Remotely Sustainable

A thesis submitted in fulfilment of the requirements for the degree of Master of Architecture

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Architecture of Necessity

How do we produce architecture that responds to the extremes of climate and culture within the context of remote Western Australian Indigenous desert communities?

Introduction

Remote Indigenous Architecture – a Definition

This paper focuses on a specific line of work that could be called ‘remote Indigenous architecture’. I define this as architecture for Aboriginal clients who are the traditional owners of their homelands, where these projects are built.

This context is critical because the issues I discuss may be relevant to other Indigenous communities in Australia. However, the customs, culture, bureaucracy and conditions mean I must caution anyone in applying any of these ideas to another community without deep consideration of and good consultation with that community.

The context also extends to the broader framework of federal and state governance. As architects and citizens it seems there is little we can do to impact on these systems, but if the government and agencies do not make appropriate decisions, there is little chance of improving the outcomes for Aboriginal people.

In 2006 the Royal Australian Institute of Architects (RAIA, now AIA) established an Indigenous Housing Taskforce, which developed a policy on Indigenous housing and organised the ‘Which Way’ conference in Alice Springs in October 2007 that resulted in a summary document of essays describing the current state of Indigenous housing.

Working in this field as an architect is extremely hard. There are almost insurmountable problems that arise from ineffective government agencies, difficulties in communicating with clients, extreme distances to travel, physical discomfort to be endured and very little in the way of fees to perform these tasks. The difficulties begin at the consultancy stage and continue throughout the project until occupation by the clients. There is great difficulty in ensuring that the builders and tradespeople do their jobs properly and ensuring they return to sites to fix defective work is problematic.

The budgets allocated to Indigenous housing projects are often well below that required to produce buildings that satisfy the clients’ needs and expectations. This is possibly because there are no votes in tackling the issues in remote Indigenous Australia – largely because the problems cannot be ‘solved’ within a single term in government – hence, funding is allocated to more popular priorities.

Finally, there is little appreciation of the work that architects do in these communities, possibly because in some cases architects do their job badly.

This study seeks to reveal some of the difficulties faced when delivering these projects, in order to encourage the development of better solutions in the future.
Background
I have been working in the area of remote area and Indigenous design since I graduated from university in 1991. Immediately after graduation I was employed by NBC Aboriginal Corporation in Broome, Western Australia until 1993. I had a short break working in Perth and then worked for NBC from 1994 until 1996.

After returning to Perth I commenced my own sole practice until forming Iredale Pedersen Hook Architects (iph) in 1999.2

The work I performed with NBC ranged from housing inspections, to maintenance programmes, infrastructure upgrades, community planning projects and the design of houses and community buildings. The projects were located throughout the Kimberley and Pilbara regions of Western Australia and were typified by radically different climatic and cultural conditions, different language groups, and unique but often overlapping design criteria.

At NBC there was no formal training in the area of consultancy and design for Indigenous clients, and the knowledge required to perform in this field was gained directly from colleagues and from non-architect friends, including lawyers (criminal and native title), anthropologists and linguists, health workers and administrators. Knowledge for me also came from my close friendships with Pat Lowe and her late husband, the Walmajarri artist Jimmy Pike.

NBC projects that I designed which the user groups consider very successful are the houses at Wah Community, the Kimberley Language Resource Centre in Halls Creek, and the Karrayili Adult Education Centre in Fitzroy Crossing.

The first Indigenous project designed by iph was the Karmulinunga Housing Project for the Budulah and Djimund Nguda communities in Derby. This project began as an Architecture, Landscape and Fine Arts studio at the University of Western Australia, where I was a studio leader. The designs were furthered developed and documented and the building contract was administrated by iph.

The next iph projects were the Western Desert Houses, Tjuntjuntjara Houses and Walmjarri Community Centre and these projects form the three case studies detailed below. Subsequent to these projects, iph has designed community housing at Ngurawaana Community in the Pilbara, and, in collaboration with TAG Architects, the West Kimberley Regional Prison (WKRP), which is currently in schematic design.

Our other involvement in this field of work has been providing critique and feedback to the state government via formal and informal pathways. Formal pathways include the writing of a response to the enquiry into the Western Australian Department of Indigenous Affairs, conducted by Dr Dawn Casey; providing comments to the National Indigenous Housing Guide; attending Aboriginal Housing Infrastructure Unit (AHIU) review workshops; and holding informal peer meetings to address common issues that local architects working in this field encounter.
Identification of the Problem

The Research Question

How do we produce architecture that responds to the extremes of climate and culture within the context of remote Western Australian Indigenous desert communities?

‘Extremes of culture’ refers to the radically different lifestyles and belief systems of our clients, both in respect to our own backgrounds and experiences as designers, and the differences between ‘cultures’ within an Indigenous community and between different Indigenous communities. For instance, the needs and aspirations of a young Martu family at Kunawarritji are different to that of their grandparents, and from those of a young Spinifex family at Tjuntjuntjara.

‘Extremes of climate’ refers to the harsh natural environments of these remote locations, to the extreme heat during summer, and to the very cold temperatures of winter nights. The physicality of the landscape in each community has a profound effect on how families shape their camps and dwellings, and generally means that different parts of a dwelling are designed to respond to the dynamic nature of these environments within the timeframe of a day or a season.

The Need for the Study

The Little Children are Sacred Report, the subsequent federal government 2007 ‘Intervention’ into Aboriginal communities and the change of federal government have had the positive effect of highlighting the terrible realities of life for many Indigenous people in remote (i.e. non-urban) Australia. However, there is a sense of deja vu as another round of politicians ‘discover’ these conditions and respond with similar knee-jerk reactions to those seen in years past.

Additionally, there is discussion amongst state and federal bureaucrats about the viability and value of these remote communities. Anecdotal evidence from officers of the Western Australian Government has revealed that the state is seriously considering de-funding communities below 150 persons in size; in effect closing them and forcing their people to move into larger nearby communities or towns.

In my experience smaller, family based communities are often more functional and have fewer social problems than larger ones, but smaller communities often have more significant problems with the management of operational infrastructure, such as a community store, school or health clinic.

This issue is not the focus of this study, but is important to address in order to contextualise the issues of remote Indigenous architecture within today’s political climate.

“Australian governments ... must urgently address the humanitarian tragedy of the lack of housing and basic services for the Indigenous peoples of Australia ...”

UN Special Report on Housing, 1 June 2007

Family camp, Tjuntjuntjara Community, Great Victorian Desert
The Current State of Indigenous Housing

In 1988, one year into my architecture degree, an article titled ‘Aboriginal housing: The state of the art (or the non-state of the art)’, by Dr Paul Memmott, appeared in Architecture Australia (June 1988). This article contains a ‘potted history’ of Aboriginal housing and describes problems and possible solutions. Memmott describes, in Yuendumu community, a cycle of housing solutions from humpies, to tin sheds, to conventional houses and back to tin sheds in the space of 20 years. He proposes that when communities have a housing shortage, and when they can get funding for a single house, which also equates to the funding for four or more ‘tin shed’ shelters, there is considerable pressure to buy the shelters. He asks whether this interim measure simply postpones and magnifies the size of the Aboriginal housing problem … as a legacy for the next generation…”

The federal Labor government’s response to this ‘current’ housing crisis closely resembles that of the Whitlam Government’s 1971 response, described by Memmott as Whitlam having “promised that, if elected to office, he would house all Aborigines in ten years”. In attempting to achieve this some of the worst housing ‘solutions’ were built across Australia. These include the Kingstrand House – a pre-fabricated, single-skin aluminium house, which was found to be thirteen degrees hotter at 11 pm in summer than the traditional Spinifex humpies they were built to replace.

In recent tenders and expressions of interest for housing solutions in the Northern Territory the focus appears to be on fast, cheap delivery of houses and ‘new ideas’ to achieve this, rather than a considered consultation and design based approach.

At a State level I attended a workshop in Broome on 6 March 2008 arranged by the Department of Housing and Works’ Aboriginal Housing Infrastructure Directorate. This revealed that the department was exploring both ideas of a ‘portfolio’ of standard designs and ‘new construction ideas’ for building new houses for communities in Western Australia.

The architects attending the workshop seemed split between those who supported standard designs (which goes against the principles outlined in the NIHG) and those who didn’t support this idea, or supported it on the condition that good consultancy should occur. This division reflects the difference between architects who perform a high level of consultancy and those who perform rudimentary consultancy.

Twenty years on from Paul Memmott’s article the problems remain the same, though the solutions have been tried, developed and well documented. We can no longer claim that there is no clear direction in which to proceed. Unfortunately, the history of actions by government and bureaucrats reveals that lessons have not been learnt.

It is also crucial to identify that the issue of ‘housing’ cannot be isolated from the other issues and conditions surrounding remote Indigenous communities, such as the delivery of essential services – education, heath services, employment – and the numerous state and federal government agencies that attempt to deliver these services.

These agencies have been repeatedly criticised for their ‘silo’ mentality, that is to say, their failure to coordinate the planning and delivery of these services with other agencies in the area.
Sustainability

In the field of Indigenous housing, the critical and overarching issue is that of sustainability. By ‘sustainability’ I refer to the broad definition that covers environmental, economic and social (and in this case, cultural) sustainability.

