Revalidating vernacular techniques for a sustainable built environment by way of selected examples in the Eastern Cape

By
Colleen Avice Steenkamp
B.Arch.Stud, B.Arch.Hons (UFS)

A Dissertation submitted in partial fulfilment of the degree Masters in Architecture in the Faculty of Natural and Agricultural Sciences

University of the Free State
2012

Supervisor: Gerhard Bosman
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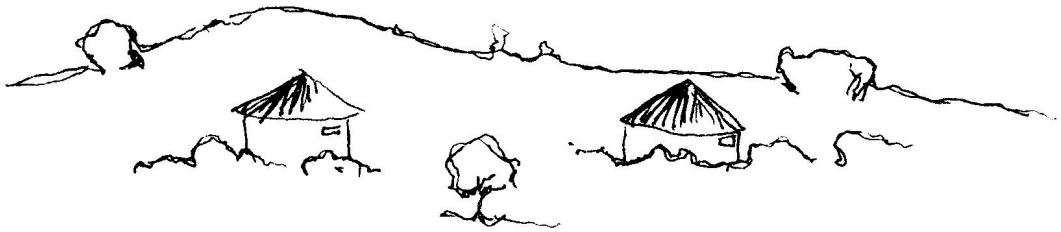
“Perhaps the soul could remember a little of its origination,
when people still belonged to the spirit of a place.”
(Martin Prechtel, Secrets of the Talking Jaguar, cited in Elizabeth and Adams, 2005: 3)



“The true basis for the more serious study of design and architecture lies with those indigenous more humble buildings everywhere that are to architecture what folklore is to literature or folksong to music and with which academic architects are seldom concerned... these many folk structures are of the soil, natural. Although often slight, their virtue is intimately related to the environment and to the life of the people”
(Frank Lloyd Wright, cited in Papanek, 1989)

Abstract

Contemporary design and construction methods often entail large amounts of wastage, high construction costs, high energy consumption for heating and cooling, and thus a large carbon footprint, which limits their sustainability. While South Africa's granting of much-needed houses to the indigent population is noteworthy, the quality of these houses sometimes leaves much to be desired. In addition, the cultural identity of the inhabitants of these houses is being lost.

The purpose of this study is to determine if vernacular architecture and building techniques could be a possible solution to the above-mentioned problems concerning contemporary design in the Eastern Cape. Five case studies were conducted for this research. The first involved a perception analysis – through a questionnaire – of inhabitants of vernacular and contemporary homes in uMasizakhe, Graaff-Reinet. The next two case studies involved documenting the now-demolished Luxolweni community on the outskirts of Hofmeyr and three now-demolished rondavels surrounding Hofmeyr. The last two case studies are of recently-built contemporary designs. The first is a vernacular building in rural Centane and the second is a building steeped in innovations for sustainability in East London.

The main results from the study revealed that the material properties of vernacular buildings are in many ways superior to their contemporary counterparts (these houses are cooler in summer and warmer in winter), vernacular homes are considered socio-culturally acceptable by their inhabitants, vernacular techniques can be successfully incorporated into contemporary architecture and that innovations can be incorporated within vernacular architecture for longevity. It was concluded that vernacular architecture has the potential to improve human settlements and the sustainability of the built environment, as well as strengthening the cultural identity of the local populace. This research is relevant in a country where buildings are often unsustainable and housing is lacking, as it offers a potential solution to these problems.

Keywords: Vernacular architecture, sustainability, indigenous knowledge, innovation, knowledge transfer.

Opsomming

Kontemporêre ontwerp en konstruksie metodes-veroorsaak in baie gevalle groot hoeveelhede vermorsing, hoë konstruksie koste en hoë energie-verbruik vir verhitting en verkoeling. Gevolglik is daar dus ’n groot koolstofvoetspoor wat die volhoubaarheid daarvan inperk. In Suid Afrika is die verskaffing van broodnodige huise aan die hulpbehoewende bevolking noemenswaardig. Die gehalte van hierdie huise laat soms veel te wense oor. Voorts gaan die kulturele identiteit van die inwoners verlore.

Die doel van hierdie studie is om te bepaal of inheemse argitektuur en boutegnieke as ’n oplossing kan dien vir die bogenoemde probleme in kontemporêre ontwerp in die Oos-Kaap. Vyf gevallestudies is gedoen vir die doelwit van hierdie navorsing. Die eerste handel oor ’n persepsieanalise –by wyse van ’n vraelys- van die inwoners van inheemse en kontemporêre huise in uMasizakhe naby Graaff-Reinet. Die volgende twee gevallestudies behels die dokumentering van die nou afgebreekte Luxolweni gemeenskap aan die buitewyke van Hofmeyr en die nou afgebreekte rondawels rondom Hofmeyr. Die laaste twee gevallestudies behels onlangs geboude kontemporêre ontwerpe. Die eerste is ’n inheemse gebou in die landelike Centane en die tweede is ’n gebou wat deurspek is van innoverings vir volhoubaarheid in Oos-Londen.

Die resultaat van die studie het onthul dat die eienskappe van die materiaal van die inheemse geboue in baie gevalle beter is as die kontemporêre eweknieë daarvan (hierdie huise is koeler in die somer en warmer in die winter). Inheemse huise word beskou as meer aanvaarbaar in sosio-kulturele sin deur hulle inwoners, inheemse tegnieke kan suksesvol in kontemporêre argitektuur geïnkorporeer word en innoverings kan in die inheemse argitektuur geïnkorporeer word vir langlewendheid. Daar is tot die slotsom gekom dat inheemse argitektuur die potensiaal het om menslike vestings te verbeter, die volhoubaarheid van die bou omgewing te verbeter asook om die kulturele identiteit van die plaaslike bevolking te versterk. Hierdie navorsing is relevant in ‘n land waar geboue meermale nie volhoubaar is nie en behuising skaars is. Dit bied ‘n potensiële oplossing vir hierdie probleem.

Sleutelwoorde: Inheemse argitektuur, volhoubaarheid, inheemse kennis, innovering, kennis oordraging.

Declaration

I, Colleen Avice Steenkamp, declare that ‘Revalidating vernacular techniques for a sustainable built environment by way of selected examples in the Eastern Cape’ is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Signature: _____

COLLEEN AVICE STEENKAMP

Date: _____

Acknowledgements

I would firstly like to express my sincere gratitude to The Almighty God who kept me safe throughout my life-journeys, past, present and future.

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Mr Roco Pase, pastor at the St. Philips Church in uMasizakhe, for personal pedestrian tours through the community, for indigenous knowledge and histories unheard of. Zola Zali, my translator, guide and friend, for selfless time and lengthily conversations in uMasizakhe. Peter Whitlock of Moffat Whitlock Architects in Graaff-Reinet, for offering relevant material otherwise unattainable, thank you for sharing in the love for South African history. Mark Finney chair of the Graaff-Reinet Chamber of Commerce for providing accommodation for my visits to Graaff-Reinet.

My appreciation to Al Stratford, architect, engineer, innovator extraordinaire; for countless hours of discussions and debates relating to architecture, life, and also for his patience during my research into his design of the University of Fort Hare New Auditoria and Teaching Complex (NATC). Vernon Collis, sustainable architect and engineering guru whose passion for vernacular architecture and sustainability is not only heard but seen, thank you for meeting me at the most inopportune times and for sharing ideas, facts, notes and experiences regarding particularly sustainability, and the Centane Greenshops Financial Service Centre (GFSC), my thanks also for granting permission to include the plans of GFSC in this dissertation.

This research would have been entirely unattainable had it not been for my incredible parents and sister, who continually probed and supported the research. The Whitfield family, thank you for being continuously patient, hospitable, and for challenging every possible discussion regarding earth construction. To Dr Johan Wilkinson, neurosurgeon at the Bloemfontein Mediclinic, thank you for enabling me to see the Light again. Kevin Whitfield, my teacher, trainer, lecturer, *umfundisi*, guide, supporter, translator and closest friend – words could never come close to the gratitude I owe to you.

Of vital importance is the gratitude I owe to the local communities of uMasizakhe, Luxolweni and Centane for gladly opening their homes and environs for interviews, conversations, photographs, sketches and tea – I pray that this research will lead to the upliftment of your communities.

Table of Contents

Translations

	English	***Xhosa***	***Afrikaans***
1.	ancestral worship	*inkonzo*	
2.	Brak-roof, flat-roofed or Highveld style	*Bafokana, iflat, iplata*	*brakdak*
3.	ceremonial totem used for cultural rituals	*eXhanti*	
4.	minister, pastor	*umfundisi*	*dominee, predikant*
5.	mud, earth	*dagha, d,aka, udaka*	*modder, grond*
6.	*Phragmitis australis*, common reed		*fluitjiesriet*
7.	rondavel, a South African round hut. Rondavels (*pl).*	*inqugwala, urontawuli*	*Rondawel*
8.	tin bucket with perforations around the perimeter to which coals are added	*mbawula, imbawula*	*vuurmaakblik, groot blik met gate ingekap waarin 'n steenkook vuur gemaak word*
9.	veld, *or* veldt, flat clearing in bush	*indle, ithafa*	*veldt*

(Wat what ntoni. Afrikaans English Xhosa. 1995)

Chapter 1: Introduction

1.1 Context and motivation for study

South Africa is faced with a growing indigent population, increasing water shortages, inadequate housing, scarce financial resources, a dire lack of sanitation and limited access to unpolluted water (Bond and Tait, 1997: 36). With regards to the problem of overpopulation, this concept cannot simply be measured by the number of people sharing a house – instead it should be viewed as a psychological and social notion linked to the culturally transmitted thoughts pertaining to 'privacy' (Papanek, 1989: 17). According to Papanek, this 'privacy' consists of a complex bundle of thoughts, phenomena and meanings – which are deeply imbedded in mans' culturally conditioned psyche. The general pattern of social deprivation, imbalanced rural-urban expansion rates, illiteracy, wellbeing, lack of social security and land tenure systems together with social policies were found to be some of the major elements influencing the African condition. The political conditions and other unidentified social factors intensify the effects of the elements on the African continent and rightly assured that for a continent struggling to develop, "the distance between the jungle and the city is very short" (Kibuka, 1990: 32, 38).

Acccording to Elleh (1996: 339), the concentration of amenities in urban centres has had distressing effects on not only rural areas, but on the country as a whole due to the dismal economic imbalance created by the rural and the urban sectors. These basic amenities mentioned include electricity and running water, paved roads, schools, hospitals or clinics, a police presence and banks. Amenities draw people from their rural communities to the cities and larger towns to seek greater opportunities. These "urban factories" cannot absorb all migrants, and those who are absorbed, are poorly paid. This results in high unemployment and has led to the generation of slums and squatter camps (Elleh, 1996). The effect of the rural population drain has furthermore led to agricultural devastation on the economy (Whitfield, 2012: 4). An example of this agricultural devastation can be seen in history where Africa was able to meet its food needs and even had excess to export to Europe until the 1960s. Today, however, African countries import food from the Americas, Australia and Europe.

It is one of the reasons that development in both vernacular architecture and agriculture is particularly weak, leaving little improvement on living conditions for the most destitute people (Schumacher 1980). Thus, South Africa should be categorised as a developing country due to the fact that more than 85% of the population live in economic conditions worse or similar to those of most people in other African countries (Elleh, 1996:304). In addition, the vast majority of South

Africans suffer from poor nutrition, unemployment and consider themselves 'second class' citizens (Black, 2000: 9).

Schumacher identified the critical problems that African countries faced as the most important task ahead (1980: xi). Some of these problems include inadequacies in shelter, educational infrastructures, hospitals, ceremonial buildings, and bureaucratic and commercial buildings (Elleh, 1996: 340). One can pose the challenge of how to enable rural people to do creative and satisfying work, earning a decent living, subsist a quality of life in a becoming way (Schumacher, 1980: xi) and thereafter "leave the planet earth in a condition at least no less capable of supporting life than that in which we found it" (Kennan cited in Schumacher, 1980: 43).

Indigenous people have proven that architecture, without architects, is not only possible, but is practiced as an everyday occurrence by ordinary people (Frescura, 1981: 3). As the 21st century dawned, views of vernacular architecture and rural traditions were often tinged with nostalgia (Oliver, 1997: xxiii). Vernacular architecture, which is produced unselfconsciously, relates to the wider nature of society and context in southern African communities, thereby reflecting their identities through architecture. It is this identity too, which needs to be safeguarded from the influences of westernized culture.

Architects and others involved in the built environment have become increasingly interested in the implementation of 'traditional' and vernacular buildings (Denyer, 1978; Frescura, 1981). It is through understanding a specific vernacular that architects are enabled to design accordingly; utilising existing indigenous knowledge systems rather than treating all geographical areas as a universally equal point of departure.

Contemporary architects' attitudes toward indigenous architecture and settlements have been to use certain aspects, such as plan, form, cross section, elevation and decoration, thereby attempting to give such design an 'African' character – without reflecting materials or techniques traditionally used (Macleod, 2002). Much knowledge can be gained by an analysis of materials and techniques and how these could relate to societies and the South African architectural identity in the 21st century. According to Knuffel (cited in Frescura, 1985: 89), a number of specialised studies have been published on the subject of rural architecture within a specific region – with the few notable exceptions from Frescura, Steyn, Peters and others – most still persist in viewing this type of architecture through the spectacles of their own westernised conditioning.

The Reconstruction and Development Programme (RDP) was all embracing initiative, it started as the Redistribution Strategy elaborated by the Congress of South African Trade Unions (COSATU). COSATU was launched in December 1985 after four years of unity talks between unions opposed to apartheid and committed to a non-racial, non-sexist and democratic South Africa. Numerous rounds of consultation eventually produced the RDP, which immediately became the African National Congress' (ANC) election platform, which was then converted into a government programme once the ANC achieved a decisive democratic breakthrough in the 1994 elections. The party was given a firm mandate to negotiate a new democratic Constitution for South Africa. The RDP office initially led the reconstruction directly from the President's office – a powerful and influential power-base. It was this destructive process whereby existing homes were demolished and replaced by RDP dwellings. The isiXhosa culture in the remote part of South Africa was subjected to pressures for change, accelerated by the exploitation of available land, resources and the introduction of modern communications. The industrial materials introduced were immediately adopted and the traditional form of building seemingly rejected. Vernacular buildings in South Africa were seen by politicians and the populace alike as representative of a backward Apartheid-past, opposing their modern ideas and aspirations within the 'New' South Africa (Ross, 2009).

One way of achieving a pride-filled architectural identity in South Africa would be through the implementation of that which is *from* the specific culture and environment. This is especially the case if one considers architects as being in a unique position to revive peoples' faith in their own products, and as such, if they implementing these products, they could be able to instil pride in the general populace's cultural heritage (Fathy, 1986: xx). In 1994, the plan to produce housing and infrastructure for the previously disadvantaged populace was based upon a model, which was not only a foreign form to the indigenous people, but also utilised alien materials and techniques. This has lead to the de-skilling of the populace, thereby robbing South Africans of their vernacular building techniques and indigenous knowledge systems. The importance and moreover the value of indigenous building techniques and materials is thereby often ignored by professionals and consultants alike – at the expense of the people for whom they are intended.

Western technologies and materials found throughout Africa have had a detrimental effect on the vernacular. These materials, which are neither locally available nor socially inclusive, have made it increasingly difficult for the indigenous African populace to develop their architecture in accordance with the level of their industrial technology. As such, Africa is designing and building ahead of its technology (Elleh, 1996). Ignorance may be the root cause of the influx of prescribed, expensive and alien solutions (Anderson, 1977: 3), but the result is inadvertently opposing the "highest forms of sustainability" (Ozkan, 2006: 108).

Experience in the Eastern Cape has shown that the value of community participation, knowledge transfer and the use of traditional methods and available materials go further than the physical boundaries of floor, wall and roof. It is these specific values that are rooted in both historically-inherited ideas as well as the local people's ability to build in such a way as to suit their given conditions. In order for architectural design and practice to be more appropriate and sustainable, it is essential to de-mystify indigenous methods and materials.

1.2 Problem statement

Contemporary design and construction methods typically entail large amounts of wastage, high construction costs, high energy consumption for heating and cooling, and thus a large carbon footprint, which limits their sustainability. On the other hand, vernacular architecture and building techniques could possibly be a solution to the above-mentioned problems concerning contemporary design, but vernacular architecture is disappearing under a hegemony of RDP houses.

1.3 Objectives of study

The key objective of this study is to determine whether vernacular architecture can offer the built environment a sustainable alternative to what is currently practiced.

Beyond this, other objectives aim to determine:

- Whether the material properties of vernacular buildings are superior to their contemporary counterparts;
- Whether vernacular homes are socio-culturally accepted by their inhabitants;
- Whether vernacular architecture lends itself to skills transfer;
- Whether vernacular techniques can be successfully incorporated into contemporary architecture;
- Whether innovations can be incorporated within vernacular architecture to aid in their longevity;
- Whether innovations for sustainability are socially acceptable; and
- To document certain vernacular dwellings before they are demolished.

1.4 Research questions

The research question posed is whether or not adopting vernacular techniques can improve South African sustainability, contemporary architecture and housing needs within the greater populace. It should be noted that the research is specifically based upon peri-urban and rural regions. Furthermore, the research does not suggest the rediscovery of the traditional mud hut, but rather a synergy and interdependence between traditional techniques and contemporary architectural design.

The main research question is: Can vernacular architecture offer the built environment a sustainable alternative to what is typically practiced?

Other research questions include:

- Are the material properties of vernacular buildings superior to their contemporary counterparts?
- Are vernacular homes socially and culturally accepted by their inhabitants?
- Does vernacular architecture lend itself to skills transfer?
- Can vernacular techniques be successfully incorporated into contemporary architecture?
- Can innovations be incorporated within vernacular architecture to aid in their longevity?
- Are innovations for sustainability socially accepted?

1.5 Hypothesis

Vernacular architecture and building techniques can offer the contemporary built environment a sustainable alternative to what is currently practiced.

Sub-hypotheses include:

- The material properties of vernacular buildings are superior to their contemporary counterparts;
- Vernacular homes are socially and culturally accepted by their inhabitants;
- Vernacular architecture lends itself to skills transfer;
- Vernacular techniques can be successfully incorporated into contemporary architecture;
- Innovations can be incorporated within vernacular architecture to aid in their longevity; and
- Innovations for sustainability are socially acceptable.

The intention of the research is to argue that vernacular architecture is not only appropriate, but necessary for sustainable contemporary design and construction. In addition, material availability is directly related to lowered construction costs, energy efficiency and thermal qualities, which surpass contemporary counterparts. If these assertions are true, then the social responsibility of architects should be reinforced, whereby communities are bolstered, identity and skill transfer is encouraged, and the implementation of appropriate building techniques is used.

1.6 Delimitations and assumptions of study

Instead of constructing synthetic and generally insupportable distinctions in some hypothetical sequence, the study chose to examine the sustainability and innovation of vernacular architecture within a specific region, in this case the Eastern Cape, in order to identify its source, people, traditions, cultures, materials and skills. As such, the research is particular to the study area, although certain principles could be generalized to other areas.

This research is limited to focusing on whether vernacular architecture can offer a sustainable alternative to contemporary design and construction by examining its material properties, socio-cultural acceptance, skills transfer, incorporation into contemporary architecture, incorporating innovative techniques into vernacular architecture, and the social acceptance of innovation for sustainability. Determining the political will to implement vernacular architecture into contemporary architecture is not within the scope of this research and is therefore not included. This topic would require further research.

For the purposes of this dissertation, the definition of vernacular that will be used is: Vernacular architecture comprises the dwellings and other buildings of the people, and is directly related to the environmental context and available resources of the people; it is usually owner or community-built, utilizing a variety of traditional technologies to meet the specific needs and to accommodate the values, economies and ways of living of the cultures that produce them (Oliver, 1997: xxii; AlSayyad, 2006; Bourdier and Minh-ha, 1996; Asquith, 2006; Lawrence, 2006; Ozkan, 2006).

1.7 Importance of study

This research is important for a number of reasons. Firstly, South Africa has a large indigent population that has inadequate housing and solutions are urgently needed. Secondly, contemporary building practices are expensive and have a large carbon footprint, while vernacular architecture could offer the opposite of this. Thirdly, the research aims to determine what innovative measures

can be incorporated into vernacular architecture to increase its longevity. Lastly, the research aims to document certain vernacular buildings in the study areas as earlier field visits to the selected cases proved indispensable as when these cases where revisited in 2011, many had since been demolished. This reduced the documentation thereof solely to photographic records.

According to Pavlides (1997: 59), numerous vernacular buildings have been lost to the world through disaster, abandonment, decline of traditions or purposeful demolition. Many of these grounds relate directly to the case of the uMasizakhe and Luxolweni communities, and the three rondavels that will be researched and this poses urgency in the documentation of these local vernaculars.

1.8 Research outline: The Structure of the Dissertation

Chapter Two follows and details the research methodology, which explains the rationale behind the research, these include case studies, the research location and population and the research instruments, such as literature, questionnaires, field-work photographs and data analysis.

Chapter Three is the literature review. The purpose of the literature review is to embed the study's argument in a theoretical context. This starts with the historical and political context of housing and human settlements in South Africa, which is followed by sustainability and its measurements. The next topic discussed is vernacular architecture and includes the definition, the importance thereof, benefits, approaches, tradition, cultural heritage and identity, indigenous technical knowledge and knowledge transfer. This is followed by innovation, previous studies on the research subjects and a model towards improved human settlements.

Chapter Four contains the research results and findings of the case studies. These case studies include a perception analysis of the uMasizakhe community, photographic evidence of the now-demolished Luxolweni community of Hofmeyr, photographic and technical descriptions of three now-demolished rondavels around Hofmeyr, a case study of the Greenshops Financial Service Centre in Centane and the New Auditoria and Teaching Complex at the University of Fort Hare in East London.

Chapter Five is the final chapter in which conclusions are drawn and recommendations made. This is followed by the references and appendices of the research questionnaire used for the uMasizakhe community as well as the designs of Greenshops Financial Service Centre.

1.9 Research design

The research used a variety of approaches to test the main hypothesis and sub-hypotheses. These included case studies of now-demolished buildings as well as new buildings that have been erected recently. It also involved a questionnaire to perform a perception analysis of people living in vernacular homes. These case studies are supported by relevant literature in the literature review. The research methods used are elaborated further in Chapter Two.

Chapter 2: Research Methodology

As described above, the research encompassed a variety of approaches in testing the hypotheses. The study involved researching the community of uMasizakhe outside of Graaff-Reinet, the now-demolished Luxolweni community of Hofmeyr, the three rondavels around Hofmeyr, Greenshops Financial Service Centre in Centane and The University of Fort Hare's New Auditoria and Teaching Complex in East London. The approaches used for each case study are discussed in this chapter as well as the research locations and the research population.

2.1 Case Studies

Selecting appropriate case examples involved the weighing up of a number or factors: availability and accessibility of the relevant information; the appropriateness of examples to the validity of the research; on-site research as a key component to realizing the project's objectives in a proficient and equitable manner; the collection of analytical information; the evaluation of innovative methods and technologies; and the actual implementation thereof in the projects all play important roles (Voss, 1992).

The five-year time frame (2005-2010) ensured that case studies are up to date for the emphasis of the study. The author chose not to use the familiar fiction, sometimes called the 'ethnological present,' which implies that the Eastern Cape society and its buildings subsist in an invariable, monotonous state, when in fact, the historical and cultural methods of construction concerned have diminished and many vernacular dwellings have since disappeared or have been demolished (Steenkamp, 2010: 161). The case studies were selected from a specific region, time period and architectural intention, so as to make relevant and unbiased comparisons.

The dissertation will combine theoretical discourse with empirical data. For uMasizakhe, quantitative research was captured through scientifically and statistically formulated questionnaires. Qualitative methods utilized for the recording and documentation of the case studies are vast and vary from the study of books, journals, personal discussions and conference proceedings to architectural drawings, field sketches and photographs (conveying spatial relationships, qualities of materials and the relative size of occupancies). Preparing a site plan allowed the mapping of documented buildings in relation to orientation, topography, natural resources, land use, communications, site, settlement patterns, significant structures and aspects of socio-spatial organization, and have also been noted and documented where relevant. Both quantitative and qualitative methods were used

to ensure the effectiveness of documentation pertaining to vernacular architecture, thereby enabling findings to be reviewed, judged and supported by literature.

For uMasizakhe, a quantitative and qualitative analysis, using questionnaires and structured interviews, was used to assess the sustainability of the current vernacular homes; the use of available natural resources, as well as the attitudes of respondents toward their homes. Of the contemporary South African cases, such as the Greenshops Financial Services Centre in Centane, show that traditional precedents have guided design concepts, which could contribute to the revival within the isiXhosa people's faith and pride in their own culture.

As this dissertation is aimed at being interdisciplinary, there exists some measure of shared competence in the recording and documentation of vernacular buildings, using established techniques that can be read and understood the world over. Therefore, utilizing sketches, photographs, questionnaires, recorded interviews, maps, plans and literature, a common resource-base may be formulated regardless of discipline. These techniques significantly augment the data collection.

2.2 Research Locations

All of the research was conducted in the Eastern Cape, albeit in different regions. The first was on the outskirts of Graaff-Reinet (see Figure 2.1 for location within Eastern Cape), in the community of uMasizakhe (see Figure 2.2 for position around Graaff-Reinet. The people chosen to participate in the questionnaire where those people who were living in vernacular homes and *Apartheid*-era 'RDP' homes. The homes chosen are depicted in Figure 2.3, below. The second case study was performed in the Luxolweni community of Hofmeyr, the location of Hofmeyr is depicted in Figure 2.4 below. The third case study was on three rondavels around Hofmeyr, their location is depicted in Figure 2.5. The last two case studies were in Centane and East London, there location is depicted in Figure 2.6.

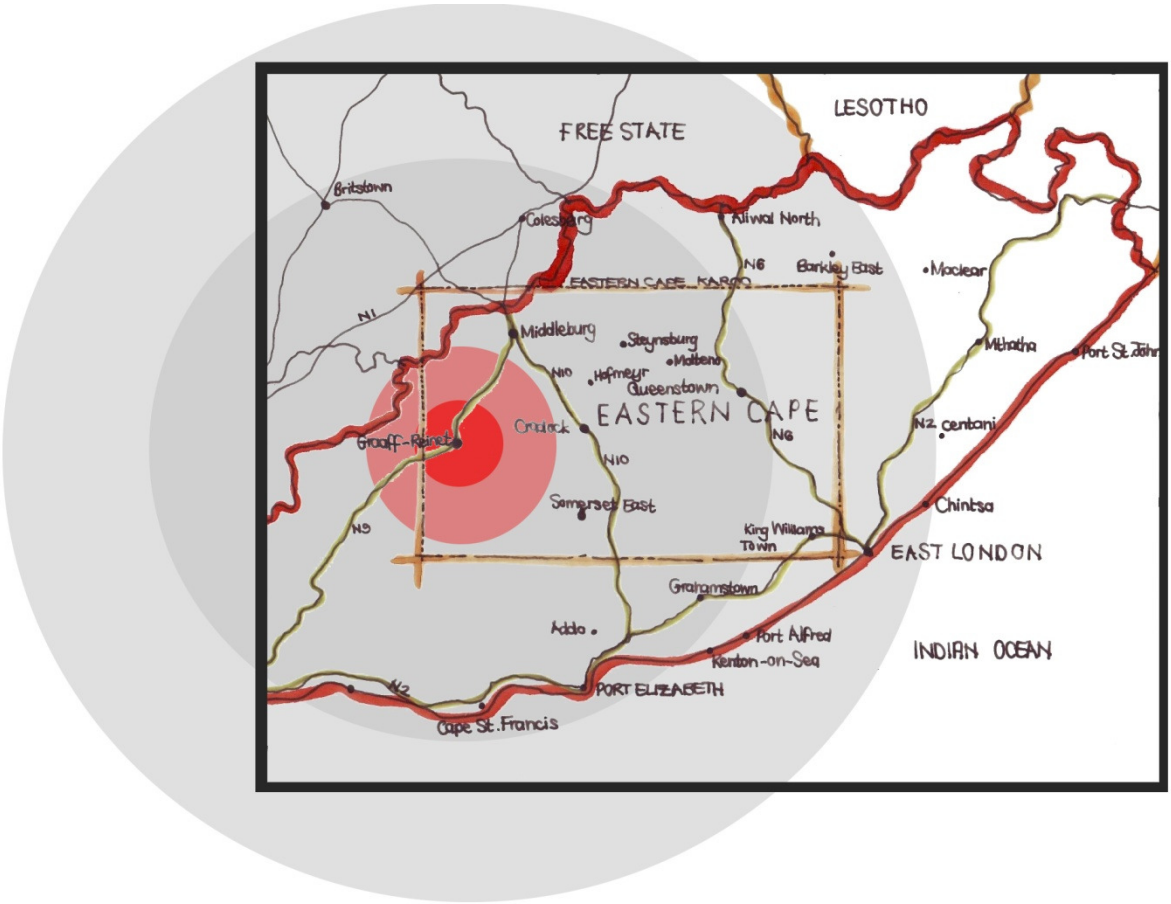

Figure 2.1: Location of Graaff-Reinet within the Eastern Cape

Figure 2.2: Contextual map locating the position of uMasizakhe in relation to its surroundings and the planned layout of Graaff-Reinet enveloped by the Sundays River

Figure 2.3: uMasizakhe community plan, with red blocks depicting the dwellings which were part of the research population

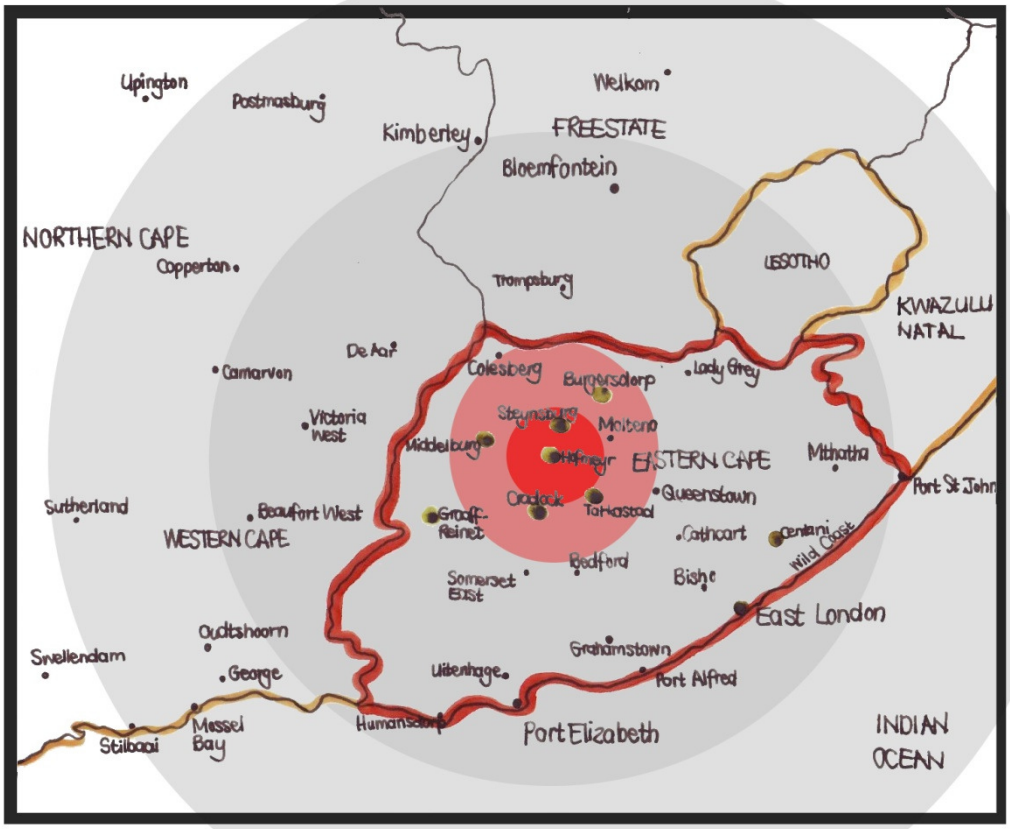

Figure 2.4: The position of Hofmeyr in the Eastern Cape, north of Port Elizabeth between Cradock and Steynsburg

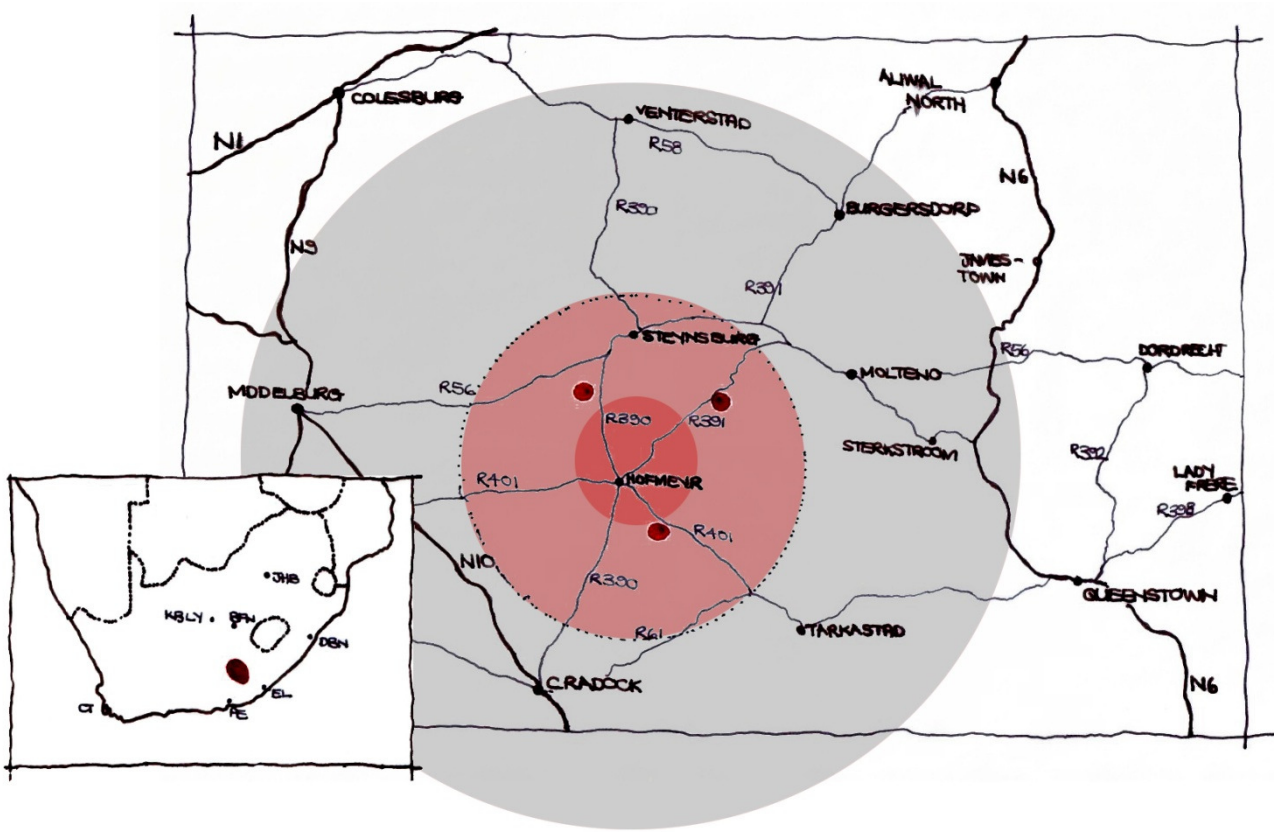

Figure 2.5: The position of the three rondavels around Hofmeyr

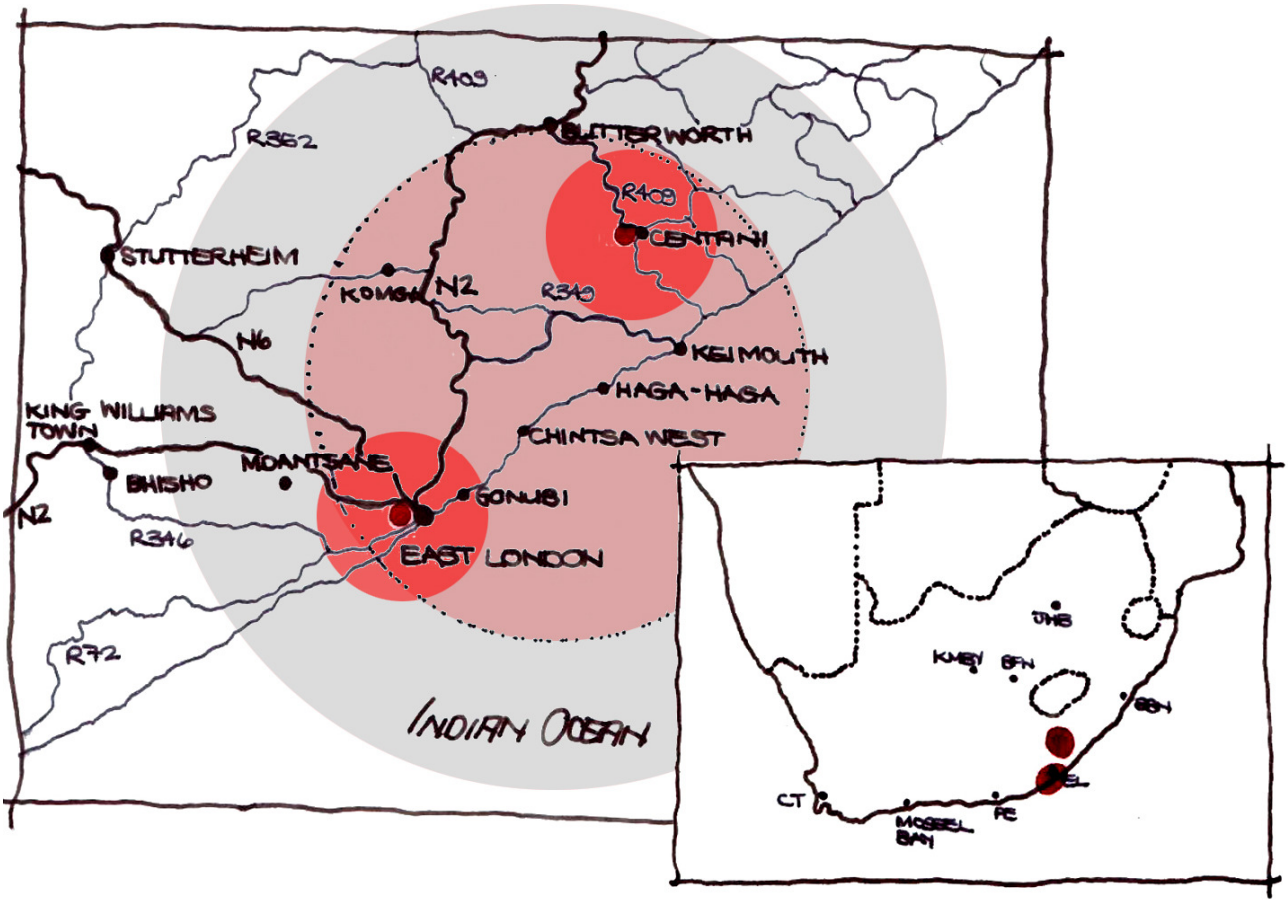

Figure 2.6: The position of Greenshops Financial Service Centre and University of Fort Hare's New Auditoria and Teaching Complex

2.3 Research Population and Time-Management

Research for this dissertation was conducted between April 2010 and November 2011, although hitherto information gathered by the author since 2007 was included. The process of data collection took the primary form of personal on-site investigations, assisted wherever necessary by a translator or person(s) familiar with the local conditions. The collection of data concerning rural architectural practices, within the uMasizakhe community, was supported by on-site interviews utilizing non-random participants. Research participants were pre-selected by way of occupying indigenous, vernacular homes. Structured questionnaires provided information regarding vernacular building technology, building materials and land ownership among others. Although formal questionnaires were used (Appendix 1), questions were adapted and simplified as it was found that some questions puzzled interviewees, many of whom had limited education, which inhibited a free-flow of information and conversation.

