

1. INTRODUCTION

The shelter employed by man to protect himself (and his possessions) has shown significant development since the earliest attempts at enclosure. The cultural anthropologist Melville Herskovits states that “[m]an cannot exist unless he meets the challenge of his habitat” (1960: 154). From its earliest days, architecture has been in a relationship with nature. On a functional level, the built environment requires the natural environment to remain operational, and the latter should therefore be protected.

De architectura (the 1st century BCE publication edited by Vitruvius) presents an argument concerning architecture as an imitation of nature (Rowland & Howe, 2001: 47, 76). Vitruvius compares man’s construction of a house (from natural materials) to birds and bees building their nests (Rowland & Howe, 2001: 34). This view was supported by Abbé Marc-Antoine Laugier who attempted to define the essence of architecture in his *Essai sur l’architecture* (1753) (Curtis, 2010). In this publication, Laugier illustrates *The Primitive Hut*, thereby defining “...the fundamental characteristics of a building constructed from local natural resources” (Groák, 1992: 153). Curtis states that the ideal of *The Primitive Hut* has a functional or structural basis, while having its origin in nature (2010).

According to Kenneth Frampton, Gottfried Semper presented a fundamental break with the Vitruvian triad of *utilitas*, *firmitas*, and *venustas* in *Die vier Elemente der Baukunst* (Ballantyne, 2002: 142). Semper described viewing a Caribbean hut in the Crystal Palace Exhibition, and this shelter prompted “...a counter thesis to Laugier’s Primitive hut...” (Ballantyne, 2002: 154). Semper proposed an articulated model comprising a hearth, earthwork, a framework roof and an enclosing membrane. He referred to a stereotomic base with a tectonic frame, and thus established the idea of a climatic response (Ballantyne, 2002: 154). Architecture was now utilised to react to and diminish the forces of nature.

In early settlements, development associated with population growth continued to widen the gap between natural and man-made; thereby further distancing man from his habitat. Glazewski argues that the origin of planning could be traced to North

London in 1666 is perhaps the most widely recognised such event (Tricker & Algar, 2006: xiii). In 1667 the British Parliament passed the London Building Act, which restricted the use of timber, specified a minimum thickness for external walls, and banned inflammable roof coverings (Cowan, 1985: 205, 209). The origin of building regulations in Southern Africa displays similar characteristics, and is discussed later in more detail.

Since the Industrial Revolution, development within the built environment has continued unabated with associated control measures being introduced. However, the relationship between architecture and nature has changed to one of master and servant. Glazewski states that “...virtually all environmental problems stem from the way we decide how to use and manage land” (2000: 11). He further elaborates on this by claiming that “...the form of tenure on specific land invariably has environmental consequences...” (Glazewski, 2000: 11).

The authors of the publication *The Science and Politics of Global Climate Change, A guide to the Debate*, argue that present knowledge and available evidence of the risks of climate change demand strong action, although various uncertainties remain (Dessler & Parson, 2006: 154). They reviewed six possible causes¹ of climate change, and concluded that human activities are responsible for the recent global warming (Dessler & Parson, 2006: 66-67). They also criticise the reliance on voluntary programmes of existing climate change policy as “...woefully inadequate in view of the challenge...”, suggesting that “[o]nly binding, authoritative policies that carry real incentives can provide the structure, clarity, planning environment, stability, incentives and leadership” are necessary (Dessler & Parson, 2006: 159). Despite requesting a formalised climate change policy for every country, Dessler and Parson propose that the national policies should allow for flexibility in implementation, suggesting that environmental goals and regulations could be phased in over time, thereby limiting costs and allowing for planning stability (2006:160).

According to the *2009 Sustainable Cities Report* (De Lilly, 2009: 26), “[t]here is a direct link between buildings and climate change due to the high rate of carbon

¹ Apart from human activities, the natural processes that have been proposed as responsible for twentieth century warming are orbital variations, tectonic activity, volcanoes, solar variability and internal variability.

emissions from the construction and ongoing use of buildings. Building resources take up to 40 per cent of energy use and 17 per cent of fresh water use. Twenty-five per cent of wood harvested and 40 per cent of material produced are attributed to the built environment.”

On 26 May 2010, the General Secretariat of the *Conseil International du Bâtiment*² (CIB) announced the introduction of a new CIB Task Group (TG). TG79 will focus on the *Building Regulations and Control in the Face of Climate Change* (CIB, 2011). According to Chan and Visscher (the joint coordinators of TG79), “[t]he last twenty years have seen dramatic changes in the approach taken to building regulation and control... [and there is an] ...increasing role that building regulation and control must perform in achieving significant reductions of CO₂ emissions from buildings”.