The general question of whether or not these small remote communities are sustainable is not the focus of this paper; though the communities are under considerable stress due to low employment levels and health services, general poverty, alcohol and drug dependency and poor nutrition. The structural difficulties of operating these communities are significant, but this paper addresses the issues of built infrastructure and housing.

In the context of buildings there has been little in the way of design inroads to environmental sustainability in remote Australia.

At the state level there is currently no mention of any sustainability requirements in the design or specification of systems in the AHIU brief, except for the use of solar hot-water systems.

Precedents/Knowledge Base – Key Texts

The nature of the specific problems of designing housing and infrastructure for remote Aboriginal communities is now well documented and understood. Published papers and reports, including the RAIA’s ‘Take 2’ collection, HealthHabitat’s publications and the ‘Fixing Houses for Better Health’ projects and associated database demonstrate there is no shortage of specific information. This data is best summarised in the National Indigenous Housing Guide, Third Edition (NIHG) edited by Paul Pheleros.

The most current summary of policies in the field of Indigenous housing can be found in the Australian Housing and Urban Research Institute’s (AHURI) Positioning Paper 98 and the subsequent Final Report No. 114, Towards a design framework for remote Indigenous housing.

These papers also provide case studies of housing projects in the Northern Territory, Queensland and South Australia. I hope this paper will add to these excellent studies from the viewpoint of the architect as practitioner, rather than from that of the sociologist.

The AHURI Final Report 102, ‘An audit and review of local and international Indigenous housing research’, provides an overview of the research in this field.

International Studies – Similar Communities

While the conditions of Aboriginal people and their housing needs in northern Australia are unique, other first world countries and territories have aboriginal or first nation people who suffer similar social, economic and associated problems of remote communities. These include Canada, USA, New Zealand, Greenland and the Sami People of the Arctic Circle. The conclusions to be drawn from this body of research fall outside the parameters of this paper.
HealthHabitat’s focus on the health hardware components of houses

HealthHabitat’s 9 Principles for Health Housing
Map of project locations
Case Studies: Three Projects in Four Deserts

This paper will study three community projects in remote Western Australia.

The case studies are: the Western Desert Semi-Transportable Houses; the Tjuntjuntjara community housing in the Great Victoria Desert; and the Walmajarri Community Centre at Djugerari on the northern edge of the Great Sandy Desert. These projects were selected because they share common issues, but each have unique design parameters that affect the final designs.

Two of the case studies focus on housing, while the third is a community centre. The inclusion of the community centre allows for reflection on what a ‘civic’ building may be in this context.

Common Issues

All of these communities are small, desert based community hamlets, with the exception of Irrungadji community, which is located in the town of Nullagine. Appendix A shows a summary of each community.

All of the remote communities were established in the 1980s as part of the homeland movement, whereby government policy allowed people to return to their communities. The exception, again, is Irrungadji, which was established by the Western Australian Government’s Department of Native Welfare in the early 1970s.

The following issues are likely to be common to Indigenous communities in remote desert regions of Australia:

1. Existing Housing Stock

These communities collectively have examples of all surviving dwelling types built in remote communities in Western Australia, ranging from humpies made from corrugated steel and canvas, to dome tents, recycled (often decrepit) ‘dongas’, 1970s steel frame, steel lined and clad houses, 1980s fibre cement clad ‘hot boxes’, recycled concrete slab ex-Telfa transportable mining houses and 1980s and 1990s DHW/AHU steel framed and clad homestead style houses.

2. Existing Infrastructure Buildings and Management

Generally, each community had a school, a clinic, a community office with associated staff housing, a store, a workshop, a diesel powered generator and a water tank and bore. Due to their remote nature, there are significant problems associated with employing staff for any positions in the communities.

3. Funding, Administration and Effects on the Consultancy

The western desert houses and Walmajarri Community Centre were administered by the DHW/AHU. The consultants were engaged via a lowest-price basis, with a standard conditions of contract and housing brief. This process limits the ability of consultants to innovate because of the fee bidding process, and has a low level of reporting.

The Tjuntjuntjara houses were the last initiative of the ATSIC/NAHS Environmental Health Program, whose brief has strong aspirational objectives that include “maximise outcomes relating to community self determination, including enhancing the ongoing sustainability of assets constructed under the program”. This allows the consultants to innovate and perform a more detailed consultation process, resulting in a higher level of reporting.
Key Issues

Macro and Micro-Climatic Conditions
The southern edge of the Great Sandy Desert and the Little Sandy Desert is the hottest part of Western Australia. Summer temperatures can reach over 50 degrees Celsius, and night time temperatures can be in the high 30s. Winter conditions are not as extreme as those in the southern parts of the Western Desert region, but frosts sometimes occur. The Great Victorian Desert has extreme daily temperature ranges, especially in the winter months when night time temperatures drop below freezing, while day time temperatures rise over 35 degrees Celsius. The south-easterly breezes, the ‘Eucla Doctor’, brings cooling relief to hot summer nights, but the engine of the southern ocean also brings year-round dust storms.

The Western and Great Sandy deserts are vulnerable to post-cyclone rain bearing depressions and can be extensively flooded, but the cycle of these events is in the range of five to ten years. Wind is a key issue in designing for habitation – lighter breezes need to be exploited for their cooling effect during hot periods, especially at night, while dust storms are constant during the winter months, and cock-eye bobs pose a threat in the summer months.

Acceptance of Living Patterns
We actively avoided forcing a different pattern of living on the occupants of the houses. We sought to understand how the people used their existing residential infrastructure and explored with them how the new infrastructure would work to support their patterns of habitation.

Location
The locations are extremely remote, thus the communities are protected from many of the social threats such as drugs and alcohol, meaning that the houses need not be as secure as in other ‘tougher’ communities. The remote location meant that the houses are expensive to build, and any systems in the houses must be simple to maintain and replace.

Water Supply
Water is abundant at Irrungadjji and Kunawarritijji communities, but there are high mineral levels in the water, which causes the calcification of water fittings. Tjuntjuntjara’s limited water supply means that flushing toilets are not a possibility for the community.

Power Supply
Each community has a diesel powered electricity plant. Power conservation measures include run-down timers for electric stoves and exhaust fans; energy efficient light fittings; parasol roofs to reduce high summer heat loads; insulated building shells to reduce ambient heat gain in summer and heat loss in winter; wood heaters in living rooms/dining rooms/kitchens and solar hot-water systems with thermostat ‘hot-shot’ electric boosters.

Shared Infrastructure
Many communities share their housing infrastructure with immediate and extended family members. This means that a single house may periodically accommodate up to more than 20 people at any given time. This has significant impact on the service infrastructure of the house. The provision of external sheltered living areas and easy access to ablutions can better facilitate this use.
Multi-Generational Housing
In several houses the family members living inside the house were young adults, while older family member were living around or next to the house while using it for ablutions and as a water supply, or using the verandah as a shelter. It was considered important by the architects to support this pattern of use (common at Tjuntjuntjara, but less so at the Western Desert communities).

Sleeping Fires, Cooking Fires
At Tjuntjuntjara community, elder members chose to sleep outside using a sleeping fire to keep warm during the very cold winter nights. These fires are small and often consist of a major branch, some eight centimetres in diameter, and are sometimes made on sheets of flattened steel to allow for easy relocation should the wind change. Cooking fires vary in size depending on the meal being prepared. They are used to boil water for tea, to make damper, to heat canned foods and to cook bush meats such as wallaby, goanna, bush turkey, and ‘pussy cat’.

The Western Desert communities generally used the verandah areas of the houses for sleeping and living activities slightly less frequently. The absence of evidence of sleeping fires around existing dwellings supported this observation, with the exception of the elders at Kunwarritiji who had a few separate camps within 20 metres of the site of their new house.

Food preparation– Bush Foods and Standard Foods
The food supply is limited to what can be bought at the community store and what ‘bush tucker’ can be caught or gathered. Broadly speaking, it appears that store bought food is often prepared inside, with the exception of damper made from flour and water, which is cooked outside with foil or in a camp oven on cooking fires. Bush meats are prepared and cooked outside. If a dwelling doesn’t have a refrigerator, cooked bush meats will be hung in the bough of a tree, on a verandah or in a flour drum out of the reach of dogs.

Generally, people do not store very much food in their dwellings, except for ten kilogram drums of flour and sugar, powdered milk, tea and vegetable oil. Community members often shop for food each day as part of their daily activities.

Hunting is an exhausting and intensive activity and generally requires the use of a functional vehicle, as game can be widely dispersed. Nevertheless, evidence of bush meat consumption was frequently observed in dwellings (for example, the feathers of ‘bush turkey’, wallaby, goanna and pussy-cat bones).

Outside Kitchen
Each house was to have a steel-framed bench with a stainless steel trough and drainer and cold water supply to support outside cooking and the cleaning of pots and game.

Durability and Maintenance
Due to the remote location of the communities and the periodically intensive use of the housing infrastructure by large numbers of community members, durability is a general design criterion of any Indigenous house. Additionally, householders may not have experienced living in a ‘proper’ (as in conventional), house before and may not have developed many ‘homemaker’ skills, such as those required for cleaning and maintaining the house. At Tjuntjuntjara, community staff have been holding informal ‘homemaker’ courses via the community’s Women’s Centre.