The research approaches used were both developmental and ecological (see Chapter 2.5). The former provides two developmental contexts from which vernacular architecture can be explored. Firstly, to impede socio-economic and physical decline caused by broader socio-economic change and environmental degradation, and secondly, to facilitate communities in meeting changing needs and rising aspirations. The environmental effects have most commonly affected the vernacular through eroding the organic materials' resource base. Both contexts within the developmental approach were explored within the questionnaires together with the biological, ecological and anthropological ordering of organic, inorganic, cultural, social and human factors found within the ecological approach.

The research population of uMasizakhe consisted of 47 respondents (see Figure 231). Of the 47 people, 74.5% were living in traditional vernacular homes (Table 4.1) at the time the research was being conducted. 12.8% of the respondents were living in *Apartheid*-era 'RDP' government-funded houses and the remaining 12.8% were living in the Royal Block (see Figure 4.2), in Queen Street, uMasizakhe. The research was conducted for two days in September 2011 from roughly 09:00am-16:00pm. See Appendix 1 for the Questionnaire.

2.4 Research Instruments

2.4.1 Literature

Literature based on relevant vernacular topics and architectural principles will be used to form a conceptual and theoretical basis from which conclusions are deduced in order to answer the research questions (Bak, 2004). Existing studies of vernacular architecture, specifically those of Fathy (1973; 1986), Oliver (1971; 1986; 1987; 1997; 2003; 2006) and, Anderson and Poole (2009) are reviewed for comparison, together with field surveys conducted by Makaka and Meyer (2006), within related communities of the Eastern Cape. Various authors were consulted, guiding the research and supporting the findings. Authors included Lawrence (1997; 2000), Asquith and Vellinga (2006), Afshar and Norton (1997), and Rakotsoane and Rakotsoane (2007) in the explanation of perspectives and directions pursued. Finally, the dissertation is aimed at testing theories surrounding vernacular architecture, utilising both the developmental and ecological approaches and adding suggestions to build upon these.

2.4.2 Questionnaires

The questionnaire consisted of both quantitative and qualitative questions (see Appendix 1). The research was conducted in this manner in order for quantitative data to be drawn from the number of individuals living in indigenous dwellings, together with the material properties and construction methods used. Qualitative questions were used to determine the reasons and socio-cultural belief systems. The questionnaire was designed to establish firstly, socio-economic factors, followed by the physical dwellings' material uses and concluding with qualitative open-ended questions.

Findings of the questionnaire are verified by the literature review and data was analysed to provide percentages of participants living in the various indigenous buildings. These individual indigenous buildings are compared to contemporary counterparts, thereby determining which process holds the greatest holistic and sustainable worth.

2.4.3 Field-Work Photographs

According to Pavlides (1997), photographic records are preferable for research and documentation purposes, as such, photographs will be used to convey or confirm documentary information. Utilising qualitative photographic recording methods, the relationship between the documented buildings and their environmental location can be confirmed, and internal spaces together with construction details recorded. Both black-and-white, colour and edited photographs will be used, as there exists an inevitable loss of hue utilizing solely gray-scale images.

2.4.4 Data Analysis

According to Glatthorn and Joyner (2005), data is analysed by reducing common information, which is then grouped accordingly and displayed. At this point, the data can be compared to literature on the subject. Data for this dissertation was independently and statistically processed by the Information and Communication Technology Services of the University of the Free State.

2.5 Approaches to researching the vernacular

There are two different types of approaches to investigating vernacular architecture, namely the developmental approach and the ecological approach, both of which are discussed below.

2.5.1 Developmental Approach

The developmental approach was adapted from, and based on the writings of Afshar and Norton (1997: 25-27). According to Afshar and Norton (1997: 25), an approach to vernacular architecture as a coherent framework of theory and practice has yet to be articulated. The developmental approach envelops both the process of achieving well-being and the products that manifest its achievement, therefore casting a sound foundation for sustainable development to follow. It views vernacular architecture as an aspect of development (improved shelter, settlement and an enhanced environment), among several other factors (improved food through agriculture, superior goods through industry), therefore proposing a holistic solution rather than solitary answers. The developmental approach used in studying vernacular architecture looks to the future, evaluating the potential of traditional buildings to meet world housing problems, together with the economic or technical support which may be needed in order to do so (Afshar and Norton, 1997: 25).

In order to reason authenticity and support the implementation of the developmental approach within South African architecture, it is essential to confront the historical outlook of the approach (Afshar and Norton, 1997). Early expressions of a developmental vernacular can be seen in the mid-1940s in Fathy's construction of New Gourna village in Egypt. In practice, however, Fathy focussed on aesthetics and the finished product – neglecting a participatory process and the socio-economic viability thereof (Fathy, 1973). Later in the 1960s, Turner (1978) discussed the distinction between process and product, emphasizing the process and architectures' contribution to development in ways that also applied to the vernacular rather than focussing (as Fathy did) on the product. The 1970s saw the birth of a comprehensive approach formulated by the Development Workshop, which demonstrated how their vernacular 'indigenous building' approach could relate to broader development theories and practice (Cain, Afshar and Norton, 1975). The Development Workshop encompassed settlement planning, building material industries, construction and training, all based on vernacular architecture. From the 1980s and well into the 21st century, the developmental approach has continued to be shaped by an increasing number of projects with greater institutional support from government and international aid agencies. The success of such projects enhances the credibility of using vernacular architecture to meet South African contemporary needs.

As a result of the holistic view of the developmental approach, vernacular architecture gains a widening of its scope beyond architecture's traditional emphasis on the physical product, its design, aesthetics and technology. A developmental approach solicits questions regarding the vernacular influence from outside as well as its influence on broader development processes, therefore, it is

possible to understand that vernacular architecture is not only influenced by local conditions but also by the broader and 'holistic' developmental perspective being adopted (Whitfield, 2010; Lawrence, 2006; Oliver, 1997; Ozkan, 2006; Peters, 1997; Frescura, 1981). Key opportunities are embarked upon whereby the vernacular can achieve both a better built environment and broader social well-being (Oliver, 2003). The developmental approach argues that vernacular architecture demonstrates how the poor, which constitute the majority of the South African population, can use local resources self-reliantly to meet shelter needs in an ecologically sustainable manner. From this perspective, vernacular architecture has much to teach the contemporary built environment (Oliver, 2006).

Utilizing a developmental approach to vernacular architecture would mean exploiting characteristics of vernacular architecture such as local and cultural material resources and techniques to achieve improved shelter, settlements and broader development objectives. In effect, the approach thrives upon small-scale developments, which are technologically and organizationally simple and inexpensive, ideal perhaps for rural and peri-urban South African precincts. Planning and construction can be controlled within local communities and implemented by these and local builders. The values and needs of the local people expressed through the developmental approach together with a demonstration of continuity with change could allow communities to remain rooted in their cultural traditions, while simultaneously incorporating innovation and appropriate external technologies.

In conclusion to the developmental approach, the characteristics found within this approach make it cost-effective and therefore economically viable. Labour intensive and therefore job-creating, focussing on accessible resources therefore enhancing local income and utilizing renewable-resources, therefore allowing them to be ecologically sound. The simplicity could encourage community participation and its affirmation of local values and approaches encourages self-esteem and local pride. This would support Fathy's belief that architects are in the inimitable position to revive people's faith in their own culture (Fathy, 1986: xx).

2.5.2 Ecological Approach

The ecological approach which follows is adapted from, and based on the writings of Lawrence (1997: 31-33).

Human ecology is a holistic interpretation of those ecological and specifically human processes, products, orders and mediating factors that occur at all scales of the earth's surface and the biosphere. It connotes an integrated framework for the analysis and the comprehension of three logics and the interrelations between three constituents using a historical perspective. These logics are: 'bio-logic', 'eco-logic', and 'anthropo-logic' (Lawrence, 1997: 31).

The biological process mentioned above is the order of all living organisms including animals and plants. The ecological processes are the orders of all inorganic constituencies such as air, water, soil and the sun. Finally, the anthropological processes are the ordering of cultural, social and individual human factors that include social customs, rituals and values. Given that human products and processes are pertinent for human ecology, all activities, customs and conventions related to the use of resources are relevant for an ecological approach. Essential for the development of sustainable communities is the use of land and material resources, including the construction of vernacular buildings. An ecological outlook provides a conceptual outline that enables academics and practitioners alike to accept divergent disciplinary concepts, techniques and allows the application of an integrated approach. From this perspective, the environment is multi-dimensional and complex, quite opposite to the connotation used by many architects and social scientists that refer to the environment as if it were a neutral background. In order to comprehend this complexity, it is necessary to apply an integrated approach.

The primary benefit of an ecological approach is that it enables selective, sectored interpretations to be replaced by integrated, multi-dimensional ones in which sets of quantifiable material factors and qualitative human factors are considered simultaneously. This approach is based on the following sets of principles: Firstly, the interrelations between humans and their surroundings and should include beliefs, doctrines, ideas and representations. Secondly, the characteristic discursive and reflexive knowledge which exists within the interrelations between the populace and their surroundings is unlike other biological organisms. Thirdly, the 'human environment' can be contrasted with the environment of other biological organisms by the instrumental functions and roles attributed to it. Human processes and products transform the constituents of the environment in order to meet prescribed aspirations, goals and needs. In addition, human activities can provoke unintended consequences on environmental constituents and in turn, affect human well-being.

According to Boyden (1987), ecological and historical analyses of human civilizations show different ecological phases that are defined with respect to the interrelations between the biosphere and human societies on the one hand, and the interrelationship between environmental conditions and human well-being on the other. When ecological and historical approaches are combined to study

the development of human settlements and building construction in precise localities, they can identify both the intended and the unintended consequences of the shift from traditional to modern societies.

It has been observed that the influence which modern or outside cultures have had on African indigenous architecture have not always been for the better. It is argued that the introduction of change within any community could be so rapid that the essential qualities of the traditional architecture are lost in the technical execution process (Anderson, 1977: 33). Within rural or traditional communities, there exists the desire for modern materials and technology, which is in line with the development of other areas, and as developing countries try to catch up with the developed ones, these aspirations grow (Anderson, 1977; Onatu, 2011). There is, however, an essential differentiating element which comes into play: the community which desires modernity versus the community which is forced into modernity (Steyn and Bosman, 2010: 200).

During the resettlement of 440000 indigenous Kambri people during the construction of the Kinji Dam in Nigeria (completed in 1968), the Kambri's purportedly left their dwellings and moved into government constructed homes less than a year after they were resettled by the federal government of Nigeria. The initial resettlement intentions were good, with architect Robin Atkinson successfully duplicating the traditional form of the Kambri house with material differences. Unfortunately, the cement blocks, asbestos roofs, along with the spatial aspects of Kambri architecture were not accounted for, which resulted in the built product being too hot. The linear grid and streets disrupted Kambri lifestyle and the Kambri people were unable to maintain their houses due to their lack of knowledge pertaining to the alien materials used. Thus, a combination of technical and socio-cultural problems forced inhabitants out of their new houses (Elleh, 1996: 345-354).

An additional example to the importance of considering the ecological approach pertains to the studied development of Hong Kong prior to the founding of the British Crown Colony and until the 1970s. Boyden (1981) compared the traditional and modern housing and building construction methods, uses of land, energy, water and other resources. The findings reflected that long-term economic developments in Hong Kong included a growing reliance on the import and export of food, building materials and many other goods in addition to the accumulation of toxic and non-toxic wastes, which resulted in significant changes to the diet and well-being of the population. Through this study, Boyden (1981) proved that as the indigenous cultural know-how of traditional building methods declined, the impact on the layout and construction of the built environment, along with the consumption of materials and energy, significantly increased.

2.5.3 Concluding the approaches to vernacular

From these instances, it can be derived that in contemporary architecture there exist dual choices between traditional methods and materials on the one hand; and synthetic, modern materials alongside new technologies on the other; the former – as remarked earlier by Oliver (2006), Rapoport (1989) and Fathy (1986) – typically enables the use and re-use of renewable resources, whereas the synthetic alternative generally requires more energy and skill proficiency resulting in increased non-recyclable waste products, which lowers their level of sustainability on most fronts. The arbitrary use of alien materials can have unforeseen negative impacts on human and community well-being. According to Denyer (1978: 4), it should come as no surprise then, that more architects were turning to vernacular architecture, not because they wish to repeat the structures, social orders, materials or technology, but because it is recognised that these structures satisfy specified communities' psychological, spiritual, physical and cultural needs far better than modern settlements ever could.

A narrative by Soyinka (cited in Elleh, 1996: 341), dramatized the quick approach to development together with the lack of consideration taken regarding the ordering of all things living, dead as well as social organisations in his play 'The Lion and the Jewel'. The narrative follows with a village teacher deciding to rid himself of his traditional past by refusing to pay the customary bride price since it was not 'civilized' to do so. The teacher believed that he could win the girl he loved through civilized romance, the way educated men and Christians do. To his dismay, the girl was disgusted by his affection. She did not understand this method of enticement. The teachers' efforts resulted in him not only losing his 'bride', but also realising that his dreams of converting the small village to which he belonged into a prominent city could only be done by "divorcing the past and clearing the jungle for the railway tracks and every other thing that represented the progress in the modern city".

This tale is analogous to these architects who decide to plan without utilising the ecological or developmental approaches in a rural, peri-urban and predominantly traditional environment. It is these architects who see development and modernisation as a clearing of the jungle and planting alien structures including roads and other foreign elements completely ignorant to the past and the community's actual needs. As teachers and "authoritative critics", architects can learn that 'courting' villages, traditional societies and communities is best done by making reference to the past and honouring the people (Fathy, 1986: xx).

Chapter 3: Literature Review

3.1 Historical and political context of housing and human settlements in South Africa

The Republic of South Africa has nine provinces, covering an area of about 1.2million sq km. It is bounded by the Atlantic and Indian Oceans. The country consists of a coastal plain, an inland plateau and a separating escarpment. The Eastern Cape Province is located in the south-eastern part of South Africa, abutting the Indian Ocean. It is the second largest province in terms of surface area after the Northern Cape Province.

With a total population of 6.4 million, the Eastern Cape is the third most populous province in South Africa. The black population make up 88%, the coloured group 7% and the white population 5% of the total provincial population (Statistics South Africa (SSA), 2003:12). The majority of the population (61%) live in the rural areas (SSA, 2003: 2).

The Eastern Cape has been a region of resistance and oppression for roughly 200 years (Lind, 2003). Wars between the European settlers and the indigenous population, over land and the control of the region, lasted for almost a hundred years in the 19th century (Switzer, 1993: 3). The characteristics of the political agendas in the Eastern Cape have even manifested themselves in the livelihoods of the people, when tracing the unwillingness of the indigenous people to implement too radical a change in their built form (Frescura, 1981: 75).

It is necessary to revisit the colonial period to understand how “inequality became entrenched” in the region as the province, as even today, it displays low levels of social development and ineffective economic growth (Nel, 1999: 67).

Following South Africa’s historic 1994 elections, the primary vehicle chosen by the new Government of National Unity to address social housing challenges, was the Reconstruction and Development Programme (RDP) (Figure 3.1), which provided a broad framework for socio-economic reform. The first Minister of Housing, Joe Slovo, introduced the public housing scheme in 1994, setting the ambitious target of delivering one million houses by the end of the first term under the new government (Pieterse, 2002). It sought to mobilise the South African populace as well as available resources toward the final eradication of apartheid and the building of a democratic, non-racial and non-sexist society (Blumenfeld, 2003).

Figure 3.1: The Luxolweni community in Hofmeyr clearly depicts the implementation of the Reconstruction and Development Programme

The RDP considered a good environment to be a human right and insisted on participatory policy processes to assure that environmentalists and government agreed on how this should be realised. The RDP made its highest priority attacking poverty and deprivation while it called for affirmative action for “black” people, women and rural communities and in particular "vulnerable groups such as farm workers, the elderly and the youth" (Bond and Khosa, 1999). Nelson Mandela, at his victory speech in May 1994, pragmatically said that “we have emerged as the majority party on the basis of the programme which is contained in the Reconstruction and Development book. That is going to be the cornerstone, the foundation, upon which the Government of National Unity is going to be based. I appeal to all leaders who are going to serve in this government to honour this programme” (quoted in Bond and Tait, 1997: 31).

In spite of the economic challenges experienced by South Africa in the transition to a democratic government in 1994, the mass production of RDP houses seemed convenient as the government took to expanding its educational and housing infrastructure in anticipation for an influx of South Africans who had been denied access to improved living conditions and better education due to their ethnic background. The apparent increase in infrastructure and the introduction of modernised materials and obvious transformations in shape and form have not altogether influenced those living in rural areas from continuing with indigenous building techniques.

Addressing rural inequality, the government established new structures of local government and local coordination and promoted fair and equitable access to social welfare. The RDP offered explicit standards for an acceptable quality of housing, subject to community negotiation. By 1998, the Housing Minister herself cited community anger about the quality of housing projects and inadequate construction standards on many of the houses delivered (Bond and Khosa, 1999).

The history of the Republic of South Africa cannot be discussed without looking at problems resulting from the socio-political issues within because of the close ties between its economic, socio-political attributes and architecture – the latter of which is largely reflected in settlement patterns and urban landscapes (Elleh, 1996: 215). The challenges South Africa faces is to try to imagine its own nationhood in new terms, beyond that of its prolonged state of colonial domination by white people and Western culture (Nettleton, 2008: 107).

Much confusion arises when addressing the impact of historical and political issues on settlement patterns as there are vast differences between urban and rural landscapes, settlements and building techniques, the latter of which addresses primarily the traditional indigenous impact rather than colonial and apartheid influences which resulted. It is argued that African states inherited administrative forms from colonial regimes based on the two prongs of firstly, direct rule, applied to those in urban conglomerates; and secondly, indirect rule, applied by those in rural areas. It is in as a result of the latter that rural dwellers remain ‘natives’ and too often keep colonially-assigned ethnic divisions (Mamdani, 1996).

The current state of South Africa can be described as taking a leap of faith that goes beyond the present conditions and looks to the future with optimism and the hope resulting in the restoration of faith in humankind (Elleh, 1996: 215). This approach did not advocate ignoring problems currently faced within the country, such as the socio-political, unemployment, housing and educational struggles, but rather believed that these would be resolved to the benefit of all concerned.

3.2 Sustainability and its measurements

Sustainability is broadly defined as development that is economically viable, socio-culturally acceptable and minimises environmental degradation (Whitfield, 2011). According to Engela (2006), principles that guide sustainable buildings place emphasis on reduced energy consumption, a safe and healthy environment, and a reduction of waste. Other guidelines include:

- Minimising energy consumption and the use of renewable sources of energy;
- Minimising the buildings’ site impact on the environment;

- Utilizing less resources through recycling and improved technologies;
- Minimising the effects of building materials on the environment;
- Utilizing less harmful chemicals;
- Minimising waste through recycling;
- Utilising existing buildings to preserve land; and
- Increasing the quality of the indoor environment through use of natural light and air, and improved solar exposure through building orientation.

The report from the World Commission on Environment and Development (UN, 1987: Online), together with the writings of Conway (1985: 31-35) and Whitfield (2010: 147), defined sustainability as the ability to ensure that humanity meets the needs of the present, without compromising the ability of future generations to meet their own needs and, encompasses a balance between economic viability, social acceptability and environmental integrity such that the system has the ability to maintain productivity in spite of disturbances.

After much investigation regarding the meaning of sustainability, a concise but useful discussion of the foremost, though sometimes conflicting interpretations of what 'sustainability' is, is needed. Albeit a brief explanation of the premises of a human ecological perspective on vernacular architecture is presented by McDonough (1993: 398-410), Hatfield-Dodds (2000) and Lawrence (2006), which suggest that various basic principles may be applied to increase the sustainability of the built environment.

Lawrence, Hatfield-Dodds and McDonough's principles emphasize the need to consider ecological and cultural diversity, the importance of interrelations between different geographical scales, the value of participatory approaches to development and the critical need to raise public awareness of the sustainability issues concerned. The provision of guarantees that economic activity would not over-exploit natural resources or exceed the capacity of the earth to adjust to the impacts of human activity should ensure that ecological integrity and resilience to change is maintained by the amount and diversity of natural resources and other environmental assets. The latter consequently reduces the inequalities between human societies and within specific human settlements by authorising institutions to be key actors in monitoring the environmental and social consequences of the uses of natural resources. Maintaining human well-being and quality of life by promoting broader participation in decision-making, especially at the local community level, fosters ethical frameworks, moral values and attitudes that give more consideration to future generations and non-human components.

Subsequent to sustainability and sustainable development, lies the concept of a 'sustainable livelihoods', which is central to poverty reduction, rural development and environmental management (Whitfield, 2010). Sustainability can be viewed as the bridge by which to fully engage with the world in a way that is empathetic, intuitive, aesthetic and environmentally sensitive (Lawrence, 2000, 2006; Hatfield-Dodds, 2000; McDonough, 1993). There is a need to address sustainable responsibilities relating to the social equity of people through vernacular architecture as the identity of indigenous peoples groups within South Africa is vast, with a long heritage of artistic, mythical and sacred traditions that can provide a solid foundation on which to base ideas for future architectural endeavours (Ozkan, 2006: 109).

Investigations into building construction has found industrialism to be toxic and a change in the industrial and architectural practice based on respect for human life, the natural world and its complex processes would meet the environmental agendas and reduce the source of the pollution problem (McDonough, 1993: 385-398).

Sustainability guides towards a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for future generations. This is the responsibility of architects, as leaders in developing new definitions and measures of prosperity, productivity and quality of life, to implement (Fathy, 1986; McDonough, 1993). According to McDonough (1993: 398), humans need to "...come to peace with our place in the natural world". Sustainability is a pattern of resource use that aims to meet today's human needs, while preserving the environment so that these needs can also be met in the future. Following this stance on architects' responsibilities, was the emergence of the Hannover Principles, which would act as the ethical guidelines for sustainable design in the future (McDonough, 1993: 408-410).

Attention needs to be drawn to the awareness of architecture as a social and intellectual discourse (Jencks quoting Rowe, 1973: 260). In addition, one of the most critical tasks that confronts rich and poor societies alike is how to enable the populace to do creative and satisfying work, live independently and sustainably in a dignified manner, and having done so, to leave the planet in a condition at least no less capable of supporting life than that in which we found it (Schumacher, 1980: xi).

In an effort to construct design criteria for economically-viable and sustainable housing in 1992, at the United Nations Conference on Environment and Development Earth Summit Conference in Rio

de Janeiro, 180 nations adopted a program in an international attempt to create a normative blueprint for sustainable development worldwide (United Nations, 2002: Online). It is, however, not completely possible to define a normative blueprint for a world-wide spectrum of human settlements as economical, ecological, geographical, topographical and social contexts differ (Tapela citing Minnaar, 2007a).

The SANS 10400 part XA, which was introduced in 2011, are the first regulations to confront sustainability in the South African built environment. Within these new building standards specific to each region, there now exists a list of design assumptions that need to be accounted for. Building envelope requirements include the walls, floor and roof of a building. Each of these units is handled separately within the document. Bruane, the Technical Executive at the Green Building Council of South Africa applauded and congratulated the SABS and government for "putting a stake in the ground for the first time in terms of minimum energy consumption requirements for new buildings and refurbishments" (Green Building Council of South Africa, 2011: Online). Local requirements and sound standards need the cooperation of local governments in setting targets and increasing the exchange of indigenous and environmental information practices and the SANS 10400 part XA may just be the catalyst for such targets. The role of demonstrated examples within contemporary architecture, building according to sustainable standards, whereby traditional techniques and available materials are used could prove invaluable to the built environment of South Africa.

3.3 Vernacular architecture

3.3.1 Defining vernacular architecture

The Concise Oxford Dictionary (1950) defines ***Vernăc'ūlar,*** *a. & n.* as "of one's native country, native, indigenous, not of foreign origin or of learned formation." The Latin meaning of vernacular refers to "things that are homemade, homespun, home-grown, not destined for the marketplace, but are for home use only" (Bourdier and Minh-ha, 1996: x). In terms of architecture, several authors have described it in a number of different terms. According to Lawrence (2006: 10), vernacular buildings are human constructs that are the results of interrelations amid ecological, economic, material, political and social factors. Ozkan (2006) described it as architecture that utilizes the most accessible materials and employs the widest available technologies.

However, it is the Latin meaning of vernacular that has perhaps led to the inconspicuous view of vernacular architecture which architects continue to hold. According to Prain (1992: 52), vernacular

architecture continues to be associated with the past, underdevelopment and poverty. This view is widely held as architecture found in Africa is often viewed solely in the clichéd light of mud huts and thatch roofs (Asquith, 2006: 1-2; Oliver, 1997: xxii). Despite these popular misconceptions, it has been noted that vernacular building traditions are not remnants of an underdeveloped or romantic past, but rather as buildings of importance and relevance to many cultures and people in the world, past, present and future (Asquith, 2006: 1-2). Vernacular architecture often embodies community values, as even a simple dwelling may reflect both the material and spiritual worlds of its builders and occupiers (Oliver, 1997: xxii).

One cannot then only classify the vernacular and cultural as a concept that must remain a static legacy of the past, but rather a model that reflects the buildings of the people in the democratic South Africa (AlSayyad, 2006: xviii). Architecture is often articulated by a vernacular context and appreciation, and if one aspires to develop a true and honest African architecture, one cannot just understand climatology and regionalism, but also the vernacular (Elleh, 1996). The South African vernacular could therefore be viewed as a documentation project, which principal mission is the dynamic interpretation and re-interpretation of its past in the light of an ever-changing present (AlSayyad, 2006).

3.3.2 Importance of vernacular

The implementation of indigenous building techniques and materials in contemporary South African architecture is the presumption that architects are in a unique position to revive people's faith in their own culture (Fathy, 1986: xx). The architecture found within individual communities around the world is intimately related to the identity and culture of the people within (Popescu, 2006: 189). Therefore architects, as authoritative critics, are in an unique position to show what is admirable in local forms – and if, as such, they can go so far as to implement commendable forms, local communities will immediately begin to look upon their own products, skill and knowledge with pride. These admirable local forms refer to the vernacular architecture in a specific area as being human constructs that are the results of interrelations between ecological, economic, material, political and social systems (Fathy, 1986: xx; Lawrence, 2006).

The relevance of vernacular architecture in the 21st century is that it could be the highest form of sustainable building, as it uses not only the most accessible materials, but also employs the widest available technologies (Ozkan, 2006). The available resources used are customarily owner or community-built, utilizing a variety of traditional technologies and were created to meet specific

needs, accommodating the values, economies and ways of living of the cultures that produce them (AlSayyad, 2006; Asquith, 2006; Lawrence, 2006; Oliver, 1997; Ozkan, 2006; Peters, 1997; Frescura, 1981).

There exists a predicament within the current African context of vernacular architecture. According to Denyer (1978), scant archaeological evidence remains where vernacular buildings were once inhabited by communities due to urban migration and the assault of low-cost housing on the built environment.

Current practising African architects often lack information on the subject of African architecture (Elleh, 1996; Denyer, 1978; Oliver, 1986; Radford, 1989) as these buildings have been meagrely documented, hence African architecture cannot be fully understood and the architects are "unable to incorporate and interpret the vernacular in the changing skylines of Africa" (Elleh, 1996: 142). Traditional societies, utilising available resources, whose cultural heritage is handed down orally from one generation to the next, have shown themselves to be particularly vulnerable to the impact of modern society (Elleh, 1996; Bess, 1996), urban migration (Lawrence, 2006; AlSayyad, 2006; Gwinner, 2011), together with the onslaught of mass low-cost housing initiatives that have caused great social, political and educational stumbling blocks, which have consistently aided in the degradation of communities (Anderson, 1977).

The loss of vernacular, relating to the architectural discourse to which master builders pertain, is an ongoing crisis with fundamental problems surrounding the loss of cultural identity, tradition and social equity (Makaka and Meyer, 2006; AlSayyad, 2006; Lawrence, 2006). Elleh (1996) warned against the temptations, which existed as swift designs were hastily implemented, in order to meet the political promises made during the run-up to the 1994 elections. Unfortunately, South African architects rarely utilized the vernacular precedents around them.

If vernacular architecture is a superior form of sustainable building due to the fact that it employs the widest range of available technologies (Ozkan, 2006), then Western technologies and materials, found throughout Africa, have had a detrimental effect on the vernacular. These materials, which are neither locally available nor socially inclusive, have made it increasingly difficult for the indigenous African populace to develop their architecture in accordance with the level of their industrial technology. Elleh (1996) stated that Africa is designing and building ahead of its technology. Vernacular architecture reveals a cultural heritage of sophistication and ecological balance that has for too long been ignored by many architects and professionals (Boudier and Minh-ha, 1996; Fathy, 1973). Ignorance may be the root cause of the influx of prescribed, expensive and

alien solutions (Anderson, 1977: 3), but the result is inadvertently opposing the possible “highest forms of sustainability” (Ozkan, 2006: 108).

According to Elleh (1996), the influence of not only other cultures, but also the political promise to meet the nation’s infrastructure needs have been detrimental to South African architecture. These detriments are as a result, first and foremost, of the change that was introduced so rapidly that essential qualities in traditional architecture have been lost in the technical execution of most architectural endeavours. In turn, the social equity of communities is deficiently distorted to a considerable degree, thereby further supporting the lack of sustainable architectural implementation (Anderson, 1977). However, the desire for modern materials and technology is understandable and is in line with the principles of development, as developing countries try to aspire to, and catch up with, developed ones (Onatu, 2011).

Maxwell thoroughly debated building materials and deduced that, if only in materials, design is confronted by hostility between traditionalism and modernity such that tradition views the past through rose-tinted glasses just as modernism does the future. The final confrontation would exist as the traditional and indigenous vernacular accepts its place in a tradition, provided that it is done in good faith. The modern, however, refuses tradition and refuses even to consider it as a style, claiming that it is only a regular method of work concentrating on the use and function, which if faithfully executed, could bring future reality into existence. The material battle has not yet produced a convincing winner.

Translating Maxwell’s debate into South African architecture would be prompted with natural materials being viewed as not only an African vernacular but also a traditional style. Rural African people have evolved with these natural materials; therefore it is common for people to feel at home in these ‘historic’ materials (Day, 1990). The need for South African roots has led to revivals of past architectural styles such as the African hut or rondavel (Steyn, 2003). These revivals have been denounced as these revivalist forms were constructed using modern materials and, look as forged and void as they sound when one knocks them (Maxwell, 1996). These false pretences toward a rooted, historical, natural-looking architecture taint the built environment throughout our country (Steyn, 2006). Much contemporary architecture is shaped by style. This prioritizes time-bound fashion over place-appropriateness, appropriateness of ‘particular’ places and the people of those places (Oliver, 1987). Neo-vernacular and revivalist reactions have a fake feel about them as they only seek to impose a singular idea, in this case plucked from a particular period of the past. All such approaches are more concerned with ‘style’ than ‘responsiveness’ (Maxwell, 1996).

Compelling perhaps, the showdown between vernacular and modern may never end. It is here that contemporary architecture ought to initiate a South African identity whereby the distinction becomes vague and rooted in what could become a democratically identified South African architecture. Such an approach would declare South African architecture as neither European, nor African, reflecting a Rainbow Nation where colours are integrated within 'masterpiece-architecture'.

3.3.3 Benefits of vernacular architecture

The temperatures of the interior of South Africa are characterized by extremely high and varying diurnal temperature ranges, against such fluctuations, the desirable material would be one with a high heat-capacity. The capability and qualities of the required material is one with the ability to absorb solar radiation during the day and slowly re-radiating it at night. Therefore the diurnal temperature difference inside the building would be "flattened out" into a much more comfortable profile. It has been noted that clay and stone are high heat-capacity materials (Fitch and Branch, 1960: 138).

Research comparing the thermal comfort of traditional isiXhosa huts and the low-cost houses being built found that the traditional architecture offers better thermal comfort. This is due to the fact that vernacular buildings have small windows, a single door, thick (300-350mm) rubble walls and insulating thatch roofs, which assure minimal thermal loss (see Figure 3.2, below) (Makaka and Meyer, 2006: 84). In addition, traditional homes are often plastered with a mixture of mud and cow-dung as this was found to be particularly good for repelling pests (Denyer, 1978: 93-94).

Figure 3.2: Cross section of a traditional isiXhosa hut displaying various material properties that ensure thermal stability

Although the thermal performance of RDP houses are notably inferior to those of traditional vernacular dwellings, residents of these structures feel as though they have advanced socially (Minnaar and Cloete, 2006: 68; Steyn and Bosman, 2010: 200). In addition to this, a survey by the Nova Institute in 2004, which aspires to the improvement of the quality of living for the poor populace, found that 78% of rural and urban respondents indicated that they did not open their windows at night for fear of witchcraft and 'spiritual' superstitions.

However, not all localities within the Eastern Cape have the material resources to construct a traditional isiXhosa house, such as thatch for roofing. Fagan (2008: 190) assessed the materials and resources that are available in the Karoo area and remarked: "...it is in this desolate and dry region of the Karoo where plants are rare and stones abound". According to Fagan (2008: 190), early settlers constructed their buildings of rubble and mud, and laid flat roofs of earth on ceilings of local reeds, which were attached to joists made of the flower stems of giant agaves. The thick mud walls, small windows and *brak*-roofs provided the necessary insulation where temperatures can reach 40° in summer and the winters are icy cold. Depictions of these structures are given in Figure 3.3 and Figure 3.4, below.

The thick 305mm walls were advantageous for insulation, especially with shuttered windows that ensured air-flow during the hot summer months. The 150mm 'mud' ceiling on a reed or slat base, with its *misvloer* (cow manure) or peach-pip studded floor was eminently practical and certainly cheap to construct (Henning, 1975: 187). According to Fagan (2008: 174), maintenance of the *brakdak* (or 'flat-roofed' house) reed and mud ceiling was cheap, whereby "...for £2 one could buy a load of *brak* that had been picked out at a *brak* patch... The lumps of *brak* were now crushed to dust, sifted and spread one inch [25mm] thick onto the existing roof. The roof would then be watered for five consecutive mornings with a watering can, after which the *brak* was so hard that no dust would sift through".

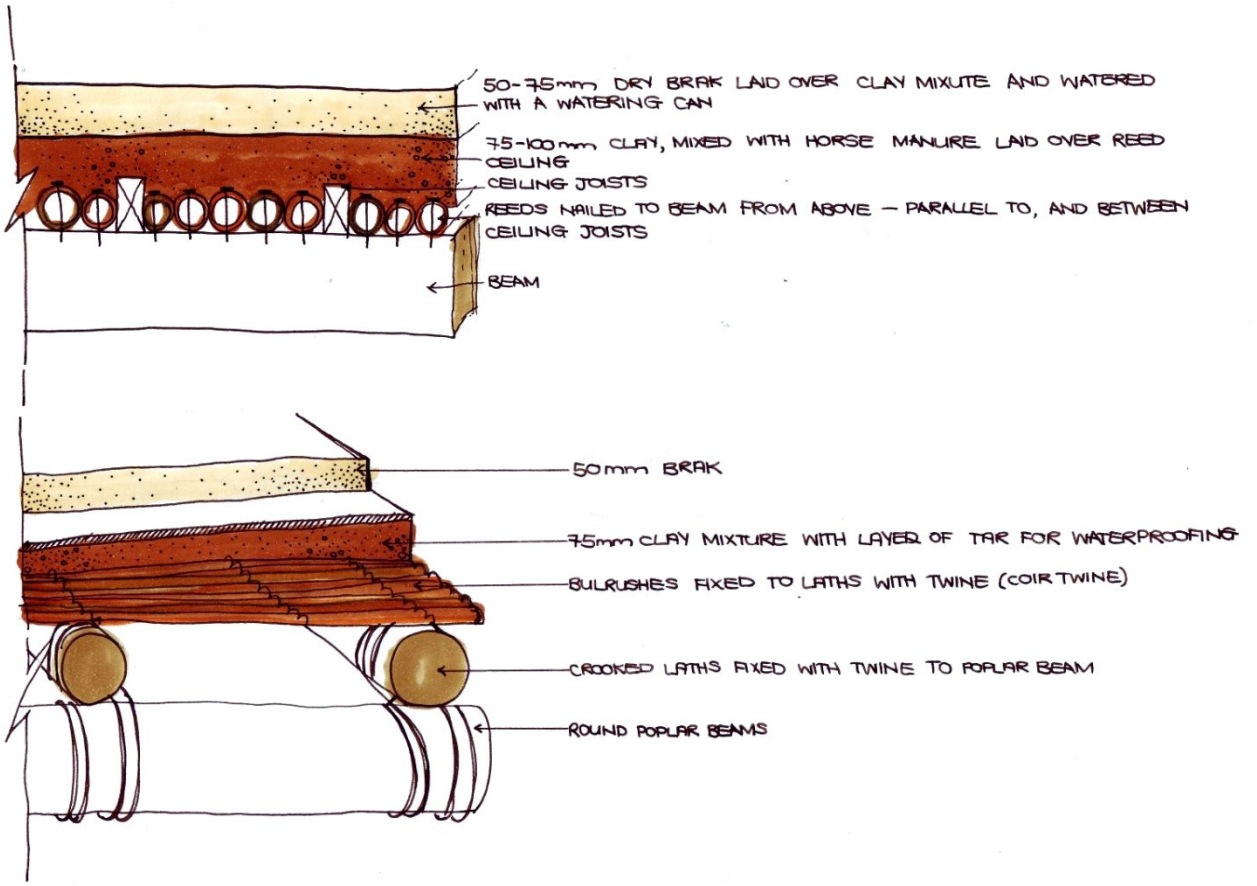

Figure 3.3: Variations of the *brakdak* roof construction methods described by Fagan (2008) and Henning (1975)

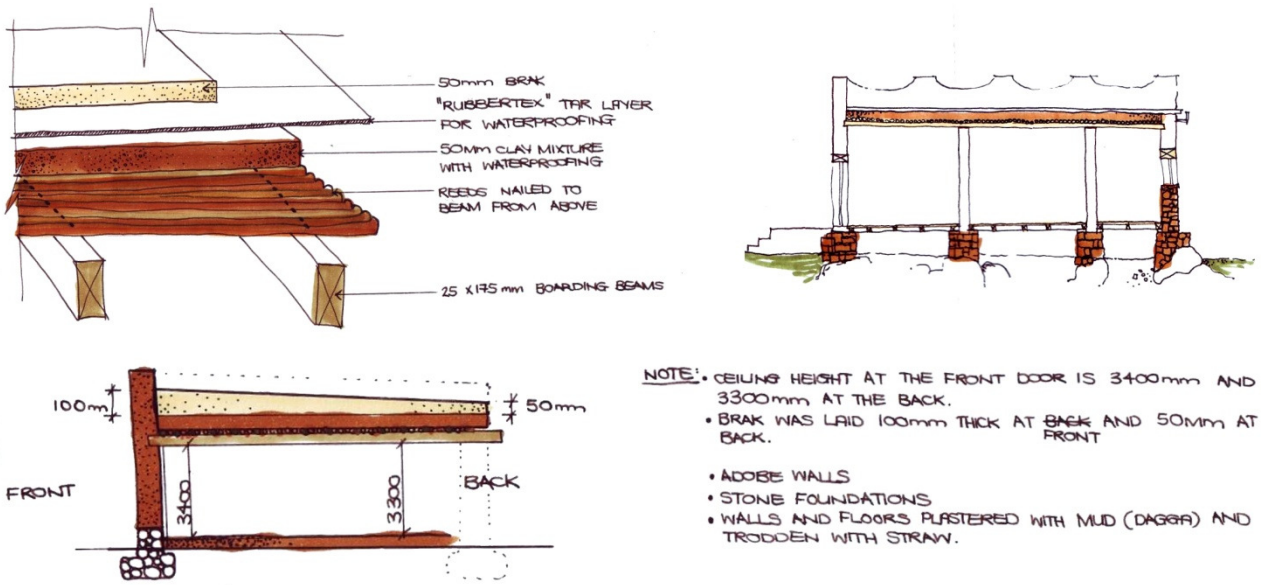

Figure 3.4: Illustrations of the house form from descriptions given by Fagan (2008: 190)

Following this, Henning found it exceedingly difficult to establish with accuracy the date of the flat-roofed or *brakdak* construction in Graaff-Reinet area as they were built predominantly throughout the 19th century in the area, some revealing specimens of fine workmanship and others indifferently constructed (Figure 3.5 and Figure 3.6). Opinions on these rectangular, classic designs differ considerably. For example, Lewcock (2006) noted that these houses were especially climatically adaptive and this was achieved by employing relatively primitive building techniques and naturally available – but crude – materials. On the other hand, Vos (cited in Henning, 1975: 187) described the same structures as being put together with a fine feeling of proportion and that these elements produced a simple style of dignity and charm. Frescura (1989: 7) described the development of the flat-roofed dwellings as a "material, technological, social and economic transition in the southern African hinterland", while Steyn (2006: 33) assumed that this was in reaction to contemporary pressures, realities and resources. The key element which caused the shift away from these flat-roofed houses was the introduction of lightweight corrugated metal sheeting, which was introduced during the period of British colonisation (Steyn, 2003: 186).