Among others, the objectives of TG79 are to “...provide an overview of the state of building regulations and building control and the related policies to address climate change...” (CIB, 2011).

1.1 THE PROBLEM AND ITS SETTING

“The home of man is one of the oldest building types. In its construction man reveals something about his inherent biological nature, and in its modification through time, his cultural evolution.” (Fisher, 1992: 86) This view by Fisher is similar to that of Frank Lloyd Wright when he declared in 1894 that “[t]he more true culture a man has, the more significant his environment becomes to him” (Gutheim, 1941: 3).

The process of erecting and occupying the built environment (*home*) represents a pattern of ever-increasing resource consumption. This is evident during the construction phase, occupancy phase, and post-occupancy phase. In the *Green Building Handbook*, Llewellyn van Wyk argues that the built environment is one of the primary consumers of resources (Van Wyk, 2009: 51). EarthTrends³ corroborates

² International Council for Research and Innovation in Building and Construction (CIB, 2011).

³ *EarthTrends* was initiated by the *World Resources Institute* (www.wri.org) in 2000 as an accessible source of world resource data that is continually updated as new information emerges. It is recognised as an authoritative source for statistics and unbiased analysis of environmental issues. The online collection is available at www.earthtrends.wri.org. It is sponsored by inter alia the *United Nations Development Programme*, *United Nations Environment Programme*, *World Bank Group*, *Dutch Ministry of Foreign Affairs*, *Swedish International Development Cooperation Agency*, *United States Agency for International Development*, and the *Danish Ministry of Foreign Affairs*.

this claim, although different figures are listed (2010). The information available for the Republic of South Africa (South Africa) is provided in Addendum A.

Richard Holden, who was the Building Control Officer (BCO) for the City of Johannesburg in 2006, argues that the primary focus of Act 103 of 1977 (and therefore the NBR) is "...ensuring that buildings would be designed and constructed in such a way that people could live, work and play in a healthy and safe environment" (Holden, 2006: [1]).

As a regulatory instrument the NBR lack an appropriate platform from which the current minimum standards can be implemented in a uniform manner. The inclusion of regulations on sustainability remains limited; therefore the ideal of a healthy built environment remains unattainable. As long as this is the case, the bulk of new construction (and alterations to existing buildings) will continue, oblivious to their impact on the environment.

The current official version of the NBR does not include any sustainability aspects. The first edition of the South African National Standard (SANS) 204-1⁴ (sub-titled *Energy efficiency in buildings*) was published in 2008, but has remained a voluntary standard. Public comment on its successor, *SANS 10400-XA: 2010 The Application of the National Building Regulations Part X: Environmental Sustainability Section A: Energy Usage in Buildings*, was invited on 15 June 2010. However, this proposed standard relies heavily on SANS 204, which was written from a climatic perspective that differs from that of South Africa.

In 2008/9 the Green Star SA rating system (for office occupation) was launched. This system was adapted from the Green Building Council of Australia's Green Star rating system, which in turn originated from the American rating system, namely Leadership in Energy Efficient Design (LEED). At this stage, Green Star SA is a voluntary system that only offers official rating tools for offices and retail centres, and a multi unit residential pilot tool (Green Building Council of SA, 2011).

⁴ The SA standard for energy efficiency in buildings consists of three documents: Part 1: General requirements (SANS 204-1:2008); Part 2: The application of the energy efficiency requirements for buildings with natural environmental control (SANS 204-2:2008); Part 3: The application of the energy efficiency requirements for buildings with artificial ventilation or air conditioning (SANS 204-3:2008).

Even though a number of local authorities (LAs) have initiated 'green' building guidelines, any implementation of or compliance with these guidelines is still voluntary. These 'green' initiatives currently have limited or no legal standing within the built environment.

1.2 STATEMENT OF THE MAIN PROBLEM

The researcher observed that although titled the 'National' Building Regulations, the statutory requirements of Act 103 of 1977 and NBR are not implemented uniformly in South Africa. In addition, it is the researcher's opinion that the current mandatory built environment regulating instruments (and implementation methods) do not address sustainability challenges, except on a voluntary basis.

The main problem could therefore be delineated as follows:

The purpose of this study is to determine the origin of the current minimum regulations and standards applicable to the built environment of South Africa, and to examine the goals and implementation methods of Act 103 of 1977 and its Regulations (together with the Code of Application (SANS 10400:1990)), in an attempt to achieve uniform implementation of the requirements and align the aforementioned with accepted passive design principles to promote a more sustainable built environment in South Africa.

