Clare Design's Cotton Tree Housing development, can be seen as typical of recent Australian housing projects in its cost effectiveness and environmental sustainability.

Housing the world

The house is the first architectural sign of civilisation. The type varies according to climate and culture: from 24 hour corporate housing in Tokyo, Japan to the "sweat equity" social housing of downtown Santiago, Chile. Joshua Levine in Kuala Lumpur, Michael Rowe in Paris, David Cohn in Madrid, Oliver Hamn in Berlin and Judith Davidson in New York report on some of the distinctive international variations of this ubiquitous architectural type.

Asia Pacific

Australia

In Australia, the majority of housing developments can be divided into two groups, urban renovation/reclamation projects and clusters of low-rise medium-density suburban units. The gentrification of previously fringe and inner city derelict districts has led to projects like Housing Ultimo by Tonkin Zulairha and Roderick Simpson. These affordable housing units are designed to both fit well within the old city and be environmentally sensitive. Melbourne Postcode 3000, initiated by the local government and planned by the Victorian Department of Housing, is another popular urban redevelopment scheme at the scale of an entire postal area.

As the commercial market remains dormant, there has been a rise in the number of housing starts. The target market and financing for these projects has come mostly from Asian sources. Sydney, which has high expectations for the Olympic games, should lead the increase in housing projects.

The scale of fees for housing is respectable, but the amount of time necessary to realise the projects is high. The most lucrative projects, like those by the developer Meriton in Sydney, are influencing development in other urban areas.

Australian architects are privileging two design issues: environmental sustainabilty and cost effectiveness. Cotton Tree Housing, by Clare Design, is a recent award winning design which looks at the issues of the environment and private domain. This project incorporates such features as passive solar energy and natural ventilation in a carefully planned layout offering private and semi-private landscaped areas.

Malaysia

The two main housing developments in Malaysia are high-density service apartment blocks and new suburban townships. The number of service apartments in the downtown regions of the large cities has greatly increased as Malaysia becomes the hub of south-east Asian commuter business. The southern Malaysian border town of Johor Bahru will soon be linked to Singapore by an extension of Singapore's Light Rail Subway. This has led to the development of large tracts of detached and semi-detached residence units. In Kuala Lumpur, a similar phenomenon is taking effect as the development of new suburbs is activated in anticipation of the completion of Kuala Lumpur's subway lines.

Industrial and commercial developments are still strong and the housing market is not as significant a sector of the market as in neighbouring regions. Developers are privileging density, location and price over amenities, thus construction costs and fees are generally lower.

One notable project still under discussion is the Bukit Cahaya project near Shah Alam. The development is a new community of up-market bungalow tracts with the imagery of Beverley Hills. Proposals for the individual houses have been designed by Jimmy Lim (CSL Associates), Arthur Erickson, Itsuko Hasegawa and other internationally known architects.

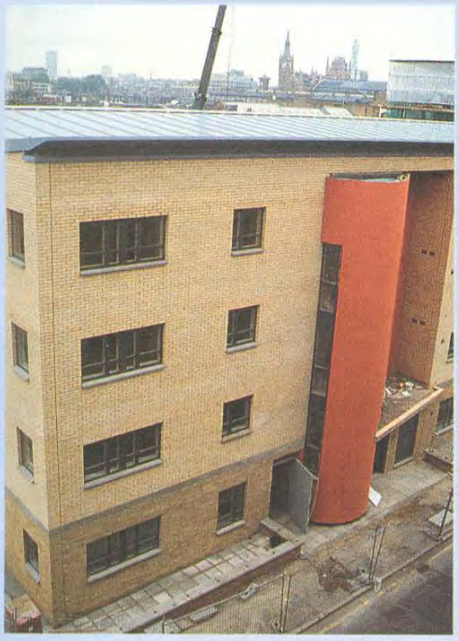
Hong Kong

The general increase in the quality of living conditions coupled with higher salary expectations has pushed the housing market from its mid-nineties lull to its currently healthy state. The concentration is in two areas: high-end housing and the development of new areas outside Hong Kong Island and Kowloon. The affluence and sophistication of the buyers is forcing developers to offer units with increased amenities and common facilities. The completion of the airport link rail is also expected to open up new territories for development. These rail stations will be linked to the commercial areas and become highly developed and attractive commuter locations.

