REPUBLIC OF SOUTH AFRICA

National Department of Housing

DESIGN AND CONSTRUCTION OF HOUSES

Project Linked Greenfield Subsidy Project Developments

Generic Specification GFSH-11
April 2003

INTRODUCTION

Introduction

Specifications for houses may be described as being:

i) ***Prescriptive*** *in terms of which a collection of codes and standards are used to describe how houses should be designed, constructed and maintained.*

ii) ***Functional*** *in which qualitative functional statements are made but no quantitative user or technical performance criteria are prescribed.*

iii) ***Performance-based*** *in which:*

a) qualitative functional requirements are established;

b) quantitative user and technical performance criteria are provided; and

c) acceptable solutions and evaluation and design tools are offered.

This specification is a performance specification that is driven by user requirements for a number of basic housing attributes. Its key objective is to satisfy user needs and requirements. This it does by identifying and capturing user requirements for a number of attributes and translating them into functional and performance criteria and providing a framework within which such requirements and criteria may be satisfied.

The performance-based approach has a hierarchy that starts with a user need (a general statement of requirements for a house to be regarded as being satisfactory by the user) for each house attribute, followed by a performance description (a statement which identifies agents that affect performance in a qualitative manner and establishes how these agents affect the state of the house) and performance parameters (user requirements expressed in terms of the quantitative performance of a house attribute). The means of verifying that the construction solution offered also needs to be provided so that compliance with the requirements of the specification can be readily demonstrated or predicted. (See Figure 1). Typically, the performance evaluation for prediction or the verification of performance requirements can be roughly divided into application of rules, testing, verification methods, documentary evidence and expert judgement.

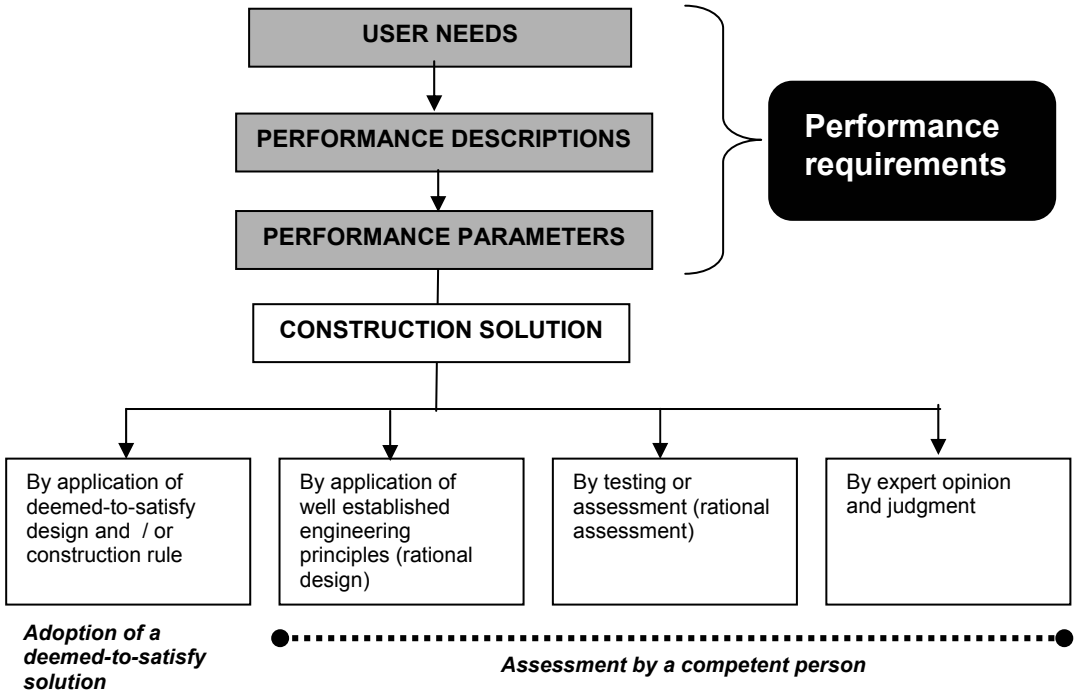

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Figure 1: The performance based approach to the procurement of houses

Deemed-to-satisfy design and construction rules typically include examples of materials, components, geometric configurations and construction methods, which if complied with, provide satisfactory evidence that the applicable performance requirements have been met. Such provisions are essentially prescriptive in that they explain step-by-step what is necessary to demonstrate compliance. Put in another way, they are a recipe for minimum construction that satisfies all requirements and constitute one option for verifying that applicable performance requirements have been met. Unavoidably, deemed-to-satisfy provisions are conservative in their formulation and only cover the most common forms of construction.

On the other hand, assessments by competent persons can be applied to any form of construction to provide satisfactory evidence that a performance description is satisfied for the nominated performance requirements. Such assessments are likely to be less conservative. Competent persons can be either natural or juristic persons, e.g. registered engineers which have competence by virtue of their experience and training or certification agencies such as Agrément South Africa that engage technical experts to evaluate housing systems comprising materials and elements whose properties, characteristics and behaviour are not well known.

The National Building Regulations are generally functional in nature (i.e. they set out what is required of a building or element or component thereof in respect of a particular characteristic without specifying the method of construction, dimensions or material to be used). They do, however, contain some performance-based regulations and make provision for prescriptive requirements through deemed-to-satisfy requirements. The National Home Builders Registration Council's technical requirements are also functional in nature. Accordingly, compliance with this specification will generally result in compliance with the National Building Regulations and the NHBRC's Technical Requirements. Compliance with these documents should, nevertheless, be confirmed.

The National Building Regulations and the NHBRC's Technical Requirements published in terms of the National Housing Consumer's Protection Measures Act contain ways in which health and safety requirements may be satisfied. The approach adopted in both these documents is illustrated in Figure 2. This generic specification only deals with how requirements may be satisfied and not by whom. Other specifications dealt with the "by whom".

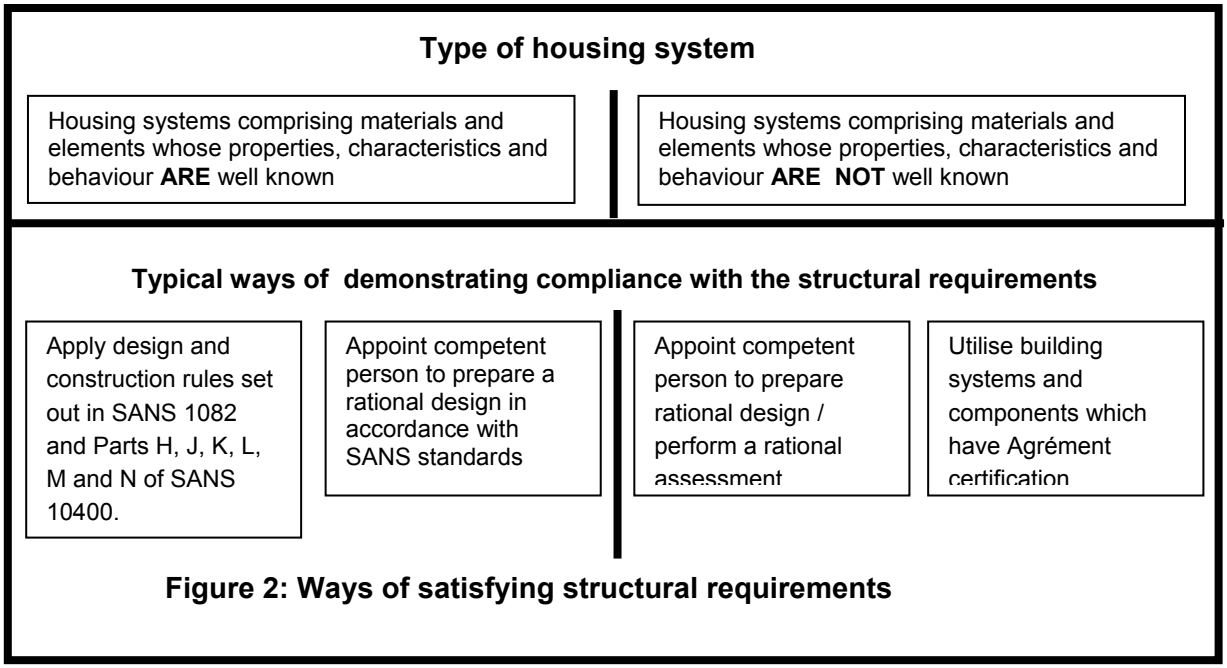

Figure 2: Ways of satisfying structural requirements

There are a number of attributes which could be considered in housing, viz:

ATTRIBUTE	TYPICAL CONSIDERATIONS
Adaptability	The capacity of a house to be altered or extended.
Aesthetics	The appearance of a house.
Constructability	Transportation to site, erection, health safety.
Durability	Retention of performance over required service life with specified maintenance.
Economics	Initial, running and maintenance costs, demolition costs, life cycle costings.
Energy efficiency	The extent to which the building envelope optimises the amount of energy required to achieve a required level of indoor climatic control.
Fire safety	Egress, fire suppression, fire resistance, risks of outbreak of fire and of spread of fire, physiological effects (smoke control and ventilation), and evacuation time (escape routes).
Functionality /Accessibility / Accident safety	Number, size, geometry, subdivision and interrelation of spaces. Circulation patterns and ease with which a room can be furnished; ease of access and provision for children, aged and disabled; protection against gas explosion, sharp points, edges, protection during movement, falls, slipperiness, obstruction.

	Safety during movements and circulation (limitation of floor slipperiness, unobstructed passage, guard rails, etc).
Health and hygiene	Water supply, cleaning, waste removal, dangerous materials used in the construction of a house (e.g. materials that may be carcinogenic or are likely to release toxic gases).
Indoor Environment - Acoustics	Control of external and internal noise.
Indoor environment - Hygrothermal	Hygrothermal, air temperature, humidity, condensation, indoor air quality, contaminants, weather resistance, ventilation. Control of condensation.
Indoor environment - Visual	Provision of natural or artificial lighting, sunlight, required illumination. Aspects of spaces and finishes (colour, texture, regularity, evenness, verticality, horizontality, squareness, etc.). Visual contact, internally and with the external world (links and barriers for privacy).
Maintainability	Ease / practicality of carrying out cleaning, routine repairs, periodic maintenance, maintenance of services.
Security	Protection against unwanted human or animal intrusion and vandalism.
Structural durability	Performance retention of the structure
Structural safety	Resistance to static and dynamic actions, both individually and in combination, impacts, intentional and unintentional abuse, accidental actions
Structural serviceability	Resistance to loss of function, damage, and avoidance of user discomfort
Sustainability	Use of resources, e.g. recycling and environmental aspects

This generic specification deals mainly with the mandatory requirements addressed in regulations issued in terms of the National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977), the Housing Consumers Protection Measures Act (Act No. 95 of 1998) and certain minimum requirements for houses constructed in terms of the subsidy housing scheme. It also contains a limited number of optional requirements that will improve the quality of the housing. This generic specification as such has been developed to translate the norms and standards contained in the National Housing Code into quantitative requirements, consistent with applicable requirements of the National Home Builders Registration Council and the National Building Regulations. Compliance with the provisions of this generic specification will result in compliance with the technical requirements of the National Building Regulations and Building Standards Act and the Housing Consumers Protection Measures Act in respect of the attributes that are covered by these pieces of legislation.

This generic specification is intended to govern the design and construction of all housing in South Africa built with subsidy funds under the Project Linked Greenfield Subsidy Project programme. This generic specification will as such form part of the project agreement between the developer and the MEC to ensure that housing complies with minimum requirements. Provincial Housing Departments may develop policies regarding the choices permitted in the specification, e.g. choices in user performance levels and optional requirements, in order to ensure that housing satisfies local requirements. Where there are specific policies regarding choices, nominated parameters (see Annexure 5) must be included in the specification data in the project agreement

This generic specification, together with a set of associated nominated parameters (see Annexure 5), will serve as the design brief to those responsible for the design and specification of houses in the traditional pre-panned contracting strategy and the contractor in the turnkey contracting option.

Community preferences for particular user performance levels in respect of each attribute, where applicable, and desires for optional requirements can be captured and weighted prior to the confirmation of subsidies. These should be weighted to indicate the importance placed by the community on each choice. This information can be used to inform designers of community priorities in the traditional pre-panned contracting strategy and can be used to provide tender evaluation points to tenderers who undertake to satisfy community choices in the turnkey option.

This generic specification was prepared by the Task Team: Implementation of National Housing Programmes to facilitate compliance with the requirements of Chapter 3 of Part 3 of the National Housing Code and the provisions of the Housing Consumers Protection Measures Act (Act 95 of 1998).

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1 SCOPE

1.1 This specification provides both mandatory and optional performance requirements for a range of house attributes, including sanitation systems and their components installed within erven, and different user performance levels in Green Field Project Linked Housing developments. It provides the following in respect of each of these attributes:

a) user needs;
b) performance descriptions;
c) performance requirements; and
d) ways in which it can be demonstrated or predicted that solutions satisfy requirements.

1.2 This specification does not provide requirements for sewer mains.

Note: 1 Annexure 1 contains information relating to the regulation of house construction in South Africa.
2 Annexure 2 outlines the differences between user performance levels.
3 Generic specification GFSH-10: Design and Construction of Engineering Services contains requirements for components of sanitation systems constructed (i.e sewer mains) in municipal servitudes and road reserves and in Interconnected complexes.

2 NORMATIVE REFERENCES

Agrément South Africa: ACTMAP 1: General Requirements, Test Methods and Performance Criteria for the Assessment of Products used for the Waterproofing of Roofs.

Agrément South Africa: ACTMAP 3 – Agrément Criteria and Test Methods applicable to a Product (ACTMAP) for Sanitation Systems. October 1998.

Agrément South Africa: Assessment Criteria for Building and Walling Systems: Structural Assessment of Dry-stack Masonry Building Systems. (www.agrement.co.za).

Agrément South Africa: Assessment Criteria for Building and Walling Systems: Structural Strength and Stability (www.agrement.co.za).

Agrément South Africa: Assessment Criteria for Building and Walling Systems: The Thermal Performance of Buildings (www.agrement.co.za).

ASTME 1646-95 Standard Test Method for Water Penetration of Exterior Metal Roof Panel System by Uniform Static Air Pressure Difference.

Department of Housing: Geotechnical site investigations for housing developments. Generic specification GFSH-2.

National Home Builders Registration Council : Home Building Manual.

SANS 140-4 ISO 140-4: Acoustics - Measurement of sound insulation in buildings and of building elements - Part 4: Field measurements of airborne sound insulation between rooms.

SANS 717-1 ISO 717-1: Acoustics - Rating of sound insulation in buildings and of building elements - Part 1: Airborne sound insulation.

SANS 542: Specification for concrete roofing tiles.

SANS 1263-1: Safety and security glazing materials for buildings Part 1: Safety performance of glazing materials under human impact.

SANS 10155: Code of Practice for accuracy in buildings.

SANS 10160: Code of Practice for general procedures and loadings to be adopted in the design of buildings.

SANS 10177-2: Fire testing of materials, components, and elements used in buildings: Fire resistance test for building element.

SANS 10177-5: Fire testing of materials, components, and elements used in buildings: Non-combustibility at 750 º of building materials.

SANS 10400: Code of Practice for the application of the National Building Regulations.

3 DEFINITIONS

action: an assembly of concentrated or distributed mechanical forces acting on a structure (direct action) or the cause of deformations imposed on the structure or constrained in it (indirect action).

agent: whatever acts on a house or parts of a house.

