



2. LITERATURE REVIEW OF PERTINENT ASPECTS

2.1 INTRODUCTION

The purpose of this chapter is to

- note the origin of building regulations;
- determine the South African origin, development, goals and methods of implementation of the current edition of the NBR, and
- evaluate recent changes to the NBR in the light of its set goals.

The literature review focuses on the regulatory framework of the built environment and is presented from a historic perspective (in chronological order). The first section of this chapter serves as an introduction that provides a brief overview of the origin of building regulations. The second part of the chapter traces the origin and development of the primary legislative instrument governing the erection of buildings in the South African built environment.

This chapter focuses on sub-problem 1, namely:

What is the origin of the NBR, and did the goals and the methods of implementation of the current edition of the NBR (which represents the minimum regulations and standards applicable to the built environment in SA) evolve since its origin?

It is hypothesised that a study of the origin, implementation methods and goals of the NBR is necessary to emphasise the importance of the NBR within the South African built environment.

2.2 THE ORIGIN OF BUILDING REGULATIONS

2.2.1 The Code of Hammurabi

Watermeyer (2003:25) claims that "...building standards have been in place since man was able to capture his thoughts in writing". According to Cowan the oldest surviving building code can be traced back to the reign of King Hammurabi in Mesopotamia (1985: 27). However, the first translator of the code, Charles F. Horne argued in 1915 that Hammurabi's code implied the existence of an earlier set of laws

(King & Horne, 2006). This claim is corroborated by researchers at the Louvre who maintain the source of the Hammurabi Code as “...two Sumerian legal documents drawn up by Ur-Namma, King of Ur (c. 2100 BC) and Lipit-Ishtar of Isin (c. 1930 BC)” (Iselin, 2011).

Hammurabi’s Code of Laws is inscribed on a basalt stele (Figure 1) that is on display in the Louvre. The code dates back to circa 1780 BCE, and was originally translated by L.W. King in 1910 and edited by Richard Hooker in 1996 (Hooker & King, 1999).

Figure 1: The 2.25 m high basalt stele erected by King Hammurabi of Babylon (Iselin, 2011)



The Hammurabi Code is considered “...the most important legal compendium of the ancient Near East” (King & Horne, 2006), and it represents the earliest-known example of a ruler proclaiming publicly to his people an entire body of laws. “The laws are arranged in orderly groups, for all men to read and know what was required of them.” (Hooker & King, 1999) It was displayed publicly, and comprised 282 different Codes of Laws. Cuneiform script was used, and Stockdale (2005) notes its efficiency in “...the expansion of literacy, and subsequent governmental regulation and authority over an increasingly literate public”.

The code is grouped into different chapters that focus on family law, slavery, and professional, commercial, agricultural and administrative law (Iselin, 2011). The following six codes refer to the built environment:

- Code of Law No. 228:



“If a builder build[s] a house for some one and complete it, he shall give him a fee of two shekels (sic) in money for each sar (sic) of surface.” (Hooker & King, 1999)

- Code of Law No. 229:

“If a builder build[s] a house for some one, and does not construct it properly, and the house which he built fall[s] in (sic) and kill[s] its owner, then that builder shall be put to death.” (Hooker & King, 1999)

- Code of Law No. 230:

“If it kill[s] the son of the owner the son of that builder shall be put to death.” (Hooker & King, 1999)

- Code of Law No. 231:

“If it kill[s] a slave of the owner, then he shall pay slave for slave to the owner of the house.” (Hooker & King, 1999)

- Code of Law No. 232:

“If it ruin[s] goods, he shall make compensation for all that has been ruined, and inasmuch as he did not construct properly this house which he built and it fell, he shall re-erect the house from his own means.” (Hooker & King, 1999)

- Code of Law No. 233:

“If a builder build[s] a house for some one, even though he has not yet completed it; if then the walls seem toppling (sic), the builder must make the walls solid from his own means.” (Hooker & King, 1999)

The first code deals with payment after the completion of a successful building project, while the remaining five codes list different manners of recourse, should a structure prove unsafe. It could be argued that this set of six official codes represents the origin of contemporary building regulations (Table 7). It is noteworthy that the largest part of the code refers to a minimum standard – requiring the builder to guarantee the safety of the construction. These objectives remain relevant to this day, and they echo the primary purpose of architecture; to safely house man and his possessions.

Table 7: A synopsis of Hammurabi’s Code of Laws according to the various requirements, subsequent events and the relevant obligations or recourses

Hammurabi’s Code of Laws:							
No.	Requirement	▶	Event	+	Post-event	=	Obligation or Recourse
Objective 1: Erection of the structure and its associated cost:							
228	If a builder builds a house, and	▶	the builder completes it	+	none	=	Payment (fee/surface)
Objective 2: Should a structure prove unsafe during its occupation, the following recourses are available (it is presumed that the house was paid for in accordance with Code 228):							
229	If a builder, builds a house, and it is not properly constructed, and it	▶	collapses (<i>fall in</i>), and	+	kills the owner, then	=	a. Death to the builder b. See 232.b that is implied, although it might be difficult to achieve c. See 232.c that is implied, although it might be difficult to achieve
230	If a builder, builds a house, and it is not properly constructed, and it	▶	collapses (<i>fall in</i>), and	+	kills the son of the owner, then	=	a. Death to the builder’s son b. See 232.b that is implied, but not expressly stated c. See 232.c that is implied, but not expressly stated
231	If a builder, builds a house, and it is not properly constructed, and it	▶	collapses (<i>fall in</i>), and	+	kills a slave of the owner, then	=	a. The builder has to pay slave for slave b. See 232.b that is implied, but not expressly stated c. See 232.c that is implied, but not expressly stated
232	If a builder, builds a house, and it is not properly constructed, and it	▶	collapses (<i>fall in</i>), and	+	damages the owner’s goods, then	=	a. The builder has to compensate the owner for the ruined goods b. and re-build the house c. at his own cost (<i>own means</i>)
233	If a builder, builds a house, and it is not properly constructed, and the	▶	walls fail (<i>seem toppling</i>)	+	none	=	a. The builder has to re-build the walls b. at his own cost (<i>own means</i>)

The Hammurabian codes focus on the relationship between owner and builder, while the interests of a larger settlement (and by implication the interests of the neighbours) are not addressed explicitly. It could be argued that the stratification of society according to class and community structure implied settlement patterns and associated rules of engagement. However, as the number of inhabitants in a particular settlement increased, it inevitably led to an increased number of risks.



2.2.2 The growth of settlements

Klitzke (2011) states that “...ever since man began to use fire as his servant, he discovered ... that it frequently could not be controlled. When man congregated in cities, the servant turned master even more often”. Watermeyer (2007:26) supports this point of view, and argues that settlement growth brought “...the scourge of fire and health risks associated with poor sanitation”. Larger communities therefore necessitated a form of orderly settlement planning through regulation.

Arguably the best known assimilation of these regulations could be found during the reign of the Roman Empire. *The Encyclopedic Dictionary of Roman Law* provides the following definition for the construction of a house (Berger, 1991: 353):

“**Aedificatio**: Building a house. The construction of houses is governed by building regulations (statutes, senatusconsulta, imperial enactments) and is subject to the supervision of magistrates (aediles, censors for public buildings, under the Empire the praefectus urbi and his staff). Among the imperial enactments the building regulation by Emperor Zeno is the most important. The interests of the neighbors are protected by *OPERIS NOVI NUNTLATIO*, a kind of protestation against a new construction which may be detrimental to the owners of adjacent buildings or lands. On the other hand, the house builder who gives sufficient guaranty is protected by a special interdict *no vis fiat aedificanti* (= that force should not be used against the builder of a house) against disturbance. Unless special permission is granted, building on public places is prohibited. Demolition of constructions already erected may be enforced by an *INTERDICTUM DE LOCIS PUBLICIS*.”

From the above it is evident that the Roman Empire introduced a hierarchical structure to govern the construction of buildings within the Empire. Emphasis was placed on a larger environment, with specific rights and obligations assigned to neighbouring properties. In addition, the construction process was supervised by a governing authority.

Similar laws that fall within the ambit of building regulations in *The Encyclopedic Dictionary of Roman Law* are:



- **Ambitus:** Describes the open space between neighbouring houses (Berger, 1991: 360).
- **Lex municipalis tarentina:** A municipal charter that contains provisions about the building regulations, among others (Berger, 1991: 557).
- **Lex lulia de modo aedificiorum:** A building regulation that determined the maximum height of houses and the thickness of walls (Berger, 1991: 554).
- **Lex lula municipalis:** Although Caesar's authorship and the date of the law are debatable, some of the topics dealt with in the *Tabula Heracleensis* are building and traffic regulations (Berger, 1991: 554).
- **Servitus altius non tollendi (sc. aedes):** This "urban servitude imposed on the owner of a building the duty not to build higher over a certain limit. A counterpart was a servitude *ius altius tollendi* which gave the beneficiary the right to build higher" (Berger, 1991: 703).
- **Servitus ne prospectui officiator:** According to this servitude, the owner of an immovable property has the "right to prevent his neighbour from building a house or planting trees which might impede the beneficiary's pleasant view" (Berger, 1991: 703).
- **Servitus oneris ferendi:** This urban servitude involved the right of a beneficiary to have his building supported by a neighbour's wall. "The latter was bound to keep his wall in good condition" (Berger, 1991: 703).

Cowan finds that fire damage and structural failure have featured in safety regulations from a very early time, and specific building regulations in this regard in the City of London go back as far as the 12th century (1979: 90).

2.3 DEFINITIONS OF BUILDING REGULATIONS

The *Dictionary of Architecture and Building Construction* (Davies & Jokiniemi, 2008: 52-53) does not differentiate between building codes and building regulations, and provides the following overall definition:

"A statutory code which regulates the construction, alteration, maintenance, repair, and demolition of buildings and structures."



In a similar manner, Watermeyer (2003:6) does not distinguish between the two terms, and defines a building code or regulation as follows:

“A document used by [a] local, state or national government body to control building practice through a set of statements of ‘acceptable’ minimum requirements of building performance. This is usually a legal document. Acceptable requirements are typically established on the basis of socio-political and/or community considerations.”

The book entitled the *Building Regulations in brief* (Tricker & Algar, 2006: [i]) provides the most concise description of a building regulation:

“A statutory instrument, which sets out the minimum requirements and performance standards for the design and construction of buildings, and extensions to buildings.”

For the purposes of this study, a **building regulation** is acknowledged as

- a regulating instrument, that
- describes a minimum standard, that
- 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
- protecting public health and safety during
- the construction, occupation and post-occupation phases of
- buildings and/or structures.

2.3.1 The relationship between building regulations and building standards

In the construction industry, a building regulation often makes reference to a building standard, and it is important to note the distinction between the directive and the yardstick with which its implementation is measured. Watermeyer (2003: 6) presents a standard as a benchmark, claiming that essentially it is “a series of technical documents that standardise ... some activity in relation to building and construction”).

In the 2008 edition of the *Dictionary of Architecture and Building Construction*, Davies and Jokiniemi (2008: 360) do not specifically include the term building standard, but



provide the following definition for a **standard**: “any product, method, process or procedure which has been established as an exemplar ... or otherwise represents the norm”. A **norm**, on the other hand, is described as a “standard, an officially recognised exemplary standard of measurement, quality, regulative legislation or classification” (Davies & Jokiniemi, 2008: 251).

A **building standard** could thus be defined as

- an official technical point of reference, that
- standardises building and construction activity,
 - (generally) in terms of
 - ‘quality’, or
 - ‘performance,’ and
 - (occasionally) in terms of
 - size, or
 - procedure
- thus providing measurement criteria.

According to the *Dictionary of Architecture and Building Construction* (Davies & Jokiniemi, 2008: 52) **building codes of practice** are described as

“legal documentation setting out the requirements to protect public health and safety, and outlining standards of good practice with regard to the construction and occupation of buildings.”

2.3.2 Approaches to the formulation of building standards

Both Groák (1992: 140) and Watermeyer (2003:6) distinguish between different viewpoints from which the formulation of building standards can be approached, specifically:

- The performance approach ¹¹
- The functional approach
- The specific design solution (the prescriptive approach)

¹¹ For more information on the *performance approach*, see the 2005 report entitled *Performance based design: Bringing Vitruvius up to date* (Spekkink & Jasuja, 2005).



For example, a building's thermal performance could be defined in terms of the minimum energy loss during a prescribed period, as compared to a functional requirement stating that the building should achieve *energy efficiency*, or compared to a specific design solution where a particular insulation product is specified (Groák, 1992: 140).

2.3.2.1 The functional approach

The functional approach relies on qualitative functional statements, while no quantitative user or technical performance requirements are provided (Watermeyer, 2007: 26). However, Groák warns against merely using function as "...a measure of usefulness at the time" (1992: 140). He states that "[t]he term itself changes meaning and use" (Groák, 1992: 140). Groák further argues that the functional approach led to the origin of the performance concept, thereby linking the building industry with the building material industry (1992: 140).

2.3.2.2 The performance approach

According to Watermeyer (2003:6), the performance concept is driven by nominated requirements that are intended to satisfy particular needs and expectations. Groák defines the performance approach as a framework that defines "...buildings and their constituent parts in terms of what performance-in-use they should achieve over time" (1992:140). Davies and Jokiniemi (2008: 272) elaborate on this notion by providing the following definition: "[p]erformance [refers to] the specified, expected or actual behaviour of a building material, component or building while in use". The performance specification is thus defined as a technical document that outlines, lists and documents the behaviour or use of a product, process, installation or service (Davies & Jokiniemi, 2008: 272).

2.3.2.3 The prescriptive approach

Watermeyer (2007: 26) describes the prescriptive approach as a collection of standards that depicts how buildings should be designed, built, protected and maintained with regard to the public's health and safety. The constituent



building components are described, specified and procured, resulting in a distinctive building with a particular set of characteristics (Watermeyer, 2003: 6).

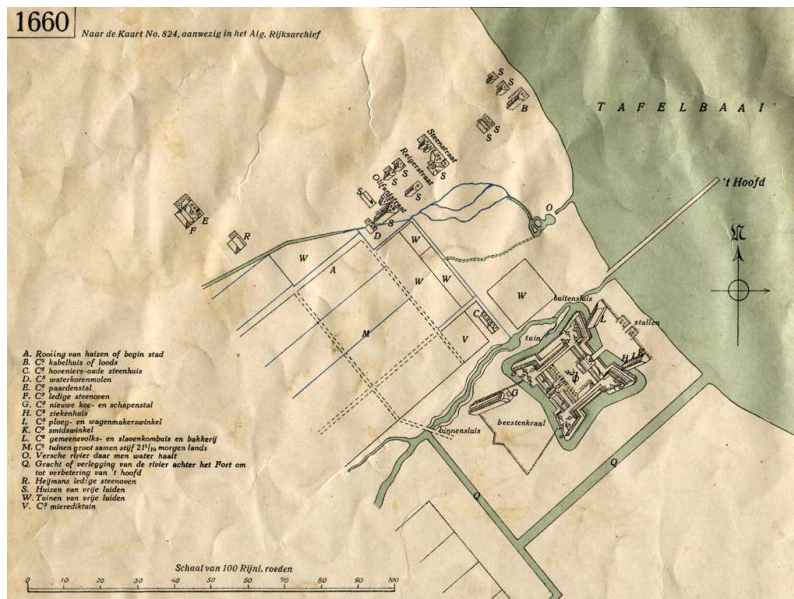
Groák highlights the performance approach as “[o]ne of the most important developments in building research” (1992: 140). This approach (with its origins in mechanical engineering), defines a building and its constituent parts in terms of its ‘performance-in-use’, which should be achieved over time. It defines requirements, rather than focusing on a general function, or prescribing a known solution.

