

Importance of building regulation in support of building industry, consumer and the economy



**First Annual NRCS
Regulatory
Conference**

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Engineering

Herbert Hoover, the 31st president of the United States (1929-1933) described engineering in his memoirs as *“a great profession. There is the fascination of watching a figment of the imagination emerge through the aid of science to a plan on paper. Then it moves to realization in stone or metal or energy. Then it brings jobs and homes to men. **Then it elevates the standards of living and adds to the comforts of life.** That is the engineer's high privilege”*.

Bill of rights (Constitution of the Republic of South Africa)

Section 26(1) - *“Everyone has the right to have access to adequate housing.”*

Section 24 Everyone has the right:

- a) to an environment that is not harmful to their health or well-being; and*
- b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
 - i) prevent pollution and ecological degradation;*
 - ii) promote conservation; and*
 - iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”**

The built environment

The built environment comprises the manmade surroundings that provide the setting for human activity

Buildings

- provide shelter for humans, animals, or property of any kind
- are central to the built environment and the economy of any country as well as the well being of its inhabitants
- buildings shape and define the environment in which humans live, work and relax



Hammurabi code (Babylonian dynasty - circa 1792-1750 BC)

It is not surprising that building standards have been in place ever since man has been able to capture his thoughts in writing

The earliest known building code is that of Hammurabi which dealt with two basic issues

- the fee a builder was to paid for completing a house
- the recourse that an owner had to that builder in the event that the house was not properly constructed

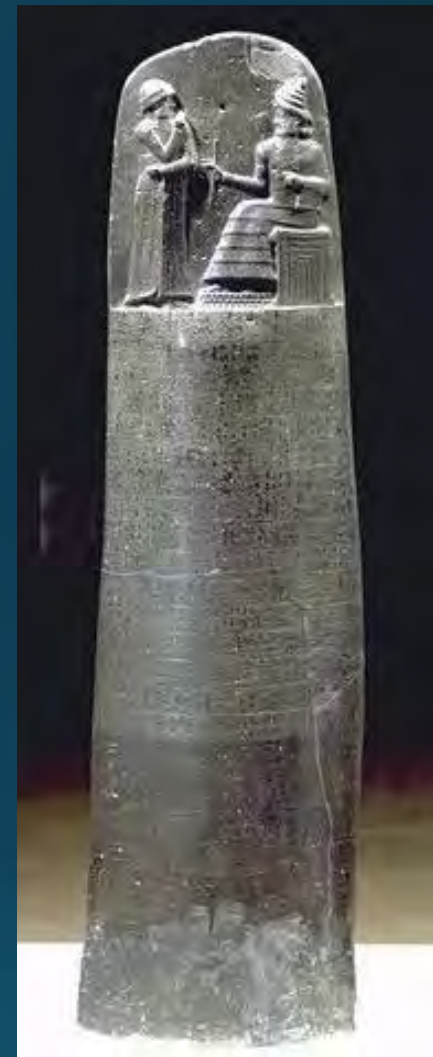


Hammurabi code (Babylonian dynasty - circa 1792-1750 BC)

If a builder build a house for some one, and does not construct it properly, and the house which he built falls in and kills its owner, then that builder shall be put to death

If it kills the son of the owner the son of that builder shall be put to death

If it ruins goods, he shall make compensation for all that has been ruined, and inasmuch as he did not construct properly this house which he built and it fell, he shall re-erect the house from his own means



Hammurabi code (Babylonian dynasty - circa 1792-1750 BC)

Says nothing about women (wives and daughters) !

