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How Construction Laws, National Building Regulations and South African National Standards Affect Homeowners

Prior to 1985, various provinces and municipalities in South Africa had their own construction laws and regulations which, although similar, were not the same.

Over a period of years a committee of experts, including architects, builders, developers, and the Bureau of Standards (SABS) professionals researched and compiled a proposed draft legislation. This was then sent out to numerous interested parties throughout the country for comment. All comments were meticulously examined and alterations to the draft were made where necessary. Eventually, in 1977 South Africa’s first national construction laws, the National Building Regulations were promulgated; and on September 1, 1985, they became effective in law.

Although widely referred to as the National Building Regulations (NBR), the legislation is National Building Regulations and Building Standards Act No. 103 of 1977. Relatively general in format, the Act relies on national standards published by the South African Bureau of Standards (SABS) that provide a code of practice (also known as deemed-to-satisfy rules) for the application of the NBR.

Role of the SABS in the NBR Construction Laws

While the national Building Regulations and Building Standards Act does not refer directly to the SABS or the national standards, it does use the terms “council” and “bureau” throughout. In terms of definition, “council” and “bureau” are dealt with in the Standards Act, No 30 of 1982 (which amended parts of the NBR), and refer to the Council of the South African Bureau of Standards – in other words, the SABS and its national standards.

From the start, the SABS has produced its codes of practice after the legislation was introduced or revised. So while the Act became effective law in September 1985, it was only two years later, in September 1987 that the first code of practice – SABS 0400-1987 – was published. The Act was amended again in 1984 and in 1989, and the national standards were amended in 1990. The intention was to publish another revision of SABS 0400 in 1995, but this never happened.

Meanwhile, a decision was made to substantially update the law. The amended legislation was published on May 30, 2008 and it came into operation on October 1 the same year. Two years later, the bulk of SABS documents explaining how designers and builders should interpret the regulations, were still not available and they were forced to refer to SABS 0400-1990, that had been renamed SANS 10400-1990. Now that all the new SANS have been published by the SABS, this outdated document is available from the SABS and on this site, free.

While the “deemed-to-satisfy rules” provide invaluable comment about the regulations and construction laws, and explain how designers (including architects and engineers) and builders should interpret them. More importantly they expand on ways to ensure that all construction and building work results in buildings and homes that are safe. The NHBRC’s handbooks contain similar information.

Because the Act is more than just an enabling legislation, it is important to realize that the Act and the SANS should be read together. Local authorities are responsible for the correct application and administration of the regulations and their bylaws.
General principle and requirements - Part A

Design, Planning and Supervision of All Construction Work Must Follow a Legal Process

Each section of SANS 10400, the Code of Practice for The application of the National Building Regulations (NBR) is presented with the relevant extract from the building regulations (which is law), and is then followed by a general commentary explaining how the law should be interpreted to “satisfy” the law.

Generally the regulations themselves are remarkably short, while the deemed to satisfy rules (now referred to as deemed-to-satisfy requirements) are quite lengthy. But in Part A of SANS 10400, General Principles and Requirements, the regulations cover about 15 pages. By contrast, the regulations section relating to excavation covers just half a page.

You can download the standards (as published in 1990), as well as the most recent version of the regulations (the Act) published in its entirety, HERE, as well as the recent amendments to the Act. Just be aware that while the amendments to the regulations are complete, the SABS commentary in these documents, that explains how the regulations should be interpreted and applied, is not.

You can buy specific sections of the most recent edition of The application of the National Building Regulations SANS 10400-2011 from the SABS, either at one of their offices, or online at the SABS Internet store.

What is Covered in Part A: General Principles and Requirements
This section of the NBR covers details of requirements for plans, drawings and various documents that MUST be submitted to your local authority before you are allowed to build any sort of structure. For instance, you need to have:

- a site plan,
- layout drawings,
- a fire installation drawing,
- drainage installation drawings,
- particulars of any existing building or structure that is going to be demolished – and you need to state how it will be demolished,
- and any other plans and particulars that your local authority requires.

These general principles and requirements also specify the details that must be included on different plans, as well as the size and scale required on plans and drawings. They also state what colours to use to identify different materials on plans. For instance, new masonry must be shaded red and new concrete green. All existing materials are shown in grey.

When architects, designers and engineers draw plans, they use symbols to identify certain details. These are also specified in Part A.

There is also information regarding building control officers and their qualifications; specifications relating to plumbers and anyone doing plumbing work – only trained plumbers are permitted to do this work – specifications of who may design buildings, as well as inspect and assess them.

Changes to Part A of The application of the National Building Regulations
Previously referred to as SABS 0400-1990, these regulations were totally overhauled in 2008. This meant that the deemed-to-satisfy elements had to be overhauled and rewritten too. Reasons given for the overhaul were:

- the fact that the apartheid system had been abandoned
- the fact that South Africa’s population had doubled since the regulations were first written
- the fact that local authorities throughout the country had been completely restructured
- formation of the National Home Builders Registration (NHBRC)
- the introduction of much more complex building control and systems
- the introduction of an increasing number of innovative, new construction system for building
Furthermore, Section 24 of the Bill of Rights in the South African Constitution states that everybody has a right to: “an environment that is not harmful to their health or well-being”. So if our buildings aren’t healthy, and aren’t built with our health and welfare in mind, they are essentially unconstitutional!

Perhaps the greatest change – certainly the one that will impact on both individuals and the building profession – is the fact that all applications to build must now be accompanied by a declaration by a person registered in terms of a built-environment professional council, as to how the applicable functional requirements are to be satisfied. All plans must also be submitted by a “competent person” who is professionally registered in terms of the Engineering Professions Act, the Architectural Professions Act, or the Natural Scientific Professions Act. So unless you are a qualified architect, engineer, designer or somebody specifically with the required “education, training, experience and contextual knowledge” to judge whether a dwelling will meet the functional regulations, you are not a competent person!

Class of Occupancy of Buildings from the NBR
The NBR classifies all the different types of buildings, and when you look at the regulations, you need to be sure that what you are referring to refers to the correct type of “occupancy”.

<table>
<thead>
<tr>
<th>Class of occupancy of building</th>
<th>Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Entertainment and public assembly</td>
<td>Occupancy where persons gather to eat, drink, dance or participate in other recreation.</td>
</tr>
<tr>
<td>A2 Theatrical and indoor sport</td>
<td>Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral, cinematographical or sport performances.</td>
</tr>
<tr>
<td>A3 Places of instruction</td>
<td>Occupancy where school children, students or other persons assemble for the purpose of tuition or learning.</td>
</tr>
<tr>
<td>A4 Worship</td>
<td>Occupancy where persons assemble for the purpose of worshipping.</td>
</tr>
<tr>
<td>A5 Outdoor sport</td>
<td>Occupancy where persons view outdoor sports events.</td>
</tr>
<tr>
<td>B1 High risk commercial service</td>
<td>Occupancy where a non-industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with extreme rapidity or give rise to poisonous fumes, or cause explosions.</td>
</tr>
<tr>
<td>B2 Moderate risk commercial service</td>
<td>Occupancy where a non-industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with moderate rapidity but is not likely to give rise to poisonous fumes, or cause explosions.</td>
</tr>
<tr>
<td>B3 Low risk commercial service</td>
<td>Occupancy where a non-industrial process is carried out and where neither the material handled nor the process carried out falls into the high or moderate risk category.</td>
</tr>
<tr>
<td>C1 Exhibition hall</td>
<td>Occupancy where goods are displayed primarily for viewing by the public.</td>
</tr>
<tr>
<td>C2 Museum</td>
<td>Occupancy comprising a museum, art gallery or library.</td>
</tr>
<tr>
<td>D1 High risk industrial</td>
<td>Occupancy where an industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with extreme rapidity or give rise to poisonous fumes, or cause explosions.</td>
</tr>
<tr>
<td>D2 Moderate risk industrial</td>
<td>Occupancy where an industrial process is carried out and where either the material handled or the process carried out is liable, in the event of fire, to cause combustion with moderate rapidity but is not likely to give rise to poisonous fumes, or cause explosions.</td>
</tr>
<tr>
<td>D3 Low risk industrial</td>
<td>Occupancy where an industrial process is carried out and where neither the material handled nor the process carried out falls into the high or moderate risk category.</td>
</tr>
<tr>
<td>D4 Plant room</td>
<td>Occupancy comprising usually unattended mechanical or electrical services necessary for the running of a building.</td>
</tr>
<tr>
<td>E1 Place of detention</td>
<td>Occupancy where people are detained for punitive or corrective reasons or because of their mental condition.</td>
</tr>
<tr>
<td>E2 Hospital</td>
<td>Occupancy where people are cared for or treated because of physical or mental disabilities and where they are generally bedridden.</td>
</tr>
<tr>
<td>E3 Other institutional (residential)</td>
<td>Occupancy where groups of people who either are not fully fit, or who are restricted in their movements or their ability to make decisions, reside and are cared for.</td>
</tr>
</tbody>
</table>
The following table shows what the “design population” is for each of the occupancies above. In other words, it shows how many people are allowed in the various buildings, which are categorized according to function.

<table>
<thead>
<tr>
<th>Class of occupancy of building</th>
<th>Occupancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>E4 Health care</td>
<td>Occupancy which is a common place of long term or transient living for a number of unrelated persons consisting of a single unit on its own site who, due to varying degrees of incapacity, are provided with personal care services or are undergoing medical treatment.</td>
</tr>
<tr>
<td>F1 Large shop</td>
<td>Occupancy where merchandise is displayed and offered for sale to the public and the floor area exceeds 200 m².</td>
</tr>
<tr>
<td>F2 Small shop</td>
<td>Occupancy where merchandise is displayed and offered for sale to the public and the floor area does not exceed 200 m².</td>
</tr>
<tr>
<td>F3 Wholesalers’ store</td>
<td>Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time.</td>
</tr>
<tr>
<td>G1 Offices</td>
<td>Occupancy comprising offices, banks, consulting rooms and other similar usage.</td>
</tr>
<tr>
<td>H1 Hotel</td>
<td>Occupancy comprising offices, banks, consulting rooms and other similar usage.</td>
</tr>
<tr>
<td>H2 Dormitory</td>
<td>Occupancy comprising offices, banks, consulting rooms and other similar usage.</td>
</tr>
<tr>
<td>H3 Domestic residence</td>
<td>Occupancy consisting of two or more dwelling units on a single site.</td>
</tr>
<tr>
<td>H4 Dwelling house</td>
<td>Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuildings, if any.</td>
</tr>
<tr>
<td>H5 Hospitality</td>
<td>Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons in a dwelling unit.</td>
</tr>
</tbody>
</table>

| J1 High risk storage          | Occupancy where material is stored and where the stored material is liable, in the event of fire, to cause combustion with extreme rapidity or give rise to poisonous fumes or cause explosions. |
| J2 Moderate risk storage      | Occupancy where material is stored and where the stored material is liable, in the event of fire, to cause combustion with moderate rapidity but is not likely to give rise to poisonous fumes or cause explosions. |
| J3 Low risk storage           | Occupancy where the material stored does not fall into the high or moderate risk category. |
| J4 Parking garage             | Occupancy used for storing or parking of more than 10 motor vehicles. |

**Table 2 — Design Population**

<table>
<thead>
<tr>
<th>Class of occupancy of room or storey or portion thereof</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1, A2, A4, A5</td>
<td>Number of fixed seats or 1 person per m² if there are no fixed seats</td>
</tr>
<tr>
<td>E1, E3, H1, H3, H4</td>
<td>2 persons per bedroom</td>
</tr>
<tr>
<td>E4</td>
<td>16 persons provided that the total number of persons per room is not more than 4</td>
</tr>
<tr>
<td>H5</td>
<td>16 persons per dwelling unit provided that the total number of persons per room is not more than 4</td>
</tr>
<tr>
<td>G1</td>
<td>1 person per 15 m²</td>
</tr>
<tr>
<td>J1, J2, J3, J4</td>
<td>1 person per 50 m²</td>
</tr>
<tr>
<td>C1, E2, F1, F2</td>
<td>1 person per 10 m²</td>
</tr>
<tr>
<td>B1, B2, B3, D1, D2, D3</td>
<td>1 person per 15 m²</td>
</tr>
<tr>
<td>C2, F3</td>
<td>1 person per 20 m²</td>
</tr>
<tr>
<td>A3, H2</td>
<td>1 person per 5 m²</td>
</tr>
</tbody>
</table>
Structural Design: All buildings must have a strong, serviceable, stable and durable design—Part B

Why do you suppose we need structural design professionals to be involved in every aspect of building processes? I’ve thought about this often, since we’ve done a load of DIY projects that involve building, and we have seldom had professionals help us. But the point is that any building or structural element, however simple it may be, must be built in accordance with accepted principles of structural design. For instance we don’t just pile bricks on top of one another without sandwiching suitably mixed mortar between them—although I have visited an amazing home in Johannesburg where an architect totally defied this principle and built an incredible home on Linksfield ridge out of bricks sans mortar! But this is not the norm. Similarly, we don’t balance poles together like pick-up-sticks in the hope that they will stay in place.

The Role of the Regulations in Structural Design

As the national building regulations state:

“Any building and any structural element or component” must be designed to “provide strength, stability, serviceability and durability”.

It is also vital that buildings are designed so that if the structural system is in any way overloaded they won’t collapse with disastrous consequences.

The regulations also state that these design requirements shall be “deemed to be satisfied” when buildings are designed in accordance with this section of SANS 10400—Part B, namely Structural Design.

When I last accessed the SABS online to see if these section of the regs was available, it wasn’t. However, there is no doubt that it will ultimately list all the other standards that designers should refer to when undertaking structural design. UPDATE: This is now available from the SABS at a cost of R369.36

Structural Design must be in Accordance with National Standards

It is essential that all structural systems are designed and built by professionals. It is also essential that all materials used are suitable and SABS approved.

Some of the SANS that are used by structural designers are:

- SANS 10100-1: The structural use of concrete (specifically Part 1: Design)
- SANS 10162: The structural use of steel
- SANS 10163: The structural use of timber
- SANS 10164: The structural use of masonry

There are also various SANS that focus on the basis of structural design and actions for buildings and industrial structures. These relate to a variety of actions that are caused by self-weight and imposed loads, wind, seismic action, thermal elements, geotechnical elements, and even cranes and machinery.

Lastly, there are international standards that should also be followed, some of which are available from the SABS.
Dimensions: Every Room Must be Fit for Purpose-
Part C

The National Building Regulations (NBR) are not prescriptive when it comes to the size of rooms and buildings. However it is vital that the size of any room or space is fit for the purpose for which it was intended.

In the case of a really small house – or “dwelling unit” – the floor area of the entire building must be able to accommodate a “habitable” room as well as a separate room with toilet facilities. This is more for sanitary reasons than for comfort, and it makes perfect sense.

That’s about it, though the SANS deemed-to-satisfy requirements do give a little more guidance.

