

NATIONAL HOME BUILDERS
NHBRC
REGISTRATION COUNCIL

INNOVATIVE
SUSTAINABLE
TECHNOLOGIES BY
ISAAC VUSI HARTLEY



City Centre Sustainable Design Housing Competition



HUMAN RIGHT ISSUE

- The right to Housing is codified as a human right in the universal declaration of human rights(1948)
- Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family; including food clothing, housing...{article 25(1)}

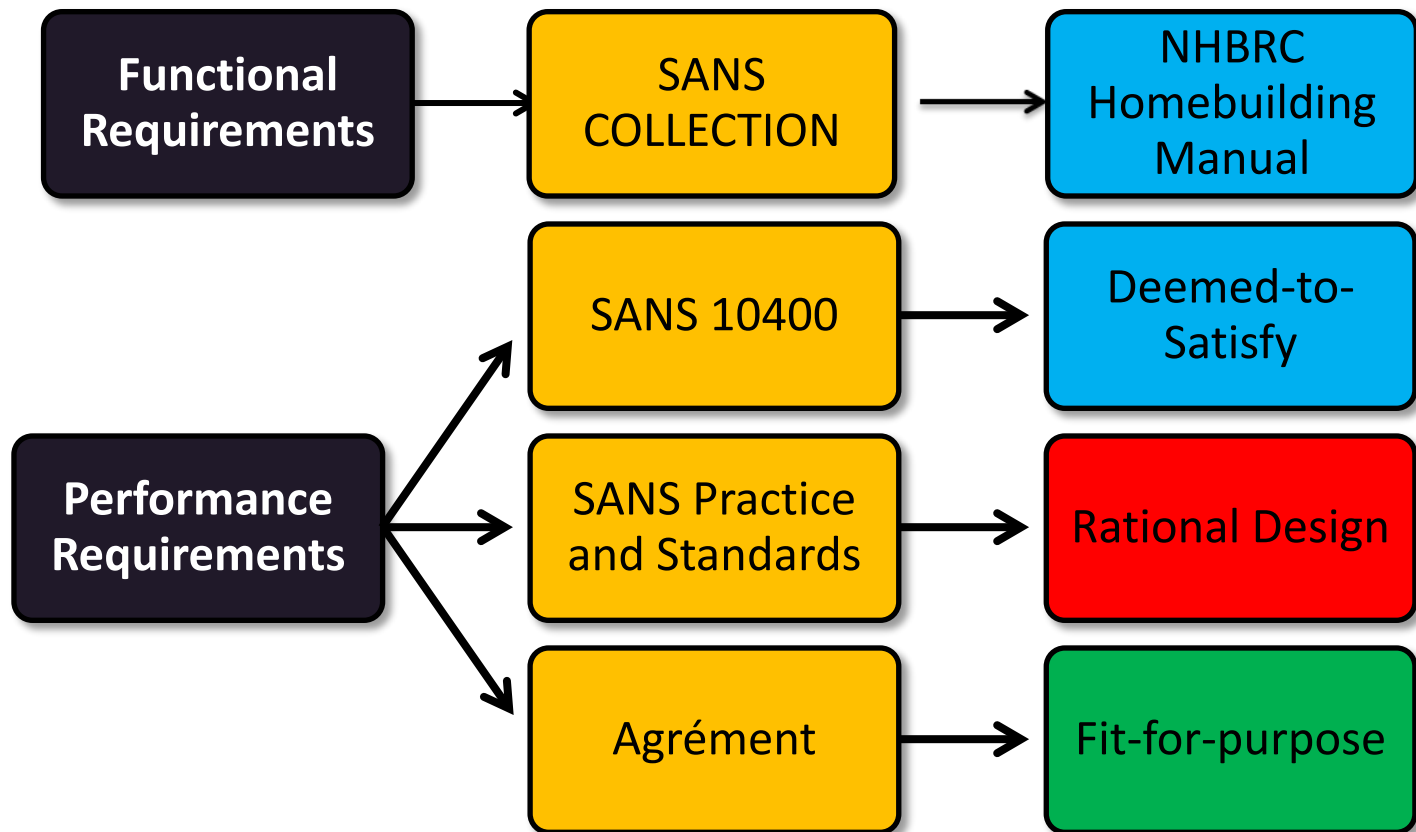




Primary pieces of legislation governing the design and construction of housing

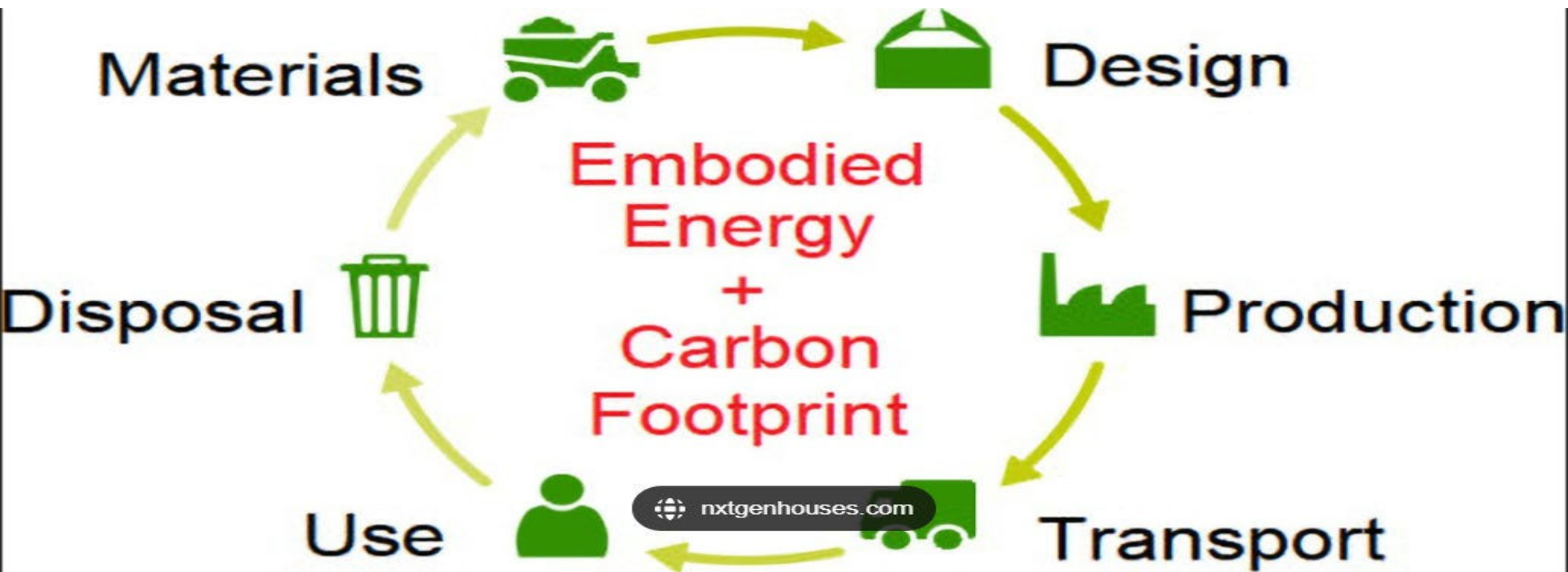
Act	Objective of the legislation in regulating the design and construction of homes
National Building Regulations and Building Standards Act of 1977 (Act No. 103 of 1977)	To: <ul style="list-style-type: none">a) protect property and the general safety, health and convenience of the public in relation to the erection of homes;b) design and construct homes which are not harmful to the health or well-being of users and occupiers; andc) ensure that certain solutions that are adopted for homes contribute positively to environmental sustainability.
Housing Consumers Protection Measure Act of 1998 (Act No. 95 of 1998)	To: <ul style="list-style-type: none">a) provide housing consumers with warranty protection in new homes against major structural defects and roofing leaks; andb) assist housing consumers in the enforcement of agreements concluded with home builders.
Occupational Health and Safety Act of 1993 (Act No. 85 of 1993)	To: <ul style="list-style-type: none">a) create a safe working environment for those engaged in the construction of a home; andb) protect persons other than those involved in the construction of a home from the hazards to health and safety arising out of or connected with such construction.

Building Standards and Regulations promote uniformity in the law relating to the erection of buildings; for the prescribing of building standards; and for matters connected therewith.



EMBODIED ENERGY

- **Embodied energy** is the [energy](#) that is consumed in order to build a given usable object. This includes the energy from material extraction, refining, processing, transporting, and fabricating.^[2] It is named as such because it is as if this energy is "embodied" within the item itself. Embodied energy also comes along with idea of embodied carbon, which is the associated [CO₂ footprint](#) that is emitted during the object's creation.