Sorcery and Window Dressing
We commonly observed the occupants of many houses in the community fixing blankets or aluminium foil permanently over bedroom windows. People did not freely discuss and seemed unwilling to discuss why this was occurring during our consultancy.14

The covering of windows makes the normal passive solar design principles difficult to achieve and passive solar heating of desert houses has been identified by AHIU15 as an important area of research to reduce remote communities’ reliance on energy intensive bar heaters in winter.

Vehicles
There appeared to be a low level of car ownership in these communities, but evidence of high levels of car usage. The absence of sealed roads or demarcated tracks was identified as a major cause of the dust problem in the community and a cause of respiratory illness and eye disease.

Each community house had evidence of vehicle maintenance, ranging from tyres and tyre levers to battery chargers, mechanical tools and ‘kangaroo’ jacks.

Dogs and Kids
One of the significant health issues in Indigenous communities is the prevalence of dogs, often in poor condition carrying parasites and diseases, and their near continuous contact with children.16 To address this issue we provided heavy-duty insect screen doors with door-closers to try and keep the dogs outside the new houses.

Dogs hold cultural importance in Indigenous communities as they are a form of protection against intruders and snakes, invaluable when hunting good at cleaning up food scraps and a source of warmth when sleeping outside on cold nights.17

Occupant Feedback and Observations
No formal post-occupancy evaluations were performed, but householders were interviewed at the end of the 12 month defects liability period and comments from administrative staff were also noted. During these inspections the designs of the houses were discussed with the occupants in order to gain feedback, and photographs were taken to document living patterns in the new dwellings. Finally, any modifications to the houses were recorded.

In the Western Desert Houses, modifications included the addition of shade-cloth to certain screened verandah areas, the erection of some bough-sheds adjacent to particular houses and the installation of gardens and lawn areas to several houses. The Tjuntjuntjara houses had few notable modifications except for the addition of garden and lawn areas, and the continuation of the ‘outside house’ living patterns.
Little Sandy Desert, Kunawarritji

Irrungadji Community - Nullagine

Kunawarritji Community
Case Study One: The Western Desert Semi-Transportable Houses in the Little Sandy, Great Sandy and Gibson Deserts

These houses were installed over two funding periods and two separate contracts. This allowed for the post-occupancy feedback from the first generation designs to inform modifications to the second-generation designs.

Place and People; Community Location, History and Context

This housing project delivered new houses and renovated some existing houses for the Martujara people in the Central and Western Pilbara regions of Western Australia. These works were performed at the following communities: Irrungadji, a town-based community at Nullagine; Kunawarritji (Well 33 on the Canning Stock Route); and Parngurr (Cotton Creek).

The Martu people are a traditional desert people who have had a difficult existence since colonisation. During the establishment of the Canning Stock Route in 1906-07, they were brutally forced to act as guides and find water for Alfred Canning.

In 1964, a small family group of women and children were forcefully removed from their country to make way for the British ballistic ‘Blue Streak’ missile tests, launched from Woomera in South Australia to a target field in Martu country. The Martu people lived traditionally, and, in fact, some had never seen white people until the mineral boom of the late 1960s. Each community has a number of very traditional elders who are now old and frail.

The most well known Martu community is the largest – Jigalong community – and was a subject of the book *Rabbit Proof Fence* by Doris Pilkinton Garimara, and the film of the same name by Phillip Noyce.

Anecdotal evidence provided by the Home and Community Care nurse who served Kunawarritji, Parngurr and the nearby community of Punmu, depicts a community that is missing its ‘middle generation’. There are children and young adults and the very old, but the middle-aged and late-middle-aged adults have almost all died. Poor health and nutrition and alcohol abuse, leading to kidney and heart disease, as well as diabetes were seen as the main causes for these deaths. Accidents, such as car accidents, and incidences of alcohol related violence were also mentioned as significant causes.

This makes for a grim demographic situation that is common across northern Australia.

The members of the Martu communities of Irrungadji, Parngurr, Kunawarritji and Jigalong are closely related and highly mobile. During our time working with the communities we observed that many families, for various reasons, would move from one community to another and spend long periods (from months to over a year) living in another community. This means a house is likely to have different families living in it – and these living situations may reflect the demographic make-up of the whole Martu community.
**Community Description**

**Irrungadji**
This community is across the river from the main town of Nullagine and consists of about 18 houses, a workshop, a community office and a frail aged accommodation building. It is also served by the local state school and service station. There is no shop other than the service station and people must drive to Marble Bar or Newman for fresh supplies.

**Kunawarritiji**
This community is built on the northern side of a parallel sand dune, or *jilji*, and is within ten kilometres of Well 33 on the Canning Stock Route. This location means the community is one of the few in the region that could develop an economic base in response to the hundreds of four-wheel-drive tourists who drive the stock route in the winter months.

**Parngurr**
Located on the southern side of Karlamilyi (Rudall River) National Park, and on a huge body of uranium ore, this community is under pressures because of its land’s mineral wealth. The community has a vibrant Aboriginal independent school of 70 students and five teachers, as well as a store, a clinic, a workshop and some 18 houses.
We were asked by the AHIU to design three transportable houses suitable for use in the Western Desert Region of WA. The department did not want to perform any extensive consultancy, but wanted us to design the houses based on our experience, then present drawings and models of these designs to each community for selection. This type of brief is similar to that described in the AHURI Report 98 as a ‘portfolio’ method of consultancy.

We expressed concerns about this process because it tries to anticipate what is appropriate for each family in a region without any evidence based research informing the design.

We visited each community and presented the drawings and scale models of the houses to the community in a general meeting, and, later, in detail to the families who were to receive the new houses. This form of consultancy did not allow us to develop rapport with the community, nor did it allow us a detailed understanding of how people lived in each community.

Specific Issues

The key issues that drove the design solution for this project can be summarised as follows.

Construction System

This commission required the architects to design factory transportable houses for installation in small numbers on a range of Western Desert communities. The implications of this construction system were: load size (4.2m width x 14.6m length x 3.6m height maximum limits) and modularisation of the house units; the possibility of some on-site works; and a requirement for level sites. These issues will be discussed in more detail in a later section of this paper.

Householder Demographics

The Martu families that received houses were generally young families with children. The house at Parngurr was a senior Law Man of the community and his family, and one of the houses at Kunawarritji was for frail, aged elders of the community – some of whom were living in self care and some of whom were assisted by the HACC workers.

Siting Strategies – Surveillance Driven

Irrungadji and Parngurr had limited serviced house sites available and, hence, we had no choice as to where the houses could be located.

At Kunawarritji the Community Layout Plan (CLP) indicated house lots in locations that would entail the excavation of the fossil sand-hill. The remaining sites meant that the community would develop in a linear west-to-east manner.

The key idea that informed the orientation of the houses on their sites was that of surveillance. For example, the community members wanted to communicate to their close relatives, often by hand signals, so main outdoor living areas required clear sightlines between specific houses. Additionally, people wanted to be able to see who was moving around the community. The ability to survey was often more important to the community in orienting the houses than were prevailing breezes or solar orientation.
Building Designs
The requirement for generic designs that were modularised for transport led to the design response of two pavilions linked by verandahs.

As heat-stress trauma is the most difficult condition to alleviate, we chose to design houses that address this climatic issue over that of winter heating.

Platforms, Pavilions and Parasols
The architectural concept driving these houses is that of platforms, pavilions and parasol roofs. Each pavilion is arranged to form a unique plan shape; a centric, linear, 'L'-shaped or 'U'-shaped plan form. The pavilions are then linked by verandahs (platforms) and sheltered by parasol roofs.\[20\]

The Centric House
This plan is the most similar to a typical four-bedroom house, but it provides an additional semi-secure verandah space for activities or visitors, and an open verandah along one side. This was the most cost effective version but lacks an enclosed external store.

The Linear House
Here, two pavilions are aligned in a linear way and are overlapped to provide a secure screened walkway to the rear of the bedroom pavilion, with each bedroom having an additional door to access a ‘front’ verandah.

The 'L'-shaped House
The pavilions are arranged at right angles to each other, but not overlapped so than an exterior space is formed on the ‘outside’ of the ‘L’. The bedrooms have a secured verandah along their length, while the kitchen/living unit has an open verandah.

The 'U'-shaped House
This is the most introverted of the plans. The two pavilions are parallel with each other and lined by an outside, screened living space with a drum oven for cooking.

The houses were constructed over two building contracts with the opportunity to modify the designs before the second contract. Thus, we describe the designs as being first- or second-generation houses. The modification of the first-generation designs happened during the consultation process, while the second-generation modifications were based on occupant feedback and observations on site.

First Generation Modifications
A 'U'-shaped and an 'L'-shaped house were modified to better serve the HACC requirements for the aged and infirm occupants – this included the installation of a wheelchair ramp, a universal access shower and toilet in the main bathroom, and handrails to the second toilet.

Second Generation Modifications
Additional shading devices, which were also retrofitted to the first-generation houses, reduced heat loads to the sides of the 'U'-shaped houses.