Expensive units with extensive facilities means the architects are able to design with more generous budgets and collect good fees. Two notable projects are Tseung Kwan O by Anthony Ng, and the Laguna City development by Dennis Lau and Ng Chun Man Architects and Engineers Ltd. The Tsueng Kwan O project ventures into the area of green architecture and offers custom-made environmental features. Laguna City, which consists of 40 towers and 8,000 units, is a good example of the use of a prototypical floor plan which maximises both privacy and open space.

Canadian Riverside Village, Hamamatsu, Japan

Canadian architects Arc Design International recently completed a Canadian style neighbourhood of 23 homes in Japan, 11 of which sold in the first three hours after the opening. The homes are of wood frame construction, pre-panelled in British Columbia and exported to Japan for assembly. The three bedroom houses are 1,100 to 1,200 square feet and include tatami, living and dining rooms. Architect Farzin Yadegari claims that "The greatest challenges were to fit everything into such a small square footage and to keep respect for the Japanese lifestyle while incorporating a western look".



Killick Street Block, London, UK

Together with the Peabody trust, Avanti Architects are developing this site near London's Kings Cross as part of a plan to revitalise the area. Although built to a tight budget, imaginative shapes and colours are used to create attractive accommodation for families and individuals. Dickon Robinson of the Peabody Trust predicts a substantial growth in the number of people living in London. "The demand for housing in central London has always been strong from the poorer people as the number of homeless testifies. However, now, for the first time in many years, large numbers of middle and professional classes are moving back to inner London. It is boom time for private house builders." The shadow housing minister Nick Raynsford disagrees with Sir Richard Rogers who believes that the solution is high density housing, claiming that planners should recognise that many people want to live in houses with gardens.

Below left *Rive Gauche, Paris. One of very few major housing schemes to have been undertaken in France during recent years. The project aims to provide Paris with a new mixed-use district combining accommodation, shops, offices and recreational areas.* ***Below*** *James Joyce Square, part of the Rive Gauche development*

Europe

France

French architects looking for commissions from the country's housing sector need to be at least as skilled in battling with paradox and uncertainty as they are at designing buildings for living in.

First the government announced a zero interest loan scheme to help relaunch new house building and the languishing residential property markets. Now it wants to chop some FF13 billion off the national housing budget as part of efforts to reduce public deficits in line with the increasingly unpopular Maastricht criteria. At the same time, it is reluctantly bailing out a subsidised housing finance specialist called the CFF, which clocked up 1995 losses of FF10.4 billion following speculative property ventures.

Then ministers decided to separate architectural issues from the Ministry of Public Works which plays an important role in social sector housing provision and establish a special architectural directorate in the much less powerful Ministry of Culture. The lines of demarcation were established with such care that callers to either are now quite likely to be referred to the other and back again.

On top of all this, the government is currently reviewing the basic criteria for allocating subsidised housing to tenants with modest incomes and everyone is waiting for the new guidelines. The move coincides with a headline making scandal over public-sector housing practices in Paris.

Some major schemes are still going ahead, though often on a reduced scale because of continued depression in the housing markets and slow economic growth. One prominent example is the Paris Rive Gauche development, which aims at providing the city with a totally new mixed-use district combining flats, shops, offices and recreational areas.

At the same time, France's 1,000 or so housing associations are struggling with the new environment. Currently, these provide accommodation for around 13 million tenants in a total of some 3.4 million residential units. Many of the associations are now devoting a growing part of their efforts to the renovation of older premises in line with renewed interest in neighbourhood life in the cities.