Agrément Certification: certificate confirming fitness-for-purpose of non-standardised construction products and/or the acceptability of the related non-standardised design and the conditions pertaining thereto issued by the Board of Agrément of South Africa.

assembly: aggregate of components used together.

component: product manufactured as a distinct unit to serve a specific function (or functions).

conservancy tank: a covered tank that is used for the reception and temporary retention of sewage and that requires emptying at intervals.

deflection: the movement under actions of a defined point in a structure, in a defined direction.

design working life: assumed period for which a house structure, a structural element or structural component is to be used for its intended purpose, without substantial additions and alterations, severe abuse or poor maintenance, without major repair being necessary.

dimensional deviation: the difference between the actual (i.e. measured) size or position and the specified size or position.

dry-stack masonry: an assembly of building units, laid *in situ*, in which the units are put together with mortar.

durability: the retention of performance and appearance of a house and its various structural elements or components over time when reasonably maintained at regular intervals in a particular environment.

environmental influence: mechanical, physical, chemical or biological influence which may cause deterioration of the materials constituting a structure, which in turn may affect its serviceability and safety in an unfavourable way.

expected damage: an approximation of the probable damage that may occur in walls and floors.

fabric: the basic architectural and structural elements of a house including the walls, floors, ceilings and roof.

fire resistance: The shortest period for which a structural element or component will comply with the requirements for stability, integrity and insulation when tested in accordance with SANS 10177: Part II.

french drain: a conventional absorption field that comprises a trench that is filled with suitably graded material and that is used for the disposal of liquid or liquid effluent from a septic tank or waste water.

ground movement: the disturbance of foundations by influences not dependent on the loads applied by the housing structure.

habitable room: a room designed or intended to be used by persons for sleeping in, living in or preparing food or drink in.

imposed action: action for which the variation in magnitude with time is neither negligible in relation to the mean value or monotonic.

lifetime: the period for which the house, as built, is used for its original intended purpose and occupancy, without substantial additions and alterations, severe abuse or poor maintenance, all of which may have a significant effect on the structural safety and structural servieceability performance of the house.

load: the value of a force corresponding to an action

maintenance: total set of activities performed during the design working life of a structure or a structural element to enable it to fulfil the intended requirements.

masonry: an assembly of building units, laid *in situ*, in which the units are bonded and put together with mortar.

minor damage: expected damage that can readily be attended to in the course of normal redecoration and requires only remedial work of a very minor nature to reinstate functional efficiency.

non-combustible: material classified as non-combustible when tested in accordance with code of practice SANS 10177: Part V.

on-site digester: a sanitation system which provides on-site biological decomposition of the sewage in a container producing an effluent which is suitable for disposal on site by means of a subsoil percolation system (so-called French drain)or an effluent collector pipe (also called small bore sewer).

Note: The on-site digester system (see Part 1 of ACTMAP 2) normally comprises:

- a receiving device or pan;
- a discharge duct linking the pan to the digester;
- a digester tank; and
- an effluent discharge pipe.

The on-site digester is distinguished from septic tank installations in that the systems require little water for their operation.

performance: behaviour related to use.

performance description: a statement which identifies agents that affect performance in a qualitative manner and establishes how these agents affect the state of the house.

performance parameter: user needs expressed in terms of the quantitative performance of a house attribute.

Note: Performance parameters provide qualitative design criteria and as such establish constraints which impact on the solution that is adopted to satisfy the user needs and performance descriptions.

permanent action: action which is likely to act continuously throughout a given reference period and for which variations in magnitude with time are small compared with the mean value.

permissible deviation (PD): the specified limits of deviation.

R-Value: the thermal resistance (m^2.K/W) of a component calculated by dividing its thickness by its thermal conductivity.

rational assessment: the assessment of the adequacy of the performance of a solution in relation to requirements by a process of reasoning, calculation and consideration of accepted engineering principles, based on a combination of deductions from available information, research and data, appropriate testing and service experience.

rational design: any design involving a process of reasoning and calculation that is based on the consistent application of appropriate national or international standards or other relevant, authoritative and published technical literature.

reliability: ability of a structure or structural element to fulfil the specified requirements, including the design working life, for which it has been designed.

roof waterproofing system: all the essential materials, components and accessories that are essential to providing a waterproof barrier to the roof structure.

Note: Roof waterproofing includes the necessary details for internal and external upstands, verges, gutters, gullies, rainwater outlets, expansion joints, pipes and other protrusions through the roof etc.

sanitation system: an integrated series of compatible products and processes which accepts human body wastes and waste water from the user, and thereafter stores, conveys, processes and safely disposes of them.

Note: a sanitation system comprises some, although not necessarily all of the following components:

- a superstructure or a room within a house;
- a receiving device, pan, wash trough, etc;
- a flushing device (pour-flush, sullage-flush or cistern-flush);
- a discharge duct linking the pan to the on-site storage unit or conveyancing system;
- treatment and disposal and / or re-use.

septic tank: a chamber designed to receive sewage and to retain it for such time and in such a manner as to secure adequate decomposition.

sewer main: a conduit that conveys human body wastes and waste water from a sanitation system though an interconnected complex or township to bulk sewer infrastructure.

serviceability: ability of a structure or structural element to perform adequately under normal use under all expected actions.

site class: areas that are designated as having common foundation and engineering characteristics, based on the expected range of total soil movements arising from ground movements within near surface soil horizons.

soil pipe: a discharge pipe which conveys soil water.

soil water: liquid containing excreta.

stability: the ability of a structure to maintain equilibrium and to resist displacement or overturning.

strength: the capability of a body to resist the actions applied to it.

structural element: physically distinguishable part of a structure such as a foundation, floor, wall, staircase or roof.

structure: organised combination of connected parts designed to provide some measure of rigidity.

stormwater: water resulting from natural precipitation or accumulation and includes rain water, surface water, subsoil water and spring water.

thermal performance: the result of a process whereby the design, layout, orientation and construction materials of the house modify the prevailing outdoor climate to create the indoor climate.

Note: Thermal performance is generally perceived by users in terms of the extent to which the house seems cool in the heat of summer and warm in cold winter weather, taking into account the amount of heating or cooling required to create comfortable thermal conditions.

tolerance: the limits within which a deviation must lie.

total R-Value: the sum of the R-Values of the individual component layers in a composite component including air space and associated surface resistance.

user: person that a house is designed to accommodate.

user performance level: nominated performance parameters that are deemed acceptable to a particular user.

user needs: a general statement of requirements for a house that may be regarded as being satisfactory by the user.

Note: User needs can be considered to be design objectives.

ventilated improved pit latrine: a sanitation system that requires no water for its operation, comprising a closet placed over, or adjacent to an excavation that is of adequate depth and size, which is designed to minimise smells and the attraction of flies.

waste water: water other than storm water that is not contaminated by soil water .

4 REQUIREMENTS

4.1 The design and construction of houses shall:

a) satisfy the requirements of the National Building Regulations issued in terms of the National Building Regulations and Standards Act (Act 103 of 1977) (see Annexure 3) and the Technical Requirements of the National Home Builders Registration Council issued in terms of the Housing Consumer's Protection Measures Act (Act 95 of 1998) (see Annexure 4);

b) satisfy the user needs and performance descriptions as stated in Table 1 and perform within the performance parameters established in 5 in respect of the following attributes:
   i) condensation;
   ii) fire safety;
   iii) functionality (basic);
   iv) moisture penetration;
   v) structural safety;
   vi) structural serviceability;
   vii) structural durability;
   viii) thermal performance;
   ix) sanitation; and

x) stormwater disposal; and

c) where required in terms of the specification data, satisfy the user needs and performance descriptions as stated in Table 2 and perform within the performance parameters established in 5.

4.2 Sanitation systems shall satisfy the requirements of the National Building Regulations issued in terms of the National Building Regulations and Standards Act (Act 103 of 1977) (see Annexure 3), and the Technical Requirements of the National Home Builders Registration Council issued in terms of the Housing Consumer's Protection Measures Act (Act 95 of 1998) (see Annexure 4) and all municipal requirements.

Table 1: User needs and performance descriptions of mandatory attributes

MANDATORY ATTRIBUTE (clause referring to performance parameters in brackets)	**USER NEED (DESIGN OBJECTIVE)**	**PERFORMANCE DESCRIPTIONS**
Acoustics at the separation between detached houses (5.2)	The noise reaching users through the separation between attached houses shall be reduced to a nominated level.	The separation between attached houses shall, with an appropriate degree of reliability provide acoustic privacy between houses.
Condensation (5.3)	The thermal performance of a house and its energy efficiency should provide protection at a nominated user performance level against illness arising from the presence of harmful spores in the indoor environment as a result of mould growth on interior wall surfaces and the degradation of the structure of a house arising from prolonged exposure to moisture.	When located in the Southern Cape Condensation Problem Area, the whole house and its parts shall and within established parameters for assumed living conditions, prevent: a) condensation of water vapour on the underside of metal sheeting and at ceiling level; b) interstitial condensation with the wall structure; and c) accumulation of moisture on internal wall surfaces for prolonged periods that give rise to , and sustain, mould growth on such surfaces.
Fire safety (5.4	The fire safety behaviour of a house and/or its components shall be such that the life safety of the dwelling occupants or people in the vicinity of the house is safeguarded to the extent embodied in a nominated user performance level.	The whole house and its parts shall, with an appropriate degree of reliability, perform within established parameters in the event of a fire in terms of: (a) time for occupants to escape; (b) prevention of spread of fire, smoke and noxious gases; (c) fire suppression and rescue; and comprise materials which when fired do not emit toxic gases that can result in sleeping occupants being overcome, suffering permanent damage to their health or dying.
Functionality (basic) (5.5	The functionality of the house in terms of its spaces, ease of access, indoor visual environment, natural ventilation and accident safety shall be adequate and shall enable people to move around safely.	The dimensions of the spaces and the openings for natural lighting and ventilation in the house shall be fit for the purpose for which such spaces are intended and shall provide for safety during movements . Internal floor and wall surfaces shall not be rough to the extent that it injures users.

MANDATORY ATTRIBUTE	USER NEED (DESIGN OBJECTIVE)	PERFORMANCE DESCRIPTIONS
Moisture penetration (5.6)	The penetration of moisture into the interior of the house from whatever cause, shall be limited to a nominated user performance level. The roof waterproofing system shall be capable of being effectively repaired in the event of being damaged, despite aging of the materials.	The whole house and its parts shall, with an appropriate degree of reliability, resist the penetration of rain water and the passage of moisture into its interior. Rising damp in walls above floor level and through surface beds shall be reliably prevented over the design working life of the house. The roof waterproofing system shall in addition, resist with an appropriate degree of reliability over its design working life: d) the effects of rapid reversals of temperature; e) the effects of UV radiation, together with its protection, without the deterioration of its essential properties; f) the effects of standing water on its top surface and condensation at the undersurface; g) chemical attack from common atmospheric gases and saline atmospheres in marine environments; h) the growth of bacteria, lichens, fungi, etc.; i) puncturing and penetration when the roof is in use; and j) any reversible and irreverseable movement emanating from the roof structure. Accumulated hail on roofs after moderate hail storms shall not cause water to penetrate the interior of the house.
Sanitation system (5.7)	The sanitation system shall be sustainable, dispose of pathogens, pollutants and contaminants in a manner that does not compromise the health and safety of the users or others and be acceptable to the community.	Sanitation systems shall with an appropriate degree of reliability over the lifetime of the structure: (a) provide for privacy and protect the user and others from the weather when in use; (b) prevent soil, garbage and other foreign materials from entering into the system by the action of rain, wind or animals; (c) not present or cause a nuisance or a danger to health as a result of their use and operation; (d) withstand all the actions to which they are likely to be subjected to; (e) not leak soil water into the surrounding soil, if buried; (f) be compatible with the water supply; (g) be capable, where required, of carrying the design hydraulic load and drain and discharge into a municipal sewer system, a common drain or other sewage disposal system, or dispose of effluent in a safe and inoffensive manner; (h) not contaminate clean water supplies or ground water unacceptably; (i) be easy to use, clean and maintain; (j) be able to accommodate and dispose of commonly used cleaning materials; and (k) satisfy nominated parameters, depending upon the nature of the system. Sanitary fixtures shall comprise of impermeable, non-corrosive material, and have a smooth and readily cleanable surface that is free from ledges or protrusion that can be easily soiled.

MANDATORY ATTRIBUTE	USER NEED (DESIGN OBJECTIVE)	PERFORMANCE DESCRIPTIONS
Stormwater disposal	Storm water emanating from the roof, paving or area in the immediate vicinity of the house shall not cause damage to the house structure or structural elements or accumulate in a manner that unduly inconveniences the user.	Storm water disposal arrangements shall, (a) not resulting in the undercutting of foundations due erosion or flooding; (b) drain away from houses under the action of gravity and not accumulate against or in close proximity to external walls; and (c) make provision for the drainage of sites that are water-logged or seasonally waterlogged.
Structural safety (The behaviour of houses under possible actions related to human lives) (5.8)	The risk of collapse or other kind of severe damage resulting from structural failure, which may affect the life safety of the occupants in the house or people in the vicinity of the building, shall not exceed a nominated user performance level.	The whole house and its parts shall, with an appropriate degree of reliability, have the capacity to maintain their resistance and equilibrium under all actions likely to occur during its design working life.
Structural serviceability (The behaviour of houses under possible actions related to normal use) (5.8)	The following characteristics of a house, for normal use and condition, under all expected actions, should be kept within nominated user performance levels: (a) the functioning and appearance of the house and its components; (b) the functioning of the occupants and the equipment in the house; (c) the comfort of the occupants, and (d) the asset value of the house.	The whole house and its parts shall, with an appropriate degree of reliability, have the ability to respond within established parameters, under all expected actions for normal use in terms of: (a) local damage (including cracking) (which may affect the efficiency and appearance of the house and its components); (b) deformation (which may affect the efficient use or appearance of the house or the functioning of the people and equipments); and (c) vibration (which may cause discomfort or affect the activity of occupants or the functioning of equipments).
Structural durability (The retention of performance requirements relating to structural safety and serviceability over the design working life of the house.) (5.8)	Changes in sectional form or mechanical properties of the construction materials over time shall not compromise the structural safety and serviceability performance of a house and its parts over their design working lives when preventative maintenance is carried out at intervals acceptable to the user.	The whole house and its parts shall, with an appropriate degree of reliability and subject to adequate periodic maintenance being effected, have the ability to fulfil its intended safety and serviceability performance in the environment in which they are located for their design working lives

Table 2: User needs and performance descriptions of optional attributes

OPTIONAL ATTRIBUTE (clause referring to performance parameters in brackets)	USER NEEDS (DESIGN OBJECTIVE)	PERFORMANCE DESCRIPTIONS
Acoustics (general) (5.9)	The noise reaching occupants from both the inside and the outside of the house shall be reduced to a nominated level.	The whole house and its parts shall, with an appropriate degree of reliability: a) reduce the ingress of noise into a room from the outside or from other rooms; b) prevent the noise generated within from annoying persons outside the house or adjacent houses; and c) provide acoustic privacy between rooms.
Construction accuracy (5.10)	Construction tolerances in all structural elements and structural components shall satisfy a nominated level.	The physical dimensions of structural elements and components and the joints at the interfaces between vertical components shall be within defined limits.

OPTIONAL ATTRIBUTE	USER NEEDS (DESIGN OBJECTIVE)	PERFORMANCE DESCRIPTIONS
Water saving measures (5.11)	The sanitary and water supply fittings shall discharge water in their usage at a nominated flow rate.	The capacity and flow rates of cisterns and shower heads, respectively, shall be within established parameters.

5 PERFORMANCE PARAMETERS

5.1 General

5.1.1 Houses which have any attribute nominated as being user performance requirement level 1 shall:

a) have no basements;
b) have a maximum length between intersecting walls or members providing lateral support of 6,0 metres; and
c) have a floor area not exceeding 80 m².

Note: 1 Performance parameters are provided for one or two user performance levels in respect of each attribute and are designated as being level 1 or level 2 (See Annexure 2). Where no reference is made to a specific user performance level, there is no difference in performance between the performance parameters for that attribute.

2 The performance of many of the attributes can be upgraded from user performance level 1 to level 2. It is, however, not always possible to do so.