Weldmesh dog barriers were installed below the verandah edge to prevent dogs from digging under the verandahs. Ceiling fans were removed from outdoor verandah living areas as these were destroyed by windstorms.

Axonometric, first generation 'U'-shaped house

Centric House

Linear House

L-Shaped House

U-Shaped House
Occupant Feedback and Observations

Construction System
Comments recorded from householders in regards to the construction system or house designs highlighted the following issues; rain blew in below the parasol roof onto the outdoor living space in the ‘U’-shaped houses, dogs dug under the verandahs, wind damaged the outside living fans and plywood screen wall to a ‘U’-shaped house in Kunawarritji.

Sleeping Fires, Cooking Fires
No evidence of sleeping fires was observed, but cooking fires were observed at all houses. The CAT drum ovens installed appeared to have been used at only three houses.

Dogs and Kids
Dogs caused problems when they dug below the verandahs to escape the heat. Sick dogs died below the verandahs and were difficult to remove.\textsuperscript{21}
Tjuntjuntjara 'Breezeway' Family houses
Case Study Two: Tjuntjuntjara
Community Housing, Pila Nguru, Great Victorian Desert

Place and People; Community Location, History and Context

Tjuntjuntjara is the gateway to the Pila Nguru, or Spinifex People’s homelands. It is located some 650 kilometres east-northeast of Kalgoorlie near the border of South Australia and Western Australia.

The community is set in spectacular desert country with scattered mulga, western myall and casuarina trees, smaller flowering plants such as cassia species, sandalwood and spinifex grasses.

The community are the most south-western speakers of a dialect of the Pitjantjatjara language. The population is limited to 120 people, due to the available water supplies, and seems to be generally 100 persons.

The Spinifex people inhabited their country for millennia until they left their country during a time of severe drought and the British nuclear testing program at Maralinga in the 1950s and ‘60s. They moved southwest into Cundeelee Mission, 200 kilometres east of Kalgoorlie, where they reconnected with family groups that were dispersed by the drought and nuclear tests. The community was compensated by the British Government for the effects of the tests and this money, the Maralinga Trust Fund, was used, in part, to find a new community site located in their homelands.

People began to return to the country in the 1980s, but water was extremely scarce and it wasn’t until the late 1980s that Tjuntjuntjara was established next to a shallow lens aquifer that is thought to be able to support a population of up to 120 people.

The community is extremely proud and strong. Their traditional culture is robust and intact and everyone in the community speaks Pitjantjara; there are only a few fluent English speakers. Community members had previously worked closely with Adelaide architect Richard Woods and, thus, had some experience of the role of consultancy and design in delivering buildings.
Existing Building Stock

Other than the AHU houses which have an attached laundry and ablution block, the remaining community houses have shared ablution blocks to support family members in the immediate house and any additional family members camping in a humpie or tent nearby. The ablution blocks were a single building containing a laundry, shower and toilet, where the toilets were of the long-drop pit type.23 Several stand-alone pit toilets were placed around the community near camping or activity areas.

Consultancy Method

Our site team consisted of project manager, John Knuckey (Capital House); myself; and Sarah Yu, a consultant anthropologist.

We saw it as critical that there was a female consultant in the team because culturally it is often the case that the women, especially the younger ones, will not talk frankly (or at all) to male consultants.

Additionally, we requested and the community provided a man and a woman to attend each of our meetings to act as a translator to ensure good communications.24

The consultancy stage consisted of three workshops involving the entire community, performed over several days at the community site.

The first workshop was a scoping study performed with the intent to develop an understanding of how people lived in their existing accommodation, how they wanted to live in their new houses and what they wanted in their new houses. Additionally, we needed to develop a rapport with the community and gain their trust so that we could produce the best solutions possible. We endeavoured to gain an understanding of the demographics of the community and the familial relationships between householders.

To this end, we interviewed every ‘household’ family (including all camps and humpies) over a three-day period and documented these interviews in detail. We also took photographs and detailed notes of every dwelling site, paying particular attention to where people were making sleeping spaces and activity spaces (such as tool making areas or cooking areas), and asked specific questions so that we could determine how these places changed during the different seasons.

Finally we asked the community to identify which families were getting the new houses so we could ensure that specific needs were addressed. The sites for the new houses were then discussed and roughly selected.

The outcome of this first stage was a detailed design brief.

The second three-day workshop involved the presentation of a series of house designs that addressed the design brief. These house designs were then drawn and modelled at a ratio of 1:100 in cardboard. The designs were initially presented to the whole community, then individually to each family ‘household’. It should be noted that the designs were also presented to people who were not getting a new house because it was seen by the community that all of its members should have input into the design of the houses.
We took notes and photographs during the individual presentations to build on the observations of the dwelling spaces for each family. We then discussed orientation to wind and to their homelands.

The community selected two designs out of the six produced and asked that modifications be made to some areas. These designs were then further developed and drawn at a larger scale, remodelled and presented at a final two-day community workshop, supplemented by individual family presentations to allow each family the opportunity to discuss the designs. Again, specific notes as to the use of the existing dwelling spaces were taken to build on our knowledge base for the community.

The new housing sites were revisited and the footprint of each house was roughly established using star pickets and ‘brickies’ string.

This consultancy method is what I see as ideal.

**Siting Strategy – Geographic Planning**

During any community meeting the whole community would form an approximately 25 metre diameter circle, with each person sitting with their back to the direction of their homelands. In the location of the houses (or camps) the community used this same method of planning. Unfortunately, the Community Layout Plan (CLP) that was drafted for the community does not reflect this radial geographic plan and had to be amended to accept the new house locations. Additionally, the community saw the meeting place as the heart of the community and were keen for the houses to look towards this place while looking back ‘to country’.
**Wind-sock House**

Our observations as to the living patterns during our consultation stage show that in many dwellings one family group regularly used the inside rooms of the existing houses. Often this family group consisted of younger adults and their children. The outside of the houses was frequently used by the community elders, and they did not seem to use the 'inside house' very often, choosing to sleep, prepare food and work (on tool making and painting) around the house.

The patterns of use of this ‘outside’ house are driven by the seasons and the prevailing winds. We have coined the term ‘wind-sock’ house, as it is common to see the living spaces in the lee of the ‘inside’ house during the cold months.

We have attempted to support this type of living with verandahs, an outdoor food preparation bench and trough, and windbreak elements in the new designs. The provision of a ‘breezeway’ verandah with roller doors enables the breezeway to be closed down in windy periods.

**Building Designs**

The ‘L’-shaped House

This house was very similar to the 'L'-shaped house that the community saw when we first presented our consultancy proposal to them. We were requested to bring the design back for consideration.

The house consists of two pavilions – one living/dining/kitchen pavilion with a separate room at the end which could be used as a fourth bedroom or additional living space, and a separate pavilion with three bedrooms and a covered connection to a shower and laundry block and a pit toilet and hand basin.

The pavilions are covered by a parasol roof that forms a verandah over concrete slabs. The verandahs are screened in the corners with plywood windbreaks that assist in verandah living and sleeping and provide some privacy. The pavilions are separated in the join of the ‘L’, forming a breezeway living area.

The ‘Breezeway’ House

The house consists of a large square pavilion, and adjacent breezeway and a second pavilion consisting of two bedrooms accessed from the breezeway. This is a house plan that has been used successfully in the Pilbara and Kimberley regions and has a historic precedent to nineteenth-century station houses in Australia, such as Lillimurura Station in the Kimberley.

The main pavilion has two bedrooms accessed off an open-plan living/dining/kitchen area.

The 4.2 metre wide breezeway living can be secured by link-mesh fencing on the outer side of the house, and by two garage roller doors on the front of the house. The breezeway also has a large fire pit for cooking and a hole in the parasol roof to vent the smoke.

Both houses have the same general finishes, fixtures, internal dimensions and facilities, but vary in their plan form configurations. The houses were documented to allow for both site-built and transportable constructions. Each house could be broken down into three loads for transport on a low-loader semi-trailer. The lowest tenderer elected to build the buildings conventionally, on site.
The exterior dwelling utilising the downwind side of the ‘inside house’

View from verandah

‘L’-Shaped Pit Toilet

Meeting Shelter ‘L’- Shaped House

‘L’-Shaped house
Occupant Feedback and Observations

A small number of the community members regarded the houses as being of a lower standard than the teachers’ or administrators’ houses, possibly due to the internalised bathrooms and flushing toilets in the teachers’ and administrators’ houses, though determining an exact reason is difficult.

The screened verandah edges were used as living spaces and sleeping areas – in several cases there was a television outside in these areas.

The main criticism was that the toilets did not flush. The concern that the shower units were open-topped vanished after they were built.

Sleeping fires were observed on several verandahs and cooking fires were observed at all houses. The fire pit in the Breezeway was reported to have been used, and most often during the winter months. The wood heaters installed to all houses were well used.