The updated requirements, published by the SABS in October 2010, were compiled with the assistance of the South African Institution of Civil Engineering. You can buy them from the SABS, either from one of their offices, or online.

What SANS 10400-C Covers

In essence the section on Part C, Dimensions in the Code of practice for the application of the National Building Regulations simply establishes the requirements for plan size dimensions as well as room heights and overall floor areas. It’s that simple.

Definitions

The National Building Regulations and Standards Act has a glossary of terms; however there are additional terms that are defined in the various parts of the SABS codes of practice. In Part C, there is a new definition of category 1 buildings. These are specifically buildings that are classified as:

1. Places of instruction (A3)
2. Buildings used for worship (A4)
3. Small shops (F2)
4. Offices, as well as banks, consulting rooms and similar (G1)
5. Dormitories where a groups of people are accommodated in one room (H2)
6. Domestic residences with two or more dwelling units on a single plot (H3)
7. Dwelling houses, which may or may not include a garage and/or outbuildings (H4)

But in addition to the classification there are several other parameters:

- There must not be a basement in the building
- The maximum length between walls or “members” that provide lateral support is 6 m
- The floor area in the building may not exceed 80 square metres.

There are certain requirements and limitations that are imposed on category 1 buildings by other parts of SANS 10400. For instance, in terms of Part T, Fire Protection, they are restricted to one storey. The maximum number of people allowed in category 1 buildings is also regulated.

Supposedly this means that if a house, church, office, shop etc has a basement or is double storey, it is not classified category 1, and a different code of practice will apply.

Dimensions of Plans

When you see dimensions on plans, you will know that these are the horizontal dimensions between UNPLASTERED wall surfaces. Of course once you plaster a wall and re-measure it, the distance between the two walls will be slightly less, since there will usually be at least 10 mm of plaster on the wall (though no one coat should be thicker than 15 mm) – and up to 30 mm if three coats of 10 mm-thick plaster are applied.
The Height of Rooms

If you’re a keen camper, you may not mind bending down in your temporary canvas home. But homes and other buildings have to be able to accommodate people standing up! Very few people are taller than 1.8 m (most are shorter), and so room heights generally are set at between 2.1 m and 2.4 m. This doesn’t, however, prevent designers making ceilings higher than this, even though it does increase building costs.

Minimum heights specified relate to different rooms in homes and other buildings:

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Minimum Height Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bedrooms</td>
<td>2.4 m above a floor area of at least 6 sq m with a clear height of at least 1.8 m at any point that is more than 0.75 m from the edge of the floor space.</td>
</tr>
<tr>
<td>Any other habitable rooms in dwelling houses/units</td>
<td>2.4 m above a minimum of 70% of the floor area, and not less than 2.1 m above the remaining floor area.</td>
</tr>
<tr>
<td>All other habitable rooms</td>
<td>2.4 m.</td>
</tr>
<tr>
<td>Passages and entrance halls</td>
<td>2.1 m.</td>
</tr>
<tr>
<td>Bathrooms, shower rooms, laundries and toilets.</td>
<td>2.1 m above any area where a person would normally stand upright.</td>
</tr>
<tr>
<td>Open mezzanine floor with an area no more than 25% of the area of floor immediately below it</td>
<td>2.1 m above and below the mezzanine floor.</td>
</tr>
</tbody>
</table>

Note that this specification has not changed since 1990 – so the existing table in the free downloadable version of SANS 10400 applies.

When ascertaining the height of a room, the minimum dimension allowed is measured from the top of the finished floor to either:

1. the underside of the ceiling,
2. the underside of the roof covering (if there isn’t a ceiling), or
3. the underside of any structural element (member) that is below the ceiling or roof and is larger than 30% of the plan area of the room. In addition, if there is a structural element projecting below ceiling or roof covering level, the height of the projection may not be less than 2.1 m

How to interpret the dimensions relating to minimum floor to ceiling height

In the top section of the drawing, two levels are indicated. Normally the height would be taken at level 2, but if the total plan size of the shaded areas in the bottom part of the drawing exceed 30% of the total area of the room, the ceiling height should be measured to the first level indicated.

Floor Areas for Buildings

Having said that the floor area of a small size home must be large enough to be habitable, plus must accommodate a separate toilet, there are other specifications in the regulations to consider. So while the minimum specifications are pretty tiny, they are not quite as small as you might be imagining.
For instance the regulations state that the floor of any permanent building that is used as a "dwelling house" must be no less than 30 m². Permanent category 1 building may be smaller, 27 m²; and temporary buildings can be as small as 15 m². So while a bedroom can legally be as small as 6 m² (providing no wall is shorter than 2 m) it won't be sufficient to add on a bathroom and loo and claim that it is a house!

There are also minimum specifications in terms of the floor area allowed for a certain number of people using a room or building at any one time. This is based on the dimensions shown on the plans, but excluding the area that is taken by built-in cupboards, cabinets and so on (see drawings below).

How to measure floor plan areas

These references are specifically in terms of change rooms and dining rooms, and so relate not only to private dwellings, but to hostels and other establishments. If one to 15 people are going to be using a dining room, the minimum allowable area is 0.8 m² per person, but the room must still be at least 6 m² in size.
Public Safety: Even at Home Public Safety is Paramount - Part D

All home owners have a responsibility to people who visit their homes, or members of the public who are able to access their homes.

According to the National Building Regulations, we must be concerned specifically with:

- changes in level,
- pedestrian entrances to parking area in all buildings,
- ramps and driveways,
- swimming pools.

Change in Level

If people can access a level other than ground level on your property, you need to be absolutely certain that they are not likely to fall off. Areas of special concern include balconies, flat roofs and in fact anywhere that is more than one metre above another level.

The most common form of protection in these circumstances will be balustrades, parapet walls, and some sort of handrail.

Pedestrian Entrances

Here the main concern is that people walking to their cars, bikes or whatever form of vehicle they are driving or being transported in can do so safely.

This is generally more of a problem for public buildings rather than private homes. However if there is any possible danger that someone might unintentionally walk in the path of a moving vehicle, make sure there is some sort of warning sign and lighting at night.

Ramps

The building regulations state that any ramp or driveway must be designed in such a way that it is “safe when used and is fit for the purpose for which it is intended”.

Concern here is more for semi-public buildings or places where groups of people are accommodated. However the guidelines suggested in the SANS are relevant for properties where there are two or more dwellings, as well as for other buildings where people live or stay:

- ramps and driveways used by cars and similar vehicles should have a gradient of no more than 1:25 within a distance of 5 m from street boundaries the driveway crosses,
- those used by pedestrians may be considerably steeper than this: a maximum gradient of 1:8 is permitted,
- if ramps and driveways are going to be used by pedestrians and vehicles, there should be a walkway that is at least 1.2 m wide, with a kerb that is at least 150 mm high.

The diagram below shows how this works for ramps and driveways.

![Diagram showing ramp and driveway guidelines](image-url)
Swimming Pools

While the building regulations simply state that property owners must control access to their swimming pools, most local authorities have much stricter rules and regulations. Remember it is ultimately the local authority that will decide whether you must fence the pool.

And if you don’t comply with the local authority requirements and don’t control access, the regulations warn that you will be guilty of an offence. This is not the type of warning that is often seen in the national building regulations – so take it seriously!

SANS 10400 suggests several possible control mechanisms. For instance, you may install or build a fence or wall:

- around the swimming pool and ensure there is a self-closing gate,
- around the house and the pool and make sure that there is a self-closing gate at the entrance – and no other openings,
- around the pool and the house, but in a way that leaves results in the front wall (and therefore the front door) of the house open to any area that is not walled or fenced,

Examples of safe swimming pool enclosures (extracted from SANS 10400 D)

There are also guidelines for protecting children from the potential hazards of swimming pools in SANS 10134: The safeness of private swimming pools. SANS 1390: Steel fencing for private swimming pools details SABS requirements for pool fencing and self-closing gates.

The SANS guidelines may be followed, providing they are in keeping with your local authority requirements.
Demolition Work: Site Safety during Demolition - Part E

If you have to do some demolition work before you build, Part E is the section of the National Building Regulations that you need to familiarise yourself with. But really all it states is common sense and caution. There are only three elements that are covered: 1 – demolition itself, 2 – making sure basements are safe during and after demolition, 3 – prohibition of dangerous methods of demolition. And if you contravene any of these, or ignore any notices, conditions or orders that relate to the demolition, you will be considered to be guilty of an offence.

Demolition of a Building

First and foremost you have to get permission from your local authority before you can demolish a building or solid structure on your property.

Very often the local authority will give permission, but at the same time impose specific conditions that must be adhered to according to Part F of the National Building Regulations – Site Operations.

Essentially the sub-regulations they normally refer to are those that relate to the safety, health and convenience of the public, and those that aim to prevent damage to property, which might include neighbouring buildings, not just the structure that you are wanting to pull down.

The building regulations state categorically that nobody is allowed to leave any build that is in the process of being demolished, or which has been demolished, in a dangerous condition. Again this is primarily to protect members of the public as well as neighbouring properties.

If the local authority finds that the site is dangerous in any way, they can serve a notice requiring you to immediately make it safe, and if you don’t, they can do the necessary work and then hold you liable for costs.

Safeguarding Basements

Basements can cause great challenges during and after demolition, particularly when a building is flattened to ground level. In this event the owner of the property must ensure that there is safe lateral support for the sides of the basement.

Prohibition of Dangerous Methods

Safety is paramount, and the local authority will decide whether or not you may use a particular demolition method. For instance blasting in a built-up suburb may be considered a danger to either other buildings or people, or both. If they do not allow a particular method to be used, the owner of the property is entitled to a relevant reason, in writing.
Site operations must be carried out in a safe, responsible manner. It is for this reason that Part F: Site Operations of the National Building Regulations specifies how the public and property belonging to the local authority must be safeguarded. Other issues that are addressed include:

- environmental conditions,
- site preparation,
- soil poisoning,
- control of noise and dust on site,
- demolition work,
- waste materials on building sites,
- cleaning of sites,
- sanitary facilities, and
- builders’ sheds.

Unlike many of the other parts of the Building Regulations, the legislated regulations (i.e. what is specified by the National Building Regulations and Building Standards Act), is considerably more detailed than the SABS Deemed to Satisfy Rules published with the regulations.

**Changes to Part F: Site Operations**

The most significant changes to this section relates to Unstable Soil Conditions, a heading that has changed to Geotechnical Site and Environmental Conditions. Primarily, it is to ensure that the soil that we build on is not contaminated, and it is safe. Dolomite land in South Africa has proven to be particularly problematic, and this concern is reflected in this part of the building regulations.

Interestingly, definitions of both **contaminated land** and **dolomite land** were included when the regulations were altered in 2008. This followed a comprehensive report by the Department of Public Works *Appropriate Development of Infrastructure on Dolomite: Guidelines for Consultants* that was published in August 2003.

**The New Definitions**

This is the wording used in the building regulations:

**Contaminated land** means any land that, due to substances contained within or under it, is in a condition that presents an unacceptable risk to the health and safety of occupants of buildings constructed on such land.

**Dolomite land** means land underlain by dolomite or limestone rock directly or at a shallow depth less than:
a) 60 m in areas underlain by limestone;

b) 60 m in areas underlain by dolomite where no de-watering has taken place and the local authority has jurisdiction, is monitoring and has control over the groundwater levels over the areas under consideration; or

c) 100 m in areas underlain by dolomite where de-watering has taken place or where the local authority has no jurisdiction or control over ground water levels.

Protection of the Public

This section relates to the erection of fencing, hoarding or barricades that the local authority might require to protect the public from accessing a building site. If required, this must be safe (in keeping with the local authority’s requirements), and may not be removed without their approval in writing.

There are also regulations that relate to both erection and demolition activities on site. For instance builders may not encroach on adjacent land or on public space.

Damage to Local Authority’s Property

If a local authority believes that demolition or erection activities MIGHT affect local authority property adversely, it has the legal right to call for a deposit (or some other sort of security) that may be used to repair any damage caused.

Geotechnical Site and Environmental Conditions

Previously “Unstable Soil Conditions”, this section of the legislation has been substantial changed and is a lot longer than it used to be.

Previously the local authority simply had to inform anyone applying to build on suspect land that there might be a problem – specifically if it had reason to believe there might be “unstable subsoils or unstable slopes in the area in which a site, upon which a building is to be erected, is situated”. Clearly this was too vague.

The legislation now states that where a local authority “has reason to believe that a site upon which a building is to be erected” is:

1. situated on contaminated land,
2. situated on potentially unstable land where a risk could be reasonably foreseen, that ground movements caused by land-slip, slope stability or subsidence may impair the stability of the building or part of it, or pose a threat to the safety of future occupants of the building, or
3. underlain by subsoils that have the potential to cause movement of foundations caused by swelling, consolidation, shrinkage or settlement, and as a result might impair the stability of the building (or part of it),

it must inform the person applying to build of the probable situation.

If the person applying to build IS aware of the fact that the land is either contaminated or potentially unstable, they are bound to “appoint an approved competent person to undertake an appropriate geotechnical site investigation”.

The definition of “competent person” also changed when the legislation was updated in 2008. Previously the term meant “a person who is qualified by virtue of his experience and training”. Now it means “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 these regulations.

This person is required to determine – using accepted principles, methods and technical considerations:

1. whether or not a building may be constructed or erected on the site, and if permission is granted, what conditions should be applied, and
2. the magnitude of any potential and differential movements that the building (or part of it) might be subjected to.

Any geotechnical investigations should be conducted in accordance with the requirements of SANS 10400 Part B: Structural Design (in the case of dolomite lands) and Part H: Foundations.
**Preparation of Site**

Before any foundations may be laid, the area where the building is to be constructed must be properly cleared of all vegetable matter including tree stumps, timber and other cellulose material, as well as debris, refuse and any contaminated materials.

If the site is waterlogged, seasonally waterlogged (in other words not necessarily waterlogged all the time) or saturated with water, or where any building will be situated so that water will drain naturally towards it, drainage must be provided so that the water is directed away from the site or building to a storm water drain, or disposed of in another “safe approved manner”.

**Soil Poisoning**

The section was also expanded in 2008, and a reference to termites included. Essentially the regulations now insist on protection from subterranean termite activity if the local authority deems this to be necessary (which would be in areas of high termite infestation). Treatment must be in accordance with SANS 10124.

**Control of Unreasonable Levels of Dust and Noise**

Owners of land where excavation work is in progress, or where a building is being demolished or erected, must take precautions to limit the amount of dust that makes its way to surrounding roads and footways to a “reasonable level”.

Anyone involved in demolition, excavation and building work has to take care not to “unreasonably disturb or interfere with the amenity of the neighborhood”. Specifically there are times that they may not use any machine, machinery, engine, apparatus, tool or contrivance that is noisy or makes a lot of dust.

