



New courtyard houses of Beijing: direction of future housing development

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The aim of this study is to evaluate the physical form of the phase one new courtyard housing prototype in Juer Hutong ('Chrysanthemum Lane') of Beijing, and propose further design development for the new courtyard type. In doing so, Heliodon experiments were carried out, using architectural simulation models, to test sunlight penetration during different times of the day and different times of the year, to find the optimum courtyard proportion of plan form and building height. Furthermore, two architectural models of different courtyard sizes were created and studied, to compare their density value and plot ratio. Comparative studies were also made of four different housing types built in Beijing since 1949. The results show that the new courtyard housing type not only achieves high density, but also provides more meaningful residential lifestyle when looked at from social, cultural, architectural, environmental, and historical perspectives.

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Introduction

People need green spaces. They want to feel in touch with nature and away from the 'hustle and bustle.' Beijing has a number of city parks, and at least one is located in each urban district. They are peaceful refuges from the toughness of a working life, sanctuaries for the enjoyment of the art of landscape; they are the places for family recreation in the weekends, but too far for the majority of people to reach daily. Green areas are created here and there in the city; they sit mostly along the middle of two traffic roads and have a few dozen trees, which function only as decorations to the street scene rather than as places for people to enjoy their shade.

Children need areas for play. Alexander *et al* (1977) argued that 'If children don't play enough with other children during the first 5 years of life,

there is a great chance that they will have some kind of mental illness later in their lives' (p. 342). They further affirmed that adults need areas for sport; the human body wears down when it is not used. 'There is ample empirical evidence that physical health depends on daily physical activity' (p. 364). And the elderly need areas for morning exercises such as Tai-chi, to maintain physical and psychological well-being. But where can they find these spaces?

The New Courtyard Houses of Beijing seem to be the most appropriate solution. People can be freed from the previously incrementally over developed old courtyard houses or the isolated new apartments, and immediately enter a piece of green land with trees, water, and flowers, beautifully designed and arranged. Balconies and gallery corridors can be built on the upper levels for viewing the scenery inside the courtyard (Figures 1 and 2).

The essence of the courtyard house lies in its definition of an interior landscaped realm. Its form suggests an inward, closed world, separated

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Figure 1. Juer Hutong new courtyard housing, Beijing.



Figure 2. Juer Hutong new courtyard housing, Beijing.

from the street. The symbolism of the courtyard is an illusion of an infinite space, an impression enhanced by its isolation. Its myth of the hollow form embodies an 'Island of the Blessed,' and approximates to the archetype of the mother, who is a symbol of femininity (Blaser, 1985). The courtyard offers air, light, and seclusion. It provides the desired privacy and peace, making the environment an oasis of tranquillity, at the same time as if creates a strong sense of territory.

The courtyard is also a place for contemplation. Humans are not only rational beings, they are also contemplative (Polyzoides *et al*, 1992). We think of

contemplation as a religious exercise, as prayer in church or monastery, or perhaps as quiet meditation in a park or garden. But the basic unit of human activity for most people, and for society as a whole, is the family (Chermayeff and Alexander, 1963). The traditional courtyard house of China was for one family. Therefore, a courtyard house can be a very convenient location for contemplation to take place.

The Chinese have been living in their traditional courtyard houses for thousands of years (Figures 3 and 4). The earliest type of courtyard house in China dates from 3000 BC (Blaser, 1985). Beijing



Figure 3. Aerial view of well-preserved traditional courtyard housing in Beijing.



Figure 4. Well-preserved traditional courtyard housing in Beijing.

has been the capital of China for the last 800 years. This imperial city has a unique pattern of courtyard housing embedded in its urban fabric, and the traditional courtyard house was the *only* architectural form in Beijing for centuries (Chatfield-Taylor, 1981).

The classical courtyard houses have many advantages in the creation of a pleasant living environment, such as allowing more sunlight penetration and natural ventilation than the residential tower blocks, and providing a green space for the family and social gatherings. These

aspects meet our current search for a sustainable urban form.

In a contemporary discourse on sustainability, Chawla (2002), Lyle (1993), and Orr (2002) called for an 'ecological design.' Farmer and Guy (1999) argued that one of the ways to achieve environmental sustainability is through the use of natural ventilation to reduce energy consumption. Brundtland (2005) belied that only if we solve 'social and economic problems can we solve environmental problems.' Through his study, Khattab (2002) gained 'important lessons about

the mutual interaction between culture and architecture, and the effect that each has on the other' (p. 1). Hargreaves and Webster (2000) also stressed the importance of social and cultural sustainability for existing communities. Capra (1994) contended, 'The central challenge of our time is to create and maintain sustainable communities, that is social, cultural, and physical environments in which we can satisfy our needs and aspirations without diminishing the chances of future generations' (p. 1). Wheelwright (2004) considered that sustainability describes a 'cultural practice' which is still very much in the making, because according to Merchant (1990), culture is dynamic and primary, whereas nature is passive and secondary – 'nature is simply the space wherein cultural change takes place.' Wheelwright further argued that 'this identity crisis underlies all environmental thinking and suggests that the issue of the environment and the place of sustainability is fundamentally a cultural problem not a natural one' (p. 3). In Wheelwright's view, architecture can bridge the natural-cultural divide since architecture is culturally conceived, earth-changing artifacts stuck in the ground in the wind, rain, and sun. As such, architecture is viewed interdisciplinary which draws as much from the social sciences as the natural sciences. Sustainability is about remembering where we come from and rethinking architecture at its roots.