Figure 3.5: Highveld, flat-roofed or *brakdak* houses found within uMasizakhe

Figure 3.6: Example of flat-roofed or *brakdak* houses found within uMasizakhe

The choice of material and thermal functions also plays an essential role in developing an indigenous building technology for Africa. It has been found that the traditional adobe structure and pliable roofing materials kept the house cool and that few things are worse than being inside a house with a roof of metal sheeting in mid-summer without air-conditioning (Elleh, 1996: 343). On the other hand, poor energy supply and lack of resources within contexts such as uMasizakhe make the cost of cooling by air conditioning not only expensive, but actually unthinkable. It is therefore important to seek building materials other than brick and metal sheeting. This raises the question of how South Africa can financially cope with the construction of houses that use unnecessarily expensive industrialised materials.

The vernacular architecture of a community demonstrates an individual environment produced without the intervention of professionally trained experts (Anderson, 1977: 4). The economy, precision, balance, skill and integration within the built environment of each community should rather become an object lesson to experts.

The universal rediscovery of vernacular housing methods coincided with the growing realization that modern architectural design, which is overly animated for innovation, has too often ignored the social and environmental disadvantages of utilising high technology and industrialised materials (Anderson, 1977: 4; Denyer (1978: 93-94). According to Anderson (1977: 4), the study of traditional forms and methods is now seen to be a first step towards the new generation of housing forms which will hopefully embody the lessons of integration of man, activity and environment, which would entail the maximum use of renewable materials for economic reasons, the improvement of traditional methods to reduce the amount of regular maintenance needed for longevity of buildings, the controlled and rational uses of modern materials when they can contribute to a saving in maintenance costs and, an improvement in living conditions and health standards.

3.3.4 Tradition, Cultural Heritage and Identity

According to the Concise Oxford Dictionar*y* (1950), tradition is defined as an "Opinion or belier or custom handed down, handing down of these, from ancestors to posterity". According to Asquith (2006), tradition can be viewed as the creative processes through which people interpret past knowledge and experiences to face the challenges and demands of the present. The actual significance of tradition within the architectural practice is often overlooked to allow for the prevailing Western influence (Anderson, 1977; Elleh, 1996; Garlake, 1990). However, "traditon should be seen as a reference to the learning that generates cultural expressions and the authority that precedent holds" (Bronner, 2006: 5).

The roots of traditional African architecture can be traced back thousands of years (Elleh, 1996: 19). This is despite the fact that most of the historical events that shaped African building culture are not documented (Denyer, 1978; Bourdier and Minah-ha, 1996; Oliver, 1971). The words 'traditional African architecture*'* evokes several images for architects and non-architects alike regardless of nationality and education (Steenkamp and Whitfield, 2011: 74). Current practising architects in Africa often lack information on the African vernacular and therefore they cannot fully understand African architecture and are unable to incorporate and interpret it in the changing skylines of African cities (Elleh, 1996; Denyer, 1978).

The concept of tradition cannot be viewed merely as that which opposes modernization without falling prey to the pitfalls of binary dualist thinking. This view was advanced by referring to the writings supporting the failure of modern architecture and its participation in the idea of progress

being achieved with universal rationality and of emancipation at the scale of humanity, of which the colonial enterprise was a comprehensive manifestation (Bourdier and Minh-ha, 1996: x).

According to Anderson (1991), modern South African nationalism is the result of colonial impositions of a European style of 'national' historical consciousness and awareness, which was suggested, needs linguistic unity in order to birth a national culture. However, taking pride in one's cultural heritage instigates and promotes a spirit of ownership (Aikawa-Faure, 1996: 96) and the implementation of cultural methods results in pride within one's own heritage (Fathy, 1986: xix-xxiii). It is further suggested that the intangible cultural heritage, which is closely related to the spiritual life, value systems, visions of cosmology and social practices of peoples and communities, is embodied in cultural identity (Aikawa-Faure, 1996: 97).

French geographer, Vidal de la Blache conceived the idea of *genre de vie*, which is the belief that the lifestyle of a particular region reflects the economic, social, ideological and psychological identities imprinted on the landscape. Architecture and identity, individual and collective, appear to be essentially connected. This is true particularly for communities, since they identify themselves with the place in which they have evolved (Popescu, 2006: 191).

It would follow that the ability to re-establish worth, ownership and identities of communities – and in so doing, social upliftment – lies in the hands of architects to design dwellings and buildings that positively reflect the identities of individual communities, rather than treating all communities as a collective whole, regardless of the geographical location or cultural stem. Thankfully, the implementation of the SANS 10400 part XA introduced in November 2011 states that, unless it is impossible because of geographical location or other factors, a house should face north, and all living areas should be on the northern side of the house (Green Building Council of South Africa, 2011: Online).

Within South Africa's new dispensation, the challenge of searching for cultural heritage and identity, after emerging from a prolonged state of colonial domination and westernised culture, is to try to imagine South Africa's own nationhood in new terms, and to define her own identity and heritage (Nettleton, 2008: 107). The type of architecture found within individual communities around the world is essentially and intimately related to the identity of the people within (Popescu, 2006). This identity holds the key to South Africans experiencing their environment as meaningful and it is also here that the study of vernacular architecture must make a fundamental contribution (Radford, 1981). It is this narrative property of architecture, seen within (mass produced) architecture, which has led to the loss of cultural identity, moral and ethical values and the degradation of various other

socio-economic issues. The Reconstruction and Development Programme (RDP) has engendered a loss of traditional, cultural and spiritual references, and cultural innovative practices, which has led to an urgency to rediscover a true South African identity (Steenkamp and Whitfield, 2011: 72).

The issue of South African identities and cultures is therefore viewed as a volitional process, the significance of which is more noteworthy within a group, since collective identity is overtly constructed. The multiple manifestations engendered by this process have a common denominator: the aspiration towards identity. The diversity of manifestations is determined by the evolution of support for identification (ideological and/or aesthetic).

3.3.5 Defining indigenous technical knowledge

According to the Concise Oxford Dictionary (1950), indigenous means native or belonging naturally. According to Hirji, Johnson, Maro and Chiuta (2002:313), indigenous knowledge is "a system of methods, customs and traditions developed over many generations, through a traditional way of living and the in-depth knowledge regarding a system or systems by local people". Indigenous knowledge was described by the National Research Foundation (NRF) as being the complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular geographic area (Rozani, 2006). In this study, the term indigenous knowledge will refer to the knowledge that is inherent to the people of a particular area.

There is particular relevance in documenting indigenous knowledge as local indigenous and technical knowledge, within the building practice, should never be overlooked as the indigenous peoples' knowledge about the specific conditions in which they live and work may be more exact than the knowledge of practising individuals in the built environment (Ezaguirre, 1992: 19). Furthermore, there is a danger of losing indigenous knowledge due to the manner in which this information is handed down orally from one generation to the next. Therefore, it is equally important for the recording and protection of indigenous knowledge as it can be utilized in ways which benefit owners and communities (Rozani, 2006: 5, citing De Gutchteneire, Krukkwer and Von Liebenstein).

The knowledge, experience and skills of the indigenous Xhosa people, specifically in the Eastern Cape, still has an essential contribution to make concerning the creation of sustainable settlements and buildings needed in the future (Ozkan, 2006: 108). Past and present indigenous knowledge can play a key role in sustainability (Sawyer, 1992: vii).

Why has the indigenous knowledge of the South African people been largely overlooked by architects, our government and even by local communities? According to Rozani (2006: 6, citing De Guchteneire), indigenous knowledge is generated within communities, is location and culture specific, is the basis for decision-making and survival strategies, concerns critical issues of human and animal life, and is not systematically documented. Furthermore, indigenous knowledge is dynamic and based on innovation, adaptation, is experimental and is oral and rural in nature. This occurrence within the economic considerations as well as cultural, political and climatic factors, which underscore the need to develop indigenous African building technology to meet 21st century needs (Elleh, 1996: 343).

Indigenous knowledge systems in the built environment have for too long been limited to the study of exotic or primitive architecture, and the organic nature of the development of such settlements, emphasising the essentially transient nature of planning systems that engendered these built forms. Until the arrival of Europeans, the myth existed that Africans had lived in universal 'chaos' and 'stagnation'. According to Tapela (2007a: 105, citing Amankwa-Ayh), "...for countless centuries, while all the pageant of history swept by, the African remained unmoved, in primitive savagery". While these myths and legends have optimistically been silenced, there still exist anthropological debates of strange Phoenicians building cities of 'Great Zimbabwean' proportions (Davidson, 1959: 74-93).

Other variants of African pessimism still permeate contemporary debates on the African vernacular condition, its past and lack of position in the future (Roberts, 2007). Various authors have began to wrestle with analysing and situating the study of African indigenous architecture and systems of planning within the unfolding political, economic and ecological use of resources (Fathy, 1973; Denyer, 1982; Oliver, 1971, 1986, 1987, 1997, 2003, 2006; Steyn, 2003, 2006; Frescura, 1981, 1985, 1989). According to Fagan (2008), this marked a welcome transition from the sensationalist traditions of vernacular architecture and organic planning. These authors have moved away from studies aimed at the ideological justification for 'difference' toward more inclusive discourses that recognize that pre-colonial African settlements and cities were built on sound town planning, design and architectural principles. It has been observed that "the break in tradition at the time of colonisation consisted not so much of the creation of towns as it did in the replacement of one network (pre-industrial) by another (industrial), giving dominance to industrial-resource frontier regions, sometimes to the detriment of the other areas" (Coquery-Vidrovitch, 2009: 51).

Indigenous patterns of settlements were firmly rooted in the planning, building, construction and maintenance of their vernacular before the advent of colonialism (Tapela, 2007: 107). Furthermore,

those pre-colonial South African communities minimized urbanism and the feeling of congestion, while making maximum use of available space (Coquery-Vidrovitch, 2009; Anderson, 1977) (see Figure 4.8). These traits, together with a delicate balance of mass and space, which accompany such fortuitous spatial intimacy, lent themselves to a feeling of cohesiveness and group control. Such principles probably account for the environmental sustainability of the pre-colonial villages (Tapela, 2007a, citing Amankwah-Ayeh).

A re-assessment of the practical virtues of the traditional environment is needed. This should not be done to promote a sentimental, backward-looking and inevitably artificial imitation of pre-industrial and pre-colonial times, but to preserve the existing skills and knowledge of using local materials and methods of construction (Anderson, 1977: 2-3). In so doing, the future built form may be suitably adjusted to the changes in lifestyle and building practice. Counteracting the use of vernacular architecture, as Karl Marx put it: “Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly encountered, given and transmitted from the past. The tradition of all the dead generations weighs like a nightmare on the brain of the living” (cited in Wilkinson, 1981: 44). If the validity of this understanding of history is accepted, then the primary task of professionals within the building industry shifts to concerns facilitating change and coming to terms with the seemingly negative “tradition of all the dead generations”.

According to Tawney (cited in Schumacher, 1980: 27), from an ethical and social point of view, there is an immense hatred of the system that stunted human personality and corrupted their relationships by permitting the use of man by man as an instrument of pecuniary gain. For the basic aim of modern industrialism is not to make work satisfying, but rather to raise productivity and its proudest achievement is labour saving, whereby labour is stamped with the mark of undesirability. The undesirability of industrialism has been described as something that cannot confer dignity, resulting in the working life of a labourer as a life without distinction. The result, not surprisingly, is that it often stimulates a spirit of sullen irresponsibility that refuses to be mollified by higher wage awards (Schumacher, 1980: 29).

In many rural areas in South Africa, there exists resentment towards traditional earth dwellings. The general opinion leans toward the desire for ‘modern’ houses of brick or concrete blocks and mortar, together with the perception that traditional vernacular dwellings do not qualify as ‘real’ houses (Steyn and Bosman, 2010: 214; Macleod, 2002: 2). Even aesthetic responsibilities are not only visual and sensory experiences, but also lend to the intangible and perceptible ‘spirit of place’ (Day, 1990: 14). This would require those involved in housing to bury stylistic and individualistic

preferences in favour of 'listening' to what the place, the moment and the community ask for. The rich and extensive variety of food resources, architectural heritage and other economic activities are being virtually obliterated. It has been argued that these resources and heritage are being replaced with mass-marketable foods, building materials, technology and other economic activities that have benefited the unfolding settler capitalist agriculture and industry (Tapela, 2007: 106). From this point of view, it is possible to think of culture, not as clutter from which the architect has to free himself, but as a field rich in possibilities, an architecture that is full of heritage, innovation and ideas that can be shaken up, transpiring into the catalyst for future rural communities (Day, 1990: 14; Maxwell, 1996:48). According to studies on indigenous knowledge by Frescura (1985: 65), many rural residents had fires in their dwellings for both heating and cooking functions. Furthermore, the smoke from these fires was allowed to rise and percolate through the thatched roof, where applicable, thus effectively fumigating and discouraging vermin infestation. This process was also effective where clay walls were concerned.

3.3.6 Knowledge Transfer: Apprenticeship and Community Participation

According to the Concise Oxford Dictionary (1950), the following definitions apply to knowledge transfer, apprenticeship and community participation:

- **Knowl'ėdġe** (nŏl-), n. Knowing, familiarity gained by experience, (*of* person, thing, fact); person's range of information, as *it came to my* ~ (became known to me), *not to my* ~, not so far as I know, *he had to my (certain) ~ been bribed* (I know he had); theoretical or practical understanding (*of* subject, language, etc.); the sum of what is known, as *every branch* of ~. Hence ~ABLE (nŏlĭj*a*-) a. (colloq.), well-informed, intelligent. [ME *knaulage,* century later than obs. vb *knowledge* confess (KNOW, -*ledge* unexpl.)];
- **Trănsfer',** v.t. (-rr-). Convey, remove, hand over;
- **Apprĕn'tĭce**, n. Learner of a craft, bound to serve, and entitled to instruction from, his employer for specific term; tiro. Hence ~SHIP (-ssh-) n; and
- **Partĭ'cĭp|āte,** v.t. & i. Have share in (thing *with* person); have share (*in* thing *with* person); have something *of*, as *his poems ~ate of the nature of satire.* So ~ANT, **partĭcĭp**A'TION, ~ātor, nn. [f. L *participare* (as PART + *cip*- = *cap*- st. of *capere*take)].

The maintenance of an apprenticeship system is where one is bound to another to learn a trade that endows a community. This endowment is functional not only through the technical skills learned, but also through an improved sense of social identity and professional responsibility. An apprenticeship system is the most effective way to guarantee the sustainable reproduction of a distinct architecture

and a built landscape imbued with changing and dynamic meaning for the people that inhabit it (Marchland, 2006: 51). This view is supported through the re-interpretation of the latter into architectural theory and practice, which encompasses all the factors that surround the art of building (Ozkan, 2006: 108).

According to Ozkan (2006: 108), this traditional knowledge is embedded within society and is passed down from one generation to the next by means of cultural apprenticeship systems. It is when these cycles of transmission of information or technology are broken by outside forces that apprentice systems cease to be active. According to Frescura (1981: 75), in indigenous societies, the technology of construction is learnt as part of the general education undergone by every member of that society, the awareness of building filters through reaching every aspect of rural life. Even when specialised builders do arise within a community, the average homeowner and his family have an intimate knowledge of the building process and are able to take part in it.

Unfortunately, changes which ignore the complex nature of social and environmental forces yield architecture that is neither appropriate nor socially acceptable (Elleh, 1996: 229). Corresponding to this statement is the transformation which has occurred in South Africa since 1994. Elleh correctly prophesied that which was South Africa's largest temptation and downfall in the period of the construction boom: the need for quick design solutions. Irrespective of the positive contribution which Democracy brought about, what occurred simultaneously was the urban-migration, which not only created slums (Gwinner, 2011), but also the militaristic ranks of housing that have reduced opportunities that might have existed had these migrants had the opportunity to learn traditional skills through apprenticeship systems and knowledge transfer (Simao, 2011). Professionals in the built environment might not complain about the lack of skills in South Africa had these 'military housing ranks' and alien building methods not been introduced (Ozkan, 2006; Anderson, 1991; Elleh, 1996).

In a country where the scarcity of energy, resources and building materials is only likely to increase (Sexwale, 2011), the determination to make use of abundant local resources, the reintroduction of an apprenticeship system along with the desire to respect and engage with the complexities of cultures, historical contexts, tradition and the pressing needs of habitat, will most certainly give rise to impressive, durable and socially conscious architecture (Popescu, 2006). With regards to the actual apprenticeship system, Schumacher (1980) identified three purposes of human work: to produce necessary and useful goods and services; to enable communities to use and perfect talents and skills; and to serve, and collaborate with the broader populace, so as to "liberate ourselves from our inborn egocentricity".

According to Hirji, Johnson, Maro and Chiuta (2002: 313), indigenous knowledge is “a system of methods, customs and traditions developed over many generations, through a traditional way of life of an in-depth knowledge of a system or systems by local people”. The knowledge, experience and skills of indigenous South African builders and craftsmen therefore have an important contribution to make towards the creation of sustainable communities, including the identity of individual groups. According to Sawyer (1992: vii), the past and present indigenous knowledge plays a key role in sustainability. It is essential therefore that a housing precedent should be set, where indigenous knowledge is integrated with modern innovative technology. The result of an equally weighted ‘team’ between the latter could lead to the development of settlements and buildings that are both contemporary and modern, yet which build upon the characteristics of the local and cultural traditions and knowledge. This would further lead to the amalgamation of both the environmental and ecological contexts, thereby reflecting the identity of the local community, resulting in the upliftment of individuals and communities through education, traditional and cultural knowledge transfer and the reimplementation of cultural traditions.

3.3.7 Holistic historic studies for contemporary success

Religion has often accentuated the continuity between available materials and the cultural environment, by relating the individual to the spirit of his or her ancestors (Denyer, 1978: 16). Sometimes little distinction between the living and the dead was made when referring to people, the dead had merely changed state and were still a potent force. As such, traditional dwellings should be seen as more than a mere shelter, but also a national asset (Anderson, 1977: 24). Research into the South African vernacular is vitally important as it can contribute to the appreciation and conservation of not only building methods, but also what is left of traditional streetscapes (Fagan, 2008: 1).

Regional cultures embrace the values, significance and understanding of climate and available resources, thereby allowing a link between past and present architectural practices, tantamount with solutions and accomplishments in the future. Architecture can thus be described as the material expression of the culture that built it (Jekot, 2007: 74). According to Anderson (1977: 7-13), in order to build and shape the environment for the future, it is essential to understand the past. The vernacular buildings and settlements demonstrate what is valued and what is not. These dwellings further illustrate patterns of collection and production, together with forms of economical, political, social and cultural behaviour. Architecture is therefore a statement. Not only of the patterns of

privilege and power, but of the established relationship between humans and the environment. Furthermore, without understanding the past, no genuine South African architecture will emerge as planners will continue to borrow randomly (and expensively) from foreign and conflicting ideas for national building targets and how best to fulfil them (Anderson, 1977: 7-13).

Anthropological influences are important in studies of vernacular architecture, which together with the task of providing shelter, forges close community involvement that may account for the purity of style typically found throughout South African vernacular dwellings (Papanek, 1989:17). From this perspective, this also results in a harmonic relationship between dwellings that are ever-changing. Aesthetic values force a style that is often a vivid response to man's psychic inheritance. Jung's 'collective unconscious' linked to what Freud called 'archaic remnants', and a whole collection of demons, gods, mystical inhabitants from 'beyond' or 'the far side', and of ancestors who are deemed to have never 'really' left home (Nesbitt, 1996: 176-181, citing Jung). With all these considerations mentioned above, there comes an intoxicating trace of the romantic, exotic or richly eccentric. This elevation of vernacular forms obscure the issue and makes it difficult to see the many manifestations of vernacular for what they really are, a functional and prudent response to man's needs within his specific environment (Nesbitt, 1996: 176-181).

3.4 Innovation

Innovate is defined as the act of inventing or beginning to apply new methods or ideas (Concise Oxford Dictionary, 1950). Innovation is very important as it is a result of the process of examining what is currently done and thereafter developing methods or products that improve on what is currently practiced. While this research is not on innovation *per se,* innovation is necessary in increasing sustainability as well as making possible improvements to the vernacular. It seems imperative then that an architectural perspective is created – in which valuable indigenous knowledge is integrated with equally valuable modern innovative technology, such technology is easily demonstrated in the case of the New Auditoria and Teaching Complex at the University of Fort Hare in East London (Figure 3.7).

Figure 3.7: The New Auditoria and Teaching Complex at the University of Fort Hare in East London (Source: Stratford, principal architect)

In an exciting and significant development that incorporates implementation of innovations, the South African National Standards (SANS) 10400 part XA sees all new buildings and refurbishments in South Africa having to comply, from 9 November 2011, to minimum standards of energy efficiency – the first of a set of minimum standards for environmental sustainability in new and refurbished buildings (Green Building Council of South Africa, 2011: Online). These documents cover energy efficiency in buildings. When implemented in November 2011, these new standards were said to drastically change the way that buildings are planned and built in South Africa. The SANS 10400 part XA will cover energy efficiency as relating to various topics such as hot water supply, energy usage and building envelope (covering maximum energy demand), design assumptions, building envelope requirements, orientation, floors, external walls, fenestration and roof assemblies, to name but a few.

3.5 Previous studies on research subjects

3.5.1 uMasizakhe

The uMasizakhe settlement, outside Graaff-Reinet, lies 750 meters above sea-level where the semi-arid plateau region of the Eastern Cape Province can be characterised with low and unreliable rainfall and great extremes in temperatures (Frescura, 1985: 37). Undoubtedly, one of the main reasons for the selection of the site at Graaff-Reinet was the abundant supply of water from the Sundays River (Minnaar, 1987: 1) (see Figure 2.2), which contrasts greatly with the surrounding arid

areas of the Karoo (Henning, 1975: 7). The landscape of the Karoo has been illustrated as being "... unique in its ugliness..." and "...wanting in everything that can please the eye or soothe the mind…", however it has also been described as having "timeless appeal" resulting from its "rugged beauty" that is found within the "boundless Karoo" (Henning, 1975: 7).

The climate of Graaff-Reinet has determined to a large extent the livelihoods of the people. Graaff-Reinet has, like the surrounding Karoo, a climate of extremes. Extreme temperatures of up to 38°C can be expected in mid-summer during the day and in the evening temperatures may drop to 32^0C with an occasional thunderstorm to relieve the heat. During the winter months, the opposite extreme is experienced. Snow is rarely seen in the valley, but is frequent within the surrounding Sneeuberg Mountains, consequently temperatures of well below freezing point are experienced (Minnaar, 1987:1; Henning, 1975:7) (see Figure 3.8).

Most colonial vernacular buildings are located in the south and east coastal belt from Cape Town to KwaZulu-Natal, in the semi-arid inland plateau of the Great Karoo, and in the mountain valleys or on the escarpment between them. The Great Karoo, where Graaff-Reinet lies, is semi-arid with little perennial water and low scrub (Japha and Japha, 1997: 2152)

"In the Karoo vegetation there is no green patch, no shade of a tree, no field of corn; there is not a mountain, but it is bare; not a river but it is dry; in the vegetable kingdom all appears sapless, withered and dry; the mimosa, the aloe and the Karoo bush alone survive the excessive heat and the prolonged droughts which are features of the climate" (Henning, 1975: 7).

It is from this description that Graaff-Reinet may be viewed as an oasis within the central parts of the Eastern Cape's Great Karoo. Graaff-Reinet was laid-out in a bend on the course of the Sundays River (refer to Figure 2.2), it is further surrounded on three sides by mountains. In the distance, the Sneeuberg Mountain range (Figure 3.8) towers above the landscape, while to the south, the dry arid plains of the Karoo stretch as far as the eye can see (Henning, 1975:7; Fagan, 2008: 78; Minnaar, 1987:1).

Figure 3.8: Snow on the surrounding Sneeuberg Mountains

Minnaar (1987:1) noted that in the colonisation of the Cape Colony, the eastward expansion of the Dutch-speaking farmers (the *trekboer*) resulted in the establishment of Graaff-Reinet as the fourth-oldest town in South Africa. It was from Graaff-Reinet that the frontiers of the Cape Colony were secured and the interior explored, civilised and developed. By the time of the second British occupation in 1805, Graaff-Reinet was marked as the extreme eastern edge of permanent occupation (Radford, 1989: 21).

While the Southern Bantu people were subjected to influences of Khoisan people as well as western civilizations, each Bantu people is characterised by a national pattern peculiar to itself (Peters, 1997: 2152). The Sotho and Nguni peoples – the vast majority of all Bantu living in South Africa, are distinguished from other cultural groups in Africa linguistically as well as culturally. The isiXhosa people, as part of the Nguni people, are spread toward the south of the country in the former Transkei and Eastern Cape (Peters, 1997:2152). The Xhosa settlement found in Graaff-Reinet

within the uMasizakhe community is picturesquely situated as one enters Graaff-Reinet on the Middleburg road (Fagan. 2008: 79, refer to Figure 2.2). The earliest huts and shelters built in uMasizakhe were round in the Khoisan style (Figure 3.9) with reed mats for roofing; unfortunately none of these earlier houses have survived, although it is important to be acquainted with the indigenous technique and available materials used so as to follow the current forms.

Figure 3.9: Artistic impression of early huts or shelters around Graaff-Reinet

According to Henning (1975: 186), the local settlers of Graaff-Reinet in the early ninetieth century evolved a building style that eminently suited the material and environmental conditions. Contributing factors were the limited economic opportunities and the geographical isolation from the Cape Colony, which eliminated the possibility of importing skilled artisans. Although the residents had semi-skilled isiXhosa slaves and others who could build with minimum supervision, the shortage of suitable reeds for thatching and the non-existence of forests suitable for timber in the Karoo added to the challenges faced. This vernacular architecture has been somewhat neglected by researchers, but it is in these symmetrical square-designed *brakdak* dwellings which allow a town such as Graaff-Reinet to retain its old world charm and atmosphere, and for this reason, commands our attention (Fagan, 2008: 175).

According to Pase (2011), many houses found within uMasizakhe were built during the initial ‘cattle killings’, which occurred between 1856 and 1857, and were constructed using the most accessible materials, such as rubble, adobe and grass. The earliest isiXhosa houses were round in the Khoisan style with bulrush mats over brushwood hoops (Figure 3.9); unfortunately none of these earlier houses have survived.

According to Elleh (1996: 355), the African environment is in continuous transition both in the rural and urban areas. South Africa is not isolated from this transition as economic conditions of the past few decades have put enormous stress upon the environment. The call for sustainable communities is rightly the solution to these economic and inorganic relationships, whereby communities can not only be self-sustaining, but also self-reliant. Rural architecture derived its existence from the availability of natural materials. This distinct style uses the natural environment as a ready resource quarry, obtaining timber, rubble, clay and thatch required for construction. The architecture found within rural areas such as uMasizakhe have proven the highly functional and thermal qualities are obtained when utilizing available natural resources in accordance with their natural properties. Thus, the distinct style of Karoo *brakdak* houses was developed (Pase, 2011; Frescura, 1985; Peters, 1997).

The sustainable relationship between materials, the environment and the built-form is perhaps nowhere better illustrated than in the communities found in peri-urban and rural areas (Frescura, 1985:41). Furthermore, the degree of inventiveness shown by the uMasizakhe community in utilizing common objects out of their familiar context and adapting them to fulfil new functions, successfully demonstrates a shared ability to grasp the fundamental nature of materials.

The study of traditional detailing reveals a cultural heritage of sophistication and ecological balance that has for too long been ignored by most architects and professionals – who have prescribed expensive and alien solutions in rural and peri-urban areas, reliant on prestigious, modern materials and techniques. These 'new' and industrially-produced materials that are often introduced in the rural areas are not used with the same understanding and skill as is clearly evident in the traditional use of the organic and inorganic material relationships (Anderson, 1977:3). The use of these new materials is often associated with the building activities of government and urban centres, consequently symbolizing progress and prosperity, which deceives rural people who then replace sustainable organic and inorganic materials with industrial ones (Onatu, 2011). According to Fagan (2008: 2), one can observe the beauty, which sometimes exists in rural areas, where each house has its own identity and enlivens the whole environment. However, these individually identifiable characteristics are often no longer evident (Anderson, 1977: 34).

When traditional materials are no longer available, it is interesting to see how traditional techniques adapt. It has been observed that the impact of corrugated iron (see Figure 3.10) was not the rigidity thereof as much as competing economic, social and political pressures (Denyer, 1978: 99). Westernised architectural pressures suffocated indigenous vernacular methods from then onwards. Corrugated iron sheeting will therefore not go without mention.

Figure 3.10: Transkei, 2009, the evolution of the dwelling forms from circular to rectangular as a result of the introduction of corrugated iron

Although corrugated iron was invented during the late 1820s, it seems certain that its export to the Cape Colony occurred as from 1850 (Henning, 1975: 189). According to Anderson (1977), corrugated iron is seen as a time-saving comparative advantage. Although these sheets have proven to be more durable than traditional roof construction techniques, they are less subjective (Oliver, 2006). The use of such sheeting, and surely furniture too as beds, cupboards and tables are rectangular, also influenced the shape of the traditional dwelling from circular to rectangular (see Figure 3.11), resulting in more skill requirements now needed to evenly distribute the weight of the materials used. In areas where the marked diurnal temperature range is wide, the use of this material makes it necessary to have more fire wood, warmer clothes and bedding, which has resulted in a less sustainable environment and an inorganic relationship.

The evolution from a circular plan to a four-cornered dwelling was supported by the spatial ease in which western furniture could now be used and moved within the shelter. In addition, the four-cornered dwelling no longer required a central structural pole, which previously limited movement and the overall perimeter once the walls were built. Figure 3.11 (below) also illustrates the ease at which available corrugated iron roof sheets could now be included in dwellings.

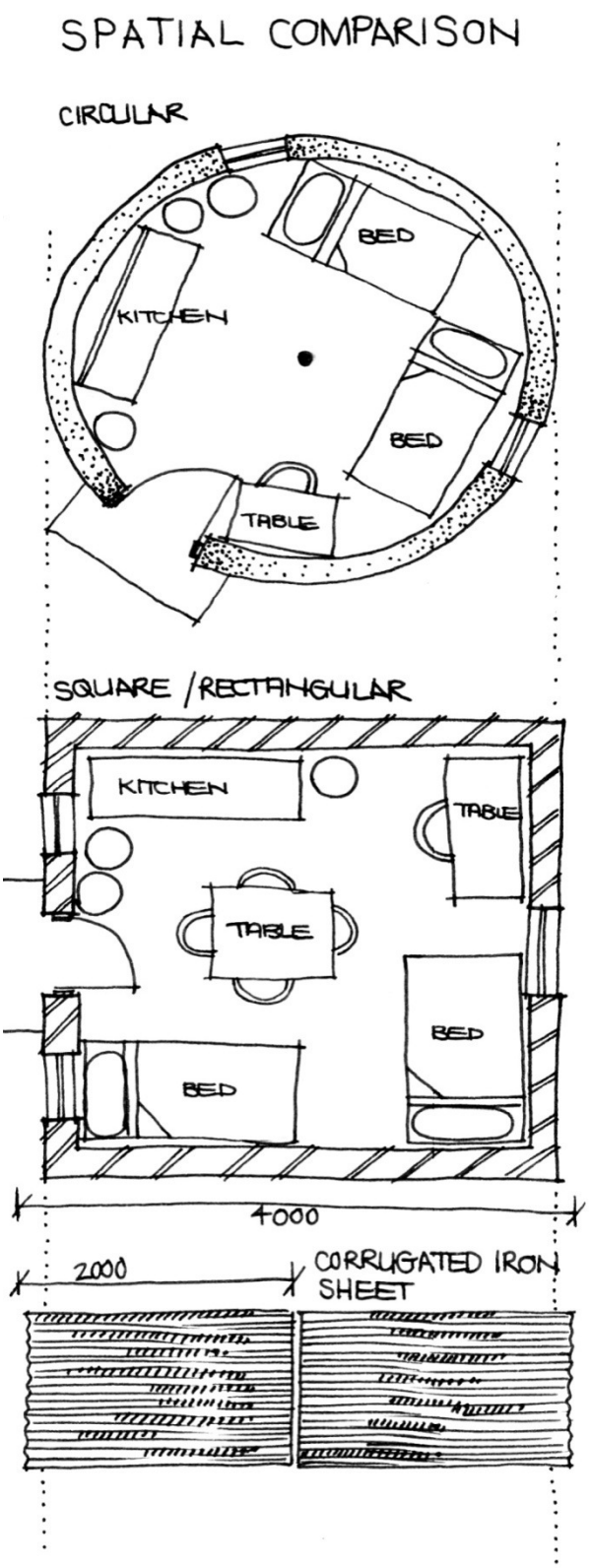

Figure 3.11: Spatial comparison of circular and rectangular houses with furniture and corrugated iron sheets for comparison

3.5.2 uLoxulweni community of Hofmeyr

According to Anderson (1977: 2), the vernacular African homes consisted of an integrated use of materials (most were renewable), which produced buildings that provided satisfactory comfort-levels for the household members and their livestock.

Most African houses traditionally had mud floors, and while a mud floor tends to conjure up the idea of something soft and insanitary, but this is far from the case when the floor was properly prepared. A well prepared floor could be almost as hard as concrete and relatively smooth. A good, firm floor was obtained by beating the mud with a wooden mallet while it was setting; the *dagha* was also mixed with charcoal, other small aggregates or with cow-dung and then smeared with ash (Denyer, 1978: 94). In certain areas it was found that the mud from low ant-hills (common in the Eastern Cape) was particularly good for making hard, practically waterproof, bluish cement (Stulz and Mukerji, 1988).

Structurally, the walls were built of clay, which had to be carefully prepared. The process was described as clay, which was thoroughly mixed with *kraal* manure and straw, which was then carefully trodden and then left in a heap covered with bags to ferment. This process was repeated for seven days after which the mix was ready for building (Fagan, 2008: 210).

It has been explained that African societies were by no means static in the past, but changes in the twentieth century may have been more cataclysmic and irreversible than ever before. The question was posed as to the variability of traditional architecture completely vanishing under the plethora of cement and corrugated iron where the possibility of vernacular architecture adapting to the twenty-first century way of life was opposed (Denyer, 1978:192). However, Fagan (2008: 1) has described the aesthetic properties of the vernacular architecture found throughout Southern Africa as "...a nostalgic longing for the simple buildings, so modest and similar, yet each with its own identity, economically planned and built with basic materials – mud, rubble, wood and sometimes whitewashed with lime".

According to Denyer (1978: 193), under the current conditions, the individual has had no choice but to accept what is offered or possible. Should the traditional styles, praised by Fagan, be allowed to simply decay under the industrialized way of 21st century living? This type of question can only be answered by each community concerned. It should not be outsiders who dictate policies, which may be said to spring from sentimental European notions of conservation or a hankering to return to pre-industrial harmony (Denyer, 1978: 193). What is important, however, is that those making decisions

should not be inhibited by the feeling that everything about traditional architecture is wrong. In many cases, the old materials may be unsuitable for modern living or a mud floor and a thatched roof are far more comfortable than a concrete floor and a corrugated iron roof, but these need to be investigated.

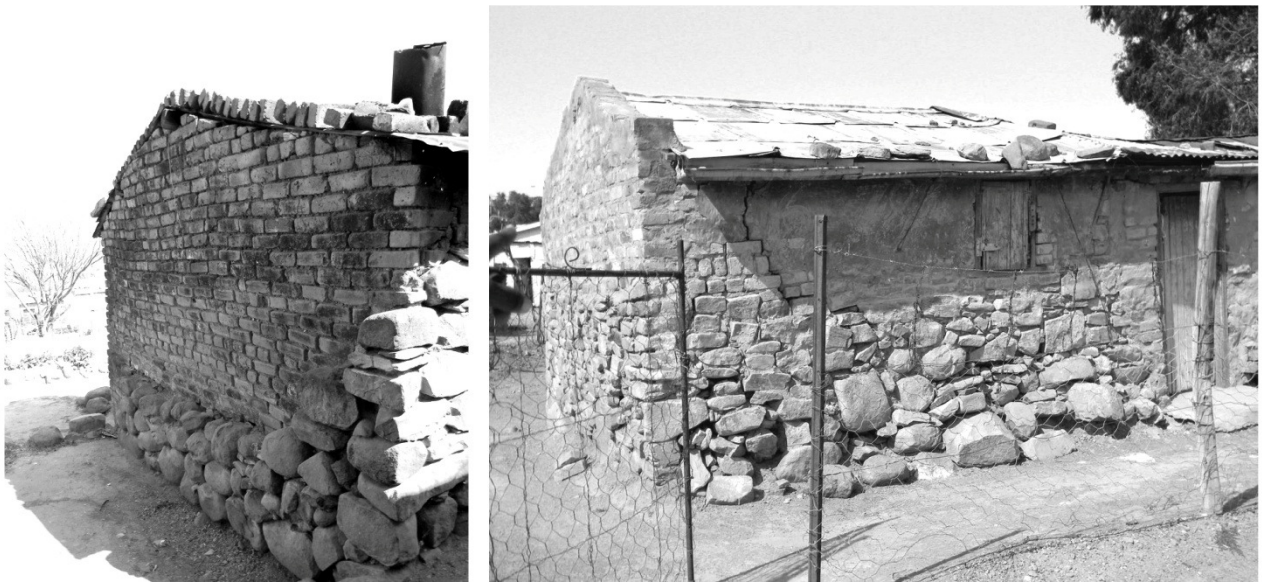

Figure 3.12: Vernacular house within now-demolished Luxolweni location

As can be seen in Figure 3.12 (above), the biological and ecological properties of available materials used far surpass their contemporary counterparts. *Dagha* and rubble are not only cost effective, but are also heat-retaining materials; together with the life expectancy of the dwellings and their social acceptability, these vernacular buildings are more sustainable than most present-day dwellings (Makaka and Meyer, 2006; Fitch and Branch, 1960).

3.5.3 The rondavel

The prevalence of the rondavel has been commented on by numerous authors, such as Steyn (2006: 21-38) and Schoenauer (2000: 58), who stated that the basic dwelling forms of a sedentary society are the circular hut with conical thatched roof, the oval house and the rectangular dwelling with semi-rounded corners and a saddle-type roof. It was argued that the rondavel was dominant in about 66% of sub-Saharan Africa toward the middle of the twentieth century (Walton, 1956: 24). Finally, the rondavel has been described as "possibly the most universal of southern Africa's house forms" (Frescura, 1981: 53). It is proposed that the reason is a combination of resistance to change and the suitability of the rondavel type to prevailing conditions.