The aspects contained in the main problem are divided in a number of sub-problems and related hypotheses (Table 1):

Table 1: List of the sub-problems and the corresponding hypotheses

1.3 SUB-PROBLEMS 1-4 (Posed as questions)	1.4 HYPOTHESES 1-4
<p>Sub-problem 1 What is the origin of the NBR, and have the goals and methods of implementation of the current edition of the NBR (which represents the minimum regulations and standards applicable to the built environment of South Africa) evolved since the origin of the NBR?</p>	<p>Hypothesis 1 The goals and implementation methods of the NBR (which represents the minimum regulations and standards applicable to the built environment of South Africa) have evolved since the origin of the NBR.</p>
<p>Sub-problem 2 Are the current regulations and standards, as defined by the NBR, implemented uniformly by the respective LAs?</p>	<p>Hypothesis 2 The various LAs do not implement the requirements of the NBR in a uniform manner.</p>
<p>Sub-problem 3 Are the most significant NBR role-players, i.e. the BCOs, 3.1 aware of the origin, methods of implementation and goals of the NBR? 3.2 willing to support the uniform implementation of the NBR? 3.3 aware of recent developmental changes to the NBR?</p>	<p>Hypothesis 3 The most significant role-players, i.e. the BCOs, are not 3.1 aware of the origin, methods of implementation, and goals of the NBR; 3.2 willing to support the uniform implementation of the NBR; 3.3 aware of recent developmental changes to the NBR.</p>
<p>Sub-problem 4 Are BCOs willing to implement new regulations that focus on sustainability in the existing administration system of the NBR?</p>	<p>Hypothesis 4 BCOs are willing to implement new regulations that focus on sustainability in the existing administration system of the NBR.</p>

1.5 DELIMITATIONS

- 1.6.1 The focus of the study is the existing regulatory structure of the South African built environment, but the study is limited to the current edition and form of Act 103 of 1977.
- 1.6.2 The study accepts the NBR as the minimum official regulations and standards applicable to the built environment of South Africa.
- 1.6.3 The basis of determining the target population to be researched in this study is the extent of the contribution of LAs towards the national value of recorded building plans passed, and buildings completed. For this purpose the 2008 information was used as provided by Statistics South Africa (Stats SA) in the *Building Statistics Report No. P5041.3* (Stats SA, 2009b). This report was used for the pilot study (Phase 2).

- 1.6.4 A subsequent report was released, entitled *Building Statistics Report Number P5041.1* (Stats SA, 2010). Since it was based on similar statistical patterns as the previous report, it was used for the remainder of the study.
- 1.6.5 Although a concerted effort was made to ensure representation of all provinces in the initial phases of the study, the unavailability of existing policy documents (during the desk survey) forced the researcher to concentrate on the larger metropolitan areas (metros). However, the BCOs who participated in the questionnaire were from all the provinces of South Africa.
- 1.6.6 The provincial delineation as determined by the South African Local Government Association (SALGA) was used as is to determine the existing provincial status of the various LAs.
- 1.6.7 The proposed national standardised submission and approval pro forma (included as Addendum N) has not been tested. It is presented for information purposes only and copyright is held by the author.

1.6 ASSUMPTIONS

- 1.7.1 Although the title, format and/or definitions might change, the study assumes that the regulatory role of the NBR will remain as such within the South African built environment.
- 1.7.2 The study accepts the existing relationship between Act 103 of 1977 (South Africa, 2011: 1-33), the Regulations (South Africa, 2011: 201-266) and the Application of the NBR through the Code of Practice of the South African Bureau of Standards (SABS), namely the Deemed-to-Satisfy Rules (South Africa, 2011: 301-460).
- 1.7.3 A direct result of the above status quo is that the respective LAs are responsible for the implementation of the NBR. Therefore, the implementation of Act 103 of 1977 by the different LAs in accordance with the current approval procedure constitutes the basis of this study and its recommendations. **It is important to note that the study is not investigating an alternative system of regulation.**
- 1.7.4 The study further acknowledges the administrative requirements (as determined by the NBR) that have to be implemented by the respective LAs through
- the guidelines for plan submission,

- the plan submission process,
- the notice of plan approval, and
- the listed inspections, to be conducted on site by the LA or its representative.

1.7.5 The 1968 *Intergovernmental Conference for Rational Use and Conservation of the Biosphere* of the United Nations Educational, Scientific and Cultural Organization (UNESCO) is recognised by this study as the first multinational assembly where ecologically sustainable development was debated (Fuad-Luke, 2004: 8).

1.7.6 The study accepts the validity of the goals (and subsequent deadlines) as determined by the following multilateral agreements that have been signed by South Africa (Sustainable Energy Africa, 2006: 129) (CIDB & UNEP SBCI, [2008]: 24):

- The 1992 *United Nations Framework Convention on Climate Change* (UNFCCC or FCCC)⁵
- The 1997 *Kyoto Protocol to the UNFCCC* (ratified by South Africa in 2002)⁶
- The 2000 *Millennium Declaration and Millennium Development Goals* (MDGs)⁷
- The 2002 *Johannesburg Plan of Implementation* (JPOI) (2002)⁸

1.7.7 Lastly, the study recommends that the above goals and deadlines should be implemented in the South African built environment as a matter of urgency.