Over the last few decades, the traditional courtyard houses of Beijing have been experiencing rapid deterioration, and there have been heated debates, nationally and internationally, as to whether Beijing should demolish or preserve them. The traditional courtyard housing type was the product of particular historical situations; it no longer properly serves modern living requirements. The decline of the courtyard, the appearance of the 'chaotic-yard,' or even 'chaotic-no-yard' in the Old City of Beijing has proved this (Figures 5 and 6). Also, it would be impractical to rebuild these one-storey courtyard houses with the aim of accommodating housing needs of everyone. The total population of China has tripled since 1949, according to the 2000 census.

There have been a number of research studies on neighbourhood renewal in the Old City of Beijing (eg Wu, 1992, 1994, 1999; He, 1993; Lü, 1993; Broudehoux, 1994; Tan, 1994, 1996; Zheng, 1995; Li, 1998; Han, 2001; Zhang *et al*, 2003; Hu, 2004).

However, no study of an optimum new courtyard form, based on the traditional courtyard proportions, no density comparison of different courtyard sizes and of different housing types in Beijing has been found (Zhang, 1994). Thus this research has attempted to fill this knowledge gap.

The Juer Hutong¹ ('Chrysanthemum Lane') new courtyard housing phase one experiment won six awards, including the *World Habit Award* in 1992 (Wu, 1999). This prototype, the first of its kind, was completed in 1990 on an existing old courtyard housing site. The method is to demolish old, deteriorated, one-storey courtyard houses, to trace their original layout on site, and to build 2–3-storey new apartment blocks around the courtyard, aiming to improve the physical environments of those particular neighbourhoods, and meanwhile to contribute to the formulation of rehabilitation strategies for this historical area as a whole through planning and design as well as onsite experiments (Figure 7). In this strategy, the old trees are preserved, still providing shade in summer for the local residents who continuously tell tales about the old courtyard to the new generations. The integration of the house with the site is then maintained due to the compatibility between the new courtyard houses and the old courtyard system in the city. It was hoped that by re-accommodation on site, the original neighbourhood community structure would be maintained (Wu, 1992).

Led by Professor Wu Liangyong, the research team at the Institute of Architectural and Urban Studies of Tsinghua University of Beijing designed the Juer Hutong new courtyard housing prototype. These new courtyard houses exemplify the crucial order and social structure which existed in Beijing, and which many urban design efforts currently lack. It demonstrates, through phased remodelling (Figure 8) and rehabilitation, that the originality of the traditional courtyard house with its distinct local features can still be maintained while living conditions have been improved.

The concept and realization of the new courtyard house is powerful and successful. It not only achieves high density, but also has the capacity for communal facility provision and good privacy

¹The word *hutong*, for 'lane,' was derived from the word 'well' in the Mongolian language during the Yuan dynasty (1279–1368). Source: Wu, 1999; Zheng, 2005.



Figure 5. Deteriorated courtyard housing in Beijing.



Figure 6. Deteriorated courtyard housing in Beijing.

and security control. The courtyard creates a comfortable outdoor environment for the local residents, which is essential for the 21st century modern living.

However, after having studied the phase one experiment model, it becomes obvious that some adjustments to the design of the new courtyard house are required. The purpose of this research is to evaluate the physical form of the phase one new courtyard housing prototype in Juer Hutong ('Lane') of Beijing, and propose further design development for the new courtyard type.

Discussion

A key feature of the new Juer Hutong is the use of the courtyard: two large ones and two small ones shared by 46 households. Why are they different in size? Wu (1999) revealed that in order to raise the floor-area ratio,² the research team had to

²Floor-area ratio is defined as the amount of floor area built on a certain area of land; it reflects the intensity of the site's use with regard to building. Planning for a floor-area ratio can control building density, population density, and environmental quality. The higher the floor-area ratio, the greater the profits the developer can make. *Source:* Wu, 1999.



Figure 7. Aerial view of the new courtyard housing in Juer Hutong. Photo by Y. Chen.

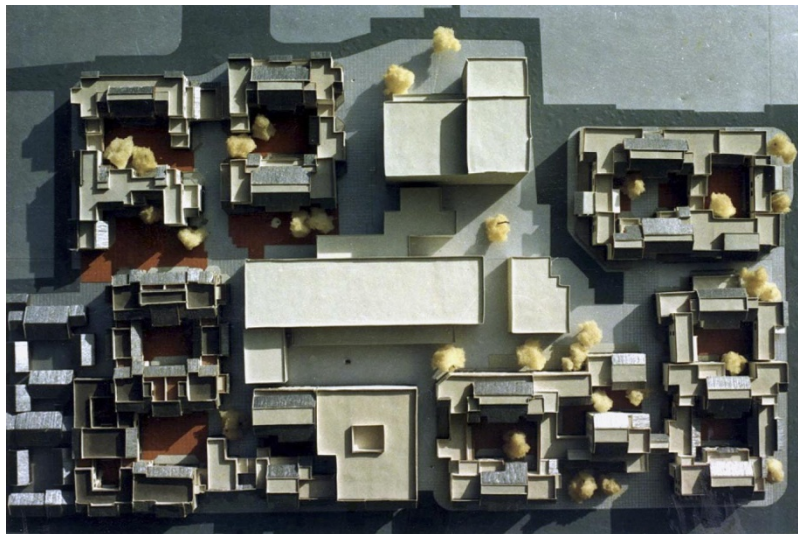


Figure 8. Juer Hutong site model of phase 1, 2, and 3 experiments. Photo by Y. Chen.

