outer edge only.

Rammed earth is the most common material in China, materials are easily at hand and wooden shuttering can be used over and over again. The modern facility of Chinese contractors results from a history of rammed earth craftsmanship. Loadbearing mud bricks or adobe are very common and are often used in conjunction with hangtu (rammed earth) and fired bricks.

Adobe bricks were made in the country districts by taking advantage of the natural silting up of fields. Thus in autumn, after the second rice harvest, the fields were ploughed and the surface smoothed with a stone roller, and the mud made into bricks. Mud bricks were considered to allow greater flexibility of design and construction than rammed earth and were therefore considered very desirable and signifying a wealthier household. This shortage of wood meant that the south has more fired brick than the north as no wood was required for house heating in the south.

Renders may be mud, straw and lime mixtures. Walls in the south are always rendered and limewashed. Lime was slaked on site and plaster or render were both applied in two coats.

Cantonese roofs are formed from clay tiles. There are however different shapes of tile and methods of laying in China. In Hong Kong there are only two basic types. The first system involves a lower concave red plain tile with a convex green-grey tile on top. The second system involves a similar lower red plain tile but with a red roll tile over the joints. Both types occur in roughly equal proportions with the green-grey tile confined to more modest dwellings. The green/grey are sometimes considered to be of Hakka origin and roll tile Cantonese. Roof pitches tend to be in the region of 20 degrees to 27½ degrees. The following are typical examples:- Clay forming the tiles is wrapped around an upturned bucket-shaped mould and scored four times. The dry cylinder is deliberately collapsed by pressing inward prior to firing. Thus producing four tiles, having been split along the indented quarter lines. The kilns are of a reducing type that again results in a green-grey colour. Red under-tiles are made in the pantile method and fired in a different kiln with an oxidizing atmosphere, which gives a red colour. Over tiles are then stacked one over the other with each tile resting on the one below until the ridge is reached where the top tile is built into the chunam rendering which covers the ridge and forms the decoration. The roll tile roof has the same under tile and red moulded tile on top. The system, like so many elements in Chinese building, resembles the Roman, which used a combination of flat and rounded tiles. In roll tile roofs the undertiles that carry the water down the roof are usually fitted with "dip tiles" or "drip tiles" at the eaves. The intention of this is to

throw water clear of the eaves and prevent water from flowing back onto the timber eaves board. Dip tiles were also a decorative feature. They are usually decorated with embossed patterns of flowers and plants stamped on during manufacture while the clay is still wet. The roll tiles also have a special end tile. In the Ch'ing Dynasty, like the Han, this took the form of a normal roll tile with a stop end and took the identity of a medallion. Generally Hong Kong tile roofs were not glazed, as glazing required a second firing which doubled firing costs, but glazing increased with later prosperity.

Carpentry. Chinese carpenters generally worked with pine (China Fir). Just as classical Greek buildings have aesthetic corrections, so do China's ancestral halls. The cross section of the hall curves, and the longitudinal section curves upward at the gables due to the side hall beams being inclined. Columns lean in and taper. This must be recognized and not corrected when reconstructing. Mortice and tenons are used throughout and some joints pegged to reduce movement. While the roof is considered to be the main element of Chinese buildings, the development of the bracket system is considered the most important part of the roof element and indeed is one of the major characteristics of Chinese architecture. In order to allow a gentle curve to a roof, Chinese rafters (batten rafters) are wider than they are thick 100mm wide and 15mm thick, so they will bend to follow the roofline. The space between rafters is regulated by the size of the tiles to be laid on top.

The ends of the rafters are protected by an eaves board which is usually about 200mm deep in late Ch'ing Dynasty buildings and is heavily carved and painted in ancestral halls, temples and domestic buildings.

Metal nails in China were made for shipbuilding, hobnails for shoes, fastening the iron tyre onto the wheels of wheelbarrows, for coffins and leatherworking.

Bamboo nails were used in drum making and building. The ancient Chinese believed that wood, fire, earth, metal and water were fundamental elements of matter which produced one another in an endless circle. These elements also destroyed one another a little like the children's game scissors, stone and paper. This meant that metal nails for example were not used in traditional Chinese buildings because "metal destroyed wood". This was inauspicious, bad fung shui. Bamboo nails are cheap, readily available, and can be produced on site as required. The nails are fried in sand in a wok over a fire for about thirty minutes; this hardens the nail to a degree that makes it very difficult to break the point.

Chinese painters used an elaborate groundwork (filler) of ox blood (pig blood in Chiu Chow districts) and lime, followed by several coats of paint or lacquer to fill cracks between planks in doors.

Latticework forms a characteristic feature of Chinese decorative woodwork. It is used to fill the space between roof and floor in garden pavilions, temples and houses.

Lattice screens can be found in doorways, windows, gratings, the fronts of dwelling houses and shops, for dividing rooms and all manner of internal arched decorations. It was the Chinese lattice screen that so impressed and influenced those who extolled the virtues of the Chinese style during the fashion for the Chinoiserie.