It is evident that a particular approach would result in a different type of standard. It is therefore important to trace the origin of the NBR locally, and to determine the approach that was adopted in the formulation of these standards.

2.4 THE ORIGIN OF BUILDING REGULATIONS IN SOUTHERN AFRICA

In 1650 the United East Indian Company decided to occupy the Cape of Good Hope as a refreshment station, and tasked Governor Jan van Riebeeck to build a fort in Table Bay (Figure 2). Just over two weeks after arriving in 1652, Van Riebeeck (and his party) managed to mount a canon on 3.75 metre high earthen ramparts. These walls tapered from six metres at ground level to five metres at their highest point (Hartdegen, 1988: 6-7).

Figure 2: Map of the fort erected under the guidance of Jan van Riebeeck (Castle of Good Hope, 2010)



Unfortunately the earth was barely workable and because the “Company instruction did not specify alternative solutions ... the ramparts were a leaky crumbly structure[s]” (Hartdegen, 1988: 7). The imminent failure of the walls required immediate maintenance. Ras (1959: 23) notes that heavy rain caused the collapse of one side of the *Walvis Bastion* and the partial collapse of the curtain walls in August 1654.

The Company instruction above is most probably the first prescriptive specification implemented in Southern Africa. However, the failure of the ramparts of the fort could also be described as the first failure of a prescriptive standard imposed on the South African built environment.

According to the publication *Our Building Heritage* (Hartdegen, 1988: 7) “... much of South Africa’s building heritage rests on a building system derived almost exclusively from mud, stone, shells, reed, thatch and timber, developed and refined by the European pioneers of the seventeenth century”. Hartdegen (1988: 7) also describes the experimentation with various building methods and materials by a hundred men (*including eight masons*) to construct stores, sheds and living quarters within the fort.

In his diary, Van Riebeeck noted: “Although we have found reeds for thatch, we want people who know how to lay them on, for what has already been done, has been done in such a slovenly and insufficient manner that it must be taken off again” (Hartdegen, 1988: 9).

The third volume of H.B. Thom’s translation of Van Riebeeck’s diaries includes the following inscription entered on Wednesday, 7 January 1660 (1952: 173):

	Line no.:
<i>...after mature</i>	i.
<i>deliberation, and in the interests of the Hon. Company and for the security of the</i>	ii.
<i>said buildings and the goods stored in them, it has been considered essential, and</i>	iii.
<i>has also been decided that the thatch should be removed from the roofs of all</i>	iv.
<i>the Company’s buildings and replaced by baked tiles. Furthermore it has been</i>	v.
<i>decided that we should try and sell the thatch to the free burghers so as to defray</i>	vi.
<i>the additional costs as far as possible. To this end an agreement has been reached</i>	vii.
<i>with the free brick and tile maker, Wouter Cornelissen Mostert, who is also the</i>	viii.
<i>free miller, whereby he shall forthwith make as many tiles for the Hon. Company</i>	ix.
<i>as are required for the said purpose at a rate of 40 guilders a thousand, counted</i>	x.
<i>whole on the roof, each tile being in Rhineland measure, 6 inches wide and 12</i>	xi.
<i>inches long. The Hon. Company shall at its own cost convey the tiles by cart or</i>	xii.
<i>wagon from the oven.</i>	xiii.
<i>And as straight laths must be sawn for such a tiled roof, an agreement has also</i>	xiv.
<i>been made with the free sawyer, Leendert Cornelissen of Seevenhuijsen, to deliver</i>	xv.
<i>the required laths (each to be sawn not less than one inch square) at a rate of 13</i>	xvi.
<i>guilders per hundred foot of plank from which they are cut.</i>	xvii.
Resolved and affirmed <i>in the fort of Good Hope on the above date.</i>	xviii.
<i>(Signed) Jan van Riebeeck,</i>	xix.
<i>Roeloff de Man,</i>	xx.
<i>Abraham Gabbema,</i>	xxi.
<i>Pieter Evrards and</i>	xxii.
<i>Gijsbert van Campen (Secretary)</i>	xxiii.

If the earlier definition of building regulations is applied to the journal entry (Table 8), this inscription could be interpreted as the first official transcribed building regulation for Southern Africa.

Table 8: A comparison of the diary entry by Jan van Riebeeck with the requirements of a building regulation

The first building regulation in Southern Africa		
Definition: building regulation	Selected key words from the Journal of Jan van Riebeeck: 7 January 1660 (Thom, 1952: 173)	Line no:
a) a regulating instrument, that	<i>...in the interests of the Hon. Company...</i>	ii
	<i>...considered essential...</i>	ii
	<i>...Resolved and affirmed...</i>	xviii
b) describes a minimum standard, that	<i>...decided that the thatch should be removed from the roofs...</i>	iv
	<i>...and replaced by baked tiles...</i>	v

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	It is implied that the changing of the roofing materials should take place during the alteration/replacement/maintenance phase of the buildings lifespan	n/a
d) protecting public health and safety during	<i>...security of the said buildings and the goods stored in them...</i>	ii-iii
e) the construction, occupation and post-occupation phases of	See c	
f) buildings and/or structures.	<i>...all the Company's buildings...</i>	iv-v

The journal entry proposed a standard in addition to the regulation. When the regulation is further investigated it becomes evident that the specification for the roof tiles and battens follows a performance approach. An agreement is reached with a free burgher to manufacture as many baked tiles as necessary for the purpose of providing a fire-resistant roofing material. A price per 1000 units (counted per whole tile on the roof) is agreed on, as well as the size of the tiles and the standard of measure (Rhineland)¹².

In a similar agreement with carpenter Seevenhuijsen, he is to provide laths that are cut in straight lengths of a minimum size. The rate of payment is determined per length of timber from which the battens are cut. It could be presumed that the Company was responsible for the supply of the timber and the carpenter was only required to saw it to the correct size, while the actual batten lengths were of less importance.

This building regulation was formulated in accordance with a contextual approach. The danger of fire necessitated the change of a particular roofing material, while cost dictated that an indigenous solution be sought. This regulation was only applicable to certain Company buildings inside the fort, although the settlement continued to expand.

Outside the walls of the fort, in the village of *De Kaap*, the first homes consisted of single-storey rectangular wooden frameworks with wattle-and-daub walls. Where thatch was used as a roofing material, the reeded ceiling was usually smeared over

¹² To accept these terms, Mostert must have had adequate faith in the strength of the fired tiles, their loading and transport from the oven to the buildings, their possible storage, and finally their installation on the roof, because Mostert's involvement in the process after manufacture is not entirely clear.



with a coating of clay to form a "... *brandzolder*, or fire ceiling in the event of fire. In later years, thatched roofs were prohibited because of the fire hazard and a tax of two shillings a month was levied on each chimney" (Hartdegen, 1988: 11).

It could be argued that the risk of fire necessitated the development of the first official building regulations for Southern Africa. This is in accordance with the arguments presented by Klitzke and Watermeyer in par. 2.2.2. The community and authorities shared an interest, and the introduction of a tax levy on each chimney is possibly the first time that building regulations in the European tradition were enforced locally. Nevertheless, the associated cost of exchanging one roofing material for another remained excessively high, and it was only once the risk grew too great that alternatives were implemented.

De Bosdari (1953: 47) indicates that in 1712 the thatched village of De Kaap had grown to 170 private dwellings and this required a form of settlement planning, which is described by Bierman (1955: 13) as follows:

Reeds vroeg in die bestaan van die dorpie in die Tafelvallei gryp die owerheid in om sindelikheid en orde te bewaar. Die Valsrivier kry gemesselde walle en sluise en 'n deftige naam, die Heerengracht; strate wat mekaar reghoekig oorkruis word uitgelê, en die boupersele weerskante raak aan streng bouordonnansies onderhewig. Om brand in die rietdak te voorkom, mag die dak nie te na aan die grond sak nie; om brandverspreiding deur die rietdakke te verhoed, mag geboue nie teenmekaar staan nie. Onder dié toestande raak die tradisionele boerehuise uit die Tafelvallei weg – hy trek binneland toe – en sy plek word deur die stadshuis ingeneem, want korte jare na die stigting, is „de Caabse uithoek” reeds 'n stad.¹³

¹³ Very early on in the existence of the Table Valley village, the authorities stepped in to preserve cleanliness and order. The Vals River received built embankments and sluices, and a dignified name, the Heerengracht; streets that intersected at right angles were laid out, and the adjacent building sites became subject to strict building regulations. To prevent fire in the thatched roofs, they were not to descend too close to the ground; to prevent fire spreading through the thatched roofs; buildings were not allowed to stand too close to each other. Under these circumstances the traditional farmhouse of the Table Valley disappeared – it migrated inland – and its place was taken by the townhouse, because a few short years after its establishment, the remote Cape hamlet had already become a town. (Translated by author, 2011)



According to Bierman (1955: 34-35), traders in the Kaap often built double-storey houses, with the bottom storey used to store products, and the living quarters situated above. Frequent conflagrations resulted in the abandonment of thatch after the 1717 instruction by the Council of Policy (De Bosdari, 1953: 47). Within the built-up area, flat roofs were proposed as an alternative. However, the resulting problem of water tightness was difficult to overcome.

The Council of Seventeen of the United East Indian Company issued the following recommendation on how to construct a new flat roof (Hartdegen, 1988: 11):

“The walls of the building being finished and the beams laid thereon, laths or ribs are to be laid upon them, each three or four inches, the broadest (sic) side resting on the beams. No planks are to be used; otherwise the defects of the roof will not be visible from below. Over these ribs, grey or other burnt bricks which are made here, eight by four inches, are laid with the heads meeting each other on the laths. The floor having been thus laid, the builder is to take four parts of stamped lime shells taken out of the oven (kiln) and two parts ordinary mason lime and two parts finely powdered bricks. All these materials are to be well mixed whilst dry, and gradually cocoa-nut oil is to be thrown until the whole is thoroughly prepared like dough. It is then at once to be laid on one and a half inches thick, and rubbed in with the trowel and steadily beaten together as much as possible with wooden mallets. The mallets are not to be too heavy and the beating must be gentle or moderate lest the bricks are broken. Whilst busy with this, the second layer is to be prepared, viz, ten parts finely sifted lime, three parts finely sifted gravel of baked bricks and one part of Bengal Gor or sediment of sugar (draf zucker = molasses). This composition is to be treated in the same way as the first and to be put on when ready, about one inch thick, and carefully beaten down on the other layer. Finally a liquid composed of lime, oil and Gor is made with a strong hand and a smooth trowel well rubbed on the last coat.”

In 1736, five houses were gutted by a fire fanned by a Southeaster. One of the houses was rebuilt with a flat roof, and “...many other people followed ... [t]his example... At the beginning of the 18th century Cape Town was a thatched village: by



the end of it, the fear of fire has changed it into a flat-roofed town” (De Bosdari, 1953: 47).

The establishment of a settlement and its associated growth necessitated the development of some form of regulation. The different municipalities performed this regulatory function and individually developed their own sets of municipal by-laws that addressed the built environment, among others. Holden states that “...every town council in South Africa had its own set of building by-laws, many of which were archaic and convoluted” (2006: [1]). According to Watermeyer the 19th century law makers developed building laws to ensure proper sanitation and to diminish possible conflagrations, while 20th century law makers “developed minimum standards for the construction and maintenance of buildings, designed to protect public health, safety and general welfare” (2007: 26).



2.5 ACT 103 OF 1977

The full title of the current edition of Act 103 of 1977 is as follows (South Africa, 2011: 3):

**“NATIONAL BUILDING REGULATIONS AND BUILDING
STANDARDS ACT
NO. 103 OF 1977**

[ASSENTED TO: 22 JUNE, 1977]

[DATE OF COMMENCEMENT: 1 SEPTEMBER, 1985]
(ENGLISH TEXT SIGNED BY THE STATE PRESIDENT)

as amended by

National Building Regulations and Building Standards Amendment Act,
No. 36 of 1984

National Building Regulations and Building Standards Amendment Act,
No. 62 of 1989

National Building Regulations and Building Standards Amendment Act,
No. 36 of 1995

Mine Health and Safety Act, No. 29 of 1996

[with effect from 15 January 1997]”

The full description of the current edition of Act 103 of 1977 is the following (South Africa, 2011: 4):

“To provide for the promotion of uniformity in the law relating to the erection of buildings in the areas of jurisdiction of local authorities; for the prescribing of building standards; and for matters connected therewith.”

The shortened title of the current edition of Act 103 of 1977 is as follows (South Africa, 2011: 33):

National Building Regulations and Building Standards Act, 1977.

The current version of the NBR consists of three parts:

- Act 103 of 1977 (South Africa, 2011: 1-33)
- The Regulations (South Africa, 2011: 201-266)
- The Application of the NBR, through the Deemed-to-Satisfy Rules (also known as SANS 10400, previously SABS 0400) (South Africa, 2011: 301-460)

The applicable documents are for reference purposes included in Addenda C and D.



2.5.1 Background

The first set of Standard Building Regulations (SBR) was published by the Department of Civil Engineering and Packaging Services of the SABS in 1970. This standard was voluntary, and it was followed by a metric version in 1972. However, the majority of LAs continued to use their own building by-laws. In 1974 the SABS started preparing a new set of building regulations based on a more flexible approach.

In 1977, the then Minister of Economic Affairs chaired an *Anti-inflation Committee* that investigated ways to reduce medium and long-term inflation. Part of the recommendations by the committee was for the formulation of a national set of building regulations. “It was the Minister’s anti-inflation committee which instigated (the) promulgation of the Act, its primary objective being to reduce building costs in the medium to long term” (Bevis & Misselbrook, 1997: 4).

Act 103 of 1977 was passed by Parliament on 22 June 1977.

The first draft of the NBR was published in the *Government Gazette* in 1981 and solicited a response of nearly 1100 pages. After restructuring the regulations through various evaluation committees, the first workable set of regulations in the NBR was published on 1 March 1985, with an effective implementation date of 1 September 1985 (Bevis & Misselbrook, 1997: 1).