USE THE EDGE TOOL

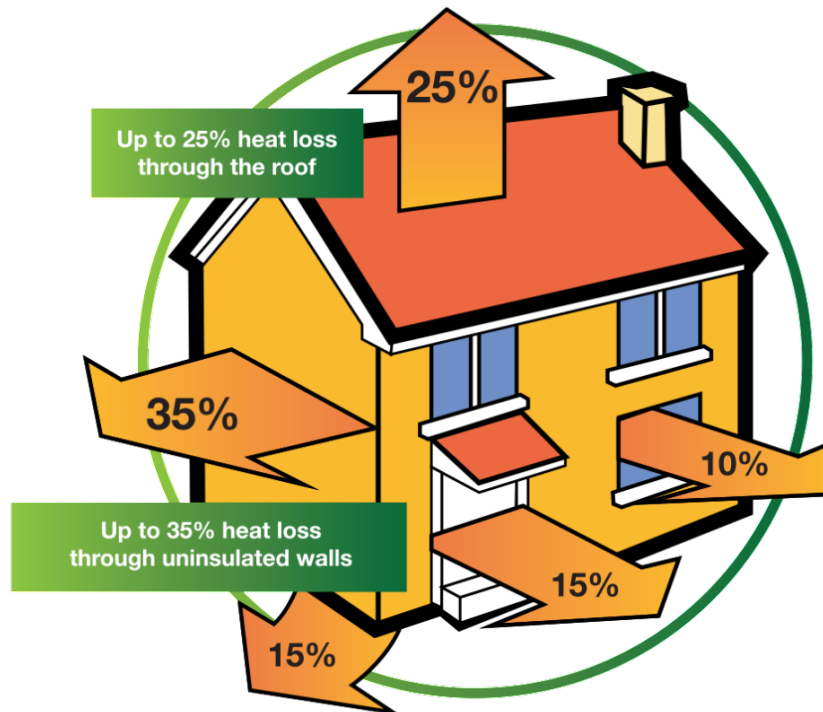
- Compare different scenarios to typical local practices:
- Embodied energy and carbon
- operational energy and carbon
- utility cost
- water use, and
- incremental cost, payback period

When selecting building materials, the embodied energy should be considered with respect to:

1. the durability of building materials
2. how easily materials can be separated
3. use of locally sourced materials
4. use of recycled materials
5. specifying standard sizes of materials
6. avoiding waste
7. selecting materials that are manufactured using renewable energy sources.



What is wrong with current buildings?