1.8 PURPOSE OF THE STUDY

The purpose of this study is to determine the origin of the current minimum regulations and standards applicable to the built environment of South Africa, and to examine the goals and implementation methods of the National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977) and its Regulations (together

⁵ The UNFCCC is an intergovernmental treaty developed to address the problem of climate change that "...sets out an agreed framework for dealing with the issue..." (CIDB & UNEP SBCI, [2008]: 24).

⁶ The Kyoto Protocol "...does not commit developing countries like South Africa to any quantified emissions targets in the first commitment period..." (2008-2012) (Sustainable Energy Africa, 2006: 129) (CIDB & UNEP SBCI, [2008]: 24).

⁷ The eight MDGs constitute a blueprint to meet the needs of the world's poorest by the target date of 2015 (Sustainable Energy Africa, 2006: 129).

⁸ The JPOI was the outcome of the World Summit on Sustainable Development and highlights areas of key importance for ensuring sustainable development (i.e. economic and social development and environmental protection) (Sustainable Energy Africa, 2006: 129) (CIDB & UNEP SBCI, [2008]: 24).

with the Code of Application⁹ (SANS 10400:1990¹⁰), in an attempt to achieve uniform implementation of the requirements and align the aforementioned with accepted passive design principles to promote a more sustainable built environment in South Africa.

1.7 OBJECTIVES

The specific objectives that the study sets out to accomplish are the following:

- 1.7.1 To determine the origin and goals of the current edition of the NBR, which represents the minimum regulations and standards applicable to the built environment of South Africa.
- 1.7.2 To determine how various LAs implement the requirements of the NBR, and whether this is done uniformly across South Africa.
- 1.7.3 To determine whether the relevant role-players (BCOs) are aware of recent developmental changes to the NBR.
- 1.7.4 To determine if BCOs are willing to implement new regulations that focus on sustainability in the existing administration system of the NBR.
- 1.7.5 To identify specific passive design criteria that would have a limited impact on developmental costs for possible inclusion in the NBR and the administrative processes thereof.
- 1.7.6 To propose (within the existing administrative system of the NBR) a new standardised format for plan approval to assist the BCO in implementing the requirements of the NBR and possible passive design criteria.

1.8 THE RESEARCH CONTEXT

The research design was formulated within a particular milieu. The purpose of the following section is to provide the research context and specifically the researcher's paradigm. Paul Leedy equates research to architectural planning, starting at the conceptual level and progressing through various stages to detail planning (1985: 81).

In the discipline of architecture, “[c]ontext refers to the fact that most buildings are designed and made for a specific place; the characteristics of which represent many of the constraints and opportunities in which a design is determined ... However,

⁹ This refers to the Code of Practice for the application of the National Building Regulations.

¹⁰ SANS 10400 was previously known as SABS 0400-1990.

respect for context does not necessarily mean that a design has to conform” (Porter, 2004: 37). The research presented in this document was approached in a similar manner.

Research is frequently undertaken in the built environment, although the results of such exercises are not evident and often do not contribute to a larger body of knowledge. In Groák’s *The idea of building* (1992), it is argued that the architect in practice employs research aids in decision making, especially when designing and documenting a building project. Groák (1992: 67) states that practitioners in the built environment tend “...not to publish the full richness of their knowledge and experience, their know-how, relying instead on oral traditions and the examples available in existing buildings”. He advocates a greater need for research literacy on the part of the practitioner, because “...all building projects will have to be treated as innovative, *whether or not those concerned intend them to be so*” (Groák, 1992: 180).

Fellows and Liu (2003: x) state that “...construction is of major importance to all societies and economies, it is essential that the discipline advances as rapidly and as rigorously as possible”. An essential component in the development of any discipline or profession is establishing a unique body of knowledge. “Construction draws on a wide variety of established subjects ... and applies them to its particular context and requirements” (Fellows & Liu, 2003: ix). However, Fellows and Liu (2003: 6) remind the researcher of possible bias, stating that “[t]he fact that research is being carried out will itself influence the results...” In the opinion of the researcher, a research project is executed within a particular context, and the process requires a well-defined method that allows for adaptability.

1.9 THE RESEARCH PARADIGM

The research paradigm refers to the researcher’s point of reference. It highlights views adopted by the researcher and his approach to questioning and discovery. This is required because the research subject is not studied in an isolated environment (such as a chemical laboratory). In this study, the researcher acknowledges both the positivist ideal and the interpretivist paradigm (as proposed by the structuralist).

