Factories for Living In

Simon Anderson has taught and practised architecture at The University of Western Australia since 1989. In that time has been Head and Dean of Architecture, won University and national awards and citations for excellence in teaching and championed the practice of architecture as a legitimate research activity for academics involved in the teaching of architecture.

He has curated major architectural exhibitions; written on contemporary Australian architecture; authored expert opinions; produced competition briefs; been a design award juror, design competition judge, and professional journal editor and advisor.

His residential, institutional and commercial buildings and designs have won awards, prizes and commendations from the AIA and industry, been published in books and professional journals, and been widely exhibited, most notably at the 2006 Venice Biennale.

Most recently, in 2007 he won the architectural competition for a world’s best practice eco-resort at Ningaloo, and in January 2008 he was Artist in Residence at the Arthur & Yvonne Boyd Centre for Australian Art at Bundanoon.
Housing providers often talk about advances in industrial building techniques being utilised in their industry. But there appears to be little evidence of this in the market with most low- to medium-density housing still being produced using traditional materials and trades, and extensive sub-contracting. Yet one area of small-scale building provision, the commercial factory building, does show signs of the advances in industrialised building techniques. Why? Because the commercial imperative allows one to ignore history, style and aesthetics, and to concentrate on buildings as physical systems expected to have certain measurable outcomes. However many of the current topical issues in housing are measurable in some way. Issues such as affordability, sustainability and flexibility of use are essentially quantitative topics and warrant rational attention. So this project does nothing more than attempt to develop alternative housing prototypes at low- to medium-density through systematically utilising the current techniques of the commercial factory building.

General housing clients typically need affordable, low-energy use, contemporary houses for their own long-term occupation, yet they want some flexibility in being able to accommodate changing family structure, and they desire some income/superannuation benefit from their house.

Prototypical sketch designs are illustrated for a variety of low- to medium-density sites within the Perth metropolitan region. The designs would be suitable for similar climatic zones. Densities range from low to potentially high densities (R2 to R200+) with emphasis given to grouped dwelling over multiple dwellings. Hypothetical sites are used to explore alternative orientations and access patterns. Briefs are commensurate with available general housing in terms of total area, room sizes and functions. Our designs are fully compliant with all authorities. All planning is prosaic, even generic, and intended to be more illustrative rather than definitive; circulation legible; wet areas compact and efficient.
THE SUBURBAN PROTOTYPE
We started with the largest market—the single house on 500–1000sqm in a suburban area.

At this density (R10 to 20) local government authorities typically allow two-storey development with no streetscape policy given the heterogeneity of the suburbs, and require maximum 50% site coverage, large street setbacks, and smaller setbacks for all other neighbours for walls containing non-major openings, two-car parking behind the setbacks for each house.

On lots of this scale a free-standing rectangular volume can be positioned to achieve good solar access, street surveillance, nominal overshadowing. A very compact two-storey house was designed to optimise the use of the selected building technology, to allow for significant landscape retention and large tree planting, and to provide for possible future buildings to be added behind the new house. The upper storey also allows for some distant views to break the insularity of single-storey suburbia, especially in very flat subdivisions. Alternative orientations can all be accommodated using a simple rectangular volume.

The planning maximises northern exposure and puts parents and children upstairs at opposite sides of the house separated by wet areas. Living rooms are downstairs with numerous doors both internal and external used to provide enormous flexibility of access and gradations of privacy control.
The suburban prototype

SITE/GROUND FLOOR PLAN

FIRST FLOOR PLAN

SECTION LOOKING WEST

VIEW FROM GARDEN
THE URBAN PROTOTYPE

Next we tried a more urban condition at medium to high density. We limited our design to terrace or row housing in the belief that it is an under-utilised typology worthy of re-investigation. Contemporary ‘row housing’ in places like East Perth and Subi Centre, where up to five-storey houses have recently been built, is not really row housing: there is little sharing in any sense that terrace or row housing allows. In fact East Perth and Subi Centro houses are really nothing more than large suburban houses compressed onto very small lots.

In medium- to high-density grouped housing the proportion of the individual lots is critical to achieving efficiency, in particular in relation to the provision of good car parking, service access, street planting and passive surveillance. A lot width of seven metres was chosen as it provides commodious accommodation and facilitates all of the above. It allows two cars to be parked on each lot with an additional bay on the street which could be accessed by resident stickers. The seven metre width then allows pedestrian access past the on-site cars, and planting of a significant street tree. Differential lot widths could also be added with some being smaller, say four metres with others larger, say nine metres. Further visitor/public parking is provided on the cross streets at a rate of six bays per number of houses on the block.