$$25\% + 35\% + 15\% + 15\% + 10\% = 100\%$$





Veggie-based insulation:

Carpets made from corn, paint made from soy and Forrest Stewardship Council-certified lumber and framing materials make up the insulation of the walls, floor, roof and basement.

Wind power system:

Wind turbines on the roof provide energy inside the home.

High-performance thermal windows, doors: Reduces heat loss, increases daylight and passive solar heating.

Solar panels: Convert sunlight into electricity.

Low-flow water fixtures: Reduce hot water usage.

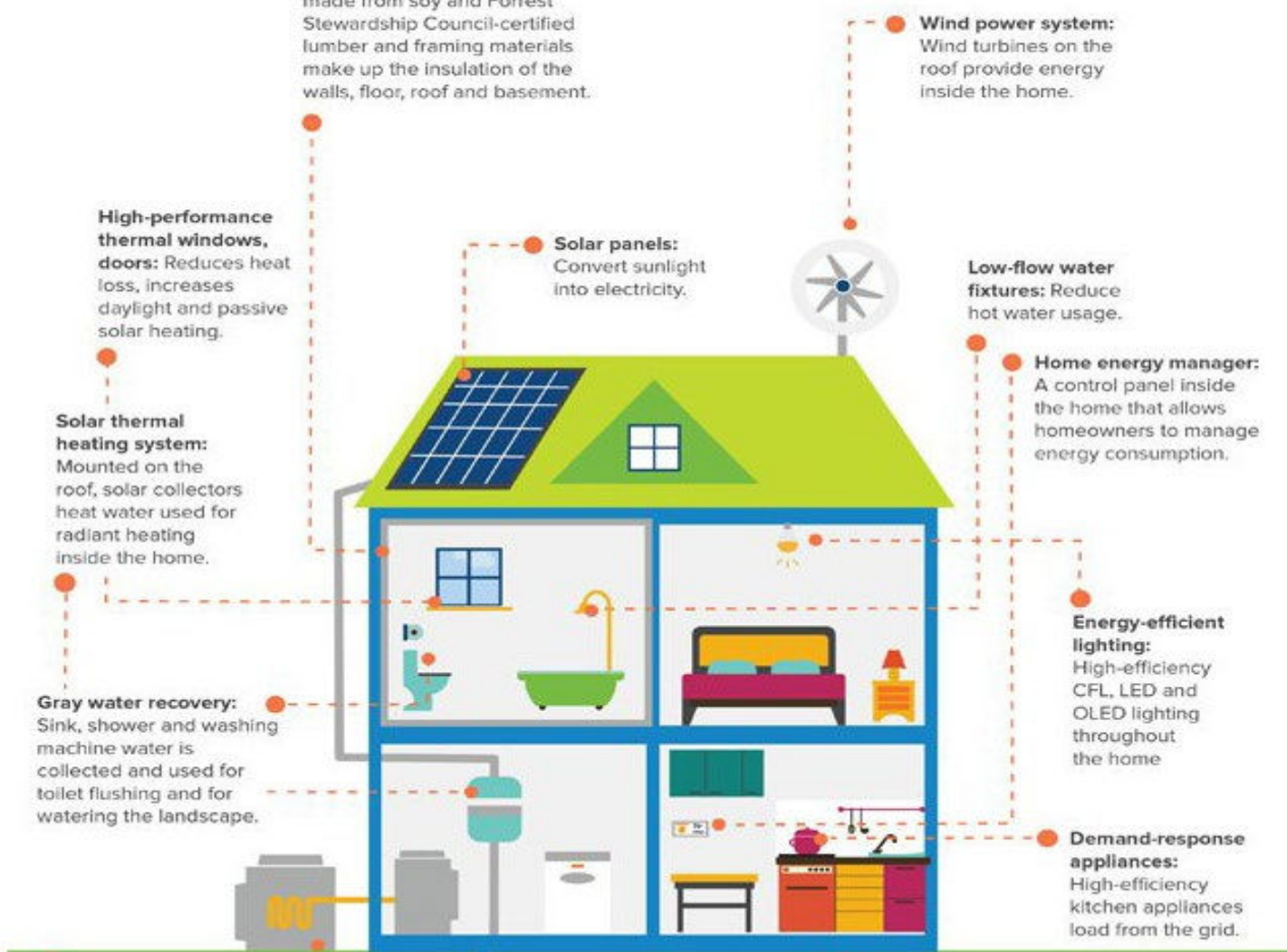
Solar thermal heating system: Mounted on the roof, solar collectors heat water used for radiant heating inside the home.

