NATIONAL HOME BUILDERS
NHBRC
REGISTRATION COUNCIL

PROMOTING INNOVATIVE BUILDING TECHNOLOGIES

CENTRE FOR RESEARCH AND HOUSING INNOVATION

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> One of the key mandates of the National Home Builders Registration Council (NHBRC), in terms of the Housing Consumers Protection Measures Act, is to establish and promote ethical and technical standards in the home building industry.

Preface

The Housing Consumers Protection Measures Act (Act 95 of 1998), as amended, requires the NHBRC to establish a fund aimed at providing assistance to housing consumers where a home builder fails to rectify major structural defects (foundations, floors, walls and roofs) or a roof leak attributable to workmanship, design or materials, which has manifested itself within five years or 12 months from the date of occupation respectively. One of the key mandates of the National Home Builders Registration Council (NHBRC), in terms of the Housing Consumers Protection Measures Act, is to establish and promote ethical and technical standards in the home building industry.

Innovative Building Technologies (IBTs) can provide solutions to both the public and private sector. On the one hand, government's subsidy housing dilemmas can be addressed through innovative technologies. Alternatively, they can provide an attractive option for the private sector. NHBRC has an interest in the development of innovative building technologies for homes to ensure compliance with the performance based regulatory system in terms of the National Building Regulations. This document promotes the use of these technologies by explaining what IBTs are in relation to alternative building technologies (ABTs), why they are relevant, how they comply with the National Building Regulations, and provides examples of IBTs.

1. What are IBTs?

Literature provides various definitions and perspectives on what innovative and/or alternative building technologies are. Although the NHBRC recognises that there are more inclusive definitions, its definitions are based on its major objective; which is to ensure the structural integrity of a house for which warranty cover is provided.

Dictionaries define **'innovation'** as 'introducing something new': the Latin stem 'innovare' refers to altering or renewing. This is derived from 'novus', meaning 'new'. An innovation is something that is new, is positively different, or is better than what was there before. Innovations however, are subject to change. Concepts of newness or reformation are viewed differently by different people, and to categorise something as new or 'innovative' places additional meaning on its value or relevance. As such, to be 'innovative' is an affirmative description of an artefact or a process.

The construction industry interchangeably uses the terminology of either alternative or innovative building technology to describe the new technology of a building. The NHBRC has taken the position that the term **innovative building technology (IBT)** is more inclusive of all innovation in artefacts or processes. It is also stipulated in the Housing Consumers Protection Measures Act of 1998 (No 95 of 1998), as amended, what **non-standardised** construction means to which IBT relates, which is defined as any form of building that utilises building systems, methods, materials, elements or components which are not fully covered by existing standards and specifications or codes of practice and/or which are not described or referred to in "deemed-to-satisfy" rules of the National Building Regulations. IBTs are also often contrasted with **conventional/standard building systems**, which can be defined as a building system, method, materials, elements or components, that are fully covered by existing standards and specifications or codes of practices.

2. What are the benefits of IBTs?

This document emphasises the benefits that an IBT could have when compared to standard building systems. These benefits are not guaranteed and must be checked by asking proof from the system owner or appointing a competent person to provide verification. The benefits of IBTs are the deciding factors that will determine whether government or prospective homeowners will choose non-standardised construction as listed in Table 1 below.