The glory of Hong Kong's buildings lies not in their construction, but in their decoration. Unlike in the West, colour was used for its symbolic meaning and is not a purely aesthetic choice. Flowers, fruit, trees and vegetables, animals, birds and certain objects were chosen for their symbolic meanings. The decoration includes the body of motifs, which are in effect pictures of an auspicious nature. There was no essential difference between the elements of design for decorative plaster or woodwork, and any other Chinese decorative art. Animal subjects available by the Ch'ing Dynasty was very wide. Early animals included dragons, phoenixes, birds on rocks, deer, lions and fish. The first two creatures had ancient symbolic associations and were employed to decorate buildings to ensure their protection. Ch'ing Dynasty patrons took a delight in as much decoration as could be afforded, it was lavished on buildings, but only in certain areas which followed strict aesthetic rules. The West cannot teach China much about the economical use of human resources. Effort was made where it counted most. Much of a building remained unadorned but when decoration was added it was done with spirit and to the greatest effect. This result was not necessarily great art, very little Ch'ing Dynasty decoration in the Pearl River Delta can be considered great art.

What it is, however, is folk art, competent, diligent, sometimes lively, even exuberant and full of meaning.

Colour in Chinese architecture is very important, it is related to both religion and fung shui. Each colour has a significant meaning and should not be used indiscriminately. To Western eyes the colours may seem crude as they are usually used in their primary form, the brilliance however only adds to the power and efficacy of the charm that the colour bestows. Decorative features are usually painted in a naturalistic style; flowers and fruit are their real colour. Some particularly auspicious creatures, like bats, may have a colour change to lucky red, but this is the exception rather than the rule. The main ridge beam of a hall will invariably be painted pink/red with the application of gold leaf squares applied as diamonds at approximately 600mm centres, along the underside of the beam. This pink beam is thought to be a hangover from the earlier practice of wrapping the ridge beam in red paper or cloth at the time of "topping out", the celebration of raising the roof ridge on completion of the structure would ensure prosperity and harmony for the occupiers.

The traditional paints used on wood, render and plaster were mainly water based (with some oil bound using linseed) which resulted, not in a peeling or cracking of the

paint surface but in a pleasant slow wearing away with colours gradually becoming more mellow. It is common that amongst traces of remaining paint gilding will be the longest lasting coating.

Gold coatings are very popular on traditional buildings and even the poorest dwelling may have some small decorations in gold leaf. In richer temples there may be a riot of gold, to the exclusion of all colours except a dark background. A thin gesso base was applied to the area to be gilded by mixing lime with paint, and a chrome yellow pigment was applied to give a warm hue to the gold.

Door heads are a common feature of Cantonese houses. Render and plaster were inexpensive, craftsmen could display their greatest qualities, a delight in care and painstaking detail. House owners could display their taste, if not their riches, to their neighbours. Because the modelled decoration is protected by the canopy of the door head the material can be more refined and workmanship more delicate. The delicacy of plasterwork can be breathtaking, possibly the best display of the art can be seen in the modelling of birds, twigs with flowers, fish and representations of wicker baskets pierced to show more modelling inside.

Ceramics. The first Chinese official to oversee pottery production burnt to death in a kiln. He is recorded as being so thorough in his duties that he frequently entered the kiln to check the progress of a firing. On one occasion, he evidently ventured too far. China's long and successful ceramic history was rooted in the high quality and wide distribution of raw materials, and a high degree of organization. Ceramic screens developed throughout China. In Hong Kong they fill windows, blind windows or form balustrades and may be divided into two main types, glazed and unglazed. Their effect is very similar but their methods of manufacture are very different, one being pressed from a sheet of clay the glazed being slip poured into a mould.

Shekwan's decorative ceramic roof tiles and ornaments were famous throughout China. The decorative panels of Cantonese temple roofs are whole ceramic units formed as free standing animals, fish or figures, or a complex frieze grouping of panels. Foshan or Fatshan, is a mineral and industrial centre located on a linear strip of land in the West of Guangdong Province about twelve miles from Canton. The kilns at Shekwan have existed since Sung times and in addition to providing decorative architectural materials, have produced a unique style of provincial folk sculpture. Like the canal based pottery transportation from central England, the carriage of fragile pottery along the river meant safe delivery of heavy products over long distances. The towns and villages of San On County tended to be close to the coast and it was easy to deliver the attractive and popular product. The most obvious product from Shekwan dragon kilns was the famous roof ridge panels, which were joined together to make one long panel but other products include, dragons and

flaming pearls, phoenixes, carp and various figures representing the sun and moon to be set on the roof along with other forms of architectural decoration. Artists skillfully used the yellow gritty colour of the local clay as a natural finish for the suntanned faces of the Cantonese in their figures. Hence they developed a unique style of modelling with its own style and colour range. The earliest example of Shekwan ceramic ornament is on a temple in 1817, but most examples date from 1875-1908 when the Shekwan kilns experienced their major flourishing. Ceramic friezes were modelled, glazed and fired in complete sections and often displayed the date of production as well as the name of the kiln where they were produced. Figures from the theatre and opera dominate the subject matter of these Shekwan panels. However it should be noted that, in general, subject matter from novels and plays are common motifs in all southern temple ornamentation and are not unique to Shekwan.