- Before 6 am and after 6 pm any day of the week.
- Before 6 am or after 5 pm on a Saturday.
- On Sundays or public holidays.

Previously the legislation only applied to a handful of public holidays: Good Friday, Ascension Day, Day of the Vow, Christmas and New Years Day.

This prohibition is waived if the use of machines etc. is required urgently to:

- preserve the life, safety or health of any person,
- preserve property,
- execute work on behalf of a public authority, or
- the work has been authorized by the local authority.

**Cutting Into, Laying Open and Demolishing Certain Work**

This all-important section of the National Building Regulations specifies when a local authority can demand that building stops or a structure must be demolished.

This might be because the local authority believes that the work has not been carried out in accordance with the NBR, or because approval was not granted. If this is the case, the local authority must give notice in writing for the owner of the building to:

- supply proof that the work is in accordance with the regs and/or it has the approval of the authority,
- cut into, lay open or demolish the building (whatever the local authority deems fit),
- insist that tests are carried out.

If tests have to be demanded, then the owner is obliged to supply a written report to the council that states (amongst other things) what was used for testing, who did the test, and what the results of the test were. If the officials are not satisfied, they may take further steps in terms of the regulations – possibly to insist on demolition.
**Waste Material on Site**

If owners of building sites allow excessive rubble, rubbish and other debris – or combustible waste material – to accumulate, they can expect to receive written notice to have it removed within a certain period. If they don’t comply, they will be regarded as being “guilty of an offence” and the local authority then has then right to remove the materials and make them pay the bill.

**Cleaning of Site**

This is essentially the same regulation that applies to waste material, only here the regulations refer to “surplus material and matter” that has accumulated on site, or on adjoining land or a public street.

**Builder’s Sheds**

Builder’s sheds are legal on building sites as long as they are properly maintained and only used for building purposes. When building ceases, the shed has to be removed. You can’t for instance, decide to keep the shed and use it for your garden tools.

**Sanitary Facilities**

It is against the law to do any demolition or construction work if there are no approved sanitary facilities for workers and other personnel. If sanitary facilities are not provided, the local authority can halt the building process.
Excavations are not always necessary when we build our homes, but it often is, even if the ground is reasonably flat and level. **Part G** of the National Building Regulations deals with excavations and their safety.

**The Importance of Stability**

One of the reasons it is always wise to employ, or at least consult experts is so that all building operations are safe. However it is the owner of the property’s responsibility to take precautionary measures during building operations – or to make sure that precautionary measures are taken.

For instance, major excavations may weaken or even damage the safety and stability of a property, so it essential that precautions are taken to prevent this from happening.

Another factor is that during excavation, there are always open spaces, so it is important that these are safe at all times.

In any case, according to the building regulations, if excavations are likely to be any deeper than 3 m, the property owner must get written authorisation from the local authority before digging begins. In this instance the local authority is likely to specify precautionary measures that must be taken, and/or they may insist on the appointment of an appropriate “competent person” to oversee the operation and be responsible for it.

Even if written authorisation is not required, property owners planning to excavate must let the local authority know at least seven days prior to the operation commencing.

According to the regulations, anyone who doesn’t comply with these requirements will be considered to be guilty of an offence.

**Foundation Excavations**

SANS 10400 states that to comply with the building regulations as they relate to excavations, a professional engineer or other “competent person” should design foundations for excavations that are more than 3 m deep.

Other guidelines include taking excavations for foundations down to firm, natural ground, unless approved measures have been taken to ensure stability of a foundation cast on fill.
The bottom of all foundations should be flat, level and therefore absolutely horizontal – UNLESS they are cast on solid rock that is stable. If a concrete foundation is placed on solid rock, the rock must be clean and dry and it should be “stepped or dowelled” to ensure that there isn’t any lateral movement that could cause the foundations – and then possibly also the walls – to crack.

Stepped foundations on ordinary ground are acceptable, but these must have horizontal and vertical surfaces.

Generally, the guideline is that the bottom of excavations for the foundations of external masonry (brick, block or stone) walls – other than those built on solid rock – should be not less than 300 mm below the level of the adjoining finished ground.
Foundations: Regulations for Foundations - Part H
A Focus on Safety

Foundations, Part H, of any structure, large or small, must be built to safely transmit all loads of the building to the ground. If foundations are not correctly built, walls may crack and at worst, could even collapse.

While the National Building Regulations specify general requirements for foundations, it is the deemed-to-satisfy rules contained in SANS 10400 that give you more detailed information about how to ensure that your foundations comply.

Furthermore, the building regulations require you to have a competent person involved in the build of your home. You must also have plans drawn up according to the regulations AND the requirements of your local authority. This will ensure that the necessary controls are in place, and should guarantee that your structure will be safe and legal.

In addition to 10400, there are other South African National Standards (SANS) that deal with foundations. For example:

- SANS 2001-CM2 covers construction works for a variety of foundation types (strip footings, pad footings and slab-on-the-ground foundations) for masonry walling.
- SANS 10161 covers the design of foundations for buildings in general.
- SANS 10746-2 relates to information technology, specifically open distributed processing. The reference model for this standard is foundations.
- SANS 12575-2 which covers thermal insulation products, specifically exterior insulating systems for foundations. This is highly technical and really only for the professional use of commercial/industrial installers of foundations.

All these standards are available for a nominal fee from an SABS office or from the SABS online store.

The SABS also holds certain international standards, many of which were formulated by the International Standards Organisation (ISO). ISO standards relating to foundations refer to thermal insulation (ISO 12575-2:2007), thermal performance of building in cold weather, when there is frost (ISO 13793:2001), and information technology (ISO/IEC 10746-2:2009).

There is another IEC (International Electrotechnical Commission) standard available: IEC 61773: Overhead lines – Testing of foundations for structures.

How the Building Regulations Have Changed

The National Building Regulations and Building Standards Act, 1977 was amended substantially in 2008. In terms of Part H of the regulations the amendments amounted to an expansion rather than an alteration as such.

Previously H1 GENERAL REQUIREMENT (1) read:
“The foundation of any building shall be designed to safely transmit all the loads from such building to the ground.”

It now reads:

“How to Ensure Your Foundations Comply With the Regulations

Part H and Part B (which covers structural design) of the building regulations go hand in hand. So basically, if your foundation is designed and the concrete placed in accordance with the requirements of Part B, you’ll be safe.

Part B “establishes the representative actions and impacts applied to building elements and structural elements, and their structural response to these representative actions and impacts”. It “also establishes requirements for rational designs and rational assessments, Agrement certification and buildings on dolomite land”. This Part of SANS 10400 was only approved on August 31, 2012, four years after the legislation changed. It is available from the SABS for R369.36 incl. VAT.

Part H, (available from the SABS for R427.50) approved at the same time as Part B, “establishes the representative actions and impacts applied to foundations, and the response of structural elements to ground movements. Buildings that comply with the requirements of this part of SANS 10400 will also comply with the structural design performance parameters established in SANS 10400-B. It contains simple design and construction requirements for foundations for certain masonry buildings to accommodate a relatively small range of ground movements”.

In addition, there are a variety of other SANS available that relate to structural design, although most are intended for industrial and larger commercial structures, with a couple relating to the structural use of timber (SANS 10162-1 and 10163-2).

Empirical rules for foundations as specified in SANS 10400-1990 were relatively basic, following good building practice. For example:

- The basic rules for foundations relate only to walls that are placed centrally on foundations – which ensures that they will safely transmit loads; AND are built on good quality ground soil – NOT heaving soil or shrinkable clay. So if there are ground issues on your site, or special foundations have to be designed by an engineer for some other reason, you cannot rely on the dimensions specified below.
- Basic, uncomplicated foundations should be constructed with concrete that has a compressive strength of at least 10 MPa at 28 days, OR concrete that is mixed proportionately by volume in the ratio 1:4:5 cement:sand:stone. Mixing by volume involves carefully measuring out of the materials in a same sized container. A wheelbarrow may be used, but it is not a suitable method for large building projects.
- Continuous strip foundations should be at least 200 mm thick, unless laid on solid rock.
- The width of continuous strip foundations should be at least 600 mm if the foundation is for a load-bearing or free standing masonry wall, or a timber-framed wall that supports a tiled or thatched roof (which should, of course be constructed according to the building regulations), OR 400 mm if the wall is a non-load bearing internal wall or a timber framed wall that supports a metal sheet, fibre-cement sheet or light metal-tiled roof.
- If a strip foundation is laid at more than one level, it is important for the higher portion of the foundation to extend over the lower portion for a distance that is equal at least to the thickness of the foundation. If there is a void between the top section and lower section, you will need to fill the void with concrete that is the same strength as the concrete used for the foundations.
- Sometimes people thicken an existing concrete slab to form a foundation. In this instance, the TOTAL thickness (ie the concrete INCLUDING the original slab) must be at least the thickness that is usually required for continuous strip foundation (200 mm). The width of the thickened portion under the floor slab must be at least the thickness of a continuous strip foundation (see above).
- The only time you won’t have to add additional thickening is when the walls are timber-framed and NOT load-bearing.
- If a pier is built into the wall, or forms a part of the wall, the thickness of the foundation to the pier must be the same as the foundation required for the wall itself. The length and width of the foundation to a pier should project by 200 mm at any point.
The thickness of the foundation to a supporting sleeper pier or sleeper wall must be at least 150 mm; the length of width of the foundation to the sleeper pier must be at least 450 mm; and the width of the foundation to the sleeper wall must be at least 300 mm.

If you are building a simple structure (a granny flat, a garage or perhaps a freestanding workshop) on flat ground or on a site that is easily levelled, you can rely on these dimensions and specifications. But don’t forget that the building regulations require you to draw up plans which a “competent person” must submit to your local authority for approval BEFORE you start construction of the foundations.
Floors: Building Regulations that Apply to Floors-
Part J

The Application of the National Building Regulations that apply to floors (Part J of SANS 10400) are certainly not exhaustive. In fact, if you think of how much of our house is floor, it’s what we might, in South Africa, describe as a biekie min. But the authorities have, at least, increased this part of the document from a single page to nine pages (although these include a page of references to other SANS that need to be taken into account, and more than a page of definitions) plus a cover page, a Foreword, Contents page, an Annex that gives the official, legal Regulations (see below), a one-line Bibliography – on a full page, a couple of blank pages and some info about the SABS Standards Division.

Changes to the Law

Like all the other parts of SANS 10400, Part J, Floors, has two sections. One section covers the Regulations (the National Building Regulations and Building Standards Act, 1977 and all its amendments) and the other covers how they should be applied (previously what fell under the “deemed-to-satisfy” rules).

In terms of the Regulations (the law), there is one substantial change to the first general requirement that previously stated that any floor of a building must simply “be strong enough to safely support its own weight and any loads to which it is likely to be subjected”. It now states that “any floor of any building shall be designed and constructed to safely support its owns weight and any actions which can reasonably be expected to occur and in such a manner that any local damage (including cracking), deformation or vibration do not compromise the efficient use of the building or the functioning of equipment supported by such a floor”.

In addition (and this hasn’t changed):

- Floors must be fire resistant and where necessary, non-combustible.
- Floors of laundries, kitchens, shower-rooms, bathrooms and toilets (hooray, they are no longer referred to as WCs!) and urinals must be water resistant.
- Timber floors must have adequate under-floor ventilation.
- Concrete floors supported on ground or filling must be constructed in such a way that moisture will not penetrate the floor slab.

As always, the Regulations state that these requirements will be “deemed to be satisfied” if the design and construction of the floor complies with this part of SANS 10400. However, if the local authority deems it necessary, certain other requirements may be needed. For instance the local authority may demand that the entire area within the foundation walls of any building be covered by a suitable damp-proof membrane, and in the case of a basement, or semi-basement, they may require adequate sub-soil drains to be provided under the floor to drain and therefore remove any water that accumulates.

Interestingly, the Regulations now define the word “adequate” in this context:

a) in the opinion of any local authority
b) in relation to any document issued by the council, in the opinion of the council

So if you’re not sure of anything that relates to floors and flooring, approach your local authority for guidance. They are obliged to help you.

**Application of the National Building Regulations as they Apply to Floors**

In addition to a number of SANS that relate to building materials including boards, timber, concrete and fire testing of materials, the SANS states that Parts A (general principles), B (structural design), H (foundations), T (fire protection) and V (space heating) of SANS 10400 must also be taken into account when constructing floors.

The Application of the Regulations relate to:

1. floors in wet areas as specified in the Act (that must be water resistant)
2. suspended timber floors that are not exposed to the elements
3. floors and slabs supported on the ground
4. all timber used for building

There are some useful drawings that show how suspended timber floors should be built.

![Diagram of suspended timber floors](image)

Bearing details for suspended timber floors on ground level
A competent person (civil engineering) shall design and inspect fills where the maximum height of fill beneath floors, measured at any point, exceeds 400 mm.

There are also specifications for maximum spans of floor joists:

1. for those made with sawn SA pine for single- and double-storey houses
2. for those made with laminated SA pine, Grade 5 or higher, also for single- and double-storey houses

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* Commonly available sizes.

Sawn SA pine
Additional floor specifications relate to:

- Flooring boards that must comply with SANS 629 and amongst other things should have a face-side width of at least 50 mm and not more than 140 mm, and tongued on one edge and grooved on the other, with square-sawn or end-matched ends; and have tongues and grooves that produce a tight-sliding fit, and a flush joint on the face-side of the boards.
- Strip flooring that amongst other things should have a width between 35 mm and 90 mm and a nominal length of at least 460 mm (and tongues and grooves as above).
- Particle board that should comply with SANS 50312 and SANS 1931.
- Composite and plywood that should comply with SANS 929.

Additional guidelines relating to suspended wooden floors relate to the clearance between the joints and ground; ventilation; metal masonry anchors to be used and so on.

There are also a number of guidelines given for floors that are supported on ground or filling, but it is also stated that this type of floor should be designed and constructed in accordance with the requirements of SANS 10109-1 under the direction of a competent person (civil engineering) unless the building is to be used for storage or industrial purposes, in which case different guidelines are given.

This section also gives guidelines for underfloor membranes and filling beneath floors. Apart from anything else, a competent person (civil engineering) “shall design and inspect fills where the maximum height of fill beneath floors, measured at any point, exceeds 400 mm”.

So even if you go the DIY route, you’re going to need professional assistance.
Walls: Walls Support the Roof and other Loads-
Part K

The fundamental structure of a house is formed by its external walls, which must support the roof and take any other load that is built above. The section of the National Building Regulations that deals with walls is SANS 10400-K and it has several parts, each dealing with building walls, and the elements of how both internal and external walls should be correctly constructed.

Changes to the Legislation

Like much of SANS 10400, Part K: Walls has changed quite substantially, both in terms of the legislation and the section that deals with the application of the National Building Regulations, which is the document prepared by the SABS and published separately to the legislation.