Most of the houses had multi-generational occupants, ranging from infants and young children to young adults and very senior Elders. The ‘L’-shaped house was used by elder community members without young children.
New houses from near meeting area- looking to ‘country’

New houses looking towards meeting area
Djegerari community with the Walmajarri homelands beyond

Community Centre south elevation
Case Study Three: The Walmajarri Community Centre at Djugerari, Great Sandy Desert

The inclusion of the Walmajarri Community Centre in the case studies provides a non-housing remote community project that is affected by similar design issues and constraints as the housing projects.

Place and People; Community Location, History and Context
Within only one generation, in the 1950s the Walmajarri people left their homeland behind to face the world beyond the sand hills.

The last Walmajarri family who lived a traditional nomadic life left the desert in the late 1970s, and the last massacre by police occurred in the late 1930s, with several surviving witnesses alive today. The families are faced with almost third-world conditions; unemployment, poverty, health and social problems and, most critically, the matter of how their children will tread the path between the modern world and traditional culture.

When the Fitzroy River Valley to the north of the Walmajarri homelands was opened up by pastoralists, the Indigenous people on whose country the cattle began to roam were coerced to work on the cattle stations as a way of staying on their own country. Familial ties between the language groups had to be maintained and these pulled populations to the north from the desert into the river valley and the Walmajarri people began to leave their country.

Djugerari Community
Djugerari community is the beach head of Walmajarri country. It is the point where the jilji – the parallel sand hills of the desert – meet the ancient sandstone ranges and mesas that separate the river valley from the desert. It is here that the Walmajarri people were able to gaze from their own homelands to the lands to the north and observe the new strangers with their cows, horses and guns.
Consultancy Method

We were directly approached by the community coordinator, Ziggy Miedema, at Yakunarra community because he wanted “an innovative, environmentally sustainable building”, but the DHV/ AHIU required that consultants be selected by open tender.  

The first stages of the consultancy at Yakunarra community involved three community workshops, the first to establish a brief and a site for the building, and the second to present some schematic designs. The third visit was to present the developed designs.

I had worked with this community in the early 1990s when it was first established and there was no need to have a female consultant, as the female members of the community felt confident in speaking directly with male consultants.

At the completion of the design development stage of the consultancy, the corporate executive of Walmajarri Inc., the managing body and funding recipient for the building, decided to relocate the building to Djugerari community. This unusual situation reflects the ups and downs of local politics within all Indigenous community groups.

The consultancy was resumed with a new, smaller group of community members from Djugerari, led by the committee members who made the decision to relocate the building.

The functional brief of the building shifted slightly away from training and more towards the possibility of ethno-tourism – Djugerari is well placed for this activity.

The new community client group was less engaged with the consultancy process but open and frank in meetings.

The change of site and client group may well have had a negative impact on the success of the design, but this is difficult to determine.
Specific Issues

Construction System
Due to the required room sizes and the community’s proximity to the Great Northern Highway, we anticipated that factory built steel frames, flat-packed and erected on site would be the general construction system. We did, however, keep the designs for many of the enclosed spaces, except for the main meeting room, within the module that could be transported on a road train.

This project utilised a parasol roof as a way of mitigating heat loads in a civic building. A mechanical engineering firm (Healey Engineering) was engaged and they estimated that the parasol roof was saving 1800 litres of diesel fuel per year, due to the lower temperature loads on the air-conditioned spaces.

Siting Strategies
The community wanted to locate the building at the entry to the community, over-looking their country to the south. They discussed the need for the building to be “something that they can be proud of and show off to visitors”.

The building was located at the entry to the community to ensure that visitors could be received without driving into the community housing areas. Additionally, the pavilions below the parasol roof were oriented to frame distant views of hills and sites holding cultural significance for the Walmajarri people.

The developed brief was as follows:
A community centre and staff house with sensible, environmentally sustainable design considerations.

The house had to function as a shared house with good separation between the bedrooms.

The brief stated the Community Centre required:
1. A meeting area that can open onto a covered area for larger meetings or events
2. A general community office
3. A coordinator’s office
4. CDEP Office (Community Development and Employment Program)
5. A kitchenette serving the meeting room
6. A men’s training room and associated outdoor space
7. A women’s training room and associated outdoor space
8. A common outdoor area with a workspace and troughs for cleaning art materials, etc.
9. Men’s and women’s ablutions
10. The ability to ‘paint-up’ the building with murals showing cultural stories
11. That parts of the building would frame views of ceremonial sites to the south.
Building Design
A civic building, to the Djugerari community, is seen as an expression of their hope for the future. The chairperson, Ivan McFee, wants the building to be widely known and to provide a place for young Walmajarri people to learn about their culture and language and from which to develop an economic base through ethno-tourism.

The building is a simple cluster of pavilions that initially appear informally placed, but as one moves between the pavilions specific views are framed and the dramatic landscape is revealed. This building is a device that frames, conceals and reveals the landscape. The concrete verandah extends the functional spaces of the pavilions during fine weather.

Occupant Feedback and Observations
Macro and Micro-Climatic Conditions – Prevailing Winds
Unexpectedly high wind gusts make the outdoor activity spaces unusable for periods of time.

Generally, the training rooms appear to be used infrequently, possibly due to the lack of developed programs. The meeting room seems to be well used and is popular. The wall murals have yet to be painted, but there has been some discussion about applying for grants to run a workshop with Mankajar Arts in Fitzroy Crossing.
Case Study Conclusions – Themes and Ideas

The case studies compare three remote area Indigenous building projects on similar sized community hamlets. While each project shares many common issues they each have unique circumstances that affected the design process. The most important ideas in shaping the designs are listed below.

The case studies all demonstrate well documented issues and principles that affect the design and delivery of housing and building projects in remote Indigenous communities as summarised below.

Consultancy as Core Process

The consultancy model used with the Tjuntjuntjara community is our preferred consultancy model. While each project was regarded by the community and government agency as successful, we believe that the critical flaws in the consultancy methods used in the Western Desert Houses and the changing client group in the Djugerari Community Centre have affected the quality of the outcome in these two projects.

For the Western Desert Houses the government agency required us to complete the designs prior to performing any consultancy with the community. The reality of changing the location of the Walmajarri Community Centre from Yakunarra to Djugerari may have had a real impact on the functionality of the final building. I believe that the detailed consultancy and the coordination with community training activities in Yakunarra community would have resulted in more active use of the training spaces in the centre. In contrast, the training activities, and the plans for ethno-tourism, were at a conceptual stage at Djugerari. To date, only a few programs have been conducted and the tourism project has yet to reach fruition.

Anthropological Approach

Due to the difficulty in obtaining the trust of and bridging the language barriers with these client groups, our site observations, photographs and notes proved to be an invaluable aid in understanding the domiciliary habits of the community members.

This has been described as a ‘forensic’ approach, i.e. evidence based approach. It can be more accurately described as an ‘anthropological’ approach – that is, looking for evidence of domiciliary life and including discussions around these observations with the client families to better reveal how a family lives and to discuss how they want to live (which may differ, somewhat).

Furthermore, this technique can be used during formal or informal post-occupancy evaluations to determine the success of the design solutions.

Supporting Living Patterns

As designers we seek not to change how people live in these communities – only to provide housing infrastructure that supports the way they choose to live. In some cases this may mean that a house is less adaptable to different user groups, but a ‘one size fits all’ solution is not possible. The concept of the ‘wind-sock’ house is the best example of a compromise-based design that supports the traditional camping and hunting life of the elders at Tjuntjuntjara community, while their younger family members can choose to live in the ‘inside house’. In some cases...
there can be conflict between the type of house people state they want and evidence that reveals how they use the house.

**Siting Strategies**

In each of these case studies the siting of the buildings was of particular concern to the communities. In most cases the Community Layout Plans (CLPs) were driven by existing service distribution and therefore the ideal community plan was not possible. Within this compromised plan, the community still have key concerns. These are reflected in the following issues affecting siting strategies.

**Geographic Planning (Tjuntjuntjara)**

The community has a flexible enough CLP that the individual houses of each family are oriented radially around a central common area (often a formal meeting area). The direction of each house location indicates where points to the country that family comes from. When the community has a meeting, people sit in a circle with their backs to their country.

**Surveillance (Western Desert Houses)**

Each house has direct views to approaching strangers and clear lines of site to other family houses. Community members communicate over these distances with hand signals. This planning form can further be supplemented with screening to provide privacy to the householders on verandahs watching the scene.

**Framing (Djugerari)**

The buildings or spaces (in this case pavilions) frame key views of culturally important sites. At Djugerari the location of the community centre means it also acts as a ‘gate house’ for visitors. There were some surveillance issues influencing its location.

**House as Infrastructure (House Within a House)**

In these remote hamlets the house is a shared piece of infrastructure and, as such, the designer needs to gain a deep understanding of the other components – physical, cultural and functional – of the community.

The ‘wind-sock’ house described in the Tjuntjuntjara case study matches similar descriptions of a ‘decentralised’ house, where a “house is a set of separate structures, combined with other site elements and services”. Furthermore, AHURI, Paper 98, states: “The concept of housing is extended in this study to include what is generally encompassed in the term ‘built environment’ to describe ‘all aspects of the physical environment, including the social, cultural and environmental attributes of places’, not only dwellings but also open space, infrastructure and community services. All need to be considered in relation to the design of dwellings.”