Spain

Decent housing is a constitutional right in Spain's 17 year old democracy, but price increases in the late 1980s have placed housing out of reach of first-time buyers: in Madrid, children do not leave home on average until the age of 30, and the median apartment costs eight times the annual salary of a young working couple. The resulting crisis, together with the soft office market and lowering interest rates, has created a boom in housing construction promoted by massive state aid.

The region of Madrid for example has authorised the construction of 500,000 units over the next 20 years, serving a population increase of only 500,000 with 300,000 units in the 1996-2008 General Plan of the city alone. Local authorities urbanise vacant land, specifying the number of subsidised units required (generally half) for qualifying buyers with incomes at two and a half – to three and a half times the minimum wage. Besides parks, schools and other services, each municipality has ceded 10 percent of the buildable space for its own use, generally dedicated to housing for the indigent. For qualifying buyers, the central government also subsidises low-interest mortgages, over 100,000 nation-wide per year.

Typical of these developments is Madrid Sur, finished in 1994, with 4,385 units, all subsidised and organised by builder's and worker's unions in co-operative owners' associations. The development succeeds a shanty town rehoused in the famous Paolmeras housing for the 1970s nearby. Its nostalgic patio-block buildings and regular street grid, designed by A Vázquez de Castro, provide the model for similar developments across the country, although newer trends combine row houses and end-block towers in longer blocks, as seen in Equipo Auia's Loranca underway outside Madrid.

Development plans are generally municipal, but architects such as MBM and Ricardo Bofill

Below *Hans Kollhoff's condensed block structure in Berlin-Wilmersdorf. Designed with the requirements of the professional urban dweller in mind (either single people, or couples without children) the emphasis is placed on privacy.* ***Below right*** *Rüdiger Kramm's row housing in Frankfurt-Bonames. Comprised of five rows, the open spaces in between encourage a sense of communal living, a feeling enhanced by the flexibility of the structure neighbouring flats can be either joined or divided depending on the needs of the habitants*

(both Barcelona) or Equipo Auia and Manuel Ayllón in Madrid are leading specialists. The architects associated with the best housing (generally public) are synonymous with the best names given the importance of the field, including M De las Casas, M Bayón (Madrid), G Vázquez Consuegra, Cruz & Ortiz (Sevilla), Torres & Martínez Lapeña, C Ferrater, O Tusquets, J Llinás (Barcelona), etc.

Germany

Over the last decade, there has been a spectacular "rise and fall" in the German residential sector, influenced by the reunification process in 1989/90, and its consequences: a massive investment in east Germany, both in private single-family housing, and in housing estates financed by private investors, companies or co-operatives. The possibility of reducing income taxes by about 50 percent of the total building costs to investors caused a boom in the residential sector (felt even more explicitly in office building).

West Germany, too, profited from the economical upswing at the end of the 1980s: the rate of building permissions in the housing market rose between 1987 and 1994 from 190,700 to 586,500 units, but in 1995, it fell down to 458,700 units, as a consequence of the new economic crisis. In east Germany, the end of the boom is also in sight: in December the 50 percent deduction programme will terminate, causing a dramatic drop in housing construction. More than 700,000 units throughout Germany are forecast for completion during 1996, is a huge task which is probably out of reach.

The stagnation or drop in disposable incomes and the high demand for flats in cities, and for single-family or terraced houses on the periphery, results in a rising need for "cost and surface-saving building systems". Dutch, Scandinavian and US pre fab-housing systems are increasingly pressing for a market share. German building contractors and architects neglected the development of the mass-produced elements for too long although in recent years, some experiments have been undertaken. For example "timber system construction" for apartments in Bavaria, where 900 units in 20 communities, in three-storey structures have been built at a cost of less than 1,800 DM per square metre pure building costs (that is more than 20 percent under standard in Germany, taking into consideration that the overall costs in agglomerations rise up to more than 5000 DM/square metres).