(NOte: Previously SABS 0400, which became SANS 10400, was published by the SABS in its entirety, with the legislation and a Code of Practice which took the form of “deemed-to-satisfy requirements”. When the legislation changed on May 30, 2008, this was gazetted. The SABS then progressively updated its guidelines and published them over a period of years, as a series of individual documents. These are available from offices of the SABS and from the Bureau’s webstore, HERE. The new version of Part K was published on 29-03-2011 and it costs R517.56 including VAT.)

This article deals primarily with the changes to the legislation, and how it applies to building walls, rather than the South African National Standards.

Structural Strength and Stability of Building Walls

Part K 1 of the regulations states that, “Any wall shall be designed and constructed to safely sustain any actions which can reasonably be expected to occur and in such a manner that any local damage (including cracking) or deformation do not compromise the opening and closing of doors and windows or the weather tightness of the wall and in the case of any structural wall, be capable of safely transferring such actions to the foundations supporting such wall.”

This has been substantially expanded. Previously the legislation simply said the walls should be capable of safely sustaining any loads to which they would be likely to be subjected. It also said that structural walls should be capable of safely transferring such loads to the foundation supporting a structural wall.

There are various walling materials available, made primarily from clay and cement-based products. You will need to decide which is the best material for your particular purposes. Walls can also be built with stone or timber, but each material has its own set of methods to satisfy the requirements.

Solid brick walls normally consist of two brick skins that are joined together and strengthened with brickforce or brick reinforcing and/or wall-ties (a mild steel wire laid between some of the courses to add strength). The interior and exterior surfaces are normally plastered but may be fairfaced (facebrick). Concrete block walls are a more economic option and are often used for garages and outbuildings.

Water Penetration of Walls
Whatever materials you choose to use when you build, the method used for building walls must comply with Part K 2 of the regulations. Primarily they must be built to prevent water penetrating into any part of the building. All cavity walls must be well drained by means of weep holes above a damp-proof course. All cement bricks and blocks are relatively porous and should be plastered or rendered on both sides for thorough waterproofing.

Basements and semi-basements are also referred to in the “new” legislation, and any room below ground must be adequately waterproofed.

The legislation reads: “Where a building includes a basement or semi-basement, the local authority may, if it considers that conditions on the site on which the building is to be erected necessitate integrated designs for the penetration of water into such basement or semi-basement applicable to all construction elements or components thereof, require the submission of such designs for approval. Construction shall be in accordance with the requirements of the approved design.”

In recent years, a variety of alternative construction methods have been developed, most notably in the sphere of cheaper housing. These include the building of walls with insulated fibrecement panels; with fibreglass panels; creating the basic structure with shuttered no-fines concrete; using polystyrene sprayed onto a basic framework; or piling up sausage-shaped bags of sand and cement. If you want to use any alternative method it would be best to contact your local authority planning division, or building inspector, for guidance.

**Roof Fixing**

Part K 3 deals with the way in which the roof of any building is attached to the wall and states that this must be done securely and safely and must be able to withstand any natural forces such as high winds or rain and hail. Specifically, it states:

“Where any roof truss, rafter or beam is supported by any wall, provision shall be made to fix such truss, rafter or beam to such wall in a secure manner that will ensure than any actions to which the roof may normally be subjected will be transmitted to such wall.”

While this clause of the legislation is basically the same as it was previously — one word has changed with forces deleted and actions replacing it — there are substantial amendments to the so-called “deemed-to-satisfy requirements” published in SANS 10400, Part K Walls. Similarly there are many changes — more so in the form of additions — to SANS 10400, Part L Roofs.

**The Ways Walls Behave in Fire**

Part K 4 deals with Behaviour in Fire, and state simple that, “Any wall shall have combustibility and fire resistance characteristics appropriate to the location and use of such wall”.

Brick, block and stone walls are generally accepted as fire resistant. Timber frame with timber or fibrecement cladding need to be certified, and you should check with the supplier regarding these rules for their type of walling, before you decide which material you are going to use for building walls.

**Deemed-to-Satisfy Requirements**

Part K 5 of the legislation states that Parts K 1 to K 4 will have been deemed to be satisfied “where the structural strength and stability of any wall, the prevention of water penetration into or through such wall, the fixing of any roof to such wall, and the behavior in a fire of such wall” complies with the relevant part of SANS 10400. This standard, “Establishes deemed-to-satisfy solutions for rain penetration and damp-proofing and contains simple design and construction provisions for masonry walls in single-storey and double-storey buildings and framed buildings that do not exceed four storeys; masonry balustrade walls and masonry free-standing boundary, garden and retaining walls.”
Building Regulations as They Apply to Roofs-Part L

When the South African National Building Regulations were updated by the Department of Trade and Industry in May 2008, the General Requirement relating to Roofs was changed to incorporate certain safety elements.

For example, instead of simply having to “resist any forces” to which the roof might be subjected to, the regulations now state that “The roof of any building shall be so designed and constructed that it safely sustains any actions which can reasonably be expected to occur and in such a manner that any local damage (including cracking) or deformation do not compromise its functioning”. In simple language, if there is a major wind or some other really horrible weather conditions (God forbid), the roofs of our homes are expected to be able to stay on the house and protect us from the elements without themselves being damaged.

Instead of simply being “durable and waterproof”, roofs are expected to be “durable” and should not allow “the penetration of rainwater or any other surface water to its interior”.

As previously, roofs must “not allow the accumulation of any water” (but not simply rainwater, which was the limit of the old building regulations) “upon its surface”. In addition, the roof should be “adequately anchored against wind uplift” which was not covered in the previous edition of the regs.

Lastly, the General Requirements specify (as they did previously), that the roof should be designed “as part of a roof and ceiling assembly” and should provide “adequate height in any room immediately below such assembly”. This last one, though, is open to interpretation as not all roofs incorporate ceilings as such.

The South African National Standard for Roofs

While the legislation changed in 2008, it was only in 2011 that Part L: Roofs was published by the SABS. And the changes are substantial. It’s not so much that they’ve changed, but rather that the guidelines are now much more comprehensive and useful.

General Rules for the Construction of Roofs

As with most of the National Building Regulations, those that apply to roofs relate to SANS other than the one specific to that particular element. For instance, where any roof is to be supported on the wall of a building as described in the relevant section of Part K: Walls, the roof MUST be constructed in accordance with the rules laid out by the relevant SANS (in this case 10400). In addition, the new SANS remind designers and builders that other sections are also vitally important when it comes to roof design, including Part A: General principles and requirements; Part B: Structural design; Part C: Dimensions; Part R: Stormwater disposal; Part T: Fire protection; and Part V: Space heating.

Of course they are. Any qualified designer knows that every one of the SANS that form part of 10400 needs to be considered as a whole. It’s just because the different new sections were published over a period of years that has made it more of a challenge for many.

Since anybody building a house MUST either BE a “competent person” in terms of the regulations, or must EMPLOY a “competent person” to put in plans and oversee the building operation, either you or the person you employ should purchase the updated section.
of SANS 10400 Part L Roofs from the SABS to double-check details and specifications. Also be acutely aware that circumstances vary from site to site.

There are several South African National Standards (SANS) that relate to roof timbers, all of which must be complied with when roof trusses and other roofing elements are constructed. In addition there are standards that relate to roof coverings and other elements. They include:

- SANS 542, Concrete roofing tiles
- SANS 1288, Preservative-treated timber
- SANS 1460, Laminated timber (glulam)
- SANS 1701-1, Sawn eucalyptus timber – Part 1: Proof-graded structural timber
- SANS 1701-2, Sawn eucalyptus timber – Part 2: Brandering and battens
- SANS 1783-2, Sawn softwood timber – Part 2: Stress-graded structural timber and timber for frame wall construction
- SANS 1783-4, Sawn softwood timber – Part 4: Brandering and battens
- SANS 2001-CT2, Construction works Part CT2: Structural timberwork (roofing)
- SANS 10407, Thatched roof construction

You’ll find the full list in Part L of SANS 10400 (or check with an SABS librarian for the relevant information).

**Basic Requirements**

Roof design depends on a number of factors including the type of covering you are going to use, and the span over which the roof structure is to be supported. More often than not, the roof structure is assembled from a series of roof trusses. These rest on wooden wall plates, and are designed to span the walls of the house. They will be either nailed or bolted together on site, or delivered to site on order by a specialist truss manufacturer.

![Common Truss Configurations](image)

Illustration courtesy The Complete Book of Owner Building in South Africa

The trusses themselves are made up of rafters, tie beams, posts and struts, all of which are assembled according to a specific design. The illustrations above shows some of the most usual configurations. The new regulations have simple line drawings for:

- Four-bay Howe truss with a maximum clear span of 6 m (the same as centre right above)
- Six-bay Howe truss with a maximum clear span of 8 m (called a King Post Truss above)
- Two-bay mono pitched Howe truss with a maximum clear span of 3 m
- Three-bay mono pitched Howe truss with a maximum clear span of 4 m
The regulations also state that no member of any truss should have a length that is greater than 60 times its smallest dimension.

The basic requirements shown in the table below, apply to Howe-type trusses as listed above. There are some additional tables mentioned below.

**MAXIMUM TRUSS SPANS FOR RAFTER AND TIE-BEAMS**

<table>
<thead>
<tr>
<th>MAXIMUM TRUSS SPANS FOR RAFTER AND TIE-BEAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Table Image" /></td>
</tr>
</tbody>
</table>

*a* Heel joints should have 2 x M12 bolts per joint with 40 mm washers at each end

*b* All timber members should have a thickness of 38 mm or 36 mm if the timber is planed

*c* 38 mm x 114 mm Grade 7 members may be substituted for 38 mm x 152 mm Grade 5 material, if required

*d* The maximum overhang of a 114 mm top chord or rafter is 600 mm. The top chord or rafter must be increased to 152 mm if the overhand is greater than 600 mm but less than or equal to 900 mm

[TC = top chord; BC = bottom chord; web = cross pieces that tie the structure together]

This table is considerably more useful than the one that was in the previous 1990 edition of the regulations, as not only maximum truss spans are indicated, but also the allowable and recommended pitch of the roof, and the member sizes and grades of timber that are specified in SANS 1783-2.

You will also see that the maximum centre-to-centre spacing of the trusses varies according to the type of roof covering you are going to be using.

Another element that is specified in this table is the type and number of bolts to be used at heel and splice joints (although it must be said that builders often use nails).

A heel joint (mentioned here) is simply an indentation that is cut into a rafter so that the timber can rest on the top plate. Normally this type of joint is about a third of thickness of the rafter.

The new regulations have a number of different tables that specify the maximum clear spans for rafter and/or purlin beams. Specifically for:

1. Sawn softwood rafter beams that have a pitch of less than 26 degrees
2. Laminated SA pine rafters that support tiled or slated roofs that have a pitch of less than 26 degrees
3. Laminated SA pine rafters that support profiled metal or fibre-cement sheeting or metal tiles with a pitch of less than 26 degrees.
4. Sawn SA pine purlin rafters or purlin beams that support profiled metal or fibre-cement sheeting.
5. Laminated SA pine purlin rafters or purlin beams that support profiled metal or fibre-cement sheeting.
6. Gum pole rafters.

The timber grades allowable for softwood and all SA pine rafter beams is Grade 5 and Grade 7. Laminated beams should be Grade 5 or higher and should comply with SANS 1460. Where relevant, specifics are shown in the tables for maximum clear spans for sawn softwood beams with a 26 degree pitch below.

![Maximum Clear Spans for Sawn Softwood Beams](image)

Note that the type of roof covering in this table (maximum clear spans for laminated SA pine supporting a tile or slate roof with a 26 degree pitch) is shown in the first column, and the rafter spacing in the other four columns. Also note that the maximum mass of tiles or...
slates, including battens or purlins, should not be more than 65 kg per square metre.

Note that * indicates the most commonly available sizes. Below is a table for maximum clear spans for laminated SA pine rafter supporting profiled metal or fibre-cement sheeting or metal tiles with a 26 degree pitch.

### Maximum Clear Spans for Laminated SA Pine Rafter Supporting Tile or Slate Roof

<table>
<thead>
<tr>
<th>Nominal timber size</th>
<th>600 mm rafter spacing</th>
<th>760 rafter spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 x 133 *</td>
<td>2.0</td>
<td>1.8</td>
</tr>
<tr>
<td>45 x 133 *</td>
<td>2.5</td>
<td>2.2</td>
</tr>
<tr>
<td>70 x 133 *</td>
<td>3.0</td>
<td>2.7</td>
</tr>
<tr>
<td>32 x 166</td>
<td>2.6</td>
<td>2.3</td>
</tr>
<tr>
<td>45 x 166</td>
<td>3.2</td>
<td>2.8</td>
</tr>
<tr>
<td>70 x 166</td>
<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>45 x 200 *</td>
<td>3.9</td>
<td>3.5</td>
</tr>
<tr>
<td>70 x 200 *</td>
<td>4.9</td>
<td>4.2</td>
</tr>
<tr>
<td>45 x 233</td>
<td>4.6</td>
<td>4.1</td>
</tr>
<tr>
<td>70 x 233</td>
<td>5.3</td>
<td>4.9</td>
</tr>
<tr>
<td>70 x 266 *</td>
<td>6.1</td>
<td>5.7</td>
</tr>
<tr>
<td>70 x 300</td>
<td>6.9</td>
<td>6.4</td>
</tr>
<tr>
<td>70 x 333 *</td>
<td>8.0</td>
<td>7.1</td>
</tr>
<tr>
<td>70 x 366</td>
<td>8.0</td>
<td>7.8</td>
</tr>
<tr>
<td>70 x 400 *</td>
<td>8.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Note that * indicates the most commonly available sizes. Below is a table for maximum clear spans for laminated SA pine rafter supporting profiled metal or fibre-cement sheeting or metal tiles with a 26 degree pitch.