Lessons:

Building codes reflect societal values and expectations

Imposed responsibility for results and left the means of achieving them open



Evolution of building regulations

With urbanisation came the scourge of **fire** and health risks associated with **poor sanitation**

Over the centuries, many cities were razed to the ground by fire and millions of people died as a result of poor sanitary conditions in highly populated areas



Nineteen century law makers developed building laws to secure proper sanitary conditions and to diminish the outbreaks and disastrous consequences of fires in cities



Informal settlements



St Francis Bay fire

Law makers in the twentieth century developed minimum standards for the construction and maintenance of buildings designed to protect public health, safety and general welfare

Focus on:

- structural safety and serviceability
- fire safety,
- health and hygiene
- moisture penetration
- hygrothermal (humidity and temperature)
- safety
- accessibility and usability

Standards for buildings need to reflect societal values and expectations

Building standards for the twenty first century need to be developed to address the issues of the day

Many of these standards, particularly the earlier ones, were prescriptive in nature and addressed only local or conventional construction techniques and methods

Death risk rates by activity (Madsen , 1986)

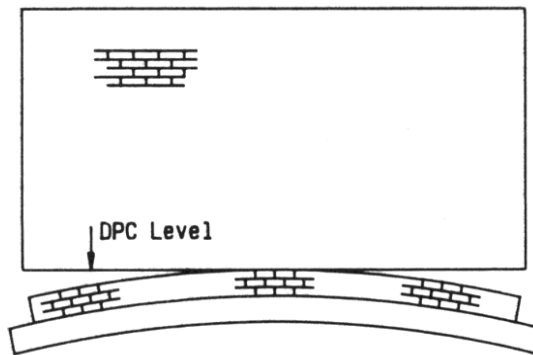
Activity	Rate per hour for billion people exposed	Exposure (hours per year)	Death rate per 100 000 people exposed per annum
Mountain climbing	2 700	100	27
Flying (crew)	120	2 900	17
Automobile travel	56	400	2.2
Construction	7.7	2 200	1.7
Flying (passengers)	120	100	1.2
Home accidents	2.1	5 500	1.1
Factory work	2	2 000	0.4
Building fires	0.15	5 500	0.08
Structural failure	0.002	5 500	0.001



Recent enhancements in National Building Regulations flowing out of the NHBRC structural warranty scheme



Damage due to heaving clays



Doming
(Hogging)



Damage due to collapsing sand

Regulations amended in 2008 . Deemed to satisfy provision (SANS 10400) amended in 2010 - 2012

Recent enhancements in National Building Regulations flowing out of the NHBRC structural warranty scheme

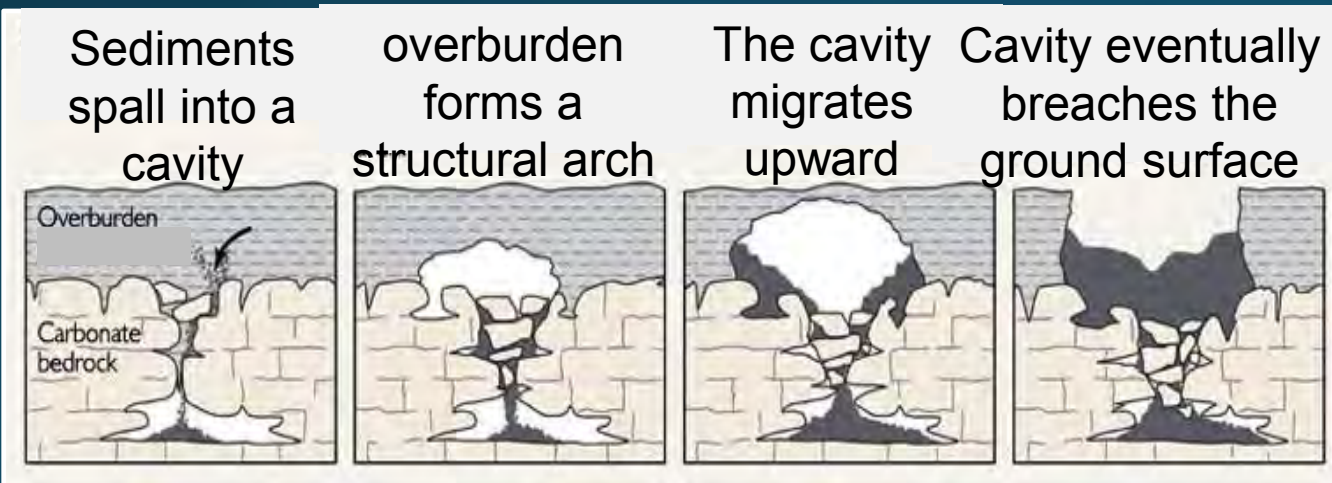
Development of dolomite land



CITY PRESS (28 December 2010)