2.5.2 The development and evolution of NBR legislation

Already during the first year of implementation a number of shortcomings were identified. An administrative decision was taken to remove the Deemed-to-Satisfy Rules from future gazetted NBRs, with only the functional requirements remaining. This resulted in all the Deemed-to-Satisfy Rules being published as part of a separate (and new) SABS Code of Practice (Code). In response to objections received, the *Mark II* version of the NBR was published on 10 June 1988, defining the aforementioned functional requirements. At the same time, the SABS released the new *SABS 0400: The Application of the National Building Regulations*, which contained the updated Deemed-to-Satisfy Rules (Bevis & Misselbrook, 1997: 2-3). This Code for *The Application of the National Building Regulations (First Revision)*



was approved by the Council of the SABS on 23 August 1990 (SABS, 2010a: 2). The amended version of the NBR was published in *Gazette* Notice No. R.2378 on 12 October 1990, and the SABS shortly afterwards issued the accompanying 0400 Code.

In the preface to this code it was envisaged that revised versions of the code and, if necessary, the regulations would be published at 5-yearly intervals (SABS, 2010a: 4). However, the first revised version was published sooner, on 8 March 1991, in Government Notice No. R.432. It incorporated further objections to and proposals for the 1990 code.

Three technical corrections were published on 22 May 1996, and on 30 July 1999 the only amendment to the NBR addressed *Regulation A13 (1)(b): Building Materials and Tests* (SABS, 2010a: 2). Despite the original intention, no revisions were published in either 2000 or 2005. On 30 May 2008, Notice No. R.574 was published in the *Government Gazette* No. 31084, on recommendation of the Council of the SABS, and

“...the honourable Minister of Trade and Industry, Minister M Mpahlwa, declared that ... under Section 17(3) of the National Building Regulations and Building Standards Act (Act 103 of 1977), particular ... regulations ... [will] come into operation on ... 1 October 2008” (Government Gazette, No. 31084, 30 May, 2008: 45-68).

Table 9 summarises the development and evolution of the NBR as a legislative instrument that governs the erection of buildings in South Africa (Bevis & Misselbrook, 1997: 2-3), (personal communication with Opperman, 3 March 2011):

Table 9: Summary of legislative development and amendment of the NBR and the direct influences thereof

Gazette		Act No./ Government Notice No.	Title/Description	Date of operation
Date	No.			
30 May 1945	[?]	A.24 of 1945	The SABS established as a statutory body	1 Sept 1945
22 June 1977 (assented)	n/a	A.103 of 1977	<i>NBR and Building Standards Act, 1977</i>	See R.441
[6 Jul 1977]	564	A.103 of 1977	<i>NBR and Building Standards Act, 1977</i>	[?]
[1981]	[?]	[?]	NBR First draft published in Gazette (soliciting a response of 1100 pp)	[?]
17 Mar 1982	8082	A.30 of 1982	Standards Act, 1982 (30 of 1982)	1 May 1982
4 Apr 1984	9513	A.36 of 1984	<i>NBR and Building Standards Amendment Act, 1984 (36 of 1984)</i>	1 Sep 1985 (commencing)
1 Mar 1985	9613	R.441	First workable set of NBR published	1 Sep 1985
13 Sep 1985	9927	2074	Review Board Regulations	13 Sep 1985
13 Sep 1985	9927	2075	Report to the Minister (regulations regarding adequacy of certain LA measures)	13 Sep 1985
13 Sep 1985	9927	2076	Servitudes or Restrictive Conditions Over Land (regulations regarding the Minister's power to remove such restrictions or servitudes)	13 Sep 1985
25 Apr 1986	10205	798	<i>NBR and Building Standards Act, 1977 (Rectification Notice)</i>	1 May 1986
25 Jun 1986	10304	A.58 of 1986	<i>Black Local Authorities Amendment Act, 1986 (58 of 1986)</i>	15 Aug 1986
10 Jun 1988	11333	R.1081	<i>NBR and Building Standards Act, 1977 (103 of 1977)</i> NBR (Mark II)	1 Oct 1988
19 Aug 1987	[?]	[?]	SABS releases SABS 0400	[?]
26 Aug 1988	11474	R.1726	<i>NBR and Building Standards Act, 1977 (103 of 1977)</i>	1 Oct 1988
30 May 1989	11901	A.62 of 1989	<i>NBR and Building Standards Amendment Act, 1989 (62 of 1989)</i>	30 May 1989
23 Aug 1990	n/a	n/a	SABS 0400 (1 st revision) approved by SABS Council	See R.432
12 Oct 1990	12780	R.2378	SABS 0400 (1 st revision) promulgated under Section 17(1)	See R.432
28 Aug 1990	[?]	[?]	0400 is issued by SABS	[?]
8 Mar 1991	13054	R.432	Commencement of Regulations in terms of Section 17(3)(b)	8 Mar 1991
4 Oct 1995	16717	A.49 of 1995	<i>NBR and Building Standards Amendment Act, 1995</i>	4 Oct 1995
22 May 1996	[?]	[?]	SABS 0400: 1990 Technical Corrigendum 1 (pp. 13, 45, 135)	[?]
14 Jun 1996	17242	A.29 of 1996	<i>Mine Health and Safety Act, 1996</i>	15 Jan 1997
[?]	n/a	n/a	SABS 0400 (2 nd revision) approved by SABS Council	[?]
30 July 1999	20314	R.919	Regulations in terms of Section 17(1) of Act 103 of 1977 are amended	[?]
30 July 1999	20314	R.919	SABS 0400: 1990 Amendment of Regulations A13(1)(b)	[?]
30 May 2008	31084	R.574	Regulations in terms of Section 17(3) of Act 103 of 1977 are amended	1 Oct 2008
4 July 2008	31216	A.5 of 2008	<i>National Regulator of Compulsory Regulations Act, 2008 (5 of 2008)</i> (regulatory functions transferred from	1 Sept 2008



SABS to NRCS)		
Following the formation of the NRCS, as a separate entity from SABS, the <i>SABS 0400</i> (old blue file) becomes <i>SANS 10400</i> consisting of 22 stand-alone chapters A to W that are published individually.		
n/a	<i>SANS 10400: The application of the NBR</i> <i>SANS 10400-F:</i> <i>Part F: Site operations</i>	Published on 13 May 2010
n/a	<i>SANS 10400: The application of the NBR</i> <i>SANS 10400-N:</i> <i>Part N: Glazing</i>	Published on 26 Feb 2010
<i>Circulated on: 1 June 2010</i> <i>Public comment until: 30 July 2010</i>	<i>SANS 10400: The application of the NBR</i> <i>SANS 10400-A:</i> <i>Part A: General principles and requirements</i>	Published on 17 Nov 2010
<i>Circulated on: 15 June 2010</i> <i>Public comment until: 13 Aug 2010</i> and again from 1 March 2011 to 3 May 2011	<i>SANS 10400: The application of the NBR</i> <i>SANS 10400-XA:2010</i> <i>Part X: Environmental sustainability</i> <i>Section A: Energy usage in buildings</i>	n/a

2.5.3 Act 103 of 1977

Act 103 of 1977 consists of the following 34 sections (South Africa, 2011: 11-33):

1. Definitions
2. Application of Act
3. Duties of draftspersons of plans, specifications, documents and diagrams
4. Approval by LAs of applications in respect of erection of buildings
5. Appointment of BCO by LA
6. Functions of building control officers
7. Approval by LAs in respect of erection of buildings
8. Power of court in respect of approval by LAs
9. Appeal against decision of LA
10. Erection of buildings in certain circumstances subject to prohibition or conditions
11. Erection of buildings subject to time limit
12. Demolition or alteration of certain buildings
13. Exception of buildings from the NBR and the authorisation for erection thereof
14. Certificates of occupancy in respect of buildings
15. Entry by BCOs and certain other persons of certain buildings and land
16. Report on adequacy of certain measures and on certain building projects
17. The NBR and directives
18. Deviation and exemption from the NBR
19. Prohibition on use of certain methods or materials



20. Regulations
21. Order in respect of erection and demolition of buildings
22. Power of LAs relating to rates, taxes, fees and other moneys
23. Exemption from liability
24. General penalty clause
25. Presumption
26. Payment of certain moneys to LAs
27. Powers of Minister in respect of certain LAs
28. Delegations of powers
29. Repeal of laws
30. Repeal of section 30 by section 1 of Act 62 of 1989
31. Repeal of section 14 of Act 33 of 1962, as inserted by section 4 of Act 72 of 1964
32. Repeal of section 32 by section 40(1) of Act 30 of 1982
33. Repeal of section 33 repealed by section 6 of Act 36 of 1984
34. Short title and commencement

The full documents are included in Addenda C and D for reference purposes. The different sections are next discussed briefly (in order of appearance).



2.5.3.1 **Section 1: Definitions**

Act 103 of 1977 provides broad meanings to particular words (Bevis & Misselbrook, 1997: 5). For instance, the term ‘building’ is described as follows:

“‘**building**’ includes -

- (a) any other structure, whether of a temporary or permanent nature and irrespective of the materials used in the erection thereof, erected or used for or in connection with –
 - (i) the accommodation or convenience of human beings or animals;
 - (ii) the manufacture, processing, storage, display or sale of any goods; [Sub-para. (ii) substituted by s. 1 (b) of Act 62 of 1989.]
 - (iii) the rendering of any service;
 - (iv) the destruction or treatment of refuse or other waste materials;
 - (v) the cultivation or growing of any plant or crop;
- (b) any wall, swimming bath, swimming pool, reservoir or bridge or any other structure connected therewith;
- (c) any fuel pump or any tank used in connection therewith;
- (d) any part of a building, including a building as defined in paragraph (a), (b) or (c);
- (e) any facilities or system, or part or portion thereof, within or outside but incidental to a building, for the provision of a water supply, drainage, sewerage, stormwater disposal, electricity supply or other similar service in respect of the building.” (South Africa, 2011: 11-12)

2.5.3.2 **Section 2: Application of Act 103 of 1977**

Act 103 of 1977 is applicable in the area of jurisdiction of any LA, but the Minister may exempt an area through a notice in the Gazette. Sections 2(3) and 2(4) explicitly state that the Government is not obliged to submit plans for approval, but must only make a submission for information purposes before the commencement of building (South Africa, 2011: 14-15).



2.5.3.3 Section 3: Duties of draughtsmen of plans, specifications, documents and diagrams

This section requires the person who prepared the plan to provide his name and address, and to communicate a relevant registration number, etc. (South Africa, 2011: 15). The name and address of the owner and/or applicant have to be communicated (South Africa, 2011: 15).

2.5.3.4 Section 4: Approval by LAs of applications in respect of erection of buildings

Section 4(1) prohibits anyone from erecting a building without prior approval from the LA, while section 4(4) states that a person who contravenes this requirement shall be guilty of an offence and liable to a fine on conviction (South Africa, 2011: 16). Section 4(2) requires an application for approval to be made in writing on the form provided by the particular LA (South Africa, 2011: 16). According to section 4(3)(a) an application should contain the name and address of the applicant and/or owner of the land on which the proposed building is to be erected, and section 4(3)(b) states that the application should be accompanied by the plans, specifications, documents and information required under Act 103 of 1977 and any other particulars that may be required by the LA (South Africa, 2011: 16).

2.5.3.5 Section 5: Appointment of a BCO by the LA

This section of Act 103 of 1977 deals with the appointment of the BCO by the LA. It also refers to the qualifications of a BCO, the possible sharing of a BCO between two LAs, and the temporary appointment of a BCO. Under section 5(1) it specifically states that "... a local authority shall appoint a person as building control officer in order to exercise and perform the powers, duties or activities granted or assigned to a building control officer by or under this Act" (South Africa, 2011: 16).

In order to apply the requirements of Act 103 of 1977 (and the corresponding regulations), Act 103 of 1977 accordingly obliges the LA to appoint a BCO. With this appointment certain powers of the LA are delegated to the BCO.



2.5.3.6 Section 6: Functions of the BCO

Act 103 of 1977 describes the functions of a BCO in sections 6(1)(a) to (d). These include making recommendations to the LA on applications brought before the LA, and ensuring that instructions made in terms of Act 103 of 1977 are carried out (South Africa, 2011: 17). The BCO is required to conduct inspections during the erection of a building and should report any non-compliance to the LA.

According to section 6(2), recommendations by the chief fire officer (or his appointee) should be taken into account when a fire protection plan is required. Lastly, section (6)4 allows for the delegation of powers transferred to the BCO (from the LA) to be transferred to an officer under his control (South Africa, 2011: 17). This however, should be done with the written approval of the LA.

2.5.3.7 Section 7: Approval by LAs in respect of erection of buildings

If the LA is satisfied that the application complies with Act 103 of 1977 and other applicable law, it shall grant approval according to section 7(1)(a). The LA can refuse to grant approval in certain instances (South Africa, 2011: 17). Nonetheless, a time limit is imposed on the LA to make known its decision, namely 30 days after receipt of an application less than 500 m², and 60 days after receipt of an application larger than 500 m² (South Africa, 2011: 18). The approved plans have a currency of 12 months according to section 7(5) (South Africa, 2011: 18). Upon written request, the LA may provide provisional authorisation to an applicant to commence with the erection of a building (South Africa, 2011: 18-19). Sections 7(7)(a) and (b) respectively address an application or approval granted before the date of commencement of Act 103 of 1977 (South Africa, 2011: 18-19).

2.5.3.8 Section 8: Power of court in respect of approval by LAs

An applicant may approach a court to direct the LA to perform its duties timeously (South Africa, 2011: 18).



2.5.3.9 Section 9: Appeal against decision of LA

An applicant who feels aggrieved by the refusal of an LA, or by a notice of prohibition, and wishes to dispute the interpretation of the application, may appeal to the review board in terms of sections 9(1)(a) to (c) (South Africa, 2011: 19).

2.5.3.10 Section 10: Erection of buildings in certain circumstances subject to prohibition or conditions

According to sections 10(1)(a) to (b), the LA may prohibit a person from erecting a building (or earthwork) if, in the opinion of the LA, it is not in the interest of good health; it is unsightly; it may become a nuisance to the neighbouring properties; or it will diminish the value of adjoining properties (South Africa, 2011: 20).

2.5.3.11 Section 11: Erection of buildings subject to time limit

The LA may order an owner to resume construction (and to complete the building within a specified period) if more than 3 months pass without any construction activity in terms of s11(1) (South Africa, 2011: 20). The remaining four sections deal with the recourse of an LA, should the owner of such a building fail to resume or complete the specified works.

2.5.3.12 Section 12: Demolition or alteration of certain buildings

If an LA is of the opinion that a building, or the land on which it is situated, or earthwork is dangerous to life or property, it may order the owner to take make remedies (South Africa, 2011: 21-22). Unless the LA gives written permission, the occupation or use of the aforementioned building is not allowed according to section 12(5).