A study revealed that 55.8 percent dealt with symbolic representations of animals, plants and saintly persons; scenes from history composed 11.7 percent; scenes depicting filial piety made up 11.4 percent; while only 1.8 percent were purely religious scenes. Amongst the famous artists popular in Hong Kong is Kwan Yu who was working around the end of the nineteenth century. His works may be found on the ridge of the Kwan Ti Temple at Tai O, Lantau Island (about 1900), another Temple in Wanchai, and the Tin Hau Temple in Yau Ma Ti, Kowloon. Man Yu-bik was another famous artist from Shekwan. His sons and grandsons used his name for their shop after his death. Man produced the ridge decorations of the Fatshan Ancestral Temple in 1900. In Hong Kong he was responsible for the work at Tai Fu Tai in 1865.

Another specific style of southern roof ornament dominated the nineteenth century architectural practices of the region and was a style in vogue in Canton in the 1870s, although usually known as Fukien style. The technique is known "cut and paste". A hard lime base was formed of either limestone or seashell powder over an armature and porcelain sherds were set to create colourful mosaic-like patterns. An excellent example of broken pottery ornament is found the Pak Tai Temple on Cheung Chau Island. The same temple has carved brick decorations. The search for cheap materials lead to the carving of panels brick built into the end of gable walls, facing the front. The carvings although delicate are brittle, and unfortunately easily damaged. The Chen Family Academy in Canton takes the art of carving brickwork to extreme heights, where even the top levels of external walls are covered with the most intricate carving. The panels and frames on the main elevation built in 1890 are large and deeply carved. Canton was the centre of the craft although nearby Foshan also has fine examples.

The methods used in Chinese woodcarving may be classified under low relief and flat carving, perforated carving, modelling in high relief and carving in the round,

mouldings and lettering. The chisel is used with boldness and precision following the design on the paper. Sand and glass paper is rarely used so most of the carvings show the work of the cutting tool. Most work is carried out in the common Chinese fir, which gives a light, fragrant, easily worked wood, although occasionally mulberry, sycamore, maple, persimmon and satin walnut were used for carving in the highest quality buildings, along with imported hardwoods from Thailand. From the Sung Dynasty Manuals it was considered wasteful to carve away at structural timbers. Carved decoration was added to structural beams. Struts, brackets and blocks may all be carved with dragon fish, lions, symbols or domestic scenes. Eaves boards were originally intended to throw water away from the roof structure and the open rooms below but soon became a decorative element. Eaves boards are always painted due to their exposed position.

LU BAN. Carpentry was considered the greatest of the building crafts, Lu Ban, (born in 507 B.C.) the god of carpenters has been taken to be the god of all builders and thus we have all inherited some of his powers.

He was credited with creating the hand tools that revolutionized Chinese carpentry, such as the saw, the plane and the chisel.

He was gifted at carpentry and is said to once have carved a bird cut out of wood so realistically that it flew away.

If you wish to know more about the development of such skills please speak to me about the new conservation course open to you all at Hong Kong University, School of Architecture in September.

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New Life for old (and ordinary) buildings

Christopher Law
Director
The Oval Partnership Ltd

1.0 Many of the most exciting architectural spaces are housed in rather basic buildings.

The Lingotto, Turin Italy

The Fiat factory in Turin, built in 1917-23 with a concrete frame structure, used to employ 12,000 workers. The building was originally scheduled for demolition but in 1986 a decision was made to convert the building into a city within a city. There is now a hotel, a concert hall, offices, an exhibition hall and a piazza in the complex.

Schlumburger Factory, Montrouge France

Schlumburger used to be famous for its electronmechanices. The shift to electronics requires new offices, parks, restaurant, in another word, a completely new environment.

Partial demolition of the central building provides space for a new park with fabric structure.

Oxo tower and Butlers Wharf. Design Museum London UK

Old warehouses and industrial buildings at Butlers Wharf were converted into residential use with a Design Museum, restaurants, shops, etc.

The Oxo warehouse not only provides new restaurants but also low-rent housing, art and craft studios, and are managed by the local community group CSCB.

Together, these initiatives help to revitalize the South side of the river.

The combination of public and private, upmarket and low-rent are ideas which proved to be workable.

The Temporary Contemporary Art Museum LA, and PS I Institute for contemporary Art NY Long Island US

The Temporary Contemporary Art Museum was housed in a dis-used warehouse. The architect Frank Gehry had a budget of US$ 1 Million for the 62,000 ft2 premises.

The temporary exhibition is such a success that it is now a permanent museum.

PS: Stands for public school. The originator of the project lobbied the city government to grant use of old government schools and convert them into art space, not disimiliar to our Oil Street in Hong Kong.

Clarke Quay Singapore

The renovation of old shop houses and the creation of a new centre of town for both tourists and local.

2.0 The Hong Kong Situation

In many parts of the world, old buildings have found new life. The situation in Hong Kong is different. Very few buildings beyond the age of 25 have found ways to extend its life. We see decay everywhere.

Buildings, like living things, actually want to survive, and often seem to have a life of their own. They adapt to the environment.

The following pictures show how these two buildings in New Orleans changed throughout the years.

Many buildings in Hong Kong such as Man Mo Temple and the Pedder Building have gone through numerous transformations.

We need to remember the life cycle investment and the change rate of buildings. The rate differs from type to type but most buildings change all the time.

The internal use, its layout, the services have a high churn rate. The least dynamic element is the structure.