Residents protest against Bapsfontein relocation

The Ekurhuleni metropolitan municipality has said that about 3000 families have to relocate because of a dolomite problem in Bapsfontein



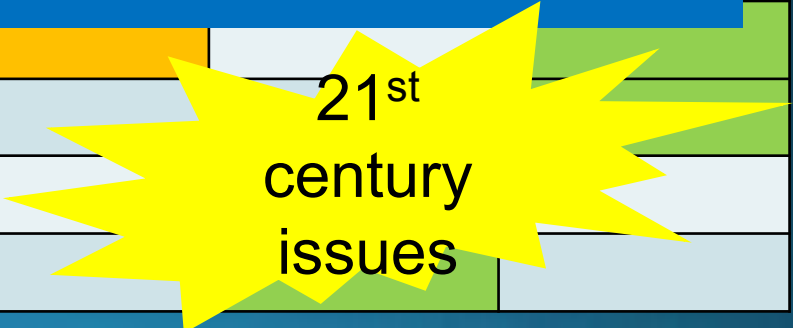
Main aspects which are issues of concern	Core areas of protection / issues of concern / aspects impacted upon by construction works						
	ecosystem	natural resources	health and well-being	social equity	cultural heritage	economic prosperity	economic capital
Emission to air					Sustainable development (ISO 21929-1)		
Use of non-renewables							
Fresh water consumption							
Waste generation							
Change of land use							
Access to services							
Accessibility							
Indoor conditions and air quality							
Adaptability							
Costs							
Maintainability							
Safety							
Serviceability							
Aesthetic quality							

The building and construction sector

- is a key sector in national economies
- represents a large share of the economic assets of individuals, organizations and nations
- is one of the single largest industrial sectors with impacts on employment, economy and environment
- proper housing and infrastructure are key elements in determining the quality of life
- has a significant interface with poverty reduction through the provision of basic services and the potential opportunities to engage the poor in construction, operation and maintenance activities

Choices relating to the following in buildings impact upon sustainability:

- building materials;
- constructions methods and resources;
- operating energy;
- water services; and
- sanitary systems



Green and Brown agenda - poverty, development and the environment

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GREEN AGENDA		BROWN AGENDA
Ecosystem well-being	Key concern	Human well-being
Forever	Timeframe	Immediate
Local to global	Scale	Local
Future generations	Concerned about	Low-income groups
Protect and work with	Nature	Manipulate & use
Use less	Services	Provide more

Affluence & over-consumption

Poverty & underdevelopment

**S
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Different agendas

Contributions to sustainable development

- **Usage of resources such as energy and water** e.g. greenhouse gas emissions, use of renewable and non-renewable resources and consumption of fresh water)
- **Choice of building materials** e.g. use of renewable and non-renewable resources, use of harmful substances, potential to generate business and employment opportunities for targeted groups and formation of waste hazards)
- **Choice of construction methods and resources** e.g. potential to generate business and employment opportunities for targeted groups and health and safety during construction
- **Methods of waste disposal** .e.g. recycling and disposal of hazardous waste
- **Resilience** (ability to recover / bounce back from extreme hazards / disasters)

Current regulations regarding sustainability (2011)

Part XA: Energy usage

XA1 In order to contribute to the reduction of greenhouse gases buildings

Regulation W covers fire installations

Water for consumption is not covered – covered but not enforced through Water Services Act of 1997 - Regulations merely state that every consumer installation must comply with SANS 10252-1

Bill of rights

Section 24 (b) Everyone has the right to have the environment protected, for the benefit of present and future generations

Constitution

39. Interpretation of Bill of Rights.- (2) When interpreting any legislation, and when developing the common law or customary law, every court, tribunal or forum must promote the spirit, purport and objects of the Bill of Rights.