### Maximum Clear Spans for Laminated SA Pine Rafter Supporting Profiled Metal or Fibre-Cement Sheet or Metal Tiles

<table>
<thead>
<tr>
<th>Nominal timber size</th>
<th>750 mm rafter spacing</th>
<th>900 mm rafter spacing</th>
<th>1,000 mm rafter spacing</th>
<th>1,200 mm rafter spacing</th>
<th>1,400 mm rafter spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 x 133 *</td>
<td>2.5</td>
<td>2.2</td>
<td>2.1</td>
<td>1.9</td>
<td>2.0</td>
</tr>
<tr>
<td>45 x 133 *</td>
<td>3.0</td>
<td>2.8</td>
<td>2.6</td>
<td>2.3</td>
<td>2.4</td>
</tr>
<tr>
<td>70 x 133 *</td>
<td>3.8</td>
<td>3.5</td>
<td>3.3</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>32 x 166</td>
<td>3.1</td>
<td>2.8</td>
<td>2.7</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>45 x 166</td>
<td>3.8</td>
<td>3.5</td>
<td>3.3</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>70 x 166</td>
<td>4.8</td>
<td>4.4</td>
<td>4.1</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td>45 x 200 *</td>
<td>4.6</td>
<td>4.2</td>
<td>4.0</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>70 x 200 *</td>
<td>5.3</td>
<td>5.3</td>
<td>5.0</td>
<td>4.6</td>
<td>4.6</td>
</tr>
<tr>
<td>45 x 233</td>
<td>5.4</td>
<td>4.9</td>
<td>4.7</td>
<td>4.2</td>
<td>4.2</td>
</tr>
<tr>
<td>70 x 233 *</td>
<td>6.7</td>
<td>6.2</td>
<td>5.8</td>
<td>5.3</td>
<td>5.3</td>
</tr>
<tr>
<td>70 x 266 *</td>
<td>7.7</td>
<td>7.0</td>
<td>6.7</td>
<td>6.1</td>
<td>6.1</td>
</tr>
<tr>
<td>70 x 300</td>
<td>8.0</td>
<td>7.9</td>
<td>7.5</td>
<td>6.8</td>
<td>6.8</td>
</tr>
<tr>
<td>70 x 333 *</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>7.5</td>
<td>7.5</td>
</tr>
<tr>
<td>70 x 366</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>70 x 400 *</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Note that * indicates the most commonly available sizes. Below is a table for maximum clear spans for SA pine purlin rafters or purlin beams supporting profiled metal or fibre-cement sheeting (or metal tiles in the table below) with a 26 degree pitch.

### Maximum Clear Spans for SA Pine Purlin Rafters or Purlin Beams Supporting Profiled Metal or Fibre-Cement Sheeting

<table>
<thead>
<tr>
<th>Rafter/beam spacing</th>
<th>750 mm</th>
<th>750 mm</th>
<th>1,000 mm</th>
<th>1,000 mm</th>
<th>1,200 mm</th>
<th>1,200 mm</th>
<th>1,400 mm</th>
<th>1,400 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal timber Size (below)</td>
<td>Grade 5</td>
<td>Grade 7</td>
<td>Grade 5</td>
<td>Grade 7</td>
<td>Grade 5</td>
<td>Grade 7</td>
<td>Grade 5</td>
<td>Grade 7</td>
</tr>
<tr>
<td>50 x 152</td>
<td>4.0</td>
<td>4.7</td>
<td>3.4</td>
<td>4.0</td>
<td>3.1</td>
<td>2.9</td>
<td>3.4</td>
<td></td>
</tr>
<tr>
<td>50 x 228</td>
<td>6.0</td>
<td>6.8</td>
<td>5.2</td>
<td>6.0</td>
<td>4.7</td>
<td>4.3</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>76 x 228</td>
<td>7.2</td>
<td>—</td>
<td>6.3</td>
<td>—</td>
<td>5.7</td>
<td>—</td>
<td>5.3</td>
<td>—</td>
</tr>
</tbody>
</table>
Below is a table for maximum clear spans for gum pole rafters with a pitch above 26 degrees and above 26 degrees.

<table>
<thead>
<tr>
<th>Purlin rafter or beam spacing</th>
<th>Nominal timber size (below)</th>
<th>At least Grade S</th>
</tr>
</thead>
<tbody>
<tr>
<td>750 mm</td>
<td>900 mm</td>
<td>1,200 mm</td>
</tr>
<tr>
<td>45 x 133 *</td>
<td>3.0</td>
<td>2.8</td>
</tr>
<tr>
<td>70 x 133 *</td>
<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>45 x 166</td>
<td>4.8</td>
<td>4.4</td>
</tr>
<tr>
<td>70 x 166</td>
<td>5.8</td>
<td>5.3</td>
</tr>
<tr>
<td>45 x 200 *</td>
<td>6.7</td>
<td>6.2</td>
</tr>
<tr>
<td>70 x 200 *</td>
<td>7.7</td>
<td>7.0</td>
</tr>
<tr>
<td>45 x 233</td>
<td>8.0</td>
<td>7.9</td>
</tr>
<tr>
<td>70 x 266 *</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>70 x 300</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>70 x 333 *</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>70 x 366 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 x 400 *</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The maximum mass of the tiles or slates, including battens or purlins, shall not exceed 65 kg per square metre.
In addition to maximum spans, there are also minimum requirements in terms of slope (or pitch) and minimum end laps.

![Minimum Roof Slopes and Sheet End Laps](image)

When it comes to thatch roofs, generally the slope should be 45 degrees, except at dormer windows where the slope should only be 35 degrees. The minimum thatch layers and thickness vary depending on the type of grass or reed used for thatching. Fine thatching grass or reed should have a 1.2-2.5 mm stem/butt diameter, and it should be 175 mm thick. Coarse thatching grass or reed should have a 2.5-4 mm stem/butt diameter, and it should be 200 mm thick. Water reeds should have a 1-7 mm stem/butt diameter, and a 300 mm layer thickness.

**Some Important Factors Regarding Connections**

It is vital that roof trusses and other roof framing elements have joints that are accurately cut, securely made and fitted so that the component parts are drawn tightly together. All trussed roofs MUST be provided with approved bracing that prevents any possible buckling of the rafters, tie-beams and long web members. The bracing also needs to keep the trusses in an upright position. Whoever is doing the maths need to be certain that no section of the truss has a length that is greater than 60 times its least (or smallest) dimension.

If rafter construction is used instead of roof trusses, and the roof covering is regular sheeting or tiles (as already mentioned), it is important to accurately assess the parameters for rafter spans and the size and grade of rafters. Please note that if the rafter spacing is not the same as that shown in the table below, intermediate values of maximum rafter spans may be interpolated within the range of values suggested for relevant timber grades.

When constructing a roof framework, the rule of thumb is that any purlin should have a minimum nominal depth and width of 76 mm or 50 mm, and max centre-to-centre spacing between the purlins ought to be 1.2 m. Joints between purlins next to one another should be staggered. But the tables that follow are a lot more specific.

All roof trusses, rafters and beams that are supported by a brick or concrete block (or even a stone) wall must be securely fastened to the wall using galvanized steel strapping or galvanized steel wire that complies with the National Building Regulations. It is also important that fasteners are resistant to corrosion.

If you order factory-manufactured trusses that are made with metal plate connectors, they may not comply directly with the requirements of the various tables in the SANS. But a "competent person" will be able to tell you whether they meet the requirements of the regulations. If you buy from a reputable company you can rest assured that they will be absolutely fine.

Remember that the National Building Regulations are not prescriptive. But because they were established as a guide to MINIMUM standards, you must never ignore them.
**Pole Construction**

You will notice that the last table above is for gum pole rafters. Pole construction is another new addition to the NBR SANS.

If this method of construction is used, softwood poles must comply with SANS 457-2 and hardwood poles must comply with SANS 457-3, and ALL poles must be treated in accordance with the requirements of SANS 10005. If they have cracked or the end are plot within a space that is equal to the diameter of the pole, they MUST NOT BE USED. This is simply a structural issue.

If poles are sawn or reshaped at the ends, any of the exposed ends must be treated with a Class W preservative. It is also necessary to cover at least 35% of the surface area of the end with a new nail plate to prevent or at least minimize cracking.

Thatched roof construction – which utilizes pole structures – is also mentioned, though there are additional standards that need to be referred to.

For thatched roofs, laths must have a minimum diameter of 25 mm and they must comply with the requirements of SANS 1288. Spacing must be done according to SANS 10407. If a thatched roof is constructed with gables, without hips, valleys or dormer windows, it must have a pitch of 45 degrees, and a clear span that is no more than 6 m. Construction must also be in accordance with SANS 10407 and with additional specification in SANS 10400-L that are shown in the form of drawings and a table. You will need to either buy the standard or visit an SABS library to access these. In the drawings, specifications for rafters state that if the poles are 100 mm to 125 mm in diameter, then the truss clear spans may not be greater than 4 m. If the poles are 125 mm to 150 mm in diameter, then the spans may be more than 4 m but not greater than 6 m.

**Protection from the Elements**

There are other factors that relate to fire resistance an combustibility, and waterproofing – which of course has to cover (excuse the pun) flashing and flat roofs!

1. Fire resistance and combustibility relate to light fittings and any other components that penetrate the ceiling, as well as the non-combustibility of “such assemblies”. No part of any roof or ceiling that is made of wood or any other “combustible” material is permitted to pass through any separating element of a building.
2. Waterproofing refers mainly to runoff water from the roof … and therefore relates directly to the slope of the roof. This, in turn, is totally reliant on the roof covering used. SANS 10400 has specs on minimum roof slopes and sheet end laps. The new regs include a number of invaluable drawings that show principal waterproofing details including parapet wall waterproofing on balconies; where it is required against a solid brick wall; where it is required against a concrete balustrade wall on a balcony or against an ordinary concrete wall; and various other balcony details. Additional waterproofing details include a stepped DPC in a cavity wall; tanking against a cavity wall; waterproofing under timber and aluminum door frames; and waterproofing at a shower base.
3. Flashing, which is used to stop leaks coming in from around chimneys and other “projections”.
4. Flat roofs are an issue all on their own! For instance, flat roofs are not actually flat, they MUST have a fall of about 1:50.

Part L of the updated national building regulations (published in 2011) also include new sections on roof coverings and waterproofing systems for pitched roofs, and drainage and waterproofing of flat roofs.
Safety is Paramount when it comes to Stairways-
Part M

It stands to reason that stairways must be safe. If stairs are too steep, and they don’t have railings, or if screens and balustrades are not strong and secure, people may fall with disastrous consequences.

What the National Building Regulations say about Stairs and Stairways

*Any stairway, including any wall, screen, railing or balustrade to such stairway, shall:

(a) be capable of safely sustaining any actions which can reasonably be expected to occur and in such a manner that any local damage (including cracking) or deformation do not compromise its functioning;

(b) permit safe movement of persons from floor to floor; and

(c) have dimensions appropriate to its use."

What this means is that stairways, in addition to all the elements relating to them, must be properly designed. This takes us back to Part B of the NBR, which deals with structural design.

Like everything else, stairways must be designed to provide the strength, stability, serviceability and durability required for use. It is imperative that they are built so that any accidental overload won’t cause the stairway to collapse. It is also vital to takes steps to ensure that people won’t fall off the structure. If the sides of the stairs don’t have railings or screens this CAN happen – and it does (sadly) happen.

In addition to these general requirements, there are fire requirements that must be adhered to. These are outlined in Part T of SANS 10400 – Fire Protection, but when it comes to houses, those that are relevant mainly relate to basics (including the materials used to build your home). For instance you don’t have to have fire escapes, exit doors, escape routes, and that kind of thing.
SANS 10400 Stairways – Part M

As always, the South African National Standards give a good rundown on how we should build to ensure that we “satisfy” the legislation. The most recent Standard was published in April 2011; and it contains new guidelines that relate to both masonry stairways and timber stairways.

You will find Part M of the legislation towards the end of Standard, on Page 11.

It should be read in conjunction with several other Standards, including SANS 2001-CC1, -CC2, and -CM1 that deal with structural concrete works, minor concrete works and masonry walling; SANS 1460, Laminated timber (glulam); and SANS 1783-2, that deals with stress-graded structural timber and timber for frame wall construction; as well as several other parts of SANS 10400, specifically Part A (general principles), Part B (structural design), Part K (walls), Part S (facilities for people with disabilities), and Part T (fire protection). This is important because, for instance:

- **Part S** reduces the rise of the step (as indicated in this part), increases the width of stairways and the length of landings. It also has a requirement that solid risers should be used where stairs overlap the next lower tread, and another that specifies the need for handrails on both sides of the stairway.
- **Part T** increases the standard width of stairways as indicated in this part, disallows the use of spiral stairways, and requires solid risers for all buildings except those defined in Part A as D4 (a plant room that contains mechanical or electrical services that are necessary for the running of a building, and are usually left unattended).

Requirements of this particular Standard that relate to dimensions specify that:

- there must be sufficient headroom above any stairway: at least 2,1 m measured vertically from the pitch line of the staircase (see drawing below)

![Minimum headroom allowed on stairways](image)

- stairs need to be wide enough for safe use, usually not less than 750 mm (see drawing below)
- the going (depth of the tread) and width of treads must be at least 250 mm (see drawing below)

![Allowable minimum dimensions of treads and risers](image)

- treads of stairways that do not have solid risers must overlap the next tread by at least 25 mm (see drawing above)
- landings serving two flights in a straight line need to be at least 900 mm long and at least as wide as the flight of stairs
• there shouldn’t be a vertical rise that is greater than 3 m between landings
• single step risers shouldn’t be more than 200 mm
• doors cannot open onto stairways unless it’s onto a landing – and the landing then needs to be at least the width of the door (which must not obstruct people using the stairs)

Sometimes the dimensions of risers and going of treads vary in a flight of stairs. This variation should not be more than 6 mm. Further, dimensions of each individual step can be checked for safety by adding the dimension of the going to 2 x the height of the riser. This should be at least 570 mm and no more than 650 mm.

Tapered treads and winders (which are are steps that are narrower on one side than the other and used to change direction of the stairs without landings) are most common in spiral stairways. If they don’t form part of a spiral staircase, they must be designed to comply with the minimum tread and riser dimensions shown in the drawing above, and have a minimum going of 125 mm. The angle between successive risers (measured horizontally) must be constant (see drawing below).

To check the variation in going between tapered treads, measure each tread at the same distance from the narrow end.

Stairways that incorporate winders – defined by the SANS as a “tapered tread that has a going of at least 50 mm and which is used in conjunction with non-tapered treads in a single flight” – are permitted in our homes as long as there are no more than three of them, and the winder may not turn through more than 90 degrees.

Spiral stairways are defined as a “succession of tapered treads forming a curved stairway which extends as a single flight from one floor or landing to another”. These must be no wider than 800 mm and may not be used as an emergency route. There are also restrictions in terms of certain buildings where they may not be used, including theatres and other entertainment venues, schools, sports facilities, places of worship, exhibition bays, jails, hospitals and health care facilities, offices, hotels, dormitories and hospitality venues.

**Prevention Against Falling**

It should be common sense, but people don’t always see it that way, because stairs don’t always LOOK good with railings!

Essentially what SANS tell us is that:

If a flight of stairs is more than three risers high, it could be dangerous, especially if toddlers and old people use it. This is why it is essential to have some sort of protection to prevent falling.

This can be in the form of:

• a secure wall
• a screen of some sort
• railings or a balustrade – all of which should be at least 1 m high

Other issues include “openings”. If a child can fall through a gap in the railings, or if someone falls and their leg or foot gets stuck in the gap, it could end up really badly. The opening specification is similar to that which relates to swimming pool fencing: it shouldn’t allow anything with more than a 100 mm diameter to pass through it.
Handrails are also an important element. If a flight of steps continues for more than about five risers, there should be a handrail of some sort. And any sort of handrail MUST be securely fixed to the wall, screen, railing, balustrade or whatever! In some instances, for example when the stairs are wide (more than 1.1 m), it might be necessary to have a railing on either side.