reduce the courtyard size during the design process. After seeing the phase one experiment model, my immediate questions were, 'Are both the large and small courtyards working? How large should the courtyard be so as to make it work environmentally and climatically?' Marcus and Sarkissian (1986) maintained that if the courtyard space is too narrow, it may generate a feeling of privacy invasion for the residents whose windows face each other. It will also probably be over-shadowed for most of the time during the year. Too much space can be as much a problem as too little. Neighbours on opposite sides of this area will probably never get to meet each other.

Juer Hutong phase 1 Heliodon³ experiment

To test the performance of the new courtyards in Juer Hutong phase one experiment, an architectural simulation model was made at 1:500 scale (Figure 9) and a Heliodon experiment was carried out in a laboratory at Oxford Brookes University, aiming to examine the shadow movement inside the courtyards during different times of the year and different times of the day, so as to draw a

³Heliodon: A mechanical device, used in architecture, for demonstrating the sun's motion relative to a building. *Source:* Science Fair Project Dictionary, 2005.

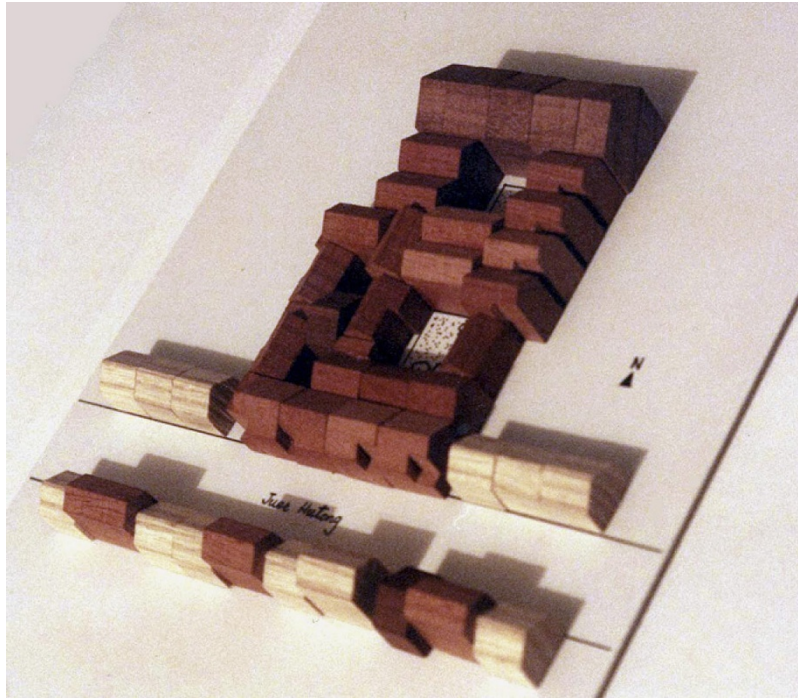


Figure 9. Sample of the Juer Hutong Phase 1 Heliodon experiment: Equinox 12:00 noon.

tentative conclusion about the optimum courtyard form. Data were recorded during this experiment (Table 1).

Analysis of data

Despite the size of the courtyards, 12:00 noon of the summer solstice is the only time of the year that the courtyards are not affected by overshadowing. The small courtyards in this prototype do not seem to work; they are always overshadowed at all times of the day all year round. This finding confirmed the post-occupancy evaluation by the residents living in the ground floor apartments around the small courtyards (see Wu, 1999). In the winter solstice, at all times, the large courtyards are also totally overshadowed. At this stage, it would be interesting to compare how overshadowing affected the traditional courtyard, surrounded by one-storey buildings, with its new adaptation, surrounded by 2–3-storey buildings with the same courtyard dimensions in plan.

Comparative Heliodon experiment

Two more architectural simulation models were made at 1:500 scale (Figure 10) for this comparative Heliodon experiment. Assuming that the new

courtyard houses are built exactly to the same layout as the traditional ones, with the same courtyard dimensions in plan, data were recorded during the second experiment (Table 2).

Analysis of data

Despite the height of the surrounding buildings, 12:00 noon of the summer solstice is the only time of the year when the courtyards are not affected by overshadowing. In the winter solstice, at all times, both the traditional and the new courtyards are always totally overshadowed. Overall, the new courtyards are more overshadowed than the traditional ones, because of the increase in the height of the surrounding buildings.