Section 17 of the National Building Regulations and Building Standards Act

The Minister maymake regulations, to be known as national building regulations-(h) regarding the provision of water and of sewerage and drainage services in respect of buildings

Attributes and considerations regulated in buildings to a greater or lesser degree

Attribute	Regulated by NBRs	Attribute	Regulated by NBRs
Accessibility	Yes	Maintainability	Yes
Adaptability	Not regulated	Safety in use	Yes
Acoustics	Not regulated	Security	No
Aesthetics	Not regulated	Structural safety	Yes
Air purity	Yes	Structural serviceability	Yes
Contributions to sustainable development	Yes (energy usage only)	Suitability of spaces for specific uses	yes
Constructability	Not regulated	Tightness (water, air, gas and dust)	Yes (some)
Durability	Yes	Visual	Yes (lighting and contrast)
Economics	Not regulated		
Fire safety	Yes		
Hygiene	Yes but not water		
Hygrothermal (moisture and heat)	Yes		

Starting to introduce 21st century issues

Resilience

Resilience is the capacity of a system to survive, adapt, and grow in the face of unforeseen changes, even catastrophic incidents

The United Nations International Strategy for Disaster Reduction has defined resilience as:

The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.

Oxford English Dictionary resilience means *act of rebounding or springing back*

Resilience provides better understanding on how society should respond to disruptive events and accommodate change

“Bounce back”
from disaster.
“Are we
prepared?”
Rather than
“can we prevent
it?”

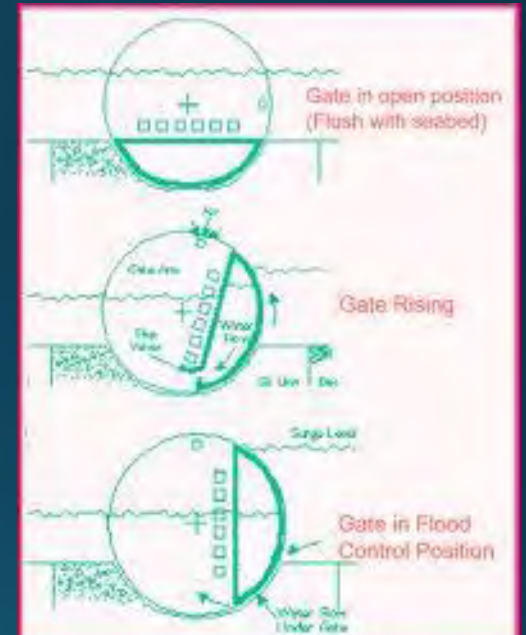
**The concept of
resilience – the
capacity of
human and
physical
systems to
respond to
extreme events**

London Thames barrier (commissioned in 1982)

- purpose is to prevent the floodplain of all but the easternmost boroughs of Greater London from being flooded by exceptionally high tides and storm surges moving up from the North Sea
- designed to protect London against a very high flood level (with an estimated return period of **one hundred years**)
- at the time of its construction, the barrier was expected to be used 2/3 times per year.
- it is now being used 6/7 times per year

Flood control in the Netherlands

- about two thirds of the Netherlands is vulnerable to flooding
- the sea defences are such that the safety norm of a flood chance is **once every 10,000 years** for the economic heart and most densely populated parts and once every 4,000 years for less densely populated areas



New Orleans – levee failure

- On 29 August 2005 there were over 50 failures of the levees and flood walls protecting New Orleans and its suburbs following passage of Hurricane Katrina and landfall in Mississippi
- The levee and flood wall failures caused flooding in 80% of New Orleans and all of St. Bernard Parish

Levee design:

Any event beyond the 50-year frequency of occurrence (2% chance of occurring each year) could produce significant flooding and losses

- Large events such as the 100-year (1% chance each year) flood would cause extensive flooding and losses
- Extreme events like the 500-year (0.2% chance each year) flood would totally devastate the entire region

Event was probably a 1:100 year event



Aftermath

At least 1,833 people died in the hurricane and subsequent floods
Total property damage was estimated at \$108 billion (2005 USD)