In terms of the architecture of Germany's housing two examples from the most influential German cities on the international architectural scene during the 1920s, and which seem to have regained their significance in the 1980s and 1990s, are Frankfurt and Berlin. The two projects represent two contrasting building types: row housing on the periphery, and a high-condensed block structure within an agglomeration respectively, but also two different design views: the progressive south German "school of Behnisch" (principle: "layers") and the more conservative, Berlin-like "critical reconstruction". As a result, both Rüdiger Kramm's five rows in Frankfurt-Bonames and Hans Kollhoff's block in Berlin-Wilmersdorf, offer flexibly usable rooms and strong contrasts between the wide-open main facade, and the nearly closed facade along the circulation side. But while Kramm's housing estate offers the possibility of unifying two neighbouring flats or separating a larger one into two, should the household grow or shrink ("optional living"), Kollhoff's block of flats is "for singles and dinkies

Heerstrasse/Nennhauser Damm

This residential development in Spandau, Germany is being developed by the Lincoln Property Company, the largest real estate developer both in Germany and the US. The scheme was designed by HOK. Lincoln propose to build public recreation space and provide access to "Am Rain" street enabling the project to be developed in an optimal manner.

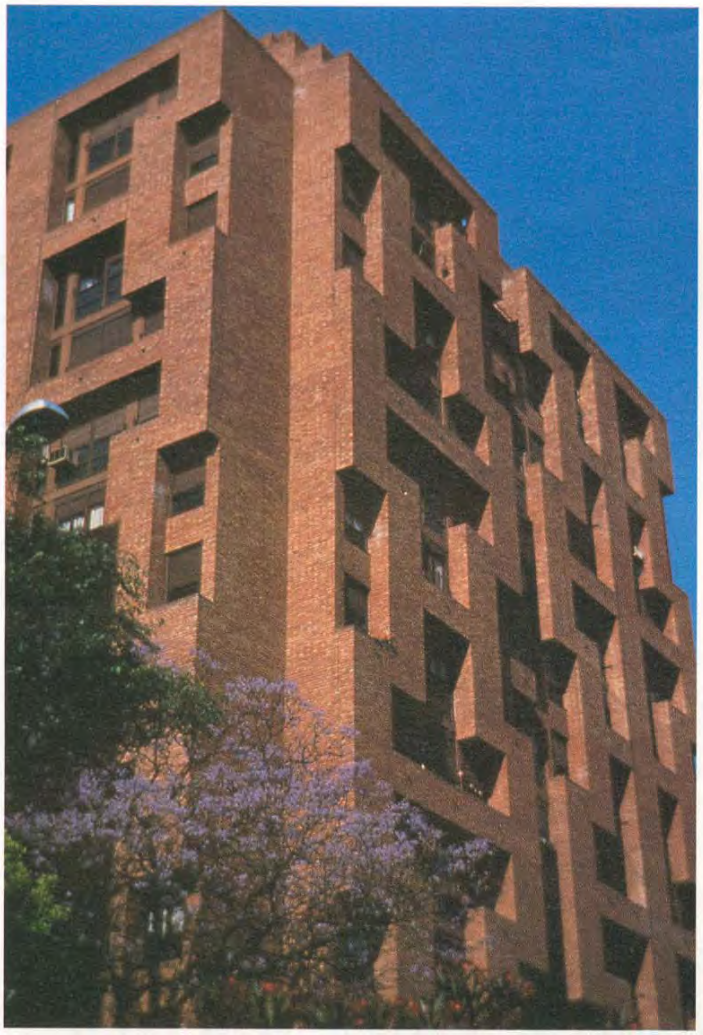
Colsubsidio Citadel, Bogotá

Sterile and anonymous projects traditionally seem to characterise Latin American suburbia, especially when dealing with large projects for low and middle income groups. That is not the case with the Colsubsidio Citadel, one of the largest and most ambitious housing projects being developed in Bogotá by German Samper. When complete, it will house 12,000 dwellings, combining both single houses and apartments. Its initial phase, completed in 1995, had 6,000 units and community services.