According to Rapoport (1969: 25, 27), circular huts are more difficult to roof than rectangular ones, but emphasises that the choice might ultimately depend on the symbolic nature of the forms, adding that some traditional cultures do not have a word for 'straight' (1969: 25, 77). It therefore remains that the round plan must have been the result of an elementary choice, with the rondavel simply the most appropriate solution for the conditions. The rondavel offers unlimited flexibility to respond to different social structures, economic activities and external threats such as predatory animals, human raiders or climatic challenges (Steyn, 2006: 29). A spatial comparison between the rondavel and rectangular dwelling, illustrates that although the circular shape of the rondavel was the elementary form of choice, the rectangular dwelling accommodated furniture and spatial use better (Figure 3.11).

The isiXhosa traditional hut (see Figure 3.13), as noted above, is of the cone-on-cylinder type, commonly referred to as the rondavel (Steyn, 2006; Peters, 1997). The walls of the rondavel are traditionally plastered and consist of wattle poles and woven saplings with rubble or mud infill, or sun-baked mud-blocks, with a pole in the centre to support the cone-shaped roof of rafters and saplings to which thatch, reeds or *'fluitjiesriet'* is fixed. 'Fire-places' or *mbawula* are positioned in the centre of the hut for heating, cooking and vermin repelling reasons (Peters, 1997: 2152). The floor is smeared with dung to improve its durability (Peters, 1997: 2152). Rectangular huts with hipped roofs became popular after indigenous peoples had been introduced to the European styles of architecture (Frescura, 1985; Steyn, 2006) (Figure 3.14).

These rectangular huts had corrugated iron roof-sheeting, which is held down by large rubble-stones. These stones could be removed and thereafter the sheets could be removed and cleaned after the winter, before the heavy summer rainfall (Theron, 1972: 41) (Figure 3.15). Choice of construction materials is highly dependent on local resources (Peters, 1997; Oliver, 1971; Frescura, 1985), which confirmed that rubble was used for many wall constructions, which together with the thermal qualities of the thatched roof provided comfortable internal environments (Peters, 1997:

2153; Makaka and Meyer, 2006; Fitch and Branch, 1960). Walls are traditionally wholly or partly plastered. The rondavel and four-cornered houses have become the types of houses most likely to be built by the isiZulu and isiXhosa people.

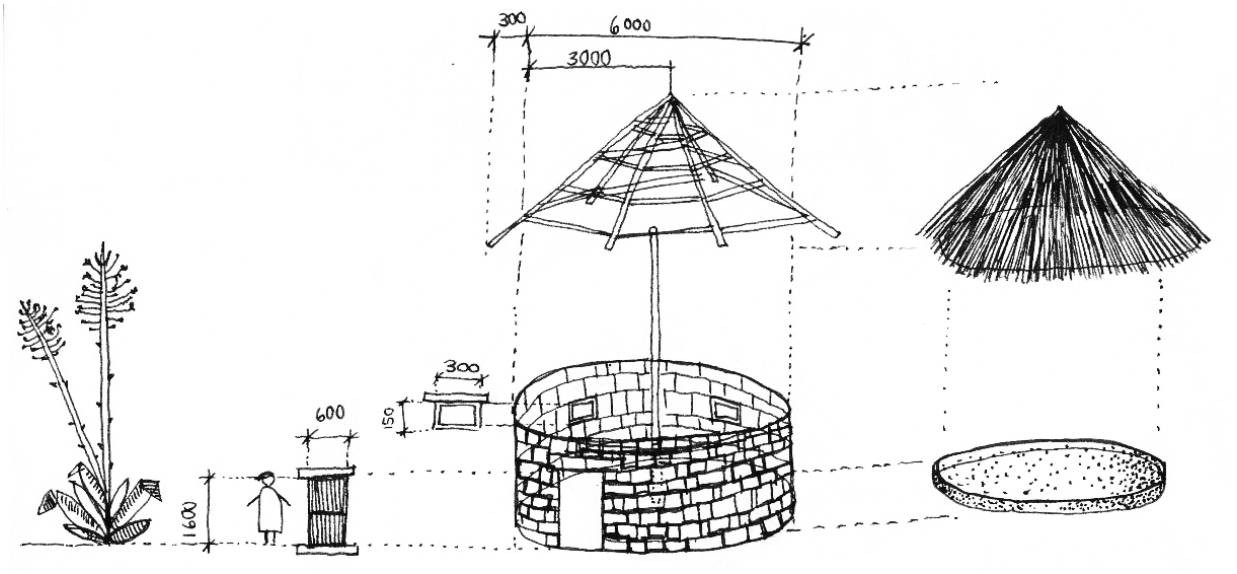

Figure 3.13: The isiXhosa hut is of the cone-on-cylinder type, commonly referred to as the rondavel

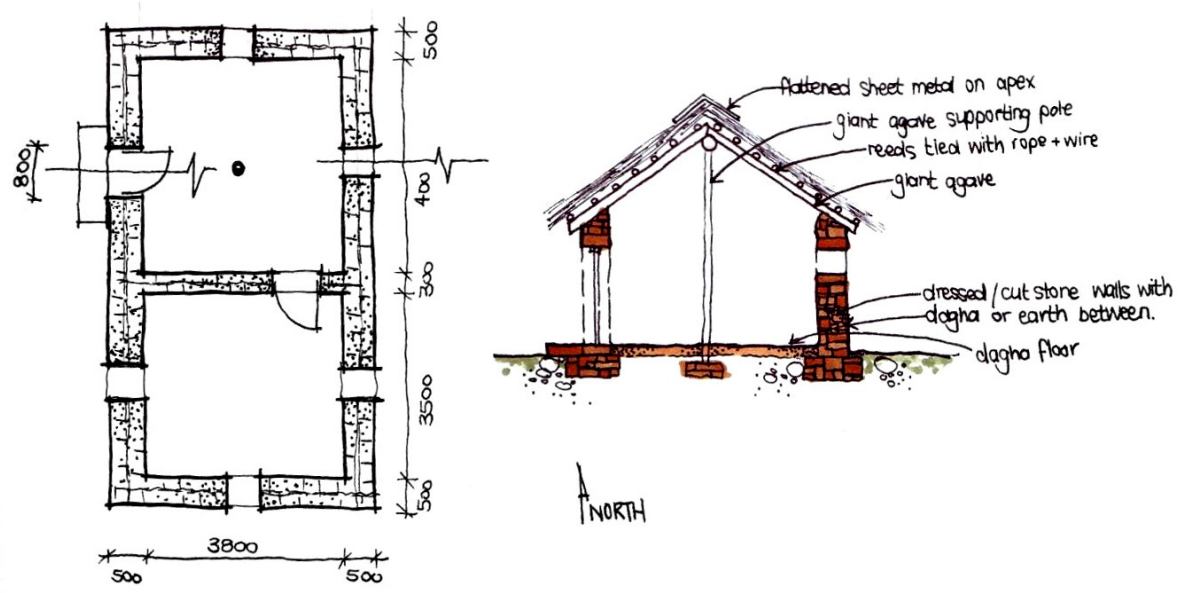

Figure 3.14 Plan and section sketches, illustrating rectangular dwellings with hipped roofs

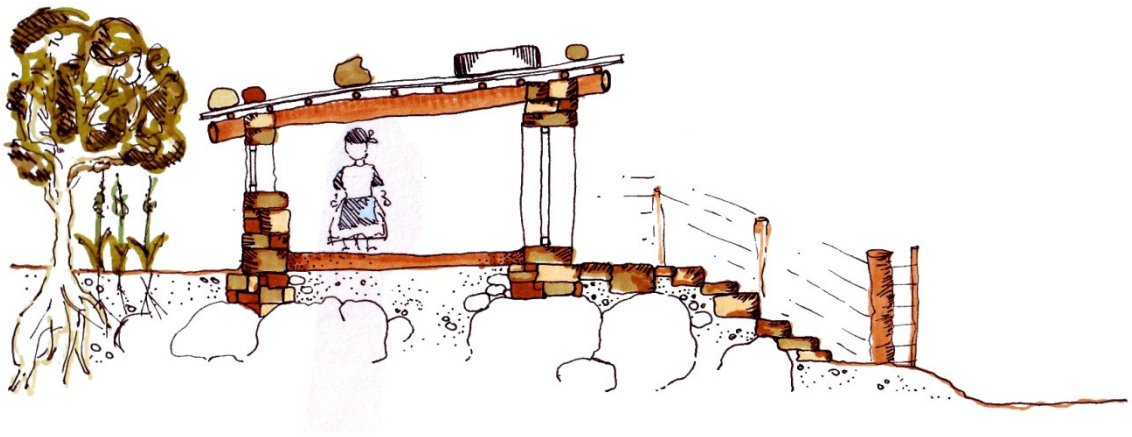

Figure 3.15: Section through an isiXhosa dwelling depicting the use of available materials as well as rocks used to anchor the roof

Several researchers have identified the circular form as arguably the most distinctive characteristic of African patterns and spatial organization (Frescura, 1981; Tapela, 2007). As can be observed from a micro level in the rural setting, the basic spatial patterns and built forms are the circle, the cone and the cylinder (Tapela, 2007: 107) (Figure 3.13). These shapes are repeated in various forms and configurations for most buildings and structures such as the hut, storage buildings and animal kraals. An interesting transformation resulting from outside influences is the adaptation of the simpler circular and rectangular shapes (and associated forms of circle, cone and cylinder) (see Figure 3.10 and Figure 3.11), to the rectangular and cube-type built forms of indigenous African built dwellings (Figure 3.15).

Every Bantu people is characterised by a national pattern peculiar to itself (Peters, 1997: 2152). The isiXhosa hut is traditionally of the cone-on-cylinder type, commonly referred to as the rondavel. Tapela (2007: 108) explained the seeming ‘unplanned’ clustering of buildings around the labyrinths of alleys or cul-de-sacs as a result of the nature of ‘organic planning’. The inherent flexibility, which is the nature of organic planning, underlies its value in informing current planning processes where, for instance, the inherent resourcefulness of households and communities that resort to housing themselves in informal settlements is often misconstrued as obstacles to orderly urban development, rather than harnessing this as an opportunity for engaging with community-driven development (Steyn, 2006: 30).

It can be observed that the indigenous hut is still found in rural areas, not only in southern Africa, but also in large parts of sub-Saharan Africa (Steyn, 2006: 21). The “typical African round-hut compound dwelling” has been described as “a cluster of round huts facing an enclosed central courtyard” (Figure 4.8). It has also been observed, in more recent times, the rondavel type has often existed side by side with thatched and flat-roofed rectangular buildings in rural areas (Figure 3.10) and in rare instances, even in informal settlements near urban areas (Schoenauer, 2000: 62). The rondavel is a physical demonstration of a multifaceted value system that combines tradition, kinship, climate, available resources and geographical location. Unfortunately, many thinkers view the rondavel from a European perspective and therefore hold that a hut is not a home (Rozani, 2006: 15; Steenkamp and Whitfield, 2010: 74-75; Steyn, 2006: 24). Both Oliver (2003) and Steyn (2006) opposed the latter perspective through descriptions of the ‘praiseworthy’ traditional rondavel. It has been emphasised that the rondavel characteristics are “remarkably robust” and ‘resilient’, and that the rondavel is such a unique type that there exists a need to document the indigenous knowledge available and to preserve representative examples, in conjunction with the skills to construct and maintain them (Steyn, 2006: 25, 35).

The construction of the round hut has been described as being built up from four or more stakes, which are driven into the ground. These serve as a framework for the walls, which may consist of anything from leaves to clay or dried mud. Since the walls cannot stand much lateral pressure, the roofing must be light-weight and its skeleton is, essentially, a set of ‘umbrella ribs’ tied together at the centre with the other ends resting the weight of the roof covering. It has been noted that in larger huts, a central pole is used in order to support the roof (Figure 3.13 and Figure 3.2) (Brodrick, 1954: 103). It has been found that although statistics are meagre, the number of rondavels in South Africa is certainly declining (Steyn, 2006). The decline could be attributed to various factors including urban migration, declining indigenous knowledge systems and socio-political expectations (Elleh, 1996: 215). Regardless of the decline, the indigenous rondavel should remain a prominent presence within the South African landscape and built environment (Steyn, 2006).

Peters described the structure and materials used for the construction of rondavels. Though the view is generalized, it is explained that the walls of rondavels are traditionally plastered and consisted of wattle poles and woven saplings with stone or mud infill, or sun-baked mud-blocks, with a centre pole supporting the conical-shaped roof and rafters. Thatch is then affixed to the rafters and saplings (see Figure 4.26). *Mbawula or ‘fireplaces’* are positioned in the centre of the hut and the floor is smeared with dung to improve its durability (see Figure 4.4) (Peters, 1997: 2152-2153).

3.5.4 Greenshops Financial Service Centre (GFSC)

When cultural changes resulting from national, political or governmental factors occur, old buildings may be adapted to new ways of living, and new buildings may be altered in form to accommodate them (Oliver, 1987: 10). The basic principles for professional architectural practice are the 'adaptability' of the existing building stock to serve the needs of contemporary daily life. Today, the principles of adaptability are too easily forgotten by architects who choose to demolish, rather than renovate existing buildings. In addition to today's challenges, there is a need to consider how to reduce use of non-renewable resources, how to lower greenhouse gas emissions and lower solid waste disposal, thereby gratifying the sustainable principles of design (Lawrence, 2006:122).

GFSC was designed and managed by the architects Vernon Collis and Anna Cowen and has a dual role as both a community hall and meeting place on the one hand, and a community financial services centre on the other. The intentions were to mirror the surrounding design language, with sustainability and innovation at the forefront thereof.

The materials used within the project allowed for unparalleled flexibility, old bricks from quarried buildings were reused, and the newly built forms can be recycled or left to decompose back into the soil (Steenkamp, 2010: 162).

GFSC was built by the local people to meet their own needs, utilising available resources and a variety of traditional technologies – such as wattle and daub – and finally, GFSC was planned in such a way to accommodate the values, economies and ways of living of the local populace whom produced it. Within the context of vernacular architecture, the project has embraced what is known and what is inherited about the building (Steenkamp, 2010: 163). It has included what is called 'the collective wisdom' and experience of a society, and the norms that have become accepted by the group as being appropriate (Oliver, 1986: 113).

The approach taken for GFSC can be viewed as significant in the modern concept of tradition, namely, where the past becomes part of the present as a guide to future action (Rapoport, 1989; 2006). The GFSC project can easily be viewed as a process in which innovation and precedent are dynamically combined allowing continuous change to take place (Lewcock, 2006: 16).

Perhaps the most interesting exercise conducted by the architects of GFSC, this social development project, aimed to encourage local people, and instilled once-again, their appreciation of the traditional building methods of mud and earthen infill as the principal building material (Cooke, 2009:

25). Earth construction used as a building material within this project has provided a real alternative for the building sector, its technical performances were established, and it provided an economically viable solution, both in macro-economic terms and in terms of building capital costs. Similarly, GFSC renewed the links with traditional building cultures, thus retaining its local nature, not only by virtue of the raw materials used, but also from a cultural point of view (Booysen, 2003: 43).

The GFSC successfully explored the relationship between local knowledge, available resources, cultural identity and architecture. More specifically, the project illustrated the gestation of technical learning and socialization that occurs throughout a project that focussed on social development (Steenkamp, 2010:163). According to Marchand (2006: 46-47), the indigenous knowledge of local building trades must be central to discussions, studies and projects concerned with the sustainability in the twenty-first century and beyond.

3.5.5 New Auditoria and Teaching Centre (NATC), University of Fort Hare

The NATC was designed by architects Ngonyama Okpanum Associates in association with Native Architecture, with the principal architect being Al Stratford. The NATC is a public-service building, which serves the University of Fort Hare students' needs in particular. The intention of the building was to mirror the design language with sustainability and innovation at the forefront thereof (personal discussions, Stratford, principal architect).

The aim was to have all floors being accessible for services, the building to be orientated with long facades facing north, limited air conditioning for apparatuses only, naturally ventilated spaces, natural day-lighting, locally-sourced materials and light-weight construction (Stratford, 2009: 54-57). The economic activity within the New Auditoria and Teaching Complex was well managed through the use of innovative *Wintec* precast concrete systems introduced by Al Stratford, which minimized the amount of waste on the site and made the construction process faster.

The complex is bounded on the north and south by wide streets. The primary response was to place three wings running east and west, which cascade downward from the south towards the north. Each wing is penetrated by a pedestrian concourse that is vertically connected by an elevator in the southern wing and a series of 'double-acting' staircases at the intersection of each wing. This concourse starts on the street at parking level on the south side and spills out onto the street at second floor, which is at grade on the northern street. In this way, the concourse becomes a pedestrian arcade of the city (Stratford, 2009: 54-57).

NATC is oriented with long facades facing north, natural ventilated spaces and natural day-lighting, and a 'wind scoop' or 'wind catcher' system that aims to regulate temperatures and internal conditions. This wind scoop on the roof contains an opening that faces the prevailing wind, which is a cooler temperature than the interior of the building, because the wind velocity at this opening is greater than it is at the lower windows of the building, air in the shaft of the tower is forced down the shaft to cool the structure (Steenkamp, 2010: 165).

The ecological considerations have been accounted for through the consented solar exposure given to each wing of the building, reducing the winter shadow. Unfortunately, the value of participatory approaches to the development was very little (Steenkamp, 2010: 166). The critical need to raise public awareness of the sustainable issues concerned, are however, being addressed regularly by the architects. The economic activity on the site has not over-exploited natural resources due to the use of innovative *Wintec* precast concrete systems that minimized the use of commonly used concrete methods, which also limited the amount of waste on the site.

The external façade to the south walkway is faced with a permeable mesh screen, which serves to rupture prevailing winds and alleviate driving rain (Figure 4.37). Inside this mesh screen is a vertical planting screen at each floor, which is irrigated with harvested rainwater. This serves to provide evaporative cooling and oxygenation of natural air, which is drawn into the building from the cooler side of the building; it also provides a balustrade for the walkway (Stratford, 2009: 54-57). Despite the impressive ventilation systems used as temperature-sustaining tools (as they continually lower the inside temperatures of the building), there remains one intrinsic flaw: colder winter months have not convincingly been accounted for (Steenkamp, 2010: 166).

According to Bronner (2006: 6), tradition is about expectation and social acceptance rather than constraint. As a reference to precedent and a social construction, tradition invites commentary and interpretation and is often continuously re-negotiated, from generation to generation. As such, it allows for creativity, adaptations and innovations that might, once they have been socially accepted,

be integrated and become part of the tradition. It is this tradition used within the NATC, which needs first to be socially accepted prior to a final triumph being realized (Steenkamp, 2010: 167).

As in similar instances when architects attribute innovative forms and ideas to particular buildings, it was not so much the historical veracity that was of interest, but rather the degree of esteem they accorded to creativity and signature in the building trade (Marchand, 2006: 56). Rather than use indigenous knowledge, innovative concepts were tested and stretched. In hindsight, adaptations and innovations, and the social acceptance thereof become normalised through invitation of commentary and the renegotiation of tradition and indigenous knowledge (Bronner, 2006: 6).

3.6 Towards improved human settlements: The Need for Community Participation and the Preservation of the South African Identity

3.6.1 Introduction

This sub-chapter suggests that while the issues surrounding true, honest and authentic sustainable development in housing is important, it seems somewhat extraneous when the social equity (concerning identity) of people is being disregarded. It is imperative therefore that those concerned with housing developments for the poor tackle the social issues of our time relating to architectural meaning, identity and culture (Steenkamp and Whitfield, 2011: 72). This sub-chapter is not specifically aimed at criticizing the South African Reconstruction and Development Programme (RDP) or any similar developments, but is rather aimed at a possible solution to the loss of cultural identity within such housing developments. Addressing sustainable development and sustainability, which includes social equity, this sub-chapter focuses on the issues surrounding cultural identity, knowledge transfer and community participation as part of the solution while implementing both the developmental and ecological approaches discussed earlier.

3.6.2 Sustainable Development Approach: Implementation Strategy

Architects and developers should stress that knowledge transfer through public participation needs to be integrated in all areas of development (Ben-Meir, 2005). The implementation of such a transfer system will lead to the ability to achieve ambitious goals, including an 'appropriate social architecture' for each region as was suggested by the SANS 10400 part XA regulations. This assertion stems from the basic lessons of development experienced around the world: That local communities need to implement projects that they determine will effectively promote sustainable development through private-public partnerships, informed decision-making, flexible economies and self-reliance. Within the design process, planners and consultants should encourage strategies that catalyze and facilitate community participation in development planning. Participatory approaches should include the transfer of appropriate skills to help the community to successfully manage their environment (Steenkamp and Whitfield, 2011: 73)

From this introduction, it is possible to translate such an initiative into practical, sustainable and integrated programmes and projects. The following strategies suggested promote public participation in local developments and should be considered for any community or housing initiatives action plan. Ben-Meir (2005) proposed housing initiatives for Morocco, and it is necessary to trace the similarities between these two countries to understand its relevance: Morocco has a wealth of architectural examples that reflect traces of different human settlements and a succession of civilizations much like our 'Rainbow Nation'. Each region possesses its own ethnic characteristics and has its own peculiarities. This makes it possible for many regions to contribute to a national culture and heritage. From this scanty background, the strategies which follow could help 'translate' an initiative for the benefit of the local people and serve as a model to effectively address the challenges and threats that face similar rural and peri-urban communities in South Africa (Steenkamp and Whitfield, 2011: 72)

Step 1: Train in Facilitation

Development initiatives should begin with a training period for members of the community. It is imperative to include training in facilitation since it has previously been stressed that communities should embrace the development initiatives to ensure optimal implementation of the development underway. Community members, who are typically young and eager to improve the social conditions in the villages they serve, can be excellent facilitators of community development once they receive the necessary training. Facilitation techniques encourage broad community participation in local development. The interactive development experience creates mutually beneficial relationships and trust among the community participants as well as the developer. Typically, communities themselves can determine their specific development priorities. In the beginning, experts (from both the public and private sectors) could share and adapt with local

individual communities and counterparts (Steenkamp and Whitfield, 2011: 72). This process is displayed in Figure 3.16, below.

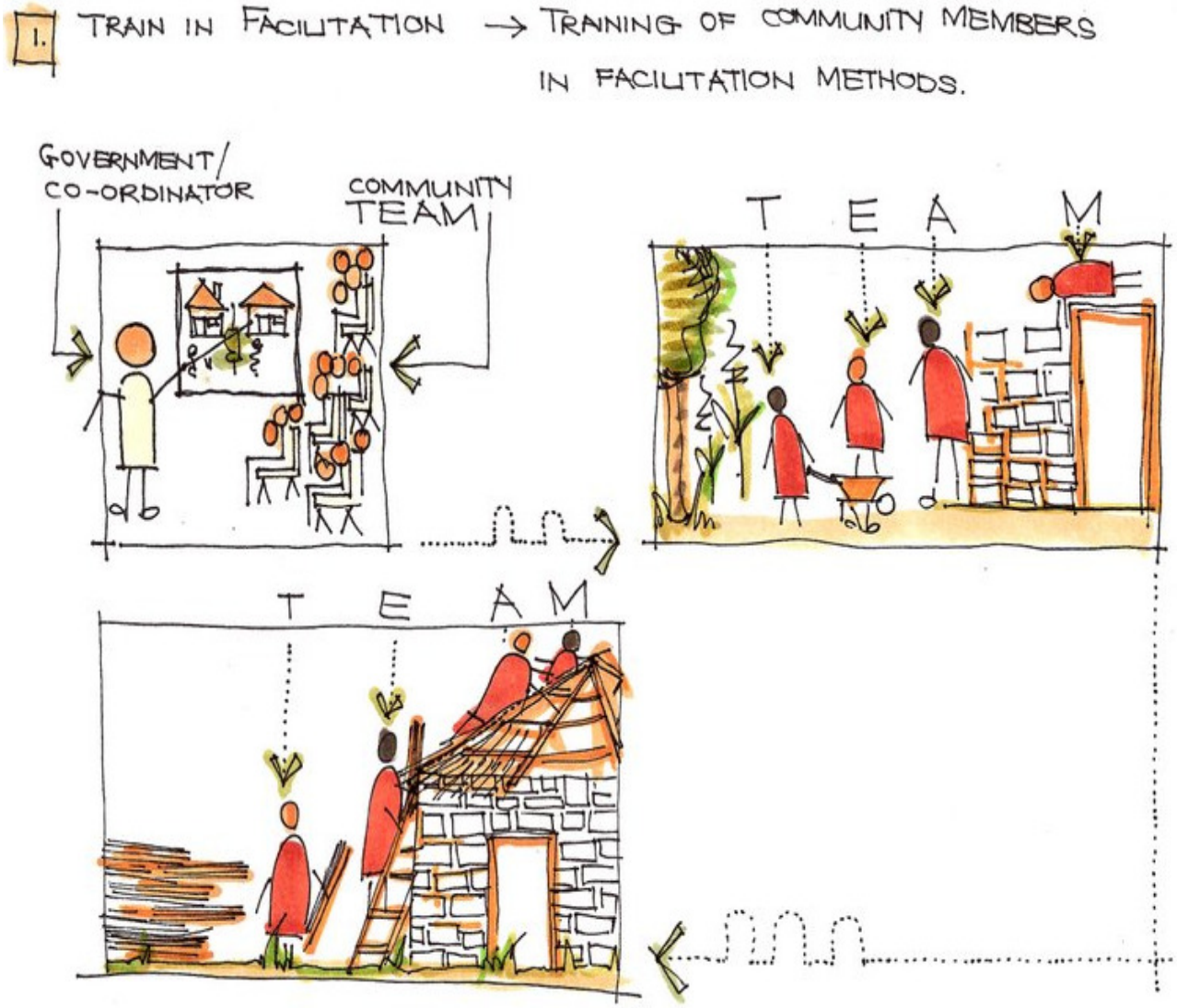

Figure 3.16: Train in facilitation

Step 2: Establish community development planning and training centres

These centres can play a key role in providing assistance to people most vulnerable to poverty and therefore address a primary objective of housing initiatives. Planning and training centres, situated in communities and managed by community members, would be able to assist local people in determining their priority goals and then in the final design and implementation of the projects, their goals should be achieved. Community members should also be provided with training in management, facilitation, modern agriculture, traditional building techniques (for knowledge

transfer), health, and other skills desired by the local community to meet their necessary needs (Ben-Meir, 2005). See Figure 3.17, below.

The aim is to give shape to the method of development and rehabilitate sustainable community activity. Leaders within the community can base projects on their constituencies' self-described priorities, which will help achieve the community targets and increase their prospects for success with heightened local support. The community members described should understand that an effective social movement can begin with a series of community meetings where local people are given the opportunity to express their concerns and interests. They realize too, that inclusive collaboration in the design and management of local developments will open the doors for the region and community to achieve its development potential. A local leadership will emerge that understands and is dedicated to addressing the real issues of concern to citizens (Steenkamp and Whitfield, 2011: 72).

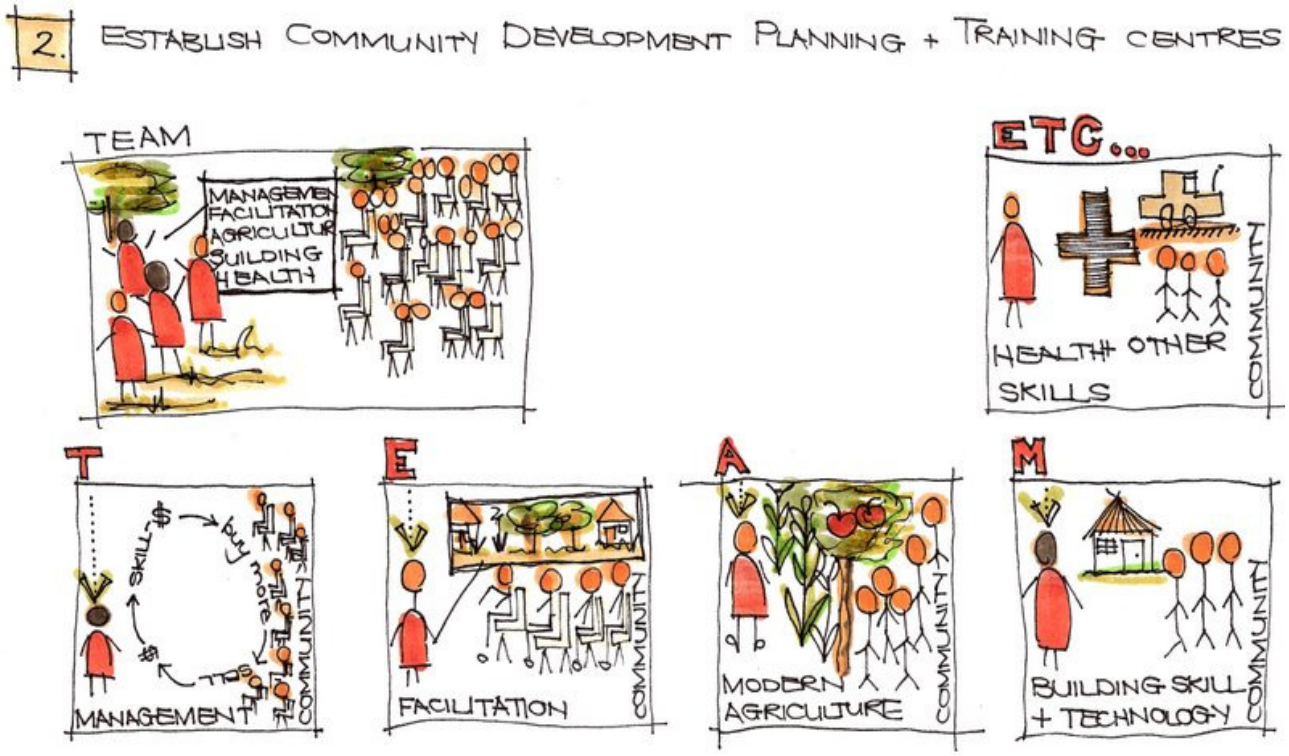

Figure 3.17: Establish Community Development Planning and Training Centres

Step 3: Assist the creation of local associations

Experiences around the world shows that when local associations are created (and civil society grows), communities work together to accomplish their collectively defined development agenda (Fathy, 1973). This impacts society's 'architecture' because new tiers of co-operation form as

neighbouring communities begin to implement projects beneficial to the entire region. An assessment ought to be made of additional reforms to further enable initiatives to promote an innovative civil society (Steenkamp and Whitfield, 2011: 75).

Step 4: Create a 'team of co-ordination'

This could act as an administrative framework that organizes the achievements of the previously described strategies. It should have the flexibility to operate at regional, provincial and national levels in order to negotiate partnerships (among communities, government agencies and NGOs) that promote local development (Ben-Meir, 2005). Among the priority cases should be the inclusion of rural and peri-urban settlements, which neighbour each development. In many cases, these villages are statistically among the most isolated and poorest in the country (Steenkamp and Whitfield, 2011:76).

These strategies can be included in development initiatives, for a relatively low cost, and could be among the most effective ways of solving housing backlogs. The strategies are, in a sense, natural extensions of such an initiative and share its ultimate objective, which is "to enable all members within the community, men and women alike, to avail themselves to a wide range of possibilities and opportunities". Public participation is the method which might effectively attain this (King Mohammed VI, cited in Ben-Meir, 2005).

3.6.3 Closing Remarks

There already exists a long established, though still somewhat marginalized discourse that focuses on the ways in which indigenous traditions and innovations may be integrated into contemporary building practice (Afshar and Norden, 1997). At present, however, while concerns over sustainability and cultural identity continue to shed animosity over the processes of modernization and globalization, an alternative, innovative approach to development is continuously being looked for. It seems a more opportune and urgent a time than ever to fabricate the achievements of such research into contemporary practice.

What is needed is the disposal of the stigmas of underdevelopment, poverty and the past that clings to the concept of indigenous vernacular architecture. Such research and education should focus on issues of process rather than product, identifying general principles and concepts rather than basic facts and figures. More importantly, it should be critical and actively engaged in realities of the present, rather than remaining focussed on the past (Rapoport, 2006). However, in order for the

sustainable, innovative, indigenous and vernacular architecture to teach lessons that are relevant to the future, a more problem-orientated, comparative and integrative stage that leads to explanatory theory needs to be entered.

Participatory approaches should become an integral component of the building culture (Marchand, 2006), as well as development initiatives which aim to promote and establish sustainable supplies of locally available building materials (Lawrence, 2006). Local appreciation for traditional Eastern Cape architecture and building methods should be bolstered, and its social, economic and ecological value recognized (Steenkamp and Whitfield, 2011: 72). The post-colonial dichotomy between tradition and modernity must be challenged along with the popular association of tradition with stasis and 'backwardness' and the conceptual affiliation of modernity with concrete, corrugated iron and all things Western must be debunked. Changing attitudes can only be achieved through educational processes that promote scholarly investigation, publications, public displays and open discussions (Marchand, 2006).

Chapter 4: Research Results and Findings of Case Studies

This chapter is divided into two parts. The first part describes the case studies of private dwellings, which are currently homes or were previously homes. This is comprised of three different case studies. The first case study involves a perception analysis of people living within traditional vernacular homes within the uMasizakhe Community outside Graaff-Reinet. The second case study is comprised of mostly photographic evidence of now-demolished vernacular homes on the outskirts of Hofmeyr; these homes have since been replaced under South Africa's new dispensation's RDP programme. The third case study involves the study of three traditional isiXhosa rondavels on various routes around the town of Hofmeyr. Although these three huts are in various states of dilapidation, their structural form remains intact enough to add an integral facet for this study.

The second part of the chapter describes two public buildings that exhibit either use of traditional vernacular building techniques or innovation or combinations thereof. This second part is comprised of a critical analysis of two separate case studies of contemporary architectural designs, of which both are public spaces, meaning that the public occupy these buildings for various purposes. The first is Greenshops Financial Service Centre in rural Centane, which houses a Nedbank branch and a community centre. The second is the New Auditoria and Teaching Complex at the University of Fort Hare in urban East London. Both of these buildings entail innovation, alternative technologies and sustainability, while the former has incorporated traditional and vernacular techniques and fits into the pattern language of the surrounding area, the latter does neither due to its innovative nature. Both are relevant and will be discussed separately, with a comparative analysis performed at the end. All of these studies were performed within the Eastern Cape Province of South Africa.

4.1 uMasizakhe Community Findings: A Perception Analysis

The research population within uMasizakhe consisted of 47 respondents. Of the 47 people, 74.5% were living in traditional vernacular homes at the time the research was being conducted, 12.8% of the respondents were living in *Apartheid*-era RDP government-funded houses and the remaining 12.8% were living in the Royal Block, these results are displayed in Table 4.1, below. The Royal Block, in Queen Street of uMasizakhe (see Figure 4.2, below), was included in the research population as the historical significance of these row-houses is a planned national asset worth conserving, particularly for tourism incentives. However, these dwellings were found to be too small for inhabitants, some of which were measured to be approximately 3500mm wide and 5000mm deep.

Table 4.1: The various housing placement of the research population

Where do you currently live?					
		Frequency	Percent	Valid Percent	Cumulative Percent
	Traditional house	35	74.5	74.5	74.5
	Royal Block	6	12.8	12.8	87.2
	RDP house	6	12.8	12.8	100
	Total	47	100	100	

Figure 4.1: Members of the uMasizakhe community who were interviewed for this dissertation; Graaff-Reinet, September 2011

Figure 4.2: The Royal Block

4.1.1 Problems existing within uMasizakhe Community

As is the case throughout South Africa, the social problems proved vast, ranging from ill-health and unemployment to the lack of education and low nutrition (Table 4.2). It was found that 61.7% of the 47 respondents within the research population were unemployed, with the remaining 38.3% living off some form of financial support. 72.7% were living off either government pension funds or disability funds, leaving only 6.4% of the population being self-employed as builders or in other trades.

The majority of dwellings were over-populated, with 45.7% of the dwellings housing between 3-6 people, and an astonishing 20% housed between 7-10 people. 31.4% accommodated between 1-2 people, and 2.9% more than 11 people. 74.5% of the respondents could read, leaving 25.5% illiterate.

Table 4.2: Income, housing and literacy variables within the research population of uMasizakhe

Do you/ someone in your home have an income?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	18	38.3	38.3	38.3
	No	29	61.7	61.7	100
	Total	47	100	100	
If you do get an income, from whence does it come?					
Valid	Government Pension	15	31.9	78.9	78.9
	Disability Grant	1	2.1	5.3	84.2
	Self-Employed	3	6.4	15.8	100
	Total	19	40.4	100	
Missing	0	28	59.6		
Total		47	100		
How many people live in your house?					
Valid	1-2 people	13	27.7	27.7	27.7
	3-6 people	20	42.6	42.6	70.2
	7-10 people	12	25.5	25.5	95.7
	11+ people	2	4.3	4.3	100
	Total	47	100	100	
Can you read?					
Valid	Yes	35	74.5	74.5	74.5
	No	12	25.5	25.5	100
	Total	47	100	100	

4.1.2 Identify existing Knowledge and Skills within uMasizakhe

80.4% of the respondents currently living in vernacular dwellings were able to maintain their own homes and were part of the actual building process. Thus these respondents could practice home

maintenance, whereby available material resources were utilized, however crudely done, but nevertheless proving their ability to solve problems with innovative ideas and indigenous knowledge (see Figure 4.3). Of the research population, 93.6% demonstrated sound knowledge of cross-ventilation together with 60% of these also having the ability to either cool or warm their dwelling during the summer and winter seasons respectively. Complementing the thermal qualities of materials used, 61.1% of dwellings had floors comprising of natural earth *(dagha)* or cow-manure. 63.8% used *mbawula* (coals which are added to a tin bucket with perforations on the sides, displayed in Figure 4.4) in the centre of the house. The *mbawula* has dual uses as it was used for cooking and heating during the winter months, while also eradicating any termite or rodent infestations within the dwelling. 80.9% of the research population have been living in their traditional homes for over 25 years, suggesting the possibility of a rich array of knowledge and skill which continues to exist within the community of uMasizakhe, which could aid in solving the housing backlog in the future. These results are displayed in Table 4.3, below.

