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An investigation of the National Building Regulations to promote uniformity and sustainability in the South African built environment

by

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PRETORIA
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In accordance with Regulation 4(e) of the General Regulations (G.57) for dissertations and theses, I declare that this thesis, which I hereby submit for the degree Philosophiae Doctor (Architecture) at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

I further state that no part of my thesis has already been, or is currently being, submitted for any such degree, diploma or other qualification.

I further declare that this thesis is substantially my own work. Where reference is made to the works of others, the extent to which that work has been used is indicated and fully acknowledged in the text and list of references.

The thesis is 107 308 words long (excluding the scanned items).

Jacques Laubscher

TABLE OF CONTENTS

….man leaves a resistant sediment on the earth: a mixture of objects and signs that bear witness to his passage, to his role as an agent of change on the surface of the earth and in more recent years, on what is above and below its crust. Certainly, the most significant of this sediment is architecture... It is necessary to build, to consolidate, to protect the constructed object as a part of nature, man's ally, by creating conditions that continually evolve and correspond to different (and contradictory) levels of understanding in the relationship between nature and architecture. (Portogeseshi & Young, 2000: 9)

PREFACE

The current minimum standards applicable to the South African building industry (as defined by the *South African National Standard (SANS) 10400:1990 The application of the National Building Regulations*, May 2010) are slow to incorporate sustainability aspects, despite a worldwide trend towards sustainable design principles and 'green' construction methods. Although a new draft standard on *Part XA: ENERGY USAGE IN BUILDINGS* was published for public comment, the current standards do not mention sustainability.

Development in the built environment of the Republic of South Africa (South Africa) shows little progress in becoming more sustainable, although current literature describes the building industry as one of the major consumers of resources.

It is the author's opinion that the origin, goals and implementation methods of the existing regulatory structures of the South African built environment should be investigated in an attempt to align the building industry with the goals of key environmental and development milestones.

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LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

10400	See SANS 10400:1990
0400	See SABS 0400-1990 and SANS 10400:1990
Act 103 of 1977	National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977)
Act 5 of 2008	National Regulator for Compulsory Specifications Act, 2008 (Act 5 of 2008)
BCO(s)	Building Control Officer(s)
Code	Code of Practice, see SANS 10400:1990
CIB	*Conseil International du Bâtiment*
CHPE	Centre for Housing Performance Excellence
CSIR	Council for Scientific and Industrial Research
DSS	Draft South African Standard
DME	Department of Minerals and Energy (since 2009 functioning as two separate departments: the Department of Energy and the Department of Mineral Resources)
DTI	Department of Trade and Industry
GBC	Green Building Council
HVAC	Heating, Ventilation and Air Conditioning
LA(s)	Local Authority (Local Authorities)
MDGs	Millennium Development Goals
NBR	National Building Regulations, see SANS 10400:1990
NFRC	National Fenestration Rating Council
NHBRC	National Home Builders Registration Council
NRCS	National Regulator for Compulsory Specifications
SANS 10400-XA: 2010 (Part XA)	SANS 10400-XA: 2010 The Application of the National Building Regulations Part X: Environmental Sustainability Section A: Energy Usage in Buildings
Republic of South Africa	South Africa
SA	South Africa
SABS	South African Bureau of Standards
SANS	South African National Standard(s)
SANS 10400:1990	South African Standard, Code of Practice for the application of the National Building Regulations, previously known as SABS 0400-1990
SABS 0400-1990	South African Standard, Code of Practice for the application of the National Building Regulations
SANS 204	South African standard for energy efficiency in buildings, consisting of the following three documents: ● SANS 204-1 Part 1: General requirements ● SANS 204-2 Part 2: Naturally ventilated buildings (with natural environmental control) ● SANS 204-3 Part 3: Artificially ventilated buildings (with artificial environmental control)
SALGA	South African Local Government Association
SBR	Standard Building Regulations
Stats SA	Statistics South Africa
UNCHS	United Nations Centre for Human Settlements
UNEP	United Nations Environment Programme
UNEP SBCI	United Nations Environment programme, Sustainable Buildings & Climate Initiative
UNFCCC	United Nations Framework Convention on Climate Change
WISOPS	Weather Intelligence Systems (Pty) Ltd
WorldGBC	World Green Building Council
WTO	World Trade Organization
Z of S	Zone of Space