July 2007 –
population 60%
of pre Katrina
population



Evacuating a city prior to a hurricane

Seismic events in South Africa

Magnitude (Richter scale)	Average earthquake effects
<2.0	Microearthquakes, not felt, or felt rarely by sensitive people. Recorded by seismographs.
2.0–2.9	Felt slightly by some people. No damage to buildings.
3.0–3.9	Often felt by people, but very rarely causes damage. Shaking of indoor objects can be noticeable.
4.0–4.9	Noticeable shaking of indoor objects and rattling noises. Felt by most people in the affected area. Slightly felt outside. Generally causes none to minimal damage. Moderate to significant damage very unlikely. Some objects may fall off shelves or be knocked over.
5.0–5.9	Can cause damage of varying severity to poorly constructed buildings. At most, none to slight damage to all other buildings.
6.0–6.9	Damage to a moderate number of well-built structures in populated areas. Earthquake-resistant structures survive with slight to moderate damage. Poorly designed structures receive moderate to severe damage.
7.0–7.9	Causes damage to most buildings, some to partially or completely collapse or receive severe damage. Well-designed structures are likely to receive damage.
8.0–8.9	Major damage to buildings, structures likely to be destroyed. Will cause moderate to heavy damage to sturdy or earthquake-resistant buildings. Damaging in large areas.
9.0 and greater	Near or at total destruction - severe damage or collapse to all buildings. Heavy damage and shaking extends to distant locations.

Max mining induced seismic event



Max natural seismic event



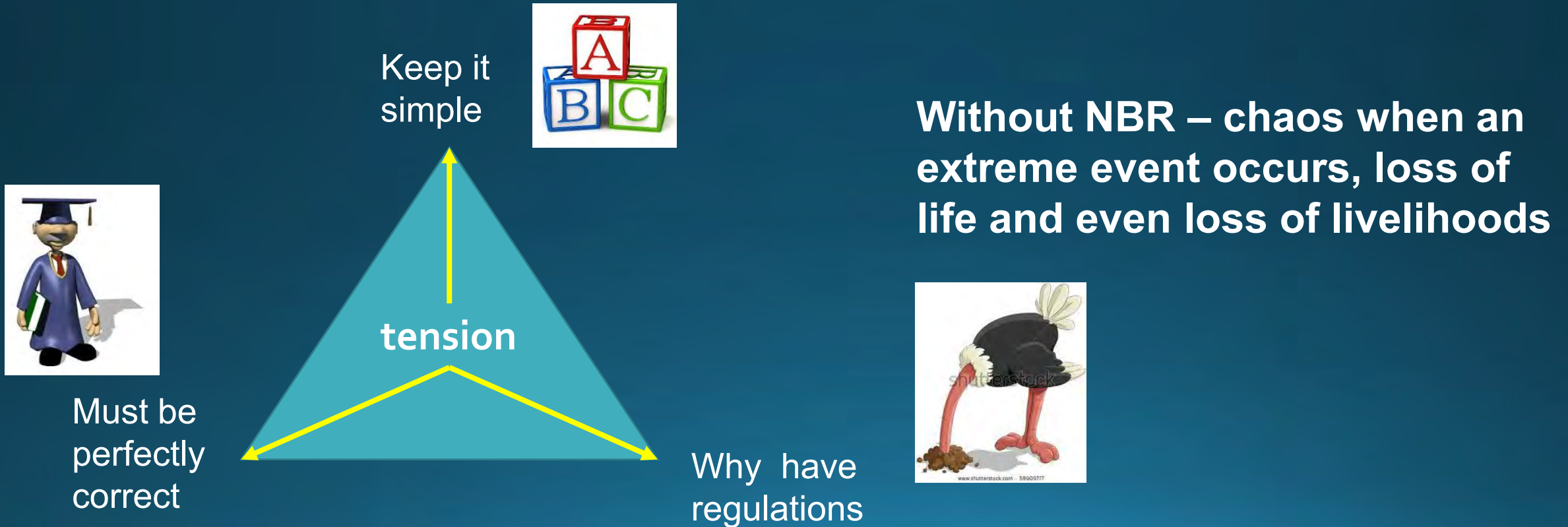
What happens?

Importance of building regulation in support of building industry, consumer and the economy

When buildings function – building regulations are seen as a hindrance

When buildings fail at scale – national disaster

When buildings fail and there is no insurance cover – who pays?



Thank you