User requirements, social norms, safety standards, business demand go through enormous changes in the 50 years cycle of the structural life of a building.

Unfortunately in Hong Kong this natural adaptation is often prevented by a combination of

a) Lack of financing mechanism.

b) Rigid building and fire regulations which do not take into account the special circumstances of old buildings.

c) The upfront cash flow implication of land premium.

Much of the potential use of our existing building stock cannot be realised, except in illegal forms. This sub-optimal use of our building stock impedes our economic growth.

Property is one of the biggest investments of Hong Kong people and corporations. We deserve to get more out of our investment. We could see how important it is that we should allow not only old buildings to adapt, but also new buildings to grow and learn. In one of the classics " The life and death of the great American cities" Jane Jacobs ,once said

" Only operations that are well-established, high-turnover, standardized or highly subsidized can afford, commonly, to carry the costs of new construction. Chain stores, chain restaurants and banks go into new construction. But

neighborhood bars, foreign restaurants and pawn shops go into older buildings. Supermarkets and shoe stores often go into new buildings; good bookstores and antique dealers seldom do. Well-subsidized opera and art museums often to into new buildings. But the unformalized feeders of the arts-studios, galleries, stores for musical instruments and art supplies, backrooms where the low earning power of a seat and table can absorb uneconomic discussions - these go into old building..."

Old ideas can sometimes use new buildings. New ideas must come from old buildings.

Architects and Surveyors are ideal partners to work together, in identifying the new needs of the society and the physical solutions to cater for the demand of the new millennium.

Urban Renewal and the Community :

A Paper By Alan Macdonald (Director Urbis Ltd) to the Hong Kong Institute of Surveyors Conference on "Buildings: Our Heritage for the New Millennium (4 March 2000).

1.0 Preface

The physical and economic growth of Hong Kong from its acquisition by the British in 1841 to the present has been remarkable. Whilst this may appear to have been a process which has been rationally planned and implemented this has not always been the case. Economic growth and regional political events more often than not promoted expedient solutions.

"When will they finish Hong Kong?"

Over the years Hong Kong has consistently re-invented itself in response to its ever changing economic and trading functions. In this regard the composition and form of urban development within Hong Kong has never remained static. Renewal and redevelopment have been inherent to the development and prosperity of the territory. The question is frequently asked : "when will they finish Hong Kong?" As long as Hong Kong remains a dynamic economic force within South East Asia the answer is "probably never". Hong Kong's vibrant economy has required constant modification to the infrastructure which supports its economy. A major part of this infrastructure consists of the buildings in which the population live and work. At many points within the history of the Territory these have not been appropriate or sustainable. When change has been initiated it has been the ordinary Hong Kong citizen who has had to adapt and adjust. This paper charts this process through history and highlights the challenges future urban renewal strategies will have to address if community requirements are to be considered.

The process of Urban Renewal in Hong Kong

Urban renewal frequently tends to be thought of as something which is pre-planned or is rationally conceived in respect of instituting physical improvement to the urban environment. In Hong Kong urban renewal has often been a reactive process which has not always considered the ramifications of its actions on the structure of the urban area and its effects on the community. Typically, renewal of the built environment in Hong Kong has taken place as a result of :

- market forces which have prompted the redevelopment of land where existing buildings no longer optimise potential realisable value.
- a reaction to a natural disaster or other event which has necessitated intervention in the built environment
- intervention by government agencies or others as part of a planned renewal or upgrading strategy

This paper looks at the historic events and processes which have driven urban renewal and redevelopment initiatives in Hong Kong. As will be noted there is particular emphasis on shelter. The quest for adequate forms of shelter for Hong Kong and its people have permeated the entire history of the territory. The paper also seeks to understand the historic implications of urban renewal and redevelopment on the community.

Community in Hong Kong

In Hong Kong the community tends to have a slightly different meaning than would be ascribed to communities in established urbanisation elsewhere in the world. In Hong Kong tight knit urban residential communities have never existed to the extent of those which have grown in established industrial countries. The composition and character of Hong Kong's population has always been in continuous change. Population growth has been exaggerated not by natural growth but more by in migration of a combination of economic and political refugees and other persons who came to Hong Kong to exploit the potential gains which could be realised from its historically strong economy.

2.0 Hong Kong : the early colonial years

Hong Kong : the founding of an hybrid human settlement

Hong Kong has always been an *hybrid* human settlement. Its initial acquisition in January 1841 by Captain Elliot did not exactly meet with the full approval of the then British Government. The administration was somewhat perplexed as to what could be done with, as Palmerston put it, the "barren rock." The British Governments frustration with Elliot was reflected in his eventual demotion and posting to Texas (not the best of places to be in the mid nineteenth century).

Elliot did, however, provide Britain with a territory which enjoyed an excellent natural harbour ad a geographic location well suited to international trade. This provided the core driving force which would eventually establish Hong Kong as a mercantile centre.

Nevertheless, the problem with Hong Kong was that it had:

- very limited developable land
- no apparent natural resources sufficient to support it.
- an unwelcoming climate.
- a small indigenous population with little or no skills pertinent to the establishment of a mercantile economy.