The project itself has specific historic references, and reflects nostalgic values and images of what a city was and what it can still be in the midst of modern demands. Plazas, smaller squares, green areas and streets favour pedestrians over vehicles; sectors are linked by means of slightly curved walkways that allow for permanent changes of perspectives and views; the combination of houses and buildings provides variety and a frame of reference.

Traditional construction systems were used, as opposed to sophisticated prefabricated alternatives, keeping the final cost suprisingly low. This was due not only to the size of the project, but also because of the extreme rationality of the architectural and technical designs.

Below *The Zigurat housing development, Cordoba, Argentina by Togo Diaz. With over 20 years experience in residential construction Diaz' work aims to achieve a new urban identity, through both materials used, and form.* ***Below right top*** *Arc Design International's 33 unit condominium complex, Langley, Canada.* ***Bottomright*** *Group of 17 residential units, Santa Monica, California by Arc Design International – architect for both projects H Amanat*



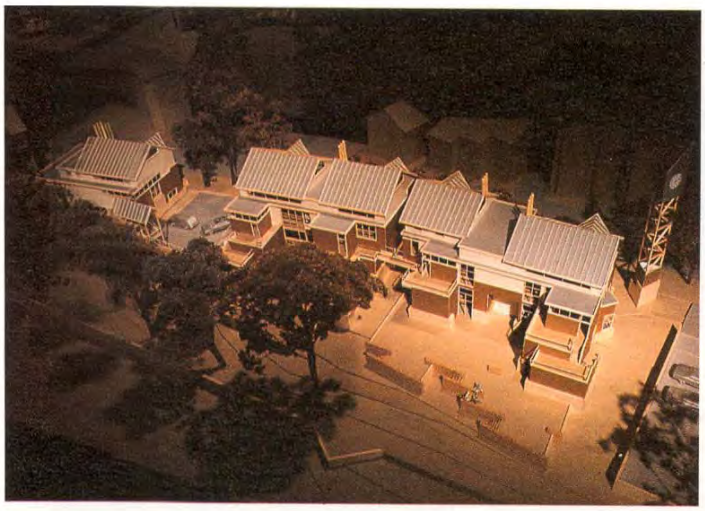
[double income no kids] only". The function of staircases and winter gardens in the two cities are opposite. In the Frankfurt suburb they are semi-public places, with more emphasis on the outside than those in the Berlin development. In the latter the stairs and gardens face the regional train; they are private zones. In this respect the two schemes represent totally different ways of living, although both are typical of modern German cities.

United States of America

Call it affordable housing, low-income housing or social housing, production in the US is about half the rate of a decade ago. Last year only 278,000 units became available at prices suited to the 20 million households earning less than half the median wage and paying up to 50 percent of income on often substandard housing. A 1996 American Institute of Architects resolution states, "the rapid decline in the provision of affordable housing has been largely ignored ... 25 percent of our population cannot afford unsubsidised housing." Public housing projects, which shelter approximately 30 percent of the nation's needy and have waiting lists of up to 12 years, are knocked down or blown up regularly in Pittsburgh, Baltimore, Newark and, in Atlanta, the nation's first project whose site is slated for private development. "In many cases the maintenance was awful," says AIA vice president Richard Bradfield, "but they could have been fixed. We've thrown the baby out with the bath water." Despite the adverse climate, however, architects, local governments and local community groups have been producing a slow but steady stream of low-rent units designed not just as shelter but also as community stabilisers, showing more aesthetic intent than affordable housing has in some time. Architects committed to this building type consider themselves well paid, even when complicated financing and intense work with end users are taken into account.