3 User performance level 1 in respect of fire may only be nominated if the house is a single storey house.

5.1.2 The design working life of a house shall not be less than 30 years in respect of the structural system and non-accessible components and 15 years for repairable or replaceable components and materials such as claddings, roofing materials, exterior trims, and integrated components such as windows and doors.

5.2 Acoustic performance for walls separating attached houses

The minimum weighted standardised difference between a room in a house and an adjacent room in an attached house, calculated in accordance with the provisions of SANS 717-1 ISO 717-1 and SANS 140-4 ISO 140-4, shall not be less than 45 dB (DnT,w).

Note: 1 In acoustics, there is often a large grey area between a situation with which almost everyone will be completely satisfied and one which almost everybody will find totally unacceptable. The performance parameter provided does not cater for the provision of a very high quality to satisfy the majority of people even under extreme conditions. They should rather be seen as criteria to promote a minimum standard where acoustical performance has been attended to.

2 The following masonry walls are deemed-to-satisfy requirements, provided that a ceiling is provided, or where no ceiling is provided the masonry is taken up to the underside of and are sealed to the roof covering:
- 106 mm solid unit wall plastered on both side;
- 140 mm solid unit wall;
- 140 mm hollow unit wall plastered on both sides;
- 190 mm hollow unit wall;
- cavity wall (any units)

3 The Agrément South Africa assessment criteria for the acoustic performance in buildings provides some basic explanations regarding acoustical terminology and requirements. (see www.agrement.co.za).

5.3 Condensation

The design and construction of the building envelope in the SCCP Area (see Figures 1 and 2) shall be such that the thermal performance of the building is of a sufficient standard to ensure

that it will not contribute significantly to the occurrence of condensation on the internal surfaces of external walls for extended periods of time during the cold winter months.

All houses in the SCCP area shall be provided with ceilings.

The minimum thermal performance that Agrément South Africa regards as satisfying the above condensation requirements are that the method of construction for the house under consideration shall provide a level of thermal performance at least equivalent to that of the Standard Agrément House. Calculation of thermal performance for assessment purposes shall be on a house of similar orientation, size, layout and fenestration as calculated by the simulation programme developed for Agrément South Africa. The programme incorporates a number of assumptions including occupancy rates at various times of the 24 hour day, ventilation rates, shading, solar radiation, and maximum and minimum design day outdoor temperatures for the relevant climatic zone.

NOTE: 1 Agrément South Africa's standard house is constructed from:

user performance level 1: (work is advanced and will be available shortly)
user performance level 2: 230 mm solid masonry, plastered internally, with a concrete surface bed and a sheeted roof that is fitted with a ceiling without insulation.

2 The condensation referred to leads to is prolonged in nature and results in the absorption of moisture by interior wall surfaces and ceilings. This encourages and sustains mould growth on such surfaces, releasing spores into the indoor environment that can have severe detrimental effect on the health of occupants. The factors that give rise to such condensation include overcrowding, poor thermal performance of the wall and roof construction, inadequate ventilation, the use of paraffin and/or gas heating and cooking and the indoor washing and drying of laundry. All of these factors contribute to the generation of excessive water vapour in the indoor atmosphere, which condenses on walls and ceilings when the surface temperature falls below the dew point.

3 The Agrément South Africa assessment criteria for the condensation buildings provides some basic explanations regarding condensation terminology and requirements. (see www.agrement.co.za). It should be noted that the standard house is not immune from condensation problems.

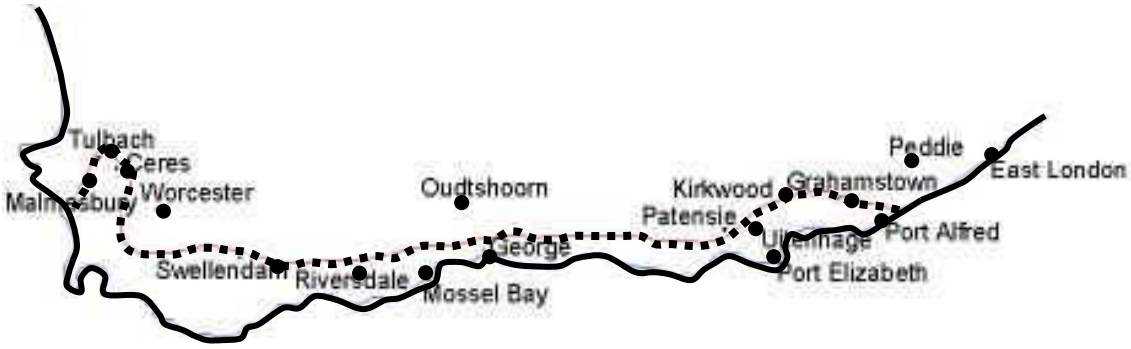
5.4 Fire safety

5.4.1 General

5.4.1.1 The minimum distances from an external wall of attached and detached houses to the lateral and rear boundary of the site shall not be less than:

a) 0,0 m for walls with no openings and a fire resistance (stability, integrity and insulation) of at least 30 minutes;
b) 0,5 m for walls with no openings, constructed with non-combustible external cladding and a surface area of not more than 7,5 m², where such walls have a fire resistance of less than 30 minutes but which, when tested, satisfy the requirements for stability and integrity for a period of not less than 30 minutes;
c) 1,0 m for walls as described in (b) above but with a surface area greater than 7,5 m²;
d) that tabulated in Table 3 for walls similar to those described in (a), (b) and (c) above but with openings, provided that openings in walls at right angles to the boundary are at least 500 mm away from the boundary; and
e) 4,5 m where walls have combustible external cladding, or non combustible cladding external cladding which does not have a fire rating of 30 minutes for stability or integrity, unless the town planning or local legislation requirements are such that, in the event of fire, the fire spread is limited to a group of 20 or fewer houses, where the distance may be reduced to 2,0 metres.

5.4.1.2 Where the roof cladding is combustible, the distance from the boundary to the edge of the combustible material shall be in accordance with the provisions of that for walls established in 5.4.1.1(e).



Notes:
1: The SCCP area is readily identified by combining the following environmental features:

- It lies south of the major mountain ranges in the Southern Cape.
- It includes the area that receives winter and all-year-round rainfall.
- It receives an annual rainfall of between 250 mm and 500 mm per year.

2: Towns falling within the SCCA area are:

Town that lie on the SCCP boundary

Albertina	Alicedale	Barrington	Bathurst	Blanco
Bluecliff	Ceres	Franschhoek	Genadendal	Gouda
Grahamstown	Greyton	Hamlet	Hankey	Heidelberg
Herbertsdale	Joubertina	Kammiebos	Katara	Kirkwood
Langholm	Lindeshof	Louterwater	Mamre	Malmesbury
Paarl	Port Alfred	Prince Alfred	Riebeek-East	Riebeek-West
Riversdale	Riviersonderend	Ruiterbos	Stormsvlei	Suurberg
Suurbraak	Swellendam	Tulbach	Uitenhage	Villiersdorp
Wellington	Wolseley			

Towns that lie within the SCCP Area

Addo	Alexandria	Amsterdamhoek	Askraal	Aston Bay
Atlantis	Baardskeerderbos	Bellevue	Bethelsdorp	Betty's Bay
Bloubergstrand	Bluecliff	Boesmansrivier-mond	Boknesstrand	Botrivier
Brandwag	Bredasdorp	Caledon	Cape Town	Clarkson
Coega	Coerney	Colchester	Dana's Bay	Despatch
Droë Vlakte	Elgin	Elim	Fairfield	Firgrove
Fish Hoek	Gans Bay	George	Gordon's Bay	Gouritsmond
Grabouw	Groot Brakrivier	Groot Jongensfontein	Hartenbos	Hawston
Hermanus	Hermon	Herold's Bay	Houtbay	Humansdorp
Jeffrey Bay	Kalbasskraal	Kareebouw	Kariega	Kasuka
Kenton-on-Sea	Kleinmond	Klipdale	Knysna	Kruisfontein
Kommetjie	Kuilsrivier	Kylemore	Loerie	Malgas
Melkbosstrand	Milnerton	Mossel Bay	Muizenberg	Napier
Noanaha	Onrus	Oukraal	Oyster Bay	Pacaltsdorp
Papiesvlei	Paradise Beach	Paterson	Pearly Beach	Philadelphia
Plettenberg Bay	Pniel	Port Beaufort	Port Elizabeth	Protem
Riethuiskraal	Rietpoel	Rondevlei	Salem	Scarborough
Sea View	Sedgefield	Simon's Town	Sinksabrug	Skipsdorp
Slangrivier	Somerset West	Southwell	Stanford	Stellenbosch
St Francis Bay	Still Bay	Stormsrivier	Strand	Struis Bay
Sunland	Swartkops	The Crags	Vermaaklikheid	Viljoenskroon
Vlees Bay	Waenhuiskrans	Wilderness	Windmill	Witsand
Wittedrift	Witteklip	Woodlands	Wydgeleë	

Figure 1: The Southern Coastal Condensation Problem (SCCP) Area

Perspective from north-west

Plan

Note: The window area does not exceed 15% of the floor area.
The floor area is 53 m2.
The walls comprise 230 mm thick burnt clay masonry, plastered on both sides.
The floor comprises a concrete surface bed
The house is orientated true north (ie predominant windows of the living area face true north, or the longer axis of the house runs as near east / west as possible.

Figure 2: Standard Agrément South Africa masonry comparative house used in condensation and thermal performance assessments (user performance level 2)

Table 3: Minimum boundary distances - user performance level 1

AREA OF OPENINGS, m² IN ELEVATION			
<5	5	7,5	10
MINIMUM BOUNDARY DISTANCE (m)			
1,0	1,5	2,0	2,4

5.4.2 User performance level 1

5.4.2.1 Houses shall have only one storey.

5.4.2.2 Detached houses constructed with internal walls that do not have a 20 minute fire resistance shall have:

a) external doors located such that an occupant does not have to move through more than one room to reach an external door or escape routes; and
b) boundary distances appropriate to the type of cladding used in roofs and walls.

5.4.2.3 Attached houses shall either have:

a) external walls with a fire resistance of 30 minutes (stability and integrity) and a separation wall between houses extending to the underside of the roof covering having a fire resistance of 30 minutes (stability, integrity and insulation) of 30 minutes; or
b) external walls of combustible material, or non-combustible walls with a fire resistance of less than 30 minutes, and a separation wall between houses extending to the underside of the roof covering having a fire resistance of 30 minutes (stability, integrity and insulation) of 30 minutes with projections beyond the faces of external walls and above the roof of at least 500mm.

5.4.3 User performance level 2

5.4.3.1 Structural elements or components, not forming part of any roof assembly, shall have a fire resistance (stability only) of not less than:

a) 30 minutes in single and double storey houses;
b) 60 minutes in three storey and higher structures.

5.4.3.2 Partition walls that subdivide spaces within a house shall have a fire resistance of not less than 20 minutes.

5.4.3.3 Walls and floors that separate attached houses shall have a minimum fire resistance rating of 60 minutes. Any structural element or component directly supporting such walls or floors shall have a fire resistance (stability only) of not less than 60 minutes.

5.5 Functionality

5.5.1 The floor area of a house, based upon the overall (external) plan dimensions, shall not be less than 30,0 m^2.

Note: The National Housing Code does permit the MEC to reduce the floor area to 27 m^2 and to 24 m^2 under certain circumstances.

5.5.2 The floor area of a habitable room other than a kitchen, based on horizontal plan dimensions between unplastered wall surfaces, excluding any area occupied by a built in cupboard or any dividing wall or panel, shall not be less than 6,0 m^2.

Note: Two or more spaces shall be deemed to be one room, if any dividing wall or partition, including any door, erected between such spaces occupies less than 60% of the area of the separating plane.

5.5.3 The height (vertical dimension from the top of the finished floor level to the underside of the ceiling / underside of roof covering where no ceiling is provided / underside of structural members projecting below such ceiling or roof coverings, where the plan area of such coverings exceeds 30% of the plan area of the room) of any room or space shall be not less than that tabulated in Table 4.

Table 4: Rooms and their dimensions

ROOM OR SPACE	MINIMUM HEIGHT
Bedroom	2,4 m over a floor area of at least 6 m² with a clear height of at least 1,8 m at any point more than 0,75 m from the edge of the floor space.
Any other habitable room	2,4 m over a minimum of 70 % of the floor area, and not less than 2,1 m over the remaining floor area.
Passage or entrance hall	2,1 m
Bathroom, shower-room or room containing a WC pan .	2,1 m over any area where a person would normally be in a standing position.

5.5.4 The minimum vertical height measured from finished floor level to the underside of any structural member projecting below a ceiling, or underside of roof covering where no ceiling is provided, shall not be less than 2,1metres.

5.5.5 The height between the floor and underside of any opening in a wall through which occupants are to pass through shall not be less than 2,0 metres.

5.5.6 The edge of any balcony more than 1,0 metres above the adjacent ground floor or floor level, shall be protected with a balustrade not less than 1,0 metres in height.

5.5.7 The headroom at any point on any stairway shall be not less than 2,1 m measured vertically from the pitch line.

5.5.8 Stairways shall be such that:

a) the width, measured to any enclosing wall or balustrade, is not less than 750mm;
b) any landing serving two flights in the same straight line has a length of not less than 900 mm and a width of not less than that of such flights;
c) no door opens onto a stairway unless such door opens onto a landing and the width of such landing is less than that of such door;
d) the rise of any step is not in excess of 200 mm;
e) the going and width of any tread is not less than 250 mm, provided that where the stairway does not have solid risers, each tread overlaps the next lower tread by not less than 25 mm;
f) the variation in the dimensions of the risers and the going of the treads in any one flight is not more than 6 mm; provided that this requirement is not to be construed as prohibiting the use of tapered treads in the same flight as treads that are not tapered;
g) there are not more than three successive winders and such winders do not turn through more than 90degrees; and
h) where there are more than three risers, each side is protected by a secure wall, screen, railing or balustrade which is not less than 1 m high.

5.5.9 Where clear glazing is used and is not likely to be apparent to or suspected by any person approaching it, such glazing shall bear markings which shall render such glazing apparent to such person.

5.5.10 Safety glazing in accordance with the provisions of SANS 1263-1, shall be provided:

a) in any entrance (doors and sidelights);
b) where any window is not guarded by a barrier to reduce the possibility of persons coming into contact with the glass panel;
c) where the sill of the window is at a level of less than 500 mm from the floor or where the window is so placed that persons are likely on normal traffic routes to move directly towards such window, the sill is less than 800 mm from the floor; and
d) where a bath enclosure or shower cubicle is constructed of glass;.

5.5.11 Each habitable room, bathroom, shower room and room containing a WC pan, with the exception of a Ventilated Improved Pit Latrine, shall be provided with at least one opening in an external wall, or in a suitable position in the roof, that is glazed with transparent or translucent glazing material. The area of such opening, or the total area of such openings, inclusive of frames and glazing bars, shall be not less than 5% in respect of user performance level 1 and 10 % in respect of user performance level 2 of the floor area of the room or rooms served by it, or 0,2 m², whichever is the greater.

5.5.12 Each room shall have an opening not less than 5% of the floor area of the room, or 0,1m² in respect of user performance level 1 and 0,2m² in respect of user performance level 2, whichever is the greater, comprising either an opening or door in an external wall, or an openable glazed window in an external wall or in a suitable position in the roof.

5.4.13 Where rooms open onto any roofed or enclosed balconies and verandas, the floor area of the balcony or veranda shall be combined with that of the floor when the requirements for the size of openings and openable sections are calculated in accordance with the provisions of 5.5.11 and 5.5.12, respectively.

5.6 Moisture penetration

5.6.1 The resistance of walls and roofs to rain penetration shall be in accordance with the provisions of Table 5.

5.6.2 Water penetrating into the fabric or structure of the wall shall drain to the outside and/or dry out without causing any structural damage. In timber frame construction no water shall penetrate the cavity.