2.5.3.13 Section 13: Exception of buildings from NBR and the authorisation for erection thereof

Sections 13(1)(a) and (b) declare that buildings resorting under the definition of 'minor building work' may be exempt from plan submission by the BCO, or may be granted authorisation in accordance with certain conditions (South Africa, 2011: 22-23). Section 13(2) determines the currency of the approval, whereas section 13(3) addresses the method of recourse should an applicant feel aggrieved (South Africa, 2011: 22-23).



2.5.3.14 Section 14: Certificates of occupancy in respect of buildings

Section 14(1) of Act 103 of 1977 states that the LA shall issue a certificate of occupancy (within 14 days after the certificate has been requested) if the LA is of the opinion that a building has been erected in accordance with the requirements of Act 103 of 1977 and other relevant conditions (South Africa, 2011: 23). However, section 14(1A) determines that a building may be used for a certain period subject to particular conditions before the certificate of occupancy is issued (South Africa, 2011: 22-23). According to section 14(2), the registered electrician responsible for the installation has to issue a certificate stating that the electrical wiring and installation is in accordance with the provisions of all applicable laws (South Africa, 2011: 23).

Section 14(2A) requires the submission of a certificate to the LA upon completion of the structural system, the fire protection system, and the fire installation system (South Africa, 2011: 24). Sections 14(3) and (4) deal with any contraventions of the above requirements, while section 14(5) addresses Ministerial exemptions (South Africa, 2011: 24).

2.5.3.15 Section 15: Entry by BCOs and certain other persons of certain buildings and land

Sections 15(1) to (3) address access to a building or land at a reasonable time by the LA to conduct an inspection (South Africa, 2011: 24-24(1)).

2.5.3.16 Section 16: Report on adequacy of certain measures and building projects

The Minister may request the LA to report on the adequacy of measures against fire, floods or other disasters and request recommendations to mitigate the aforementioned (South Africa, 2011: 24(1)-25).

2.5.3.17 Section 17: NBR and directives

Mulholland and Matshe (2010) state that section 17(1) of the NBR and Building Standards Act (103 of 1977) does not only regulate building standards but take cognisance of environmental issues. Examples listed by Mulholland and Matshe (2010) are the handling of waste material on site and provisions relating to contaminated land. "The NBR empowers a local authority to order a site owner to



remove waste which accumulates beyond the normal levels. Failure on the part of the site owner to comply with such an order is a statutory offence. The local authority may also require that the soil in all areas within the site be treated in accordance with the recommendations of SANS 10124” (Mulholland & Matshe, 2010).

2.5.3.18 Section 18: Deviation and exemption from NBR

Upon written request, an LA may permit a deviation from (or grant an exemption of) a national building regulation, except where it relates to the strength and stability of buildings (South Africa, 2011: 28).

2.5.3.19 Section 19: Prohibition on use of certain methods or materials

The Minister may prohibit the use of any method or material that is not in the public interest or dangerous to property or life (South Africa, 2011: 28).

2.5.3.20 Section 20: Regulations

This section focuses on the review board by determining the hearing procedure, the powers, duties and functions of a review board, possible costs involved, etc. (South Africa, 2011: 28-29).

2.5.3.21 Section 21: Order in respect of erection and demolition of buildings

According to the requirements of this section, a magistrate’s court has jurisdiction to halt construction works or order a structure to be demolished (when an application to do so is made by the LA or Minister) (South Africa, 2011: 29).

2.5.3.22 Section 22: Power of LAs relating to rates, taxes, fees and other moneys

The LA may charge moneys when executing any duties in terms of this Act (South Africa, 2011: 29).

2.5.3.23 Section 23: Exemption from liability

Section 23(b) states that the owner of a building has to ensure compliance with Act 103 of 1977 or any other applicable law, and exonerates the LA by stating that:



“[n]o approval, permission, report, certificate or act granted, issued or performed in terms of this Act by or on behalf of any local authority ... shall have the effect that (a) such local authority ... be liable to any person for any loss, damage, injury or death ... resulting from or arising out of or in any way connected with the manner in which such building was designed, erected, demolished or altered ... or the material used in the erection ... or the quality of workmanship ...” (South Africa, 2011: 29).

2.5.3.24 Section 24: General penalty clause

Where the penalty requirements are not expressly stated, a convicted offender under this Act shall be liable to a maximum fine of R4000 or to maximum imprisonment for a period of 12 months (South Africa, 2011: 30).

2.5.3.25 Section 25: Presumption

Section 25 of Act 103 of 1977 is entitled ‘Presumption’ and states the following:

“If in any prosecution for an offence in terms of this Act it is necessary, in order to establish the charge against the accused, to prove that he failed to comply with the requirements of this Act ... an allegation in the charge sheet that such accused so failed, shall be sufficient proof thereof unless the contrary is proved.” (South Africa, 2011: 31)

Bevis and Misselbrook’s (1997: 13) interpretation of the above is that “...where an offence relating to the standard or quality of materials, design or workmanship has been committed, the accused is AUTOMATICALLY guilty of the allegations on the charge sheet unless the contrary is proved”. The aforementioned stipulation is reiterated by Bevis and Misselbrook, stating that the property owner “...should be aware of the provisions of the guilt presumption incorporated in s 25 of the Act, which basically states that the defendant is automatically guilty of the offences listed on a charge sheet unless he can prove the contrary...” (1997: 36). It could therefore be concluded that the NBR require the accused to prove his/her innocence, placing the *onus probandi* on the respondent.



2.5.3.26 Section 26: Payment of certain moneys to LAs

Except for certain exclusions, "...all moneys recovered by way of fines or estreated bail in connection with any offence in terms of this Act ... shall be paid to the local authority concerned" (South Africa, 2011: 30).

2.5.3.27 Section 27: Powers of Minister in Respect of Certain LAs

If the Minister "is satisfied that a local authority fails to apply any relevant provision of this Act properly", he may instruct the LA to do forthwith, and if the LA continues to fail in this respect, the Minister may revoke the LA's power in terms of Act 103 of 1977 (South Africa, 2011: 30).

2.5.3.28 Section 28: Delegations of powers

In terms of section 28(1) to (3) the Minister, council and director-general of the bureau (SABS) may delegate any conferred power to specific persons or organisations in writing (South Africa, 2011: 30-31). The LA may delegate any power conferred upon it to any appointed committee or employee (South Africa, 2011: 31).

2.5.3.29 Section 29: Repeal of laws

This Section of Act 103 of 1977 removed the power of the LAs to make any building by-laws. Section 29 specifically states:

"Repeal of Laws. –(1) ...the provisions of any law applicable to any local authority are hereby repealed in so far as they confer a power to make building regulations or by-laws regarding any matter provided for in this Act..." (South Africa, 2011: 31).

According to Bevis and Misselbrook (1997: 9-11), the legislators' intention with Amendment Act 62 of 1989 was to remove any municipal by-laws for building elements that are covered by the NBR. Glazewski supports this viewpoint by stating that "[t]he purpose of this Act [103 of 1977] is to provide uniformity in the law relating to the erection of buildings ... and to prescribe building standards" (2000: 253).

Provisions were made where a building regulation, or by-law, or standard building regulation is not covered by the NBR, or alternatively where the building regulation, or the by-law, or the standard building regulation is 'repugnant' (in conflict) with the



NBR (South Africa, 2011: 31). These provisions include, among others, sections 29(2), 29(8)(a) and 31 of Act 103 of 1977. They are subject to the approval of the Minister of Trade and Industry, should be submitted within a particular time frame, and require a notice to be published in the *Government Gazette* (South Africa, 2011: 31-33).

2.5.3.30 Section 30

Section 30 was repealed by section 40(1) of Act 30 of 1982 (South Africa, 2011: 33).

2.5.3.31 Section 31: Repeal of Section 14bis of Act 33 of 1962, as inserted by section 4 of Act 72 of 1964

“Section 14*bis* of the Standards Act is hereby repealed...” (South Africa, 2011: 33).

2.5.3.32 Section 32

Section 32 was repealed by section 40 (1) of Act 30 of 1982 (South Africa, 2011: 33).

2.5.3.33 Section 33

Section 33 repealed by section 6 of Act 36 of 1984 (South Africa, 2011: 33).

2.5.3.34 Section 34: Short Title and Commencement

The shortened title for this Act is “the National Building Regulations and Building Standards Act, 1977, and shall come into operation on a date fixed by the State President by proclamation in the *Gazette*” (South Africa, 2011: 33).

2.5.4 The integration of the NBR with other laws applicable to the built environment

In the publication entitled *The Home Builder's Handbook on the NBR*, Bevis and Misselbrook (1997: 4) warn against reading and interpreting Act 103 of 1977, the Regulations and the Deemed-to-Satisfy Rules in isolation, referring to the interrelated and complementing nature of the documents. These aspects are only discussed briefly, as they are not the focus of this study.



According to Bevis and Misselbrook (1997: 8), any conflict between the NBR and town planning requirements should be resolved by assuming that the "... more restrictive requirement will prevail".

The necessity of an integrated approach towards built environment legislation is further emphasised by Holden (2006) when he discusses the stipulation in Act 103 of 1977 that determines the approval parameters of a building plan application (submitted to an LA) in terms of section 7(1)(a) of Act 103 of 1977:

"If a local authority having considered a recommendation referred to Section (6)(a)... is satisfied that the application in question complies with the requirements of this Act and any other applicable law [author's underlining], it shall grant its approval in respect thereof."

It could be argued that the reference to 'any other applicable law' obliges an LA (and therefore the applicant) to operate in accordance with the relevant municipal by-laws, relevant Provincial Ordinances, and other relevant laws that govern the South African built environment. At the same time, the SABS warns that the Code is a complex document that cannot be incorporated with existing municipal by-laws without proper consideration. The following statement is made by the SABS:

"Authorities who wish to incorporate this Code of Practice into legislation in the manner intended by Section 33 of the Act should consult the South African Bureau of Standards regarding the implications concerned. The code includes provisions intended for information and guidance only. These provisions may not be suitable for direct incorporation." (SABS, 2010a: 2)

Addendum B provides a comprehensive list of the regulations applicable to the South African built environment.

2.5.5 Interpretation of Act 103 of 1977, NBR and SABS 0400

Act 103 of 1977 supplies definitions under section 1 (South Africa, 2011: 11-14) and the Regulations provide definitions under Part AZ2 (South Africa, 2011: 206-217), while definitions for the application of the NBR through the Deemed-to-Satisfy Rules are listed under section 2 (South Africa, 2011: 309-325).



“The importance of reading the ‘definitions’ sections of the Act, NBR and 0400 [10400] cannot be overstressed. Certain words are given meanings which extend beyond their common usage meanings.” (Bevis & Misselbrook, 1997: 7) For example, the term ‘habitable room’ is given a meaning that extends beyond common usage, and includes not only bedrooms and living rooms, but also a kitchen, laundry, office, shop, etc. (Bevis & Misselbrook, 1997: 7).

2.5.6 Organisation of the NBR, Deemed-to-Satisfy Rules, and SABS 0400

Each part of the NBR states its non-prescriptive functional requirements at the onset. This is followed by a reference to a relevant Code of Specification which, if adhered to, will ‘deem to satisfy’ the stated functional requirements:

“[t]he NBR are organised in a logical sequence, starting with Parts A to F which cover administrative, health, strength and stability and site related aspects. Then follow Parts G to W, most of which deal with particular building elements, roughly in the order in which one would expect a building to be constructed” (Bevis & Misselbrook, 1997: 5).

The SABS 0400 is organised in a similar fashion, with the different parts listed in the same alphabetical order. The Deemed-to-Satisfy Rules (most of which are empirical) are stated under each part of Code 0400, or another SABS code or specification is referred to (Bevis & Misselbrook, 1997: 5).

2.5.7 SABS 0400 as regulating instrument

S 4(1) of Act 103 of 1977 states that:

“[n]o person shall without the prior approval in writing of the local authority in question, erect any building in respect of which plans and specifications are to be drawn and submitted in terms of this Act” (South Africa, 2011: 16).

During the application process, the LA issues a ‘notice of approval’ in terms of building plans and specifications to the applicant. It is argued that the application and subsequent notice serve as controlling instruments ensuring compliance with the Deemed-to-Satisfy Rules of the NBR.



This notice of approval represents Act 103 of 1977 and all its relevant requirements and, should the applicant conform to the materials and methods as described in the application, the structure should be fit for its purpose. However, the owner of the property (or his agent) remains the legally responsible person, because section 23 of Act 103 of 1977 exonerates the LA from any liability should any associated damage, injury or death occur.

The implementation and regulation of the current version of the NBR take place through the following stages and inspections:

- Stage 1: An application is lodged at the relevant LA.
- Stage 2: A 'notice of plan approval' is issued to the applicant.
- Stage 3: The following site inspections take place after the LA is requested to be in attendance (a specific number of working days' notice to the LA are required for each inspection):
 - Inspection 1: Commencement and/or demolition
 - Inspection 2: Fire installation connection
 - Inspection 3: Foundation trenches/excavations
 - Inspection 4: Drainage
 - Inspection 5: Occupation certificate

2.5.8 The changing objectives of Act 103 of 1977 and the NBR

According to Bevis and Misselbrook (1997: 1), the objective in establishing Act 103 of 1977 represented an attempt to curb the inflation cycle at a time when construction costs were spiralling upwards, and these standards were a direct result of the 1977 recommendations of an 'Anti-Inflation Committee' under the auspices of the then Minister of Economic Affairs. It could thus be argued that the goal of the NBR (and also the Code) is to stem inflationary tendencies in the built environment. Bevis and Misselbrook (1997: 2-3) further state that the current South African building regulations contain no regulations on thermal insulation or sound insulation, because "such regulations were considered to be inflationary and therefore only the minimum acceptable levels of comfort, to ensure reasonable health and safety standards, have been taken into consideration in the NBR and 0400". The aforementioned argument could however be challenged by citing rising electricity costs and current tariffs together with the spiralling environmental cost of supplying electricity.



The original objective in establishing Act 103 of 1977 required the NBR to be less restrictive than most municipal building by-laws, "...without sacrificing safety, health, strength and stability criteria" (Bevis & Misselbrook, 1997: 1-4). A high degree of flexibility in building design, material selection and construction methods was achieved by "...employing a 'performance' concept, rather than imposing 'prescriptive' requirements" (Bevis & Misselbrook, 1997: 4).

Unfortunately, the non-prescriptive performance approach made universal application difficult. This led to the formulation of the so-called Deemed-to-Satisfy Rules through which a benchmark was defined that suggested type, size, etc., for different materials and methods.