At 778-unit Passyunk Homes in Philadelphia, built in 1941 as temporary Navy housing, Kelly/Maiello conducted numerous meetings to discover what tenant leaders, teenagers and the elderly wanted; immediate priorities became new roofs, a community centre and a medical centre. "When no work has been done

Below left top *Jan Wampler has incorporated "sweat equity" and flexibility in his 12-unit project for artists in Boston, USA.* ***Below left bottom*** *Kelly/ Maiello's 80-unit Regent Terrace, has become a model for community stabilisation through housing renewal in the USA.* ***Below*** *Hardison Komatsu Ivelich & Tucker's Courtyard, San Fransisco is typical of the practice's work in the city, with tightly packed units in a small area. HKIT use as much glass as possible in order to maximise the number of "eyes" on the street. Local police have found that this helps to reduce criminal activity*



for decades," says Emanuel Kelly, "they need to see some immediate results." Recent television coverage of Kelly/Maiello's 80-unit Regent Terrace, a model for community stabilisation through housing renewal, shows the development to be as pristine as the day it opened.

Realistic upgrades – three or more bedrooms, adequate storage, private entrances for security, private baths and kitchenettes in single occupancy rooms (SRO) – prevent one-to-one unit replacement, as do required social service spaces when Federal money or service-oriented sponsors are involved. Other building types, however, are being converted to housing: Close Associates' social services centre and 11 housing units in a former fur-coat factory in St Paul, Minnesota, and Peter L Woll and Beth Cooper Lawrence 123 SRO units in an abandoned New York hospital are examples.

New construction adopts a tightly packed new urbanism of town houses with secured out-door encounter spaces and a maximum number of windows, or "eyes" on public streets, a pattern police departments say reduces crime. Hardison Komatsu Ivelich & Tucker designed 51 town houses with pitched roofs and winding paths on top of a garage in San Francisco and 62 units tucked into a few large suburban-residence envelopes next to a historic district in Berkeley. At the Tenderloin in San Francisco, designed for 238 households, some of whom had been living seven to a room, HKIT analysed the city's past successes and failures and concluded that clusters of 20 to 40 units with separate elevator lobbies provide a sense of individual investment in the property and the greatest control over a large population of children.

Jan Wampler, professor of architecture at MIT, has incorporated "sweat equity" and adaptable spaces into 12-units of artists' housing for Boston. "We can't afford a bank's idea of a complete sellable house anymore," Wampler says. Double height unfinished spaces contain plumbing, heating and electrical connections, and can be configured into separate levels and rooms as the residents' lives evolve. Wampler believes in employing old materials and local suppliers, imaginative use of cheap components, mutual "barn-raising" assistance and bartering, – such as a standing-seam metal roof for a weekend in Boston for the roofers' families. **WA**

Housing
Hanscomb Associates

On an international level, trends in residential housing defy definition. Although a major sector of any nation's construction industry, local culture dictates all – location, scale and form. Hanscomb Associates make sense of a highly personal building type.

Residential construction

Residential construction, typically a major sector in any country's construction industry, may account for between 30 and 50 percent of total construction output, new construction and repair. The single family house remains a major factor in this market, although multi-family residential is an important market segment. Considering that the estimated world-wide value of construction output is in excess of US$2 trillion, the millions of housing projects required to generate this output is astounding.

Another major residential classification is private versus public sector housing. Since government policies determine the extent of public involvement in direct construction of housing, its importance varies among countries. For example, public sector housing may be less than 5 percent of the residential market in the US, whereas in the UK, it may be as high as 15 percent. In many countries, since the public sector provides low-cost housing, either by direct construction or subsidy, private residential developers often confine themselves to middle and upper income bracket housing.

Cultural characteristics

Housing is an excellent example of a building type highly influenced by local culture. Perhaps this is because it is a very personal building type. Architectural style, equipment, room type and size are predicated on cultural norms. Consider the typical construction materials for a standard quality single family house in various countries shown in *Table 1*. The construction shown may be typical for other countries in the region, but architectural styles are likely to change.