Home energy manager: A control panel inside the home that allows homeowners to manage energy consumption.

Gray water recovery: Sink, shower and washing machine water is collected and used for toilet flushing and for watering the landscape.

Energy-efficient lighting: High-efficiency CFL, LED and OLED lighting throughout the home

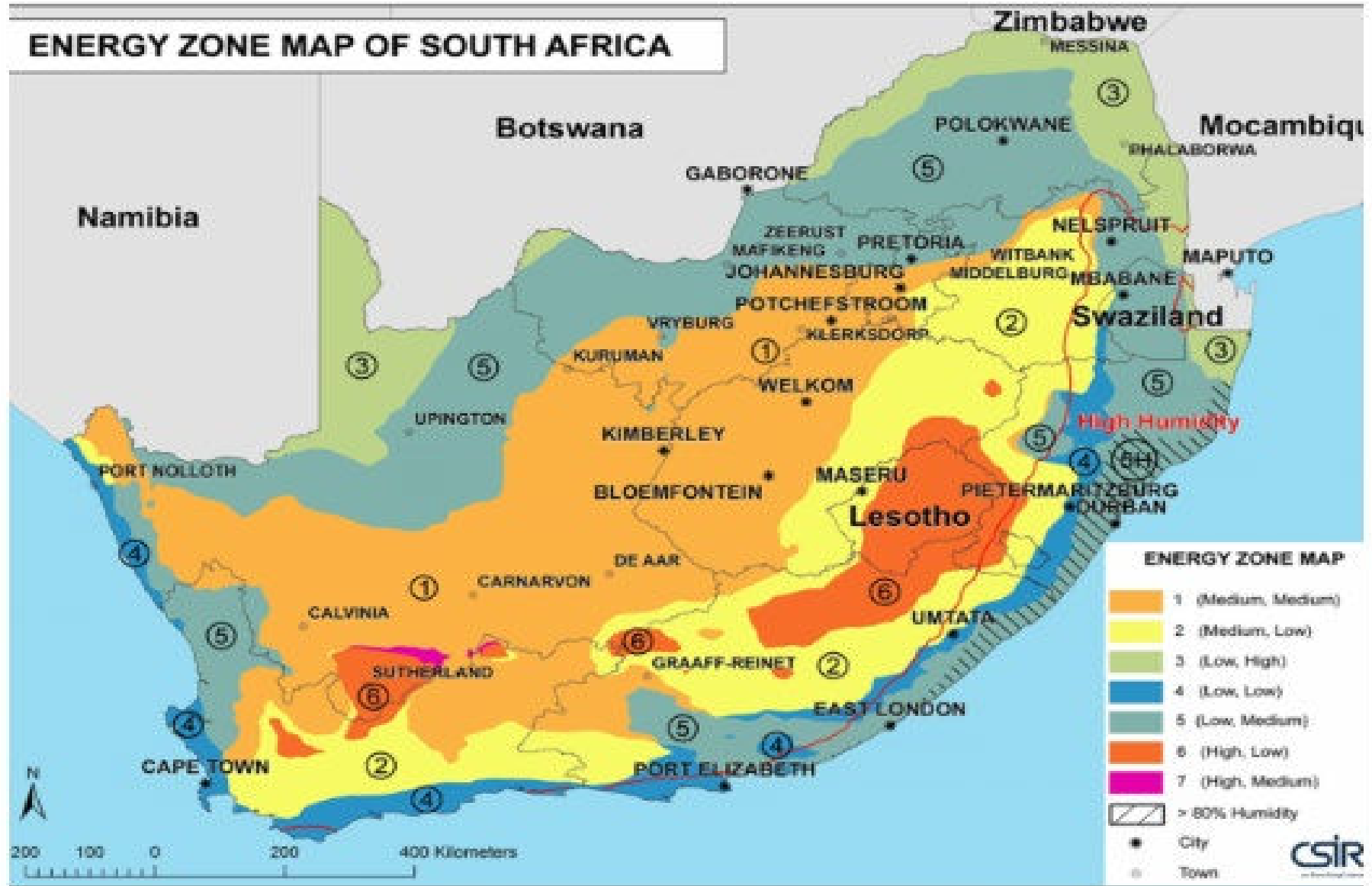
Demand-response appliances: High-efficiency kitchen appliances load from the grid.