If a screen is made of glass, it is vital that the glass used complies with the relevant SANS.

**Timber Stairways**

There are several clauses that relate specifically to timber stairs in SANS 10400 Part M (Edition 3, 2011). This section was previously not covered in the “deemed to satisfy” regulations.

**Stringer Beams**

Stringer beams support treads, and where these are not be wider than 1.2 m in double- and single-storey domestic residences and dwelling houses, they should be at least 48 mm x 225 mm. Grade 5 timber should be used and it should not be excessively warped.

**Timber Treads**

These must be at least 36 mm thick. Since timber stairways are designed in different ways, the options are that they may be:

- built into masonry walls with a minimum end bearing of 90 mm
- supported on a steel angle cleat that has minimum dimensions of 50 mm x 50 mm x 4 mm
- bolted to a wall with two masonry anchors per clear according to the manufacturer’s instructions

If anchors are used and embedded into a Grade 20 concrete (which will be 20 MPa), these anchors must have “a safe working load in shear of not less than 1,25 kN, certified by the manufacturer”.

**Materials Used for Timber Steps**

Building Materials and Tests in general are covered in Part A of the National Building Regulations. In terms of timber, it should be treated against termites and wood borer as well as protected against fungal decay in terms of SANS 10005. For consumers, the important thing to look for is the product certification mark of a body that has been certified by the SA National Accreditation System.
Glazing and the Glass You Use for It - Part N

**Part N** is the section on glazing in the National Building Regulations & Building Standards Act and is short and reasonably sweet.

Essentially you need to be sure that any material used for glazing in buildings is secure and durable and that it is fixed so that it:

- safely sustains wind actions that one would normally expect wherever you live in South Africa (but not necessarily major hurricanes or tornadoes that might be experienced in other parts of the world),
- does not allow water to penetrate the interior of the building, and
- is obvious to anyone who approaches it (if it isn’t, people could walk right into the glass and be injured, particularly if it is completely transparent and not made of “safety glass”).

Of course it isn’t only glass that we use for glazing. There are also a number of plastic and polycarbonate materials, as well as organically-coated glass, which can be used.

When it comes to choosing the best type of glazing for the job, the essential aspect is to make sure that if someone (or an animal) does impact the glazing – or collide with it, they won’t be seriously hurt. Factors to take into account include:

- the position of the glazing,
- the number of people who are likely to be able to access the glazed door or window, and
- the probably behaviour patterns of anyone (or anything) that is likely to get close to the glazed area.

And ultimately, as long as the glazing material is selected, fixed and marked in accordance with SABS 10400-N, all should be well and legal... and safe for all concerned.

**NBR Changes that Relate to Glazing**

The “new” National Building Regulations are a lot more specific in terms of glazing installations than they were previously. Not only is the maximum pane area and glass thickness specified, but so too are the different types of glass. These are:

- monolithic annealed glass,
- patterned annealed and wired glass,
- laminated annealed safety glass,
- toughened safety glass.

In addition to this, glass must also comply with the relevant SANS, as must the method of fitting the glass or alternative material used for glazing.

Just be aware that whether you are glazing doors, windows, shower cubicles, shop-fronts or anything else, glazing MUST comply with SANS 10400-N as well as other standards that relate to the manufacture of glazing materials.
Construction Standards of Glazing

The SABS also has a strategic policy that relates to glazing in buildings. The reason for this is to standardize glazing in buildings in terms of:

- terminology (so that we all understand exactly what the regulations mean and relate to),
- performance requirements,
- various methods of calculation,
- design and construction guidelines,
- the classification and specification of materials (including dimensional properties).

To this end, the SABS has a sub-committee that specifically develops, maintains and co-ordinates standards in the field of glazing materials that are used in buildings. The committee's responsibility is to:

- develop national standards,
- participate in the development of standards (getting votes, comment and so on),
- develop and review the programme of work,
- recommend what else needs to be done to ensure that the South African standards stay on track with international standards.

At the end of the day, the safety of users and installers is paramount.

Here is a drawing from the Standard that provides guidance:

Examples of safety glazing requirements for exterior doors and windows.
Good Lighting and Ventilation is Vital for Healthy Living - Part O

In terms of the National Building Regulations Part O, all habitable rooms, including bathrooms, showers and toilets (and interestingly enough garages!) must have some form of lighting and ventilation that will enable people to use these rooms safely. The most important aspect is that it shouldn’t be detrimental to the health of those using the room for the purpose for which it was designed.

If bathrooms are cold and perpetually damp, mould will start to form, and this can make people extremely ill. It will also make the room uncomfortable.

**Lighting and Ventilation Requirements**

Changes to Part O of the NBR (when the legislation was updated a few years ago) include a welcome move from WC (short for water closet – and a very Victorian term) to “toilet”.

There are also quite substantial changes to this section of the regulations. While the lighting and ventilation regulations are generally “deemed to satisfy” if they quite simply meet the requirements of SANS 10400-O, the NBR states that if there is not sufficient natural light from windows in habitable rooms, as well as corridors, lobbies and on staircases, artificial lighting MUST be provided.

Reasons for inadequate lighting might be due to:

- the size or shape of the room or space, or
- the use of thick, patterned or opaque glass for windows, which prevents natural light from illuminating the room.

Similarly, if there is insufficient ventilation, artificial ventilation MUST be installed.

Reasons for inadequate ventilation include:

- high temperatures which could be dangerous to either the safety or health of those using the room,
- dust, gases, vapour, “volatile matter” or “hazardous biological agents” that might be dangerous to health or safety, or
- the purpose for which the room is used may make natural ventilation unsuitable or inadequate.
Compliance Required for Lighting

While the Act states that, “Any habitable room in any dwelling house or dwelling unit, or any bedroom in any building used for residential or institutional occupancy” MUST have at least one opening for natural light – even if there is artificial lighting.

Compliance Required for Ventilation

It doesn’t matter where in South Africa you live, any artificial ventilation system MUST be authorized by your local authority (council or municipality, or City) according to their own specific policies and opinions.

This applies to everything other than regular air conditioners and other appliances installed essentially for comfort.

Further, the “rational design” of any artificial ventilation system must be performed or supervised by an “approved competent person”.

Compliance with Fire Requirements

In addition to the general requirements in this section of the Act, all lighting and ventilation must also comply with Part T of the NBR, a very lengthy section that deals with fire protection.

SANS 10400-O

Part O of the “new” SANS were published in January 2011 after fairly substantial updating by the SABS in collaboration with Agrément South Africa, the South African Institution of Civil Engineering (SAICE), and the South African Refrigeration and Air Conditioning Contractors Association (SARACCA).

Requirements specified in the SANS include:

- general requirements,
- requirements relating specifically to lighting,
- requirements relating specifically to ventilation, and
- requirements for designated smoking areas and smoking rooms.

Natural Lighting

The SANS specify zones of space for natural lighting which are guidelines that should be adhered to. These relate not only to the measurement of openings, but also to the angles of openings, and they specify how various obstructions affect zones of space.

Natural Ventilation

Generally, natural ventilation should be organized so that doors and windows relate to one another in such a way that the room will be effectively ventilated, and it should be at least five percent of the floor area of the room (or at least 0.2 square metres if the room is very small).

But anyone designing a home also needs to take into account the fact that in cold, wet or windy weather, doors and windows will commonly remain closed. This will minimize natural ventilation.

In holiday homes, or buildings that people only use occasionally, doors and windows will usually remain closed for long periods of time. Where weather conditions are very hot and humid, the interior of the building may become damp and mouldy. Airbricks built into the structure help; as do roof vents that provide permanent ventilation, even when doors and windows are closed.

Artificial Ventilation

The simplest and most common form of artificial ventilation is found in kitchens and bathrooms, in the form of extractor fans.
Extraction in kitchens (from stoves and hobs) not only removes heat or steam and other vapour, but it also has the effect of removing grease that is in suspension, by filtration. Because the greasy air being removed is hot, the regulations state that extraction units must be manufactured from non-combustible material.

In bathrooms and toilets, extractor fans remove humid air and filter bad smells.

**Air Requirements in Homes and Other Buildings**

*SANS 10400-O* contains a useful table that shows the minimum requirements for air, per person using the room. Again it is the health and safety of inhabitants that is vital. Where rooms are used for smoking, a considerably higher supply of healthy air is required.
Drainage and plumbing is not only what you see above ground. All water, waste disposal, soils and stormwater have to be drained away and treated to maintain safety and health. In many instances these pipes cannot be seen as they are buried underground and have to be installed by a qualified plumber using the correct pipework.

We get a number of requests asking us for the number of toilets, urinals, wash-hand basins and baths that have to be installed in buildings. This depends on how many people will live or work in a particular building. Part A20 states that:

“The occupancy of any building shall be classified and designated according to the appropriate occupancy class given in column 1 of table 1 and such classification shall reflect the primary function of such building; Provided that, in any building divided into two or more areas not having the same primary function, the occupancy of each such area shall be separately classified.”

There are two tables below Table 5 for residential accommodation and Table 6 for personnel in the workplace these are extracted from the SANS 10400 Part P – Drainage.
### Table 5 — Provision of sanitary fixtures in residential accommodation

<table>
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</table>

Add 1 sanitary fixture to the above for every 50 persons

### Table 6 — Provision of sanitary fixtures for personnel

<table>
<thead>
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<th>Population number of people</th>
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<th>3</th>
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<td>Males</td>
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<td>Females</td>
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<tr>
<td>Urinals</td>
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<td>Wash-hand basins</td>
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<td>6</td>
<td>6</td>
<td>6</td>
<td>9</td>
<td>5</td>
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</tbody>
</table>

Add 1 sanitary fixture to the above for every 100 persons

|                            |     |     |     |     |     |     |
|                            |     |     |     |     |     |     |

Add 1 sanitary fixture to the above for every 50 persons

### Notes
- If the facilities provided in a shopping complex can be conveniently situated so that they are available to the personnel and the public and visitors, it might not be necessary to provide separate facilities for the personnel in individual shops. The minimum number of facilities provided should then be the total required in accordance with this table for the total number of personnel in the shops within the complex who make use of these facilities.

- Population is the number of personnel only of a particular sex in an occupancy. The total number of personnel will, in some cases, be the total population obtained from Regulation A21, the public and visitors being very few in number. In other cases the proportion of personnel to the public and visitors will have to be established. The total number of personnel in a shopping complex, or in any particular shop, may be taken as 10% of the total population for such complex or shop calculated in terms of Regulation A21.
Non-Water-Borne Waste Disposal-Part Q

The SANS 10400-Part Q deals with the healthy handling and treatment of effluent when there is no water borne sewage system available in a particular area. Health is the major factor when it comes to effluent and any pathogens, pollutants or contaminants must not affect the user of any sanitary waste means of disposal. The local authority has the over riding say on what is and what is not permitted in any area over which it has jurisdiction.

The Part Q refers to all the parts of the system that could be used from Closets, Chemical toilets to VIP toilets (Ventilated improved pit toilets). The construction guidelines are specific as to size and location and must minimise odours and the attraction of flies.

Conservancy tanks have become the rule in many municipalities and there are specific guidelines on the installation and siting.

There is a note in the SANS 10400-Part Q that states: “The South African government is committed to the eradication of pail toilets”

Conservancy tanks for Waste Disposal

Firstly a conservancy tank must be built or a precast one can be bought. Then it must be sited beneath ground where the Building Regulations and local authority require it to be sited.
You must then organise with your local authority or an authorised provider to pump the tank out on a regular basis.
Stormwater Disposal-Part R, What the Regulations Say

Property owners are responsible for the removal of storm water from their property. They may NOT simply discharge excess water onto adjacent land or into the street unless this is permitted by neighbors and/or the local council or municipality.

SANS 10400: Part R Stormwater Disposal

The law is very clear on the issue of stormwater disposal, although sites used exclusively for “dwelling houses” and dwelling units (defined as “one or more habitable rooms and provided with sanitary and cooking facilities”) are not as carefully controlled as larger buildings.

Note that a dwelling house is (in terms of the legislation) a single dwelling unit and any garage and other domestic outbuildings that are situated on the site. A dwelling unit contains one or more habitable rooms and it provided with both cooking facilities and adequate sanitary facilities.

Part R of the Act states: “The owner of any site shall provide suitable means for the control and disposal of accumulated stormwater which may run off from any earthworks, building or paving.”

The legislation also states that the “means of stormwater disposal” used may be addition to, or in combination with any drainage that may be required in terms of F4(2). SANS 10400: Part F Site Operations is described in more detail in the section on site operations on this website. The relevant section – 4(2) – is also discussed below.
These legal requirements will be “deemed to be satisfied” if the stormwater is provided in accordance with SANS 10400-R (the SANS drawn up by the SABS for “The application of the National Building Relations”, Part R), which is available from the SABS online store for R174.42 incl. VAT.

SANS 10400, Part R deals with all types of stormwater disposal, including rain water from gutters, downpipes, roofs, and paving, and any other excess water that may accumulate on the property. It refers readers to Part H, Foundations, stating that it is essential to have good, effective drainage of areas that are in close proximity to buildings, to ensure that ground movement is minimized.

**Scope of Part R, Stormwater Disposal**

The focus of Part R is on the disposal of stormwater on individual sites, but also included interconnected complexes that have multiple dwelling units, including both cluster homes and retirement, village-type properties where management of common property is often controlled by a management body of some sort.

Two types of stormwater system are defined in the regulations:

1. Major stormwater systems that cater for severe, infrequent storm events
2. Minor stormwater systems that cater for frequent storms of a minor nature

The rational design of these systems – if required – must be undertaken by “a competent person involving a process of reasoning and calculation and which may include a design based on the use of a standard or other suitable document.” The concept of a competent person is discussed in some detail in another article. However Part R states that a competent person required for stormwater system designs must be a civil engineer who is registered in terms of the Engineering Profession Act 2000 as a professional engineer or professional engineering technologist. Alternatively this person must have a tertiary qualification (a degree or a diploma) in civil engineering.

The legislation (the Act itself rather than the deemed to satisfy rules compiled by the SABS) states that it is the right of the local authority to demand that storm water disposal is provided in accordance with “an acceptable rational design prepared by an approved competent person” So if your local authority is of the opinion that a qualified person should design a stormwater disposal system for your property they must notify you (or the owner of the property) and explain their reasons in writing, and demand that plans and particulars of “a complete stormwater control and disposal installation” for the site and any buildings on it, are submitted for approval.

**Stormwater Control and Disposal**

The legislation states that the regulations should not be interpreted specifically as requiring roof gutters and downpipes if another suitable means of drainage has been provided to remove or disperse rainwater from the roof of the building. There are alternatives that architects sometimes prefer.