The definition of a 'deemed-to-satisfy rule' as listed under section 2 of the Application of the NBR (South Africa, 2011: 312) provides the following guidance:

“**“deemed-to-satisfy rule”** (or rule) means a **non-mandatory provision** which describes a method of design or construction that is deemed to comply with a particular functional regulation.”

Bevis and Misselbrook state that the Deemed-to-Satisfy Rules are not mandatory, “IT IS IMPORTANT TO NOTE, HOWEVER, THAT THE ‘DEEMED TO SATISFY’ RULES ARE NOT OBLIGATORY. They are merely there for the convenience of the user who, in employing the rules, will be assured that his plans will be acceptable to any LA in this country.” (1997: 5)¹⁴ This interpretation is supported by the National Home Builders Registration Council (NHBRC) in the publication on the *Assessment of Housing Products* (under the auspices of the Centre for Housing Performance Excellence (CHPE)) where it is assumed that “[c]ompliance with the Deemed-to-Satisfy Rules is a straightforward means of ensuring that the Regulations have been applied” (NHBRC, 2005: 2). However, Deemed-to-Satisfy Rules are not Regulations and therefore not mandatory” (NHBRC, 2005: 2).

Bevis and Misselbrook (1997:5) come to the following conclusion concerning the requirements of the NBR:

¹⁴ Author's note: The sentence case is unaltered and appears as such in the source document.



“THE NBR ARE [the] MINIMUM REQUIREMENTS AS FAR AS THE USER IS CONCERNED, WHEREAS THEY ARE MAXIMUM REQUIREMENTS AS FAR AS THE LAs ARE CONCERNED.”¹⁵

The CHPE of the NHBRC states that the role of the Act is to “form a basis on how the development of buildings and their surroundings are to be done in order to suit human habitation” (2005: 1). This statement does not mention its original objective, i.e. to limit inflation in the construction industry, whereas the building, its surrounding environment and human habitation are given significant importance.

2.6 TRANSFERRED FUNCTIONS FROM THE SABS TO THE NRCS

The (SABS) was established as a statutory body under Act 24 of 1945, and continues to function as the national standards organisation under the Standards Act, 2008 (Act 29 of 2008). Historically the SABS was responsible for certain regulatory functions, and in the case of SABS 0400, for the writing of the NBR and the Deemed-to-Satisfy Rules. It also made recommendations to the Minister concerning Act 103 of 1977. The SABS was tasked with amending the regulations and codes, and with implementing the interpretation thereof through the Review Board. However, this was perceived as a conflict of interest and it was argued that a distinction should be made between the writers of the regulations (to comply with Act 103 of 1977), and the writers of the codes (the so-called Deemed-to-Satisfy Rules) (personal communication with Opperman, 13 May 2010).

The promulgation of the National Regulator for Compulsory Specifications Act (Act 5 of 2008) in the *Government Gazette* 31216 on 4 July 2008 brought about a number of changes. In keeping with international best practice, and to meet the requirements of the World Trade Organization (WTO) agreement on *Technical Barriers to Trade* (WTO TBT Agreement), Act 5 of 2008 transferred the Regulatory Division of the SABS and all its regulatory functions to a new statutory body. Resorting under the Ministry of Trade and Industry, the newly formed National Regulator for Compulsory Specifications (NRCS) took over the regulatory responsibility of the SABS on

¹⁵ Author's note: The sentence case is unaltered and appears as such in the source document.



1 September 2008 (Marais, 2009: [1]). According to Marais (2009: [1]), the objectives of the NRCS can be summarised as follows:

- Make recommendations to the Minister with regard to compulsory specifications
- Administer and maintain compulsory specifications
- Undertake market surveillance through inspection in order to monitor compliance with compulsory specifications
- Enforce compliance with compulsory specifications

2.7 SANS 10400

The new legislation required a number of changes; and in the future the standards would not be known as SABS standards, but rather as South African National Standards (SANS). Accordingly, the name of the code of application of the NBR through the Deemed-to-Satisfy Rules was changed to the following:

“SANS 10400:1990 SOUTH AFRICAN STANDARD Code of Practice for the application of the National Building Regulations [National Amendment 1990-08-01, National Amendment 1996-05-22].” (SABS, 2008c)¹⁶

According to Watermeyer ([2008]: [6]), the following additional amendments were made to the NBR:

- The text was cleaned up and updated.
- Greater clarity and efficacy was introduced regarding the performance-based regulatory framework.
- The procedures surrounding the appointment of competent persons were described in detail.
- Transitional measures were defined.
- New issues that were addressed included contaminated land, dolomite land and geotechnical site investigations.

Universal accessibility and environmental sustainability remain the shortcomings of the amended regulations that were published in the *Government Gazette* on 30 May 2008. Although the new regulations took effect on 1 October 2008 (Watermeyer,

¹⁶ Author's note: The sentence case is unaltered and appears as such in the source document.



2008: 7), the second edition of the SABS 0400-1990 is still used for the most part (albeit under a new name) and the third edition is yet to be published.

2.7.1 Organisation of the NBR, Deemed-to-Satisfy Rules and SANS 10400

SANS 10400 consists of Parts A to D and F to W. SANS 10400-A is labelled *General principles and requirements*, and provides the overall framework for the application of the NBR. Each consecutive section is written separately and only deals with one specific part of the regulations, although each particular section should be applied within the framework of the whole, as established in SANS 10400-A (SABS, 2010a: [Part N, ii]).

As a change from the previous format, each part of SANS 10400 is now organised according to the following headings (SABS, 2010a: [Part N, ii]¹⁷):

- Acknowledgement
- Foreword
- Introduction
 1. Scope
 2. Normative references
 3. Definitions
 4. Requirements
- Annexures

According to Watermeyer ([2008]: [6]), a substantial number of the existing SABS 0400 standards have been re-written, while the remainder were updated or informed with new content ([2008]: [14]): Regulation A2(6) was included as an amendment to the NBR and SANS 10400 to address works executed during the transitional phase.

Regulation A2(6) (South Africa, 2011: 222) states that:

“Where design work has commenced before an amendment in regulation or an amendment to SANS 10400 and an application has not been made, an owner may within 6 months...

¹⁷ Author's note: Part N is included as a separate leaflet to SANS 10400, and is therefore numbered as such in the references.



- notify the local authority accordingly; and...
- continue with the current regulations and version of SANS 10400...

provided that the application is made within 12 months of the local authority accepting that work has commenced”.

However, the May 2010 edition of SANS 10400:1990 indicates that the second edition is currently still in use, and a number of the changes envisioned have not been implemented (see 2.7).

Although Act 103 of 1977 (read with its successive amendments) still regulates the South African built environment, it should be noted that the legislative context of South Africa has changed since the first democratic elections in 1994. The subsequent promulgation of the Constitution of South Africa in 1996 established the right of the South African citizen to a particular environment (and access to housing), among other things. Table 10 provides a summary of the tiered outline of the legislative level (number one), the regulatory level (number two), and the interpretation and application level (number three). Level 2 lists the components that comprise a particular part, while Level 3 communicates the part and which particular version (SABS 0400 or SANS 10400) is currently in use (South Africa, 2011; SABS, 2010a; personal communication with Opperman, 13 May 2010 and 3 March 2011). The different levels are positioned under the umbrella of the Constitution, which makes specific reference to sustainable development.



Table 10: The organisational structure of the NBR within the context of the South African Constitution

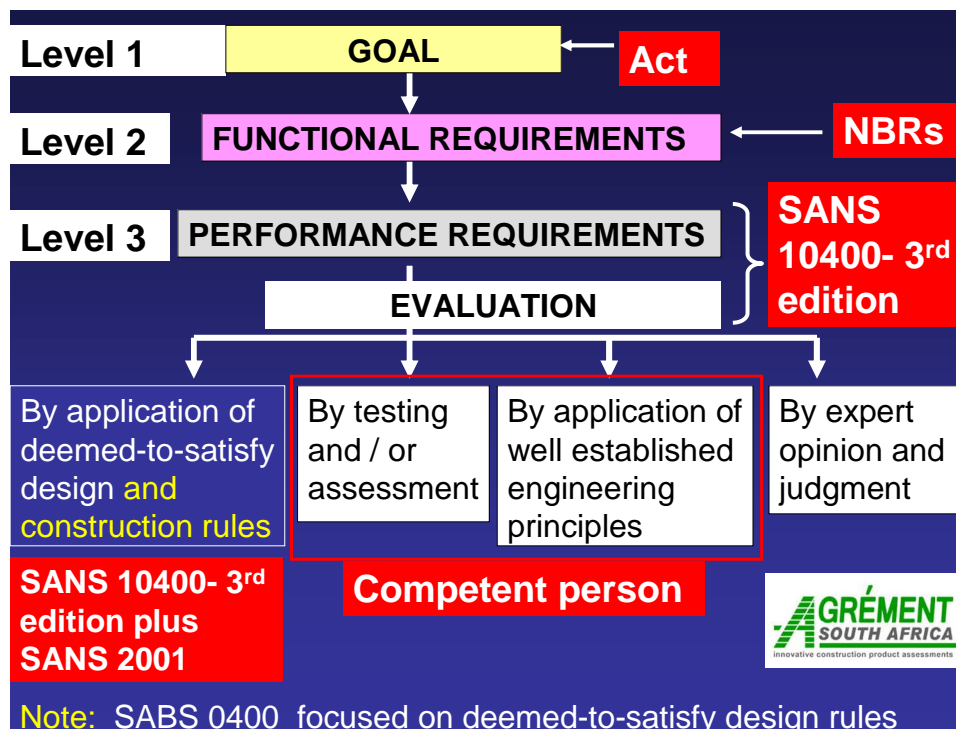
CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, ACT 108 OF 1996						
Chapter 2, Section 24, Environment						
Everyone has the right						
<ul style="list-style-type: none"> a. to an environment that is not harmful to their health or well-being; and b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that <ul style="list-style-type: none"> i. prevent pollution and ecological degradation; ii. promote conservation; and iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development. 						
Level 1						
The NBR and Building Standards Act (103 of 1977)						
Statutory requirements	Definitions	Section:	1			
	Scope	Sections:	2, 29-34			
	Duties and tasks of the LA	Sections:	4 -8, 11, 14, 15, 21- 23, 27, 28			
	Duties and tasks of draughtsmen	Section:	3			
	Duties and recourses of applicant	Sections:	9, 13, 18, 24-26			
	Safety and Security	Sections:	10, 12			
	Requests by (and duties of) the Minister	Sections:	16, 17, 19, 20			
		Level 2		Level 3		
		The National Building Regulations		The SANS Code of Practice for The application of the NBR through the Deemed-to-Satisfy Rules of SANS 10400		
Responsible entity		SABS (Standards)		NRCS (Regulations)		
Focus area	Description	Part:	Sub-part	Part	Origin	
					SABS	SANS
Introduction	Coming into operation	AZ 1		nil	n/a	n/a
	Definitions	AZ 2		No 2 (11 pp)	•	
	Standards	AZ 3		nil	n/a	n/a
	Scope	nil		No 1 (¼ p)	•	
	Compliance with Regulations	nil		No 3 (½ p)	•	
Administrative, health, strength and stability, and site-related aspects.	Administration	A	A1-A25	nil	•	
	Structural Design	B	B1	BB 1- BB4	•	
	Dimensions	C	C1	CC1-CC4	•	
	Public Safety	D	D1-D5	DD1-DD4	•	
	Demolition Work	E	E1-E4	nil	•	
	Site Operations	F	F1-F11	F1-F11		•
Specific building elements in the approximate order of erection.	Excavations	G	G1-G2	GG1-GG2	•	
	Foundations	H	H1	HH1-HH2	•	
	Floors	J	J1	JJ1-JJ3	•	
	Walls	K	K1-K5	KK1-KK17	•	
	Roofs	L	L1-L3	LL1-LL5	•	
	Stairways	M	M1-M3	MM1-MM4	•	
	Glazing	N	N1	N1		•
Services 1	Lighting and Ventilation	O	O1-O7	OO1-OO7	•	
	Drainage	P	P1-P7	PP1-PP28	•	
	Non-Water-Borne Means of Sanitary Disposal	Q	Q1-Q3	QQ1-QQ3	•	
	Stormwater Disposal	R	R1-R2	RR1-RR6	•	
Accessibility	Facilities for Disabled Persons	S	S1-S3	SS1-SS9	•	
Services 2	Fire Protection	T	T1-T2	TT1-TT57	•	
	Refuse Disposal	U	U1-U3	nil	•	
	Space Heating	V	V1	VV1-VV4	•	
	Fire Installation	W	W1-W4	WW1- WW 5	•	
Administrative	Repeal of Regulations	X		nil	n/a	n/a
	Environmental Sustainability	X	XA	nil	n/a	n/a
Sustainability	Energy Efficiency and Energy Usage in Buildings (circulated on 2010-06-15)		XA	XA1-XA3		•

2.7.2 A changing approach

Watermeyer (2003: 8) states that the SABS 0400 focused on the Deemed-to-Satisfy Rules, whereas the SANS 10400 will emphasise performance-based regulations. Despite the different goals of the two documents, the organisational structure of the original SABS 0400 remains largely intact in the new SANS 10400. The statutory application of Act 103 of 1977 still takes place through a tiered structure, and an integrated approach to its interpretation should remain the aim of the built environment practitioner.

Watermeyer (2008: 8) illustrates the performance base of SANS 10400 (Figure 3), while the associated statutory levels are indicated.