On the positive side the new colony did have the advantage of

- a natural harbour
- a geographic location which placed the territory as a natural entrepot to Mainland China and as a hub port to South East Asia
- the opportunity to set up an administration which could promote trade unfettered by the shackles of imperial Chinese bureaucracy

Early Urban Development

The rate of urban development was nonetheless remarkable. The City of Victoria grew rapidly along the north western foreshore of Hong Kong Island. The waterfront was occupied by godowns and trading premises. European settlement was generally located to the east of the new city and along the foothills of the Peak ridgeline. The City was laid out in a modified military grid (a conventional grid was unachievable. given the prevailing topography of Hong Kong Island).

In the early 1850's riots in southern China brought a huge influx of population to Hong Kong. Expedient housing lacking adequate water and sanitation facilities developed in Tai Ping Shan District (located east of the Sai Ying Pun Area). Housing conditions were exacerbated by the sheer density of development (back to back three storey housing was separated by lanes of about five metres in width).

Early Urban Development : the Human Cost

In the early 1880's Osbert Chadwick (son of Edwin Chadwick who initiated London's first sanitation and pioneered city layout principles which were thought to avert the spread of disease) was commissioned to address the public health concerns arising from rapid urban expansion. Chadwick's report published in 1882 documented the forms of habitation and street layout common at the time. His findings were to form the basis for the first building regulations and a crude form of town planning. Many of the basic principles established by Chadwick still permeate today's building regulations. Most important in Chadwick's report was a recognition that in conjunction with basic standards of sanitation and sewerage urban dwellers had to comprehend their responsibilities with respect to personal hygiene. He also advocated minimum space standards included amongst which was a recommendation that a minimum room size of 12 sq feet should be provided for a family of four (minimum window provision standards per habitable room were also advocated in the Chadwick report). Population densities in many of the poorer areas were as high as 3,920 persons per hectare. This is higher than population densities in a number of current residential areas on Hong Kong's north shore.

No action was taken initially on the Chadwick Report. The authorities procrastinated on how such improvements were to be financed. A strong lobby from Hong Kong landowners and landlords argued that such improvements would be unaffordable and would ultimately mean a huge escalation in rents. The latter, they argued, would not be affordable to their tenants and as a consequence landlords would have to face the economic consequences of having empty units. Landlords also argued that the government had no right to impose conditions the type and quality of their properties and the level and extent to which each was serviced.

In 1883, one year after the publication of the Chadwick Report, a cholera epidemic hit Hong Kong. The authorities undertook some remedial action to control the epidemic but did nothing to control its route causes. Gradually Chadwick's recommendations on food handling, hawker control and the control of markets were gradually implemented. Nothing however was done to improve housing conditions and reduce housing densities.

By 1894 poor housing conditions coupled with inadequate drainage and a period of protracted drought brought an outbreak of plague. Initially the authorities attempted to control the outbreak by despatching sanitation parties into the affected areas. Their efforts were only partially successful and by the end of the year some 2,550 people had died from the plague.

In response the authorities

- commenced resumption and clearance of the area. Chadwick's report provided the basic guidelines upon which decantation sites west of Sai Ying Pun were to be laid out
- commenced the construction of a reticulated sewerage and water supply system

By 1898 the core of Tai Ping Shan was completely redeveloped. Blake Garden was established within the heart of the area. The residential development established around the Blake Garden was serviced by improved drainage and sanitation. Additional areas of mass housing were also constructed along the coast between Sheung Wan and Kennedy Town. Residential layout and spatial standards improved gradually sufficient to mitigate against the sort of outbreaks of disease which had affected ordinary people in the latter part of the nineteenth century.

Until the outbreak of plague the authorities had largely ignored the detail of sanitation and drainage. Housing was generally an issue for the individual. The administration saw low income dwellers as a labour pool for which they had little responsibility. In both the public and private sector intervention in housing was not considered to provide advantage. The advent of the plague made the authorities realise that aspects of urban management had to be addressed if health and sanitation problems were to be avoided. This level of understanding and action did not, however, extend to a comprehension of the implications of poor physical layout and high residential occupancy.

Life for the ordinary person during the 19th century was *'short, brutish and hard'* (a phrase coined by Disraeli to describe the lot of the English working classes in the 19th Century). The urban environment in which the labouring classes resided was constructed in an expedient manner. Popular housing development was only partially regulated. Intervention from the administration only arose in response to calamity and in extreme circumstances. Housing and the urban environment were not considered as contributory to the Hong Kong economy.

Improvement and renewal were therefore reactive processes and only gave regard to the requirements of the community insofar as there would be more widespread risks in not taking action. Redevelopment also was promoted where a realisation on sites could be generated. Gradual development of building technology meant that buildings could gradually become higher and house more people (even at improved spatial standards per unit). Renewal also took place in response to the requirements of the economy. As the economy developed new land uses and facilities were required. This promoted restructuring and progressive 'reinvention' of the city. It was not until well into the 20th Century that any real attempt was to be made to rationalise and control this process through a formal planning framework.