According to Weber (2004: x), the difference between Positivism and Interpretivism is located in the choice of research methods, rather than in any substantive differences at a meta-theoretical level (Table 2). However, Weber argues that the quality of the research is dependant on the research method (2004: xi). Weber also warns against “...obfuscation in the rhetoric... [and proposes the use of] ...simple language...” when engaging in discourse (Weber, 2004: xi).

Table 2: The differences between positivist and interpretive research approaches as characterised by Sandberg (Weber, 2004: iv)

Meta-theoretical assumptions	Positivism	Interpretivism
Ontology	Person (researcher) and reality are separate.	Person (researcher) and reality are inseparable (life-world).
Epistemology	Objective reality exists beyond the human mind.	Knowledge of the world is intentionally constituted through a person’s lived experience.
Research object	The research object has inherent qualities that exist independently of the researcher.	The research object is interpreted in the light of the meaning structure of the person’s (researcher’s) lived experience.
Method	Statistics, content analysis.	Hermeneutics, phenomenology, etc.
Theory of truth	Correspondence theory of truth: one-to-one mapping between research statements and reality.	Truth as intentional fulfilment: the interpretations of the research object match the lived experience of the object.
Validity	Certainty: data truly measures reality.	Defensible knowledge claims.
Reliability	Replicability: research results can be reproduced.	Interpretive awareness: researchers recognise and address the implications of their subjectivity.

The above model (Table 2) proposed by Sandberg (in Weber, 2004: iv) was adapted (Table 3) to communicate the researcher’s normative position regarding the positivist – and interpretivist – research paradigms.

- A list of alternative terms commonly used to describe the paradigms was compiled for the sake of clarity.
- A continuum scale was inserted between the two research approaches, and the researcher’s extent of endorsement of each was communicated. It should be noted that the scale is balanced, with three assumptions indicated as neutral and two each in support of positivism and interpretivism respectively.
- The normative position of the researcher is defined at the hand of the listed seven meta-theoretical assumptions.

Although objectivity remains an ideal, Fellows and Liu state that “...research has both cultural and moral contents and so a contextual perspective ... is important to appreciate the validity of the study” (Fellows & Liu, 2003: 17).

Positivism recognises non-metaphysical facts and observable phenomena. It indicates that certain observable facts remain uninfluenced by observation or measurement. According to scientific positivism, the Cartesian duality is maintained when the same input provides the same result under similar circumstances (Fellows & Liu, 2003: 18). It could be argued that there is a strong relation between positivism and the quantitative approach.

The interpretivist paradigm refers to the perceived reality of those involved in the research process. This paradigm is based on the argument that a person’s reality is defined by observations and modifications through socialisation, which include upbringing, education and training (Fellows & Liu, 2003: 17-18). Within the interpretive paradigm, further distinction is made when the impact of the social structure is considered, and the perspective of structuralism is included. Culler, as cited in Rosen (1984: 2), states that “...structuralism is based ... on the realization that if human actions or productions have a meaning, there must be an underlying system of convention which makes this meaning possible”.

According to Fellows and Liu (2003: 19), the structuralist “... argue[s] that structure is fundamental to how society operates and to the determination of its value, customs, etc.”

Fellows and Liu further distinguish between pure and applied research in the second edition of *Research Methods for Construction* (Fellows & Liu, 2003: 7-8). “Research is never a completely closed system ... [it is] of necessity, an open system which allows for adaptability” (Fellows & Liu, 2003: 6). Pure research aims to contribute to the body of theory that exists, thereby developing knowledge in the search for the ‘truth’. Applied research attempts to solve a practical problem, whereas the addition of knowledge is more incidental. “...[P]ure research develops scientific knowledge and so asks ‘is it true?’ whilst applied research uses scientific knowledge and so asks ‘does it work?’” (Fellows & Liu, 2003: 8).

The research conducted in this study could be classified as applied research with an open-ended approach to the problem. The researcher acknowledges the description of applied research and accepts certain principles of sustainability (as defined in the realm of scientific knowledge) in the built environment. A major concern that arises from the research is the integration of different forms of research to aid informed application in the construction arena.