5.6.3 The roof waterproofing system shall resist without deterioration temperatures from -10º C to +80º C and rapid reversals of temperature of the order of 60º C.
5.6.4 Products used in waterproofing systems shall preserve their properties satisfactorily with normal maintenance specified by the manufacturer for at least:

a) systems which can be readily repaired or replaced: 10 years; and
b) systems that are difficult to replace: 20 years.

Table 5: Rain penetration acceptance criteria

STRUCTURAL ELEMENT	PERFORMANCE LEVEL	ACCEPTANCE CRITERIA WHEN TESTED IN ACCORDANCE WITH THE PROVISIONS OF 7.1
Roof	1	Water which penetrates the roof is of insufficient intensity to run down the internal face of walls onto the floor or form a damp patch on the floor or ceiling.
	2	Water which may penetrate the roof is of insufficient intensity to run down the inside surface of the roof, or drip onto ceiling.
Walls	1	Moisture which penetrates the wall is of insufficient intensity to run down the wall onto the floor of the house.
	2	No damp patches are visible on the inside of the wall.

5.7 Sanitation

5.7.1 General

5.7.1.1 Each house shall be provided with a sanitation system option stated in the specification data and with the following sanitary fittings:

a) user performance level 1: one toilet and one wash trough.
b) user performance level 2: one toilet, one washbasin, one wash trough or kitchen sink and one bath or shower.

5.7.1.2 Glazed ceramic pans shall be capable of withstanding a point load of 2,5 kN without failing. Other pans shall withstand a uniformly distributed load of 2,0 kN, deflect at this load no more than 25mm, and upon removal of the load recover to their previous shape.

5.7.1.3 French drains shall not be deeper than 1,8 metres and shall not be constructed on sites where:
a) the percolation rate, as measured in terms of the standard percolation rate test contained in 7.3.3, is less than 30 minutes;
b) effluent may flow out of the ground due to contours of or strata forming such sites;
c) the level of the water table is or may be such as to prevent adequate percolation;
d) other sites may be affected by the drain; or
e) there is insufficient space to accommodate the soakaway of the effluent.

5.7.1.4 French drains shall be sized in accordance so that the infiltration area of the side surface drainage is capable of accommodating the daily rate of flow of effluent.

5.7.1.4 French drains shall not be constructed within 5,0 metres from the perimeter of a house.

5.7.1.5 Parallel French drains shall not be closer than twice their depth from each other.

5.7.2 Waterborne sanitation option

5.7.2.1 The sewer system for each house shall be capable of handling the following minimum daily sewage flow:

a) user performance level 1: 500 litres per day.
b) user performance level 2: 750 litres per day in respect of a 2 bedroom house and 900 litres per day in respect of a 3 or more bedroom room.

5.7.2.2 Any type of joint between pipes or between such pipes and fittings in any drainage installation shall be able to withstand an internal water pressure of 50 kPa and an external water pressure of 30 kPa without leaking.

5.7.2.3 The internal diameter of any soil pipe shall be not less than 100 mm. The internal diameter of any waste pipe shall be not less than 32 mm if it serves a washbasin and not less than 40 mm if such pipe serves any other waste fixture.

5.7.3 Septic tank option

5.7.3.1 Septic tanks shall be impermeable to their contents and to sub-soil water and have:

a) a capacity of not less than 1,7 m3 where tanks serve a single house and 5,1 m3 where the tank serves more than one house;
b) sufficient to store the following number of days of the minimum daily sewage flow in addition to the volume of sludge and scum between septic tank cleanings:
    i) one day where tanks serve a single house.
    ii) three days where the tank serves more than one house.

5.7.3.2 Septic tanks shall discharge into French drains, be covered with a layer of soil between 150 and 300 mm deep and be so constructed that they are provided with a means of access for the purpose of emptying and cleaning.

5.7.3.3 The geometry of septic tanks shall be such that:

a) raw sewage separates into three distinct layers; namely a layer of sludge at the bottom, a layer of floating scum on the top and a layer of relatively clear liquid in between;
b) the organic solids and dissolved material in the sewage are attacked by bacteria so that the scum and sludge is reduced by liquification and gasification;
c) the discharge form the tank can be disposed of in a safe and inoffensive manner.

5.7.3.4 Septic tanks shall not be located within 3 metres from the perimeter of a house.

5.7.4 Conservancy tank option

Conservancy tanks shall be capable of being cleaned and serviced by the authority providing cleaning services and shall not be constructed within 2,0 metres of the perimeter of a house.

5.7.5 On-site digester option

5.7.5.1 Digesters shall facilitate the separation of solids both in the form of floating scum and settled sludge) from the liquid fraction of the waste to a level that the effluent from the digester can be dealt with in a French drain or transported by a small bore sewer to a treatment facility.

5.7.5.2 Suspended solids in the effluent at the effluent discharge pipe shall not exceed 500 mg per litre.

5.7.6 Ventilated improved pit latrine option

5.7.6.1 VIPs shall be constructed to minimise smells and the attraction of flies by means of air movements, solar heating and light, have permanent pit linings, be capable of being emptied and have a capacity such that the cleaning interval for a household of 5 persons is not less than five years.

5.7.6.2 The latrine shall be provided with a seat and closing lid such that the space between the underside of the seat and the top of the receptacle is not more than 25 mm. The seat shall be so designed that the aperture at the top of the seat is not less than 250 mm and not more than 300 mm in diameter. For children, an additional seat that has an aperture of between 150 mm and 200 mm may be provided.

5.7.6.3 The hole in the floor slab shall have the same dimension or be larger then the inside dimension of the pedestal or squatting hole template.

5.8 Structural safety, serviceability and durability

5.8.1 The representative permanent, imposed and seismic loads and impact sources applied to the structure and structural elements shall be in accordance with the provisions of Table 6. The uniformly distributed and concentrated imposed loads shall not be considered to act simultaneously. Imposed roof actions shall not be considered to act concurrently with wind actions.

5.8.2 The representative free stream velocity pressure shall be determined and converted into a wind load in accordance with the provisions of SANS 0160, provided, however, that:
a) the free stream velocity pressure applied to the house structure and structural elements is not less than 0,450 kN/m^2 and 0,370kN/m^2, respectively;

b) the minimum wind load applied to structural elements is not less than that tabulated in Table 6; and
c) the minimum wind load applied to free standing walls is not less than:
   i) 0,58kPa within a distance equal to four times the height of the wall from a free end or an end with return adjacent to an opening or discontinuity in the wall; and
   ii) 0,41kPa elsewhere.

5.8.3 Houses shall suffer little or no damage when subjected to winds associated with a 25 year mean recurrence interval. Damage from winds associated with the 50 year recurrence interval shall not prevent the house from fulfilling its intended purpose save for the possible loss of roof covering material and cladding, nor shall such damage pose a threat to inhabitants. Houses shall not collapse if subjected to wind speeds substantially greater than the design values (e.g. in an intense thunderstorm).

5.8.4 The resistance of the structure under the effects of the actions shall be assessed in terms of limit state criteria or allowable stress criteria in accordance with the provisions of SANS 10160.

5.8.5 The response of the house structure and structural elements to representative actions and impacts shall be within the limits established in Table 7.

5.8.6 The maintenance required to satisfy the user needs and performance descriptions for structural durability shall not be excessive for a given user performance level. The normal preventative maintenance cycle, where houses are designed to satisfy user performance level 2 requirements, shall not be more frequent than 5 years.

5.8.7 Construction materials used in the house structure and structural elements shall be durable with respect to:
a) insect and rodent attack;
b) abrasion due to wind blown sand;
c) corrosive attack by groundwater, surface water, rainwater, atmospheric pollutants and any subsurface or atmospheric gases to which such materials may reasonably be exposed;
d) solar radiation; and
e) condensation

5.8.8 The manufacture of components and the construction and / or erection of structural elements shall be such that the structural safety and structural serviceability performance requirements for the nominated user performance level over the design working life is not reduced by variations and inconsistencies in quality.

Table 6: Representative actions and impacts applied to the house structure and structural elements

AGENT	PERFORMANCE PARAMETER
HOUSE STRUCTURE	
Wind actions #	See 5.8.2 and 5.8.3
Seismic actions	None
Ground conditions and movements	In accordance with expected range of movements associated with Site Class Designations (see Table 5 of specification GFSH-2) and geotechnical report prepared in accordance with the provisions of specification GFSH-2.
STRUCTURAL ELEMENT: ROOF	
Permanent actions	Self weight of covering, ceilings, structure and geysers, if any. (Refer to Appendix B of SANS 10160 and specialist literature)

<table>
<tr><td>Imposed actions*</td><td>Accessible flat roofs:
• a minimum uniformly distributed load of 2,0 kN/m² measured on plan; and
• a concentrated load of 1,5 kN applied over a plan area of 0,1 m x 0,1 m and placed in the position that produces the most severe effects.
Inaccessible roofs (no access is provided other than that necessary for cleaning and repair)
• a minimum uniformly distributed load, acting vertically downward of (0,3 + (15-A)/60) kN/m²; where A is the tributary area in square metres for the member or span under consideration, measured on plan, provided that the load has a maximum intensity of 0,5 kN/m² and a minimum intensity of 0,3 kN/m² where A is 3m² or less; and
• a concentrated load of 0,9 kN, acting vertically downward and applied over an area of 0,1m x 0,1m in any position.
Cantilevered balconies
• a minimum uniformly distributed load of 4,0kN/m²; and
• a concentrated load of 3,0kN applied over a plan area of 0,1m x 0,1m and placed in the position that produces the most severe effects.</td></tr>
<tr><td>Wind actions</td><td>Uplift on roof of not less than 0,59kN/m^2
Local uplift on eaves overhang of not less than 0,78kN/m^2</td></tr>
<tr><td colspan="2">STRUCTURAL ELEMENT: ROOF (continued)</td></tr>
<tr><td>Snow actions</td><td>A uniformly distributed load corresponding to the expected depth of snow where a snow depth exceeding 250 mm can be expected to accumulate.</td></tr>
<tr><td>Hail impact</td><td>Hail impacts generating an impact in Joules of:
<table>
<tr><th>Altitude above sea level</th><th>user performance level 1</th><th>user performance level 2</th></tr>
<tr><td>Less than or equal to 1000m</td><td>10 ± 2*</td><td>10 ± 2*</td></tr>
<tr><td>Greater than 1000 m</td><td>10 ± 2*</td><td>20 ± 2*</td></tr>
</table></td></tr>
<tr><td colspan="2">STRUCTURAL ELEMENT: WALLS</td></tr>
<tr><td>Wind actions</td><td>External walls
Outward pressure on windows and doors : not less than 0,51kN/m^2
Inward pressure on windows and doors : not less than 0,45kN/m^2
Outward pressure walls : not less than 0,51kN/m^2
Inward pressure on walls : not less than 0,37kN/m^2
Horizontal pressure on the side of a
House (pressure which causes racking) : not less than 0, 37kN/m^2
Internal walls: : not less than 0,20 kN/m^2</td></tr>
<tr><td>Permanent actions</td><td>Self weight of wall (Refer to Appendix B of SANS 10160 and specialist literature)</td></tr>
<tr><td>Imposed loads</td><td>Parapet and balustrade walls which guard a drop of more than 750mm, together with the members that give them immediate support, shall be capable of supporting either of the following service loads;
• a concentrated force of 1kN acting in any direction vertically downward and horizontally inward or outward, and over 0,1m length for beam elements and over a 0,1m x 0,1m area for plate elements and acting at the top or any other position which is most severe; or
• a distributed horizontal force of 0,5 kN/m applied at the top of the wall and acting outward.
Either a horizontal concentrated force of 0,5 kN acting normal to the wall surface over an area of 0,1m x 0,1m at any point at a height of 1,3m above the floor level or a horizontal distributed force of 0,5 kN/m at a height of 1,3m, whichever is the most severe, or the soft body impacts (collapse) listed below.</td></tr>
<tr><td>Soft body impacts</td><td>Two soft body impacts each generating an impact in Joules of:
<table>
<tr><td colspan="5">User performance level 1</td></tr>
<tr><td>Type of wall</td><td colspan="2">Internal walls and external walls (impact from the inside)</td><td colspan="2">External walls (impact from the outside)</td></tr>
<tr><td></td><td>Service</td><td>Collapse</td><td>Service</td><td>Collapse</td></tr>
<tr><td>Heavy weight construction</td><td>132</td><td>265</td><td>265</td><td>412</td></tr>
<tr><td>Light weight construction</td><td>132 (framing)
88 (cladding)</td><td>265</td><td>265</td><td>412</td></tr>
<tr><td colspan="5">User performance level 2</td></tr>
<tr><td>Type of wall</td><td colspan="2">Internal walls, external walls at ground floor (impact from the inside) and external walls at first floor and higher (impact from the outside)</td><td colspan="2">Internal walls around staircases, external walls at first floor and higher (impact from the inside) and external walls at ground level (impact from the outside)</td></tr>
<tr><td></td><td>Service</td><td>Collapse</td><td>Service</td><td>Collapse</td></tr>
<tr><td>Heavy weight construction</td><td>176</td><td>412</td><td>265</td><td>530</td></tr>
<tr><td>Light weight construction</td><td>132 (framing)
88 (cladding)</td><td>265</td><td>265</td><td>412</td></tr>
</table></td></tr>
</table>

<table>
<tr><td rowspan="6">Sharp body impacts</td><td colspan="4">User performance level 1: Two blows generating an impact of 4,2 Joules</td></tr>
<tr><td colspan="4">User performance level 2: Two blows generating an impact in Joules of:</td></tr>
<tr><td colspan="2">External walls</td><td colspan="2">Internal walls</td></tr>
<tr><td>At ground floor (impact from the inside)</td><td>5,3</td><td rowspan="2">Non load bearing walls</td><td rowspan="2">5,3</td></tr>
<tr><td>At ground floor (impact from the outside)</td><td>7,9</td></tr>
<tr><td>At first floor and higher (impact from the inside)</td><td>5,3</td><td>Load bearing walls</td><td>7,9</td></tr>
<tr><td>At first floor and higher (impact from the outside)</td><td>7,9</td><td>Around stairwells</td><td>7,9</td></tr>
<tr><td>Hail impacts</td><td colspan="4">Hail impacts, on components other than glazing, generating an impact of 10 ± 2 Joules</td></tr>
<tr><td>Door slamming</td><td colspan="4">25 kg door slammed ten times from a position of 60˚ open, with a force of 150 N applied at the handle position in the direction of closure, such force being applied until the door makes contact with the frame.</td></tr>
<tr><td colspan="5">STRUCTURAL ELEMENT: WALLS (continued)</td></tr>
<tr><td>Fittings</td><td colspan="4">Lightweight fittings (e.g. coat hooks, towel rails and medicine cabinets) having a mass 8 kg suspended 45 mm away from wall at any location.
Medium weight fittings (e.g. hand basins cisterns, medium sized cupboards and 9 kg fire extinguishers) having a mass of 25kg suspended 45 mm away from the wall, at designated locations within the wall.
Heavy weight fittings (required where there is a high probability that people will stand upon the fittings; eg wash troughs, sanitary ware basins, geysers and fire hose reels) having a mass of 135 kg suspended 345 mm away from the wall for a period of 5 minutes.
Shelving: safe load nominated in the specification data.</td></tr>
<tr><td colspan="5">STRUCTURAL ELEMENTS: FLOOR LOADS</td></tr>
<tr><td>Permanent actions</td><td colspan="4">Self weight of flooring system (as determined by the supplier).
Finishes (as determined by the supplier).</td></tr>
<tr><td>Imposed actions#</td><td colspan="4">• a minimum uniformly distributed load of 1,5 kN/m²; and
• a concentrated load of 1,5 kN applied over a plan area of 0,1m x 0,1m and placed in the position that produces the most severe effects.</td></tr>
<tr><td>Vibrations</td><td colspan="4">Nil.</td></tr>
</table>

Value required to determine overall stability (overturning, wind uplift, raking)
* Roofing that is able to withstand an impact of 20 J can be classified as being hail resistant. Roofing material that is able to withstand 10 J can be classified as being able to withstand mild hailstorms and incidental damage.