3.0 Urban Growth in the early 20th Century

Territorial Expansion

As Hong Kong moved into the 20th century the economy generally developed at a rapid pace. The expansion of the economy brought with it the demand for additional land within the environs of the core commercial area (Hong Kong acquired the Kowloon Peninsula in 1859 and subsequently, in 1898, acquired the New Territories on a 99 year lease). Building technologies at the turn of the century still favoured low rise development (it was not until the 1930's that the first medium rise and high rise developments started to appear). This brought a gradual rise in the density of development and more intensive use of land. As in the 19th century much of this change was promoted by economic and property considerations.

In the years prior to the second world war the Hong Kong economy was generally robust. The economy grew gradually bringing with it a new influx of labour seeking employment. This had several ramifications

- new sites had to be provided for residential development
- residential sites had to be close to places of employment given limited and affordable transportation options
- rents had to remain low to be affordable to new migrants
- multiple accommodation of units was common
- Low or even moderate rental levels limited the extent of capital developers would commit to residential development

Land Reclamation

A series of minor land reclamations had been implemented through the latter part of the nineteenth century to facilitate the development of marine and trading facilities. Reclamation projects took off in earnest in the early part of the twentieth century. In !904 a major land formation was completed in Central. This came to house new commercial and waterfront development providing the nucleus of the core of the present Central Business District.

The core of present day Wan Chai and Causeway Bay was provided by land formation completed in 1929. This was to generate new land for trading purposes and provide major new sites for medium rise generally mixed use residential tenements. These were largely developed by the private sector and religiously followed the form allowable by the then building regulations and available building technologies . Development followed a defined street pattern and enjoyed reticulated services. The creation of new reclamations provided a ready supply of land which diverted attention problems within existing areas. New land provided the flexibility to service and promote economic growth. New development on land reclamation probably did not however remove housing stress within the established residential areas of Hong Kong. Housing densities within Western reached over 2,200 persons per hectare. Civil unrest in Mainland China exacerbated population increase within the territory. By 1936 the population of the territory fell just short of 1 million persons.

Pre second World War Public Health and Planning Initiatives

In 1935 government promulgated new public health legislation to address the poor quality of housing standards in the territory. A minimum standard of 3.25 sq metres of habitable floor area per adult was specified as a basic standard. All new premises were required to have adequate latrine facilites and no building was permitted to exceed 5 storeys without special permission. The problem for such standards is that it is extremely difficult to control or enforce occupancy ratios. The huge increase in the urban population throughout the 1930's increased the demands on the existing supply and produced exceedingly high occupancy levels

A government housing commission formed in 1935 reported that overcrowding could only be alleviated with the construction of more housing. It was estimated that up to 35,000 flats would be required. The Commission also recommended the establishment of a tax by which revenue could be generated to redevelop degraded areas. It was also recommended that town planning procedures be implemented to facilitate the replanning and redevelopment of degraded areas. A Town Planning Ordinance was enacted in 1939 to effect the recommended changes. The intervention of the war undermined implementation.

The report of the commission is significant in that it marked a shift in public policy. The administration now recognised that public intervention was essential if a built environment of adequate standard providing a sufficient volume of residential development was to be provided. The resources of the community were recognised as inadequate to meet the challenges at hand.

The advent of war and post war circumstances was to exert a significant change in direction of government policy and the manner the administration addressed the urban area.

4.0 Post Second World War Urban Transition

Housing Deficit : a Post War Legacy

The war left the territory with over 8,000 domestic units destroyed and over 10,000 units significantly damaged. This represented a major depletion of total housing stock and a major concern if the population of the immediate post war period was to be provided with adequate shelter

The extent of stress on residential stock was somewhat lessened by the huge reduction in resident population as a result of the war. Subsequent to the war the population of the Territory had fallen to some 600,000 persons.

The revolution within Mainland China in 1947 generated a refugee problem of unprecedented proportions, Within 3 years of the assumption of the Communist Government to power the population of Hong Kong increased to over 2.1 million persons.

The resources of Government and the private sector were unable to cope with the resultant housing requirements. Consequently, residents had to find their own shelter solutions. These resulted in :

- intensification of occupancy of existing dwellings
- a proliferation of squatter settlements. Government broadly tolerated the construction of relatively makeshift units made from available materials.

Some moderate success was achieved by the partially government funded Hong Kong Settlers' Housing Corporation (the Corporation was only able to construct 1,500 cottage type units). The establishment of the Housing Society in 1951 provided an agency through which homes for middle income families would be constructed. Within one year the Society had managed to provide almost 9,000 units.

Shep Kip Mei : an Unprecedented Housing Crisis

The real impetus to mass housing generation resulted from the Shek Kip Mei squatter area fire, This made over 53, 000 persons homeless overnight. Government responded with an emergency resettlement programme. Six and seven storey 'H' block units were constructed in rapid succession. By the end of the 1950's accommodation for over 120,000 persons had been provided. The programme achieved the following:

- basic forms of shelter and community facilites for those in need of shelter
- general access to modern systems of sanitation and refuse disposal
- clearance of a significant proportion of squatter units

Housing and Redevelopment Initiatives.

The establishment of the Housing Authority in 1954 under a grant from government provided another conduit through which government was able to generate housing production. The success of the Authority is well documented. The joint efforts of the Housing Society and the Housing Authority was instrumental in providing over 70, 000 units by the mid 1960's.