Table 3: The differences between positivist and interpretive research approaches as characterised by Sandberg (Weber, 2004: iv)

RESEARCHER'S PARADIGM										
	Positivism Sandberg and Weber	+	Pre-disposition of the researcher on continuum scale					~	Interpretivism Sandberg and Weber	
Meta-theoretical assumptions	Alternative terms: Quantitative, scientific, experimental, hard, reductionist, prescriptive, psychometric, etc.		Strongly agree	Agree	Neutral	Agree	Strongly agree	Alternative terms: Qualitative, soft, non-traditional, holistic, descriptive, phenomenological, anthropological, naturalistic, illuminative, etc.	Normative Position of Researcher	
Ontology	Detached experience Person (researcher) and reality are separate.							Integrated experience Person (researcher) and reality are inseparable (life-world).	i. The researcher believes it difficult to separate a reality from the individual who observes it. In this study the subject (the researcher) is linked with the object (the phenomenon in the world that is focused upon) through previous experiences, history, culture, future expectations, etc.	
Epistemology	Objectivity Objective reality exists beyond the human mind.							Subjectivity Knowledge of the world is intentionally constituted through a person's lived experience.	ii. Although the researcher attempts to construct an objective independent reality, the social construction of knowledge is simultaneously accepted.	
Research object	Separate The research object has inherent qualities that exist independently of the researcher.							Incorporated The research object is interpreted in the light of the meaning structure of the person's (researcher's) lived experience.	iii. The research activity requires of the researcher to measure and interpret the object. This activity is influenced by a pre-disposition, thereby affecting the observed phenomena.	
Research method	Content analysis through statistics Preferred research methods include laboratory experiments, field experiments, surveys, etc.							Content analysis through interpretation Preferred research methods include case studies, ethnographic studies, phenomenographic studies, ethno-methodological studies, etc.	iv. Although a survey provides the main body of data for the study, the researcher accepts a bias in the selection and composition of the questions that are used in the questionnaire.	
Theory of truth	Statement = Truth → Objective Reality Establishing a direct relationship between the research statements and reality.							Initial interpretation = Truth → confirms a meaning (from researcher's experience) Truth as intentional fulfilment: interpretations of research object match lived experience of subject.	v. The artefacts (theories, frameworks, constructs, etc.) used by the researcher to understand the world are based on a pre-conception that is influenced by a wide range of socio-cultural factors.	
Validity	Certainty: The data truly measures reality. A direct relationship exists between measurements + phenomena.							The knowledge (claim) is defensible Evaluation criteria include credibility, transferability, dependability, and ability to confirm.	vi. The researcher supports a legitimacy concept that is intimately linked to specific research methods and subsequent forms of data analysis.	
Reliability	Replicability Research results can be reproduced by the researcher or other researchers to achieve a consistent result.							Interpretive awareness Researchers recognise and address the implications of their subjectivity.	vii. The idea of replicability forms the focus of the respective research paradigms. The methods implemented as part of the study align closely with the Positivist approach.	

Fellows and Liu (2003: 11) categorise the research question according to its purpose. The current study employs characteristics of both the Exploratory and Interpretive categories, as listed below. In addition, the study is based on the Heuristic model, "...in which variables are grouped according to (assumed) relationships..." (Fellows & Liu, 2003: 12).

The applicable research methods could briefly be described as follows (Fellows & Liu, 2003: 11):

- **Exploratory**

The hypothesis is formulated within a pre-defined context; the theory is then tested via a process of data collection, analysis and interpretation.

- **Explanatory**

A specific phenomenon of the hypothesis is tested. This question represents an extension of the aforementioned exploratory phase.

- **Interpretive**

A heuristic model is employed here, where the variables are grouped together according to assumed relationships.

The research approach finds its origin in the dialectic approach, following the writings of Georg Wilhelm Friedrich Hegel who argues that a theory develops through thesis, antithesis and synthesis – the dialectic triad. Debate forms an inherent part of this process and the cycle of dialectic triad is continuously regenerated (Fellows & Liu, 2003: 13).

The historian William Shirer (1990: 144) quotes Hegel as follows in *The rise and fall of the Third Reich*: "...the State has the supreme right against the individual, whose supreme duty is to be a member of the State..." In studying the NBR, it becomes evident that in matters concerning the regulation of the South African built environment, the Republic exerts a similar right (as the aforementioned State), while the citizens (of South Africa) are dutifully obliged when erecting a structure to honour the Government.

The research paradigm applicable to this study is summarised in Table 4.

Table 4: Summary of the research paradigm

RESEARCH PARADIGM	
1. RESEARCH CONTEXT:	A balance between Positivism and Interpretivism
2. RESEARCH CLASSIFICATION:	Applied research with an open-ended problem
3. RESEARCH CATEGORY:	A mixture of Exploratory and Interpretive research, based on the Heuristic model
4. RESEARCH APPROACH:	Originating in the Dialectic model, following Hegel and Rosen through the implementation of the Dialectic triad

1.10 THE RESEARCH DESIGN

According to Fellows and Liu (2003: 5), “[r]esearch is a learning process ... perhaps the only learning process”. The relationship between the research question, data required and data analysis constitutes the basis of the research design. Fellows and Liu argue that the definition of different research styles varies to such an extent that the boundaries between different styles are not well defined (2003: 21). However, in *Research Methods for Construction*, Fellows and Liu (2003: 21-28) discuss different research styles and strategies according to the respective authors (Table 5).