The same paper notes that the ‘cultural ideal of ‘house as home’, so common in many parts of the world and in non-Indigenous Australia, is not a part of Indigenous cultural traditions. Thus, living in a building comprised of contiguous spaces/rooms, each with specific functions that satisfy the physical and social needs of a nuclear family, is a relatively new experience – perhaps as new as one or two generations – for Indigenous Australians living in remote regions.” (Page 10)

The interconnection of the physical, cultural, and environmental issues is a critical reason to always perform detailed consultancy before a housing idea is applied to a community.
Appropriate Technology

The pressures of funding lead to a situation where communities, housing bodies and government agencies seek the largest house for the cheapest price – often compromising long term operating costs for a larger house or more houses.

As part of this investigation I realised that many key design decisions were driven by a notion that we should use ‘appropriate technology’. This applies both to individual components and hardware items in a building, and more broadly to the construction systems selected by the design team.

What is meant by ‘appropriate technology’?
When I discuss appropriate technology, I refer to systems and components that are ‘fit for purpose’; serviceable and easily maintained by the skills available in the remote community.

Transportable Housing Systems

The push to deliver a low number of houses to several locations under one building contract has led the Western Australian Government (and other states and territories) to focus on transportable housing as a viable solution. This industry has grown from the mining industry with early units (‘dongers’) inappropriately re-used in Aboriginal communities. The transportable housing industry can be traced back to the first and second World Wars (and further back to the late nineteenth century) and has a history of producing some reasonable solutions.

In the Western Desert houses we designed hybrid or ‘semi-transportables’, that is, the enclosed units were factory built and transported to site on low-loader semi-trailers, where site-built decks, pre-cast pads, steel pipe ‘pile’ footings and parasol roofs were erected around the units, which were then connected to community power, water and sewer or septic systems. It took a small team of builders between a week and ten days to complete a house on site.

These semi-transportables could be relocated, but not easily.

The current standard form of construction in remote Western Australia is concrete slabs on ground, with concrete verandahs, ‘flat packed’ steel stud framing and trusses that are factory welded, stood up on site, fitted with windows and door frames, tubed out with plumbing and wiring, insulated, clad with corrugated Colorbond sheeting and lined with a nine millimetre compressed fibre cement sheet.

As part of this research I considered the factors that influence the decision to choose a factory built transportable, or a site built solution in a housing project. My conclusion to this question was if the number of houses required was low (less than six to eight), the degree of remoteness high, and there was road train access, a transportable procurement option may be viable. Conversely, if the number of houses required is high (over six to eight houses), this alone may weight the decision in favour of a site built solution. (Refer to assessment matrices on page 40)

Many alternatives have been proffered: polyurethane filled compressed sheet panel houses (Hardies System Built), the ‘Conclad’ system, where pre-cast concrete panels are fixed as cladding to standard steel-stud frames, the 1970s steel framed ‘Panelrib’ clad houses from the Department of Native Welfare,
concrete or ‘breeze-block’ houses in the Northern Territory and Ngaanyatjarra homelands (now discontinued in Western Australia as a system), and rammed earth.

The more specialised a system, the less likely that it can be easily maintained in the long term. This situation is apparent in the Conclad system, where when the company shut down no replacement cladding panels could be obtained and, accordingly, hundreds of Conclad houses throughout the state have a patchwork of ill fitting repairs that allow easy access for vermin and pose an accident risk to children.

Most critically, a housing solution for one family or community may not be appropriate for other families, typified by Glenn Murcutt’s Marika-Alderton House at Yirrkala Community in Eastern Arnhem Land, Northern Territory (1994). This house, while poetic and elegant, I believe does not address issues of over crowding and durable construction within a typical Aboriginal housing budget.

Components – the Devil is in the Details

The NIHG describes critical areas for designers to address. The specification of appropriate hardware and robust detailing is a key requirement.

A good example of appropriate technology is the rods-stay hardware used to hold open the shutters to the store-room/sleep-outs in the Western Desert houses. These units are very simple, they have one moving part – a galvanised six millimetre diameter stay and an eye fixed to the shutter frame (a simple steel door frame) – and cost about ten dollars.

In contrast, Murcutt used gas struts from the automobile industry on the elegant timber slatted shutters to the Yirrkara house – these struts have multiple moving parts, neoprene seals, pressurised cylinders and are vulnerable to salt, dust and sand. They are also expensive to buy and difficult to fit.

A failure in a gas strut may cause inconvenience to the household, but failure of any essential services or health hardware may make the house unusable, resulting in the householder using these parts from a neighbouring house, thereby adding to that house’s population load.

The solution to many design problems lies not in a high-tech response, but in a considered, low technology response. The use of a parasol roof on the case studies is a good example. At Parngurr Community we renovated three ex-Telfa two-unit mining houses that were delivered to the community in early 2000. No verandahs were built and the houses were effectively uninhabitable due to the heat loads and lack of shaded outdoor living space. As part of this housing project, the three houses were renovated by installing a thin parasol roof, a verandah and a parasol wall to the north side of the house, thereby significantly reducing heat loads.

This thin parasol was simply constructed of steel top-hat battens fixed to the existing roof cladding with tek screws. The parasol wall was a similar system. This low-tech solution made uninhabitable houses functional at little cost.

Our detailing of these remote projects is best described as agricultural, low maintenance and robust. Semi-skilled people can repair or modify the buildings if assisted by a tradesperson.
Building the Knowledge Base

Practitioners generally don’t have the time or the capacity to share or communicate their knowledge base. I have had discussions with Paul Pheleros about the next edition of the NIHG and he sees the ideal solution as an online document where practitioners can contribute content subject to peer reviews in a similar way to the website Wikipedia.

Lessons learned from the three case studies, and future areas of research, such as the following summary, could be contributed to such a document.

**Tjuntjuntjara**
Highly successful based on client feedback. The success is due largely to the detailed consultancy process. The parasol roof system proved to be cost effective and highly effective in heat load reduction.

**Issues**
- Dogs still penetrate the inside house.
- Some hardware failure – locks, lost keys, screen door closers.

**Future Works, Design Issues to Pursue**
- Passive solar heating to living and bedroom spaces in winter months.
- Water collection system and way of resolving contaminated faecal dust.
- Better dog-barriers to inside areas of houses.
- Landscaping and dust reduction.

**Western Desert Houses**
Generally successful. Client requested more verandah spaces.

**Issues**
- Rain blows under parasol.
- Timber quality variable and long-term durability of decks in question on two houses.
- Dogs burrowed below verandahs (meshing).
- A ‘thin’ parasol trialed on ex-Telfa houses as a renovation.

**Future Works, Design Issues to Pursue**
- Water collection for landscaping windbreaks and dust reduction.
- Decking alternatives.
- Better dog-barriers to inside areas of houses.
- Passive solar heating to living and bedroom spaces in winter months.

**Djugerari**
Successful – client feedback: parasol roof effective

**Issues**
- Privacy levels to staff house
- Dust screening being addressed with landscaping.

**Future Works, Design Issues to Pursue**
- Water collection for landscaping
- Wind break planting
- Dust reduction

The final, and possibly most critical, lesson is that good consultancy, based on spending time developing a rapport with and understanding of the community – both by talking with the community members, staff and service agency officers and making detailed observations of the evidence of domiciliary patterns – is performed prior to the presentation of design concepts.

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### Tjuntjuntjara Matrix

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<td>Scale of Project</td>
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<tr>
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<td>Community/cultural issues</td>
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<td>Road Access - wet season closure</td>
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<td>Available builders/trades - community labour?</td>
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*Note: max. module 14.6x 4.2x 3.6Ht for front escort low loaders.

### Pre-fabrication Assessment Matrix

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<tr>
<td>Road Access - wet season closure</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Available builders/trades - community labour?</td>
<td></td>
<td></td>
<td>x</td>
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</tbody>
</table>

### Western Desert Matrix

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Fully</th>
<th>Semi</th>
<th>Kiln</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scale of Project</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small (1-3 houses)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Medium (4-8 houses)</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Large (8+ houses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remoteness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Near (&lt; 1 days travel)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Far (many days travel)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Poor water quality/availability - just ok</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design issues - compatible brief</td>
<td></td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Community/cultural issues - Desire to minimise contact</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Access - 4 season</td>
<td>x</td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>Road Access - wet season closure</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Available builders/trades - community labour?</td>
<td></td>
<td>x</td>
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</tbody>
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### Transportable construction assessment matrices

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Applying the Research – West Kimberley Regional Prison

We are now applying these ideas to the new West Kimberley Regional Prison as follows.

Siting

The master plan of the prison locates self-care housing clusters around a central oval. This allows prisoners the flexibility of choosing where they want to stay, and during initial consultations with Indigenous groups, this included the possibility of ‘geographical planning’. Additionally, each housing cluster was driven by visual links between houses – providing the cultural need for surveillance.

The internal planning of the site seeks to minimise the removal of the existing eucalypt and boab woodland and to ensure that, as people move within key passages or spaces between buildings, the ‘framing’ technique seeks to avoid looking at other buildings but seeks first to look to the bush-land beyond the security perimeter, or to an alignment on a close mature tree.