Even at the scale of these programmes many degraded areas were left within the inner areas which were unsuited to accommodating large scale housing development. The problems of these areas were left largely on the backburner as the priority was to address immediate shelter requirements. It was far easier to create new accommodation on virgin sites rather than to address urban renewal and urban restructuring.

New Building Legislation, New Problems

In 1955 the Buildings Ordinance was radically revised to permit significantly higher densities of development than had previously been permitted. This generated a private sector building boom which lasted to 1961 (by coincidence the 1961 census indicated that there were 1.99 million persons which by the standards of the time were inadequately housed). Development consisted of very high density blocks constructed to a range of standards. Many of the tenement blocks which now cry out for redevelopment were constructed in this period. Ultimately the density of development produced by the new Ordinance was found to be fraught with problems. Although it was ultimately amended a significant amount of private sector accommodation was provided during the period.

The early post war period marked a major period of transition for Hong Kong. As the economy matured and prospered. the government was forced to address the housing requirements of a huge population lacking even basic forms of shelter. By the early 1960's rudimentary forms of shelter were generally provided for the majority of the territory's population. Hong Kong had once again reinvented itself to cater for critical shelter requirements. The community adapted to that which was provided.

Of importance was that the types of accommodation provided were affordable and within reach of those requiring shelter. The majority of units were provided within or close to the urban area . This meant that most residents had reasonable access to employment opportunities and community facilities. The majority of those housed were relatively homogenous. They tended to be in the younger age groups and had no fixed preference to location. The sole objective was to be provided with a form of shelter. Those re-housed, therefore, had a commonality of purpose and would readily accept the changes thrust upon them.

5.0 The 1960's and Beyond : Escalating Urbanisation, New Urban Challenges

In the early 1960's government embarked upon its first formal attempt at urban renewal. The Sheung Wan Pilot Urban Renewal Scheme attempted to deal with urban decay within the city proper. The scheme took almost ten years to complete and encountered numerous problems and funding difficulties. Other development routes had more appeal and could potentially provide more apparent results than those generating from urban renewal. Urban renewal was complex. It required new institutional measures and mechanisms. It required time to assemble land and to address complex community issues. The length of start up time meant that it could not address short and medium term housing requirements.

The New Town Programme : an easier route

In 1972 a Housing Programme dependent on the creation of nine new towns was launched. This provide for the potential provision of homes for over 3 million persons. It was intended that each new town would be broadly self sustaining. All towns were to be provided with a comprehensive range of social and physical infrastructure. It was planned that each town would provide a wide range of employment opportunities limiting the extent to which inhabitants would have to travel to the urban area for employment purposes.

All the new towns consist of a combination of public and private development. Each have their own commercial centres. None has been entirely successful in providing for the employment needs of its population. The advent of mass transit systems brought with them it the opportunity to travel to the urban area.

The success of the new towns is without doubt. There was a degree of resistance by some urban dwellers to move to the new towns. There is still a hard core on current housing waiting lists who are solely seeking to be re-housed within the urban area. The new towns also are inhabited by broadly similar age groups and have not as yet matured as human settlements. They are not therefore necessarily suitable environments for all elements of the urban community requiring shelter. Many could not psychologically and financially adjust to the new town environment.

Back to urban renewal

In league with public and private sector housing initiatives in the urban area the new town programme helped to attack a fundamental issue of housing shortage. Whilst the programme continues successfully Hong Kong is still faced with a pressing need to address the development and renewal of its core urban areas. Until the mid 1980's the renewal of the urban area was left second to other housing programmes. After all while much of the accommodation within the urban area was not in the best of condition it still provided the basic function of shelter. Other programmes were easier to implement as they avoided the complexities of land and property acquisition. They also generally avoided many of the human and community problems prevalent within the older degraded areas of the urban area. The advent of urban renewal in earnest was occasioned by the establishment of the Land Development Corporation in 1988. The Corporation would soon have to address many of the complexities of the community as it embarked upon its programme of urban renewal

6.0 The Land Development Corporation : a first step to a comprehensive urban renewal

The legislation under which the Land Development Corporation (LDC) was established required that it should operate under sound financial principles. Although Government would provide the Corporation with seed capital it was incumbent upon the Corporation to operate profitably. As would become clear this limited the extent and range of projects the LDC could undertake. Sites which were difficult to assemble or had complex social and community issues related to them would obviously be difficult to address. It was also likely that projects in such areas would not meet conventional viability criterion

At its advent the LDC commissioned a series of studies to determine the potential for urban renewal within specific districts within the older urban area. These were to form the basis of many of the projects it was to implement in subsequent years. Cursory examination of the studies shows that each assessed the following in detail for each of the identified study districts

- the physical character and condition of development
- the composition and use of development
- socio-economic characteristics
- development density

There was no specific analysis (and this was probably reflective of manner in which such research was undertaken at the time of each study) of the community in such areas. The Studies on Urban Development Opportunities tended to view identified sites as opportunity spaces where redevelopment schemes could be realised. A number of the studies did recognise that the community within each District contributed to the character and vibrancy of the area. Decantation schemes were advocated to retain the community in situ where practicable. Whilst retaining the community in place was a commendable objective the parameters under which the LDC was obliged to work limited the extent to which it could be practically achieved

Many of the areas in which the LDC went to work contained persons living at the economic margins of Hong Kong Society. Amongst others, these comprised the elderly on fixed or limited incomes, and the unemployed or underemployed