Figure 3: The Performance-based approach of SANS 10400 (Watermeyer, [2008]: [slide 8])



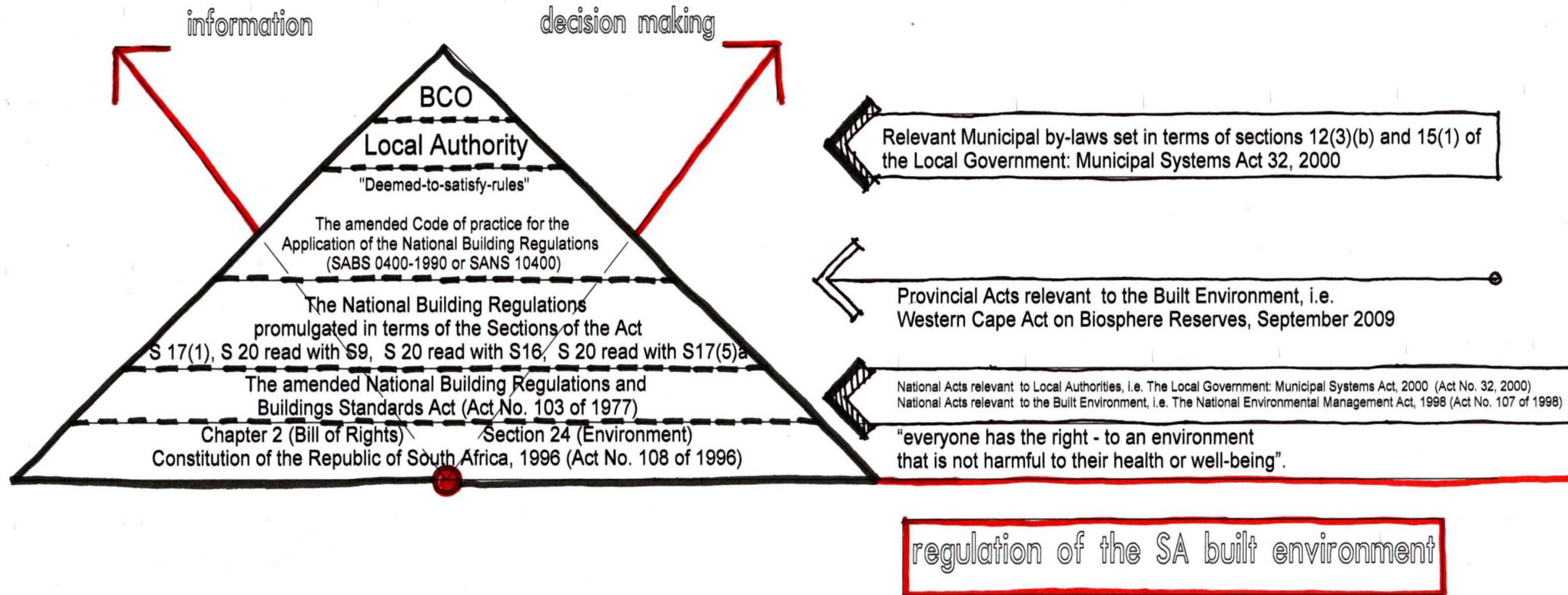
2.7.3 Implementation

In terms of the relevant sections of Act 103 of 1977, the LA should appoint the BCO to ensure the implementation of Act 103 of 1977 and the associated NBR through the code. Based on the requirements of Act 103 of 1977 and the NBR, the BCO should perform the duties associated with the regulation of the built environment. As discussed earlier (under the NBR as regulating instrument), the BCO has three stages and five inspections in which to complete his required duties.



On the other hand, the complexities in existing statutory requirements influencing the South African building industry should be acknowledged. The BCO (as officer responsible for implementing the regulations) is influenced directly and indirectly by a number of legislative instruments, and this multifaceted relationship is illustrated in Figure 4.

Figure 4: The implementation of statutory regulations in the South African built environment





It should be kept in mind that the Code is not the only option for the implementation of Act 103 of 1977 and its regulations. As stated earlier, the Deemed-to-Satisfy Rules are not compulsory and there are other avenues available to implement particular requirements. These routes include the following options:

- The use of other SANS codes
- Innovative design by a competent person
 - The design is either tested or assessed by the competent person.
 - Well-established engineering principles are applied by a competent person.
 - A third party (i.e. Agrément SA) provides an independent assessment of the design.

The SANS 10400-A: 2010, Edition 3 provides the following definition for a competent person (SABS, 2010a: 8):

“[A] person who is qualified by virtue of his education, training, experience, and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of the National Building Regulations.”

2.8 THE WORLD GREEN BUILDING COUNCIL

It is necessary to position current compulsory requirements against the development of voluntary requirements within the industry. The development of Green Building Councils and Green Star SA is therefore touched upon briefly.

In 2002 the World Green Building Council (WorldGBC) was constituted in an attempt to accelerate the transformation of the built environment towards sustainability. According to the WorldGBC, buildings and communities are responsible for over 40% of greenhouse gas emissions (World GBC, 2010).

The goals of the WorldGBC include the following (World GBC, 2010):

- Developing and adopting scientific and market-based environmental rating systems

- Supporting and encouraging teaching and research programmes that raise the knowledge and skills base of 'green' building practitioners
- Promoting the construction and use of buildings and other infrastructure that are environmentally responsible, sustainable, efficient, profitable and healthy
- Campaigning for the recognition of environmentally responsible buildings

The WorldGBC argues that the need to reduce environmental degradation is driving the formation of Green Building Councils (GBC) around the world. The current member nations of the WorldGBC represent 50% of global construction activity (World GBC, 2010).

On the African continent, South Africa is the only full member of the Council. The status of Africa, according to data published on the website of the WorldGBC, is depicted in Table 11 (World GBC, 2010):

Table 11: The current status of the GBC in Africa

Country	GBC status	Council title	Website
Mauritius	Prospective GBC	Mauritius (sic)	Not available
Morocco	Prospective GBC	Morocco GBC	http://www.moroccogbc.org/
Egypt	Associated group	Egypt GBC	http://egypt-gbc.org/
South Africa	Established GBC	GBC of SA	http://www.gbcsa.org.za/

To date, Green Star SA has only developed two rating tools, and one piloted tool (see p. 5). As a planning instrument, the success of Green Star SA can only be measured after project completion. Although its aims could be incorporated in the planning stages of projects, it remains a voluntary rating tool. This is in contrast with the NBR, which is used as a controlling instrument to enforce minimum requirements. If the current status quo on regulating and implementation methods remains, the larger part of the formal built environment will not address sustainability challenges, except on a voluntary basis.

During the 2010 UN Habitat Conference on *Green Building Rating Systems in Africa* in Nairobi, Kenya, a declaration was made by decision makers from twenty African countries. This declaration serves as a commitment to promote and foster 'green' building practices in Africa. Although the full declaration is included as Addendum J,



the following selected quotes serve to highlight the importance of this study (UN-Habitat, 2010):

“...In a continent of rapid urbanization the volume of building operation continues to grow very rapidly and requires close monitoring in terms of its environmental impact.

Africa's intense development pressure, the resulting rapid urbanization and generally carbon intensive mediums of energy generation, leaves (sic) the built environment under particular pressure to thoroughly embrace the sustainability imperative.

Considering that building operations are estimated to be responsible for 56% of energy used in Sub-Saharan Africa..., this is an urgent matter that can no longer be underestimated by decision makers, the building industry and building professionals.

We are committed to being the promoters of green practices, from planning, design, construction and operation of the built environment, as well as to the use of appropriate building materials, technologies, services and processes that minimize CO₂ (sic) emissions in our Continent (sic).

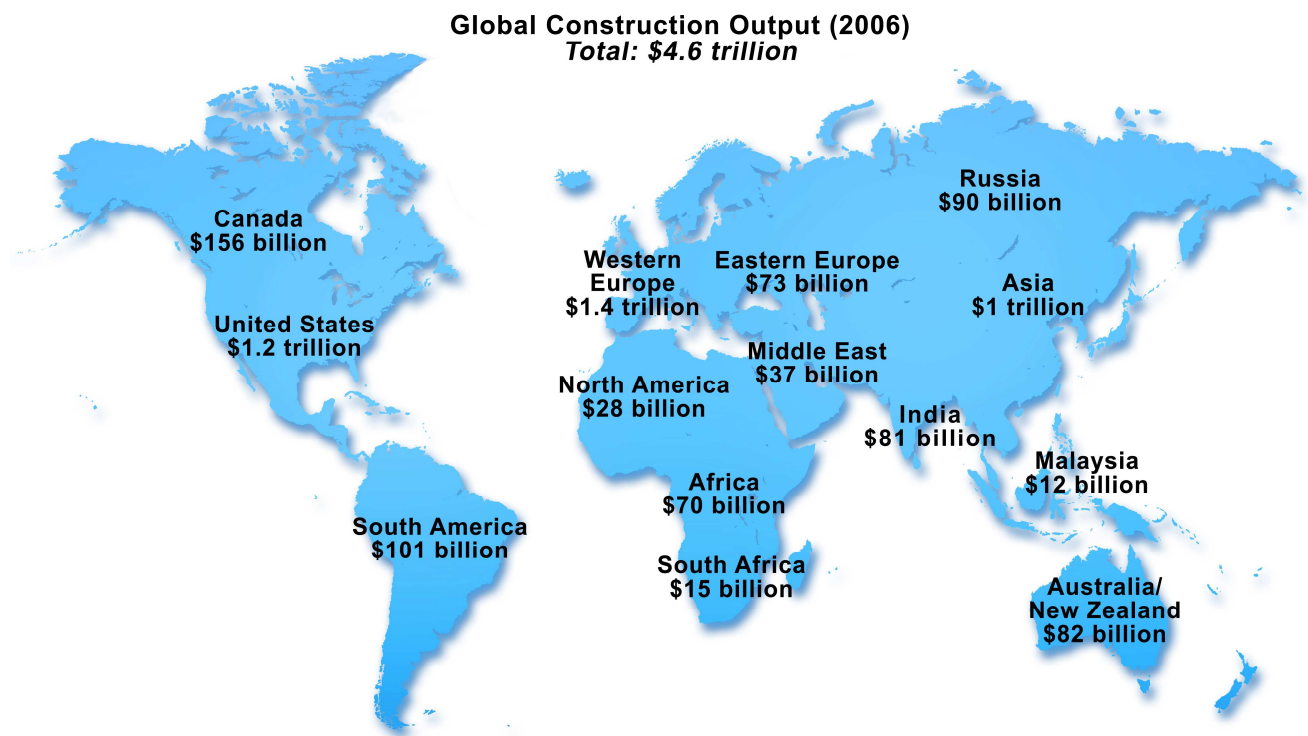
We underline the importance of taking into account social and cultural specificities of Africa in particular:

- Exploring traditional practices that have been proved to be environmentally beneficial while addressing the need for mass housing constructions in Africa given the fact of rapidly increasing urban population growth;
- Addressing the needs of populations at the bottom of the social and economic pyramid that require affordable housing and simple solutions to face economic challenges...”

2.9 THE EXTENT OF THE SOUTH AFRICAN BUILT ENVIRONMENT

According to Malanca (2010: 15), South Africa contributed US \$15 billion to the global construction output of US \$4.6 trillion in 2006. The values contributed by the various regional markets are indicated in Figure 5.

Figure 5: The 2006 value in US \$ of the regional construction markets (Malanca, 2010: 15)



The recorded building plans passed by South African municipalities from 2007 to 2009 for residential buildings, non-residential buildings and additions totalled 61,939,720 m² and with a value of R 231,250,619,000 (Stats SA, 2010a)¹⁸, or approximately US \$33,8 billion (using January 2011 exchange rates). These amounts indicate the extent of formal growth in the South African built environment, and the enlarging contribution thereof to building activity on the African continent. However, the author is concerned that no (or only limited) statutory regulations exist that can direct built environment development towards sustainability ideals.

In *The Architecture of the Well-tempered Environment*, Reyner Banham (1984: 13) declares a "...growing concern about the apparently irreversible depletion of the

¹⁸ This figure excludes government expenditure for which no accurate figures are available at present.



Earth's energy resources and the pollution of its biosphere..." and draws attention to the "...waning confidence of architects in their own ability to deal with energy problems (or opportunities)".

Sir Stuart Lipton (2003: 9) states that "[t]here is a lot of rhetoric around the concept of sustainable development but there are some very practical considerations that you cannot ignore. ... [E]nergy efficiency is a function of the services design as well as the overall building concept, which includes orientation, whether windows open ... where surface water will go and what users are likely to do about lighting, ventilation and recycling waste; all need to be incorporated into the design approach". Lipton (2003: 3-12) presents the following aspects that should inter alia be considered in building design:

- The location of the building
- The approach to design and construction
- The future use of the building
- The long-term costs of the operation and maintenance of the building

Alaric Napier argues that the majority of buildings in South Africa are conceived without consideration of environmental issues. Napier (2000: [1]) specifically mentions large buildings, which absorb enormous quantities of heat and subsequently require "...re-conditioned interiors..."¹⁹ to render them habitable:

"... frequently there are very comfortable conditions outside such buildings, but the interiors become overheated, [and] then need cooling again. The same could be said for cold regions where heating has to be applied quite unnecessarily".

The South African Report on Greenhouse Gas Emission Reduction by the CIDB, under the auspices of the United Nations Environment Programme (UNEP) Sustainable Buildings & Construction Initiative (SBCI), makes the following recommendations (CIDB & UNEP SBCI, 2008: 43):

¹⁹ Author's note: Napier (2000: [1]) uses the term 're-conditioned' deliberately. This refers to the frequent need to alter existing environmental conditions of a building in an attempt to render it habitable, thus highlighting the importance of designing for optimal environmental comfort from the onset (Napier 2000: [1]).



- The building sector should be prioritised in terms of opportunities for energy-efficiency and emission-reduction potential.
- The building sector needs a national public/private co-ordinating partnership to address climate change because of the large number of current stakeholders from different spheres.
- Accelerated and focused attention should be given to translate existing policy into action. SANS 204, specifically, has to be made mandatory.
- Energy-efficiency requirements should also focus on retrofitting existing buildings.
- The government should lead by example by setting best practice standards for new government buildings within existing resource constraints.

In the author's opinion, issues surrounding sustainability and 'green building' are becoming a growing concern within the different spheres of the South African built environment. However, under the requirements of Act 103 of 1977, the BCO is obliged to scrutinise each plan (except where it falls in an exempted category) and make a recommendation on its approval (or not). This compulsory obligation positions the NBR as ideal vehicle to implement additional statutory requirements focusing on sustainability and 'green building'. The value of formal growth in the built environment of South Africa alludes to the possible impact that the proposed introduction of these additional statutory requirements may have on the South African built environment.

2.10 INTRODUCING NEW STANDARDS

2.10.1 SANS 204

According to Lisa Reynolds (2009: 58), the 2004 publication by the Department of Minerals and Energy (DME) on their strategy for energy efficiency warranted a response from the building sector. A direct result was the formulation of three voluntary standards for improving energy efficiency in buildings, namely:

- SANS 204-1: The general requirements for achieving energy efficiency in all types of buildings
- SANS 204-2: The energy efficiency of buildings implementing natural environmental control



- SANS 204-3: The energy efficiency of buildings employing artificial environmental control

In the interest of brevity, the essence of these standards is discussed below, with the relevant complete documents for Parts 1 and 2 (as they have relevance for the study) included as Addenda E and F.

SANS 204-1 provides the general requirements for achieving energy efficiency in all types of buildings. Part 1 is largely based on the following two tables according to Reynolds (2009: 58):

- Table 3, defining the maximum energy demand per building classification for each climatic zone
- Table 4, providing the suggested maximum annual consumption per building classification for each climatic zone

A compliance certificate (that should be completed by the owner or developer) is included as an annexure thereto, and this should be submitted along with the building plans for LA approval. The certificate requires the completion of an energy audit (one year later) to prove compliance.

SANS 204-2 focuses on the energy efficiency of buildings with natural environmental control, but it also deals with artificial ventilation provided by individual units.

SANS 204-3 covers energy efficiency in buildings with artificial environmental control making use of a central HVAC system.