Table 5: Summary of research styles

Research styles/strategies			
Research styles as termed by Bell (1993) (as cited in Fellows & Liu, 2003: 21-28)	Research strategies as termed by Yin (1994) (as cited in Fellows & Liu, 2003: 21-28)	Shortened description as defined by Fellows and Liu (1997) (as cited in Fellows & Liu, 2003: 21-28)	Implementation in proposed study
Action		Research intentionally attempts to affect change in the social system.	Not applicable
Ethnographic		A scientific study of races and cultures, involving the hermeneutic circle.	Not applicable
	Histories	The past is studied on the basis of the research questions ‘How?’ and ‘Why?’	Yes
	Archival analysis	Present or past is studied; little control over independent variables is required.	Yes
Surveys	Surveys	Statistical sampling that represents a population and often employs questionnaires and interviews.	Yes
Case studies	Case studies	An in-depth investigation of certain aspects through interviews with key ‘actors’.	Partially
Experimental	Experiments (including quasi-experiments)	This is usually conducted in laboratories to determine the relationship between variables.	Not applicable

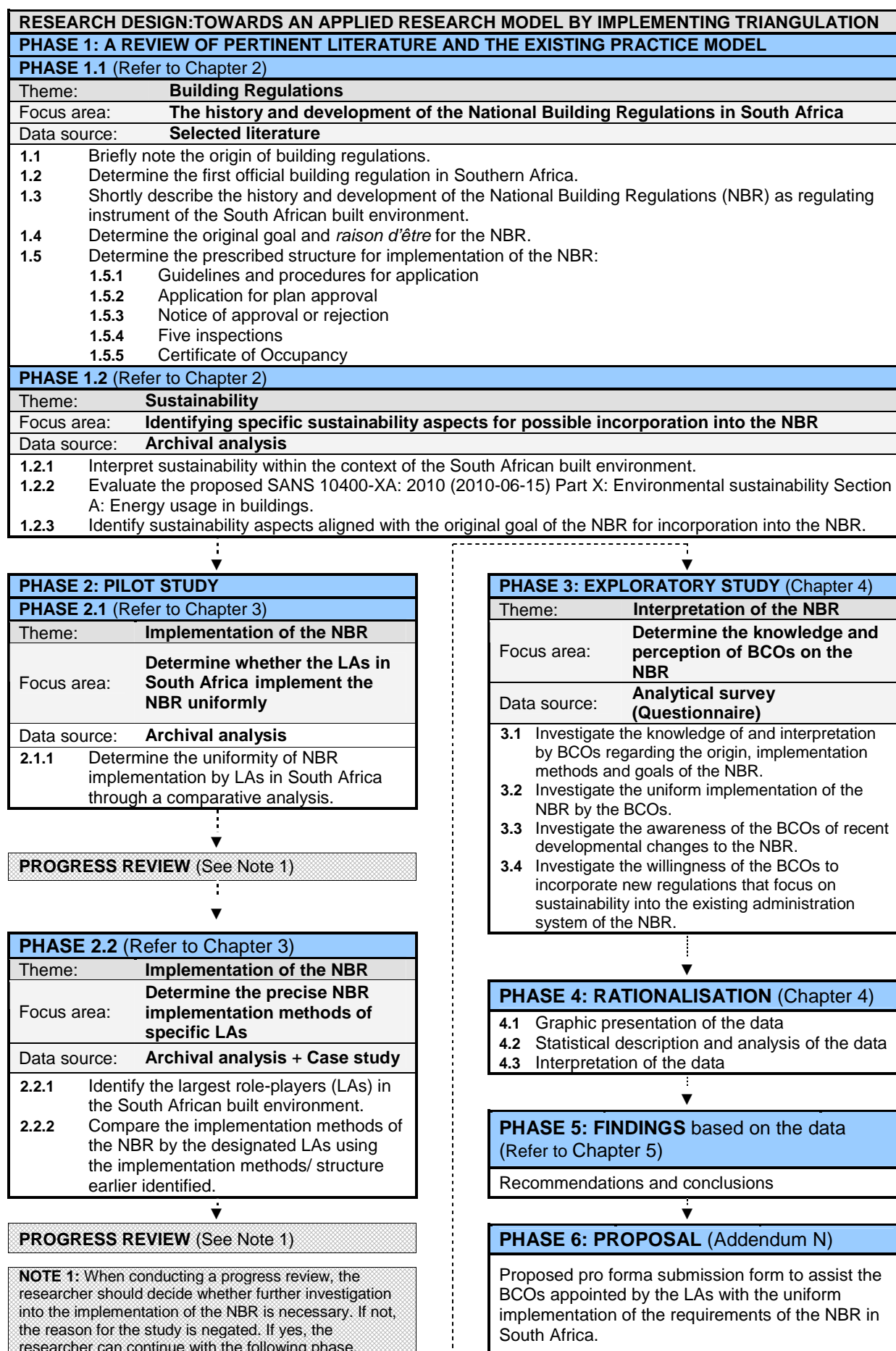
The desk study is initiated from a chronological (or historical) perspective and selected information is presented within the context of the study. The relevant theoretical approaches are identified and studied as part of the literature review to formulate the research questions and hypotheses during Phase 1.