By the end 1998 the Corporation had succeeded in completing 15 major projects and had commenced with the planning of over 30 other projects. Essentially the projects that then LDC was able to implement were essentially ***redevelopment schemes***. They were not urban renewal in the strict sense of the meaning of the term as it has been applied internationally. The schemes were not District wide. They tended to be more about real estate than community and have been unable to promote comprehensive urban restructuring. The financial basis upon which the LDC was forced to operate also meant that it was unable to address heritage and conservation issues. These generally do not have a value added component(it must be said, however, that on individual sites LDC has taken the initiative e.g. the conservation of Western Market)

The initial schemes complemented by the LDC were strictly pure redevelopment. Landlords properties were resumed through negotiation. Rehousing was provided where required with the aid of the Corporation and other agencies and compensation packages were provided where appropriate.

Communities affected by LDC schemes have not generally been absorbed into the developments constructed. Relocation to other areas has generally occurred. Many of the schemes developed by the LDC have had a bias to commercial development. Some criticism has been levelled at the Corporation for in this respect. The concern has been that the Corporation has not replaced the housing stock it has removed. The removal of residential development also has ramifications on the physical composition of redevelopment areas and their environs altering the composition of the area as an urban space and removing reference points and land uses to which the community can relate

In recent years the LDC has adopted a more community oriented approach to redevelopment. The Corporation has given greater emphasis on providing the public with information on its proposals and has also sought to bring recruit landlords as partners in development proposals (e.g. as in the proposals Hanoi Street project in Tsim Sha Tsui). The LDC annual report for 1996/97 notes the 'profound effect' which urban renewal has on the community. The solution to this issue advocated by the report is to make the public more aware of its projects and the process of urban renewal.

The general viability and success of the schemes implemented by the LDC can be attributed to the relative ease by which its sites were obtained (the LDC had the benefit of resumption powers which were the envy of many private developers. The urban areas are now left with a hard core of sites which will be difficult to obtain and difficult to integrate into a comprehensive urban renewal framework.

7.0 The Future

The community and urban renewal today

Past upgrading of the urban environment has sought to achieve wholesale solutions which totally clear given areas to replace them with superior developments which would normally be beyond the means of those formerly living within or obtaining their living from areas which have been comprehensively redeveloped. Redevelopment also frequently comes at the cost of comprehensively altering the character of given areas. Homogenous developments are replicated on an area by area basis which area incapable of defining a distinctive urban character on a District by District basis

Hong Kong is now left with a hard core of degrading accommodation. As time goes on the cost of addressing renewal escalate. The extent of community problems similarly escalate. The remaining core of degraded accommodation does have very significant functions:

- It provides a cheap source of accommodation for those on limited incomes (including the elderly)
- It provides a source of accommodation close to employment opportunities eliminating the need for significant expenditure on transport from more remote locations

- It provides trading opportunities for retailers whose enterprises work on small margins and who can only tolerate small rents

Removal of older stock without replacement provides major problems for the community. To date urban renewal initiatives have not addressed such issues and requirements.

The number of elderly persons as a proportion of the population of Hong Kong has never been so high. Many of the current elderly have very limited support bases and are dependent on access to support systems and access to cheap accommodation. As the longevity of the population increases the elderly will come to constitute a very significant proportion of the total population. They will represent a cohort group with their own very specific requirements which will require appropriate economic, social and physical support systems.

In many of the older districts redevelopment can be traumatic for many of the elderly. They lose reference points and the physical framework which defines their lives. Recent research by the University of Hong Kong found that many of the elderly within certain urban areas found it traumatic to move from the District in which they lived. Many elderly persons tended to live almost on a communal basis providing mutual psychological and support.

Urban renewal schemes implemented so far have a degree of the character of the history of redevelopment in Hong Kong. They tend to be imposed rather than negotiated and have much to do with value rather than community

The Urban Renewal Authority : A New Direction for Urban Renewal?

Government has recently made a policy commitment that urban renewal should take a new direction. It is presently planned to disband the LDC and somehow amalgamate it into a new look authority called the Urban Renewal Authority (URA). Government envisage the URA as a dynamic organisation charged with sweeping powers to acquire and redevelop and upgrade degraded parts of the urban area. The recent Chief Executive's policy speech revealed that the URA is also likely to enjoy preferential treatment with respect to the payment of land premiums on redevelopment sites.

The public consultation documents and draft legislation published so far in connection with the URA do not give particular mention on how the requirements and needs of the community are to be addressed. The 1999 URA consultation document sees the role of the Authority as being to:

- improve the environment and physical and social infrastructure available to the population
- achieve better land utilisation
- promote management of the built areas to prevent decay
- preserve buildings of historic, cultural and architectural interest

Summing Up

If the new Authority does not take into account community needs and aspirations it will simply fall into the trap of being concerned more about real estate rather than people. Urban renewal needs to be concerned about sense of place, about balance in the physical and social environment and about producing a comprehensively planned and considered urban environment to which its inhabitants can relate and function. If these aspects are not considered Hong Kong is in serious risk of producing a sterile urban environment which is simply expedient, fails to address community equirements, and, is consequently devoid of character.