Reynolds lists the following key sections that occur in both Part 2 and Part 3 of the SANS 204 (2009: 59):

- Site and siting – orientation and shading devices to face north
- Building design – foundation, floor, walls, fenestration, roof, and ceiling
- Building sealing – envelope, air infiltration, leakage
- Services – lighting and power, hot water services, appliances



Reynolds (2009: 59) states that the efficient use of renewable energy is stipulated in this standard and in her view the performance requirements of the SANS 204 are based on the following argument:

“If thermal ceiling insulation and high-performance window systems were introduced today into all new residential and commercial buildings, an estimated 3,500MW in electricity could be saved by 2020. This is almost twice the electricity currently produced by our only nuclear plant, Koeberg (1800 MW).”

To date, SANS 204 remains voluntary, with cost being the most prohibitive factor hampering its mandatory incorporation in the building sector. Another problem is the climatic origin of the international standards that are referred to in SANS 204. According to Opperman (personal communication, 13 May 2010), a concerted attempt was made by the NRCS to define the specific aspects of SANS 204 that could be incorporated in the NBR, and for this purpose *Part XA: Energy usage in buildings* was drafted. (See Addendum I for the full version of the document.)

2.10.2 Part XA: Energy usage in buildings

According to Opperman (personal communication, 13 May 2010), SANS 204 suggests best practice, but does not state the minimum standards (as is the case with SANS 10400). Approximately one year ago, the Department of Trade and Industry (DTI) commissioned the NRCS to compile a specification that will result in energy saving in buildings.

2.10.2.1 Background

Once a designated task group has drafted a standard, the NRCS forwards the particular standard to the SABS. The SABS then initiates the public enquiry stage by publishing a Draft South African Standard (DSS). The DSS on environmental sustainability was circulated on 15 June 2010, with the following title:

SANS 10400-XA: 2010 The Application of the National Building Regulations Part X: Environmental Sustainability Section A: Energy Usage in Buildings (SABS, 2010b). The closing date for comments was 13 August 2010.



The following contents are listed on page 2 of *SANS 10400-XA:2010*, Edition 1 (SABS, 2010b):

Foreword

1. Scope (p. 3)
2. Normative references (p. 3)
3. Definitions (pp. 4-5)
4. Requirements (pp. 5-9)

Annex (sic) A (p. 10)

Annex (sic) B (pp. 11-12)

The foreword of the DSS provides some insight into the standardisation process, specifically:

“This South African standard was approved by National Committee SABS SC 59G, Construction standards – Energy efficiency and energy use in the built environment, in accordance with procedures of the SABS Standards Division, in compliance with annex (sic) 3 of the WTO/TBT agreement.” (SABS, 2010b: [ii]).

2.10.2.2 THE NBR

Annexure A of Part XA (SABS, 2010b: 10) provides the requirements in terms of the NBR, namely:

“**XA1** Buildings having A1, A2, A3, A4, C1, C2, E1, E2, E3, E4, F1, F2, F3, G1, H1, H2, H3, H4 and H5 occupancy or building classifications in accordance with regulation A20, excluding garage and storage areas contained within such occupancies shall be designed and constructed so that buildings

a) are capable of using energy efficiently while fulfilling user needs in relation to vertical transport, if any, thermal comfort, lighting and hot water; or

b) have features and services which facilitate the efficient use of energy appropriate to their function and use, internal environment and geographical location, and



XA2 Buildings shall have at least 50% by volume of their annual average hot water heating requirement provided by means other than electrical resistance heating including but not limited to solar heating, heat pumps, heat recovery from other systems or processes and renewable combustible fuel.

XA3 The requirements of sub-regulations XA1 shall be deemed to be satisfied when such building is designed and constructed in accordance with the following requirements:

a) [The building] is the subject of a rational design by a competent person which demonstrates that the energy usage of such building is in accordance with SANS 10400-XA, or

b) [The building] has an orientation, shading, services and building envelope in accordance with SANS 10400-XA; or

c) [The building] has a theoretical energy usage performance determined by a competent person using certified thermal calculation software, less than or equal to that of a reference building in accordance with SANS 10400-XA.”

2.10.2.3 Critical evaluation

A comparative evaluation of Part XA together with SANS 204 (to which Part XA regularly refers) highlights some inconsistencies. The relevant documents are included for reference and information purposes as Addenda E, G, and H.

Minor discrepancies (Table 12) in Part XA are noted, although they are mostly of an administrative nature (SABS, 2010b: 5-6):

Table 12: Administrative discrepancies in SANS 10400-XA:2010: Edition 1

4.2 Energy usage and building envelope		
Building occupancy classified in terms of Regulation A20	E4 Health care	H5 Hospitality
Requirement 4.2.1 a) A competent person certifies the theoretical annual energy consumption and demand.		See Note 1
Requirement 4.2.1 b) The orientation, shading, roof/ceiling construction, fenestration and insulation of in-slab heating, external walls and services of the building are in accordance with requirements.	See Note 2	See Note 3
Requirement 4.2.1 c) A competent person certifies that the building has a theoretical annual energy consumption and demand equal to or less than a reference building.	See Note 4	
Requirement 4.2.2 Table 1 (Maximum energy demand per building classification for each climatic zone)	No information provided	No information provided
Requirement 4.2.2 Table 2 (Maximum annual consumption per building classification for each climatic zone)	No information provided	No information provided
Explanatory notes: <ul style="list-style-type: none"> • Note 1: • Required information is not provided in Table 1 or 2 • Occupancy is not listed in SANS 10400 (dated 30 May 2008), yet it is published for comment in the DSS SANS 10400-A (circulated 1 June 2010 until 30 July 2010) • Note 2: • Occupancy is not listed in SANS 10400 (dated 30 May 2008), yet it is published for comment in the DSS SANS 10400-A (circulated 1 June 2010 until 30 July 2010) • Note 3: • Required information is not provided in Table 1 or 2 • Occupancy is not listed in SANS 10400 (dated 30 May 2008), yet it is published for comment in the DSS SANS 10400-A (circulated 1 June 2010 until 30 July 2010) • Note 4: • Occupancy is not listed in SANS 10400 (dated 30 May 2008), yet it is published for comment in the DSS SANS 10400-A (circulated 1 June 2010 until 30 July 2010) 		

The following aspects need further consideration before the DSS of SANS 204 Part XA can be implemented as a SANS, thereby defining the minimum statutory requirement:

- Although requirements for glazing are stated in Part XA under 4.4.2.3 (Building envelope requirements), glazing is not listed under 4.2.1(b) where the components of the building envelope are listed. This could probably be attributed to an administrative oversight.
- The specific method for achieving proper orientation of a building (or room) is not stated in the document. The only reference made to orientation is under the definitions, namely:

“3.9: **orientation.** Direction a building envelope element faces, i.e. the direction of a vector perpendicular to and pointing away from the surface outside of the element.” (SABS, 2010b: 4)

Correct orientation is also stated as a requirement of the building envelope (see 4.2.1(b) of the DSS and the NBR requirement listed under XA 3(b)). This

will render the requirement impossible to implement because the orientation in which the building envelope should face (with possible variances) is not defined.

- Similarly, the specific method for achieving proper shading is not defined within the document. Only the requirement is stated under the heading *Energy usage and building envelope*, in Part XA (see specifically 4.2.1(b) (SABS, 2010b: 6), and its regulatory requirement under XA 3b (SABS, 2010b: 10)).
- According to item 4.4.3 of Part XA, fenestration and glazing should be installed according to the energy performance requirements of SANS 204 (SABS, 2010b: 9). In turn, SANS 204-2:2008 refers extensively to the National Fenestration Rating Council (NFRC). However, the NFRC is an American non-profit organisation with a mission statement that reads:

“We’re changing the way America shops for windows, doors and skylights, stating that their main function is to:

[A]dminister an independent rating and labeling system for the energy performance of windows, doors, skylights, and attachment products.” (NFRC, 2010).

It is the opinion of the author that the availability of materials and climatic conditions in South Africa and the United States of America differ considerably. Inevitably, the relevance of this component of the DSS can be questioned in a developing country with a temperate climate that mainly implements an ‘architecture of ventilation’²⁰. The validity of the inclusion of this aspect (especially its rating system) is therefore doubtful.

²⁰ ‘Architecture of ventilation’ is a term developed by the author in response to the European (and partially American) tradition where buildings are well insulated because of extreme temperature exposure, requiring ‘architecture of insulation’ and thereby limiting any thermal bridging. This approach is further supported when interpreting the term ‘energy efficiency’ in the European tradition. According to the Sustainable Buildings & Climate Initiative of the United Nations Environment programme (UNEP SBCI) “the energy efficiency of a building is determined by the rate at which energy is lost through the physical structure of the building (the building envelope), and the rate at which energy is used to meet the energy needs and physical comfort of the occupant” (UNEP SBCI, 2009: 23). The authors of this publication also state that “the physical structure and design of a building, interacting with the local climate, strongly influence the choice of energy system and the associated efficiency of that system” (UNEP SBCI, 2009: 23).

The average climatic conditions in South Africa in the winter period do not require excessive energy to achieve comfort levels. In the words of the Pritzker laureate Glenn Murcutt ([Thorne], 2011: 2):

I also say that we should, as architects, observe how we dress according to our different climates. We layer our clothing, put more on when its cold, take more off when its hot – and I think our buildings should equally respond to their climates. Very few of my buildings have air conditioning. To my very good Finnish friends, I point out that they tend to put on more

- According to item 4.4.4 of Part XA, roofs and ceilings should be constructed in accordance with the requirements of SANS 204 (SABS, 2010b: 9). However, item 4.5.4.1(b) of SANS 204-2 refers to a metal deck roof with “metal purlins or metal battens” (SABS, 2008b: 19). In South Africa, on the other hand, the conventional (and indeed the most cost-effective) construction material for supporting a roof is timber, specifically South African Pine, used as purlins for roof sheeting or battens for roof tiles. In this instance, the standard is prejudicial towards a particular material.
- Under item 4.5.4.1(b) of SANS 204-2 (SABS, 2008b: 19), a ceiling lining (ceiling insulation) is required, in addition to the ceiling. However, studies conducted at the Built Environment Unit of the Council for Scientific and Industrial Research (CSIR) illustrates the reduction in thermal transfer when introducing a ceiling, making it a viable option to insulation (and/or a ceiling lining (Osburn, 2010: [5]).
- In SANS 204-2 the “[m]inimum levels of insulation for energy efficiency in an unventilated roof and ceiling construction” are listed in Table 10 under item 4.5.4.2 (SABS, 2008b: 19). However, the requirements for the ventilated roof (as defined and listed in SANS 204-2 under C.1.1, C.1.2 and C.1.4 (SABS, 2008b: 40)) are not provided in a similar fashion.
- In Part XA, item 4.4.2.3 states that “[t]he requirements for glazing shall be in accordance with the fenestration requirements in SANS 204”, and three subsequent notes are provided (SABS, 2010b: 9).

Note 3 states that, should thermal resistance²¹ be added to external walling with high thermal capacity, it should be placed in between layers. However, in South Africa masonry cavity walls are predominantly used in areas with driving rain to prevent moisture penetrating through to the interior. In the event that a cavity wall is filled with a thermally resistant material, the objective of the cavity (i.e. two separate skins) is ignored. Depending on the type of material selected for insulation; a bridge for water from the outside could be formed or the material could become moist (among other possible problems).

clothes, and we in Australia think more about taking them off – that’s of course what most of my buildings do.

²¹ Thermal resistance implies that a form of insulation is added to the cavity wall.



From the above discussion it could be concluded that SANS 204 does not adequately distinguish between the normative requirements of the standard and the associated performance levels. In addition, the possible methods to achieve a particular performance (as discussed earlier in the section on the Deemed-to-Satisfy Rules) are not clearly stated, thereby confusing both the reader (builder) and the interpreter responsible for its implementation (BCO).

Lastly, SANS 204-1 states the general requirements of the standard. Its scope excludes government-subsidised housing.

This part of SANS 204 specifies the requirements for the design and operation of energy efficient buildings with artificial or natural environmental control and their sub-systems. This standard does not cover government subsidized housing (SABS, 2008a: 3).

On 21 April 2010 the Minister of Human Settlements, Tokyo Sexwale MP, addressed the National Assembly on the occasion of the Human Settlements Budget, and stated that since 1994 the South African government had constructed approximately 2.3 million housing units (accommodating nearly 11 million people), but the backlog in 2010 was still estimated to be 2.1 million units. Nevertheless, the DSS of SANS 10400-XA:2010, Edition 1 does not explicitly state whether government-subsidised housing is included as part of this draft standard. It could however be assumed that it is excluded (from the DSS of SANS 10400-XA:2010, Edition 1), thereby affecting the largest portion of the South African population adversely.

The division of the South African built environment into formal and informal segments presents its own challenges. Further division of the formal segment (i.e. government buildings and other buildings, or government-subsidised housing and other forms of housing) will eventually lead to a form of stigmatisation. This could possibly reinforce the idea that implementing sustainable design principles represents an unnecessary additional expense, that it is only the imperative of the privileged and that it is only applicable in a developed environment. This opinion will however require further study and it falls outside the ambit of the current research. It is necessary to identify the commonalities between SANS 10400, SANS 204 and the DSS Part XA in an attempt to align their relevant objectives.



2.11 PASSIVE DESIGN: A COMMON GOAL

According to the Department of Minerals and Energy (DME), houses and other buildings in South Africa are seldom designed from the perspective of energy consumption or energy efficiency (DME, 2010). Specific mention is made of the energy characteristics of low-cost housing and the associated high levels of energy consumption for space heating during the winter. The DME indicates that low-cost housing could be rendered 'energy smart' through the utilisation of elementary passive solar building design practices, resulting in fuel savings of up to 65% (DME, 2010).

In an article on *The Greening of Construction – SA*, Mulholland and Matshe (2010) say that South Africa has "...recognised the risk of climate change in its 'National Climate Change Response Policy' launched at the National Climate Change Summit in March 2009". They list the design and construction of 'green' buildings as a possible method to reduce greenhouse gas emissions. According to Mulholland and Matshe (2010) "...it has been estimated that commercial buildings account for approximately 20% of greenhouse gas emissions, both during the construction phase and the ultimate use of the building".

On 29 July 2005, Report No. 2.34-33 entitled *Energy Efficiency: Energy and Demand Efficiency for Commercial Buildings* was published by the DME. In this draft final report, Asamoah, Lindsey and Robilland (2005: 15) point out the typical definition of an energy-efficient building, namely:

"An energy efficient building provides the intended service, while at the same time minimizing/reducing the building's lifetime operating costs."

This characterisation is based on the definition supplied by the *American Society for Heating, Refrigeration and Air-conditioning Engineers* (ASHRAE) stating that "[a]n energy efficient building is one that uses less energy than new buildings that are being built according to 'current construction practice'" (Asamoah et al., 2005: 15).