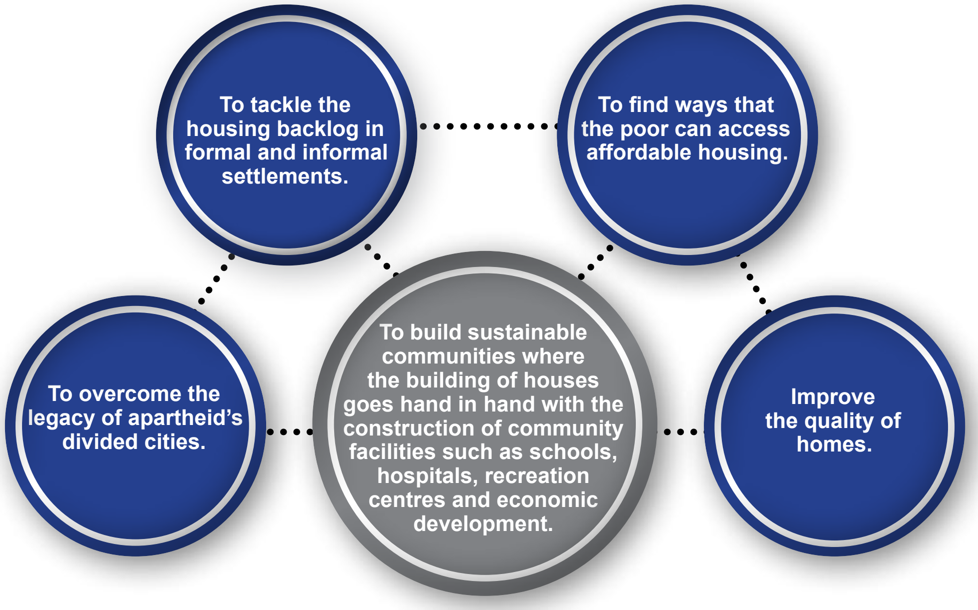
Table 1 - **Benefits of IBTs**

Group No.	Group Type	Parameters
1	Economic Factors	Improved upfront costs Improved market value Improved profitability in the long term through life cycle costing or cost benefit analysis of the total building
2	Construction Factors	Improved rate of construction and reduced labour costs Ease of construction Lower maintenance
3	Environmental Factors	Improved energy efficiency Improved embodied energy Less wastage
4	Social Factors	Social acceptability Architectural innovation

Notes:
- These guidelines are used over and above the required structural compliance requirements
- Point no.4 is included but does not form part of the scope of NHBRC's performance criteria

3. Why are IBTs relevant?

The relevance of IBTs are viewed from both a subsidy and non-subsidy housing sector perspective. From a subsidy sector perspective, a major concern of government is the housing backlog and slum conditions. To address this situation, government committed itself to do the following:



In particular, alternative solutions need to be found to address the housing backlog through innovation; which is why NHBRC is focusing on the performance of innovative building technologies (IBTs).

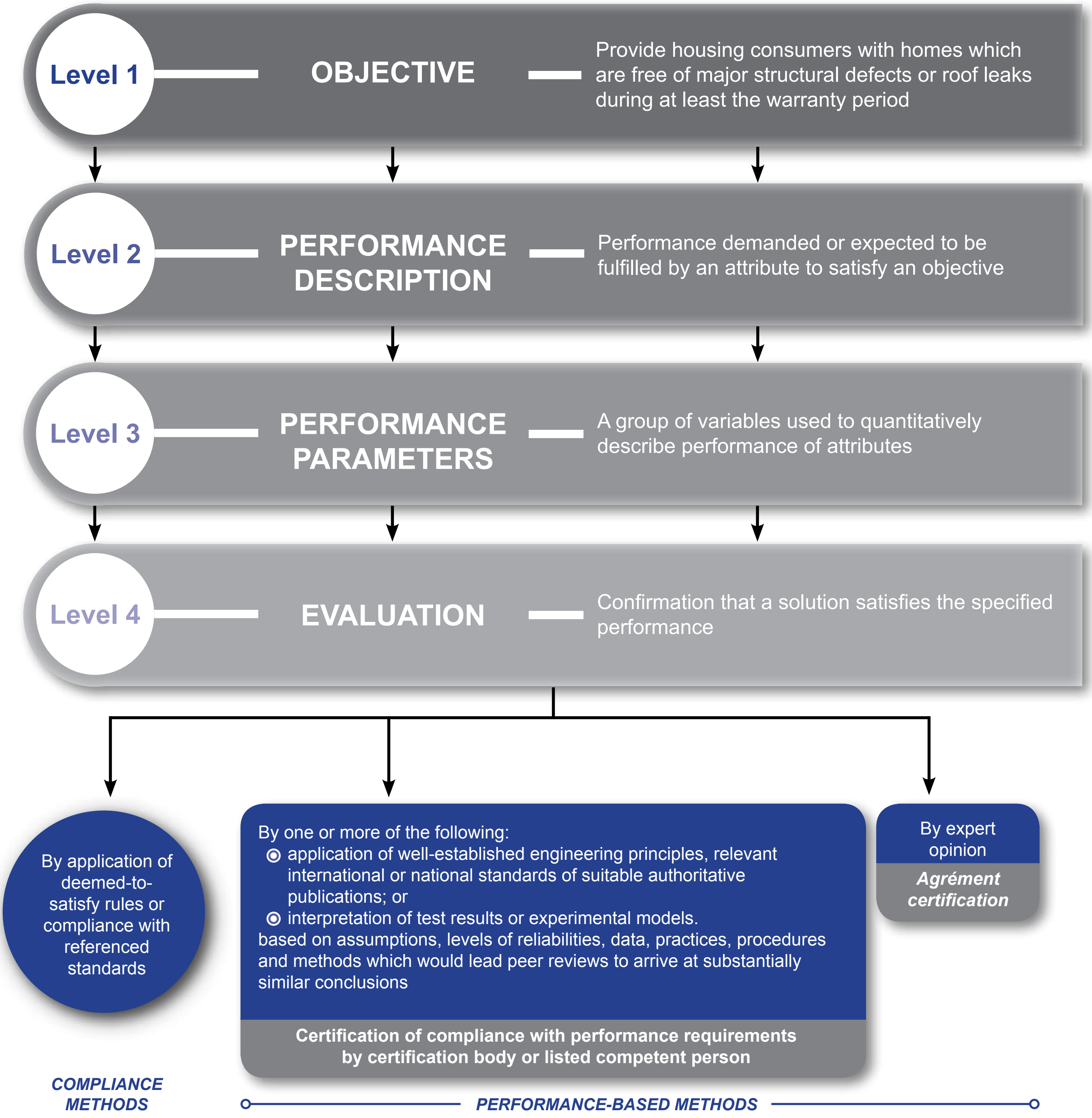
In the non-subsidy sector (private sector) homeowners mostly use standard technical building solutions due to the accessibility of materials, technical knowledge and available labour skills. The relevant benefits (Table 1) of IBTs, however, could entice homeowners as an interesting option for building homes.