Arguably, the shadow projected onto the trees inside the courtyards helps to create an interesting silhouette reflected onto the internal courtyard walls. The shadow is also the protection against Beijing's hot summer sun. One may debate how much shadow is desirable, but it is important to achieve a healthy balance between light and shadow.

The limitations of the two experiments are that the standardized simulation models at 1:500 scale may not accurately reflect the complexity of the

Table 1 Data of the Juer Hutong Phase 1 Heliodon experiment

Courtyard sizes	Big yard Small yard	15 m × 13 m (12 m × 10 m in green grass) 7.5 m × 6.5 m (6 m × 5 m in green grass)
Summer solstice	9:00 am	Big yard – 40 per cent shadowed Small yard – 100 per cent shadowed
	12:00 noon	Big yard – 0 per cent shadow Small yard – 0 per cent shadow
	4:00 pm	Big yard – 75 per cent shadowed Small yard – 100 per cent shadowed
Equinox	9:00 am	Big yard – 95 per cent shadowed Small yard – 100 per cent shadowed
	12:00 noon	Big yard – 40 per cent shadowed Small yard – 100 per cent shadowed
	4:00 pm	Big yard – 100 per cent shadowed Small yard – 100 per cent shadowed
Winter solstice	9:00 am	Big yard – 100 per cent shadowed Small yard – 100 per cent shadowed
	12:00 noon	Big yard – 100 per cent shadowed Small yard – 100 per cent shadowed
	4:00 pm	Big yard – 100 per cent shadowed Small yard – 100 per cent shadowed

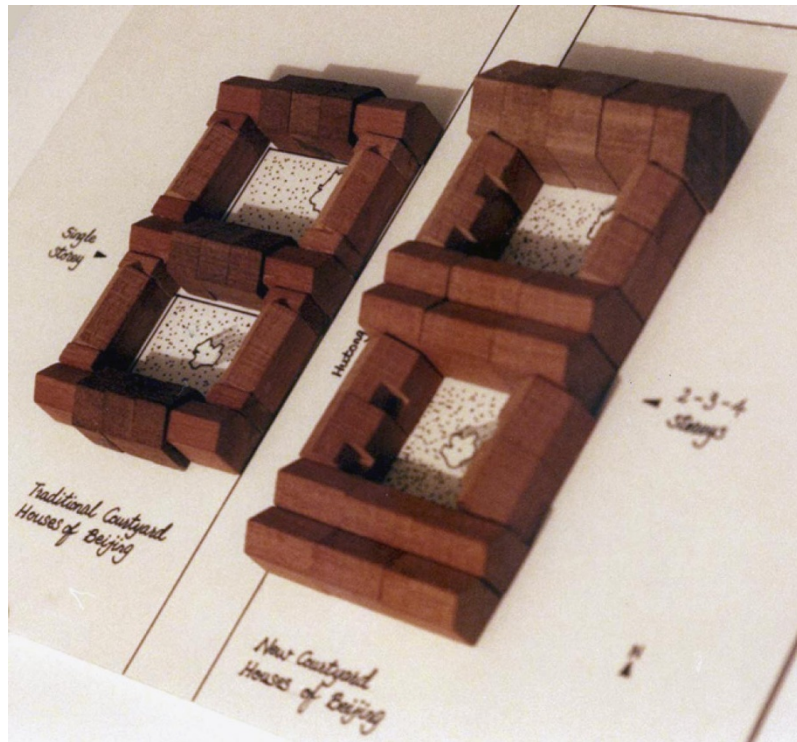


Figure 10. Sample of the comparative Heliodon experiment: Equinox 12:00 noon.

building forms in reality, such as the balconies and terraces that alter building depth and height in various parts and thus may help to increase or decrease the sunlight penetration in some areas of the courtyards.

Courtyard form

Assuming that the amount of sunlight penetration in the traditional courtyard is time-tested and is thus desirable to achieve, the new courtyard

Table 2 Data of the Juer Hutong comparative Heliodon experiment

Courtyard sizes	Traditional courtyard (old yard) New courtyard (new yard)	15 m × 20 m (1-storey of surrounding buildings) 15 m × 20 m (2–3–4 storeys of surrounding buildings)
Summer solstice	9:00 am	Old yard – 20 per cent shadowed New yard – 40 per cent shadowed
	12:00 noon	Old yard – 0 per cent shadow New yard – 0 per cent shadow
	4:00 pm	Old yard – 30 per cent shadowed New yard – 50 per cent shadowed
Equinox	9:00 am	Old yard – 70 per cent shadowed New yard – 90 per cent shadowed
	12:00 noon	Old yard – 40 per cent shadowed New yard – 50 per cent shadowed
	4:00 pm	Old yard – 80 per cent shadowed New yard – 95 per cent shadowed
Winter solstice	9:00 am	Old yard – 100 per cent shadowed New yard – 100 per cent shadowed
	12:00 noon	Old yard – 100 per cent shadowed New yard – 100 per cent shadowed
	4:00 pm	Old yard – 100 per cent shadowed New yard – 100 per cent shadowed

dimensions in plan have to be increased to achieve the proportions of the traditional courtyard (Tables 3 and 4).