As always, the deemed to satisfy rules take this further. These state that any stormwater that emanates (or flows) from the roof, paving or any area that is in the immediate vicinity of a building shall not cause damage to the interior of the building, its structure or its structural elements. Steps must be taken to ensure that water does not accumulate in a way that “unduly inconveniences” the occupants of any building.

Part R also specifies other requirements of stormwater disposal arrangements. The system:

- must not undercut foundations by erosion or flooding
- must drain away from all buildings
- must not allow water to accumulate against or close to external walls
- must make provision for the drainage of any sites on the property that become waterlogged at any time
- must be capable of being easily maintained and cleaned

Part R also specifies some of the disposal arrangements that need to be addressed, specifically:

- those that allow rainwater to flow off the roof and away from the building, including roof valleys, gutters, and downpipes
- those that channel surface water into stormwater drains that are either on the surface or below-ground, or channels – depending was is needed to remove stormwater from the site or to another part of the site where it will not affect the buildings
Ultimately, all drainage must be shown on plans submitted to the local authority, and it is up to the local authority to decide whether these are suitable and adequate for each individual site. Also, it is the decision of the local authority whether stormwater may discharge into a stormwater system that is provided for a public road, or any servitude, or onto the street.

One of the major issues is people simply discharging their stormwater onto neighboring properties. While the Building Regulations do not state that this may not be done, the Building Regulations do give very clear guidelines for stormwater control and disposal, and these DO NOT include the discharge of water into your neighbour’s garden!

**Stormwater Disposal in Interconnected Complexes**

While the regulations and deemed to satisfy requirements described above apply to all properties, including complexes that are interconnected, there are additional requirements for the latter. For instance it is essential that stormwater is “controlled, safely routed and discharged from interconnected complexes without unduly eroding land, unsurfed roads or water courses, contamination water resources or compromising environmentally sensitive areas identified in environmental impact assessment reports.”

In addition, both major and minor systems must be designed to cope with design flood recurrence intervals of both 50 and two years. At present there is legislation that requires flood lines for “townships” to be determined for 100-year recurrence intervals. This is because the storm water flow from 100-year floods is typically 25 percent greater than for 50-year floods. Part R states that major storm systems can be designed for a 50-year flood provided that the certified 100-year flood lines remain unchanged. This is very important.

Other requirements include:

- the creation of terraces for dwelling units, where needed, that will allow the water to drain by gravity
- the avoidance of erosion caused by too much water
- specifications for the velocity of stormwater flow in road-edge channels constructed as part of a minor stormwater system
- the need for channels built in soil that is susceptible to erosion to be lined
- a specification that pipes in servitudes must have a diameter of no less than 300 mm

There is also a table that specifies minimum stormwater pipe gradient in relation to the diameter of the pipe. So if the minimum 300 mm pipe is used the desirable minimum gradient is 1 in 80, and the absolute minimum gradient is 1 in 230. If the maximum 1 200 mm diameter pipe is used, then the desirable minimum gradient is 1 in 520, and the absolute minimum gradient is 1 in 1500.

**Gutters and Downpipes**

There are some important specifications that relate to gutters and downpipes, including a table that gives roof, eaves and valley gutter sizes. In summer rainfall regions, the internal cross-sectional area of a valley or gutter per square metre of the roof plan area served (per square mm) is 140; in winter rainfall regions this is 80; and in areas where it rains all year round, the figure is 115.

In addition, the internal cross-sectional area of downpipes shall be not less than 100 square mm/square m of roof plan area served by such downpipe, or 4 400 square mm.

**SANS 10400: Part F Site Operations F4(2)**

Part F4 deals with preparation of a site that is to be built on. Point (2) states that when a building is to be erected on a site that is waterlogged or saturated with water, or where any building is going to be situated so that water will drain naturally towards it, drainage must be provided to direct the water away from the site or building, to a storm water drain, or somewhere that it can be disposed of in some other safe and approved manner.

Note that these requirement are in addition to Part R.

**SANS 10400: Part L Roofs**

This part of SANS 10400 is dealt with elsewhere on this site in the section on Roofs.

Waterproofing and runoff are dealt with in some detail in the relevant SANS for The application of the National Building Regulations.

**Other SANS that deal with Stormwater Drainage**
Additional SANS that deal with storm water drains and gullies are intended for the use of civil engineering construction and include:

- SANS 1200 LE – Standardized specification for civil engineering construction Section LE: Stormwater drainage.

This is a drawing from the above SANS that shows how a precast concrete manhole for storm water should be built.

- SANS 10120 – A Code of practice for use with the above, including:
  1. Part 2: Project specification Section LE: Stormwater drainage
  2. Part 3: Guidance for design Section LE: Stormwater drainage
  3. Part 4: Typical schedule of quantities Section LE: Stormwater drainage
  4. Part 5: Contract administration Section LE: Stormwater drainage
The Importance of Facilities for Disabled People in our Buildings - Part S

The National Building Regulations and Building Standards Act was amended and published by the Department of Trade and Industry in May 2008. Some parts of the Act were affected more than others; some changed very little. Part S, which deals with facilities for disabled people (or persons) is one section that had changed radically. In fact, according to Ron Watermeyer, a civil engineer, chairperson of Standards South Africa’s Technical Committee for Construction Standards and a member of the secretariat of the Inter-ministerial Task Team for Construction Industry Development (amongst other things), it is one of 12 parts that has been “fundamentally rewritten”. The reason, of course lies in the motivation for changing the National Building Regulations in the first place. Dr Watermeyer was tasked with rewriting the SABS document, now referred to as SANS 10400 (rather than the original SABS 0400), which contains “deemed-to-satisfy” rules. And according to him, the motivation was based on several factors. By 2008, when the Act was last amended, there had been numerous changes to South African society, and these directly affected the building industry. More specifically, he said:

- the apartheid system was no longer applicable,
- local authorities throughout the country had been completely restructured,
- the National Home Builders Registration Council had been formed,
- South Africa’s population had more than doubled,
- building control and systems had become increasingly complex,
- new and innovative construction systems had been introduced.

If you’ve ever read Section 24 of the Bill of Rights in the South African Constitution, you will know that: “everyone has the right to an environment that is not harmful to their health or well-being.” Since the buildings in which we live are an integral part of our environment, the implication is that constitutionally they MUST be safe. So the primary motivation regarding changes to the Act was to make them safer than ever before. And of course this meant that it was imperative that anything relating to disabled persons, and their facilities, had to be upgraded.

What the Act Says in Terms of Facilities to be Provided for Disabled People

The essential requirements of the National Building Regulations (in terms of facilities for disabled people or persons) are that:

1. People with disabilities should be able to safely enter the building and be able to safely use all the facilities within it – specifically toilets.

2. There must be a means of access that is suitable for people with disabilities to use. In addition, access must be available from various approaches of the building via the main entrance and any secondary entrances, and should lead to the ground floor.

3. There must be a means of egress (a point of departure) that is suitable for people with disabilities to use in the event of any sort of emergency. This relates to any sort of emergency, but in addition, a further clause states that departure routes (or egress) must also be designed in accordance with Part T of the regulations, namely the section that relates to Fire Protection.

4. Lifts in buildings must be able to serve the needs of disabled people. This includes ensuring that any commonly used “path of travel” MUST be free of any sort of obstacles that would limit, restrict or endanger people with disabilities who use that route. There must also
be absolutely no obstacles that will prevent people with disabilities from accessing facilities within the building. The regulations refer specifically to people with impaired vision, but clearly they also relate to people in wheelchairs, or people who have trouble walking freely.

5. Buildings that incorporate halls or auditoriums for public use are obliged to ensure that a reasonable percentage of space is available for people in wheelchairs or other “assistive devices”.

In addition to these clauses, the National Building Regulations also state that where there is parking available for more than 50 motor vehicles, there must be parking facilities that accommodate disabled persons. There is also an obligation to ensure that persons with disabilities are provided with a suitable means of access from the parking area to the ground floor – or storey – of the building.

Of course this also means that the “deemed-to-satisfy” rules have changed.

According to this section of SANS 10400, The application of the National Building Regulations Part S: Facilities for persons with disabilities, “Establishes requirements for external and internal circulation routes, including doors and doorways, ramps, stairways, handrails, lifts, toilet facilities, auditoriums and halls, obstructions in the path of travel, parking and indication of facilities.”

Get your copy from the SABS online store or directly from them in Pretoria (head office), Durban, Cape Town, Port Elizabeth or East London. The ISBN number is 978-0-626-25219-9, and it sells for R406.98 incl. VAT.
What SANS 10400: Part T – Fire Protection Says

What the Act Says

Essentially the legislation is concerned quite simply with the need for all buildings to be designed, constructed and equipped so that in the event of fire:

1. the occupants or people using the building will be protected – including persons with disabilities;
2. the spread and intensity of any fire within buildings, and the spread of fire to any other buildings, will be minimized;
3. sufficient stability will be retained to ensure that such building will not endanger any other building: provided that in the case of any multi-storey building no major failure of the structural system shall occur;
4. the generation and spread of smoke will be minimized or controlled to the greatest extent reasonably practicable; and
5. adequate means of access, and equipment for detecting, fighting, controlling and extinguishing such fire, is provided.

The requirements of the Act will be deemed to have been satisfied if the design, construction and equipment of buildings complies with SANS 10400 Part T and satisfies the local authority.

The Act also specifies several offences that owners of buildings need to avoid, including the need for fire extinguishers that comply with SANS 10105. Also, if people do anything to obstruct escape routes in buildings, they will be guilty of an offense.

What the Standard Says

The regulations for Fire Protection are contained in a 91 page document published by the SABS, SANS 10400: Part T Fire Protection. Much of the information is the same as that published in the 1990 version of the Standard that you can download from this site.

SANS 10400 Part T is broken down into several parts:

Requirements

The bulk of the Standard is made up of a vast number of different “requirements” that relate not only to dwelling houses, but to every other possible type of building, from hospitals to parking garages.

The requirements for effective fire protection include:

- general requirements,
- regulations relating to safety distances,
- fire performance,
- fire resistance of occupancy-separating and division-separating elements,
- fire stability of structural elements or components,
- tenancy-separating elements,
- partition walls and partitions,
● protection of openings (Note that the drawings in SANS 10400 – 1990 that illustrate this have not changed),
● raised access and suspended floors of combustible material,
● roof assemblies and coverings (the drawings remain unchanged in the new version of the Standard) including thatch,
● ceilings,
● floor coverings,
● internal finishes,
● provision of escape routes,
● exit doors,
● feeder routes,
● emergency routes,
● dimensions of components of escape routes,
● width of escape routes,
● basements,
● stairways and other changes of level along escape routes (the drawing that shows the position of doors in relation to a change in level has not changed),
● ventilation of stairways in an emergency route,
● pressurization of emergency routes and components,
● openings in floors,
● external stairways and passages,
● lobbies, foyers and vestibules,
● marking and signposting,
● provision of emergency lighting,
● fire detection and alarm systems,
● provision and maintenance of fire-fighting equipment, installations and fire protection systems,
● water reticulation for fire-fighting purposes,
● hose reels,
● hydrants,
● automatic sprinkler and other fixed extinguishing systems,
● portable fire extinguishers,
● mobile fire extinguishers,
● fire-stopping of inaccessible concealed spaces,
● protection in service shafts,
● services in structural or separating elements,
● smoke control,
● air-conditioning systems and artificial ventilation systems,
● lift shafts,
● lifts,
● firemen’s lift,
● stretcher lift,
● stage and backstage areas,
● eating arrangements in auditoriums or halls and on grandstands,
● parking garages,
● operating theatres and intensive, high or critical care units,
● installation of liquid fuel dispensing pumps and tanks,
● installation of other tanks,
● warehousing of dangerous goods,
● dangerous goods signage,
● access for fire-fighting and rescue purposes,
● resumed fire resistance of building materials and components,
● building materials,
● guest houses and bed and breakfast accommodation (this is completely new),
● health care facilities (this is also completely new).

**Safety Distances**

Although there are other provisions, including the classification of the type of external wall, the table below may be used to establish safety distances where walls do not contain windows or other openings. For ordinary “dwelling houses” where the area of elevation facing any boundary is not more than 7,5 m², such safety distance may be reduced to 0,5 m.
Fire Resistance

There are several tables (five in all) that indicate requirements for compliance with “Presumed fire resistance of building materials and components”. 
This table shows what is required for “structural walls”.

<table>
<thead>
<tr>
<th>Construction and materials</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid construction clay masonry units:</td>
<td>240</td>
<td>120</td>
<td>90</td>
<td>60</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>unplastered</td>
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<tr>
<td>plastered</td>
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<td>90</td>
<td>90</td>
<td>90</td>
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</tr>
</tbody>
</table>

NOTE 1 For concrete masonry construction, see SANS 10145.
NOTE 2 The values given above refer to the thickness of masonry units of commonly available sizes and do not include any allowance for plaster. Therefore, in column 2, it will be seen that a wall made of units of 190 mm thickness in the unplastered condition will give a fire resistance of 240 min. The next lower size has a thickness of 150 mm, but this is not adequate on its own to give a fire resistance of 240 min. However, when the wall is plastered on both sides (with a normal plaster thickness of at least 12 mm), it is possible to attain a fire resistance of 240 min. Similarly, with reference to column 3, units of 110 mm thickness will give a resistance of 120 min or more, but units of thickness 90 mm will not provide this resistance. When plastered, however, the 90 mm units are capable of providing a fire resistance of 120 min. For the lower values of fire resistance, there is no advantage in plastering a wall as the unplastered unit is capable of providing the required resistance.

Plaster shall be in accordance with the requirements of SANS 2001-EM1 and shall be applied to both faces of the wall.

This table shows what is required for “non-structural walls and partitions”.

<table>
<thead>
<tr>
<th>Construction and materials</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid construction clay masonry units:</td>
<td>240</td>
<td>120</td>
<td>90</td>
<td>60</td>
<td>30</td>
<td>90</td>
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<tr>
<td>unplastered</td>
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<td>plastered</td>
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</tr>
<tr>
<td>Solid concrete units:</td>
<td>240</td>
<td>120</td>
<td>90</td>
<td>60</td>
<td>30</td>
<td>90</td>
</tr>
<tr>
<td>Class 1 aggregates</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>unplastered</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Class 2 aggregates</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
</tbody>
</table>

NOTE 1 For concrete masonry construction using hollow masonry units, see SANS 10145.
NOTE 2 The values given above refer to the thickness of masonry units of commonly available sizes and do not include any allowance for plaster. Therefore, in column 2, it will be seen that a wall made of units of 190 mm thickness in the unplastered condition will give a fire resistance of 240 min. The next lower size has a thickness of 150 mm, but this is not adequate on its own to give a fire resistance of 240 min. However, when the wall is plastered on both sides (with a normal plaster thickness of at least 12 mm), it is possible to attain a fire resistance of 240 min. Similarly, with reference to column 3, units of 110 mm thickness will give a resistance of 120 min or more, but units of thickness 90 mm will not provide this resistance. When plastered, however, the 90 mm units are capable of providing a fire resistance of 120 min. For the lower values of fire resistance, there is no advantage in plastering a wall as the unplastered unit is capable of providing the required resistance.