LIST OF SELECTED TERMS

Building regulation	For the purposes of this study a building regulation is acknowledged as *a) a regulating instrument that* *b) describes a minimum standard, that* *c) should be implemented during the building process (that initiates with design, and continues through construction, maintenance, alteration and repair to demolition of buildings and/or structures), with the aim of* *d) protecting public health and safety during* *e) the construction, occupation and/or post-occupation phases of buildings and/or structures.* (see pp. 27-28)
Built environment	"[A]n urban or [a] rural milieu, structured or produced by built form, that is part of the surroundings relating to buildings, structures and civil engineering works." (Davies & Jokiniemi, 2008: 53) "The built environment includes all structures that are planned and/or erected above or under ground, as well as the land utilised for this purpose and the supporting infrastructure." ([Sigcau], 1999: 2)
He	The pronoun 'he' will be used throughout the document in an attempt at brevity, because the English language has no alternative gender-neutral pronoun in the singular.
Man	Man/woman sexless society.
National Building Regulations	The set of building regulations as applicable in South Africa.
Plan approval	In the current study, this term refers to the whole process of plan approval that is initiated with the submission to the LA, unless otherwise stated.

SYNOPSIS

At present, the National Building Regulations (NBR) represent the minimum statutory requirements for most buildings erected in the formal built environment of the Republic of South Africa (South Africa). Although attempts have recently been made to include requirements on energy efficiency, the current version of the NBR does not mention sustainability. Local authorities (LAs) in South Africa do not use a standardised method to implement the existing requirements of the NBR uniformly.

The purpose of this study is to determine the origin, and examine the goals and implementation methods of the current minimum regulations and standards applicable to the built environment of South Africa, as defined in the *National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977)* and the associated *Regulations,* together with the *Code of Practice for the Application of the NBR (SANS 10400:1990).*

This thesis asks the following questions:

1. What are the goals and methods of implementation of the NBR, which represents the minimum regulations and standards applicable to the built environment of South Africa?
2. Are the current regulations and standards as defined by the NBR implemented uniformly by the respective LAs?
3. Are the most significant role-players in plan approval process, namely the Building Control Officers (BCOs),
    aware of the goals and methods of implementation of the NBR?
    willing to support the uniform implementation of the NBR?
    aware of recent developmental changes to the NBR?
2. Are BCOs willing to implement new regulations that focus on sustainability within the existing administration system of the NBR?

The study recognises the current administrative procedures used to implement the NBR as vehicle to initiate sustainability ideals in the South African built environment. The BCO plays a pivotal role in advising the LA on a submission for building plan approval. The BCO uses a plan submission checklist to scrutinise all applications. The researcher argues that this instrument (the plan submission checklist) could be

used to achieve certain ideals on passive environmental design and at the same time adhere to the goals of the NBR.

The study identifies specific passive environmental design aspects for possible inclusion in the checklist. It is argued that the inclusion and active implementation of the aforementioned by the BCO (in the existing administrative system of the NBR) should contribute significantly to making the South African built environment more sustainable, without resulting in excessive additional cost to the building project.

The study comprises of the following elements:

1. The problem and its setting are described as part of the **introduction**.
2. The **literature review** focuses on building regulations with specific reference to the development of the NBR in South Africa.
3. The research is initiated by means of a **pilot study** in order to determine whether the requirements of the NBR are implemented uniformly in South Africa.
4. The focus of the chapter dealing with **research and data interpretation** is a questionnaire to the BCO that aims to determine the opinion and judgement of the BCO as the most significant role-player in the plan approval process.
5. The thesis concludes with a **summary, recommendations and conclusions** in which the findings are presented against the background of the particular problem statements and consequential hypothesis.
6. **References**
7. The **addenda** contain inter alia a proposed new plan submission checklist (Addendum N). This pro forma attempts to incorporate certain passive design criteria while ensuring the uniform application of the NBR. The plan submission pro forma will require further investigation and testing before possible implementation.

ABSTRACT

Full title:	**An investigation of the National Building Regulations to promote uniformity and sustainability in the South African built environment**
Submitted by:	Jacques Laubscher (Mr)
Supervisor:	Pieter Tobias Vosloo (Prof.)
For the degree of:	Philosophiae Doctor in Architecture
Department:	Department of Architecture
Faculty:	Faculty of Engineering, Built Environment and Information Technology
University:	University of Pretoria

The study investigates two aspects that arise when an application is made for building plan approval to the Building Control Officer (BCO) in the Department of Building Control at a local authority (LA). Firstly, the uniform application of the minimum requirements for building plan approval is studied. Secondly, while keeping the original goal of the National Building Regulations (NBR) in mind, the inclusion of passive design requirements is considered as part of the minimum requirements.