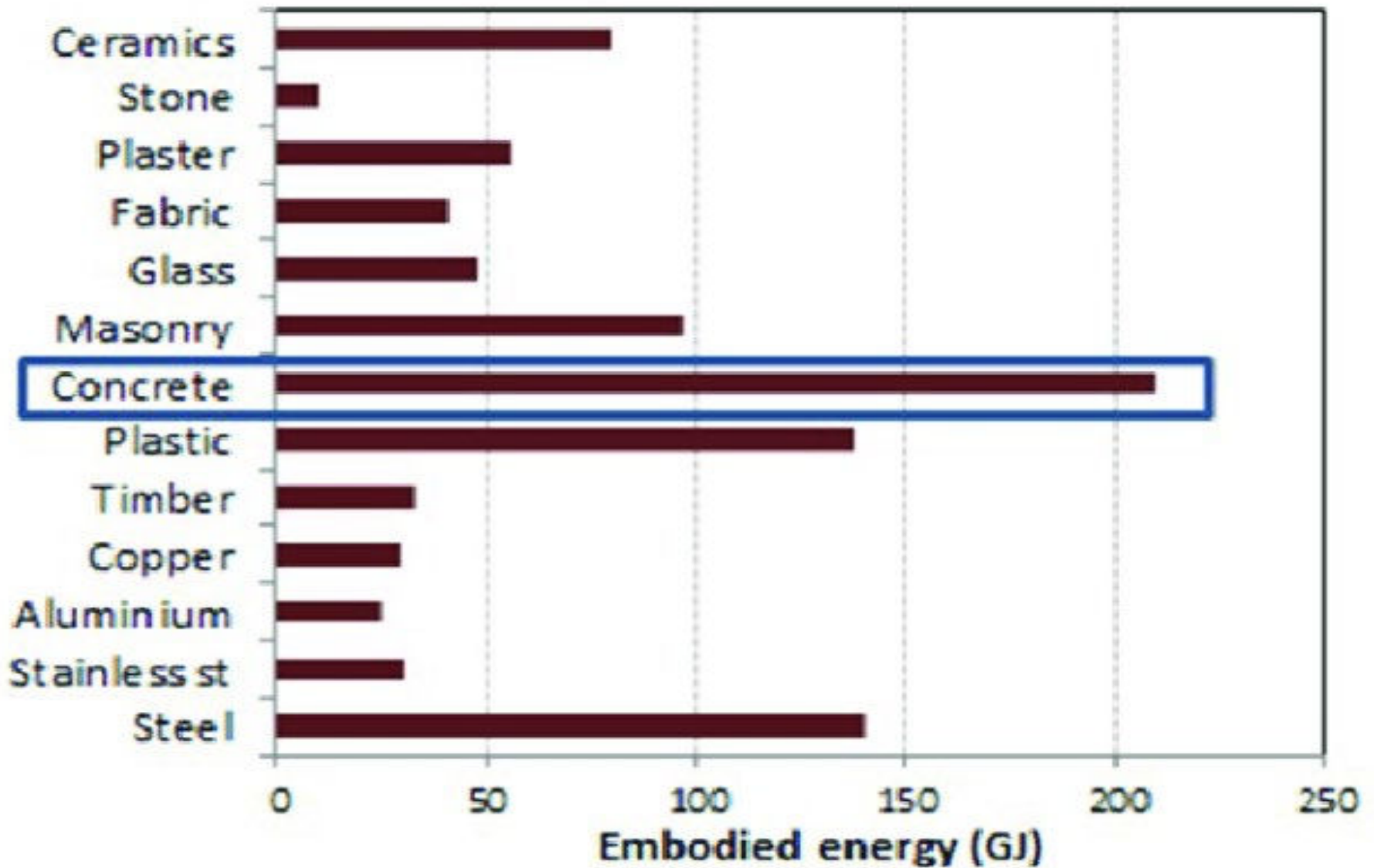
IBT ANALYSER

- The essential purpose of this software tool is to effectively and efficiently assist in the selection of appropriate IBT systems, within a specific climate and with the consideration a number of other quantitative and qualitative criteria.

ENERGY ZONE MAP OF SOUTH AFRICA



THE NEW STANDARDS NOW APPLY



INNOVATIVE BUILDING SYSTEMS

Classification label	Category	Name of building system
A	Light building system (LBS) with steel structural frame	Vela building system
		Amsa building system
		Alternative steel building system
		FSM building system
		Space frame building System
B	Light building system (LBS) with structural steel frame and insulated foundations	Imison 3 building system
		Imison stud building system
C	Light building system (LBS) with panels and light weight concrete	Goldflex 800 building system
		Goldflex 100 building system
		Goldflex 800 seismic building system
D	Hybrid building system (HBS)	Automapolyblok building system
		Aruba building system
		Blast building system
		Insulated concrete panel building system
		Rapidwall building system
		Styrox building system
E	Heavy weight building system (HWBS) with panels and dense concrete	Banbric building system
		Robust building system
F	Heavy weight building system (HWBS) with building blocks	BESA 2 building system
		Hydroform building system
		Izoblock building system
G	Masonry construction	Masonry

ENERGY EFFICIENCY OF IBT

- Energy efficiency overlaps with thermal comfort in that it establishes how much kWh can be saved to reduce costs on electricity but achieve thermal comfort and improved health at the same time. SANS 10400XA is used as a benchmark against the optimization/rational design of energy efficiency of the building envelope –
- There must be an improvement in energy usage of the optimized IBT home compared to the standard SANS 10400XA IBT home at the design stage.

- **SUSTAINABLE INNOVATIVE SYSTEM**

1. WALLING SYSTEMS
2. BUILDING SYSTEM
3. ROOFING SYSTEMS
4. CEILING SYSTEM
5. INSULATION
6. WATERPROOFING AND DAMP PROOFING

7. **WALLING SYSTEMS**

CATEGORY A LIGHT BUILDING SYSTEMS (MONOLITHIC)