Table 7: Structural response of house structure and structural elements to representative actions and impacts.

AGENT	PERFORMANCE PARAMTER
HOUSE STRUCTURE	
Ground conditions and movements	**Tilt** Angular distortion (ratio of difference in settlement between opposite sides of a house and the length between such sides) shall not be more severe than: User performance level 1: 1:100 User performance level 2: 1:200 **Total settlement** User performance level 1: 20 mm after house has been completed. User performance level 2: 10 mm after house has been completed.
STRUCTURAL ELEMENT: ROOF	
Direct and indirect actions	**Deflection** Deflection ratio (ratio of maximum deflection from the horizontal to the span of the floor) arising from permanent, imposed and wind actions at the ceiling level shall not be more severe than: User performance level 1: 1: 175.. User performance level 2: 1:250. **Cracking** Irreversible damage in the load deflection curve, even if cracks or other damage is not visible. Cracks in roofing substrates(decking) that may impair the normal function of the roof or coverings.
Hail impact	After being tested, the test specimen must be acceptably free from visible defects when viewed from a distance of 2.0m.
STRUCTURAL ELEMENT: WALLS	
Direct actions	Deflection ratio (ratio of maximum deflection from the vertical to length or height of wall panel) arising from permanent, imposed and wind actions shall not be more severe than: User performance level 1: 1: 175 User performance level 2: 1:250
Indirect actions	Minor damage that is not more severe than that of Category 1 Expected Damage (see Table 8), or the equivalent thereof.

Ground movements	Minor damage that is not more severe than Category 2 Expected Damage (see Table 8), or the equivalent thereof, as nominated by the user.
Soft body impacts	**Collapse impacts:** Walls shall not collapse or be permanently deformed. **Service impacts:** Not displaced by more than 1/600th of their height or have cracks which cannot be readily repaired of aggregate length not exceeding 300 mm and width not wider than 0,5 mm when struck.
STRUCTURAL ELEMENT: WALLS (continued)	
Sharp body impacts	Walls shall not be punctured nor, in the case of materials of a non-fibrous nature, be indented or locally displaced by more than 3mm. In addition, there shall be no readily visible cracks (i.e. wider than 0,25 mm) and the aggregate length of such cracks shall not exceed 300 mm.
Door slamming	The slamming of the test door does not cause damage to a wall or cause the frame to detach from the wall.
Fittings	The loosening and withdrawal of the fixing devices shall not cause more than minor, readily repairable damage to the wall.
STRUCTURAL ELEMENT: FLOOR	
Direct actions	Deflection ratio (ratio of maximum deflection form the horizontal to span of floor) arising form permanent, imposed and wind actions shall not be more severe than: User performance level 1: 1: 175. User performance level 2: 1:250.
Indirect actions (Slab on the ground foundations)	**Floors covered with carpets and flexible floor coverings:** Minor damage that is not more severe than Category 2 Expected Damage (see Table 9), or the equivalent thereof, as nominated by the user. **Floors covered with semi-flexible or rigid tiles:** Minor damage that is not more severe than Category 1 Expected Damage (see Table 9), or the equivalent thereof, as nominated by the user.
Ground movement and conditions	Minor damage that is not more severe than Category 2 Expected Damage (see Tables 9 and 10), or the equivalent thereof, as nominated by the user.

Table 8: Classification of damage in masonry walls

DESCRIPTION OF DAMAGE IN TERMS OF EASE OF REPAIR AND TYPICAL EFFECTS	APPROXIMATE MAXIMUM CRACK WIDTH IN WALLS (mm)	CATEGORY OF EXPECTED DAMAGE
Hairline cracks less than about 0,25 mm width are classed as negligible.	< 0,25	0 Negligible
Fine internal cracks which can easily be treated during normal decoration. Cracks rarely visible in external masonry.	< 1 (isolated; localised)	1 Very slight
Internal cracks easily filled. Redecoration probably required. Recurrent cracks can be masked by suitable linings. Cracks not necessarily visible externally. Doors and windows may stick slightly.	< 5	2 Slight

NOTE :

1. Crack width is only one factor in assessing damage and should not be used on its own as a direct measure of damage. In assessing the degree of severity of damage, account must be taken of the location in the house where it occurs.
2. This classification is based on the ease of repair which may be considered under three headings representing a progression in difficulty of repair, viz. redecoration due to wear and tear, remedial work to reinstate functional efficiency and structural repair.
3. Where cracks less than 1 mm are widespread throughout the building, the damage may be regarded as being Category 2.

Table 9: Classification of damage with reference to concrete surface beds

DESCRIPTION OF TYPICAL DAMAGE	APPROXIMATE MAXIMUM CRACK WIDTH IN FLOOR (mm)	MAXIMUM DEVIATION OF ANY JOINT FROM A 3 m STRAIGHT EDGE (mm)	CATEGORY OF EXPECTED DAMAGE
Hairline cracks, insignificant tilt of floor or change in level.	< 0,3	< 5	o Negligible
Fine but noticeable cracks. Floor reasonably level.	< 1,0	< 8	1 Very slight
Distinct cracks. Floor noticeably curved or changed in level.	< 2,0	< 10	2 Slight

Table 10: Classification of damage caused by ground floor slab settlement

DESCRIPTION OF TYPICAL DAMAGE	APPROXIMATE CRACK WIDTH IN FLOOR (mm)	APPROXIMATE GAP (mm)	CATEGORY OF EXPECTED DAMAGE
Hairline cracks between floor and skirtings.	-	Up to 1	0 Negligible
Settlement of the floor slab, either at a corner or along a short wall, or possibly uniformly, such that a gap opens up below skirting boards, where provided, but which can be masked by resetting skirting boards. No cracks in floor slabs, although there may be negligible cracks in floor screed and finish. Slab reasonably level.	-	Up to 5	1 Very slight
Larger gaps below skirting boards; some obvious but limited local settlement leading to slight slope of floor slab; gaps can be masked by resetting skirting boards and some local rescreeding may be necessary. Fine cracks appear in internal walls which may require some redecoration; slight distortion in door frames which may result in sticking of doors. No cracks in floor slab although there may be very slight cracks in floor screed and finish. Slab reasonably level.	Up to 1	Up to 15	2 Slight

NOTE: Gap refers to the space, usually between the skirting and finished floor, caused by settlement after making appropriate allowance for discrepancy in building, shrinkage, normal bedding down and the like.

5.9 Acoustic (general)

The minimum weighted standardised difference between rooms within a house and adjacent rooms in the same house, calculated in accordance with the provisions of SANS 717-1 ISO 717-1 and SANS 140-4 ISO 140-4, shall not be less than 33 dB (DnT,w).

Note:

1 In acoustics, there is often a large grey area between a situation with which almost everyone will be completely satisfied and one which almost everybody will find totally unacceptable. The performance parameter provided does not cater for the provision of a very high quality to satisfy the majority of people even under extreme conditions. They should rather be seen as criteria to promote a minimum standard where acoustical performance has been attended to.

2 All masonry walls having a width of 90mm and greater are deemed-to-satisfy requirements, provided that a ceiling is provided, or where no ceiling is provided the masonry is taken up to the underside of and are sealed to the roof covering.

3 The Agrément South Africa assessment criteria for the acoustic performance in buildings provides some basic explanations regarding acoustical terminology and requirements. (see www.agrement.co.za).

5.10 Construction accuracy (optional context)

All structural elements and components shall be constructed within the limits of the applicable permissible dimensional deviations set out in Tables 11 to 17. Items not covered in Tables 13 to 19 shall be constructed in accordance with the relevant provision of SANS 10155.

Note: The tolerances provided in this section relate to appearance. These tolerances may be suitable for the construction of the structural elements. This is co-incidental in the context of this section.

Table 11: Permissible dimensional deviations: Concrete work

DESCRIPTION	PERMISSIBLE DIMENSIONAL DEVIATION (mm)
a)Foundations	
—Linear dimension on plan cast against excavation sides	60
—Linear dimension on plan cast against formwork	30
—Level of underside of concrete	-40 + 20
—Surface level, i.e. top of foundation (excluding floor slabs)	- 30 + 15
b) Structural or components above foundations	
— Linear (other than cross-section) dimensions	30
— Cross-section dimensions	- 10 + 20
— Level (deviation from designed level with reference to the nearest transferred datum of the upper or lower surface, as may be specified, of any slab or other structural element or component)	-20 + 10
— Out-of-squareness of a corner or an opening or for short side of length	10
i) up to and including 0,5 m	20
ii) over 0,5 m up to and including 2 m	25
iii) over 2 m, up to and including 4 m	
— Exposed concrete surface (including floor slabs)	10
i) Flatness of plane surface	10
ii) Abrupt changes in a continuous surface	
— Exposed concrete surface to be plastered or receive screed	
I) Flatness of plane surface	15
ii) Abrupt changes in a continuous surface	10
Deviation from the minimum cover of concrete over reinforcement as specified is permitted.	nil

Table 12: Permissible dimensional deviations: Masonry

DESCRIPTION	PERMISSIBLE DIMENSIONAL DEVIATION (mm)	
	DEGREE OF ACCURACY	
	USER PERFORMANCE LEVEL 1	USER PERFORMANCE LEVEL 2
a) Surfaces of supporting structural elements	- 30 + 15	- 20 + 10
b) Position on plan of any edge or surface measured from the nearest grid line or agreed centre line.	30	20
c) Level (deviation from designed level with reference to the nearest transferred datum of the average top surface of a structural element or component)	- 20 + 10	- 15 + 5
d) Linear dimensions		
1. Bed joint thickness		
- Specified (average)(10 mm)	5	5
- First joint above supporting structural element	-5 + 40	-5 + 25
2. Perpend joint thickness	-5+ 10	-5+ 10
3. Collar joint thickness	-5+ 10	-5+ 10
4. Cavity width	20	20
5. Cross section of an unplastered wall, column or beam	- 10 + 20	- 10 + 20
6. Infill concrete spaces	-10+15	-10+ 15
7. Length		
- up to and including 5 m	25	15
- Over 5 m, up to and including 10 m	30	20
- over 10 m	50	30
8. Height		
- Up to and including 3m	15	10
- Over 3 m, up to and including 6 m	20	15
- Over 6m	25	20

DESCRIPTION	PERMISSIBLE DIMENSIONAL DEVIATION (mm)	
	DEGREE OF ACCURACY	
	USER PERFORMANCE LEVEL 1	USER PERFORMANCE LEVEL 2
e) Variation from a plane		
1. Bed joints		
- in any 3 m length	5	5
- maximum	15	15
Top surface of load-bearing walls		
- in any 3 m length	5	5
- maximum	15	15
f) Relative displacement between load-bearing walls in adjacent storeys intended to be in vertical alignment	15	15
g) Deviation from a straight line		
1. In any direction		
- in any 5 ml length	15	10
- maximum over length of structural element/structure	25	20
2. From the vertical		
- in any 1 m length	10	5
- in any 3 m length	15	10
- Maximum over height of structural element / structure	25	20
3. Centre line of perpend joints		
- non-facing masonry	15	15
- face masonry	15	10
h) Out of squareness of a corner or an opening or a component such as a column measured with respect to the short side length.		
- up to and including 0,5 m	10	5
- over 5m, up to and including 2m	20	15
- over 2 m to and including 4 m	25	20

Table 13: Permissible dimensional deviations: Structural Timber Members

DESCRIPTION	PERMISSIBLE DIMENSIONAL DEVIATION
Spring	5mm per 3m length
Bow	10mm per 3m length
Twist	1mm per 25mm width per 3m length

Table 14: Permissible dimensional deviations: Trusses

DESCRIPTION	PERMISSIBLE DIMENSIONAL DEVIATION (mm)
a) Overall horizontal dimensions	15
b) Overall vertical dimensions	25
c) Difference between overall vertical and horizontal dimensions of similar trusses in a continuous roof	10
d) Deviation of erected truss from the vertical for rise of	
— 1 metre	10
— 2 metres	15
— 3 metres	20
— 4 or more metres	25
e) Bow after erection	10

Table 15: Permissible dimensional deviations: Finished floors

DESCRIPTION	PERMISSIBLE DIMENSIONAL DEVIATION (mm)
Deviation from any two points measured 6 m apart	10
Deviation of any point under a 3m straight edge placed level in any direction	6

Table 16: List of permissible dimensional deviations (PD) for precast components after erection

DESCRIPTION	USER PERFORMANCE LEVEL	
	1	2
Taper of joints		
PD to be measured per metre length of joint:		
In all cases	10	6
Width of joints		
PD to be measured from the specified width:	10	6
in all cases		
Proudness of panels		
The proudness of panels and slabs is defined as the protruding of one panel or slab compared to an adjacent panel or slab.		
PD for panels and slabs:		
up to and including 3,0 m	8	5
over 3,0 m up to and including 8,0 m	15	10

Table 17: List of permissible dimensional deviations (PD) for precast concrete components before erection

DESCRIPTION	USER PERFORMANCE LEVEL	
	1	2
Cross-section and linear dimensions		
PD from specified dimensions of beams, slabs, columns and panels:		
• up to and including 600 mm	8	5
• over 600 mm, up to and including 1,5 m	10	7
• over 1,5 m, up to and including 3,0 m	16	12
• over 3,0 m	20	15
Bow and camber other than designed camber		
PD of any point on a surface from a straight line joining the extremities of that surface:		
• For extremities up to and including 3,0 m apart	8	5
• Over 3,0 m, up to and including 8,0 m	15	10
Twist (max)		
• For diagonal up to and including 3,0 m	8	5
• For diagonal over 3,0 m, up to and including 8,0 m	15	10
Abrupt changes in a continuous surface		
PD of any point on a surface from a straight line joining two points of that surface 300 mm apart	6	4
Squareness of internal corners of openings		
The same as in SANS 10155, Table 4, 'Squareness of corner'		
Squareness of panels		
The squareness of panels shall be measured as the difference between the length of the diagonals:		
• the difference shall not exceed	26	16

5.11 Water saving measures

The following shall form part of the toilet and shower systems where waterborne sanitation is provided:

a) a low-volume flush toilet system that utilises less than 8 litres per flush or a dual flush toilet system which delivers not more than 4,5 litres per half flush and not more than 11 litres per full flush; and
b) a shower head having a flow rate of less than 9,5 litres per minute.

6 CONSTRUCTION SOLUTIONS

6.1 Construction solutions, which are adopted for each attribute, shall be such that it can be demonstrated or predicted with certainty, using one of more of the following means, that the requirements of 4 is satisfied by:

a) the adoption of deemed-to-satisfy rules which are known to yield solutions that satisfy all the requirements of this specification;
b) calculation or measurement;
c) testing;
d) the preparation of a rational design; or
e) the undertaking of a rational assessment.

Note: Regulations issued in terms of the National Building Regulations and Building Standards Act, 1977 (Act 103 of 1977) and Housing Consumers Protection Measures Act (Act No. 95 of 1998) require that competent persons perform rational designs and rational assessments or Agrément Certification be obtained in respect of several of the attributes.

6.2 Observance of the appropriate deemed-to-satisfy provisions of the Home Building Manual or SANS 10400 (The application of the National Building Regulations) shall be considered to be sufficient to demonstrate compliance with the requirements of this specification.

6.3 Reliance on service experience in rational assessments shall only be made where there are sufficient numbers of representative examples available, exposed to similar or more severe service conditions, together with adequate documentation.

6.4 Testing shall incorporate, as appropriate, a realistic representation of materials, loading conditions, environmental influences, boundary conditions and construction practices. Testing for evaluating structural serviceability shall be full scale. Testing for evaluating structural response shall be full scale unless all scale effects can be appropriately estimated.

6.5 Satisfactory performance in accordance with a standard test described in 7 conducted by Agrément South Africa or the South African Bureau of Standards shall be sufficient evidence of compliance for given performance requirements.

6.6 Agrément South Africa Certification of equivalence or superior performance to the standard Agrément South African house, for the nominated user performance level, if relevant.