Cultural influences are numerous and they are more than just external style. Consider the following:

- **Mobility of the population** The US population is very mobile. About 10 percent of the population moves each year. In contrast to the masonry and concrete structures of Germany, the typical US construction appears flimsy.
- **Outdoor living space** is an integral part of houses in many cultures. It is traditionally an integral part of South American and Mediterranean homes.
- **Extended family living** is common, two master bedroom are not unusual: A Japanese house will typically have both "Western" and Japanese style (tatami rooms, paper doors and screens) rooms.
- **Car garages** Double (or even triple) garages are common in the US and Canada, whereas in less well developed countries covered carports are still the norm.

Case study – Singapore

- The building code prescribes that every occupiable space must have operable windows. They use natural ventilation, not mechanical air-conditioning, resulting in greater exterior wall space.
- Building insulation is uncommon.
- There is a preference for brick and plaster walls since solidity connotes higher quality.
- It is customary for the kitchen to have an outside service area because of traditional cooking methods.

Case study – Jakarta

- There is less regulation of the building environment than in Singapore, so high-rise apartments are more "Westernised".
- More land is available than in Singapore, therefore high-rise living is relatively new.
- Condominium ownership is still a novelty.
- Traffic congestion is one factor bringing people back into the city to live in high-rise buildings.

Information provided by Chuck Hall of Smallwood, Reynolds, Steward & Associates.

Neil Veitch, of Lincoln Properties GmbH, notes that the political and regulatory environment, a result of cultural attitudes, contribute to design and cost differences. The main elements affecting costs in Germany, compared to other European locations, are the strict structural, thermal and acoustic requirements throughout the building. As a result of environmental pressure many developments require "green" or grassed roofs increasing structural costs.

Configuration and cost

Housing costs are sensitive to the preferences in room sizes, number of rooms, amenities, and architectural styles. Social policy, personal living styles and aspirations are a few of the factors driving local preferences.

- **China** until new development brought about the rebuilding of housing high-density housing cost about US$100 per square metre, but this included communal kitchens and toilets, basic finishes, single elevator, rudimentary heating and lighting, cheap facades, but not landscaping.

Building costs by square metre – individual dwelling

- *Bathrooms* are typically a high cost room because of plumbing and finishes. The number of bathrooms is an important factor. A high ratio of bathroom area to total area will tend to increase square metre costs. The number of fixtures in bathrooms is a contributing factor both from additional space and the fixture cost itself. So fixture density (square metres per fixture) is one measure of costs.
- *Kitchens* are another high cost room. Developers generally provide cabinets, countertops and sinks in apartments. In Germany, tenants often move their kitchens with them –

Table 1 – Typical Construction Materials for a Detached, Single Family House

	Germany	UK	USA	Argentina	Australia	Japan
Structural system	Concrete frame with masonry in-fill	Wood frame	Wood frame	Concrete frame with masonry in-fill	Wood frame	Wood frame
Exterior wall finish	Stucco	Brick veneer	Brick veneer, wood siding or stucco	Stucco, brick veneer, tile or stone	Brick veneer or stucco	Stucco or cement siding
Roofing	Clay or cement tiles	Clay tiles	Fibreglass shingles	Concrete slab	Concrete tiles	Clay tiles, cement slate
Interior partitions	Masonry with plaster finish or plasterboard	Wood stud with plasterboard	Wood stud with plasterboard	Masonry with plaster finish	Wood stud with plasterboard	Wood stud with plasterboard
HVAC	Central heat, no air conditioning	Central heat no air conditioning	Central heat and air conditioning	Central heat, no air conditioning	Central heat, no air conditioning	Central heat and air conditioning
Cost per square metre	DM 1,600-1,800	£575-650	US$550-700	n/a	A$525-650	¥130,000-180,000

Table 2 – Apartment Building Cost Comparison

	Cost per square metre (in US$)
India, Malaysia, Thailand	Less than $400
Canada, Mexico	$400 to $500
Czech Republic, Indonesia, Spain	$500 50 $600
Hungary, Portugal	$600 to $700
Belgium, Ireland, USA	$700 to $800
Australia, Greece, Netherlands, New Zealand, South Korea	$800 to $900
Great Britain, Italy, Poland, Singapore	$900 to $1,000
France, Hong Kong, Sweden	$1,000 to $1,100
Denmark	$1,100 to $1,200
Germany	$1,300 to $1,400
Japan, Switzerland	Greater than $1,400

hence German domination of high class kitchen manufacturing. However, appliances are not provided in all countries. The costs for France, Greece, Ireland, and Thailand did not include kitchen appliances. Jim Davidson of Schuman, Lichtenstein, Clamon, Efron in New York City cites the high costs of bathroom and kitchen areas as a reason why developers build fewer studios now.