4. How do IBTs comply with National Building Regulations?

The performance-based regulations of the South African National Building Regulations are focused on providing the required level of performance of a building system or material, rather than stipulating how this level is to be achieved. The strength of performance-based regulations lies in their flexibility, thereby encouraging the diffusion of innovative materials and technologies.

The development of performance-based regulations worldwide is generally modelled on the Nordic 5-level system. In line with the National Building Regulations, the NHBRC parameters for structural strength and stability, serviceability, materials, behaviour in fire, drainage and storm water management and water installations, in relation to the warranty scheme, are in accordance with a 4-level hierarchy framework to establish both the performance descriptions and performance parameters as indicated in Figure 2 on following page.

Figure 2 – **The framework for assessing the performance of a system, element or component of a house (NHBRC Home Builders Manual: 2015)**



In broad terms, the structural building materials and systems provided for in the Home Building Manual are concrete foundations and concrete bedding, masonry walling and timber roof constructions. If a non-standardised material or system is to be used in the building of a house, the Home Building Manual stipulates that a home builder shall demonstrate compliance with the performance requirements by means of one or a combination of the following:

- Compliance methods prescribed by the NHBRC Council subject to the solution being within the scope of such rules provided in the new Home Building Manual.

- Performance based methods involving either:
  - Agrément certification; or
  - Certification by a certification body or a listed competent person whose name appears on the Council's list in the required category.

Some definitions are provided in terms of the verification method that may demonstrate compliance with performance requirements involving an Agrèment Certificate, certification body and the listed competent person:

- "Agrément certificate" means a certificate that confirms fitness-for-purpose of a non-standardised system, element or component and the conditions pertaining thereto (or both) issued by the Board of Agrément South Africa.
- "Certification body" means a member of a NHBRC Council approved certification scheme that provides certification services through certifiers in their employ.
- "Listed competent person" means a competent person whose credentials are accepted by the NHBRC Council and is admitted to the Council's list of competent persons.

5. How do IBTs differ from conventional building systems?

Bearing in mind that there are innovative and conventional/standard systems, methods, materials, elements or components, one cannot disregard that there are buildings comprising different combinations of the former and the latter. To be able to fully understand what an IBT house is, examples of combinations between innovative and conventional/standard materials and systems are provided in Table 2 for masonry and non-masonry groups. Should any material and/or relationship between parts be innovative (in terms of Table 1) then the house is known to be an **innovative building system (IBT)** house.

Table 2 – **Examples of Combinations between Materials and Relationship between Systems**

	Conventional relationship between systems – methods of construction	Innovative relationship between systems – methods of construction
Conventional material	1. Masonry: Hollow concrete block wall	2. Masonry: Concrete shuttering wall Non-masonry: Pre-fabricated wall panels
Innovative material	3. Masonry: Green leaf brick wall	4. Non masonry: Aluminium frame and wall panels
Conventional material		5. Non-masonry: Conventional materials using innovative relationships between components

Some images of the above are provided in Table 3 on following page for a wall system.