The block is designed as a terrace of four-storey houses using party walls for affordability and environmental efficiency. Four storeys was chosen as a conscious effort to lift density and to provide affordability in construction and in future rentals—it is hoped that the top storey could be cheaply rented. A twelve metre high wall panel is used to form the houses. The full 280sqm of the houses can then be used in a myriad of ways by simply stratifying by floors. So the ‘house’ may be used as, for example, a 280sqm house for a large family, or the ground floor could be used as a 50sqm commercial space, on top of which is a 55sqm studio apartment and then a 110sqm two-storey apartment, etc. The full four-storey house would be attractive to a range of groups of people, and would, by its ability to accommodate various usage patterns, ensure a level of social sustainability and heterogeneity lacking but needed in new housing. It would be affordable, and permit long-term occupation by extended families. It could be developed as a shell for owners to finish as they need, and it would provide good investment and superannuation options for owners, and a great deal of potentially affordable rental accommodation.

A continuous street canopy is provided over the footpath to provide rain and sun protection for pedestrians, to improve the amenity of the possible commercial uses on the ground floor, and to provide the separation needed to allow the upper floors to have a zero street setback. The street canopy could be transparent to solar radiation should it face north rather than south. Balconies could be added to the rear of the house at upper levels, and they could be offset so as to not overshadow the north-facing windows below. The courtyard is designed to be planted with a large deciduous tree, while the carport and covered walkway are designed to be covered in vines giving the entire rear of the house a verdant and overgrown appearance.

Front doors all open directly to the canopied street with back doors opening from the heavily planted car courtyard. All access is undercover with the walk-up access system providing excellent privacy, cross-ventilation, security and the ability to accommodate changes in use at successive floors. The aggregation of the various rooms, apartments, commercial and service spaces is then suppressed in an over-arching form designed to respond to the scale of the metropolis and the reality of the contemporary housing condition. Individuation in the expression of land uses and functions is limited to their natural variation within the overall design concept.
The urban prototype

SITE PLAN

SITE/GROUND FLOOR PLAN

UPPER FLOOR PLAN OPTION
Kitchen/Dining/Living

UPPER FLOOR PLAN OPTION
Master Suite

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SECTION LOOKING WEST

TOP FLOOR PLAN OPTION
Bedrooms

UPPER FLOOR PLAN OPTION
Studio Apartment

VIEW FROM REAR
THE RURAL PROTOTYPE

Lastly we designed a semi-rural or rural prototype. At such densities (R2–5) and lower, local authorities typically have no requirements other than the Building Code of Australia. And at these low densities existing landform, contours, orientation and vegetation need to be accommodated. Hence an articulated, pavilioned and spreading single-storey plan was developed, reminiscent of Richard Leplastrier’s Bayview House 1975.

The disconnected alfresco areas, also used on the suburban prototype, provide generous undercover areas but do not shade the interiors. Further, the elevated sunhoods on the rural prototype provide sheltered verandas of useable dimensions again without overshadowing the interiors, and provide an amplification of horizontal scale in response to the location.

SECTION LOOKING WEST

SITE/GROUND FLOOR PLAN

VIEW FROM NORTH
THE CONSTRUCTION TECHNIQUE

All the houses are designed and built like commercial factory buildings. Off-form full-height insulated concrete panels standing on slab-on-ground form the structure and external walls. Panels will be poured on site in various, but in a limited number of, sizes to allow for building efficiency but also to provide the variety needed to accommodate residential design. A ‘green cement’, one that does not use calcium carbonate chemistry, ensures that carbon dioxide emissions from the concrete are negligible. A light steel roof structure ties the panels together and supports a low-pitched zincalume roof lining. The panels are all rectangular with no openings cast in. Panels could be manufactured off-site and they could be engineered to accept further upper floors, and they can be recycled along with the steel roofing and internal walling.

The panels comprise 50mm external non-structural skin, 25mm rigid insulation and 125mm internal structural skin. All walls can be erected in hours. The two skins are tied together with a proprietary tie while the external skin is reinforced with galvanised wire strips. Maintaining the panel width at 200mm means that commercially available panel formwork could be used. External corners were mitred rather than butt jointed to avoid thermal bridging, while protruding blade walls are avoided for the same reason. A single industrial building sub-contractor will complete the earthworks, concrete footings and slab-on-ground, on-site panel manufacture and erection, steel roof framing and erection, roofing and insulation, paving and driveways.

All internal structure, framing, flooring, wall and ceiling linings are plantation timber and plywood allowing a single carpentry sub-contractor to bring the houses to lock-up, apart from the aluminium external joinery and steel sunshades which are manufactured and installed by a single sub-contractor. Wet areas use sheet materials, removing the need for a tiling contractor, while the cabinets are to be installed by the carpenter using flat-pack cupboards and bench tops.

The last sub-contractor, apart from the obligatory plumber and electrician, is the painter who will spray paint the entire interior with a low-sheen clear finish.

All fenestration occurs in the full-height slots between panels with the remainder of the slots sheeted with zincalume steel sheeting. The slots are parallel ensuring structural efficiency for the wall panels and complete simplicity in their casting. The powdercoated aluminium joinery and the cladding are pushed to the outside face of the panels to cover the exposed ends of the insulation at reveals, and to render the external face smooth rather than modelled. Sunshading over openings in the concrete wall panels is provided by fixed galvanised steel sunshades.

In the future the houses may be altered to produce independent houses of various possible configurations. And alterations would be easy for the occupier and allow the re-use of timber framing and linings.