Rational Designs

The design requirements include the need for a competent person to ensure that the level of fire safety is adequate. This is particularly important in large and public buildings.

This drawing shows the basic fire safety engineering process.
Building Regulations Part-U Refuse Disposal

Part-U of the SANS 10400 Refuse disposal states that 'Any building, excluding a dwelling house' that has refuse generated in that building will provide 'adequate' storage areas for rubbish containers.

Over and above this the planning and building must provide access from the street so that the containers can be removed.

All waste removals from a dwelling house are covered by the relevant Local Authority and or Regional By-Laws. The Regulation also mentions chutes that are used to dispose waste into a container, that they must be designed to be safe 'in operation'.

A neat rubbish and waste storage facility at a shopping center, with easy access for the disposal trucks.
Chimneys, Flues, Hearths and Fireplaces Used for Space Heating - Part V

Anyone searching through the National Building Regulations for information about chimneys and flues, hearths and fireplaces, might go straight to the part that deals with Fire Protection. The next step would probably to look through the part that deals with Walls – after all chimneys are often built with bricks and mortar and often extend from a wall. Or Roofs might seem to be a good place to look.

But no, you are not going to find the information you are looking for in any of these three sections of the NBR. The information you need is in Part V of the Act. This section is very short, and deals only with the design, construction and installation of fireplaces and hearths that have chimneys and/or flues.

The legislation states:

"(1) Any system of space heating in any building shall be so designed, constructed and installed as to operate safely and any flue, flue pipe or chimney used in such system shall be so designed as to safely remove any smoke or noxious gases produced by such system.

"(2) The requirements of sub-regulation (1) shall be deemed to be satisfied where the design and construction of any flue pipe, chimney, hearth or fireplace complies with SANS 10400-V." That's it.

SANS 10400-V: Space Heating

As with all the Standards that make up SANS 10400, if you ensure that your installations comply with the SANS it will be "deemed to satisfy" the law. But other Standards are often cross-referenced. This Part of SANS 10400 makes reference to:

- SANS 10177-5, Fire testing of materials, components and elements used in buildings — Part 5: Non-combustibility at 750 °C of building materials.
- SANS 10400-A, The application of the National Building Regulations — Part A: General principles and requirements.
- SANS 10400-B, The application of the National Building Regulations — Part B: Structural design.

Like all the published SANS, it has a list of useful definitions, some of which you will find in our Glossary of Terms.

Examples include:

- chimney That part of a building which forms part of a flue, but does not include a flue pipe
- flue Passage which conveys the discharge of a heat-generating appliance to the external air
• **flue pipe** Pipe forming a flue, but does not include a pipe built as a lining into a chimney

Hearth and fireplace are not defined!

**Chimneys**

Chimneys must be designed and erected from materials that are non-combustible – which of course stands to reason. It is also important that they don’t become a fire hazard, particularly to those materials adjacent to the chimney structure. Further, chimneys should not be reinstalled in shafts or ducts that might be affected by heat.

Timber is one of the combustible materials that we commonly use in our homes, and the regulation states that elements including joists for timber floors, trimmers or roof trusses may not be built within 200 mm of the inside of any chimney.

There are additional regs that relate to dimensions, for instance where the walls of a brick or block chimney are less than 190 mm-thick, it must be lined with a flue lining that is made of a material that will withstand the action of any flue gases and won’t crack or soften. The flue lining must also extend throughout the full height of the chimney.

There are also regulations that relate to the height of the outlet – this has not changed since the regulations were published previously in 1990 (and of course you can [download these free](#)). Below you can see the chimney positions.

---

Opening or adjacent structure

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Position when the roof pitch is 10 degrees or more

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Roof pitch less than 10º

**Flue Pipes**

This is all largely common sense. Flue pipes may not be designed or installed if they are going to become a fire hazard to adjacent material. They may also not be connected to shafts or ducts that form part of any ventilation system. And they may not be installed in shafts or ducts that are likely to be adversely affected by heat.
Hearths and Fireplaces

Any fireplace that is used for burning “solid fuel” MUST have a hearth that is made of a non-combustible material that is sufficiently thick. It must extend no less than 500 mm in front of the grate or fire basket and not less than 300 mm beyond each side of the grate or fire basket.

Timber floor joists and trimmers – or any other combustible material – may be built into a hearth.
National Building Regulations Part W – Fire Installation

Part W of the SANS 10400 Building Regulations is intended to keep people and property safe in the event of a fire. These have to be inspected and approved by the local authority and permission needs to be granted before any water fire fighting system is connected to the water supply.

Listed below are the main regulations and requirements:

W1 – Fire Installations

All approved fire installations shall be connected to a communication pipe supplied by the local authority: Provided that such local authority may, subject to any conditions it may consider necessary, allow such fire installation to be connected to —

(a) any approved alternative source of supply; or
(b) any source of non-potable water where such water is not to be used for domestic or any other purpose which, in the opinion of such local authority, might give rise to a health hazard.

W2 – Supply of Water

Water shall not be taken from a supply system for use in any fire installation, unless —

(a) an application has been made to the local authority for the supply of such water and such application has been granted; and
(b) the use of such water and such fire installation complies with any conditions imposed by the local authority.

W3 Design of Fire Installations

In any fire installation — (a) adequate and suitable connection and means of measuring water pressure shall be provided;

(b) so many isolating valves shall be provided to control the flow of water to the installation, and to such points within the installation, as the local authority may require; and

(c) the quantity, pressure and rate of flow of water shall be adequate for the supply of any hose reel, hydrant or sprinkler system connected thereto.

W4 – Deemed-to-Satisfy Requirements

The requirements of Regulation W3 shall be deemed to be satisfied where any fire installation complies with SANS 10400-W: Provided that where a local authority is of the opinion that it is essential for the fire installation to be the subject of an acceptable rational design prepared by an approved competent person, such local authority shall, in writing, notify the owner of such site of its reasons for the necessity for such design, and may require such owner to submit for approval plans and particulars of a complete fire installation, based on such design.
A typical fire installation in a factory showing the correct signage
In 2011, in an endeavour to make our buildings more sustainable, and to decrease energy usage in South Africa, a new part was added to SANS 10400, The application of the National Building Regulations. Part X deals with environmental sustainability, and Part XA deals with energy usage in buildings.

In many ways these new regulations have turned the building industry upside down, but not in a bad way. However for the average man-in-the-street it has become a puzzle of note. Every week we get people writing into this web site asking for advice and information about the “new energy laws” and how they affect their building and renovations.

On the down side, it seems that new regulations have opened up a can of worms that has less-than-knowledgable people (and some scamsters) flippantly quoting “the new green laws” in an effort to force people to spend more money than they need to on energy-efficient materials, appliances and the like. While there is no doubt that we need to “go green” and get our act together (pun intended) in terms of energy efficient building, it is also important to know the difference between what we should do, and what we must do to comply with the National Building Regulations and other national standards.

What the National Building Regulations and Building Standards Act Says

While the Act was originally passed in 1977 (officially it’s Act 103 of 1977), a number of amendments have been added to it over time. In 2011, Rob Davies, the Minister of Trade and Industry added the sections that relate to environmental sustainability and to energy usage in buildings.

The motivation for this amendment is to reduce greenhouse gases caused by buildings and extensions to buildings. These relate to a number of specific occupancies that are defined in Part A of SANS 10400, namely:

- A1 – Entertainment and public assembly Occupancy where persons gather to eat, drink, dance or participate in other recreation.
- A2 – Theatrical and indoor sport Occupancy where persons gather for the viewing of theatrical, operatic, orchestral, choral, cinematographical or sport performances.
- A3 – Places of instruction Occupancy where school children, students or other persons assemble for the purpose of tuition or learning.
- A4 – Worship Occupancy where persons assemble for the purpose of worshipping.
- C1 – Exhibition hall Occupancy where goods are displayed primarily for viewing by the public.
- C2 – Museum Occupancy comprising a museum, art gallery or library.
- E1 – Place of detention Occupancy where people are detained for punitive or corrective reasons or because of their mental condition.
- E2 – Hospital Occupancy where people are cared for or treated because of physical or mental disabilities and where they are generally bedridden.
- **E4 – Health care** Occupancy which is a common place of long term or transient living for a number of unrelated persons consisting of a single unit on its own site who, due to varying degrees of incapacity, are provided with personal care services or are undergoing medical treatment.

- **F1 – Large shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area exceeds 250 m².

- **F2 – Small shop** Occupancy where merchandise is displayed and offered for sale to the public and the floor area does not exceed 250 m².

- **F3 – Wholesalers’ store** Occupancy where goods are displayed and stored and where only a limited selected group of persons is present at any one time.

- **G1 – Offices** Occupancy comprising offices, banks, consulting rooms and other similar usage.

- **H1 – Hotel** Occupancy where persons rent furnished rooms, not being dwelling units.

- **H2 – Dormitory** Occupancy where groups of people are accommodated in one room.

- **H3 – Domestic residence** Occupancy consisting of two or more dwelling units on a single site.

- **H4 – Dwelling house** Occupancy consisting of a dwelling unit on its own site, including a garage and other domestic outbuildings, if any.

- **H5 – Hospitality** Occupancy where unrelated persons rent furnished rooms on a transient basis within a dwelling house or domestic residence with sleeping accommodation for not more than 16 persons within a dwelling unit.

But they specifically EXCLUDE garage and storage areas contained within these specified occupancies, as well as a number of other buildings that are used for commercial, industrial and buildings used exclusively for a variety of storage uses.

The law (because this is part of the Act – not SANS 10400) states that these “occupancies” (types of buildings) must be:

- capable of using energy efficiently while fulfilling user-needs in relation to various things including thermal comfort, lighting and hot water; OR
- have a “building envelope and services” that facilitate the efficient use of energy that is appropriate to the function and use of the building as well as its geographical location and its internal environment.

So it is **not a one solution fits** all situation. For instance, what works for a house in Durban may not make the same structure energy efficient in Cape Town! In addition, the legislation excludes the “equipment and plant” required for conducting business – if the building is used for business.

### Hot Water Heating Requirements

XA2 requires that at least a half – “50% (volume fraction) of the annual average hot water heating requirement shall be 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”.

So you can use a conventional geyser IF you meet the 50% requirement. And if you are renovating, you certainly don’t have to toss all your existing water equipment and go solar – even though there is absolutely no doubt that it’s the way to go.

### What is Required

The orientation, shading, services and building envelope must be designed according to SANS 10400 Part XA. Alternatively the rational design of the building must be done by a competent person who “demonstrates that the energy usage of such building is equivalent to or better than that which would have been achieved by compliance with the requirements of SANS XA, or has a theoretical energy usage performance, determined using certified thermal calculation software, less than or equal to that of a reference building in accordance with SANS 10400 Part XA”.

If you’re looking to change jobs, becoming a person competent to specify these requirements is one way to go! It is something that is not easy for someone who hasn’t got the relevant training to get their head around.

### What 10400 XA Says

As with all national standards, 10400 XA has a number of definitions, some of which are in the [glossary that is part of the Act](#).

A few of the important definitions that relate to this particular part of the standard are:
• **Building envelope** Elements of a building that separate a habitable room from the exterior of a building or a garage or storage area

• **Competent person** 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

• **Fenestration** Any glazed opening in a building envelope, including windows, doors and skylights

• **Fenestration area** Area that includes glazing and framing elements that are fixed or movable, and opaque, translucent or transparent

**Requirements of 10400 XA**

The requirements of this new national standard cover:

1. Hot water supply
2. Energy usage and building envelope
3. Design assumptions
4. Building envelope requirements

The standard also defines the different climatic zones of South Africa.

To be a little more specific, the main centres for each zone are:

• Zone 1 – Johannesburg and Bloemfontein
• Zone 2 – Pretoria and Polokwane
• Zone 3 – Makhado and Nelspruit
• Zone 4 – Cape Town and Port Elizabeth
• Zone 5 – Durban, Richards Bay and East London
• Zone 6 – Kimberley and Upington

**Building Envelope Requirements**

This is probably the most vital part of the new regulation, and it addresses orientation, floors, external walls, fenestration, and roof assemblies – but not in a lot of detail.
Floors

If any type of underfloor heating system is used in a home, this must be insulated under the concrete slab with insulation that has a minimum \( R \)-value of at least 1.0. The \( R \)-value is the thermal resistance (square metre K/W) of a component. According to the Standard, it is “the inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area”.

Roof Assemblies

Any roof assembly must achieve a minimum \( R \)-value for the direction of heat flow. This is specified in several tables in the regulations.

Minimum total \( R \)-values of roof assemblies

<table>
<thead>
<tr>
<th>Direction of heat flow</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up</td>
<td>3.7</td>
<td>3.2</td>
<td>2.7</td>
<td>3.7</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
<td>Up and Up</td>
<td>Down and up</td>
<td>3.7</td>
<td>2.7</td>
<td>3.7</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
<td>Up</td>
<td>Down</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
<td>3.5</td>
</tr>
<tr>
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<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
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<td>3.5</td>
</tr>
<tr>
<td>Up</td>
<td>Up</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
<td>3.7</td>
<td>3.5</td>
</tr>
</tbody>
</table>

Roofs with metal sheeting affixed to purlins, rafters or battens made of metal are required to have a thermal break that consists of a material with an \( R \)-value that is not less than 0.2, and which is installed between the sheeting and the support. In addition, roofing assemblies that utilize metal sheeting must achieve a minimum total \( R \)-value that meets the requirements shown in the table above. Insulation must also be installed with an \( R \)-value that meets the specified in the table below.

Metal sheeting roof assemblies

<table>
<thead>
<tr>
<th>Direction of heat flow</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up</td>
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<td>0.36</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
<td>0.30</td>
</tr>
<tr>
<td>Up and Up</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>Up</td>
<td>3.35</td>
<td>2.85</td>
<td>2.35</td>
<td>3.35</td>
<td>2.29</td>
<td>3.15</td>
<td>3.15</td>
</tr>
<tr>
<td>Up</td>
<td>3.35</td>
<td>2.85</td>
<td>2.35</td>
<td>3.35</td>
<td>2.29</td>
<td>3.15</td>
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</tr>
<tr>
<td>Up</td>
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<tr>
<td>Up</td>
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<td>2.85</td>
<td>2.35</td>
<td>3.35</td>
<td>2.29</td>
<td>3.15</td>
<td>3.15</td>
</tr>
</tbody>
</table>

Clay tiles used for roofing must achieve a minimum \( R \)-value as in the first table above. Insulation should be in accordance with the specifications shown below.
The other standard that you need to know about is SANS 204 (2011): Energy efficiency in buildings.
(click for preview from SABS Store)

By SANS10400