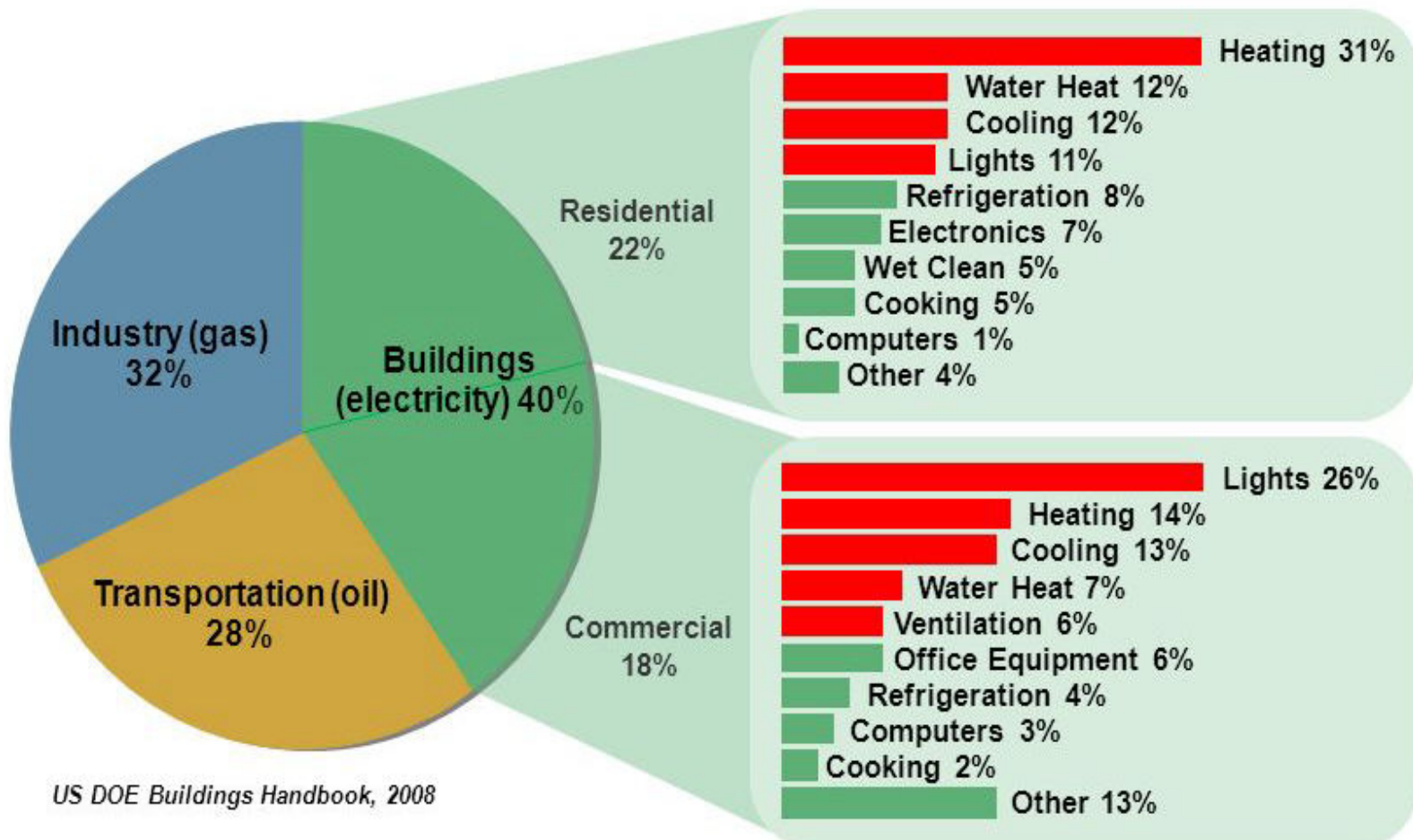
CATEGORY D HYBRID SYSTEMS

CATEGORY E PREFABRICATED PANELS

ENERGY EFFICIENCY OF SYSTEMS

MONOLITHIC SYSTEMS	HYBRID SYSTEMS	PRECAST SYSTEMS
LOW EMBODIED ENERGY	HIGH EMBODIED ENERGY	HIGH EMBODIED ENERGY
SUITABLE TO ALL CLIMATIC ZONES	SUITABLE TO ALL CLIMATIC ZONES	NOT SUITABLE TO ALL CLIMATIC ZONES
HIGH THERMAL PERFORMANCE	HIGH THERMAL PERFORMANCE	LOW THERMAL PERFORMANCE

ENERGY EFFICIENCE



US DOE Buildings Handbook, 2008

- QUALITY SYSTEMS ; -TO COMPLY TO ISO 9001
- STRUCTURAL INTERGRITY: TO COMPLY TO SANS SANS 10160 -2 AND SANS 10400 PART K.
- MANAGEMENT SYSTEMS:- TO COMPLY TO THE CER

STRUCTURAL INTEGRITY

- The objective is to provide a safe and secure house for individuals or communities displaced from their homes due to disasters, conflicts, or other crises.
- Performance Requirements
- **Design Life**
- The performance requirements for emergency housing are as follows:
 - 1) The structural system of the shall have a minimum design working life of 30 years as per SANS 10160-1; and
 - 2) Repairable or replaceable components and materials, such as claddings, roofing materials, exterior trims, windows, and doors, shall have a minimum design working life of 5 years.
- **Materials**
- These requirements ensure that the housing units are built to be durable and resilient, capable of withstanding the harsh environmental conditions that are often present in emergencies. As per the latest edition of SANS 10160, the structural system of the emergency housing shall be designed to withstand the free stream velocity pressure that is applicable to the region where the housing will be installed.

SOCIAL ACCEPTABILITY

- Objective
- The objective is to ensure that the housing meets the needs and preferences of the occupants and is culturally appropriate and socially acceptable in the community where it is located. This objective recognises that emergency housing is not just a physical structure but also a social environment that affects the mental and emotional well-being of its occupants.
- **Functional requirements**
- The functional requirements related to this objective are:
 - To assure that the house is delivered within the subsidy amount as determined by the Director General of the National Department of Human Settlements; and
 - To create housing that promotes a sense of safety, security, and well-being of the occupants.