Asamoah et al. list the following passive solar design criteria for commercial buildings (2005: 47-48):



- Orientation
- Overhangs and shading
- Insulation
- Windows
- Thermal mass
- Layout and configuration
- Day lighting

The following active solar design criteria for commercial buildings are listed by Asamoah et al. (2005: 49-51):

- Photovoltaic arrays
- Solar thermal collectors for water heating
- Solar thermal collectors for air heating
- Other technologies

It is evident that the above criteria could also be applied to the residential sector. Nonetheless, should these criteria be included in the NBR, it is essential that their original goal of limiting inflation be taken into account.

It is necessary to emphasise once again that the NBR represent the minimum obligation for the owner of a building, but maximum requirement on behalf of the LA. In other words, the LA cannot expect more from the building owner than what is stated in the NBR.

In view of these objectives, the different requirements of SANS 10400, SANS 204 and Part XA were compared in Table 13 to identify possible aspects for inclusion in the NBR.

Table 13: Passive design criteria for possible inclusion in the NBR

Identifying passive design criteria for possible inclusion in the NBR, to achieve a more sustainable South African built environment					
No.	Description	SANS 10400 Edition 2 Revision date: 2010-06-15	SANS 204 Edition 1* Publication date: 2008	Part XA Edition 1 Circulation date: 2010-06-15	Proposal
1.	NFRC Orientation (North)	nil	•	●selected occupations 1	•
2.	Shading of openings in walls: Exposed glass surfaces	nil	•	●selected occupations 1	•
3.	Natural light	•	•	nil	•
4.	Ventilation	•	•	•	•
5.	Zone of Space (Z of S)	•	nil	nil	•
6.	Cross ventilation	nil	nil	nil	•
7.	Roof/ceiling construction	nil	•	as per SANS 204	•
8.	In-slab heating	nil	•	nil	●partially
9.	Water harvesting	nil	nil	nil	•
10.	Fenestration	nil	•	as per SANS 204	nil
11.	Glazing	nil	•	as per SANS 204	nil
12.	External walls	nil	•	●selected occupations 1	nil
13.	Services that use energy/control the use of energy	nil	•	●hot water heating ●exposed hot water pipes	●exposed hot water pipes
14.	Maximum energy demand/ building classification for each climatic zone/net floor area (monthly average determined over a year period)	nil	•	●selected occupations 2	nil
15.	Maximum annual energy consumption/ building classification for each climatic zone	nil	•	●selected occupations 2	nil
16.	Certification by competent person that theoretical annual energy consumption and demand of the building is equal/ less than that of the reference building	nil		●selected occupations 3	nil
*This standard does not cover government-subsidised housing					
Classification and designation of occupancies as specified in the NBR:					
Occupations 1 = A1, A2, A3, A4, C1, C2, E1, E2, E3, E4, F1, F2, F3, G1, H1, H2, H3, H4, and H5					
Occupations 2 = A1, A2, A3, A4, F1, G1, and H1 (excluding garages and storage areas)					
Occupations 3 = A1, A2, A3, A4, C1, C2, E1, E2, E3, E4, F1, F2, F3, G1, H1, H2, H3, H4, and H5 (excluding garages and storage areas)					

The effective implementation of some of the above aspects could be controlled by the BCO, should he be willing and able, as part of an existing administrative process required by the NBR. It will be necessary to furnish the BCO will a specific checklist to allow for the possible implementation of the aforementioned criteria (see Table 14).

Table 14: BCO checklist to assist in implementation of passive design criteria

Sustainability/Passive design/'Green' building				
1. Orientation (North²²)				
1.1. Did the draughtsman provide the following schedule : ²³				
Room	Habitable	North facing?	Within 14° East of North	Within 14° West of North
	Yes/No			
1.2. Do the majority ²⁴ of habitable rooms face North, within 14° East of North, or within 14° West of North?				
1.3. If not, what mitigating passive measures (i.e. heat reflective glass, laminated glazing, screens, etc.) were taken to reduce possible heat gain within habitable rooms?				
1.4. Do these correspond with the window and door schedule?				
2. Shading of openings in northern walls: Exposed glass surfaces				
2.1. Do exposed glass surfaces in north-facing walls have a protective roof overhang and/or shading device (i.e. shutters or screens)?				
2.2. If not, what mitigating passive measures (i.e. heat reflective glass, laminated glazing etc.) were taken to reduce possible heat gain within habitable rooms?				
2.3. Do these correspond with the window and door schedule?				
2.4. Do these correspond with the detail section?				
2.5. What is the relationship between the total area of wall openings and floor area of an individual room (especially important when the room has to be heated)?				
3. Natural light²⁵				
3.1. Does each habitable room have a total window area of at least 10% of the floor area (or 0,2m ²) for natural lighting?				
3.2. Does this correspond with the window and door schedule?				
4. Ventilation²⁶				
4.1. Is the habitable room mechanically ventilated?				
4.2. If yes, see SANS 204.				
4.3. If not, does each habitable room have openable windows of at least 5% of the floor area (or 0,2m ²) for ventilation?				
4.4. Does this correspond with the window and door schedule?				
5. Zone of Space (Z of S)²⁷				
5.1. Is the Z of S outside the opening not less than 0,5m in length to the boundary line, or				

²² "True north/south orientation... is generally considered best for all buildings, particularly in warm climates because the windows can then be protected almost completely by relatively simple fixed exterior shading devices in the form of horizontal projections." (Van Straaten, 1967: 123)

²³ "The perfect orientation in SA for all habitable rooms in a house is 10 degrees east of north to minimize the heat in summer and in the cold winter months when the sun is lower it create less shadows and more heat radiation in the habitable rooms" (Botes, 2007). (KZN Department of Housing, 2011)

²⁴ For the purposes of this study (specifically the BCO checklist), a majority will be achieved if 75% or more adhere to the stated requirement.

²⁵ These are existing regulations that are not implemented by the existing approval documents; see Part O of the NBR (SABS, 2010a).

²⁶ These are existing regulations that are not implemented by the existing approval documents; see Part O of the NBR (SABS, 2010a).

1,0m to the building line to a maximum requirement of 8m?
<p>6. Cross ventilation (Van Straaten, 1967: 228-283)</p> <p>6.1. Does the section indicate cross ventilation?</p> <p>6.2. Does the plan indicate cross ventilation?</p> <p>6.3. Does this correspond with the dominant wind direction for the area?</p> <p>6.4. Does this correspond with the window and door schedule?</p>
<p>7. Roof (Bevis & Misselbrook, 1997: 70-71) /ceiling construction (Van Straaten, 1967: 133-172)²⁸</p> <p>7.1. What class roof covering will be installed?</p> <p>7.2. Will a ceiling be installed in all habitable rooms?</p> <p>7.3. If not, will the roofing material and insulation installed achieve a total minimum R-value = 3,67²⁹?</p>
<p>8. In-slab heating</p> <p>8.1. Will under floor heating be installed?</p> <p>8.2. If yes, will under floor insulation material be installed?</p>
<p>9. Stormwater harvesting³⁰</p> <p>9.1. What is the roofing material?</p> <ul style="list-style-type: none"> • If thatch, no further action is required • If other roofing material, see items below: <p>9.2. Residential ([Taylor], 2011) (Rain harvesting systems, 2010):</p> <ul style="list-style-type: none"> • Roof harvesting <ul style="list-style-type: none"> ○ When the floor area = 200 m² or more with the roof area = 100 m² or more, the minimum requirement is a gravity fed rain water harvesting system with a 2500 litre (above or under ground) tank ○ When the floor area = 400 m² or more with the roof area = 200 m² or more, the minimum requirement is a gravity fed system with a 5000 litre (above or under ground) tank complete with pump <p>9.3. Commercial ([Taylor], 2011) (Rain harvesting systems, 2010):</p> <ul style="list-style-type: none"> • Roof harvesting as above • Stormwater attenuation solutions with heavy duty underground harvesting tanks • Drainage and stormwater management for turf areas with in-field harvesting tanks • Permeable paving to dissipate stormwater runoff <p>9.4. Grey water</p> <ul style="list-style-type: none"> • No requirement
<p>10. Solar energy</p> <p>10.1. What is the total size of the water cylinder(s) powered by electrical heating?</p> <p>10.2. If 200 litres or larger, at least 30% of the capacity has to be heated using alternative energy methods.</p> <p>10.3. If larger than 300 litres, at least 40% of the capacity has to be heated using alternative energy methods.</p> <p>10.4. If larger than 400 litres, at least 50% of the capacity has to be heated using alternative energy methods.</p>
<p>11. Services</p> <p>11.1. Is the hot water cylinder fitted with a blanket?</p> <p>11.2. If not, see SANS 204.</p> <p>11.3. Are any hot water pipes exposed (either inside the structure, i.e. in the ceiling void, or outside (i.e. in the walls)?</p> <p>11.4. If yes, see SANS 204.</p>

²⁷ These are existing regulations that are not implemented by the existing approval documents; see Part O of the NBR (SABS, 2010a).

²⁸ (Osburn, 2010: [2])

²⁹ The units of measurement for R-value is m²·K/W (or equivalently to m²·°C/W).

³⁰ Against a global rainfall average of 962.7 mm per year, South Africa receives a mean annual precipitation (MAP) of 500 mm, making it the worlds 30th driest country ([Taylor], 2011) (personal communication with De Jager, 22 March 2011).

2.12 EXISTING PASSIVE DESIGN REQUIREMENTS OF THE NBR AND ADDITIONAL PROPOSALS TO BE IMPLEMENTED VIA THE CHECKLIST

Existing NBR requirements that are not, but should be, included in the building plan checklist are the following:

1. **Natural lighting**

The Deemed-to-Satisfy Rules of SANS 10400-1990: **002.1** state that:

Where for the purposes of natural lighting a room is provided with one or more openings, such opening or openings shall be situated in an external wall, or in a suitable position in the roof of the building (SABS, 2010a: 102).

The Deemed-to-Satisfy Rules of SANS 10400-1990: 002.1-002.3 also require that:

The area of such opening, or total area of such openings, inclusive of frames and glazing bars, shall be not less than 10% of the floor area of the room or rooms served by it, or 0,2 m², whichever is the greater (SABS, 2010a: 102).

2. **Natural ventilation**

The Deemed-to-Satisfy Rules of SANS 10400-1990: 004.3 state that:

The total area of any opening, door or openable glazed window contemplated in subrule 004.2(a) or (b) shall be not less than 5% of the floor area of the room, or 0,2 m², whichever is the greater (SABS, 2010a: 108).

The Deemed-to-Satisfy Rules of SANS 10400-1990: 004.4 require that:

The total area of any opening contemplated in subrule 004.2(c) shall be not less than 2% of the floor area of the room (SABS, 2010a: 108).

Proposed additional requirements of the NBR to be implemented via the checklist are the following:

3. **Cross ventilation** should be provided for the majority of **habitable rooms**.



4. *Where applicable, **water storage tanks** should be used to **harvest stormwater** from roofs for later use in cisterns, irrigation, etc.*
5. *All **electric water heating** should be **supported by a renewable energy source** to limit electricity consumption for heating.*
6. *All **electric water-heating cylinders** should be fitted with an **automatic timer** to limit electricity consumption for heating.*
7. *Except where the **roofing material** conforms to a **minimum thermal resistance level (R-value)**, a ceiling should be installed for all habitable rooms to avoid unnecessary heat gain/loss.*
8. *Where applicable, all building **entrances/exits** should be **shielded from prevailing winds**.*
9. *The **majority of habitable rooms** should **face** in a **northerly direction** to avoid unnecessary heating/cooling loads.*
10. *If **under-floor heating** is installed, **under-floor insulation material** should also be provided to avoid unnecessary heat loss.*

2.13 CONCLUSION

After the great fire of Rome the Emperor had to implement decisions regarding the growth and expansion of the Empire. Nero's decisions impacted the domus (house), the insulae (blocks of flats) and even the forum. In a similar fashion, contemporary society has to adjust to a changing environment.

Today, the environmental needs of a future generation are widely acknowledged, and there exists general agreement about the idea of sustainability. However, these ideals have to be implemented and monitored by an authority like the Senate, and the individual has to adapt to changing requirements (just like the Roman citizen had to do, see pp. 2-3).

Once the relationship between ideals has been defined, the instrument used to implement the objectives, a controlling authority, and the person composing a proposal all have to be demarcated clearly. Simultaneously, a degree of flexibility is required to allow for development. The introduction of much-needed built environment sustainability criteria as part of the NBR should however be aligned with the original goals of the building regulations (limiting building inflation).



As controlling instrument, the NBR have to incorporate ideals on sustainability. It is also necessary for built environment professionals to be adequately trained to submit development proposals in accordance with these ideals. Finally, the BCO has to be able and willing to evaluate these proposals in terms of a set of guidelines that promote certain sustainability ideals.

2.14 SUMMARY OF CHAPTER 2

Chapter 2 starts off with a literature review of pertinent aspects that have relevance for the study. The introduction lists the origin of building regulations by referring to the Code of Hammurabi, and touches on the subsequent development of building regulations.

The term 'building regulation' and the different approaches to the formulation thereof are defined.

The next section of the chapter identifies the origin of building regulations in Southern Africa and discusses the NBR and the Building Standards Act in more detail. Act 103 of 1977, its requirements as stated in the NBR, and the subsequent Code of application through the Deemed-to-Satisfy Rules of SABS 0400 are presented. Specific references are made to the changing objectives of Act 103 of 1977 and the introduction of a new regulating authority, resulting in the SANS 10400. The voluntary standard SANS 204 is critically discussed and the envisioned DSS of SANS 204:XA is evaluated. This results in a proposed checklist on passive design for implementation by the BCO in an attempt to render the built environment of South Africa more sustainable and adhere to the original objectives of the NBR.

This concludes the first phase of the study, and the following aspects were stated or addressed according to the research design presented in Chapter 1:

- 1.1 The origin of building regulations
- 1.2 Description of the first official building regulation in Southern Africa
- 1.3 Discussion of the history and development of the NBR as regulating instrument of the South African built environment
- 1.4 The original goal of the NBR



- 1.5 Interpretation of sustainability, with the focus on passive design (within the context of the South African built environment)
- 1.6 Discussion of the prescribed structure for implementation of the NBR, specifically the following items:
 - 1.6.1 Application for plan approval
 - 1.6.2 Notice of approval/ rejection
 - 1.6.3 Five inspections
 - 1.6.4 Certificate of Occupancy
- 1.7 Critical evaluation of the DSS of SANS 10400-XA: 2010 (15 June 2010) Part X: Environmental sustainability Section A: Energy usage in buildings
- 1.8 Identification of possible aspects that could be incorporated in the NBR, and a proposed checklist for the implementation of these by the BCO

To assist the reader, a summary of the research design as provided in Table 15 highlights the aspects that were addressed in this Chapter.

Table 15: A summary of the research design, highlighting the completed phases