In terms of the balance between density and building height, Alexander *et al* (1977) have rightly and explicitly stated: 'In any urban area, no matter how dense, keep the majority of buildings four storeys high or less. It is possible that certain buildings should exceed this limit, but they should never be buildings for human habitation' (p. 119). In fact, most of the old residential quarters of Beijing are within the 9-metre height control zone established by the municipal government. Four storeys is the highest limit for a building in these areas.

Density comparison

If the courtyard area is enlarged and the building depth remains, the plot area will increase, and the density may decrease. The argument would be: if a 'little drop' in density can be traded off by a larger, but climatically better performing courtyard, then this 'drop' will be worthwhile. To investigate the density variation due to the increase in courtyard dimensions in plan, it is necessary to establish two models to represent the new courtyard house type, with different courtyard sizes (Figures 11 and 12). The method is to

Table 3 Courtyard proportions

	Height 1	Width 3	Length 4
Traditional courtyard	5 m	15 m	20 m
New courtyard	6.5 m	15 m	20 m
New enlarged courtyard	6.5 m	19.5 m	26 m

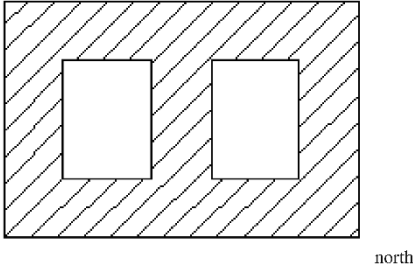

use the traditional courtyard proportion as the basic criteria (Table 3).

In the above two models, Model A has two courtyards of 20 m × 15 m each, and Model B has two courtyards of 26 m × 19.5 m each; the building depth is 10 m in both cases. Assuming that each apartment unit is 60 m² with 2-bedrooms (concluded from Juer Hutong phase one experiment), and each bedroom is occupied by two persons, the density value and plot ratio of the two proposed models were calculated (Table 5).

Analysis of data

The increase in courtyard dimensions in plan which resulted in the increase in plot area will *not* significantly affect the absolute density value because of the increase in number of households, which leads to the increase in number of persons in the courtyard neighbourhood. The above two models A and B have a density of 670 persons/ha and 657 persons/ha, respectively.

Table 4 Suggested physical dimensions for the new courtyard

Courtyard characteristics	Courtyard dimensions
Shape in plan	Squarish rectangular, avoid long and narrow
Orientation	
Sectional profile	
Number of floors	2–3–4
Floor-to-ceiling height	2.3 m–2.5 m (0.4 m for threshold, 0.2 m for floor)
Height of the courtyard (average, from ground to eaves)	6.5 m or 9 m (depending on the height of the surrounding buildings)
Proportion height: width: length (as the traditional courtyard)	1:3:4 or 1:3:5
Size in plan (optimum)	19.5 m × 26 m/19.5 m × 32.5 m; or 27 m × 36 m/27 m × 45 m (depending on the height of the surrounding buildings)

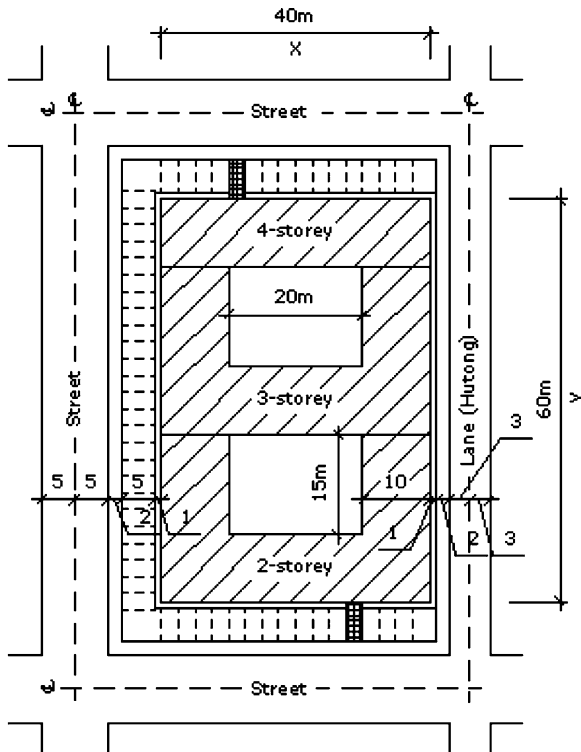


Figure 11. Model A: before enlargement. Not to scale, street: 10 m, lane: 6 m, pedestrian: 2 m, car park: 5 × 2.5 m, service route: 1 m.

This discovery indicates that the new courtyard housing type not only achieves a relatively high density compared with three other housing types constructed in Beijing since 1949 (Table 6), but also has more potential developmental advantages when looked at from social, cultural, architectural, environmental, and historical perspectives.

This result confirmed the findings on land use forms conducted by the Martin Centre of Architectural and Urban Studies at Cambridge University that, using the same area of land, the courtyard form (or perimeter block) is the most economical in terms of land use (Martin and March, 1972). It also echoed what Tsinghua University research team found: it is possible to achieve a high floor-area ratio with a 2–3-storey courtyard building form, even in this 9-metre height restricted zone (Wu, 1999, p. 124).