Phase 2 of the study progresses to an archival analysis aimed at defining the operational framework of the South African built environment and refer to the relevant voluntary and compulsory standards and norms. In addition, the size and impact of the built environment is investigated based on available statistics on the number of plans approved, after which statistical comparisons are made to identify certain relationships (should there be any). This phase concludes by defining the population, selecting a target group, and determining the sample size for Phase 3.

During Phase 3 of the study a questionnaire is designed (and tested before implementation) to obtain data from specific role-players with reference to aspects surrounding the NBR and sustainability. Statistical analysis is employed to test the original hypotheses and to determine resulting patterns, should there be any.

The finalisation of the study consists of two parts. Phase 4 lists the phenomena observed and leads to deductions based on evidence and reasoning. The study is completed during Phase 5 with a series of conclusions and recommendations in Table 6.

Table 6: Summary of the research design



1.11 THE TRIANGULATION RESEARCH APPROACH

The primary classification of research methodology is based on the particular method employed to conduct the research. The available methods could be placed on a continuum, with the quantitative or 'scientific' method representing one extreme and the qualitative method representing the other. The qualitative method describes an exploration without prior formulations. Fellows and Liu (2003: 9) propose a method of triangulation, using both methods simultaneously, to study a topic. This would result in powerful insight that could assist the drawing of conclusions. Similarly, the research design for this study is based on a method that triangulates the quantitative and qualitative data, although these are grouped in different phases.

Fellows and Liu (2003: 106) equate the collection of data to a process of communication where the aim is to maximise convergence between provider and researcher in an attempt to achieve the most accurate transfer of meaning.

1.12 THE IMPORTANCE AND BENEFITS OF THE STUDY

It could be argued that although the NBR define the current minimum regulations and standards applicable to the built environment of South Africa, it fails to provide an instrument for its uniform application.

This study not only discovers the need for an implementation instrument, but enters into discussion with the BCOs as the operational officers tasked with enforcing the NBR. This dialogue clarifies specific areas of uncertainty surrounding the NBR.

The study continues to identify certain passive environmental design criteria for possible inclusion as an additional requirement to the NBR so as to promote sustainability without incurring substantial additional cost. The introduction and application of passive environmental design criteria should result in buildings that consume less energy during their operation without significantly increasing the construction cost.

Finally, the study proposes a pro forma application form for building plan approval that should assist the BCOs during the process of implementing of the NBR.

1.13 THE RESEARCHER'S EXPERTISE TO COMMENT ON THE TOPIC

The author holds formal qualifications in architecture as well as urban and regional planning, and has been practising as a Professional Architect for the last 10 years. Moreover, he has been actively involved in tertiary education in the built environment for the same number of years.

The Law of Building and Engineering Contracts and Arbitration requires from the author as a practising architect to be "...cognizant of the requirements of building by-laws and statutes relating to building and of the town-planning restrictions in the area where a building is to be erected ... where there has been a failure on the part of the architect to observe a clear statutory enactment relating to building or town-planning which is obligatory, he would not be entitled to remuneration, on the basis that he has failed to exercise proper professional skill" (McKenzie & McKenzie, 1988: 76-77).

Hence, the researcher's vocational training, the statutory requirements of his profession and his experience in practice and education have adequately equipped and qualified him to research the topic.

1.14 SUMMARY OF CHAPTER 1

Chapter 1 defines the problem and its setting, and the statement of the main problem is provided along with the sub-problems. Different hypotheses are formulated for testing. Reference is made to selected terms and their respective definitions. The assumptions on which the study is based are listed together with the possible benefits of the study, and its objectives.

The research context and paradigm are stated to provide insight into the nuanced normative position of the author. The proposed research design is discussed based on a diagram to illustrate the employment of a triangulated research approach. The chapter concludes with a brief justification of the researcher's expertise to comment on the specific research topic.