Figure 4.3: Home maintenance, however crude, is practiced

Table 4.3: The ability and skill existing within the respondents living in traditional homes

Home maintenance				
		Responses		
		N	Percent	Percent of Cases
Who is responsible for your home maintenance?	You/ the inhabitants	41	80.40%	87.20%
	The Owner	6	11.80%	12.80%
	Family members	1	2.00%	2.10%
	Community members	2	3.90%	4.30%
	Contractors	1	2.00%	2.10%
Total		51	100.00%	108.50%

Cross-ventilation: Does your house cross-ventilate?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	44	93.6	93.6	93.6
	No	3	6.4	6.4	100
	Total	47	100	100	

Floor material type				
		Responses		
		N	Percent	Percent of Cases
What does your floor comprise of?	Concrete	21	38.90%	44.70%
	Cow-manure/ *misvloer*	4	7.40%	8.50%
	Dagha/ natural earth floor	29	53.70%	61.70%
Total		54	100.00%	114.90%

Winter heating					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	*Mbawuwla*	30	63.8	63.8	63.8
	Fire place (with chimney)	4	8.5	8.5	72.3
	Heater	11	23.4	23.4	95.7
	None, my house is cold in the winter	1	2.1	2.1	97.9
	None, my house is warm in the winter	1	2.1	2.1	100
	Total	47	100	100	
How long have you (respondent) lived in this house for?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1-5 years	4	8.5	8.5	8.5
	6-15 years	3	6.4	6.4	14.9
	15-25 years	2	4.3	4.3	19.1
	25+ years	38	80.9	80.9	100
	Total	47	100	100	

Figure 4.4: Multi-purposed *Mbawula*

4.1.3 Evaluating the Potential of Traditional Buildings to meet existing Challenges

Table 4.4: The potential of traditional buildings to meet current housing challenges

Do you love and take pride in your home?					
		Frequency	**Percent**	Valid Percent	Cumulative Percent
Valid	YES	44	**93.6**	93.6	93.6
	NO	3	**6.4**	6.4	100
	Total	47	**100**	100	
Would you rather live in a traditional or RDP home?					
Valid	Traditional	28	**59.6**	59.6	59.6
	RDP	19	**40.4**	40.4	100
	Total	47	**100**	100	
Does this house belong to you?					
Valid	YES	45	**95.7**	95.7	95.7
	NO	2	**4.3**	4.3	100
	Total	47	**100**	100	
Wall Material					
			Responses		
			N	**Percent**	Percent of Cases
What is the primary walling material used?	Fired Bricks		11	**16.70%**	23.40%
	Earth (adobe) / clay bricks		34	**51.50%**	72.30%
	Stone		12	**18.20%**	25.50%
	Timber *planke* and earth /*dagha*		1	**1.50%**	2.10%
	Tin/ corrugated iron		6	**9.10%**	12.80%
	Natural Earth/ *dagha*		1	**1.50%**	2.10%
	Other		1	**1.50%**	2.10%
Total			66	**100.00%**	140.40%
Source of wall material:					
			Responses		Percent of Cases

		N	**Percent**	
Where did you source the wall material?	Local Shop in Graaff-Reinet	33	**49.30%**	70.20%
	Shop – outside of Graaff-Reinet	3	**4.50%**	6.40%
	Site/ Hand made	19	**28.40%**	40.40%
	Local / veldt	12	**17.90%**	25.50%
Total		67	**100.00%**	142.60%
Floor material type				
		Responses		
		N	**Percent**	Percent of Cases
What does your floor comprise of?	Concrete	21	**38.90%**	44.70%
	Cow-manure/ *misvloer*	4	**7.40%**	8.50%
	Dagha/ natural earth floor	29	**53.70%**	61.70%
Total		54	**100.00%**	114.90%

Table 4.4 (above) displays the potential of traditional buildings to meet the current housing needs within various factors. It was found that the majority, at 93.6%, of people living in uMasizakhe took pride in their homes. Together with this, only 40.4% of the respondents would choose an RDP home over the traditional counterpart, but it should be noted that of the 40.4% of respondents who chose an RDP house over a traditional dwelling, 11% did not own the house and were renting – possibly impinging on ownership rather than material choice. Furthermore, the research showed that there exist many more sustainable principles (discussed in Chapter Three) within the traditional vernacular architecture than those found within the western-inspired RDP houses. These include material benefits, whereby 51.5% of walls were constructed of earth (adobe/*dagha*), 18.2% of site-sourced rubble (Figure 3.12), 46.3% of the materials used for the walls were sourced from the site, handmade or found in the nearby veld. The thermal properties of the traditional homes also proved without a doubt better than that of the RDP houses, this has also been shown in a study conducted by Makaka and Meyer (2006: 71-86). Their findings revealed that RDP houses had a diurnal temperature difference of 11.7℃ while the vernacular homes had only between 4.3℃ - 5.6℃. The thick walls and heavy insulating roofs of the traditional homes assure minimal thermal loss. The floor materials, which vary from natural earth (53.7%) to cow-manure (7.4%), also add to the insulative properties of the vernacular homes in this study. The spaces surrounding traditional homes also

lend themselves fit for traditional ancestral ceremonies, which were practiced by 100% of the research population (Figure 4.8).

4.1.4 Identification of Economic or Technical Support Needed

Financial and technical support, towards more than just building materials and structural details, is needed. This research showed that 71.4% of individuals living in the traditional dwellings were unemployed. Of the remaining 28.6%, 72.7% were dependant on government grants. With 45.7% of these, dwellings were housing between 3-6 people, it is safe to say that these individuals too, are surviving off 'secondary' government finance (research observation) (refer to Table 4.2).

Most of the research population currently living in the traditional dwellings have chosen to continue living in these houses (68.6%) for various reasons, for the most part reactions were a product of deep-set traditions, cultural beliefs and the importance of family, friends and the community within the isiXhosa culture (refer to Table 4.4.). Of the 68.6% of individuals choosing traditional homes over RDP homes, 22.9% held value to their larger homes and, its adaptability and ability to accommodate their extended families. Various respondents noted the fact that the RDP houses could never accommodate large families. 8.6% of the people were content that their dwelling was apt for their living conditions, together with the fact that they were now too old to move. 37.1% of the respondents opted for sentimental-rooted reasoning surrounding their traditional home, one of the respondents said *"*...this is my home, I love it, my family built it when I was a child and I was born here. There is a lot of heritage in this house and my ancestors will haunt me if we had to move".

Deterioration of some traditional vernacular homes is due to a lack of maintenance. Rising damp and rainwater appears to be a common problem. Maintenance problems include leaking roofs, which result in rotting timber that follows with moisture infiltrating the earth walls and *dagha* floors. Urban migration is considered one of the primary reasons for poor-maintenance as families traditionally unite whilst undertaking repairs and maintenance. A meagre 11.4% of respondents were unable to maintain their house, such that there was rotting timber, leaking roofs and unmaintained walls and floors (see Figure 4.5, Table 4.3). Unfortunately, as is the case throughout the isiXhosa community, friends and family members care for younger children, while urban migration forces parents to work elsewhere. Taking care of young children allows no time or money to be spent on maintenance of a traditional home. Urbanization has led to many social issues in this regard. Maintenance of traditional homes was done as a family or community effort in the past,

following that the young men and women who would usually aid in maintenance are now unable to do so, since they have moved to larger urban centres.

Technical and economic support is urgently needed in these rural communities. Training and educating the unemployed with regard to traditional home maintenance, through an apprenticeship system, together with basic health and nutrition and small food gardens would not only increase the quality of traditional homes, but also decrease unemployment rates. This could lead to increased income through entrepreneurial exercises and, improved health and nutrition within these communities.

Figure 4.5: Poor maintenance of some of the traditional vernacular houses

4.1.5 Biological Relationships

The poor biological order within uMasizakhe can be seen from all fronts. Natural resources are being overexploited. Timber is widely used for building purposes as well as for firewood, with little recycling or returned yield to the environment. Livestock such as cattle, sheep, goats, donkeys and chickens, together with dogs and cats scavenge the streets for food. There is an urgent need for return to the biological order, this needs to be introduced within the community.

100% of respondents practiced traditional ancestral ceremonies, which includes the slaughtering of mostly cattle and goats. 63.8% of respondents utilize *mbawula* (Figure 4.4 and Table 4.3) within their homes for cooking and heating during the winter months, whereby any available timber is burned. 2% of walls are constructed of timber, most of which was found on site or in the surrounding

natural veldt (5.6% found in surroundings), together with 11.1% of ceilings being constructed of timber or reeds. As can be seen in Figure 4.6, mats of woven reeds placed on rafters, followed by hessian bags and brak (forming the basis of dwellings that were previously *brakdak* dwellings) are evident in 11.1% of dwellings and add to the insulating properties of dwellings. These dwellings have since added corrugated iron roof-sheeting above these brak-roofs. With timber being such a widely utilised resource, the availability thereof is being reduced substantially with each passing day as replenishment is not visible.

From a biological perspective, uMasizakhe would be greatly fortified through an intervention of specifically zoned areas for grazing, planting and recycling, as well as the planting of a forest that could be used for the various needs of timber. Education on the utilization of natural resources should be bolstered together with animal husbandry.

Figure 4.6: Vernacular ceilings of mats of woven reeds placed on rafters

4.1.6 Organic-inorganic Relationships and Materials

Adobe is used widely as a building material, with 54.9% of walls being constructed utilizing the latter and a further 61.5% of floors utilizing the same material (refer to Table 4.4). Together with the utilization of earth as a building material, was the poor ecological maintenance thereof, which led to excess evaporation and soil erosion. Natural lime was found to be a good soil stabiliser and was used throughout the community with limited ecological degradation.

With the vast majority of floor material used being a mixture of clay (*dagha*), cow-manure and earth (69.2%), the inhabitants have produced a comparatively warm, yielding and clean surface throughout their dwellings. Nevertheless, the floors need to be maintained by regular re-coating. Maintenance has been previously mentioned as a problem, with the lack of labour and finances being primary contributors.

Other organic relationships are less influenced by the built environment. Abundant rubble, found within the Graaff-Reinet area for instance, provided a sound material for foundations, plinths and wall construction. Rubble walls in many traditional homes were up to 1m wide and built up to sill height (±900mm from interior finished floor level) (Figure 3.15). Where concrete floors have replaced the traditional dung or *dagha* floors, there is little room for comparison, the former being found too cold and hard resulting in higher diurnal temperature variations and uncomfortable living conditions.

It was also found that 91.5% of the respondents in uMasizakhe used corrugated-iron sheeting as their primary roof material, with only 23.4% of these having some form of insulation in their ceilings (refer to Table 4.5, below). The relationship between corrugated iron (inorganic material) and the organic materials should be noted as unsound as the thermal properties reduce the quality of the interior space. The corrugated iron heats and cools quickly owing to its poor thermal capacity. Thus the organic-inorganic relationships are lowered with the use of corrugated iron and limited insulation within dwellings. An example of the use of corrugated iron on a traditional vernacular building is exhibited in Figure 4.7, below.

Although the use of corrugated iron as a building material has had a negative impact on the thermal qualities of many dwellings, when compared with the *brakdak* construction, corrugated iron offers inhabitants care-free protection from water, while *brakdakke* were high maintenance. Erecting a corrugated iron roof is also relatively cheap (time and labour saving), easy and requires little skill, while *brakdakke* require sound knowledge of the construction method and is labour intensive. Corrugated-iron sheeting over a *brakdak* is not unheard of, and where implemented properly, it allowed inhabitants both protection, low-maintenance and thermal insulation.

Table 4.5: Primary roof material and ceiling insulation

Primary roof material:		
	Responses	Percent of Cases

		N	Percent	
What is the primary roof material used?	Corrugated Iron	43	91.50%	91.50%
	Other	4	8.50%	8.50%
Total		47	100.00%	100.00%

Roof/ ceiling insulation:

	Frequency		Percent	Valid Percent	Cumulative Percent
Is there insulation in the roof/ ceiling?	YES	11	23.4	23.4	23.4
	NO	36	76.6	76.6	100
	Total	47	100	100	& nbsp

Figure 4.7: The use of corrugated iron on a traditional-vernacular house

4.1.7 Anthropological factors

Anthropological research was done cursory and although there exist no traditional isiXhosa dwellings such as huts or rondavels which previously “lined the streets” (Fagan, 2008: 2; Pase, 2011), the social customs of the isiXhosa people together with their values and traditional rituals have not changed. Ancestral worship is still practiced throughout the community although the somewhat modernised settlement layout has limited the vast open spaces the isiXhosa people once enjoyed for such rituals (Figure 4.8). From a more recent anthropological perspective, the research has evidence regarding space-use and religious ceremonies, which require ample room to accommodate families and friends. 68.6% of respondents preferred their traditional homes over RDP homes for this reason. Many families currently living in RDP homes utilize the traditional homes of friends or family members for ceremonies.

It can be concluded then, that modern community layouts, dictated by housing policies, do not support the livelihoods of the isiXhosa people. It has been argued that African settlement patterns are curved, non-rectangular, with a strong sense of enclosure and a fine sense of adaptation to the environment and that the stiff social-class formation and authoritarian top-down hierarchy that gets revealed in square and rectangular forms and spaces of western traditional culture are predominantly non-African in origin and therefore pose several challenges to adaptability, maintainability and sustainability in Africa (Amankwah-Ayeh cited in Tapela, 2007a: 107). These grid formations form bases of cultural imposition and forcible displacement of vernacular structures in physical, economic, material, social organizational and environmental terms. The transformation of spatial patterns currently under way in uMasizakhe is displayed in Figure 4.8, below.

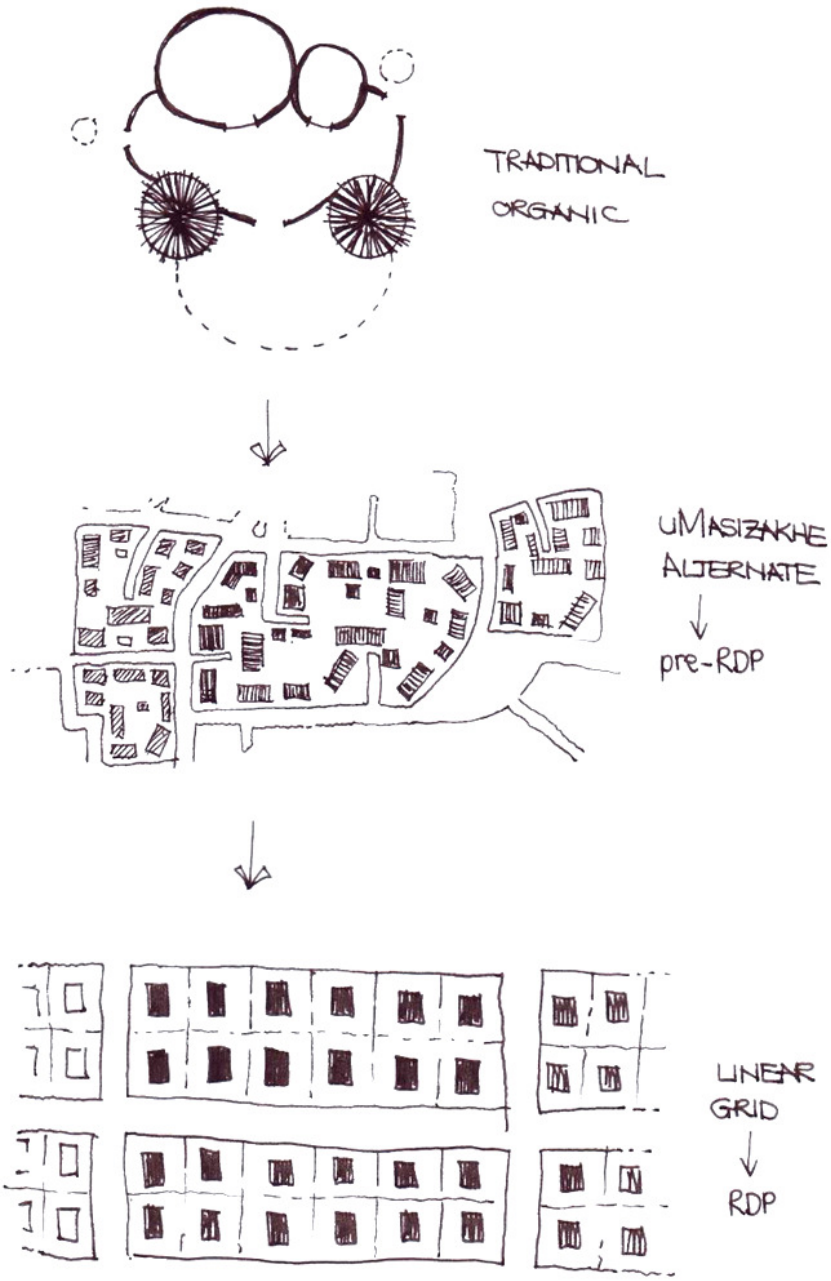

Figure 4.8: Conceptual sketches illustrating the spatial transition in the settlement pattern that has occurred in uMasizakhe

Traditionally, the isiXhosa people designated a part of their homestead to be used as a space for the close family during cultural ceremonies and rituals. An *eXhanti* or ceremonial totem (Figure 4.9) was erected in the selected area. The *eXhanti* consisted of a vertical timber or steel pole set deep into the earth, reaching a height of approximately 1600mm above the natural ground level onto which horns or antlers of sacrificed cattle, goats and wild buck were fixed with wire or twine. It is

within these spaces (amongst others) that the spirits of the families' ancestors survive. With linear RDP layouts as they exist in areas like uMasizakhe, this ceremonial area is difficult to create – limited by pedestrian traffic between houses and eliminating the traditional sacred area entirely (Figure 4.8). Today many South African villages have been replaced by grid organized townships built with government funding as mentioned previously. Traditional patterns of movement no longer clearly articulate lives around the clusters of associations linked within the village (Vogel, 1997). It should again be noted that the linear formation of streets and homes of low-cost housing initiatives are diluting tradition and diminishing the culture of the isiXhosa communities. uMasizakhe is one of the few communities where the traditional homes have not yet been demolished (as an example, the case of Luxolweni community at Hofmeyr which had vernacular dwellings demolished in 2007, see Chapter 4.2). Urgent action needs to be taken to prevent modernization from destroying cultural tradition and South African vernacular.

Figure 4.9: *eXhanti*, a ceremonial totem used for cultural rituals and *inkonzo* or ancestral worship

4.2 Luxolweni Community of Hofmeyr

Unlike uMasizakhe, Luxolweni's architectural vernacular survives only in the author's own historical photographic evidence (Figure 4.10). Demolition of the traditional houses occurred in 2007 in an effort to improve the living conditions of the populace after the 1994 elections (see Figure 4.11). Starting in 2007, vernacular homes were demolished and replaced with RDP houses with construction continuing well into 2012.

Figure 4.10: Comparative photographs of the Luxolweni community on the outskirts of Hofmeyr taken between 2005 and 2007

Figure 4.11: A demolished vernacular home in Luxolweni, 2007

From the photographs (Figure 4.10), it is evident that the use of hipped-roofs as well as flat-roofed dwellings were constructed utilizing corrugated iron as a prevalent roofing material prior to the

demolition in 2005. Having excess clay available – unlike uMasizakhe, homes were largely constructed with a rubble plinth, lowering the possibility of rising damp. Walls were constructed from various materials utilising diverse methods of construction. From photographic evidence it can be seen that there existed an assortment of techniques used for construction utilizing available resources, as can be seen in Figure 4.12, Figure 4.13, Figure 4.14, Figure 4.15 and Figure 4.16. Figure 4.13 illustrates an open-order timber frame with rubble infill as an example of the indigenous knowledge that existed, of which, Frescura (1981: 126-127) described.

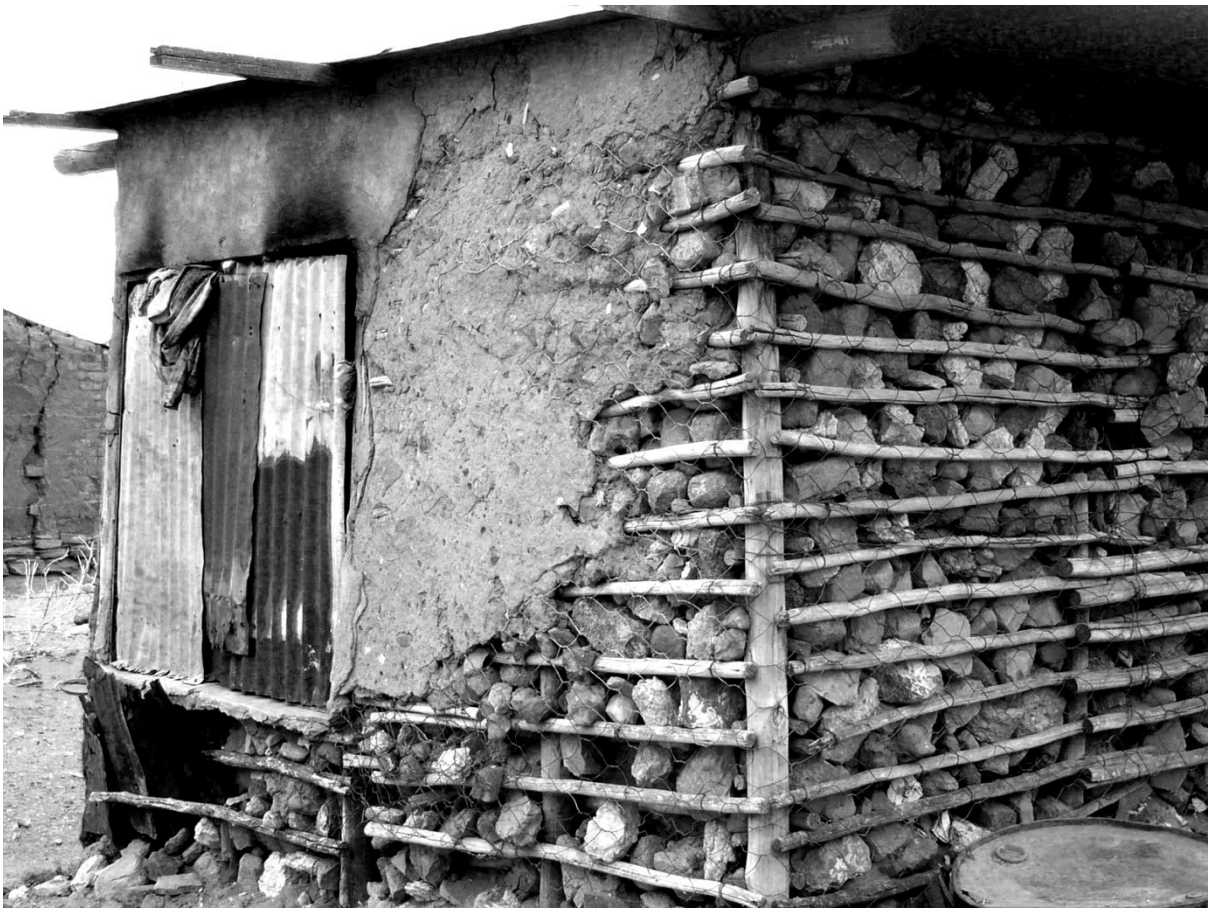

Figure 4.12: An open-order timber frame structure with double-sided laths and wire mesh used to contain the rubble infill in place

Figure 4.12 and Figure 4.13 demonstrate the structural construction of an open-order timber frame with rubble infill. Timber posts, which are ultimately positioned in order to carry the roof-load, are set into the ground at intervals of between 500mm and 1000mm with wire mesh to contain the rubble. The space between the timber posts is then built up with rubble, which is often bonded in with earth. The interior and external wall faces are then plastered over with a *dagha* mixture. The

timber posts, which are positioned on a stone plinth that raises the floor above natural ground level, also redirects water away from the dwelling. The timber posts carry the roof-load and the horizontal lattes with (optional) wire mesh contain the rubble.

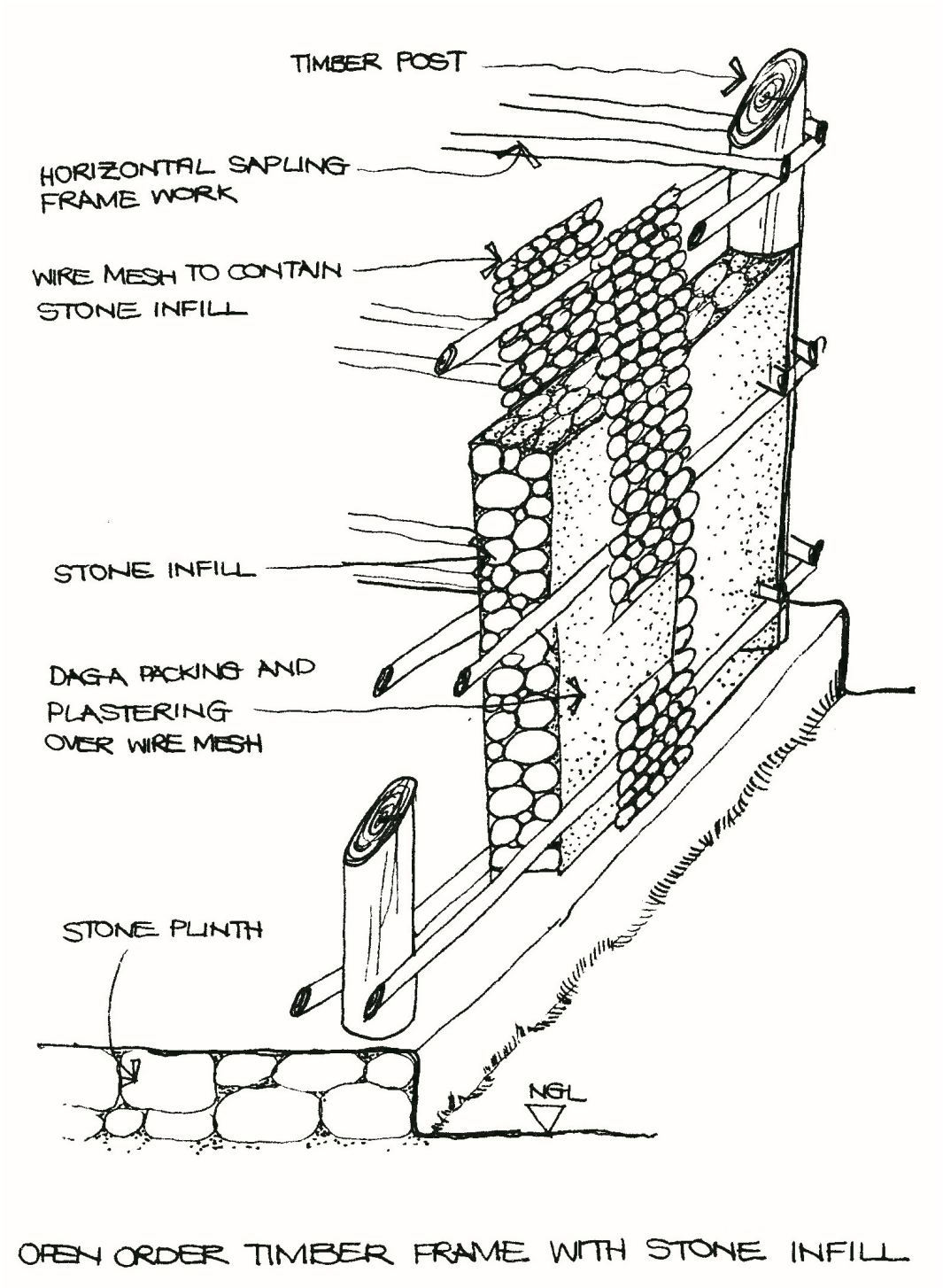

Figure 4.13: An illustration of an open-order timber frame with rubble infill

A can be seen in Figure 4.14 (below), a rough-coursed stone plinth raises the dwelling above the ground level, which reduces surface water from entering the house. Adobe blocks are laid onto the plinth, which then acts as a monolithic structure that supports the roof.

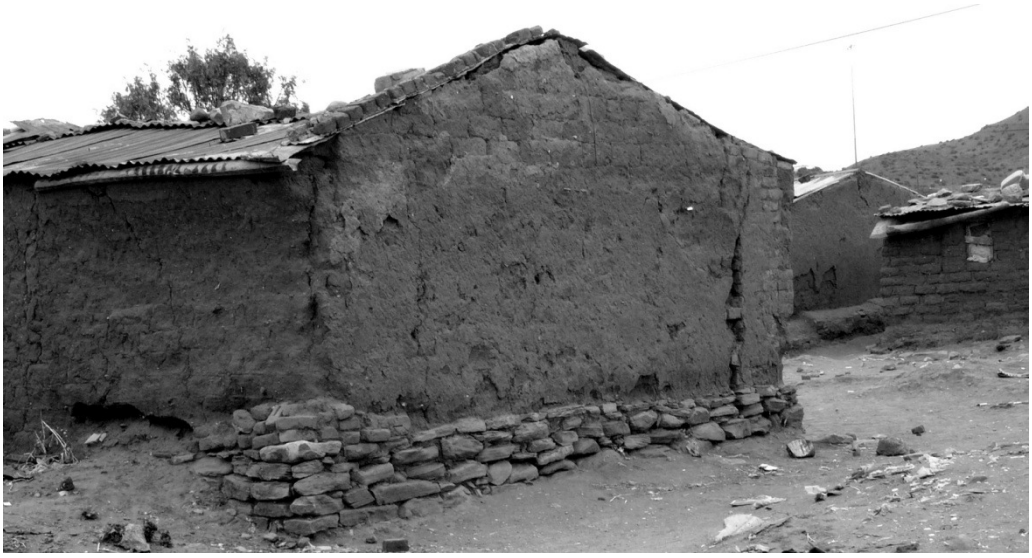

Figure 4.14: A roughly-coursed stone plinth that raises the dwelling, with adobe blocks atop, acting as monolithic structure

Figure 4.15, below, exhibits adobe blocks laid on a plinth of sundried bricks. The bricks are stronger and less permeable than adobe blocks. Mud was mixed with small quantities of veld-grass and laid into a timber template, or alternatively dried and ‘cut’ into ‘blocks’ by a garden spade or trowel. Note the various materials such as timber or steel that were used as beams supporting the corrugated iron roof. Figure 4.16, bottom, exhibits a well maintained adobe dwelling, of which one can notice the plinth that seems to consist of available rubble as well as the slightly raised threshold, which prevents storm water from entering the dwelling.

Figure 4.15: Adobe blocks laid on a plinth of sundried bricks as well as various materials used to support corrugated iron roof

Figure 4.16: A well maintained adobe dwelling with plinth of available rubble and slightly raised threshold for preventing storm water from entering dwelling

4.3 The isiXhosa Hut: The Cases of Three Rondavels

The traditional isiXhosa huts or rondavels, which are being referred to here, were discovered between September 2009 and June 2011. The first hut is existent on the R390 route south-west of Steynsburg toward Hofmeyr, the second on the R391 north of Hofmeyr toward Burgersdorp and the third (now demolished) on the R401 south-east of Hofmeyr toward Queenstown. These locations are shown in Figure 4.17. Unfortunately, these rondavels, particularly those found on the R401, have since been demolished and only photographic records exist.

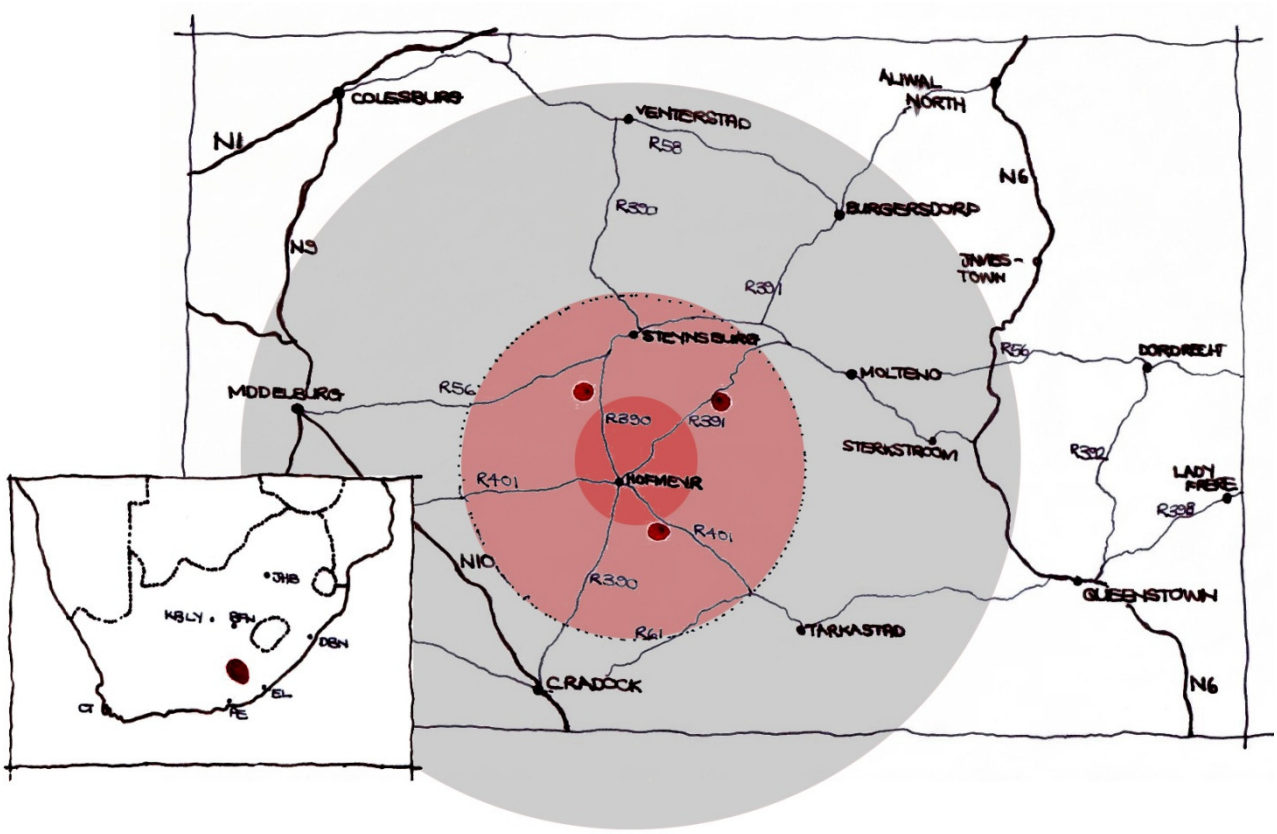

Figure 4.17: Location of the three rondavels around the Hofmeyr area

4.3.1 Case study 1: R390 rondavel (between Hofmeyr and Steynsburg)

Utilizing the available rubble, timber, reeds and *dagha*, this hut was inhabited at the time the research and documentation was being conducted (see Figure 4.18, Figure 4.19 and Figure 4.20). The load-bearing rubble walls made use of a central giant agave timber posting to support the roof. With a radius of approximately 2800mm, the hut comfortably houses its inhabitants.

Figure 4.18: The R390 (inhabited) rondavel, between Hofmeyr and Steynsburg

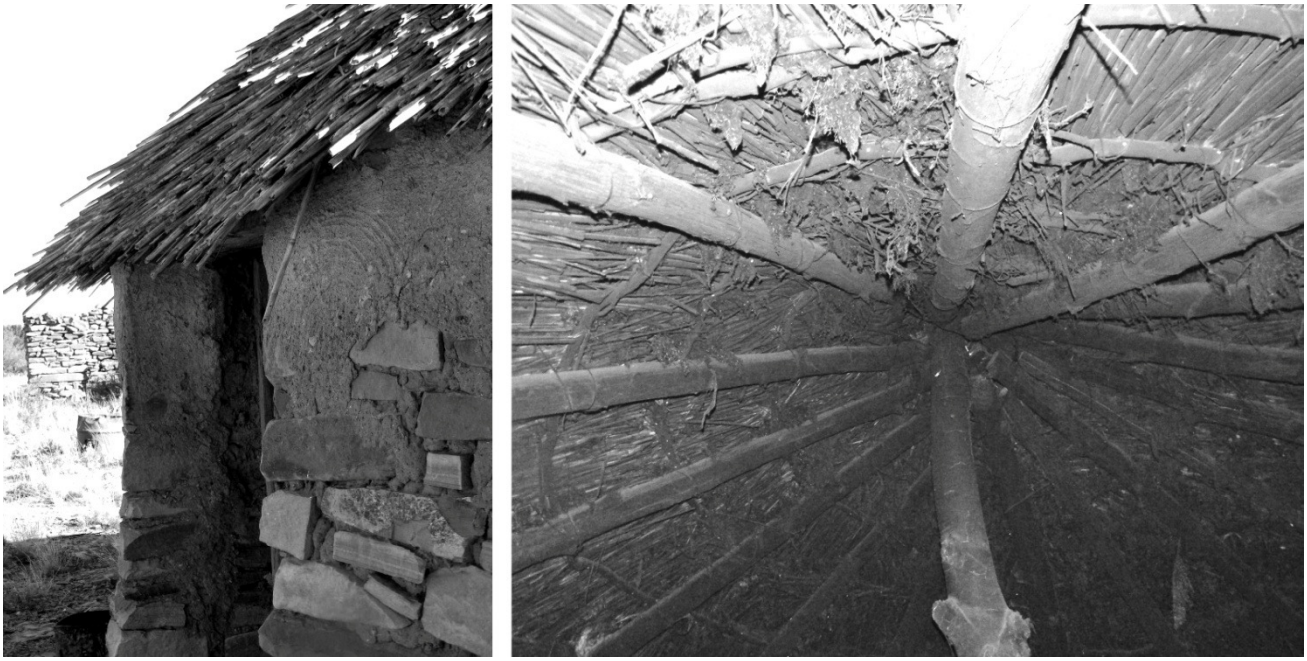

Figure 4.19: Detail of rondavel: Remnants of *dagha* plastering on the external facade (left) and central post supporting the *fluitjiesriet* roof (right)

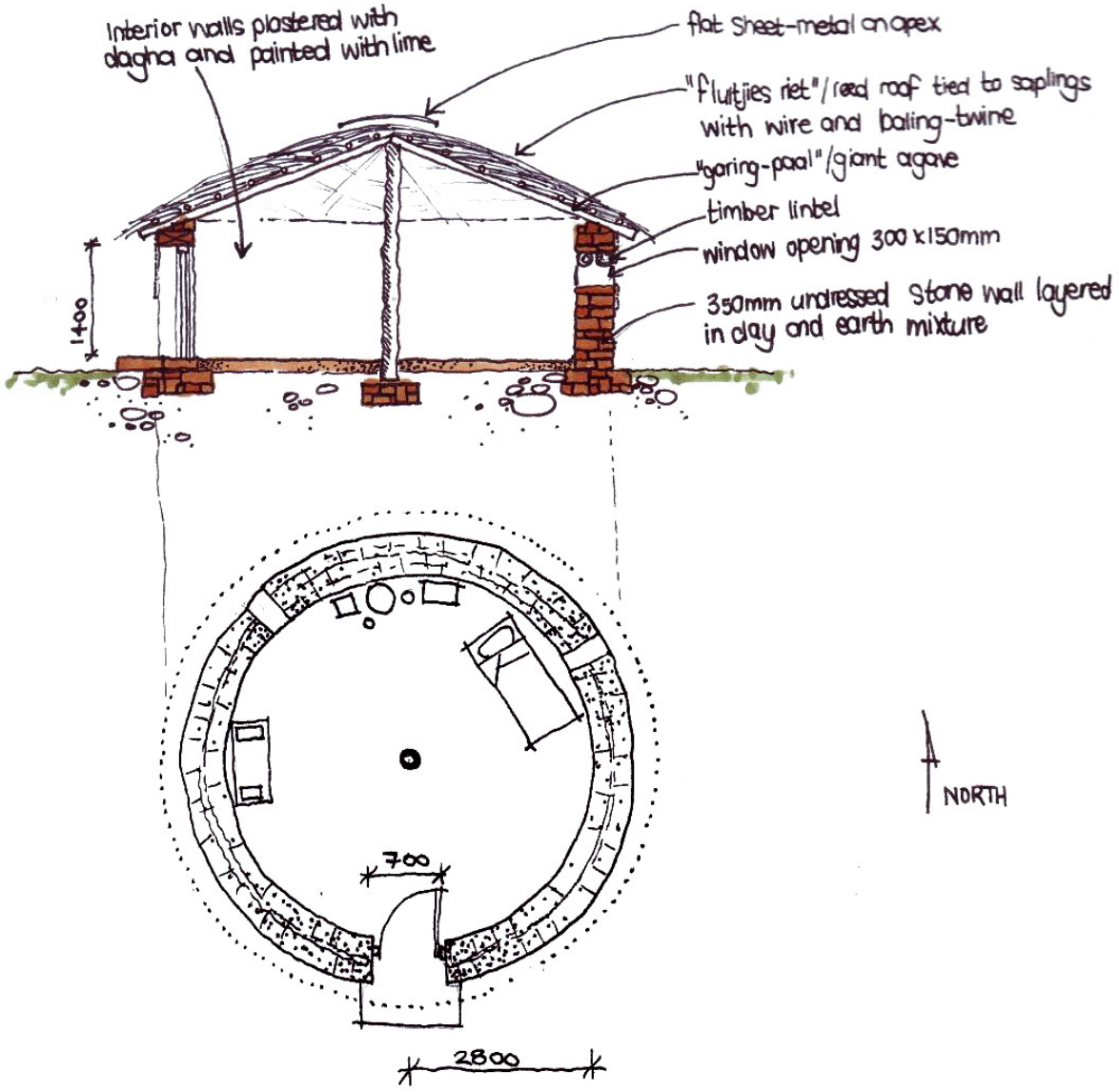

Figure 4.20: Section and plan illustrating the construction and spatial layout of the rondavel on the R390 between Hofmeyr and Steynsburg

The load-bearing walls of rubble are laid in a mixture of clay and earth after which they are plastered externally with a combination of *dagha*, cow-dung and veld-grass – much of this plaster has since weathered away – but remnants remain particularly in the areas protected from environmental exposure (as can be seen on the left in Figure 4.19). A lime plaster covers the internal walls. The floor is of rammed earth, coated with a layer of *dagha* and finished with cow-dung. The floor is raised approximately 100mm above natural ground level. The conical roof is supported by a central post sourced from the stalk of a giant agave, which is readily available in the surroundings. The roof

covering is constructed using available reeds or *fluitjiesriet,* which are fastened to the conically shaped frame which is made of saplings that project radially from the central post and act as rafters, which are all supported by the centre-post. These are held together by concentric rings of saplings which span the radial rafters that carry the reed roof. The roof overlaps in layers which are tied to the saplings beneath. The apex is covered with flattened sheet-metal. The eaves' projection is approximately 300mm. On the floor, a large flat stone accentuates the threshold, which also averts water outwards.