The limitations when applying this abstract theoretical model to the specific local conditions are that the existing layout of the old courtyard houses may not permit the increase in the new courtyard size if the method of building the new courtyard houses is to ‘trace their original layout

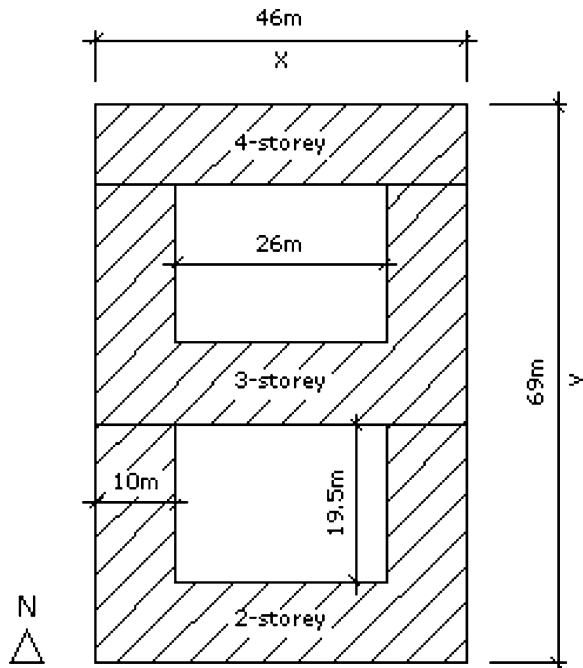


Figure 12. Model B: after enlargement. *Note:* Diagrams showing the increase in courtyard dimensions in plan (according to the traditional courtyard proportion: 1:3:4) for a climatically better performing courtyard.

on site.’ The existing infrastructure and street/lane patterns may also present problems in the new courtyard achieving its optimal dimensions. However, this theoretical model could be applied in other new housing development areas of Beijing and other cities in China.

The research findings may help the Beijing Municipal Planning Bureau, Beijing Municipal Housing Reform Office, and other related institutions to re-evaluate the benefits of this new courtyard housing type, and to make informed decisions about completing the phases 3 and 4 of the Juer Hutong project; its master planning has been completed, but construction work has been banned since 1994. It may also re-awaken academic interests in conducting more research on the new courtyard housing type. It is my sincere hope (and may be my utopian dream) that, these new courtyard houses will be built all over the City of Beijing in the foreseeable future.

Recommendations

I visited the new courtyard housing neighbourhood in Juer Hutong of Beijing in 1995 and

Table 5 Density value and plot ratio calculations

Model A	Model B
Built floor areas ‘A’: A ₁ =1400 m ² (2-storey areas) A ₂ =2100 m ² (3-storey areas) A ₃ =1600 m ² (4-storey areas) A=5100 m ² (total)	Built floor areas ‘A’: A ₁ =1700 m ² (2-storey areas) A ₂ =2550 m ² (3-storey areas) A ₃ =1840 m ² (4-storey areas) A=6090 m ² (total)
Number of households: N=Total area/unit area =5100/60=85	Number of households: N=Total area/unit area =6090/60=101.5
Number of persons: Persons=340	Number of persons: Persons=406
Site area=X × Y=2400 m ²	Site area=X × Y=3174 m ²
Plot area=5074 m ²	Plot area=6175 m ²
Density=No. of persons in block/plot area (hectare)	Plot ratio=Site area/built floor area
Model A Density=670 persons/ha Plot ratio=1:2.13	Model B Density=657 persons/ha Plot ratio=1:1.92

observed that the courtyard was, indeed, a peaceful and quiet place. However, it was not used as much as it should be. There was hardly any resident inside the courtyard while I was there (3:00–4:00 pm during a week day in March), and there was no recreational facilities provided in the courtyard either. The space was randomly parked with bicycles and hung with washed clothes. It was disappointing. This made me ponder about better design for the courtyard neighbourhood environment so as to maximally facilitate social interaction, a capability that is manifested in its physical form.

Courtyard design

The courtyard as a space, its landscape design should be treated as an integral part of the overall site design rather than as some place ‘purposely left open with a few trees.’ Several housing evaluation studies in the West show that the exterior appearance of individual dwellings matters less to residents than the layout and landscape of the scheme as a whole (Marcus and Sarkissian, 1986). To fulfil the command of the courtyard as an ‘outdoor parlour for recreation’ and the ‘communal living room,’ more work should be carried out on the design of the courtyard, with hard and soft landscape, so that it will generate a substantial variety of places and multiply the possibilities of diverse experiences within the dwellings.