In the Republic of South Africa (South Africa), the National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977) determines the minimum requirements of any building. Although the NBR are in the process of being re-written, the amended 1990 version is still being used. On 15 June 2010, the South African National Standard (*SANS*) *10400-XA: The Application of the National Building Regulations Part X: Environmental Sustainability Section A: Energy Usage in Buildings*, was published for public comment. However, the current version of the NBR does not address sustainability. Therefore, it is argued that the planning and erection of structures within the South African built environment do not currently conform to any minimum sustainability requirements.

A series of 'Deemed-to-Satisfy Rules' constitutes an integral part of the NBR. Should a development in the built environment comply with these prerequisites, it is observing the statutory requirements of Act 103 of 1977. The regulations are implemented by the Department of Building Control of the different LAs (or

municipalities). Act 103 of 1977 also prescribes the appointment, qualifications and functions of the BCO who should head the department. However, it is the LA's responsibility to appoint the BCO.

An LA's Department of Building Control uses guidelines (as determined by Act 103 of 1977) to approve applications for new buildings and alterations to existing ones. A series of prescribed inspections should be conducted during the construction phase of a building. Before a building can be used for its intended purpose, the BCO has to sign a Certificate of Occupancy. Although the NBR provide prescriptions, the requirements are implemented in different ways by the various LAs.

After determining the origin and examining the goals and implementation methods of Act 103 of 1977 and its Regulations (together with the Code of Application (SANS 10400:1990)), this study demonstrates that the current edition of the NBR is not uniformly implemented in the Republic of South Africa. Additionally, the study links the original goal of the NBR to limit inflationary tendencies with current practice to use passive design principles to combat building operation costs.

Lastly, a pro forma application form is included as an addendum (although it is not officially part of the study). This proposed pro forma could assist in the uniform implementation of NBR, while at the same time promoting sustainability.

Keywords:
Act 103 of 1977, National Building Regulations (SABS 0400/SANS 10400), local authority, municipality, department of building control, building control officer, building plan approval, sustainability, built environment, building standards, and passive design.

EKSERP

Volle titel:	**'n Ondersoek na die Nasionale Bouregulasies om eenvormigheid en volhoubaarheid in die bou-omgewing van Suid-Afrika te bevorder**
Voorgelê deur:	Jacques Laubscher (Mnr.)
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Fakulteit:	Fakulteit Ingenieurswese, Bou-omgewing en Inligtingtegnologie
Universiteit:	Universiteit van Pretoria

Die studie ondersoek twee aspekte wat ter sake is wanneer 'n aansoek om bouplangoedkeuring by die Boubeheerbeampte in die Boubeheerafdeling van 'n plaaslike owerheid ingedien word. Eerstens word die eenvormige toepassing van die minimum vereistes vir bouplangoedkeuring bestudeer. Tweedens word die insluiting oorweeg van passiewe ontwerpmaatreëls (as deel van die minimum vereistes) wat steeds aan die oorspronklike doel van die Nasionale Bouregulasies voldoen.

In Suid-Afrika bepaal die Wet op Nasionale Bouregulasies en Boustandaarde, 1977 (Wet No. 103 van 1977) die minimum vereistes waaraan enige gebou moet voldoen. Die Bouregulasies word tans herskryf, maar die gewysigde 1990-weergawe word steeds gebruik. Alhoewel die Suid-Afrikaanse Nasionale Standaard (*SANS*) *10400-XA: The Application of the National Building Regulations Part X: Environmental Sustainability Section A: Energy Usage in Buildings* op 15 Junie 2010 vir publieke kommentaar gepubliseer is, spreek die huidige weergawe van die Nasionale Bouregulasies steeds nie volhoubaarheid aan nie. Derhalwe word die beplanning en oprigting van strukture binne die bou-omgewing nie aan enige minimum vereistes rakende volhoubaarheid onderwerp nie.