Appropriate Technology

Early procurement studies explored the idea of utilising transportable buildings for the housing units. I argued strongly, based on my experience, that due to the large number of houses (20-plus) and the location in a regional centre, that the cost benefits of conventional construction outweighed the issues of transportable solutions. Additionally, the decisions, in terms of specific technologies to be used in the facility buildings, are driven by a clear understanding of the available technical maintenance capacity of Derby.

Master-plan, an ‘ideal’ indigenous community behind a high security fence, siting to allow for geographical planning and for interlink surveillance between houses within a housing cluster. Minimal removal of existing bushland.

Typical self care male house plan, this is very similar to the ‘L’-Shaped houses at Tjuntjuntjara and the Western Desert Houses.
The Influence of Remote Work on Metropolitan Projects

There are considerable differences in the operational parameters of our remote Indigenous design work and that of our metropolitan projects. Beyond the obvious issues surrounding the remote location and the extremes of climate and culture as discussed above, there are also the siting differences. A suburban density driven by residential planning codes often results in more internally focused houses, perhaps seeking framed views or ‘constructed isolation’, as opposed to houses in remote Indigenous communities that need to be visually linked to other family houses and to allow for the observation of the shared community spaces.

Another major difference relates to the actual conceptual notion of ‘house’. This is radically different for those in a remote community where an extended family shares a building as opposed to that of a single suburban family home. At a more detailed level, the community ‘house’ doesn’t stop at the edge of the verandah but continues into the surrounding community as a decentralised house, and the rooms that are labeled ‘bedroom’ or ‘living room’ may be used for a variety of purposes. It is not necessarily a house as ‘we’ know it, but it might be.

Finally the restricted palate of materials and construction systems and the issues of the requirement for high durability and low maintenance in the remote projects lead to a robust agricultural form of construction detailing.

Exchanges of Ideas from the Desert to the City

The notion of the house being something that goes beyond its perimeter walls has increased in our awareness. While we often hear the phrase ‘bringing the outside in’ the much stronger connection between enclosed house and outside house has gained traction in our metropolitan designs. Additionally, we have become interested in the idea of how multi-generational housing may operate in a suburban environment, as explored in our 2007 housing design, ‘Think Brick’.

Some systems and components of remote sustainable design have been transferred to our metropolitan projects. The parasol roof has been applied to a design for the offices of Greening Australia, Inc., in Piney Lakes, Western Australia. This same project is driven by the idea of platforms, pavilions and parasols – with the spaces between the pavilions designed as ‘rooms’ with framed views to a bush landscape.

The exploration of using transportable, or factory built systems has also been translated to two non-Indigenous projects: a house at Peppermint Grove Beach, near Capel, and another at Preston Beach, near Mandurah. These were both small, low budget houses at sites outside urban centres, thus making them unattractive as projects to builders in a stimulated local market.

The notion of using robust ‘agricultural’ construction and detailing, and actually celebrating this aesthetic, can be seen in the house in Kapang Drive, Broome; and most recently at the House in Gidgegannup.
Conclusion

How do we produce architecture that responds to extremes in climate and culture within the context of remote Western Australian Indigenous desert communities?

Of primary importance is the need to perform good consultancy that creates an understanding of the community; the physical place, the social and cultural dynamics, the dynamic of the demographics and flexible housing needs. These issues, which can be summarised as a developed brief, must then be balanced with the inadequate budgets, the anticipated contractors’ skill levels and the selection of building systems. All this occurs while trying to innovate in the field of sustainability, and while paying due attention to the use of appropriate technology.

Feedback from occupants is critical for successful design review and the recording and documentation of this feedback, and the sharing of this with peers, will lead to more successful building outcomes on remote community sites.

The methodology developed by iph concur with the conclusions of the recently published AHURI Final Report No. 114, which proposes a series of ‘best practice principles’ that can be directly implemented by architects. Refer to Appendix B for a diagram of the AHURI Revised Design Framework.

The architecture that we produce in response to the extremes of climate and culture in remote Indigenous communities is not driven by appearance but by performance. To produce an architecture that performs adequately, let alone excellently, in this context requires a sophisticated process of consultation and observation.

The vast and growing body of research in indigenous housing now needs to be applied by governments to ensure we do not repeat the mistakes of the past.

Social Sustainability

Without adequate houses in these communities, families will not be able to educate their children, get healthy and share in Australia’s prosperous future.

As architects, we have a responsibility to improve the living conditions of all people in society by performing our trade. It is unacceptable that in a country as affluent as Australia, part of our society lives in life-threatening poverty and squalor. This is a human rights issue that cannot be easily remedied, but our skills as architects are key to providing building solutions to these communities that may assist them.

As citizens we must pressure government to provide better coordination in the delivery of opportunity, employment and funding to these communities to help preserve humanity’s oldest living culture.
1 NBC AC is an organisation providing architectural, planning and infrastructure services to Indigenous communities in the Kimberley and Pilbara regions of Western Australia. NBC is owned and controlled by the three Aboriginal Resource Agencies in the West Kimberley, Mamabulanjan AC in Broome, Winang Ngari in Derby and Marra Worra Worra in Fitzroy Crossing.

2 Refer to Martyn Hook’s PHD section XXX for more detail.

3 Memmott, P. ‘Aboriginal housing: The state of the art (or the non-state of the art)’ p 34, Architecture Australia June 1988.


10 The communities require literate staff who are able to write funding applications, provide a basic payroll and book-keeping services, teachers, nurses, maintenance personnel and mechanics (for the vehicles and emergency response to power and infrastructure problems). Often, if there are no staff to write a funding application, the community will have a very diminished capacity to function.

11 CITE ATSIC/NAHS Brief.

12 The 2007 Town Planning Report (Plexus) for DHW/ AHIU identified Pargurr’s water supply as being contaminated with concentrations of uranium exceeding standards set for health based on chemical toxic affects. In addition, problems with potential contamination of the water supply from have been reported and thermo-tolerant coliform bacteria have been detected in the water supply. At the time of my last visit the community were drinking bottled water, and an investigation was underway to determine a solution for this problem.

13 The women and younger men generally wanted “proper flush toilets” but understood the issue of water restrictions. It should be noted that the state-run school and teachers’ houses have flushing toilets, as well as other staff houses. Water conservation measures include self-closing and timer taps, limiting external taps to one per household with a self-closing valve. Water collection from roofs is in

14 We were advised by lan Baird that it may be to reduce heat load (which was our initial suspicion) but more probably to protect the occupants from ‘sorcery’. Sorcery is an extremely taboo topic in communities and cannot be raised in discussions, but it seems that people feel vulnerable to this when asleep and hence protect themselves from view at this time. It has been thought that dogs also provide some protection against this issue.

15 David Carpenter, Manager Capital Works, Aboriginal & Remote Communities Public Works & Building Services Department of Housing and Works in conversation.

16 NHG, HealthHabitat’s 2007 “Fixing Houses for Better Health Project Managers Manual”, 9 principals of Housing for Health which are; washing people, washing cloths and bedding; removing waste water safely, reducing the impact of over crowding, reducing the negative impact of animals, insects and vermin, reducing the health impact of dust, controlling the temperature of the living environment, reducing hazards that cause trauma.

17 We did not perform a survey of dog numbers but our observations were that Kunawarritji and Parngurr had a high level of dog ownership, while Irrungadjji appeared to have a relatively low level. A high level could be more than five dogs per house. At Tjuntjunjara I observed one house with at least 12 dogs living around it.


19 Additionally I felt that showing people existing designs interferes with the process of consultation and interrogation of the brief for the houses. It does not encourage people to think more carefully about their housing needs – especially when the clients may have never been asked about these issues before.

Needless to say we accepted the commission, expressing our reservations and with the understanding that we would be able to modify the designs to suit individual family and community needs.

20 Each pavilion is a factory built transportable unit, with a pre-stressed concrete floor, steel stud framed walls, insulated, with corrugated Colorbond steel cladding externally and nine millimetre compressed fibre cement sheet lining internally. Each unit has its own insulated roof, vinyl sheeting to the floors, tiles to the wet areas, aluminium sliding windows with woven-wire insect/security screens with a fire-escape screen to each bedroom. Pavilion 1 has an open plan living, dining and kitchen area, with a bedroom or second living space at the end of the pavilion, and pavilion 2 has three bedrooms and an ablution area separated from the bedrooms by a breezeway passage.

The platforms/verandahs have two forms – the open verandah, from 70x35 treated pine decking on stumps, and the secured form with a one metre high wall for privacy and circular hollow section framing and chain mesh fencing to the underside of the roof. The secured verandah allow for house owners to lock this perimeter while still having access to the ablution and laundry areas of the house.

The parasol roofs are a simple corrugated roof system, propped 450mm above the pavilion roofs and supported off columns around the perimeter of the house. The parasol roof has the effect of removing the direct solar radiation load off the enclosed areas of the house, dramatically reducing the heat loads. The columns for the parasol roofs were supported off 1.8m long 230 DIA Galvanised CHS stumps dug into the ground to eliminate the need for concrete.

Two house designs (Generation 1 “U” shaped and Centric, below) had CHS outriggers with commercial shadecloth over to better shade the sides of these houses.