Table 6 Comparison of the four different housing types built in Beijing since 1949

Housing types	Facility provision per household	Threshold public/private	Security control	Density (pers/ha)	Neighbourhood community	Environmental qualities	Orientation of buildings	Relationship with urban structure
A: Socialist 'Super Blocks' (3–5 storeys) 1950s and 1960s	Communal kitchen and bathroom; central-heating provided	Public corridors of each floor as semi-public/private space	Gates of the building block unlocked at night	350	Public corridors and shared kitchens made it easy for social interaction	Open-ended courtyard normally used only for bike parking	Unresponsive to the orientation of the site	Incompatible with the existing courtyard system of the city
B: Parallel 'Walk-up Apartments' (4–6 storeys) 1960s and 1970s	Kitchen, bathroom, and central-heating provided	Landing area of each floor as the threshold	Gates of the building block unlocked at night	500–600	Isolated household units, difficult in social interaction	Open-ended courtyard normally used only for bike parking	Unresponsive to the orientation of the site	Incompatible with the existing courtyard system of the city
C: Residential Tower Blocks (8–20 storeys) 1970s and 1980s	Kitchen, bathroom, and central-heating provided	Circulation access corridor of each floor as the threshold	Gates of the building block unlocked at night	1300–1500	Isolated household units, difficult in social interaction	Shadow and high wind pressure affected local areas, created difficulty and isolation for children and elderly	Unresponsive to the orientation of the site	Destroying the skyline of the city and creating visual discomfort
D: New Courtyard Houses (2–3 storeys) 1990–	Kitchen, bathroom, and central-heating provided	On the ground floor: frontage garden and fence as the threshold, on the upper floors, landing area as the threshold	Gates of the courtyard block locked at night; reasonably secure	900–1000	Courtyard helped promoting lively neighbourhood and good social integration	Courtyard with trees and planting inside generated pleasant green and natural environment	Responsive to the orientation of the site	Compatible with the existing courtyard system of the city, well-fitted into the urban fabric

Note: Household usually comprises 1–3 bedrooms and a hall-room/living and dining room.

Artistic approach

The richness in the design of the classical Chinese gardens in Suzhou and Hangzhou can be the primary source of inspiration for the design of the new courtyard houses in Beijing to beautify the living environments, as well as to enhance China's cultural identity. Is it possible for the new courtyard house to combine both the sense of order of the traditional Chinese courtyard house and the sense of organism in the traditional Chinese garden (Figures 13 and 14) to create more pleasing living environments?

Art, as well as architecture, is not self-contained or independent, but about things outside itself: politics, ideas, morals, emotions, institutions, and history. Art has meaning, it is related to the great world outside art narrowly defined, and it lends support to high moral principles, affects urban layout, the external appearance of buildings, and their interior plans. Art seems to possess the capacity to elevate both taste and morals. To adorn a city with works of art is to uplift its inhabitants, to educate people through their eyes, form their taste, polish their manners, and elevate their soul (Olsen, 1986).



Figure 13. Wang Shi Yuan (Master-of-Nets Garden), Suzhou.



Figure 14. Wang Shi Yuan (Master-of-Nets Garden), Suzhou.

Functional approach

People need self-expression and exchange. A city is a place of exchange, not only of information, friendship, culture, knowledge, but also emotional and spiritual exchange (Engwicht, 1992). The courtyard as a basic unit of the city should be capable of providing the opportunities for this exchange to occur. Communal areas, such as a library, study room, meeting room, leisure centre, kindergarten, swimming pool, laundry, workshops, gym, public seating, and so on if provided within a courtyard compound, will help facilitate this social exchange. To provide this, special consideration should be given to the people who have reached different stages in life: the children, the teenagers, the adults, the elderly, and the disabled, all needing different facility provision. All these spaces should be arranged on the ground floor around the courtyard. These public services have not been integrated into the Juer Hutong new courtyard housing prototype, but should be in future housing renewal projects.

Special occasions

Chinese culture has undergone a sophisticated development process throughout its 5000-year written history. Some traditional festivals, such as the 'Spring Festival' and the 'Mid-Autumn Festival,' should be respected and taken into full consideration when designing the new courtyard house, to enhance China's cultural continuity. These festivals can become good opportunities for residents to become acquainted with others in the neighbourhood. The courtyard should be furnished with adequate seating, tables, and decorations for these special occasions, even if temporarily.

Housing is clearly more than 'a roof over one's head.' It is crucial for the design team to regard these amenities as an essential part of community design, to enhance all aspects of urban life in the new courtyard housing environment.

Urban design

The unique lifestyle of Beijing lies in the tradition embedded in its everyday living. Coming from such a place, I always hold a fond memory of the morning breakfast there: a bowl of Soya-bean milk, together with a steamed (or fried) bun stuffed with sweetened red bean paste, or a baked

wheat cake mixed with sesame paste. Davies (1981) also observed that 'knots of workers prop their bikes up and gather at the sales-windows of snack-shops, paying a few cents for a bowl of Soya-bean milk and a few deep-fried, twisted dough-sticks. Not everyone has time to prepare breakfast at home.' It is a pity that this kind of traditional living is disappearing in Beijing due to 'modernization.' Therefore, it is vital for the urban designers to save Chinese tradition, perhaps by designing a place like a teahouse at the corner of each urban block, with some outdoor seating, serving simple food and drinks (Figure 15). When these facilities are present, this offers something special to the lives of people who use them. The teahouse can also become a local landmark that helps to create 'a sense of place.'

In many European cities and towns, there is a street café in every urban block. Such a place provides social glue for the community and helps to increase neighbourhood identity (Figure 16). It is one of the few settings where a newcomer can start meeting people who have lived nearby for many years (Alexander *et al*, 1977).