6.7 Certification of fitness for purpose by Agrément South Africa

Note: Agrément South Africa have developed certification procedures and assessment criteria for building and walling systems in order to confirming fitness-for-purpose of non-standardised construction products and/or the acceptability of the related non-standardised design. (see www.agrement.co.za).

7 STANDARD TESTS

7.1 Rain penetration tests

7.1.1 Rain penetration tests for roofs

7.1.1.1 Tiles when laid at a pitch of 30 degrees and tested for 2 hours in a rain penetration testing (see SANS 542: Concrete Roof Tiles) and where a relative humidity of at least 70% is maintained under the tiles while the test is in progress, shall not permit the formation of rain drops on the underside of the roof construction in respect of user performance level 2 and the flow of water down the inside of the tiles in respect of user performance level 1. Flow in the test rig shall be induced by a sparge pipe placed over the top of the roof frame to simulate rain that runs down from higher courses of a full size roof and a suitable spray to simulate direct rainfall. The flow rates for the sparge and spray shall be 150 mm/hour and 75 mm/hour, respectively.

7.1.1.2 Sheeted roofs when tested in accordance with the ASTME 1646-95 Standard Test Method for Water Penetration of Exterior Metal Roof Panel System by Uniform Static Air Pressure Difference shall exhibit no leakage in respect of User Performance Level 2 and not cause water to drip onto the ceiling or floor from the underside in respect of user performance level 1.

7.1.2 Rain penetration test for walls

7.1.2.1 Standard non-pressurised test for masonry, cast in situ concrete or other types of construction without joints

7.1.2.1.1 The wall shall be thoroughly air-dry before being tested. In the case of a masonry or similar wall the inner surface may be lime washed or other means may be adopted to facilitate the detection of moisture which has penetrated through the wall. The portion of the outer surface under test shall then be continuously sprayed with water in the form of a fine mist distributed over the whole area under test at the rate of 40-50 mm depth of water per hour. Spraying shall be conducted in a still atmosphere and shall be continued as follows :

User Performance Level 1 :

- **Walls without a roof overhang in accordance with Figure 4:**
  A period of 4 hours.

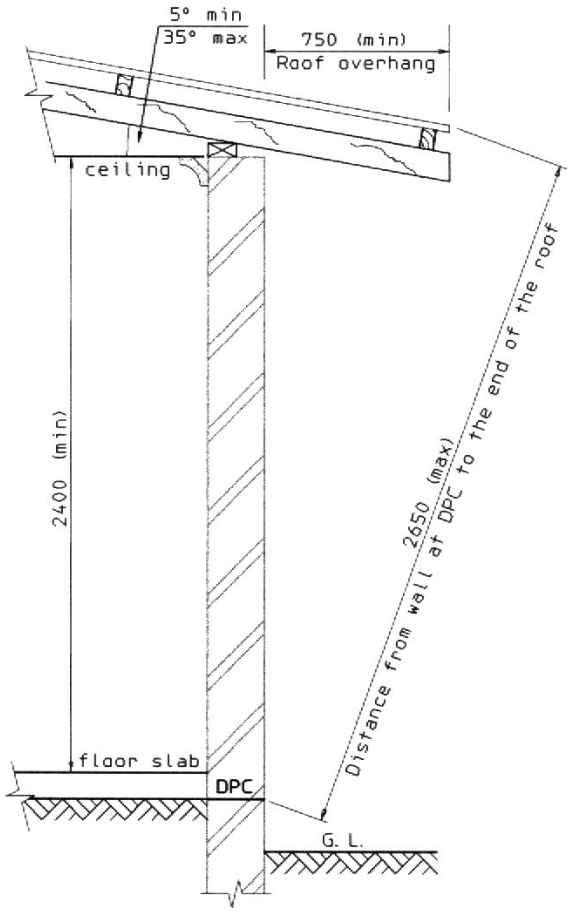
- **Walls with a roof overhang in accordance with Figure 4:**
  A period of 2 hours in respect of non-masonry walling. No test required in respect of masonry with vertical and horizontal joints filled with mortar.

User Performance Level 2 :

The minimum period required in terms of Table 18 or until the first signs of dampness appears on the inner surface of the wall if such signs appear before the expiry of such period.

7.1.2.1.2 In the case of any timber framed wall or walls of similar construction the covering of such wall shall be removed after the required test period in order to ascertain whether any moisture has penetrated to the interior of such wall and if so, whether water has been retained within the interior.

NOTE: The test methods and criteria are derived from conditions where rain results in wall surfaces becoming wet for prolonged periods under normal steady rain conditions. This continuous wetting has a detrimental effect on the ability of a wall to resist rain penetration. Sufficiently large roof overhangs can prevent rain from impinging on wall surfaces under normal steady rainfall conditions. This means that walls would only get wet under severe storm conditions where the rain is accompanied by strong wind. Such weather conditions in South Africa are nearly always of short duration. Garden sprinklers can, however, have a detrimental effect on the ability of a wall to resist rain penetration.



NOTE :

1) Roof slope to be between 5 and 35 degrees.

2) The horizontal overhang from the outside face of the wall to the end of the roofing material is not to be less than 750mm.

3) The straight line distance between the end of the roofing material to the edge of the dampproof course shall not exceed 2650mm.

Figure 4

Roof overhangs which protect walls from rain.

Table 18: Test period for standard non-pressurized rain penetration tests

MEAN ANNUAL RAINFALL* (mm)	HOURLY MEAN WIND SPEED* (m/s)	MIN PERIOD (h)
More than 1 000	20	14
	25	19
	30	20
600 - 1 000	20	10
	25	15
	30	20
200 - 600	20	6
	25	11
	30	16
0 - 200	20	2
	25	7
	30	12

* See SANS 10160 Code of Practice for the general procedures and loadings to be adopted for the design of buildings (Appendices D and F).

NOTE: The test should ideally be conducted for the maximum period shown in Table 22 as this will allow an assessment to be made of the walls resistance to water penetration in all rainfall zones in the country

7.1.2.2 Standard pressure test for non-standardised walling systems or systems with joints

7.1.2.2.1 The standard pressurised test shall be applied to a wall tested in terms of 7.1.2.1. The same apparatus shall be used except that a constant pressure difference shall be maintained between the inside and outside of the chamber.

7.1.2.2.2 The standard pressurised test shall be applied immediately after the test described in 7.1.2.1 for an initial period of 15 minutes with a constant pressure difference of 100 Pa and thereafter for a 10 minute period at 200 Pa.

Note: In addition to unpressurised tests, pressurised tests are carried out to take into account the effect of wind-driven rain if the walling system has unfilled joints or if the construction method is in any way non-standardised (eg concrete panels, dry-stack, framework with a cladding system, etc.) Wind-driven rain is simulated by subjecting the test wall to a pressurised test

7.2 Structural safety, serviceability and durability

7.2.1 General

7.2.1.1 Action effects on individual structural members shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility, and both short- and long-term material properties. Members that tend to accumulate residual deformations under repeated service loads shall have included in their analysis, the added eccentricities expected to occur during the design working life.

7.2.1.2 The assessment of distortions of individual structural members shall be determined by methods of structural analysis that take into account equilibrium, general stability, geometric compatibility, and both short- and long-term material properties.

7.2.1.3 Structural durability may be established by using methods that simulate predictable future degradation of the product such as by tests which accelerate mechanical wear, or other forms of degradation by agents such as solar radiation, heat frost, thermal shock, air humidity, condensation, salty fog, chemical agents and biological agents.

7.2.2 General performance tests

7.2.2.1 Sandbag impact test (soft body impacts)

7.2.2.1.1 The test is carried out on a representative wall specimen, approximately 4,0 m long and of storey height (See Figure 5). The wall must include a standard door opening positioned between 300 mm and 450 mm from one end of the wall. The top and bottom of the wall are fixed and both ends supported as in practice; end returns may be provided for this purpose if necessary.

7.2.2.1.2 A 250 mm diameter leather or fabric bag containing 30 kg of sand is suspended by a rope from a convenient point above the top of the wall (See Figure 5). The bag should touch the surface of the wall lightly and its centre of mass should be within 1 000 mm above "floor level" or ground level, as appropriate for internal and external faces respectively, when it is hanging freely at rest. The bag may impact any other point deemed necessary by the evaluator.

7.2.2.1.3 The bag is drawn away pendulum fashion from the wall at right angles to the face of the wall until its centre of mass is at the required height of swing above its initial free hanging position. It is then released and allowed to swing pendulum-wise and strike the wall. Two impacts are made from each height of swing on each point tested.

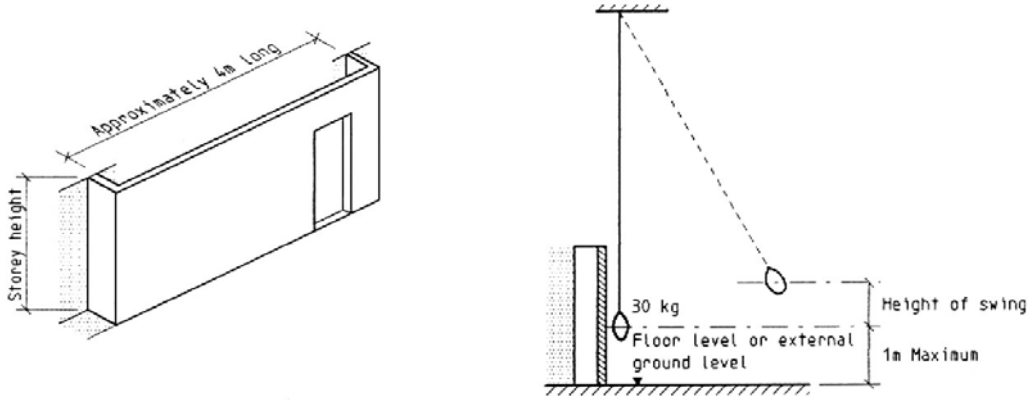


Figure 5
Sandbag impact test

7.2.2.1.4 When the test structure is of unframed construction, this operation is carried out as near as possible to a point midway in the length of the wall. It is also repeated near the end of the wall farthest from the door. If the wall is of framed construction, points of impact are chosen that are both between and on the line of the framing and joints (if applicable).

7.2.2.1.5 The height of swing that will provide the required level of impact energy is set out in Table 19.

Table 19: Height of swing in sandbag test required to simulate a range of impacts on walls

HEIGHT OF SWING (mm)	IMPACT (Joules)
300	88
450	132
600	176
900	265
1400	412
1800	530

7.2.2.2 Steel Tool Test (hard-body impacts)

7.2.2.2.1 The test may be carried out on the same structure that is used for the sandbag test or a separate wall specimen at least 1,0m wide. A 38mm diameter steel impact tool with a mass of 1,8kg, shaped like a chisel with a hardened edge 38mm wide, rounded to a 2,5mm radius and attached to a rigid pendulum which pivots in a metal frame is used (see Figure 6).

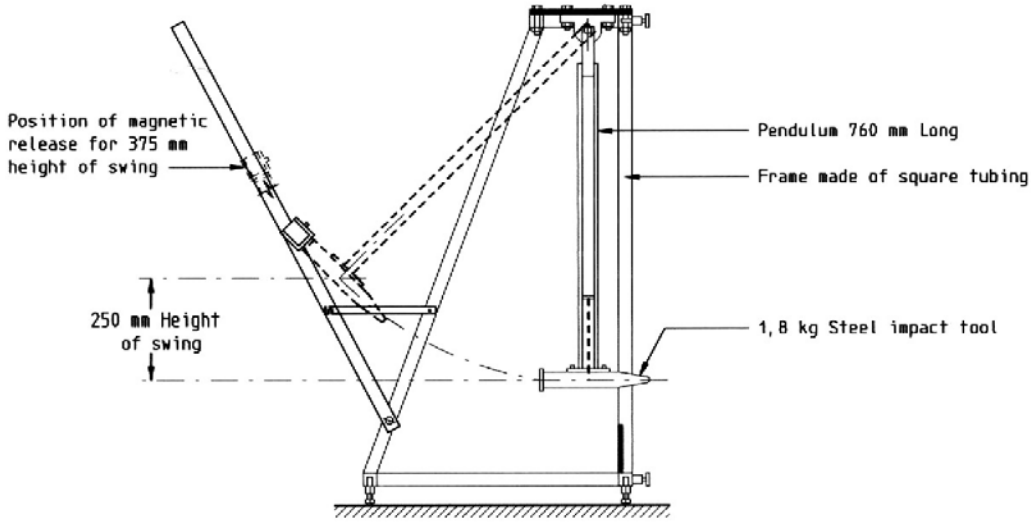


Figure 6
Steel tool impact resistance test apparatus

7.2.2.2.2 The tool is positioned so that when it is hanging freely at rest the chisel edge lightly touches the surface of the wall with the tool's long axis at right angles to the wall and the chisel edge horizontal. The tool is drawn away from the wall, pendulum fashion, until its centre of mass is at the required height of swing above its initial free-hanging position. The tool is released to swing back and strike the wall with the full width of its edge. Two impacts are made on each point tested from each height of swing.

7.2.2.2.3 If the wall is of framed construction, then the test is performed on the line of framing, close to, but not on the line of the framing, and midway between lines of the framing.

7.2.2.2.4 The height of swing that will provide the required level of energy to is set out in Table 20.

Table 20: Height of swing required in steel tool impact resistance test to simulate a range of impacts on walls.

Height of swing (mm)	Impact (Joules)
200	4,2
250	5,3
375	7,9

7.2.2.3 Test for lightweight and medium weight fittings

7.2.2.3.1 For this test a wall specimen similar to that used for the sandbag impact test is required.

7.2.2.3.2 A test fitting, fabricated from steel as illustrated in Figure 7, is fixed to the wall with four screws or such other suitable fixing devices as may be used in practice. An initial test

load of 2,3 kg is suspended at the position shown for one minute and the load is thereafter increased in 2,3 kg increments at one minute intervals until failure or maximum loads of 11,5 kg (lightweight fittings) or 23 kg (medium weight fittings) are attained.

7.2.2.3.3 This test is carried out at four different positions of the wall if it is of framed construction. The positions are chosen to avoid the lines of the framing and the joints, unless the fittings are to be fixed only to the framing members or to other additional members specially provided for that purpose.

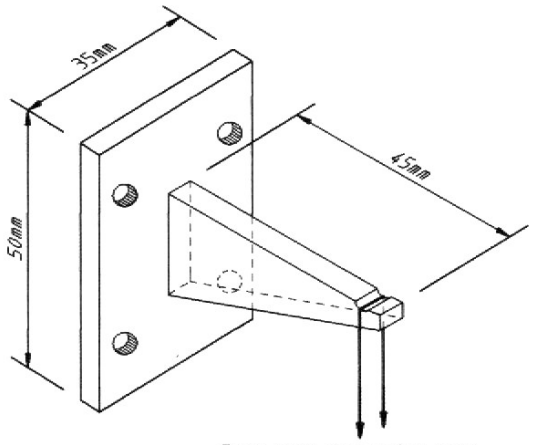


Figure 7
Test fitting for lightweight and mediumweight fittings

7.2.2.4 Test for heavyweight fittings

A test fitting, fabricated from steel, which simulates a pair of wash-hand basin brackets, is fixed to the wall with screws or such other suitable fixing devices, as may be used in practice. (See Figure 8). The test fitting is located about midway between the end of the wall and the door opening. A test load of 136 kg is suspended at the position shown on the angle iron for five minutes. This test is carried out only once for a particular wall.