21 At Kunawarritji people would leave the community for period of time and would leave a number of their dogs behind to fend for themselves, knowing that there is a pond at the visitors’ area they can drink out of. I have observed that if the dogs can access the toilet bowls they will drink this water. Door closers on toilet doors may reduce this occurrence.

22 In 2000 the Plu Nguru were the second group in Western Australia to receive recognition of their Native Title land rights in accordance with Section 87 of the Commonwealth Native Title Act 1993, and in 2004 the Unnamed Conservation Park Biosphere Reserve (now Mamurunguri Conservation Park), a pristine wilderness area of 21,000 sq/km was handed back jointly to the Maralinga Tjarutja and the Plu Nguru people.

23 Dry composting type were trailed at the community, however these posed a problem as the community disliked removing the
composted matter for social and cultural reasons they were converted to simple long-drop type facilities.

24 Throughout the project, Ian Baird, a non-Indigenous man who has married into the community, was extremely helpful in ensuring good communications and appropriate cultural protocols were maintained, and that we were kept updated as to any events that may affect our consultancy, such as the death of a community member (who's name can't be spoken once deceased) or any other community issue.

25 Internal Spaces
The kitchens have stainless steel benches, on square hollow section (SHS) steel frame, with open mesh shelves to prevent vermin build up. There are double sinks, high spout taps to allow for large pots and drums to be cleaned, galvanised steel pantries with spring door closers to prevent dogs opening them, and hasp and staple locks should an occupant wish to lock the pantry.

Each house has an electric upright stove, connected to an electric ‘run-down’ timer circuit set for 90 minutes. This means that the stove switches off after 90 minutes and has to be switched back on to continue cooking – thus preventing people accidentally leaving the stove on – or children switching them on and leaving. There is a wall mounted dumped exhaust fan, also on a run down timer, over the stove – not a ‘range-hood’ type as these historically do not get cleaned and can cause a hygiene or fire risk.

The kitchen is provided with a ‘picnic-table’ style bench and table as families often have little furniture.

The living room end of this space has a wood heater for winter months.

Bedrooms
The bedrooms have built in open mesh shelves on SHS framing and florescent tube lighting.

Ablution Areas
Shower areas are from galvanised SHS framing clad internally with 18mm compresses fibre cement sheeting, epoxy painted, with a self-closing door with rubber buffers to prevent children’s fingers getting trapped between the door and the frame, and to provide privacy. The shower is open at the bottom of the walls, and has no ceiling in order to maximise self-drying. There was some concern from the women that this may provide inadequate privacy, but once built this concern was no longer an issue.

A laundry area provides some additional privacy to the shower doorway, and contains space for a washing machine and a trough and drainer that can be used for washing babies and toddlers, as well as clothes.

The long-drop toilets area are set away from the house 7m due to the Department of Health’s requirements. Each toilet is a dry composting type with a black chimney providing odour reduction. Each has a stainless steel basin with a self closing tap valve, and a shelf and toilet paper holder. Doors are self-closing.

The ablution areas were lit at night only with florescent lights on a photovoltaic relay switch.

Windows were fitted with heavy-duty woven steel security/insect screening, and each room had a fire escape mechanism installed on the security insect screens.

Ceiling fans were installed to all rooms.

Doors were all solid core with elliptical knobs to assist aged people to operate the knob. Lever handles were not used due to the history of children damaging these types of handles. Dust seals were provided to the sides and base of the doors. The deadlocks installed were not appropriate for the site conditions and had to be replaced.

26 The initial concern discussed about the degree of privacy of the shower rooms re-surfaced during construction as there was a small gap between the door and the frame that people could be observed through. A rubber strip was installed to block this view, and to prevent children’s fingers being caught in the doorframe.


28 To best compete in the region against established Architects we proposed to work with an Aboriginal Corporation, Kimberley Aboriginal Housing and Essential Services Corporation (KAHESC), based in Broome. We had previously completed a successful housing project with KAHESC as the Project Manager. IPh were to perform all works up to Tender; and KAHESC were to administer the construction stages of the contract.

Unfortunately KAHESC ceased operating before tender, and we had to complete to works without their support.

29 This may have been because I was known to some of community members at Djugerari as I was a friend of the late Walmajarri artist Jimmy Pike who is buried in the community cemetery, and had visited the community several times with his wife Pat Lowe.

30 This is not a conversation that I have had about houses, and is unusual as I have only had this request from indigenous clients on two other projects –the Kimberley Language Resource Centre in Halls Creek the Karrayili Adult Education Centre in Fitzroy Crossing (both designed by the author whilst working at NBC AC).

31 Paul Memmott’s colleague, Carrol Go-Sam, delivered a concise paper at the Which Way conference in October 2007 (CITE) describing these issues under three paradigms for Aboriginal Housing; the ‘Cultural Design’ paradigm; the ‘Environmental Health’ paradigm and the ‘Housing as Process’ paradigm.

These paradigms describe accurately my experience of the different area of focus during the design process. The paradigms are useful to reveal particular viewpoints, however the best approximation of our process is the ‘draft design framework’ described in the AHURI’s Positioning Paper No. 98 (Appendix B).

It is interesting that our ideal, least compromised case study, at Tjuntjuntjara community, broadly follows the same process list as the AHURI framework. Where our process differs is that we did not produce a ‘limited portfolio of designs’ as I believed this to be premature when the actual parameters of the problem are unknown. However one the four scale models presenting during our community presentation, prior to being awarded the commission, was called for by a community member and remained a selected model, however only one of this house type was constructed. This design is significantly less flexible that the other model and is most suited to single people or elder people without children. The client who selected the design was an older man whose children had grown up.

I remain skeptical as to the validity of the notion that one can provide a limited portfolio of designs without first knowing detailed information about the community and then guiding the family member through the design process. Failure to do this risks members selecting a design without reflecting on their needs, or allows the process to become vulnerable to a ‘status’ driven selection – one that is referred to (CITE) as ‘I want a proper whitefella house’.

The Framework does not call or recommend an assessment of the need to use female consultants or a multi-disciplinary team with anthropologists, linguists and/or translators to assist in the consultation. It also does not advise on the techniques used to examine domiciliary evidence within the existing dwelling spaces.

These frameworks and processes proved to be important to our most successful outcome, but are not encouraged by the current State Government system.

32 This is a well-documented phenomena and is described by
Hepple, M & J Wigley in their 1981 Black out in Alice.


35 In the case of Tjuntjuntjarra the limits on water supply actually drive the physical form of the house, and produce a spatial relationship that may be in conflict with the cultural needs of the community. For instance it was observed in Pintupi communities (REF) that people preferred to be protected from view when moving to an ablation area for there was a risk from sorcery. Also, children are believed to be more vulnerable to malevolent spirits at night so locating the toilets in a position that requires the children to leave the enclosed house is not Culturally desirable, hence is in conflict with the Health Department’s requirements.

Faecal matter and hair is often believed to be collected by those wishing to do harm to a person via sorcery, so the desire for flush toilets may also be driven by another reason than convenience.

36 Tjuntjuntjarra was documented with a site-build and transportable option and the lowest Tenderer chose to site build the project. In conversation with several builders this general “rule of thumb” seems commonly supported.

37 at a talk in Perth in 1993

38 We have had failures in these projects -- the Lockwood deadlocks installed on the Tjuntjuntjarra houses, on the advice from a Lockwood salesman, were extremely complicated, had less than a millimetre tolerance for installation and failed because of the dusty environments and had to all be replaced.

We carefully considered and selected the 70x35mm treated pine timber decking for the Western Desert houses, as hardwood couldn’t be termite treated, and builders had a history on installing Meranti or Bartu illegally logged from Indonesian rainforests and the then new product “Modwood” a plastic and sawdust product had yet to be trialed in communities. Today I would consider the Modwood or another option over the variable product that was installed. The raised verandah had significant problems with dogs burrowing below the decks to stay cool, so we are considering possible alternatives for decks such as pre-cast pavers or planks when in-situ concrete is impractical.

39 During the process of performing this study, this question was asked by Sand Helsel.

40 See Adrian Iredale’s masters paper, Constructed Isolation.


42 The West Kimberley Regional Prison, by the West Australian Department of Corrective Services, is Australia’s first dedicated modern Indigenous prison, which was conceived by Indigenous people of the Kimberley Region as a way of reducing recidivism by allowing Kimberley men and women to serve the end of their sentence close to their ‘own country’, family and elders. The facility is described in the brief as a normalised, “healthy Indigenous community” behind a secured fence and is driven by triple bottom-line sustainability principals. The design is expected to be complete in 2009 and construction complete by 2011.
Table 6.1 shows that the four major changes from the draft Design Framework involved:

1. Establishing the six dimensions of ‘sustainability’ in remote Indigenous housing as the key focus of the design process;
2. Integrating consultation at all key phases in the design system;
3. Re-sequencing the elements in the framework in line with the key decision points in the implementation of a design system; and
4. Constructing the Design Framework as a cycle, with decisions at the key decision points being made through consultation and guided by the six interrelated dimensions of sustainability.

The revised Design Framework is depicted in Figure 6.1.

Figure 6.1: The revised Design Framework
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Credits
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HealthHabitat
Drawing page 8