4.3.2 Case study 2: R391 rondavel (between Hofmeyr and Burgersdorp)

Slight variations occur between the R390 rondavel and the rondavel found on the R391 between Hofmeyr and Burgersdorp (see Figure 4.21, Figure 4.22 and Figure 4.23). The most observed variable was that this rondavel was uninhabited, hence unmaintained, but once again, the rondavel utilized the available rubble, timber, local shrubs, cow-dung and *dagha*. Unfortunately, this hut has weathered severely, but key construction elements can still to be seen. Figure 4.21 exhibits the unmaintained rondavel that has kept its structural form, with its roughly-coursed rubble walls that are still partly plastered with *dagha.*

Figure 4.21: Uninhabited and unmaintained R391 rondavel with remaining structural form and roughly-coursed stonework with *dagha plaster*

Figure 4.22: Thick, coarsely laid stone walls and centre post providing structural integrity to the rondawel (left), and earth and on top of hessian bags on roof limiting earth from seeping into rondawel

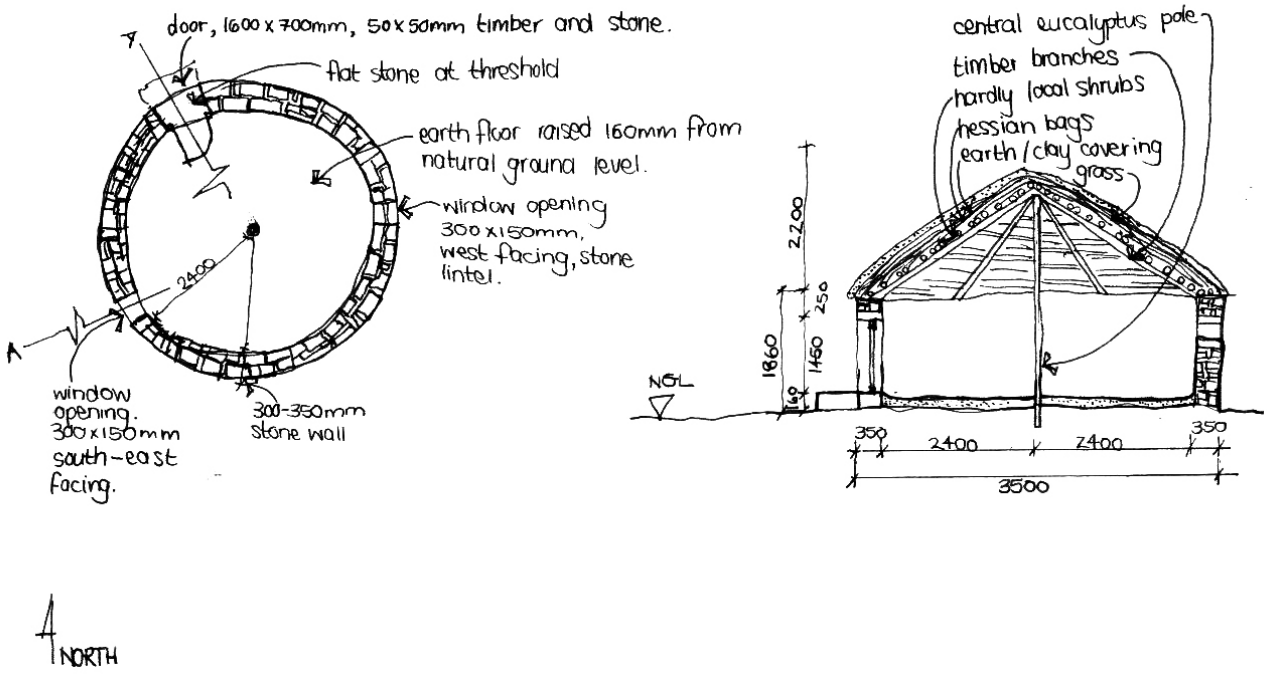

Figure 4.23: Sketches illustrating the method of construction used for the R391 rondavel

In Figure 4.22 (on the right), one can notice the earth and clay, which was placed on top of hessian bags on the roof, this limits earth from seeping into the rondawel. One can also notice the thick, coarsely laid stone walls and centre post, both of which provide structural integrity to the rondawel.

The monolithic stone wall has been placed directly onto the natural ground without a proper foundation or footing. The load-bearing walls were laid on earth and the double skin of stone is clearly evident. This rondavel had an internal radius of approximately 2400mm. The central timber pole supported the conical roof, which had been constructed of hardy local shrubs and grasses. Hessian bags, traditionally used for the storage of wool and fodder, have been positioned over the grass that was then covered with earth and clay. The hessian bags prevented the earth and clay from permeating into the internal area, also adding waterproofing to the roof. The internal walls were plastered with *dagha* and cow-dung, then painted with lime and later a water-based paint of various colours, which are generally available from the local trading store. External walls were also plastered, although this has since weathered leaving faint remains.

The floor was packed with earth, which is all that remains therefore, limiting further detailing thereof. The floor level of the rondavel was raised approximately 150mm from the natural ground level. The conical roof is supported by a central post, which seems to have been sourced from a nearby eucalyptus tree. The roof structure was constructed from saplings that radiate outwards from the central crown, from there concentric rings of battens span the radial segments. These radial segments carry the various hardy local shrubs and grasses fixed with baling-twine, which was then covered with *goiensakke* or hessian bags and 'buried' or weighed down by earth and clay.

The threshold of the rondavel has a Rhodesian teak railway-sleeper positioned between the finished floor level and the outside. The remaining stable door is only 1600mm high and 600mm wide, while the two tiny windows measure approximately 300mm wide and 200mm high. The door and window openings allow minimal natural light (and heat) into the rondavel thereby also limiting the amount of heat or cold that could enter. The thermal properties of the materials comfortably adapt to varying diurnal temperatures as has previously been noted by Makaka and Meyer (2006). Alongside the huts are the remains of stone kraals for animal enclosure and protection, together with a refuse site nearby that revealed bones, broken glass and tins.

4.3.3 Case study 3: R401 rondavel (between Hofmeyr and Tarkastad/Queenstown)

This rondavel was found alongside the R401 between Hofmeyr and Tarkastad/Queenstown, but was unfortunately demolished in 2011 (see Figure 4.24, Figure 4.25, Figure 4.26 and Figure 4.27). As can be seen in Figure 4.24 (below), the load-bearing stone walls of this rondavel did not make use of any timber posting to either reinforce the wall or take up the roof-load, but is rather a monolithic walling structure made of stone masonry that carries the roof directly. The roughly-dressed stone and remains show, once again, the vast amount of horizontal stone available within the Karoo that is good for coursing. This rondavel seems to have been uninhabited for a long time as plants were growing within the house and on top of the walls (Figure 4.24).

Figure 4.24: The R401 rondavel ruins between Hofmeyr and Tarkastad/Queenstown

As can be seen in Figure 4.25, the wide availability of stone within the Karoo enabled the builders of this rondavel to find a stone that could act as a lintel. In addition to the naturally-found innovations, synthetic innovations can also be seen in Figure 4.25 (right), whereby an old tyre is used to hold the radiating rafters together.

Unfortunately, there was no proof as to what the roof was made of, but one could assume that it was probably thatching, millet-stalk, or a combination of both. These materials were then fastened

to the conical frame, which was made of saplings projecting radially from the central apex. They were then held together by concentric rings of battens that spanned the radial rafters and carried the thatching. An elaboration at the apex of the roof is evident as an old tyre still acted as the capping holding the radial segments together, as can be seen in Figure 4.25 (right-side).

Figure 4.25: Notice the horizontal stone acting as a lintel for the small window opening (left), and tyre that holds together the radiating rafters (right)

Unfortunately the floor had already weathered, as noted earlier, leaving few remains. The threshold and windows were constructed of available timber and fencing poles respectively. As with the earlier rondavel cases, this hut also had small windows and a single door, which allowed for partially-controlled natural-light and cross-ventilation, and similarly limiting excess heat and cold into the dwelling. Figure 4.26, below, exhibits an illustration of the plan and section of the R401 rondavel, including the old tyre that binded the radial rafters together.

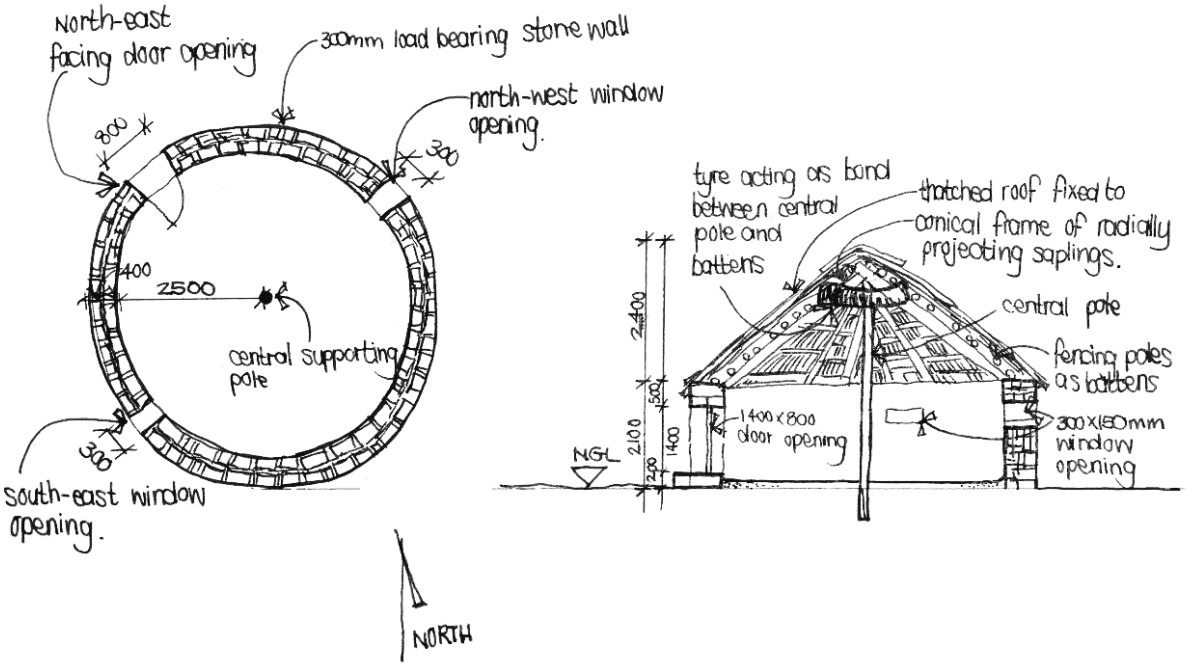

Figure 4.26: Illustration of the plan and section showing the structural detailing of the rondavel

Figure 4.27: Now-demolished rondavel

4.4 Greenshops Financial Service Centre (GFSC)

According to Oliver (1987: 10), when there are drastic socio-political changes, old buildings can be transformed to serve new purposes. Such is the case with GFSC, which was once a centre of administration for the Apartheid Governement. It has since been altered, adapted and renovated to accommodate the community's needs. The new GFSC used parts of the existing building, reclaimed material from dilapidated parts and, sourced locally-available materials and skills (labour and indigenous knowledge), which under normal circumstances, might have been considered inadequate (see Figure 4.28). With such an approach, GFSC was considered to be a worthy study on sustainability.

Figure 4.28: GFSC's Chief's Hall with wattle and daub walls and site-sourced timber together with the use of natural light and contemporary innovative design

4.4.1 Sustainability

With sustainability being the holistic study of economic developent, socio-cultural equity and environmental quality (Whitfield, 2010), and more specifically with regards to building, it should reduce energy consumption, reduce and minimise waste, minimise damage to the environment and, provide a safe and healthy working and living environment (Engela, 2006). In this regard, GFSC has performed well. The building was designed to use as much natural light as possible, with compact fluorescent (energy savers) lights used when needed, and an innovative cooling system that removed the need for air conditioning; in this way it reduced energy consumption. It also reduced energy consumption by using as much locally-sourced building material as possible, which minimised the need to transport building materials over a long distance, as Centane is quite remote. An existing building was modified, rather than demolished and re-built, which further saved on materials needed. Various materials were reclaimed from delapidated parts of the old building, while other materials were sourced from the surrounds, which further reduced its overall energy consumption.

The critical need to raise public awareness from the GFSC intended to set in motion the healing of all parts of the social body within Centane, using as few as possible of the earth's resources and 'planting' in the community an ethos of independence. This project aimed to characterise sustainability by acting as a model for architectural method that engages with the unique problems in this country and as an exemplar for sustainable development.

The materials used within the project allowed for unparalleled flexibility, old bricks from quarried buildings were reused, and the newly built forms can be recycled or left to decompose back into the soil. These economic and ecological attributes should be celebrated and promoted in light of contemporary architecture's approach to buildings.

Ecological and cultural diversity is echoed throughout, with the consistent use of local materials appropriate for the environment. Roof eaves were extended to provide protection from precipitation (Figure 4.31). The buildings were designed to maximize passive heating and cooling through the use of shading devices, raised floors and variable ventilators (Figure 4.30). Rainwater was collected from the roofs in strorage tanks for use in the Permaculture gardens (Cooke, 2009: 24). In terms of sustainability, one could say that this building could be used as a precedent for others to follow. The various attributes are depicted and displayed in Figures 4.29, 4.30, 4.31, 4.32 and 4.33, below.

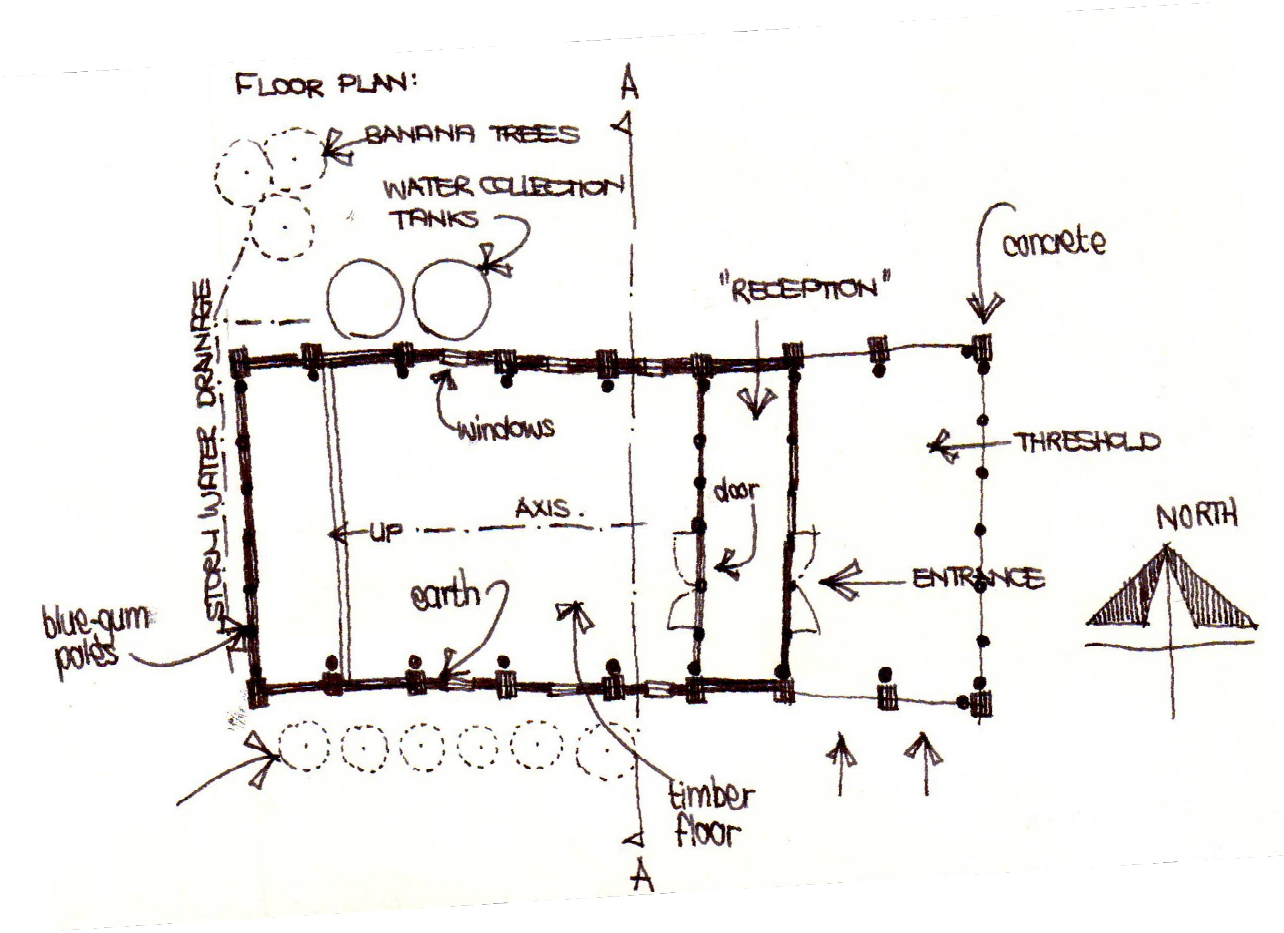

Figure 4.29: Chief's Hall Plan

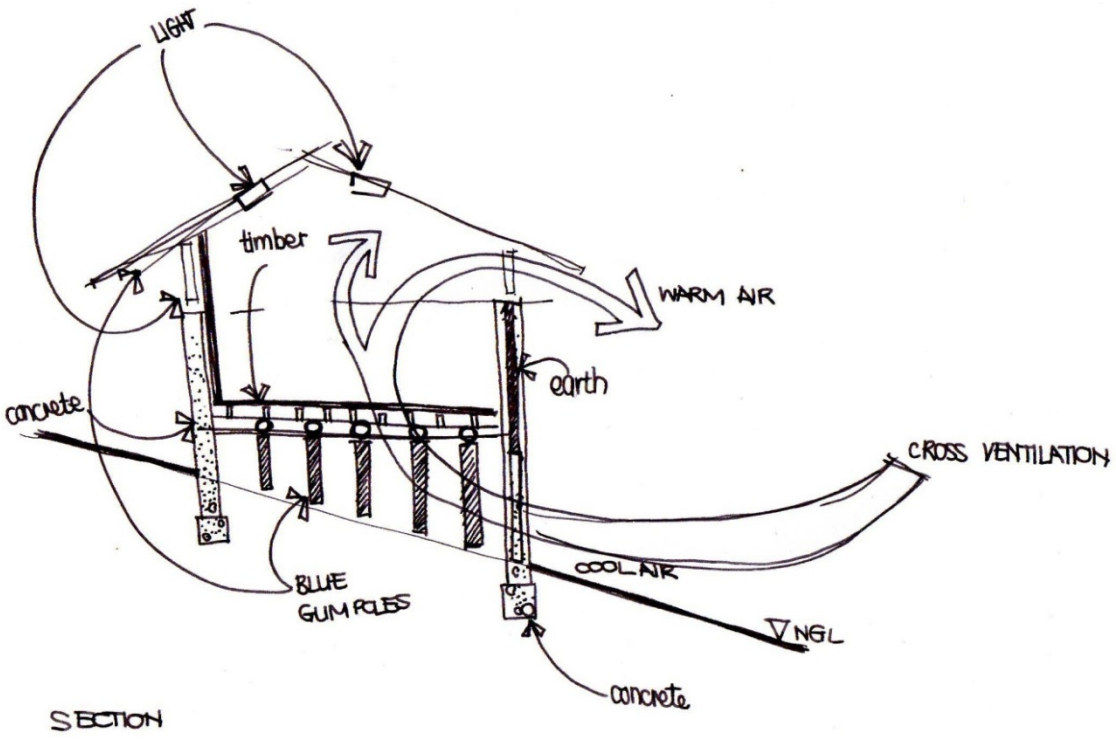

Figure 4.30: Section illustrating sustainable attributes of the structure

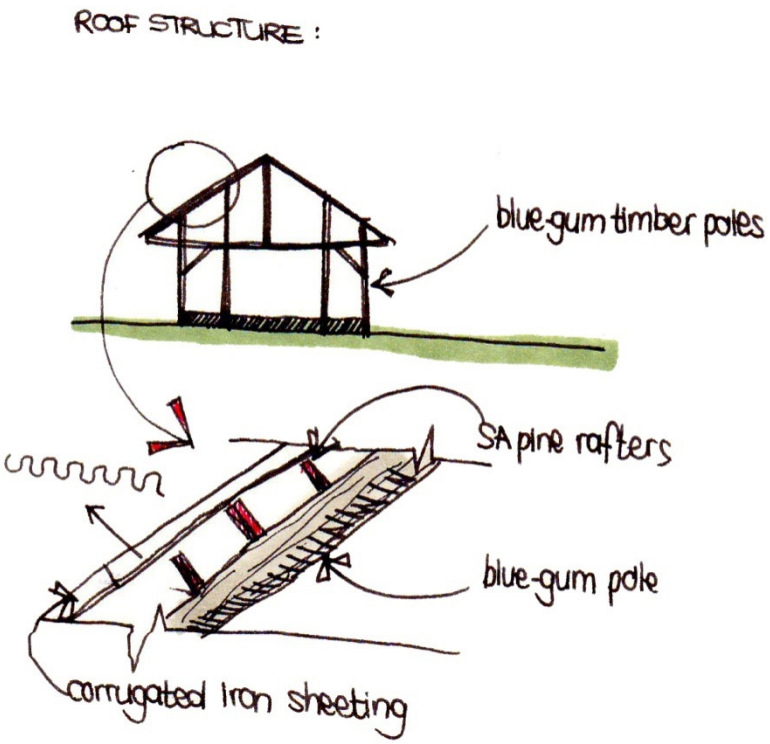

Figure 4.31: Roof detail that utilised available resources

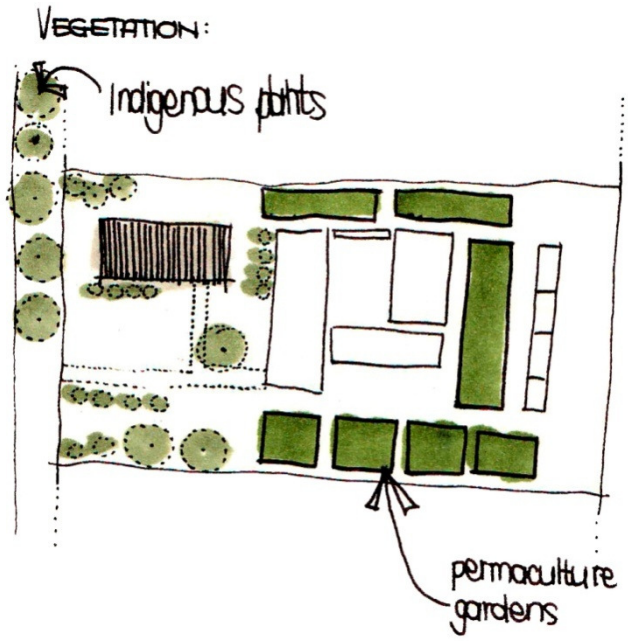

Figure 4.32: Site plan illustrating the garden layout including permaculture and vegetable gardens

4.4.2 Vernacular Architecture

As discussed previously, regarding the principles of vernacular architecture, the Greenshops project successfully inculcates vernacular principles. GFSC was built by the local people to meet their own needs, utilising available resources and a variety of traditional technologies, such as wattle and daub, and finally, GFSC was planned in such a way to accommodate the values, economies and ways of living of the local populace whom produced it. Within the context of vernacular architecture the project has embraced what is known and what is inherited about the building (Steenkamp, 2010: 163). It has included what is called 'the collective wisdom' and experience of a society, and the norms that have become accepted by the group as being appropriate (Oliver, 1986: 113).

4.4.3 Tradition

This building has not only been a vernacular architectural project, but also a social development project, which aimed to encourage local people and once-again instil their appreciation of the traditional building methods of mud and earthen infill as the principal building material (Cooke, 2009: 25). Earth construction, used as a building material within this project, has exhibited earth as a real

alternative for the building sector. Its technical performances have been established and it has provided an economically viable solution, both in macro-economic terms and in terms of building-capital costs. Similarly, GFSC renewed the links with traditional building cultures, thus retaining its local nature, not only by virtue of the raw materials used, but also from a cultural point of view (Booysen, 2003: 43).

4.4.4 Indigenous Knowledge and Innovation

One could say that the GFSC has successfully explored the relationship between local knowledge, available resources, cultural identity and architecture. More specifically, the project illustrated the gestation of technical learning and socialization that occurs throughout a project focussed on social development (Steenkamp, 2010:163). According to Marchand (2006: 46-47), the indigenous knowledge of local building trades must be central to discussions, studies and projects concerned with sustainability in the twenty-first century and beyond. Each of these was addressed within the project.

According to Rapoport (1989), innovation should start from where the past becomes a part of the present and should act as a guide to the future. Innovation was stimulated with the traditional wattle and daub technology being improved by providing concrete foundations and by adding diminutive amounts of lime and boron-treated thatch to the mud mixture. Innovation was also reflected in the architectural designs' ability to reuse the materials of ruined buildings – reclaimed bricks that were cleaned off and broken, and other hard materials were used as aggregate in foundations. Door handles were fashioned from the original jail bars, which were reclaimed from the site. These innovative ideas also aided in the sustainability of the project as a whole (Cooke, 2009: 23-24).

Encapsulating the values of the society surrounding the building, the architects eradicated the myths that surrounded the eucalyptus plantations' noises, which were found to be wind-induced. These bold steps, which were taken, understand the traditional belief systems and added to the strength of the symbolism of a bridge between the changes that occured within this building: from a *Apartheid*-era administrative centre and jail into a community meeting place and financial service hub (Cooke, 2009:23).

The plantations became the primary source of training for the local people, who were set out to manufacture doors and windows utilising eucalyptus and pine. Local residents were trained to fell

trees, strip and boron-treat the timber, and cure these in a solar kiln for use in the structure as ceilings, screens and ventilators (Cooke, 2009: 25).

4.4.5 Apprenticeship

From the start, the architects recognized the local indigenous people as pivotal agents necessary for the execution and long-term success of the project. Respect for the local autonomy and regular consultations with the builders about the project aimed at encouraging and consequently strengthened the internal ties and coordinated efforts of the professional team. The project provided local people with a valuable opportunity for acquiring practical experience in restoring the old existing buildings on site and fostered skills, which would hopefully be inculcated in successive generations of builders (Steenkamp, 2010: 164).

The GFSC was developed beyond the mere site and the architects were well aware that the potential success of the project would be determined by the local skill and social acceptance of the project. Workshops organised by the architects with local chiefs and cultural leaders, included their needs in order to develop an appropriate approach. In-depth studies of available materials and appropriate technologies to the area were also done at these workshops (Cooke, 2009: 24). According to Oliver (1987: 59), materials can only be exploited within a society who understands the technology and, good builders know their materials and therefore make the best of their properties. The architects of GFSC carefully examined the building technologies available, finding them to be a mixture of traditional indigenous methods. With much professional input and traditional influence, the majority of the workforce employed were local isiXhosa people. In a similar project performed by Oliver, he discovered that the local people had developed an intuitive senses of appropriateness for the available materials (Oliver, 1987).

The value of participatory and apprenticeship approaches to the development also reflected in the gardens, which were included to produce food for the staff and as a example for locals to replicate at their homes. This process also created work, seeded small businesses and transferred necessary skills to the people (Cooke, 2009: 24-26).

The environmental and biological subsystem of any community can be bolstered through permaculture gardens, whereby the creation of an economically sound environment where the infrastructure and humans, plants, animals and buildings are placed in the landscape in a way so as not to pollute and to be ecologically sound and viable (Minnaar and Cloete, 2006: 70) Part of the

Permaculture gardens are displayed below in Figure 4.29. According to Mollison (1991: 1), Permaculture is based on the observations of natural systems, creating a cultivated ecologically sound system that generates an excess of animal and human food than what is generally found in nature. The Permaculture gardens at GFSC were introduced by renowned sustainable agriculturalist, Tim Wigley from Kula Darma near Haga-Haga. These gardens provide nutritious fruit and vegetables for the staff of GFSC, the use of waste-water as well as rainwater together with composting vegetative matter has contributed to the quality of life in this rural locale.

Figure 4.33: Permaculture garden

4.5 New Auditoria and Teaching Complex (NATC), University of Fort Hare

The architects of the NATC for the University of Fort Hare in East London, Ngonyama Okpanum Associates in association with Native Architecture, developed a 'pattern language' for this specific building – a term originally coined by Christopher Alexander – to regulate the design intent. This *inter alia*, included all floors to be accessible for services, all buildings to be orientated with long facades facing north, limited air conditioning for apparatuses only, naturally ventilated spaces, natural day-lighting, locally-sourced materials and light-weight construction (Stratford, 2009: 54-57, Figure 4.34). The economic activity within the New Auditoria and Teaching Complex was well managed through the use of innovative *Wintec* precast concrete systems introduced by Al Stratford,

which minimized the amount of waste on the site and made the construction process faster. Figures 4.34, 4.35, 4.36 and 4.37 display various aspects of the NATC.

Figure 4.34: Image of the construction process in 2010 with precast beams and ceiling visible

The complex is bounded on the north and south by wide streets. The primary response was to place three wings running east and west, which cascade downward from the south towards the north.

Each wing is penetrated by a pedestrian concourse that is vertically connected by an elevator in the southern wing and a series of ‘double-acting’ staircases at the intersection of each wing. This concourse starts on the street at parking level on the south side and spills out onto the street at second floor, which is at grade on the northern street. In this way, the concourse becomes a pedestrian arcade of the city (Stratford, 2009: 54-57).

4.5.1 Sustainability

The Latin word *sustenere* meaning to uphold, or capable of being maintained in a certain state or condition, is the origin of ‘sustainability’, therefore, while ‘sustainable’ can mean supporting a desired state of some kind, it can also mean maintaining desirable conditions (Lawrence, 2006:11). With sustainability being the holistic study of economic developent, socio-cultural equity and environmental quality (Whitfield, 2010), and more specifically with regards to building, it should reduce energy consumption, reduce and minimise waste, minimise damage to the environment and, provide a safe and healthy working and living environment (Engela, 2006). From this viewpoint, the sustainability of NATC will be discussed.

NATC is oriented with long facades facing north, natural ventilated spaces and natural day-lighting, and a ‘wind scoop’ or ‘wind catcher’ system that aims to regulate temperatures and internal conditions (Figure 4.34). This wind scoop on the roof contains an opening that faces the prevailing wind, which is a cooler temperature than the interior of the building; because the wind velocity at this opening is greater than it is at the lower windows of the building, air in the shaft of the tower is forced down the shaft to cool the structure (Steenkamp, 2010: 165).

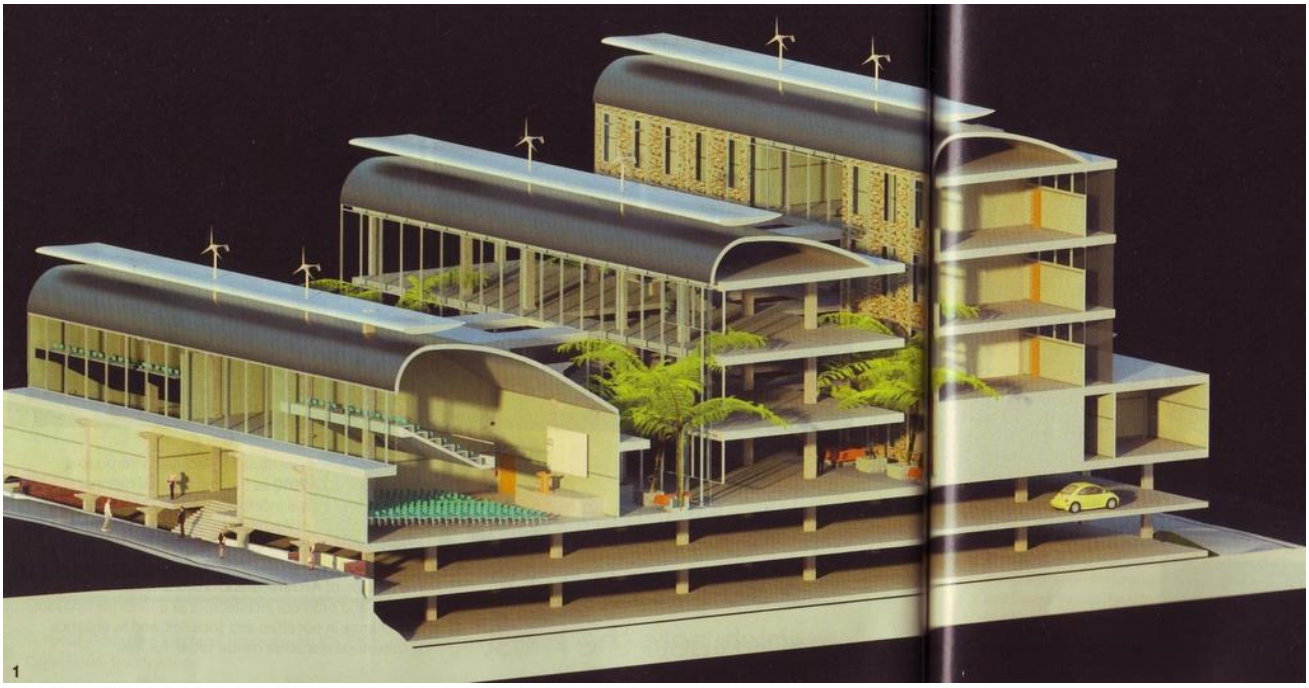

Figure 4.35: Cross-section of NATC (Source: Stratford)

The ecological considerations have been accounted for through the consented solar exposure given to each wing of the building, reducing the winter shadow. Unfortunately, the value of participatory approaches to the development was very little (Steenkamp, 2010: 166). The critical need to raise public awareness of the sustainable issues concerned, are however, being addressed regularly by the architects. The economic activity on the site has not over-exploited natural resources due to the use of innovative *Wintec* precast concrete systems that minimized the use of commonly used concrete methods, which also limited the amount of waste on the site. A section through the NATC is given in Figure 4.36, which illustrates ventilation paths, trombe wall elements and the precast-concrete system.

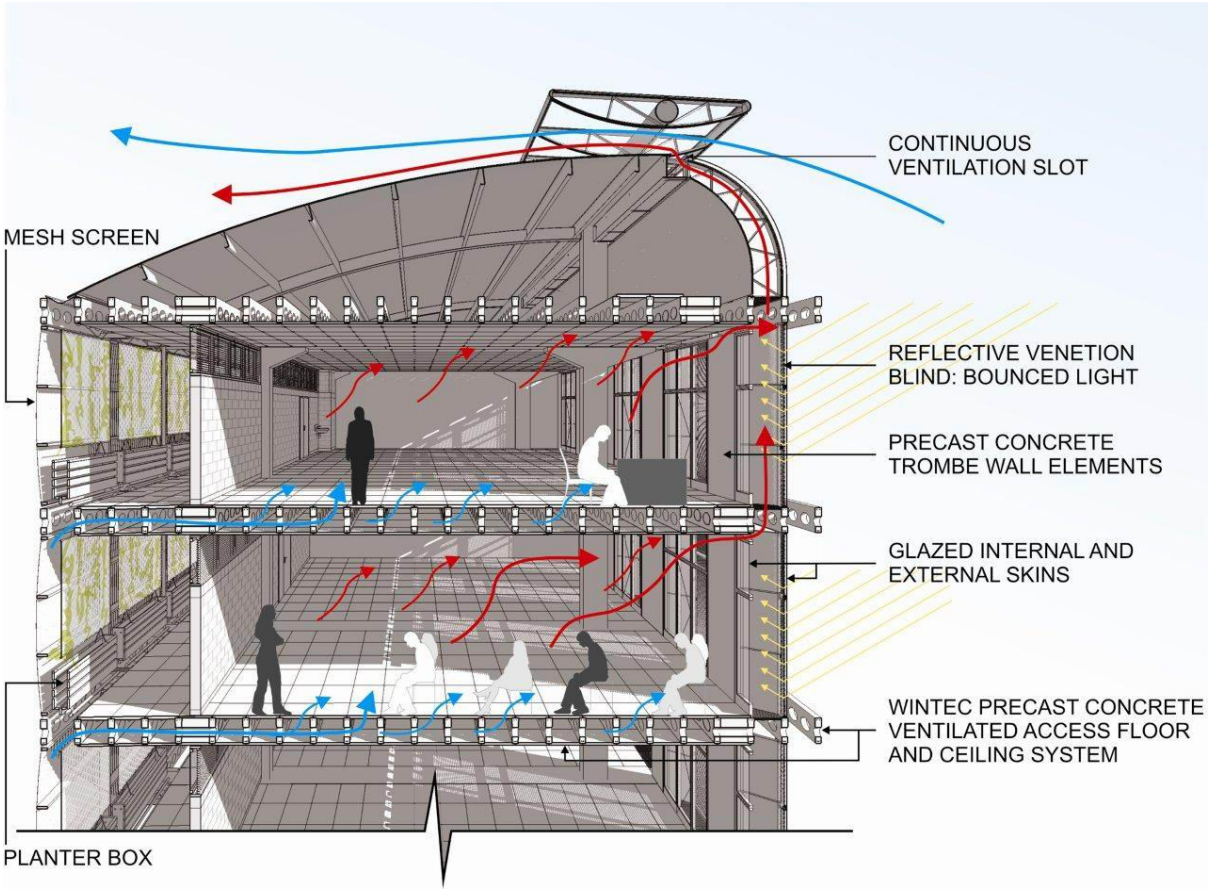

Figure 4.36: Section through New Auditoria and Teaching Complex illustrating the ventilation paths, trombe wall elements and *Wintec* precast concrete systems (Source: Stratford)

The external façade to the south walkway is faced with a permeable mesh screen, which serves to rupture prevailing winds and alleviate driving rain (Figure 4.37). Inside this mesh screen is a vertical planting screen at each floor, which is irrigated with harvested rainwater. This serves to provide evaporative cooling and oxygenation of natural air, which is drawn into the building from the cooler side of the building; it also provides a balustrade for the walkway (Stratford, 2009: 54-57). Despite the impressive ventilation systems used as temperature-sustaining tools (as they continually lower the inside temperatures of the building), there remains one intrinsic flaw: colder winter months have not convincingly been accounted for (Steenkamp, 2010: 166).