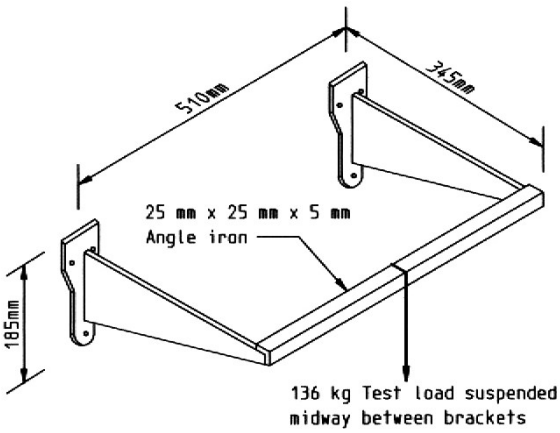


Figure 8
Test fitting for heavyweight fittings

7.2.2.5 Test for shelving

7.2.2.5.1 Four test fittings which simulate shelf brackets and which are fabricated from steel are fixed to the wall in a vertical row with screws or such other suitable fixing devices as may be used in practice. (See Figure 9). The top of the upper bracket is 2,3 m above "floor level" and the remaining brackets are spaced at 0,45 centres below it. An initial test load of 2,3 kg is suspended for one minute from each bracket at the position shown and the load is thereafter increased simultaneously on each bracket in 2,3 kg increments at one minute intervals until failure occurs.

7.2.2.5.2 In case of walls of framed construction the brackets are fixed to a vertical member located about midway between the end of the wall and the door opening, or at other specified positions.

7.2.2.5.3 The safe load allowed per shelf bracket is one half of the test load which caused either damage to the wall, or any loosening of a bracket or detachment thereof, or which resulted in a lateral deflection or movement of the wall of more than 1/600th of its height.

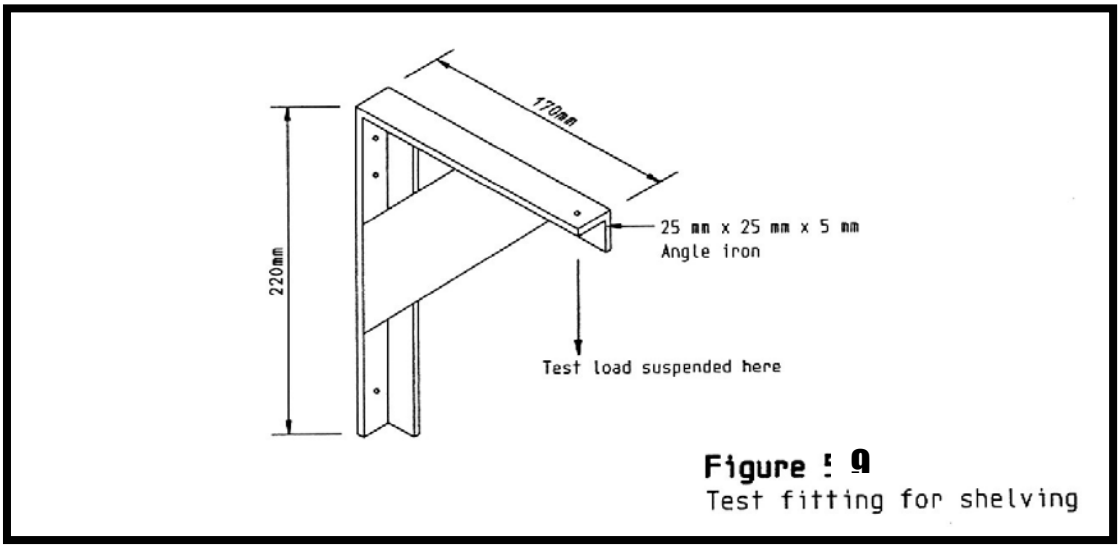


Figure 9
Test fitting for shelving

7.2.2.6 Resistance to Door Slamming

For this test a wall specimen similar to that used for the sandbag impact tests is required, and with a door frame fitted in the opening as it is done in practice. A door with a mass of 25 kg is hung in the door frame. The door is slammed from a position of 60˚ open, with a force of 150 N applied at the handle position in the direction of closure, such force being applied until the door makes contact with the frame. Slamming of the door is repeated 10 times.

7.2.2.7 Hail resistance test

7.2.2.5.1 For this test a specially developed hail gun by the South African bureau of Standards is used to fire spherical ice missiles (artificial hailstones) vertically downwards onto the test specimen. The test specimen is secured in a horizontal position in a suitable frame below the hail gun. The hail gun is set so that the kinetic energy of the artificial hailstones at impact with the surface of the test specimen is as required.

7.2.2.5.2 The test specimen is subjected to 12 impacts, or any lesser number in the event of failure occurring before 12 impacts. The impacts are delivered normal to the surface of the test specimen at evenly distributed points.

7.2.3 Tests for structural strength and stability

Suitable tests are described in Agrément South Africa's: Assessment Criteria for Building and Walling Systems: Structural Strength and Stability in respect of:

a) Test 1: Transverse flexure of walls;
b) Test 2: Horizontal load resistance-vertical spanning;
c) Test 3: Racking;
d) Test 4: Horizontal load on doors, windows and their immediate surround;
e) Test 5: Strength of L connections between walls;
f) Test 6: Strength of T connections between walls;
g) Test 7: Anchorage of roof trusses to wall;
h) Test 8: Ability of the walls to resist vertical loads; and
i) Test 9: Ability of gable walls to resist wind loading.

7.2.4 Tests for dry-stack masonry walls

Suitable tests, complete with acceptance criteria, are described in Agrément South Africa's Assessment Criteria for Building and Walling Systems: Structural Assessment of Dry-stack Masonry Building Systems in respect of:

a) Test 1: Vertical load-bearing capacity of walls;
b) Test 2: Transverse flexure of walls;
c) Test 3: Horizontal load resistance-vertical spanning;
d) Test 4: Horizontal line load resistance;
e) Test 5: Racking load resistance;
f) Test 6: Response of buildings to simulated wind loading;
g) Test 7: Horizontal load on doors and windows and their immediate surround;
h) Test 8: Transverse flexure of gable wall;
i) Test 9: Soft body impact test; and
j) Test 10: Steel tool impact test (hard body impact test)

7.3 Sanitation tests

7.3.1 On-site digesters load testing

A suitable test, complete with pass/fail criteria, is described in Annexure E of ACTMAP 3.

7.3.2 Tests for sanitary performance of water closet pans

Suitable tests, complete with requirements for demonstrating compliance, are describe in Annexure E of ACTMAP 3 in respect of:

a) Solids removal test (ball and paper test);
b) Surface-wash test;
c) Removal of liquid wastes (dye test and splash test); and
d) Waterseal test.

7.3.3 In-situ percolation test

Note: The percolation test measures the rate at which clean water, under constant or nearly constant hydraulic head percolates into the surrounding soil in both the vertical and the horizontal direction. The test is designed to quantify the rate at which water moves into the soil. Percolation will therefore change as moisture conditions change.

7.3.3.1 The percolation test shall be carried out in a test pit, or a number of test pits, uniformly spaced throughout the area in which a french drain is to be constructed, which has been excavated to the depth proposed for a french drain.

7.3.3.2 At the bottom of the test pit, a 300 x 300 mm square or 300 mm diameter hole, 350 mm deep shall be excavated (See Figure 10).

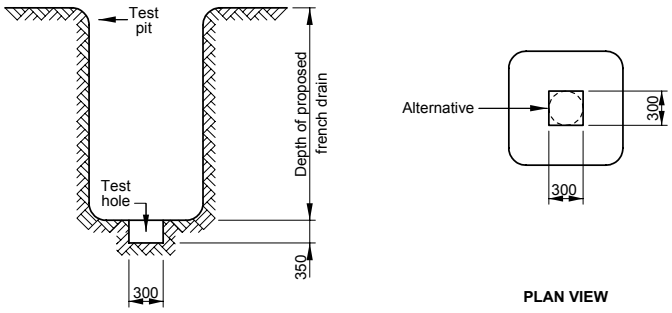


Figure 10
Insitu percolation test pit and test hole

7.3.3.3 The test hole sides shall be roughened to provide a natural infiltration surface. Any loose material from the bottom of the hole shall be removed and replaced with a 50 mm thick layer of gravel to prevent soaking when the hole is filled with water.

7.3.3.4 The prepared hole shall be filled with water to a height of not less than 300 mm above its bottom and maintained at such level for a period of not less than 4 hours. At the end of this period, the level of the water shall be recorded, and the drop in level as the water soaks away over a subsequent period of 30 minutes shall be measured. Should the water drain away within the 30 minute period, the actual time taken for this to occur shall be measured.

7.3.3.5 The percolation rate shall be reported as the time taken in minutes for the water level to drop 25 mm. Where a number of holes are tested, the average shall be reported.

7.4 Roof waterproofing system

7.4.1 Test for resistance to pull-off under suction

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.2 Test for resistance to peel

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.3 Test of waterproof membrane for resistance to water pressure

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.4 Test for resistance to thermal shock (sheet membranes)

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.5 Tests for dimensional stability

Suitable tests, complete with acceptance criteria, are described in Part 3 of ACTMAP 1 in respect of:

a) unrestrained shrinkage; and
b) restrained shrinkage.

7.4.6 Test for resistance to sliding (flexible sheets on sloping roofs)

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.7 Test for resistance to cyclical failure

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.8 Test for resistance to static puncture

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.9 Tests for resistance to dynamic puncture

Suitable tests, complete with acceptance criteria, are described in Part 3 of ACTMAP 1 for:

a) French falling arm test; and
b) Gardner impact test.

7.4.10 Test to measure permeability of water vapour

A suitable test, complete with acceptance criteria is described in Part 3 of ACTMAP 1.

7.4.11 Test for single layer waterproofing systems

Suitable tests for single layer systems (ie waterproofing layer is laid as a single sheet, or applied in situ as a continuous membrane), complete with acceptance criteria, are described in Part 3 of ACTMAP 1 in respect of:

a) resistance to leakage at joints;
b) tensile strength (shear) of joints;
c) behaviour of joints due to aging on exposure to elevated temperature; and
d) behaviour of joints due to aging on exporsue to water.

7.4.12 Tests relating to the handling of the waterproofing materials on site

Suitable tests, complete with acceptance criteria, are described in Part 3 of ACTMAP 1 in respect of:

a) resistance to tearing;
b) low temperature flexibility; and
c) unrolling test at low temperature.

Annexure 1: Regulation of house construction in South Africa

Formal housing in South Africa is required to comply with the provision of the National Building Regulations and Building Standards Act (Act No. 103 of 1977). Contractor built housing is also required to comply with the provisions of the Housing Consumer Protection Measures Act (Act 95 of 1998). This Act provides *inter alia,* for warranty protection against defects in new homes, and the establishment of technical standards in and the regulation of the home building industry. This Act in effect requires that all contractor built housing in South Africa be built in accordance with the National Home Builders Registration Council's (NHBRC) Home Building Manual by home builders who are registered with the Council. Accordingly, the design and construction of houses needs to satisfy the provisions of the National Building Regulations and the NHBRC's Technical requirements.

The requirements of the National Building Regulations can be satisfied by:

i) adopting the deemed-to-satisfy rules provided in SANS 10400 and constructing the house in accordance with sound building practice;
ii) preparing a rational design in accordance with the deemed-to-satisfy rules contained in SANS 10400 part B; or
iii) obtaining Agrément certification.

The NHBRC's design requirements may be satisfied by;

i) adopting the rules contained in the Home Building Manual; or
ii) preparing a rational design based on engineering principles; or
iii) obtaining Agrément certification.

The NHBRC's construction requirements can be satisfied by complying either with the requirements of:

i) the relevant portions of the construction standards as set out in the Home Building Manual; or
ii) the standards and specifications referred to in the rational design prepared by a Competent Person; or
iii) the relevant requirements set out in the Agrément certification documentation.

The NHBRC, on advice from its Technical Advisory Committee, accepts both generic and individual submissions in respect of non-standardized construction elements and components prepared by competent persons. Letters of acceptance to this effect are issued.

Agrément South Africa is an independent body operating under a delegation of authority from the Minister of Public Works. It has no commercial interest. It operates in the domain of non-standardized and innovative construction products. The authority of the Agrément South Africa to certificate this type of product is recognised in the National Building Regulations and is utilised by the National Home Builder's Registration Council.

During the evaluation of any product or system, Agrément South Africa uses the best available local and overseas expertise to perform the evaluation, very often expertise from the Council for Scientific and Industrial Research or from similar international organisations. The Agrément certification process has at least three quality checks by different independent groups thereby ensuring fitness for purpose. Compliance where appropriate with a relevant South African or international standard can be taken into account in an Agrément evaluation.

Product compliance with local or international specifications does not imply that the product as a whole is "fit-for-purpose." In some instances a product may have to comply with several standards before being deemed "fit-for-purpose."

Annexure 2: The essential differences between the two User Performance Levels

User performance levels allow the needs and expectations of the users to be reflected in the interpretation of performance requirements. The introduction of user performance levels facilitates an incremental approach to housing as it enables choices to be made between a range of technical options to meet the needs of occupants at a cost that is affordable to such a user at a particular time. For practical reasons, the range of user performance levels needs to be kept to a minimum. In this specification, two user performance levels are provided to interpret the user requirements. User performance level 1 is intended for houses, where for reasons of access to initial capital a user is able to tolerate more frequent maintenance cycles, limited penetration of water to the interiors, discernable deflections, minor levels of cracking etc. User performance level 2 relates to the traditional user requirements in housing involving mortgage lending finance.

The user performance level establishes what the occupant / owner expects under the application of the attribute (performance characteristic) under consideration. It does not make reference to performance but to the results brought about by performance.

The user performance levels in this generic specification are based on those developed by the Joint Structural Division of the South African Institution of Civil Engineering and the Institution of Structural Engineers. A house in which user performance level 1 is nominated in respect of each mandatory attribute would have the following features:

1) have no basements;
2) be of single storey construction;
3) have a floor area not exceeding 80 m²; and
4) have a maximum length between intersecting walls or members providing lateral support of 6,0 metres. ;

The principal difference between the two user performance levels are outlined in Table 2.1.

The essential differences between these two user performance levels may be summarised as follows:

a) **Resistance to rain penetration**
Limited dampness in walls or leakage at joints between components is tolerated in user performance level 1 buildings in exceptionally severe weather conditions. Resistance to rising damp is identical in both levels.

b) **Distress in walls arising from foundation movements in walls and floors**
Distress in both user performance levels is limited to minor damage i.e. aesthetic damage which can be readily repaired or masked during the course of normal redecoration. The severity and occurrence of minor damage in user performance level 1 hosuing located on sites underlain by heaving clay founding horizons and founding horizons susceptible to differential settlement, is greater than that for user performance level 2 on such sites.

c) **Deflection of members**
Deflections in the case of user performance level 1 houses are greater than those in user performance level 2 buildings and may be noticeable to a trained eye.

d) **Resistance to local damage due to hail stones and when struck by blunt and sharp objects**
User performance level 1 houses have an ability to withstand local damage but not to the same extent as is the case for user performance level 2.

e) **Frequency of maintenance cycles**
Maintenance cycles will probably be more frequent in respect of user performance level 1.

f) **Fire safety**

No distinction is made in respect of essential fire safety requirements. However the limitations in size and layout of level 1 buildings is such that occupants can readily escape to safety in the event of a fire and hence the need for fire rated external and internal walls falls away. Prevention of fire spread to adjoining properties is achieved by stipulating appropriate boundary distances in the same way as is done for level 2 buildings.

g) **Construction**

Apart from some relaxation in the accuracy of completed elements, there is no difference in the standard of workmanship required for the two user performance levels.