- *Size of the apartment* will affect the square metre cost, but its influence is greater on the dwelling cost. The number and size of rooms will vary square metre costs. Smaller or fewer rooms may result in higher square metre costs, at least for the interior construction, finishes and services. Smaller rooms may result in a higher partition density. Larger dwellings will reduce the impact of higher cost bathrooms and kitchens on the square metre cost.
- *Internal layout of the apartment* Michael Bennet of HOK in Berlin notes that apartment configurations are very different to those in North America. All rooms are accessible by a main corridor. There are no interconnecting rooms.
- *Quality of finishes* obviously influences cost. However, a more basic question may be level of finishes provided.

Construction unit prices per building

- Number of stories, size and perimeter configuration.
- Resident parking capacity and how it is provided. Enclosed underground parking in congested urban areas can add considerably to the cost per dwelling.
- The use of mechanical air conditioning. If it is provided, is there a central system or individual units?
- Extent and type of balconies provided.
- Extent of amenity areas included.
- Sophistication of security and communications systems used, if any.
- Level of quality of interior finishes. As finish quality increases, there is a tendency to increase public areas in size and quality.
- Pro-forma and marketability of the units drive the look and feel of the building. Construction costs must fit the pro-forma, while the amenities and design features must attract the potential buyers or renters. For example, most developers in New York City want to spend an appropriate amount on the exterior. Masonry, traditional exteriors are the norm.

Case study – Regulatory influences impacting high-rise residential design in the US

- Handicapped accessibility criteria require larger foyers, wider corridors and larger bathrooms. Often, this additional space leaves bedrooms and living rooms smaller, in order to maintain cost levels.
- Seismic code changes may have less impact on high-rise than low-rise construction, but the additional costs are a consideration.
- Zoning tends to dictate type and shape of building and location tends to dictate size of units.

Information provided by Jim Davidson of Schman Lichtenstein Claimon, Efron in New York.

Case study – US/Japan apartment cost

- A Japanese apartment built in San Francisco would probably not cost much more. However, a US design built in San Francisco would probably cost 30 to 40 percent less. A couple of design related reasons are:
  - Japanese apartments are very small. A studio in Japan might be 30 square metres, while it might be 50 square metres in San Francisco.
  - Constricted sites are the norm in Japan so designs have a small footprint. This increases structural and exterior wall costs. To enclose such a small footprint requires about one square metre of exterior wall surface for every square metre of floor area. The usual ratio in the US rarely exceeds 0.5 square metres per square foot.

Information provided by Brian Bowen of Hanscomb.

Cost comparisons

The accompanying table indicates approximate costs of apartment buildings in various locations using square metre price ranges. The costs reflect local design. Some points to consider are:

- The costs for Ireland and the Netherlands do not include floor finishes.
- Air conditioning is a common amenity in North America, but not in Europe, Asia or South America.
- Our survey suggested two bedroom apartment units as a standard for comparison. Exceptions include Mexico (3) and Thailand (1).
- One bathroom is the most common. However, Mexico and the US have two bathrooms.
- Costs for the US and Mexico include a sprinkler system as part of the building fire protection.
- The costs reported did not include window treatment (blinds and curtains), except for Sweden, Thailand and the US.

In addition, the unit costs are subject to all the usual vagaries: codes, regulations, climatic and site factors etc. The comparisons represent a suburban location at city perimeter and exclude land, demolition, site work, management and design fees, financing, other soft costs and Value Added Tax. **WA**