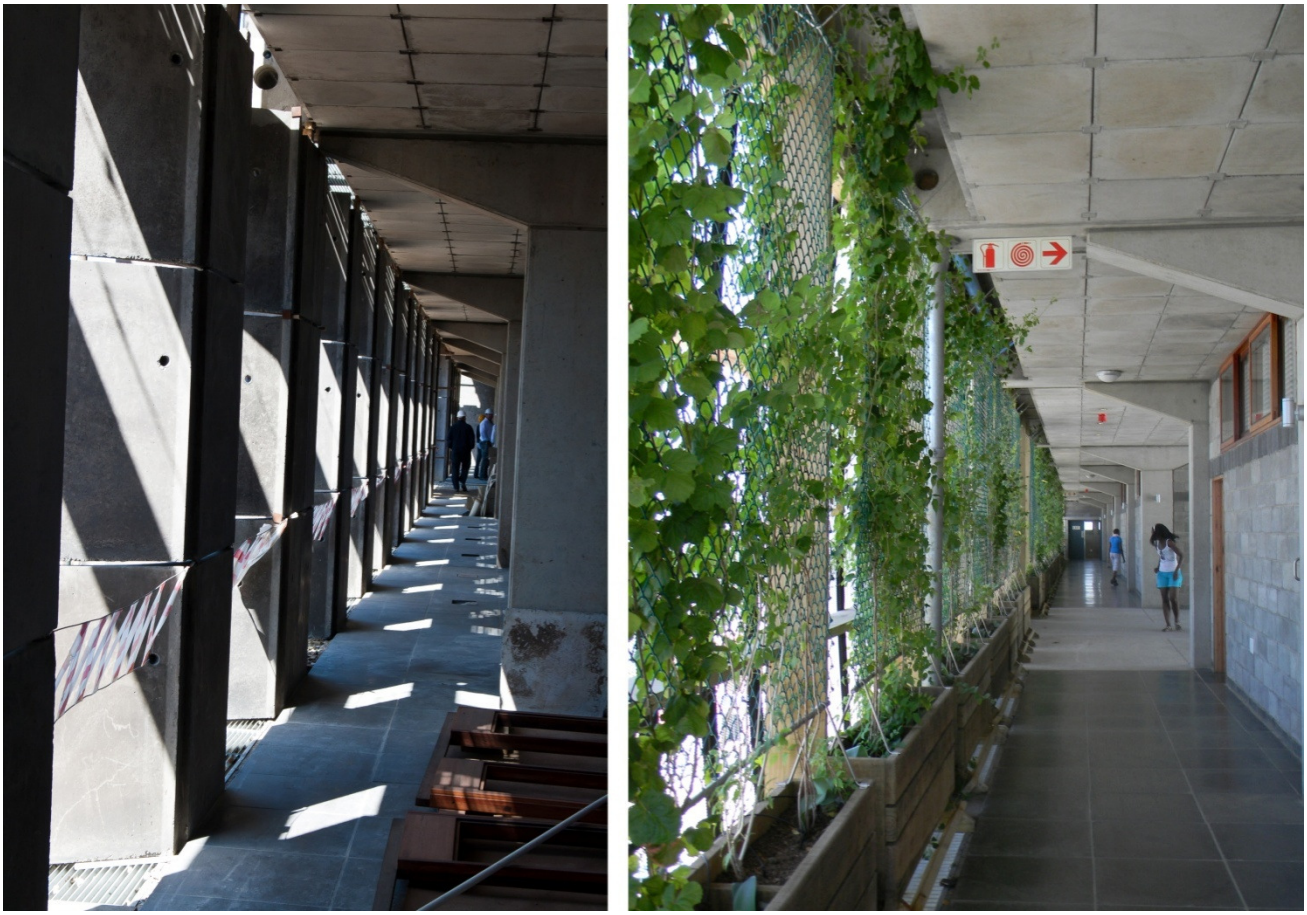

Figure 4.37: Comparative images during construction in 2010 and the completed project in 2012

In light of what has been discussed above, this building's sustainability has eclipsed many of its contemporary counterparts due to various factors. Firstly, it has been designed to minimise energy consumption through its innovative cooling system. Secondly, waste that is normally associated with buildings of its size was minimised as a large portion of the building was precast. In addition, the precast parts were constructed locally, minimising energy used in transport as well as local employment creation. Thirdly, its solar exposure (North-facing façades) is in line with sustainable building practices.

4.5.2 Tradition and innovation

According to Bronner (2006: 6), tradition is about expectation and social acceptance rather than constraint. As a reference to precedent and a social construction, tradition invites commentary and interpretation and is often continuously re-negotiated, from generation to generation. As such, it

allows for creativity, adaptations and innovations that might, once they have been socially accepted, be integrated and become part of the tradition. It is this tradition used within the NATC, which needs first to be socially accepted prior to a final triumph being realized (Steenkamp, 2010: 167).

4.5.3 Indigenous Knowledge and Innovation

As in similar instances when architects attribute innovative forms and ideas to particular buildings, it was not so much the historical veracity that was of interest, but rather the degree of esteem they accorded to creativity and signature in the building trade (Marchand, 2006:56). Rather than use indigenous knowledge, innovative concepts were tested and stretched. In hindsight, adaptations and innovations, and the social acceptance thereof become normalised through invitation of commentary and the renegotiation of tradition and indigenous knowledge (Bronner, 2006:6). As such, the full extent of this buildings sustainability and innovation can only be judged over time as people become aware of it and thereafter either accept it as an innovation for sustainability or reject it for reasons they see fit.

4.6 Comparison and conclusion of two contemporary buildings

The GFSC has been in use for four years (2008 - 2012) and although still young, it has proven that traditional methods, vernacular forms, indigenous building techniques and locally-sourced materials can be revalidated in contemporary South African architecture (Steenkamp, 2010: 162-163). The commitment from the architectural design team to make use of local resources, an approach long espoused, was rewarded by the community's continuous appreciation and independence in every sphere that proved to be exceedingly affirming (Cooke, 2009. 26).

NATC was built to serve a variety of functions to accommodate various faculties as they moved through the space. One of the more important efforts within the project was to create a "micro-climate" acceptable to their occupiers (Stratford, 2009: 54-55). Designing according to human comfort should use means and methods, which are not detrimental to the environment or human health, in order to allow the inhabitants to respond to their prevailing climatic conditions as has been exercised within both the GFSC and the NATC (Steenkamp, 2010: 169).

Vernacular resources, technologies and forms such as adobe, wind-catchers or courtyards are generally seen to be well adapted to local climatic conditions and are therefore often considered as appropriate bases for environmental design – as has been established at GFSC. What is needed,

however, are methods which enable the systematic test of the actual performance of vernacular traditions and to thereby generate an understanding of how they may possibly be improved to provide sustainable buildings for the new millennium. Although both GFSC and the NATC where considered with regard to environmental principles of design, it remains difficult to comparatively analyse these projects within the vernacular framework. One method is *in situ* monitoring – these results are aimed at showing the projects that have been 'counter-intuitive'. What is needed within the vernacular architecture of South Africa is research that critically tests the performance of vernacular traditions within various geographical locations in the face of challenges faced in the twenty-first century (Steenkamp, 2010: 169).

The Centane GFSC, in addition to its social and technological concerns, materials and methods of construction were developed taking into consideration the natural resources available (Cooke, 2009: 25). Linking the indigenous knowledge system observed within GFSC with industrialised and innovative initiatives of the NATC requires better understanding of both the role of innovative and scientific (architectural) research and the limits of empirical locality-specific indigenous knowledge. There should exist no fissure in the relationship between indigenous knowledge and scientific innovation. If South African architecture is to mean more than the mere provision of yet another roof and wall, there needs to exist a greater understanding about the qualities that shape the public needs within a project. By doing so, the architectural practice may be more effective in designing buildings appropriate to indigenous living conditions and public needs (Steenkamp, 2010:170).

GFSC essentially adopted the importance of local technical and historical methods of construction by including an apprenticeship system, together with innovative modern techniques, thereby adding to the community a unifying sense of ownership and responsibility. NATC took a wide approach by designing both engineering and architectural solutions, value is thus weighted primarily on engineering and architectural ingenuity rather than on community participation.

All buildings, whatever their functions have to meet certain physical constraints. GFSC was the result of a long tradition of techniques, assembled by trial, error and experimentation over many generations. NATC was based on detailed mathematical and engineering calculations and the application of formulae after experimentations (Steenkamp, 2010: 170). Neither is better nor worse than the other and although there could be anticipation regarding which is 'better' or more sustainable, what one can deduce from these two cases is that both are more sustainable than many other contemporary buildings.

4.7 Closing Remarks

According to Ezaguirre (1992: 19), local indigenous and technical knowledge within the building practice should never be overlooked. Fathy (1973) described an approach which focuses on the active application of vernacular technologies, forms and resources in a modern and development contexts, although this would not be without its problems, challenges and setbacks, but would have to address themes and issues that so far have been largely disregarded in the field of vernacular, indigenous and sustainable studies. As this will have to engage with, or indeed be part of, the so called 'development discourse' (Grillo, 1997), there will be need for critical discussions of the political and ethical dimensions of key concepts like sustainability, development, intervention and participation.

Unfortunately, as confirmed within these case studies, western models of planning and designs based on commercial land markets are penetrating most parts of our country (Payne, 1977). Perhaps rural areas less-so, as was shown by GFSC in rural Centane, but finding ways in which vernacular knowledge and expertise may be integrated into urban contemporary building design and practice continues to be one of the primary challenges faced in the twenty-first century (Steenkamp, 2010: 171).

NATC is a precedent from which – after experimentations – have come creativity, innovation, and change. Building typologies continue to evolve and transform, while new ones will arguably keep emerging. Though such novel 'grassroots tradition' may not be as established as that of local earth construction, it may well represent the future of the sustainable and vernacular in industrialized urban societies (Steenkamp, 2010: 172).

The patterns and principles of good practice from these case studies have been identified to successfully sustain the human settlements for which they were designed. Building design and construction, together with the layout of the buildings, were explicitly accounted for within them. Innovative approaches of this kind will not only help promote the local architectural environment, but also protect the cultural heritage of human settlements (where applicable) (Steenkamp, 2010:172). In addition, they can become a catalyst for a new kind of ecology-orientated tourism and economic investment, which was mentioned by Lawrence (2006: 124), whilst describing similar projects.

Pressure on architects to design contemporary, truthful, honest and socially acceptable buildings comes primarily from the local market. In urban areas within South Africa, contemporary, modern and 'western' architecture command a considerably higher market-price and social acceptance than

traditional designs, methods and materials. As long as the South African elites continue to conceive of earth architecture as the property of their poverty-stricken citizens, the isiXhosa-building tradition within the Eastern Cape, as well as the diversity of other building traditions and innovative designs throughout the county, will be progressively denigrated and may one day cease to exist (Steenkamp, 2010: 172).

The houses and people residing within uMasizakhe, although facing numerous social ills, have intrinsic knowledge about their homes and maintenance thereof as well as the benefits of the materials used in their homes' construction. It is somewhat sad that the community of Luxolweni's old homes are now reduced to photographic evidence. In hindsight, instead of RDP houses, this community could have been self-sufficient if they were encouraged to keep building their own homes and with a bit of innovation, these traditional homes could have been the mark of sustainability. The cases of the three rondavels show the longevity and beauty of vernacular homes and they would still be standing if people had remained living there and were not dismantled. GFSC showed the utility of vernacular and indigenous techniques and what these can offer to contemporary architecture with some improvements through innovation. The NATC offered a glimpse into sustainability that could be implemented through innovative techniques and designs.

Chapter 5: Conclusion and Recommendations

5.1 Conclusion

In informal settlements such as these found within the research population of the Eastern Cape, design criteria for sustainable development are of paramount importance within specific geographical locations. Geographical differences within the research populace have defined the nature of the architecture which exists within it. The varying environments therefore provided contrasting means of expression to the people who live there. These people have over time, responded to what was available to them in different ways.

In conclusion to the research findings, it can be said that regional cultures and vernacular cases such as these which continue to exist in uMasizakhe and, which once existed in Luxolweni, can influence both the Eastern Cape and South African building culture. These cases may simultaneously be manifestations of a world culture. As tradition is the way of living or doing things in a manner that is handed down from generation to generation, it is vital that within the architectural profession, vernacular architecture is not associated with designing and building in the manner of the ancestors. Such an approach can conversely only be relevant and understandable if nothing has changed from the past to the present, which implies that people must be living in isolation or that they have had no development in vital lifestyles. Such a state of isolation can exist solely when oppressors have frozen local aspirations and progress. Utilizing both the developmental and ecological approach on the other hand, the regional culture could play a crucial role in the successful process of exchanging, adapting and implementing standards in the built environment.

The research conducted for this dissertation has demonstrated that there exist clear elements of socially-sound and environmentally-responsive building principles. From the vernacular dwellings surviving, it is possible to inform and educate current planning policy and practice in South Africa. Through such an exercise, villages and settlements would be empowered by sensitive housing approaches in the future.

The contribution which indigenous knowledge can make to the built environment is verified not only by the research conducted in uMasizakhe and Luxolweni among others, but also in the case of the Greenshops Financial Services Centre in Centani where a participatory system was used to integrate the indigenous knowledge of the local people with contemporary architectural design and technologically-appropriate methods.

From the research findings it evident that in order to improve the ‘green’ performance of architecture, it is necessary to create a greater awareness of environmental issues. The discussion is no longer whether there is an environmental crisis, but rather how can one now integrate fragmented, contradictory and competing interests and architectural values. There is a mounting demand for higher comfort performance standards in the built environment, particularly within peri-urban and rural areas, and for the willingness to deliver such architecture, which in turn necessitates new, innovative environmental designs. It is within this context that the degree to which clients, users and designers understand the need and want to implement policies that enforce sustainable designs.

Since architects are in a unique position to revive people’s faith in their own culture, and if, as authoritative critics, they show what is admirable in local structures and even go so far as to use them, the local people at once begin to look on their own products with pride. Architects and designers, through the power of their creativity, now find themselves in the opportune position whereby they can help communities around South Africa to embrace change. Although there are temptations that exist for immediate design solutions to meet political needs, South African architects should take advantage of the traditional precedents around them and not let political expedience steer their design concepts. The fabric of architecture today should not be an art of imposition, but of discerning potentials and bringing them into play. Rather than being constrained, including vernacular methods and materials involves expanded creativity, helping the new to be born and healing that which does not work.

Today, more and more South Africans live in communities, but the environment they inhabit is very different from what we think of as a traditional African townscape. It was thus meaningful exploring the role of culture, identity and expression in South African architecture, by looking at the complex interplay between climate, context and technology as well as social and environmental processes. Many people acknowledge the limits of the human intellect and stress the importance of instinct and intuition. As was the case of GFSC, guided by the latter rather than by intellect alone, architectural design requires a harmony between head and hand, experience and memory. Instead of the unthinking application of global tendencies, the individual application should grow naturally from the design task, well rooted in the region and its resources.

South African spaces and places remind and teach us about the potential of creative applications of architectural materials and technologies representing the 'developed' and 'underdeveloped'. The most profoundly rich and dense synthesis of ideas and concerns form what is timeless in

architecture. This is the mix of simplicity and sophistication of expression, as may be found in the convergence of the so-called 'first' and the 'third' world held within these case studies.

Prior to the discovery of global-warming and the energy and oil crises of 1973 and 1976 respectively, designing and building with little regard to the environment, landscape, climate or inhabitants was fairly easy. Large glass facades permitted entirely too much sunlight to enter buildings during the summer, while these same buildings radiated the heat out during winter reducing them to uninhabitable human fridges. Dealing with such designs released a technological and industrialized chain reaction: tinted glass was installed to protect interior from sunlight and although the light was now dealt with, rooms became too dark for proper functioning. Artificial lighting was introduced solving the darkness – which again caused the building to be heated. The increased heat was solved through air-conditioning, which increased energy consumption. A vicious and expensive cycle of additive technological corrections increased energy usage and material waste – this was typical of the modernist era. The SANS 10400 part XA is a start in the right direction of policy directing sustainable buildings. Certain of these regulations have already been in place in many Western countries for decades and it is anticipated that South Africa will be able to learn from these leading nations and hopefully avoid the 45 year learning curve to get to the same level of sustainable design.

Sustainable development has been perceived as a three-legged stool, each of these three legs being a subsystem – namely socio-cultural, environmental and economical, that cannot exist in isolation. One can add two additional legs, namely a political and technical ones, so as to adapt to the instability at local South African government level and also the technical backlog.

Throughout South Africa, vernacular architecture represents the development of a sustainable architectural approach that minimizes the discomfort caused by climatic and economic conditions. While the supporters of vernacular architecture claim it as a solution to many of today's problems, its detractors think of it as romantic escapism and a dreaming of simpler times or a search motivated by nostalgia. Detractors of vernacular architecture might become silenced if the deep and vivid characteristics thereof are implemented.

Vernacular architecture as a 'process' of building is frequently enjoyed more than the resulting end 'product' as was exercised by Vernon Collis during the construction of the GFSC. It is this process-product relationship that lends an air of enchantment to vernacular architecture. Sacred and metaphysical modes of the thought surrounding work and shelter are here combined with user participation resulting in communities being strengthened.

In contemporary architectural practice, there exists the familiar fourfold constellation of client, architect, builder and user – which is a direct result of the separation of roles and the division into highly specialized functions that promote contemporary industrial architecture. Contrary to vernacular architecture, in which this quartet is generally absent: the four specialized functions are compressed either into a particular designer/ user/ builder, or else given over to a community grouping based on gender, kinship ties or ritual groupings rather than occupational specialization. Frank Lloyd Wright invariably designed his houses around the individual social and cultural requirements of his clients, and the specific climatic and environmental features of a carefully located site, utilizing whenever possible, materials from the immediate area and he also often involved the future owners in the physical act of building their home diminishing the fourfold constellation dramatically. The appearance of 'client' as separate from 'user' may well be the threshold between marginal vernacular homes and the structured capital-directed RDP houses one has become accustomed to in South Africa. The task of providing shelter forges such close community involvement that this may account for the purity of style typical of most vernacular forms. Hidden in the myriad of anonymous vernacular structures throughout South Africa, one may well find the key to turn the architectural profession around, and return to 'architecture with a human face'.

To attain communities that are independent and self-sustaining, planners will have to shift the focus to the establishment of self-supporting settlements in their quest to provide housing for the masses within South Africa. In all contexts, the benefits will be health, safety and the eventual edification of the built environment. It could be feasible utilizing vernacular building techniques, local skills and where appropriate, comprehensive educational programmes that empower the community. Educational programs need to disseminate information on topics such as alternative energy, building materials and maintenance. It is imperative that household energy awareness is bolstered together with the promotion of low-impact, re-used and/or recycled building materials as well as alternative sanitation systems. It is essential to gain the enthusiasm and co-operation of communities in order for them to develop into sustainable villages resulting in a productive life with access to dignified education.

It has been stated that the most plentiful, renewable and non-polluting resources can only be properly used by self-governing people working locally and that the alienation of people from the means of production by centrally administered systems leads to excessive demands on scarce resources as well as exceeding the social limits to growth. The increase in centralisation of decision-making and provision of housing throughout South Africa has resulted in increased dislocation

between human needs and priorities, and the quality of housing which results. Clearly, this debate is not as simple as it might seem, two issues exist that, though interrelated, nevertheless persist individually. The self-sustaining approach suggested in Chapter 3.6 viewed housing from a qualitative point of view, recognising also that certain housing methods perform better than others. The basic issue of this debate is whether quality, efficiency and fulfilment can ever be achieved through the pyramidal structures and centralising technologies currently being used. Unfortunately, this view is partial in that it perhaps ignores the position of housing in terms of more fundamental societal relationships that might exist.

Globalisation has not replaced social structures. In itself it is neither good nor bad. Its consequences are largely the results of human decisions, which can be debated and changed. Designers and architects have to reinforce the need for a regional and culturally informed architectural environment. This requires avoiding mere imitation of the vernacular and historical pastiche, and creatively engaging with the living culture of a region. The contemporary lifestyle and expectations in most of South Africa are unsustainable and unrealistic. Expectations have been raised to inappropriate levels and are giving rise to questions about the distinction between deep cultural values and impermanent lifestyles. The need for positive intervention and change, at a social and cultural level, in many regions is clearly a critical concern in the global movement.

Sharply varying interpretations placed on exchanging information and technologies may lead to the designing of environmentally-progressive architecture between cultures. The 'developed' and 'undeveloped' can co-operate creatively. Cross-cultural transfer is possible in South Africa, but can be problematic when there is no known way to tackle it. The selected sample of architectural interventions such as those found in GFSC illustrate, however, that such transfer can prove to be a great success. They can be beneficial to the architectural profession, if that which is designed is integrated allowing happier clientele and culturally-enriched societies.

Global buildings, regionally grounded yet based on international design standards are present in South Africa and in many places around the world. Globalisation is not a choice, it happens. Contemporary globalisation has had some important positive consequences with respect to cultural regeneration, the decentralisation of egalitarian power, economic productivity and the availability of a range of materials, products, technologies and ideas. There are many negative consequences too, like increased environmental degradation and various examples of cultural violence, poverty, worsened working conditions and inequalities. The question is how to address our concerns in many different regions so as to make a stronger and enhanced South African identity.

Nothing imitative is equal to that which is imitated – such as the RDP houses. Instead of imitating, there should be a search for the principles that can make them sustainable. There is a need and demand for architects who tackle today's requirements and problems with today's solutions and resources. Well-executed regional architecture can make a positive contribution to global development and the upliftment of communities.

An approach which focuses on the active application of local technologies, methods, forms and resources in a modern and development context can vastly improve the housing position. Despite the meagre resources, which existed within the research population, the indigenous peoples designed dwellings that successfully met the severest climates. Simple technique and material usages have allowed these undemanding shelters to outperform the structures of most present-day architects. 'Primitive' methods solved environmental challenges such as thermal responses, whereby vernacular dwellings were found to have an internal temperature swing of between 4.3-5.6℃ compared to that of 11.7℃ found in contemporary RDP houses. The thick walls of earth and rubble, together with floors composed of natural earth and/or cow-dung are a vast insulative 'improvement' to that of the RDP homes. With climatical conditions that require massive structures to absorb the intense solar heat, the vernacular homes and huts constructed of adobe and rubble, built on a solid rock foundation, protected inhabitants from both rain and heat. Vernacular homes have sustainably proven their excellent performance in function, form and material.

With these things in mind, one needs to refer back to the central research question of whether vernacular architecture and building techniques can offer the contemporary built environment a sustainable alternative to what is currently practiced. To answer this, one first needs to answer the six questions that make up the central research question. Firstly, are the material properties of vernacular buildings superior to their contemporary counterparts? This question can be answered in the affirmative as respondents living in vernacular homes had the ability to heat and cool their homes on cold and hot days respectively. This was due to the intricate knowledge of their vernacular homes as well as the thermal mass of their walls.

Secondly, are vernacular homes socially and culturally accepted by their inhabitants? The majority of the respondents living in vernacular homes confirmed that they love and take pride in their homes. In addition, they appreciated that they could use the space around their homes for cultural ceremonies and that their homes could be adapted to accommodate more people when the need arose. Thirdly, does vernacular architecture lend itself to skills transfer? The majority of respondents living in vernacular homes agreed that they could repair their homes when necessary and some had even been involved in the building process. However, those who were living in RDP homes had to

rely on family, friends or contractors to repair their homes. In this sense, vernacular building had lent itself to skills transfer. This was confirmed by the case study of GFSC, where one of the principle aims was to impart skills on the workforce, although much of the workforce already had the required skills.

Fourthly, can vernacular techniques be successfully incorporated into contemporary architecture? As one can see with GFSC, vernacular techniques can be incorporated into contemporary architecture successfully, although this may be due to the context of the buildings location. Nonetheless, this project has shown that it can be done. Fifthly, can innovations be incorporated within vernacular architecture to aid in their longevity? Again, GFSC implemented certain innovations to increase the longevity of the buildings. These included concrete foundations (where none would have been used previously) and an extended roof overhang to prevent rain from coming into contact with the walls (where minimum overhang would have previously been built). Lastly, are innovations for sustainability socially acceptable? This question is difficult to answer. While GFSC fits into the local pattern language, the people living in the surrounds may readily accept it. However, the NATC does not fit into the pattern language of the surrounds and the surrounding populace may need some time to adjust to it before they can accept it. This would require further research.

The research focussed on the derivative belief that vernacular and indigenous building techniques and materials could be implemented in contemporary South African architecture. The research has surely established the basic crux: that the isiXhosa people, for all their scanty resources, have built more wisely than expert architects and that in this architecture, the isiXhosa people have established principles of design that have been ignored at great cost. It would be a mistake to romanticise these accomplishments with respect to ‘civilized’ and ‘educated’ standards of scale, amenity, safety and permanence, the actual implementation thereof within the Reconstruction and Development Program has proven to be entirely inadequate. The RDP homes offer neither profit in the literal imitation of local people’s handicraft techniques nor in the artificial constraint of building materials to those locally available. Vernacular architecture therefore merits our study for its principles, as these have deep relevance for architects and the South African ill-housed population. The cost in building materials and in fuels has proven to be altogether prohibitive for the sustainable future of rural and peri-urban societies.

It is vital that vernacular and indigenous buildings and homes are studied for the usefulness of their concepts (not merely copied for antiquarian reasons) and ability to introduce a sound South African identity, sustainable communities, innovative methods of construction, and empowering

opportunities for local people along with other unknown advantages (after Biermann, 1971). Emphasis should be placed on self-sufficiency, trying to reduce the overall levels of urban migration and the depletion of resources. By investing in the training of community members as craftsmen, to help build their own communities and understand the processes involved, a chain reaction of empowering the presently redundant populace could happen. Possible teachers may be identified, who in turn could start their own programme to teach villagers how to build their own sustainable homes.

In closing, the developmental and ecological approach is a process: directions or paths of advancement can be determined and ends can, for the process of sustainable change, influence the nature of the problems that currently exist. If one believes in the basic tenet of freedom or liberation, which South Africa ascribes to, one has to accept that the ideological dispensation that emerges over time must be the reflection of the will of the people, not the will of a minority of articulate members. Furthermore, the livelihoods and rights of the generations to come – that of a better life – cannot be sacrificed in the hope that eventual sustainable changes will bring benefits while using the Reconstruction and Development Program in its current state.

Therefore, architects as authoritative critics who have the ability to revive people's faith in their own culture, must take up a position whereby they affect short-term improvement while recognising uncertainties and facilitating in longer-term societal relationships and processes that need to be resolved. To do this, architects must ensure that short-term sustainable actions do not reduce longer-term options. It has been justified throughout the dissertation that housing is a symptom of broader qualitative dimensions: it is also an institution that is vitally affected by the interaction of a wide variety of actors and interests. It is this institutional dimension that allows the issue of housing to be used as a vehicle through which broader societal issues crystallise, while short-term and significant improvements to the quality of lives are achieved.

5.2 Recommendations

Retrofitting the existing RDP houses to meet the advantages found within the vernacular dwellings would mean adding wall and ceiling insulation and simultaneously educating people regarding house maintenance. It was noted that inhabitants of the RDP dwellings rely predominantly on family members, community members and contractors for maintenance and upgrading. Such exercises, in an effort to match the comfort of traditional housing, would have to include education regarding recycling and even including participatory exercises during the retrofitting process. On the other hand, however, changing the RDP housing system from just about housing to the accommodation

of local authority and community responsibility, economy of services and, information on design and construction could lead to empowerment, dignity, self-esteem and entrepreneurship. Incorporating the use of traditional methods that utilize available resources, labour and skill could assist in the achievement of the benefits just mentioned. Implementing such an exercise would also improve the quality of the houses' thermal and sustainable properties.

Throughout the research into vernacular architecture of the isiXhosa people, it was found that the government's approach to housing was largely inappropriate. The current approach was a top-down advancement in which NGO's and government entered communities with preconceived ideas of what was wrong and how to fix it. Essential questions were never asked and the local populations were rarely involved in the building process. The local people, whom the built environment purported to serve, need to be included in more of the decision making, and although the term is so frequently used, the residents of individual communities need to be 'empowered'.

Under the current conditions, the individual has had no choice but to accept what is offered or possible. Should the traditional styles be allowed to simply decay under the industrialized way of 21st century living? This type of question can only be answered by each community concerned. It should not be outsiders who dictate policies, which may be said to spring from sentimental European notions of conservation or of a desire to return to pre-industrial harmony. What is important, however, is that those making decisions should not be inhibited by the feeling that everything about traditional architecture is wrong. In many cases, the old materials may be unsuitable for modern living, though many people find that a mud floor and a thatched roof are far more comfortable than a concrete floor and a corrugated iron roof.

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Appendix 1: Questionnaire

1

THE CASE OF uMASIZAKHE TOWNSHIP IN GRAAFF-REINET, EASTERN CAPE, SOUTH AFRICA:

1. Name: _____

2. House Address: _____;
   UMasizakhe, Graaff-Reinet, Eastern Cape

GENERAL:

3. Can you read?
   a. YES
   b. NO

4. Do you/ someone in your house work/ have a job/ income?
   a. YES
   b. NO

5. If YES, what? _____

6. How long have you/ your family lived in this house?
   a. 1-5 years
   b. 6-15 years
   c. 16-25 years
   d. 25+ years

7. Does this house belong to you/ your family?
   a. YES
   b. NO

8. If NO, to whom does it belong?_____

9. How many people live in this house?
   a. 1-2 people
   b. 3-6 people
   c. 7-10 people
   d. 11+ people

10. Do you/ your family practice ancestral worship?
    a. YES
    b. NO

11. If YES, where?_____

12. FLOOR MATERIAL:
    a. Concrete
    b. Concrete + Tiles
    c. Bricks
    d. Timber/ “planke”
    e. Dung
    f. “Dagha”/ Natural Earth
    g. Other

For office use only

1 2
3 4 5 6
7
8
9 10
11
12
13 14
15
16
17 18
19
20
21
22
23
24
25

For office use only

13. FLOOR MATERIAL SOURCE: [26]
    a. Local shop – in Graaff-Reinet
    b. Shop – outside of Graaff-Reinet
    c. Local/ Farm
    d. Local/ River
    e. Site/ Handmade
    f. Local/ Velt
    g. Other

14. WALL MATERIAL: [27]
    a. Fired bricks
    b. Earth (adobe)/ clay bricks
    c. Stone
    d. Timber “planke” + mud “Dagha”
    e. Tin
    f. Natural Earth “Dagha”
    g. Other

15. WALL MATERIAL SOURCE: [28]
    a. Local shop – in Graaff-Reinet
    b. Shop – outside of Graaff-Reinet
    c. Local/ Farm
    d. Local/ River
    e. Site/ Handmade
    f. Local/ Velt
    g. Other

16. Is there insulation in the walls? [29]
    a. YES
    b. NO

17. If YES, what material? [30]
    a. Cardboard
    b. Hardboard
    c. Newspaper
    d. Timber “planke”
    e. Bags/ Sacking
    f. Plastic
    g. Other

18. ROOF MATERIAL: [31]
    a. Corrugated Iron/ Tin
    b. Thatch
    c. Grass
    d. Roof Tiles
    e. Other

[32] [33] [34] [35] [36] [37] [38] [39] [40] [41] [42] [43] [44] [45] [46] [47] [48] [49] [50] [51] [52] [53] [54] [55] [56] [57] [58] [59]

For office use only

19. ROOF MATERIAL SOURCE: ☐60
    a. Local shop – in Graaff-Reinet ☐61
    b. Shop – outside of Graaff-Reinet ☐62
    c. Local/ Farm ☐63
    d. Local/ River ☐64
    e. Site/ Handmade ☐65
    f. Local/ Velt ☐66
    g. Other

20. Is there insulation in the ROOF/ CEILING? ☐67
    a. YES
    b. NO

21. If YES, what material? ☐68
    a. Cardboard ☐69
    b. Hardboard ☐70
    c. Newspaper ☐71
    d. Timber “planke” ☐72
    e. Bags/ Sacking ☐73
    f. Plastic ☐74
    g. Other

22. Who is responsible for MAINTENANCE in and around your house? ☐75
    a. You/ the inhabitants ☐76
    b. The owner ☐77
    c. Family members ☐78
    d. Community members ☐79
    e. Contractors ☐80
    f. Municipality/ Government

SUSTAINABILITY:

23. How do you keep your house warm in the winter? ☐81
    a. *Mbawuwla:* Tin drum with wood/ coals/ charcoal
    b. Fireplace (with chimney)
    c. Heater (Paraffin, gas, electric)
    d. None, my house is cold in winter
    e. None, my house is warm in winter
    f. Other

24. How do you keep your house cool in the summer? ☐82
    a. Open doors and windows
    b. Close doors and windows
    c. Fan
    d. None, my house is hot in summer
    e. None, my house is cool in summer
    f. Other

25. Does your house cross-ventilate?
    a. YES
    b. NO

26. Do you love and take pride in your house?
    a. YES
    b. NO

27. Would you rather:
    a. Live in a traditional/ vernacular house?
    b. Live in an RDP house?

28. What is your reason for the above question? _____
    _____

    **Voice-recorded answer*

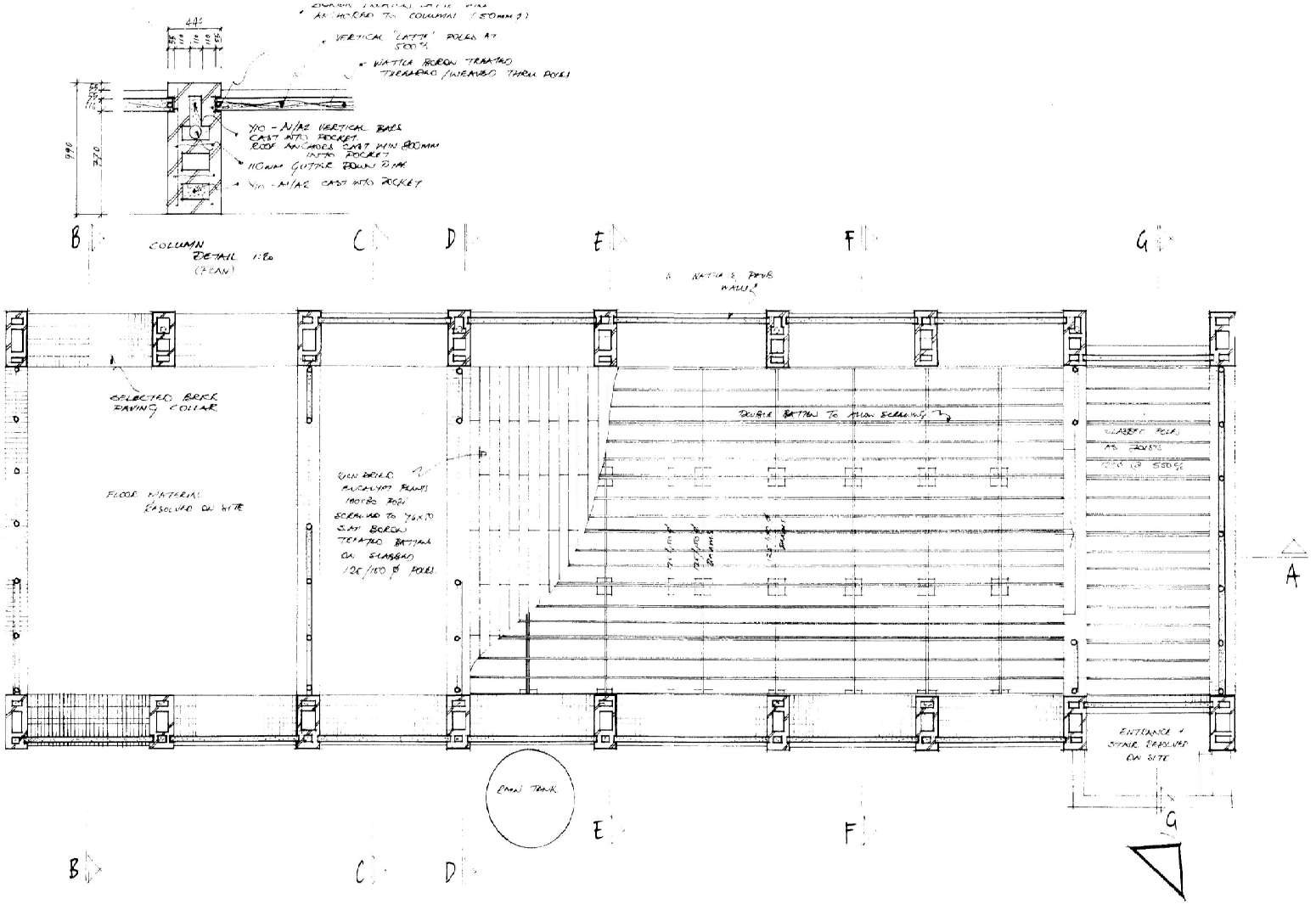
For office use only

☐ 83

☐ 84

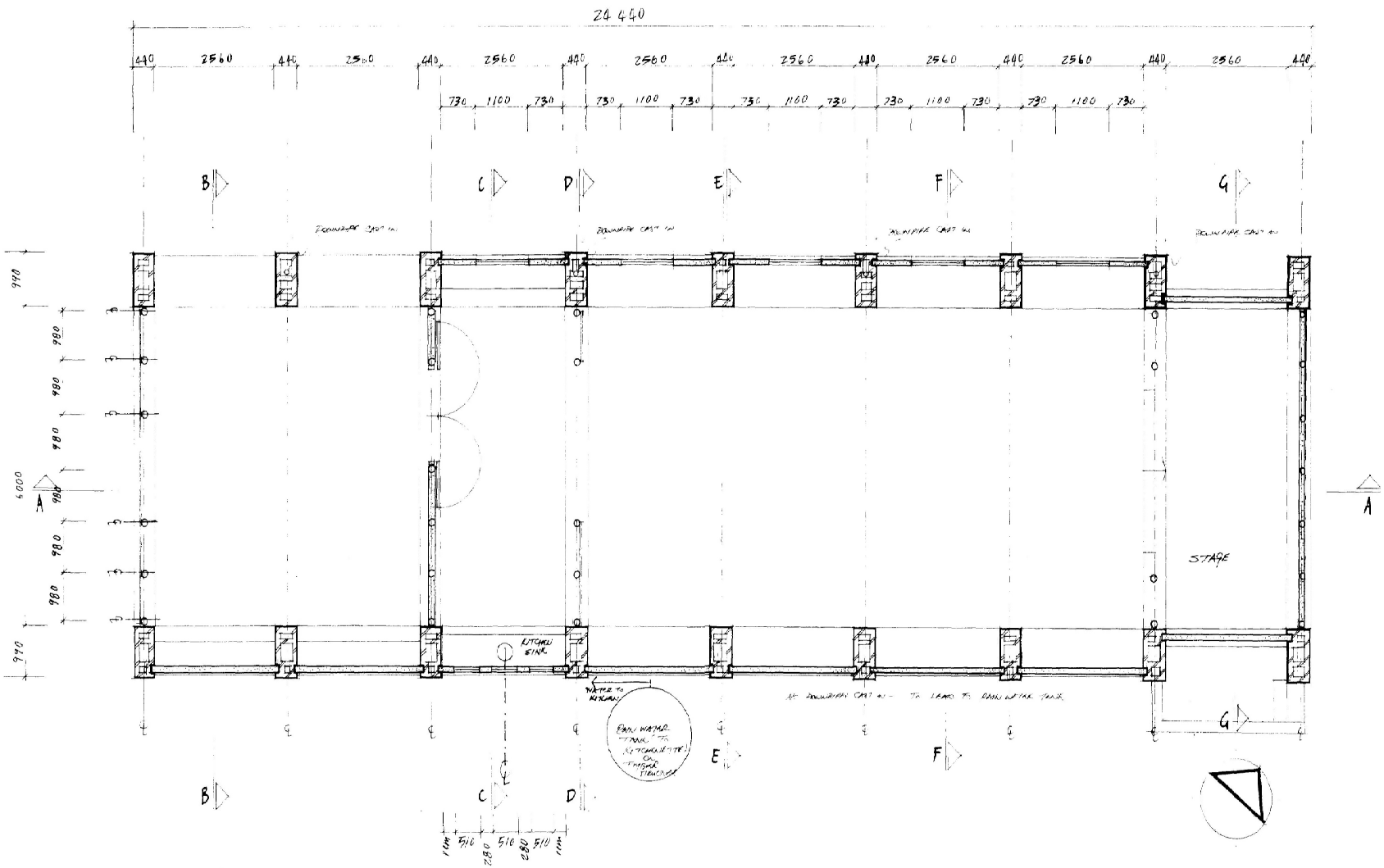
☐ 85

☐☐ 86 87



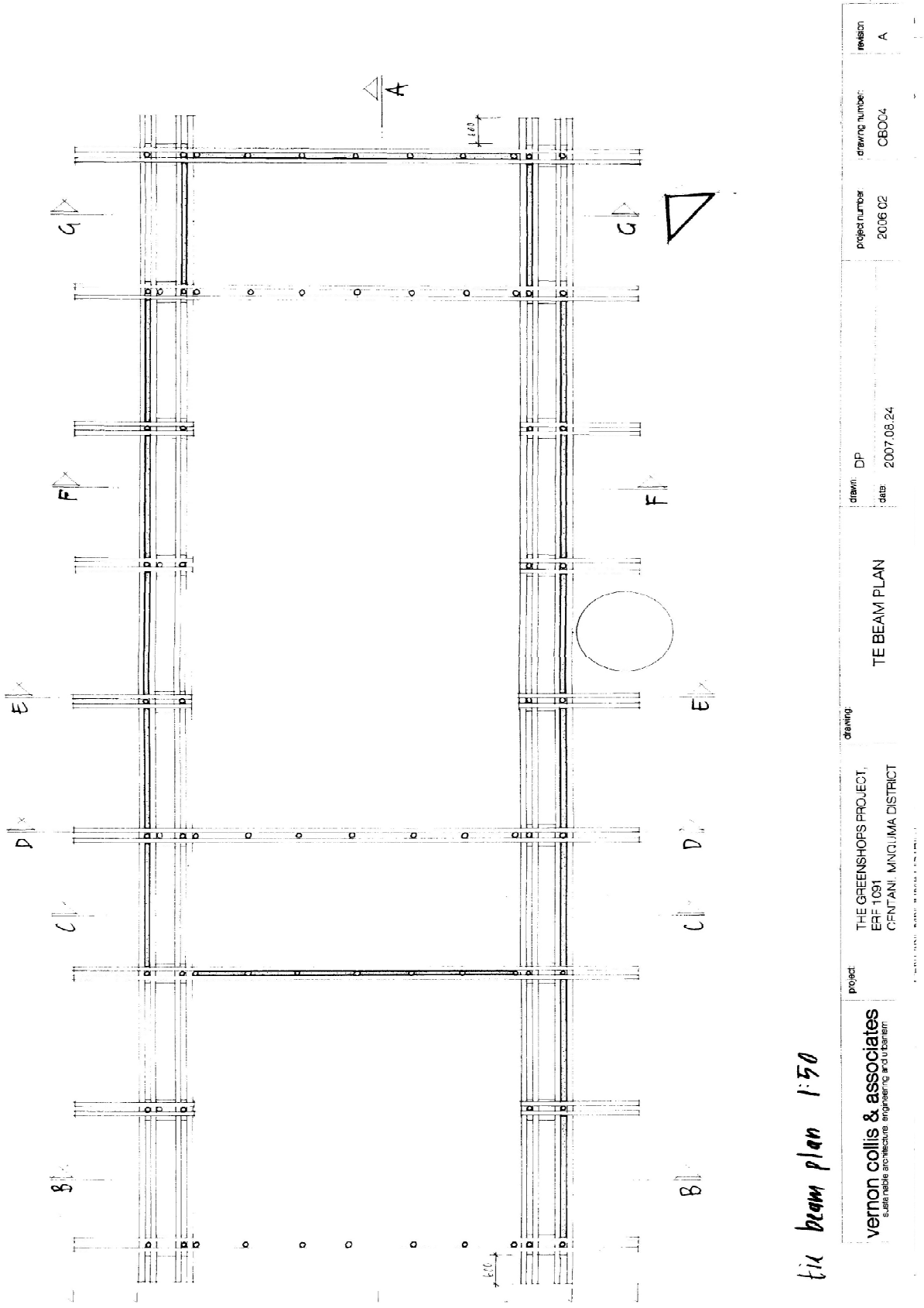
Floor structure plan 1:50

vernon collis & associates sustainable architecture, engineering and urbanism	project: THE GREENSHOPS PROJECT, ERF 1091 CENTANI, MNQUMA DISTRICT	drawing: FLOOR SR STRUCTURE P PLAN	drawn: DP date: 2007.08.24	project number: 2006 02	drawing number: CBO02	revision B