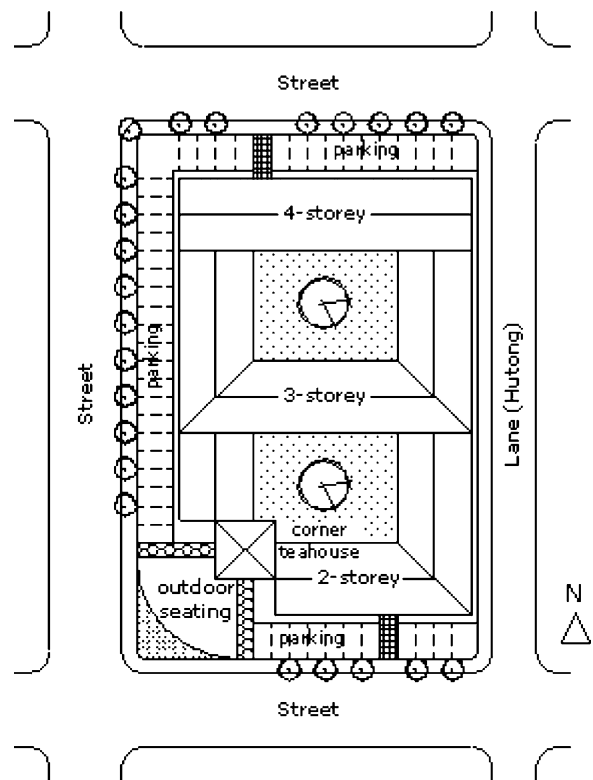


Figure 15. Proposed new courtyard block with corner teahouse and outdoor seating.

Maintenance and management

Beijing is in its infancy of a housing reform: from a state housing allocation system to a socialist market economic one. But the mechanism is far from having reached maturity. As Wu (1999) noted, the newly established Housing Cooperative did not take over responsibility for service, property management, or maintenance in the neighbourhood; there were many post-occupancy problems. Wu asserted that an effective means for resident participation and management has yet to be found. Marcus and Sarkissian (1986) discovered that good maintenance is closely correlated with overall resident satisfaction, especially the maintenance of communal open space. Native species, such as pine, plum blossom, red cedar, jujube, pomegranate, yulan magnolia, Chinese flowering crab-apple, crape myrtle, Chinese wisteria, and lilac, minimize maintenance, and existing trees should be retained, and, if possible local residents employed in maintenance work. An adequate operating budget is needed to maintain the proposed landscape. Where financially and socially appropriate, cooperative ownership could be encouraged. Where residents pay a specific maintenance fee, all households should have equal visual and functional accessibility to the facilities they are paying for.

Marcus and Sarkissian (1986) further indicated that good management is essential to the success of any multifamily housing development. Local,

decentralized, responsive, and flexible management structure is more efficient than large, impersonal, centralized bureaucracies. Design can facilitate or inhibit good management. Design should take account of project management and repair policies. Designers and management team should prepare a manual, in which tenant responsibilities on site should be clearly spelled out. Locate the management office at a central visible point. Ensure access to the office by both occupants and outsiders. Consider increasing the amount of resident participation in management. The greater the level of responsibility assigned to each inhabitant, the easier will be the task of management (Figures 17 and 18).

The experience of the Juer Hutong new courtyard housing rehabilitation project shows that urban renewal in the Old City of Beijing is a very complicated issue and a daunting task, both from the socio-economic and technical points of view. A multi-disciplinary approach to housing regeneration is necessary, requiring a high degree of collaboration between architects, urban designers, city planners, and local residents (Wu, 1994). These efforts are worthwhile; because vernacular architecture is so deeply rooted in local life, then it must have an intrinsic value for survival and revival. As Rapoport (1983) maintained, since many human activities and behaviour have not changed much since the beginning of humanity, so the small units of settlement pattern as exemplified by the traditional housing type may



Figure 16. Street pub in the summer, Brighton, England.



Figure 17. Deteriorated hutong ('lane') in Beijing. *Note:* In 1949, Beijing had over 7000 hutong. In the 1980s, the number of hutong reduced to about 3900. Today, there are only a little more than 1500 hutong left in Beijing, as Zheng (2005) noted.



Figure 18. Renovated hutong ('lane') in Beijing.

be more satisfactory than the newer ones. In this sense, the new courtyard housing type, the contemporary adaptation of the traditional one, may have a more sustainable future.

This research is purely an academic study. In reality, there are many practical matters to be dealt with during the rehabilitation process, such as building infrastructure for gas, water, and electricity supplies; installing storage boilers for

central heating systems, setting up sewage drainage lines, and obtaining funds and subsidies to guarantee that a certain number of original residents return to the redeveloped neighbourhood, and so on. Thus this research has only touched upon 'a tip of an iceberg.'

Further research will be warranted into standardization of the new courtyard system to reduce the design and construction cost; the evaluation of

the layout and structure of the urban block; and ways to promote resident participation in post-occupancy maintenance and management (Wu, 1994, 1999). Any development in human history seems to have followed a spiral improvement process. Housing is no exception. The poet T.S. Eliot (1968) has well concluded in three lines:

Time present and time past
Are both perhaps present in time future
And time future contained in time past.

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