Table 3 – Examples of Innovation in Wall Systems

Groups	**1. Masonry**: ***Conventional materials and conventional relationships between components***
Example	
Description	Hollow concrete blocks wall system used as the standard material for low-income homes. Cement: lime: sand ratio mortar mixes for 10mm joints are 1:1:6
Performance Evaluation	Application of deemed-to-satisfy-rules of SANS 10400
Economic Factors	Upfront costs approx. R2200/m^2 (costs in 2014)
Construction Process	Approx.100-150 blocks per day
Environmental Factors	R-value of walls 0.35
Social Factors	

Groups

2. Masonry: *Conventional materials and innovative relationships between components*

Example

Description

A moving shuttering system is used to make 20MPa concrete blocks according to a quality management system. Blocks are built with wet joints or, if dry, the top of the last row is chipped. The walls are simply floated off and painted.

Performance Evaluation

Rational design

Economic Factors

Less than the costs for hollow concrete blocks
Long term cost savings

Construction Process

240 sections a day compared to a qualified bricklayer who will do 400 to 700 stock bricks a day (some are faster and others are a lot slower)

Environmental Factors

R-value of walls 0.5
Less wastage

Social Factors

Groups	**3. Masonry**: ***Innovative materials and conventional relationships between components***
Example	
Description	Newly manufactured masonry brick composed of 100% recycled materials. Included in these carefully selected materials are processed sewage wastes, recycled iron oxides, recycled glass, mineral tailings, and other virgin ceramic scrap.
Performance Evaluation	Agrément Certificate
Economic Factors	Upfront costs are more than conventional hollow concrete blocks Life cycle costing benefits
Construction Process	Speed of construction is similar to conventional methods
Environmental Factors	R-value of walls 1.4 Improved embodied energy
Social Factors	

Groups

4. Non-masonry: *Innovative materials and innovative relationships between components*

Example

Description

This system uses a variety of recyclable aluminium alloy extrusions for post and beam framing, connected by a patented concealed quick connecting bolt-and-clamp component. This is supplemented by a bolt-in-place diagonal corner brace for multi-storey structures, usually concealed within the wall panels. The sheathing system uses either structural insulated panels (SIPs) or a combination of other panel materials which slide into the channels of the framing members. The aluminium alloy metal won't swell, does not deteriorate, requires no protective coating, weighs less, has increased strength and durability and is corrosive-resistant.

Performance Evaluation

Agrément Certificate

Economic Factors

Upfront costs are more than conventional methods
Life cycle costing benefits

Construction Process

Speed of construction is faster than conventional materials
Lower labour costs
Less maintenance than standard materials

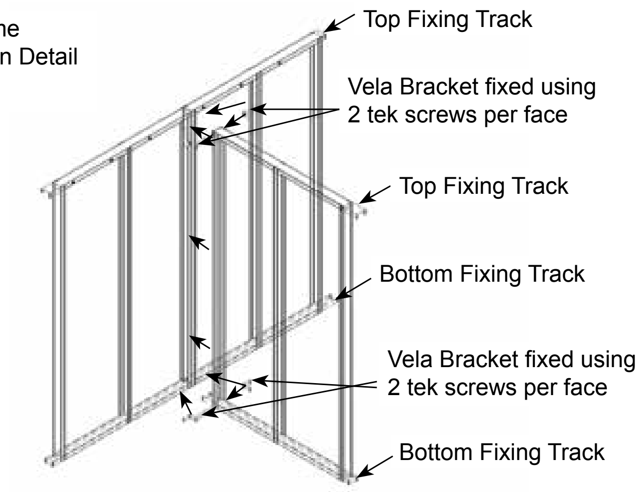
Environmental Factors

R-value of walls 2.8 and above
Improved embodied energy
Less wastage

Social Factors

Groups	**5. Non-masonry**: ***Conventional materials using innovative relationships between components***

Example



Description	Pre-fabricated wall panels within 90 wide tracks of 9mm nutec ext. board, 90mm fire-rated polystyrene type inner core and 15mm gypsum int. board.
Performance Evaluation	Rational design or Agrément Certificate
Economic Factors	Upfront costs are higher than conventional methods Long-term cost benefits
Construction Process	Improved construction speed compared to conventional methods
Environmental Factors	R-value of walls 2.8 Less wastage
Social Factors	

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