SA 3D CONCRETE HOUSE



IBT



Welkom - Everite



WC - Nyanga - Kavango



Jhb - Etwatwa - MIBT



WC - Blue Downs - LEPA, CMA & KNAUF

Walling Systems



This home in Swaziland is constructed with wooden poles. The walls are filled with rocks, which will then be plastered over with mud. (Jon Sojkowski)

AGREMENT CERTIFICATION

CONSTRUCTION PRODUCTS FIT FOR PURPOSE
SYSTEMS TESTED, CERTIFIED AND APPROVED FOR SPECIFIC USE BY
MANUFACTURER.

AutomaPolyblock Building System

Tested and approved fit for
purpose when constructed as
specified in

CERTIFICATE 2007/336

AGRÉMENT
SOUTH AFRICA
innovative construction product assessments

AGRÉMENT
SOUTH AFRICA
innovative construction product assessments

CERTIFICATE NO:
2012/407

Confirmation of Certification
AGRÉMENT CERTIFICATE 2012/407
is awarded to:

**United Fibre Cement Company
(Pty) Ltd**

in recognition of:

UCO SolidWall Building System

which certificate provides detailed information on the
performance in use and the uses of the subject of the
certificate. When presented as proof of certification this
document must be accompanied by the abovementioned
certificate or by a certified copy of the typescript of the
certificate approved by the Board.


CHAIRPERSON
Mr Pepi Silinga

The master copy of this document appears on the website:

<http://www.agrement.co.za>

Validity

Users of any Agrément certificate should check its status: all currently valid certificates are listed on the website. In addition, check whether the certificate is [Active](#) or [Inactive](#).

The certificate holder is in possession of a confirmation certificate attesting to his status.

SANS 10400 – The application of the National Building Regulations

Quick guide

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Use

The certificate covers the use of the Robust Building System in all areas of South Africa for the erection of single storey buildings for the uses (SANS 10400: Table 1 of Regulation A(20)(1)) set out below:

- places of instruction (A3)
- moderate and low-risk commercial service buildings (B2 and B3)
- moderate and low-risk industrial buildings (D2 and D3)
- small shops (F2)
- offices (G1)
- dormitories (H2)
- semi-detached and row houses (H3)
- dwelling houses and related outbuildings (H4)

This certificate and Agrément South Africa's assessment apply only to Robust buildings that are designed, manufactured and erected as described and illustrated in this certificate, and where the terms and conditions of certification are complied with.

INSPECTION REFERENCE TO SANS 10400.

Aspects of performance	Opinion of Agrément South Africa	National Building Regulations satisfied
<i>Fitness-for-purpose of materials used</i>	The materials described in Part 3 meet the requirements of the regulations.	A13(1)(a) Materials
<i>Behaviour in fire</i>	<p>Walls are classified type FR (non-combustible) with a fire-resistance rating of 60 minutes.</p> <div style="border: 1px solid green; padding: 5px; width: fit-content; margin: 10px auto;"> <p>SANS 10400 – The application of the National Building Regulations</p> </div>	<p>K4 Walls, J1(1)(B), T1(1)(b) and (c) and in so far as the walls are concerned, T1(1)(b) is satisfied. They are also deemed to satisfy the regulation T1(1)(d) in so far as the walls are concerned.</p> <p>Comments made in the section on Supplement to certificates must be taken into account when building plans are scrutinized by local authorities to check compliance with Regulations T1(1)(a), T1(1)(d) with regard to spread of smoke, and T1(1)(e).</p> <p>The following deemed-to-satisfy rules of Section 3 of SANS 10400 have been met: TT5.1(c) ,TT5.2(c) and with regard to occupancy and tenancy separating elements and party walls between adjoining dwellings units, 90 mm thick Robust walls built up to the underside of roof coverings, TT6, TT8 and TT9</p>
<i>Structural performance</i>	Satisfactory, provided the requirements of this certificate are complied with.	<p>K1, K3 & K4 Walls</p> <p>Regulations B1(1) and (2) are deemed to be satisfied:</p> <p>When Robust buildings are built in accordance with the dimensional limitations given in <i>PART 3: Technical Description</i> of this certificate.</p> <p>When these limitations are not complied with, the structural design and erection of each building is the responsibility of a professional engineer or approved competent person and deemed-to-satisfy rule BB4 of SANS 10400 is applicable.</p> <p>Regulations H1(1) and (2), <i>Foundations</i>, are deemed to be satisfied as follows:</p> <p>H1(1) on non-problematic soils;</p> <p>H1(2) in all buildings where foundations are designed by a professional engineer or approved competent person and deemed-to-satisfy rule HH1(a) applies.</p>
<i>Water penetration and rising damp</i>	Satisfactory. Robust buildings meet Agrément South Africa's criteria for resistance to water penetration and rising damp throughout South Africa.	<p>K2 Walls</p> <p>J1(4) Floors</p> <p>L1(b) and (c) Roofs</p>

Q & A