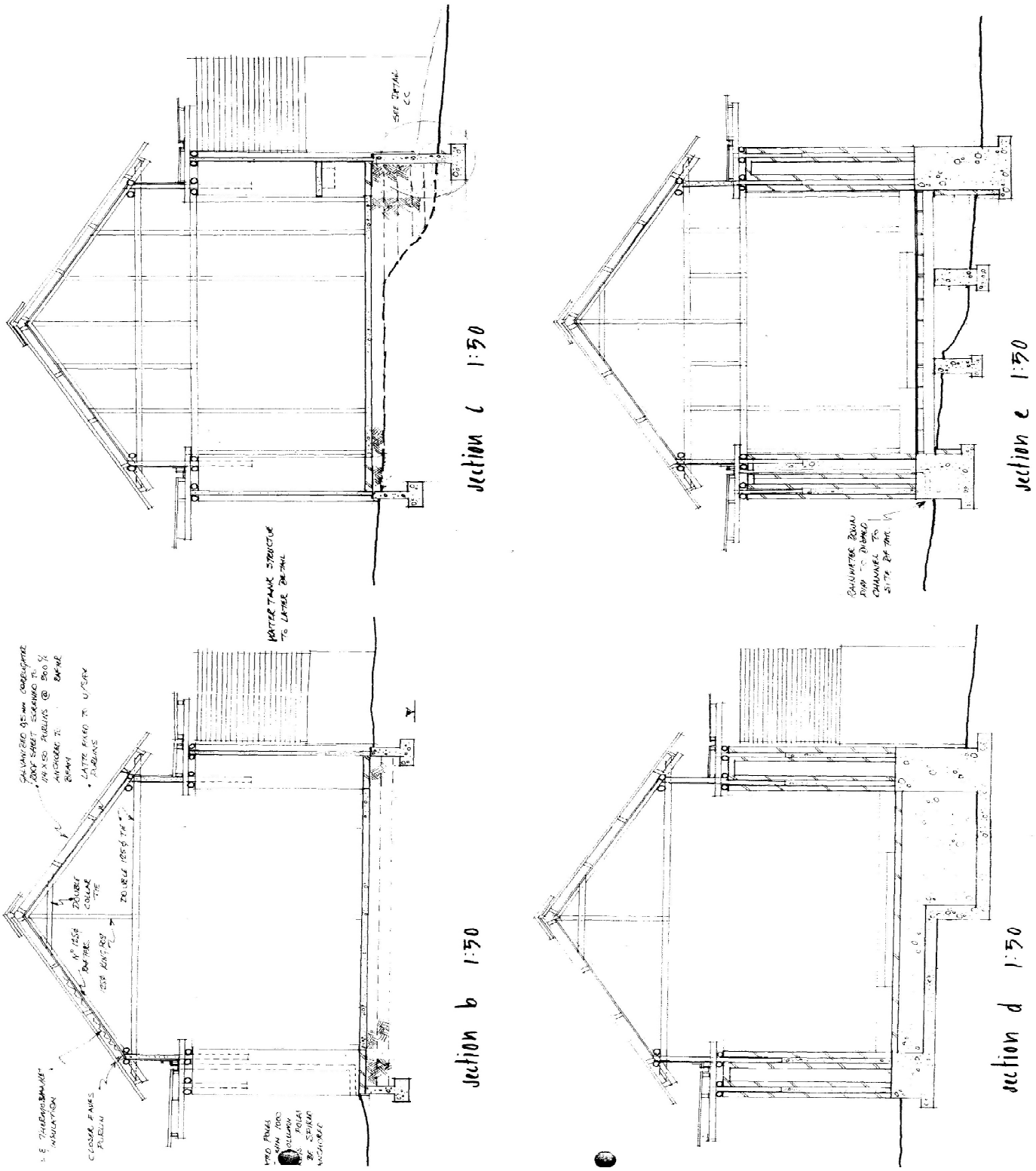
ground floor plan 1:50

vernon collis & associates sustainable architecture, engineering and urbanism	project: THE GREENSHOPS PROJECT, ERF 1091	drawing: GROUND FLOOR PLAN	drawn: DP date: 2007.08.24	project number: 2006 02	drawing number: CBO03	revision: A



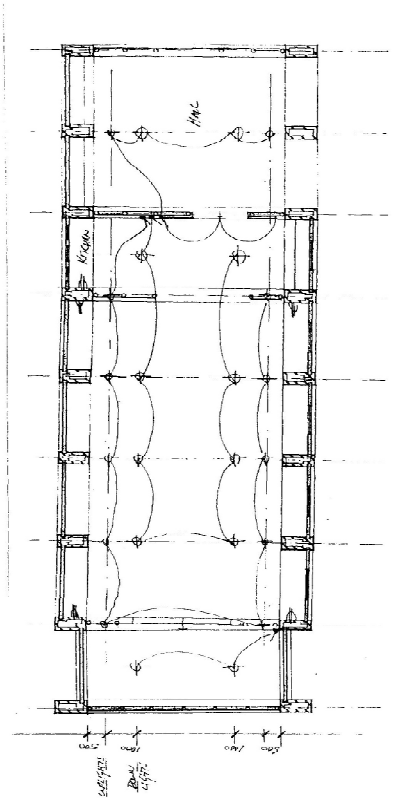
GFSC Tie Beam Plan (plans provided by Vernon Collis and Associates)

GFSC Roof Structure Plan (plans provided by Vernon Collis and Associates)

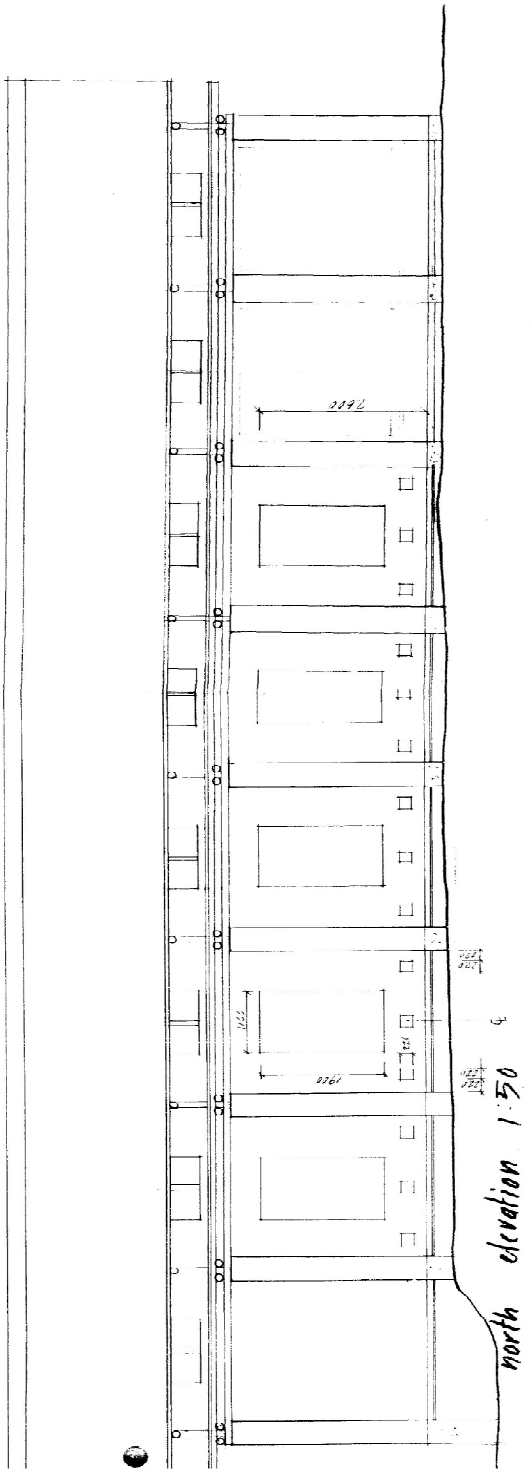


GFSC sections (plans provided by Vernon Collis and Associates)

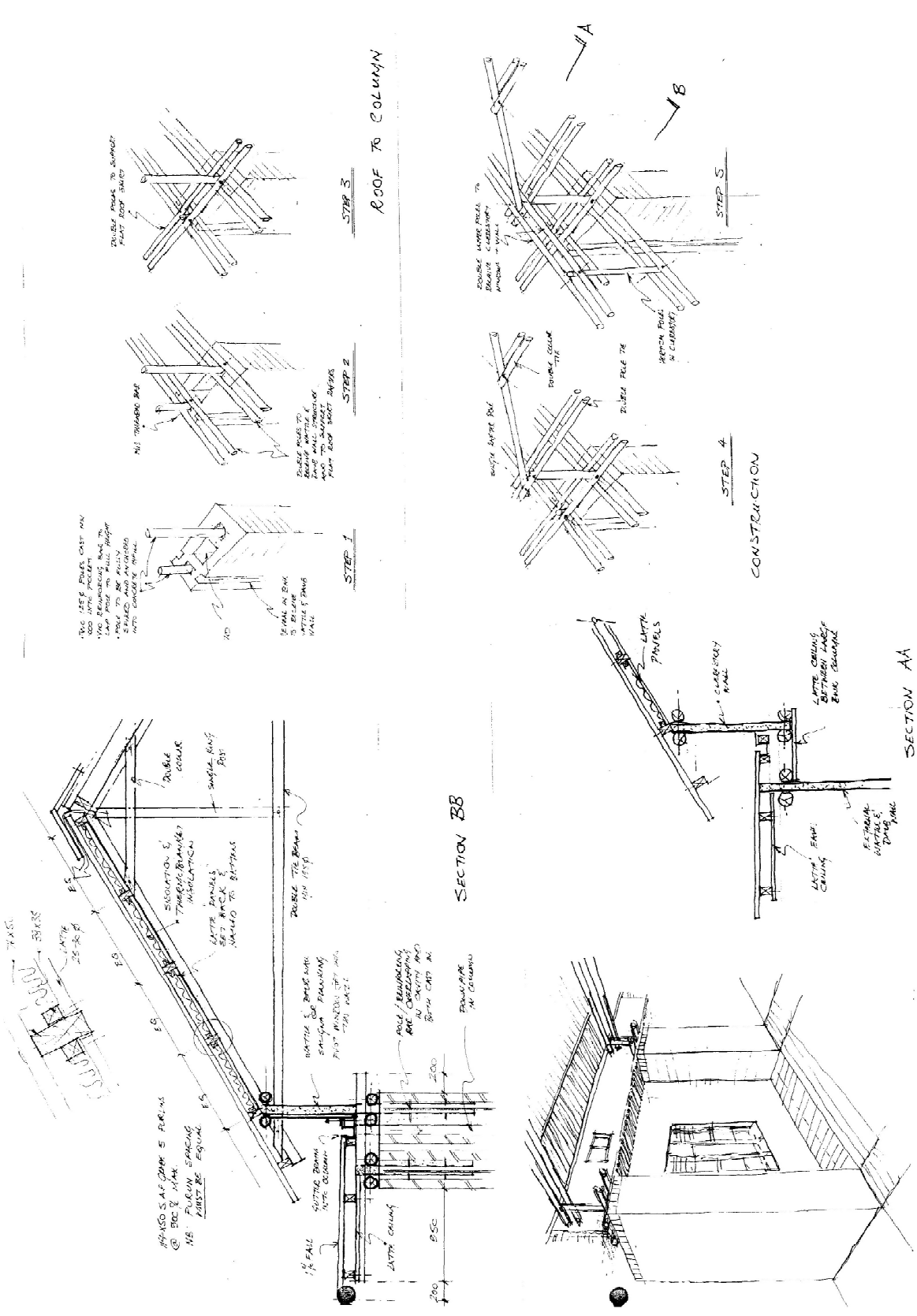
GFSC Sections (plans provided by Vernon Collis and Associates)



CHICKS BUILDING



north elevation 1:50

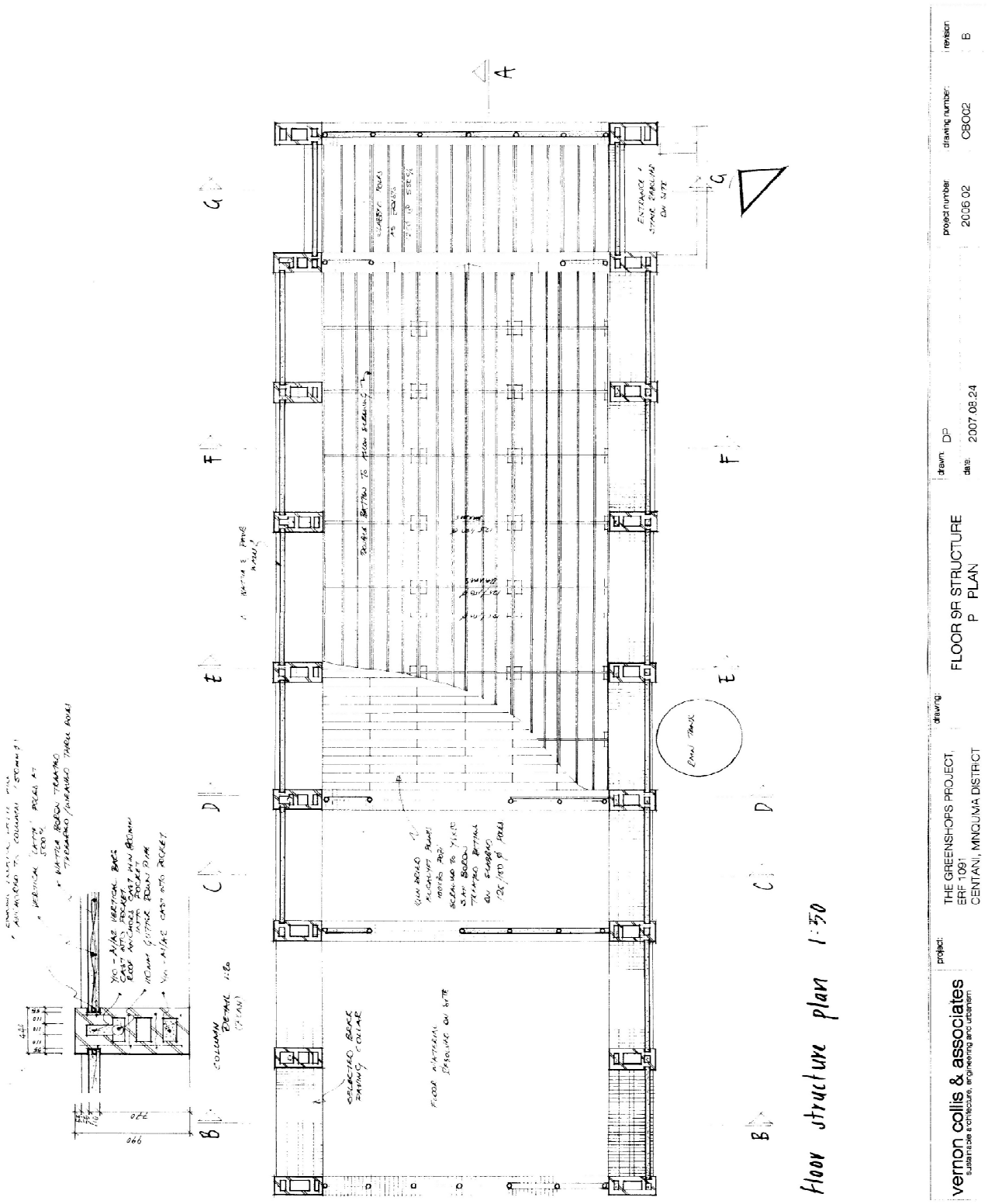


GFSC Elevation (plans provided by Vernon Collis and Associates)

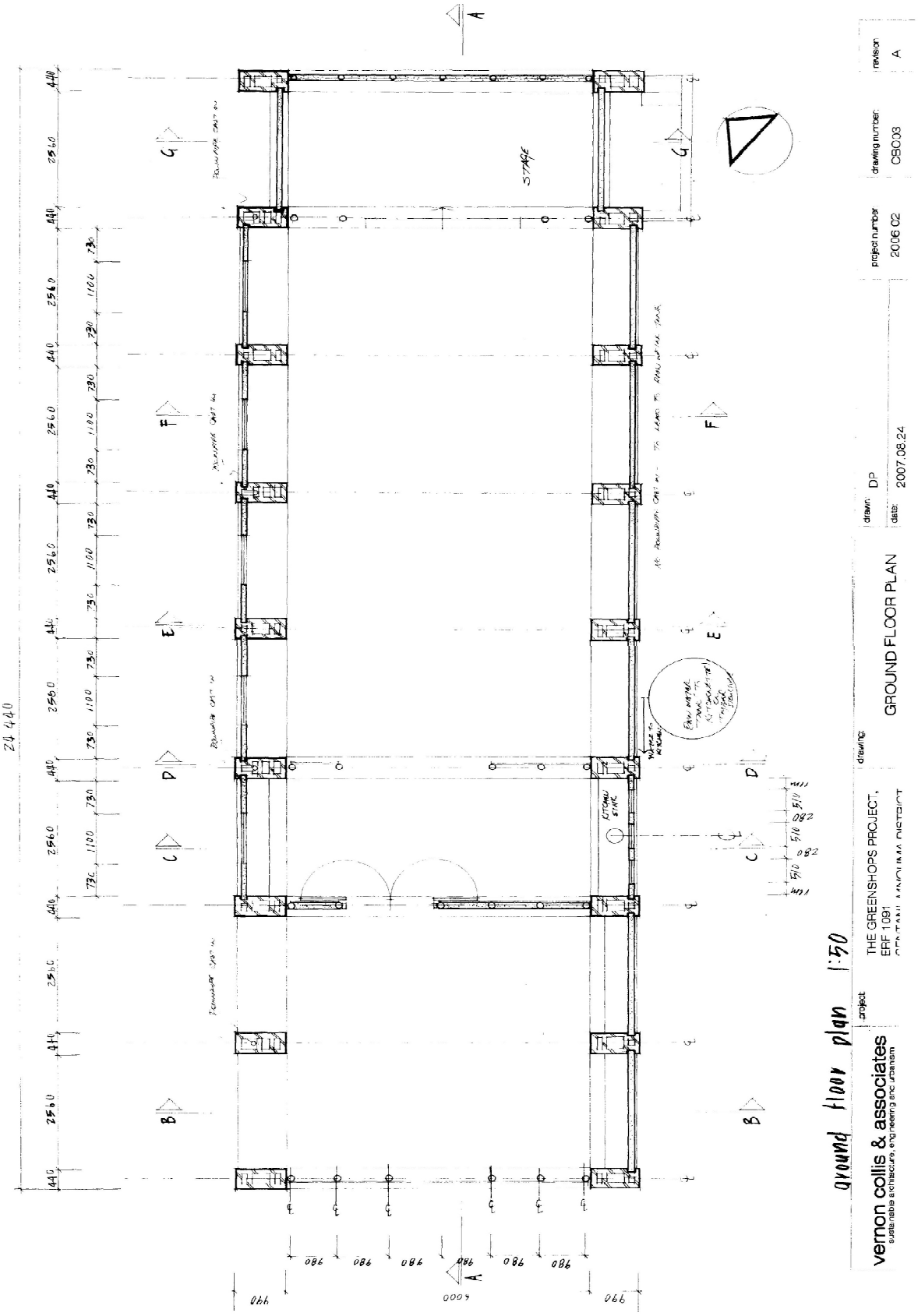
Sections and construction details (plans provided by Vernon Collis and Associates)

End.

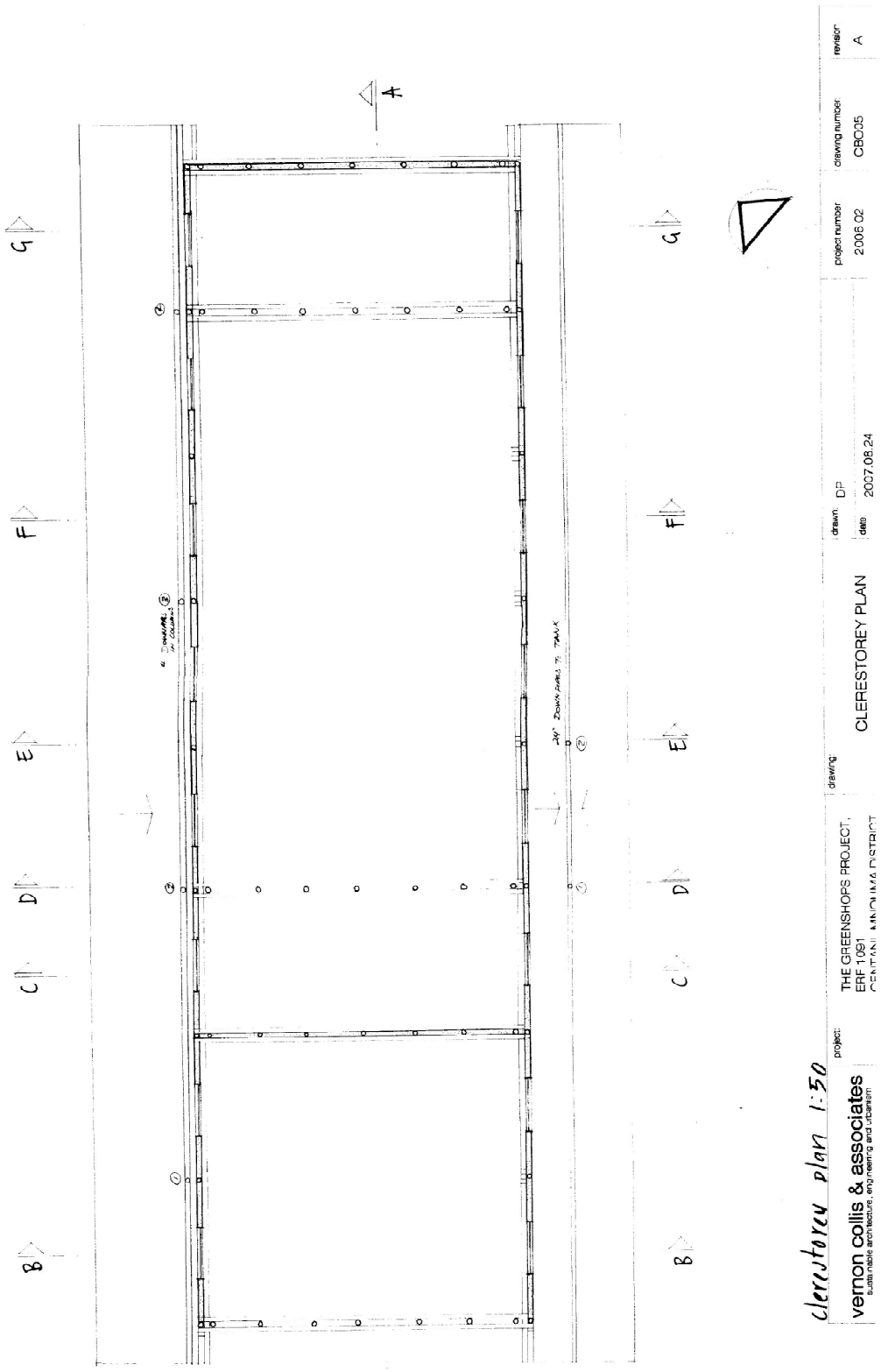
Appendix 2: Design of GFSC



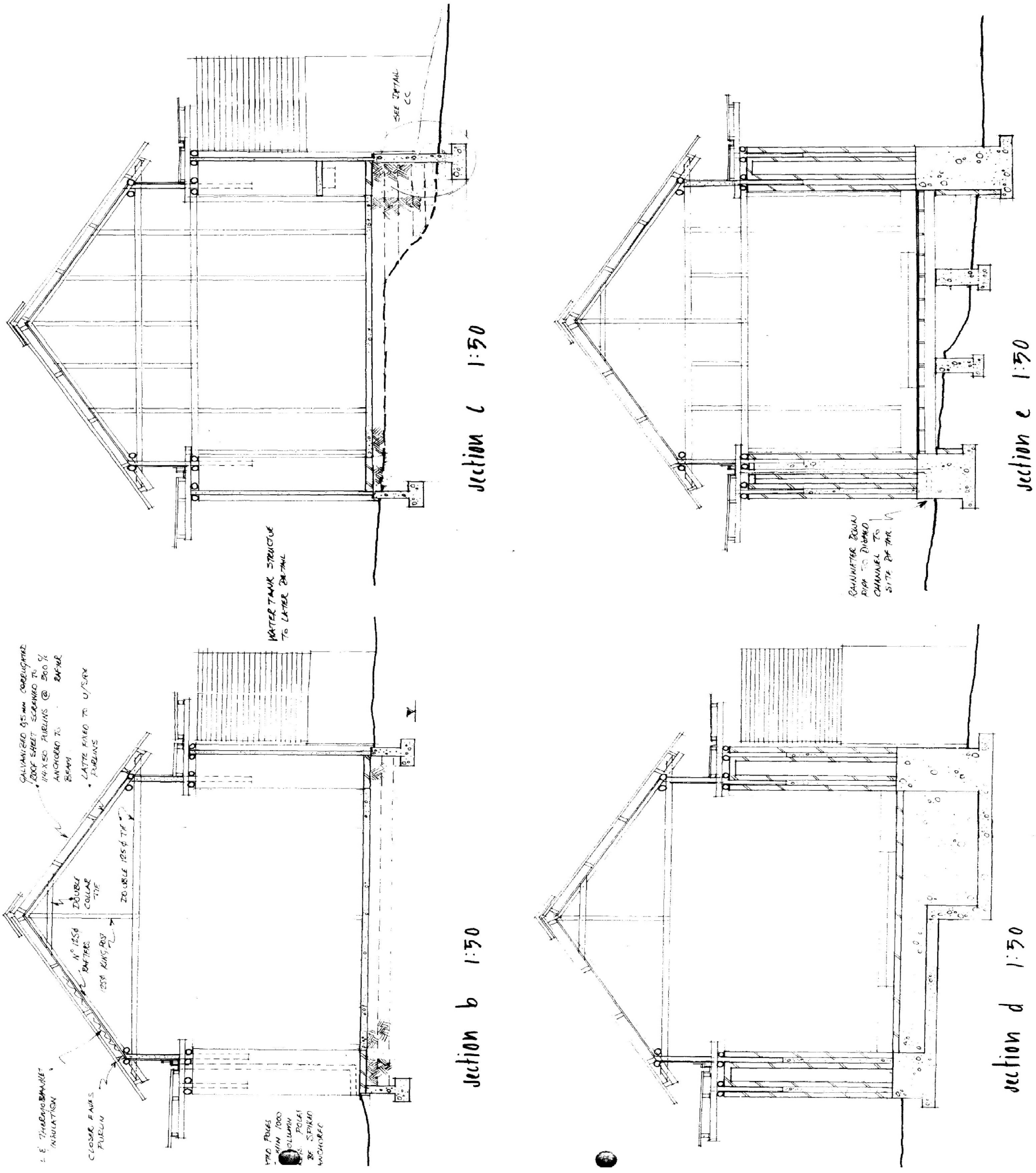
GFSC Floor Structure Plan (plans provided by Vernon Collis and Associates)



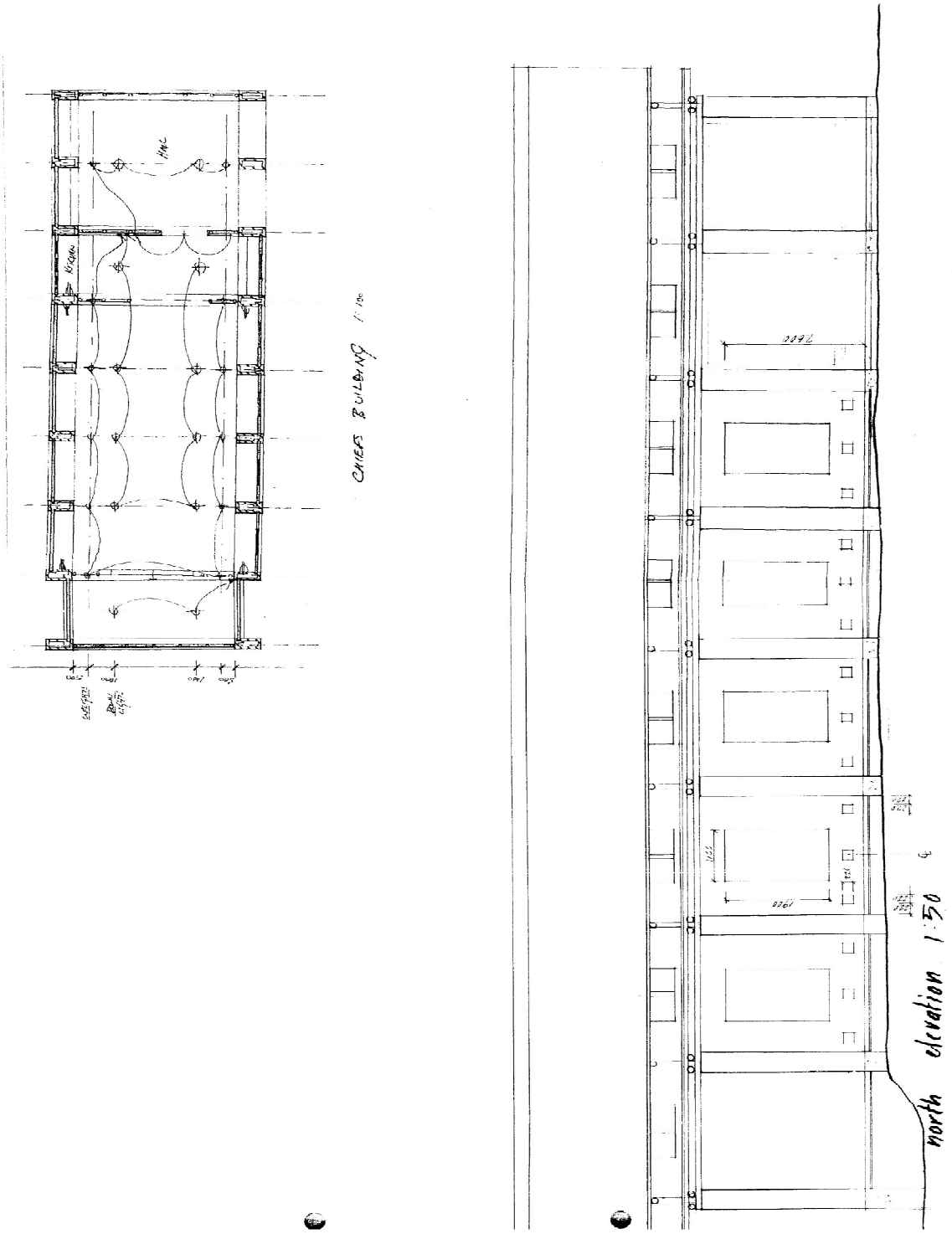
GFSC Ground Floor Plan (plans provided by Vernon Collis and Associates)



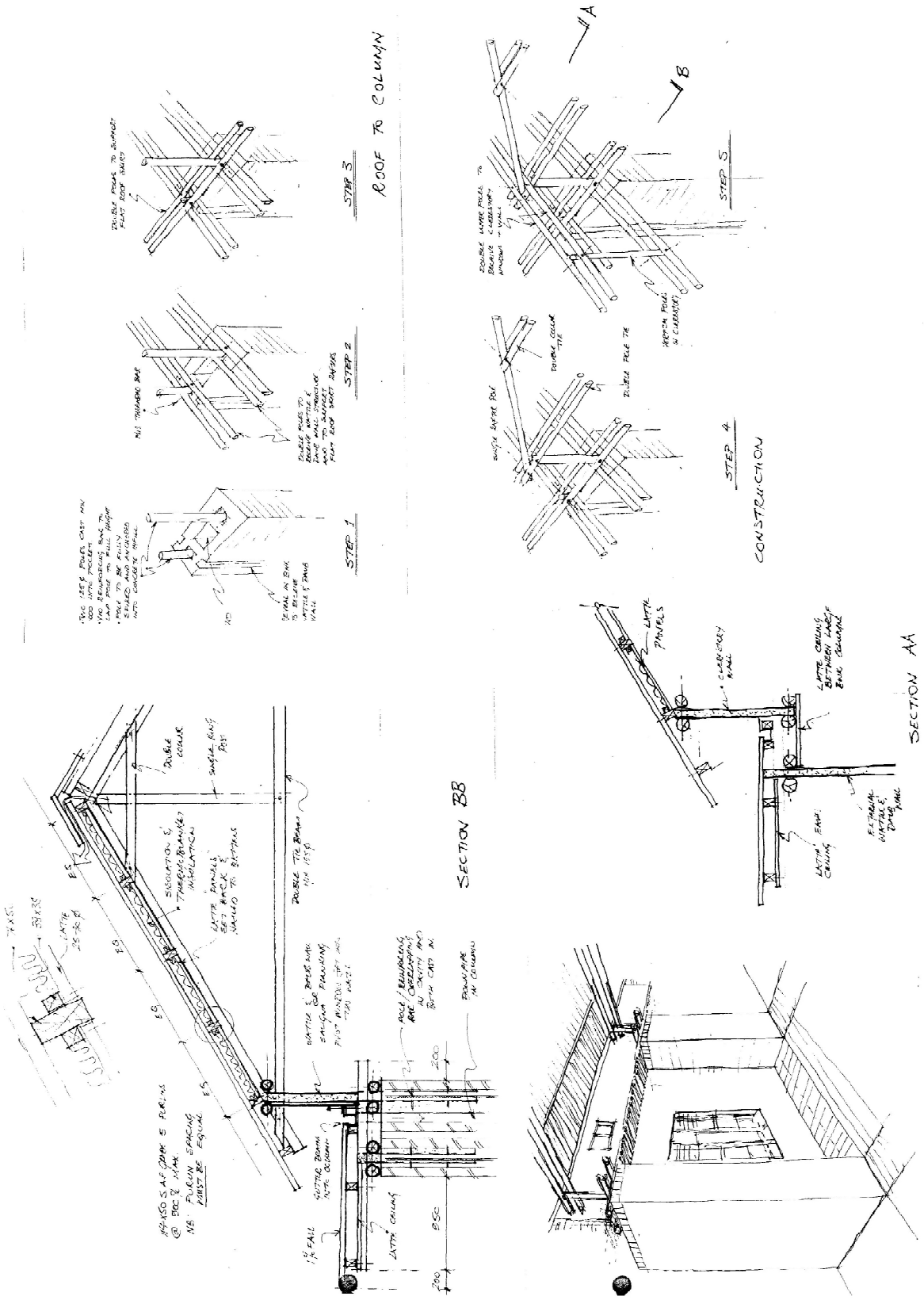
GFSC Tie Beam Plan (plans provided by Vernon Collis and Associates)



GFSC Sections (plans provided by Vernon Collis and Associates)



GFSC Elevations (plans provided by Vernon Collis and Associates)



GFSC Sections and construction details (plans provided by Vernon Collis and Associates)