'n Reeks voldoeningsvereistes of sogenaamde 'Geag-te-Voldoen Reëls' maak 'n integrale deel van die Nasionale Bouregulasies uit. Indien 'n ontwikkeling in die bou-omgewing aan hierdie reëls sou voldoen, word dit as voldoende beskou ingevolge die statutêre vereistes gestel deur Wet No. 103 van 1977. Die Regulasies word

Africa, where the "…ancient Egyptians used the familiar grid pattern to house workers on the pyramids in the third millennium BC." (2000: 230)

When Herodotus of Halicarnassus visited Giza in *circa* 450 BCE, he was informed that it had taken 400 000 men 20 years to finish the pyramid of Cheops. In contrast, "…the British archaeologist Petrie estimated that 100 000 men would have sufficed" (York, 1997: 4). Notwithstanding the difference in estimates, a *laissez faire* approach to the built environment would have inhibited development. It could therefore be argued that in order to manage the man-made environment, building works and associated processes, specific regulations were introduced. According to David it was necessary to organise the sites that housed the royal workmen, craftsmen and labourers (2003: 56-59). Often the sites "…were chosen because they were near to the worksite … even the proximity of a good water supply was not considered essential to these town sites, the requirements of isolation and security being greater" (David, 2003: 59). However, these built environment regulations mostly focused on the man-made, while negating the possible symbiotic relationship between architecture and nature.

Advances in medicine impacted on the built environment in terms of additional health requirements. Descriptive examples can be found in for instance the Roman system for sewerage removal and the aqueducts constructed for the provision of fresh water. Population estimates indicate that at its peak Rome had approximately one million inhabitants. According to Cowan, "…the AD 300 census of Rome listed 1 797 *domus* (houses) and 46 602 *insulae* (blocks of flats)…" (1985: 68). With the development of civilisation, man increasingly exerted his influence on the natural habitat, using its resources to support his endeavours.

Unfortunately, events of catastrophic proportions usually necessitated the refinement of the rudimentary requirements employed to provide order within the built environment. After the great fire of AD 64, Emperor Nero issued a decree limiting the height of buildings, banning mid-walls between *insulae,* requiring accessible roofs for fire fighting at porticoes, and restricting the use of timber. Additionally, he cut straight wide roads through the burnt-out areas of the city to act as fire breaks and provide access for fire fighters (Cowan, 1985: 68-70). In more recent history, the Fire of

toegepas deur die verskillende plaaslike owerhede (of munisipaliteite) se onderskeie afdelings vir boubeheer. Die Wet bepaal ook die aanstelling, kwalifikasies en funksies van die Boubeheerbeampte wat aan die hoof van die afdeling staan. Die plaaslike owerheid is egter verantwoordelik vir die aanstelling van die Boubeheerbeampte.

Die Boubeheerafdeling maak van sekere riglyne gebruik (soos bepaal deur Wet No. 103 van 1977) wanneer planne vir nuwe geboue asook vir veranderings aan bestaande geboue goedgekeur word. Verder word sekere inspeksies voorgeskryf wat tydens die oprigting van die gebou uitgevoer moet word. Alvorens ’n gebou in gebruik geneem mag word, moet daar ’n okkupasiesertifikaat deur die Boubeheerbeampte uitgereik word. Hoewel bogenoemde voorskrifte in die Nasionale Bouregulasies vervat word, word dit op verskillende wyses deur die onderskeie plaaslike owerhede toegepas.

Die oorsprong, doelwitte en toepassingsmetodes van Wet 103 van 1977 en die gepaardgaande Regulasies asook Toepassingskodes (SANS 10400:1990)) word bestudeer. Hierdie studie bevestig dat die huidige weergawe van die Nasionale Bouregulasies nie eenvormig in Suid-Afrika toegepas word nie. Bykomend word die oorspronklike doel van die NBR (om inflasie teen te werk) verbind met die huidige gebruik van passiewe ontwerp (ten einde die operasionele koste van geboue te beperk).

Laastens word ’n pro forma-aansoekvorm as ’n addendum ingesluit (hoewel dit streng gesproke nie deel van die studie vorm nie). Die aansoekvorm kan moontlik gebruik word vir die eenvormige toepassing van die Nasionale Bouregulasies, terwyl volhoubaarheidsaspekte terselfdertyd aangespreek word.

Sleutelwoorde:
Wet No. 103 van 1977, Nasionale Bouregulasies (SABS 0400/SANS10400), plaaslike owerheid, boubeheerafdeling, boubeheerbeampte, bouplangoedkeuring, volhoubaarheid, bou-omgewing, boustandaarde en passiewe ontwerp.