Table 2.1: Principal differences between the two user performance levels

TECHNICAL ASPECT	DIFFERENCES BETWEEN USER PERFORMANCE LEVELS
Maintenance cycles	Buildings built in terms of user performance level 1 may require more frequent maintenance.
Earthquake	Nil.
Windstorms	Nil.
Deflection and deviation from the horizontal and vertical	User performance level 1 deflections and deviation from the horizontal and vertical are greater than those associated with User Performance Level 2 and may be visible/noticeable to a trained eye although structural performance and safety is not impaired.
Expected damage in walls and floors	The degree of expected damage will generally be greater where user performance level 1 is selected; such damage will nevertheless be of a minor nature and be repairable during the course of normal redecoration.
Behaviour in fire	Restrictions will be placed on the size and layout of the building in the case where user performance level 1 is selected.
Attack by biological agents	Nil.
Abrasion resistance	Nil.
Rising damp	Nil.
Resistance of walls and roofs to rain penetration	Minor ingress may be experienced in infrequent major storms but not to the extent that any permanent damage may be caused.+
Hail resistance	Where user performance level 1 is selected, elements other than normal glazing may be more susceptible to hail damage in severe hail storms.
Resistance to local damage/soft body impact	The resistance to local damage when struck by sharp edged objects and the ability to hold fittings and the impact resistance to soft body impacts will be lower in the case of user performance level 1 than that for user performance level 2. The reduction in performance does not compromise the safety of the structure in any way under all normal circumstances of use.
Accuracy of construction	Tolerances will be greater (i.e. relaxed) in user performance level 1 buildings.

+ It is possible by means of surface coatings to upgrade a user performance level 1 buildings to a user performance level 2 buildings in this aspect.

Annexure 3: National Building Regulations

SANS 10400: the Application of the National Building Regulations contains all the National Building Regulations. The regulations that have specific relevance to subsidy housing include the following.

PART A: ADMINISTRATION

Most of the provisions of Part A apply.

B1. DESIGN REQUIREMENT

(1) Any building and any structural element or component thereof shall be designed to provide strength, stability, serviceability and durability in accordance with accepted principles of structural design, and so that it will not impair the integrity of any other building or property.
(2) Any such building shall be so designed that in the event of accidental overloading the structural system will not suffer disastrous or progressive collapse which is disproportionate to the original cause.

C1 ROOMS AND BUILDINGS

(1) Any room or space shall have dimensions that will ensure that such room or space is fit for the purpose for which it is intended.
(2) The floor area of any dwelling unit shall not be less than that necessary to provide one habitable room and a separate room containing toilet facilities.

D1 CHANGE IN LEVEL

The protection of the edge of any balcony, bridge, flat roof or similar place shall be designed to prevent any person from falling from such balcony, bridge, flat roof or similar place.

D3 RAMPS

Any ramp or driveway shall be so designed that it is safe when used and is fit for the purpose for which it is intended.

F3 UNSTABLE SOIL CONDITIONS

(1) Where any local authority has reason to believe that there may be unstable subsoils or unstable slopes in the area in which a site, upon which a building is to be erected, is situated, it shall so inform the applicant.
(2) Whether or not such local authority has informed such applicant in terms of sub regulation **(1)**, the applicant shall, if any unstable soil or unstable slope is evident within the boundaries of such site, submit to the local authority particulars specifying the measures he considers necessary to make provision for any differential movements or other effects which could be detrimental to such building and the local authority may require such particulars to be prepared by a professional engineer or other approved competent person.
(3) The measures contemplated in sub regulation **(2)** shall be applied in the erection of such building.

F4 PREPARATION OF SITE

(1) Before any foundation is laid the area to be covered by any building shall be properly cleared of vegetable matter, tree stumps, timber and other cellulose material, debris or refuse and any material contaminated with faecal matter.
(2) Where any site upon which any building is to be erected is waterlogged or saturated, or where any building is to be so situated that water will drain naturally towards it, drainage shall be provided to direct such water away from such site or building to a stormwater drain or to dispose of it in some other safe approved manner.

F5 SOIL POISONING

Where so required by the local authority, the soil in all areas within the site as defined in code of practice SANS 10124 shall be treated in accordance with the recommendations of SANS 10124.

H1 GENERAL REQUIREMENT

(1) The foundation of any building shall be designed to safely transmit all the loads from such building to the ground.

J1 GENERAL REQUIREMENT

(1) Any floor of any building shall -

a) be strong enough to safely support its own weight and any loads to which it is likely to be subjected; and

(b) have a fire resistance appropriate to its use and where required, be non-combustible.

(2) The floor of any laundry, kitchen, shower-room, bathroom or room containing a WC pan or urinal shall be water-resistant.

(3) Any suspended timber floor in a building shall be provided with adequate under-floor ventilation.

(4) Where any concrete floor slab is supported on ground or filling such floor shall be so constructed that any moisture present in such ground or filling is prevented from penetrating such concrete floor slab.

K1 STRUCTURAL STRENGTH AND STABILITY

Any wall shall be capable of safely sustaining any loads to which it is likely to be subjected and in the case of any structural wall such wall shall be capable of safely transferring such loads to the foundations supporting such wall.

K2 WATER PENETRATION

Any wall shall be so constructed that it will adequately resist the penetration of water into any part of the building where it would be detrimental to the health of occupants or to the durability of such building.

K3 ROOF FIXING

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 that any forces to which the roof may normally be subjected will be transmitted to such wall.

K4 BEHAVIOUR IN FIRE

Any wall shall have combustibility and fire resistance characteristics appropriate to the location and use of such wall.

L1 GENERAL REQUIREMENT

The roof of any building shall be so constructed that it will -

(a) resist any forces to which it is likely to be subjected;

(b) be durable and waterproof;

(c) not allow the accumulation of any rainwater upon its surface; and

(d) as part of a roof and ceiling assembly provide adequate height in any room immediately below such assembly.

L2 FIRE RESISTANCE AND COMBUSTIBILITY

The fire resistance of any roof or roof and ceiling assembly complete with light fittings or any other component which penetrates the ceiling, shall be appropriate to its use and where necessary such roof or roof and ceiling assembly shall be non-combustible.

M1 GENERAL REQUIREMENT

(1) Any stairway, including any wall, screen, railing or balustrade to such stairway, shall be capable of safely sustaining any loads to which it is likely to be subjected and shall permit safe movement of persons from floor to floor.

(2) Any such stairway shall have dimensions appropriate to its use.

M2 FIRE REQUIREMENT

A stairway contemplated in regulation M1 shall comply with the relevant requirements in Part T of these regulations.

N1 TYPE AND FIXING OF GLAZING

(1) Any material used in the glazing of any building shall be of a secure and durable type and shall be fixed in a manner and position that will ensure that it will -
(a) safely sustain any wind loads to which it is likely to be subjected;
(b) not allow penetration of water to the interior of the building; and
(c) be apparent, in the case of clear glazing, to any person approaching such glazing.

(2) Glass, plastics and organic coated glass shall be selected in order to provide, in the case of human impact, a degree of safety appropriate in relation to -
(a) the position of the glazed area; and
(b) the number and likely behaviour pattern of persons expected to be in close proximity to such glazed area.

NN2 INSTALLATION OF GLAZING

NN2.1 In any vertical glazing installation, any pane of glass and the fixing of such pane shall comply with the following requirements:
(a) Where such pane is to be exposed to the effect of wind, the thickness of such pane in relation to its area shall be in accordance with SANS 10137;
(b) Such pane shall be fixed in the frame in accordance with any suitable method described in SANS 10137 and such frame shall be so installed that it is capable of sustaining the total wind load for which such pane was designed; and
(c) Notwithstanding the requirements of paragraph **(a)**, the nominal thickness of a pane of glass shall be not less than that given in Table 1.

TABLE 1 - GLASS DIMENSIONS

1	2
Nominal glass thickness, mm	**Maximum size of pane, m²**
3	0,75
4	1,5
5	2,1
6	3,2

NN2.2 Any pane of glass, not being a door leaf contemplated in sub rule **NN2.3**, which is to be installed without the support of a frame, shall be in accordance with SANS 10137.

NN2.3 Any door leaf made entirely of glass which is not fully contained in a frame shall be in accordance with SANS 10137: Provided that such requirements shall not apply to any cupboard door.

NN2.4 Where clear glazing is used and is not likely to be apparent to or suspected by any person approaching it, such glazing shall bear markings which shall render such glazing apparent to such person.

NN3 SAFETY GLAZING

NN3.1 Any pane of glass installed in any door shall, where not made of safety glass, be not more than 1 m² in area and shall have a nominal thickness of not less than 6 mm .

O1 LIGHTING AND VENTILATION REQUIREMENT

(1) Any habitable room, bathroom, shower-room and room containing a WC pan or urinal, or any room which is a parking garage shall be provided with a means of lighting and ventilation which will enable such room to be used, without detriment to health or safety or causing any nuisance, for the purpose for which it is designed.

O2 SPECIAL PROVISION OF NATURAL LIGHTING

Any habitable room in any dwelling house or dwelling unit, or any bedroom in any building used for residential or institutional occupancy shall, notwithstanding the provision of artificial lighting, be provided with at least one opening for natural light in accordance with sub regulation **O1(1)**.

O7. FIRE REQUIREMENTS

In addition to the requirements of this Part, lighting and ventilation shall be provided to comply with Part T of these regulations.

P1. COMPULSORY DRAINAGE OF BUILDINGS

(1) **(a)** Where in respect of any building a suitable means of disposal of waterborne sewage is available the owner of such building shall provide a drainage installation.
(b) Where there is no such means of disposal, sewage shall be disposed of in accordance with Part Q of these regulations.

(2) **(a)** Where a sewer is or becomes available for the drainage of such building the owner of such building shall, at his own cost, lay, alter or extend any drain serving such building to terminate at a location and level as prescribed by the local authority for the connection to such sewer.
(b) In the case of any existing building the local authority shall serve a notice, in writing, upon the owner stating the period within which the connection contemplated in paragraph **(a)** shall be made.

(3) Where a connecting sewer has been provided to any site the owner of such site shall cause all sewage discharged from any building on such site to be conveyed by a drain to such connecting sewer.

(4) Where the owner of such building fails to lay, alter or extend any drain in terms of sub regulation **(2)** the local authority may lay, alter or extend such drain and recover the costs thereof from the owner: Provided that the local authority shall, before carrying out such work give not less than 14 days notice to such owner of its intention to carry out such work.

(5) Any owner who fails to comply with any requirement of sub regulation **(1)** or **(2)**, shall be guilty of an offence.

P2. DESIGN OF DRAINAGE INSTALLATIONS

(1) Any drainage installation in any building shall be so designed and constructed that -
(a) an adequate number of sanitary fixtures is provided in relation to the population and class of occupancy of such building;
(b) such installation is capable of carrying the design hydraulic load;
(c) such installation is capable of discharging into any common drain, connecting sewer or sewer provided to accept such discharge;
(d) all components and materials used in such installation are watertight;
(e) no nuisance or danger to health will be caused as a result of the operation of any such installation;
(f) any drain in such system is of such strength, having regard to the manner in which it is bedded or supported, that it is capable of sustaining the loads and forces to which it may normally be subjected and that it is, where necessary, protected against any damage;
(g) all sanitary fixtures are so located that they are easily accessible to those persons they are intended to serve;
(h) any necessary inspection, cleaning and maintenance required may be performed through the means of access provided.

P3. CONTROL OF OBJECTIONABLE DISCHARGE

(1) No person shall cause or permit sewage discharged from any sanitary fixture to enter -
(a) any stormwater drain, stormwater sewer or excavated or constructed watercourse;
(b) subject to the Water Act, 1956 (Act No. 54 of 1956), any river, stream or natural watercourse whether ordinarily dry or otherwise; or
(c) any street or other site.

(2) No person shall cause or permit stormwater to enter any drainage installation on any site.

(3) The local authority may by notice in writing order the owner of any site to execute, at his own cost, any precautionary measures required by the local authority to prevent such entry contemplated in sub regulation **(1)** or **(2)**, as the case may be.

(4) No person shall, without the written permission of the local authority, discharge or cause the discharge of any water from a swimming pool, fountain or reservoir, either directly or indirectly, onto any public street or public place, or onto any site other than onto the site upon which such swimming pool, fountain or reservoir is situated.

(5) Any person who contravenes or permits the contravention of any requirement of this regulation or fails to comply with a notice served on him in terms of sub regulation **(3)**, shall be guilty of an offence.

P6. UNAUTHORIZED DRAINAGE WORK

(1) Unless authorized by the local authority -
(a) no person shall in any manner interfere with any sewer or connecting sewer;

(b) no person shall break into or interfere with any part of a drainage installation other than for the purpose of repair and maintenance.

(2) Any person who carries out or permits the carrying out of any unauthorized work contemplated in this regulation, shall be guilty of an offence.

P7. INSPECTION AND TESTING OF DRAINAGE INSTALLATIONS

(1) Any drain, discharge pipe or ventilating pipe shall be so installed as to be capable of withstanding the test pressures contemplated in rule **PP26** or **PP27**, as the case may be, contained in section 3 of SANS 10400 and such tests shall be carried out in the presence of the building control officer of, or other officer duly authorized by, the local authority.

(2) Any equipment, material or labour required for any inspection or any testing contemplated in Part P of these regulations shall be made available by the person installing such pipe or drain.

(3) No person shall put into use any drainage installation before such installation has been inspected, tested and passed by the local authority as complying with these regulations.

(4) Any person who contravenes the requirement of sub regulation **(3)**, shall be guilty of an offence.

Q1. MEANS OF DISPOSAL

Where water-borne sewage disposal is not available other means of sewage disposal shall be permitted by the local authority: Provided that in the case of chemical or pail closets a satisfactory means is available for the removal and disposal of sewage from such closets.

Q2. PERMISSION

No person shall construct any pit latrine without the permission of the local authority.

Q3. CONSTRUCTION, SITING AND ACCESS

(1) Any such other means of sewage disposal shall be so constructed, sited and provided with access that the health and convenience of persons using such means shall not be adversely affected.

(2) The number of sanitary receptacles shall be adequate for the population of the building served by such receptacles.

R1. STORMWATER DISPOSAL REQUIREMENT

(1) The owner of any site shall provide an approved means for the control and disposal of accumulated stormwater which may run off from any earthworks, building or paving.

(2) Such means of stormwater disposal may be in addition to or in combination with any drainage works required in terms of regulation **F4(2)**.

R2. SAVING

(1) These regulations shall not be construed to require the installation in any building of any roof gutter or down pipe where other suitable means has been provided to ensure the disposal or dispersal away from such building of rainwater from the roof of such building.

(2) The regulations in this Part shall not apply to any site used exclusively for the erection of any dwelling house or any building appurtenant thereto: Provided that where, due to special site features, the discharge of stormwater from such site may cause significant damage, the local authority may require compliance with regulation **R1**.

T1. GENERAL REQUIREMENT

(1) Any building shall be so designed, constructed and equipped that in case of fire -

(a) the protection of occupants or users therein is ensured and that provision is made for the safe evacuation of such occupants or users;

(b) the spread and intensity of such fire within such building and the spread of fire to any other building will be minimized;

(c) 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;

(d) the generation and spread of smoke will be minimized or controlled to the greatest extent reasonably practicable; and

(e) adequate means of access and equipment for detecting, fighting, controlling and extinguishing such fire is provided.

Annexure 4: NHBRC Technical Requirements

The technical requirements published in regulation R1406 of the Housing Consumer Protection Measures Act (1 December 1999), which are reproduced in the Home Building Manual, are as follow.

1 Structural strength and stability

1.1 General

All housing units and any structural element or component thereof shall be designed and constructed to provide strength and stability, for the lifetime of the structure, in accordance with current, accepted standards of good practice. All timber to be used in a building shall comply with the requirements of SANS 1005, and shall bear the certification mark of SABS or the acceptable certification mark of any other standards authorities.

1.2 Foundations (Substructure)

Foundations shall be designed and constructed to transmit loads from superstructures to soil horizons safely and without causing excessive movement or distress in the elements, which they support.

1.3 Floors and Stairways

Floors and stairways shall be designed and constructed to carry their own dead loads, in addition to any live loads which they are likely to be subjected, safely and without undue deformation and distress.

1.4 Walls (Superstructure)

Walls shall be designed and constructed to safely withstand any load to which they are likely to be subjected without impairing weather tightness and without undue deformation and distress.

1.5 Roofs

Roofs and their components shall be designed and constructed to safely resist any forces to which they are likely to be subjected and without the roof construction or covering becoming detached from its respective supporting structure.

2 Serviceability.

2.1 General

All housing units and any structural element or component thereof shall be durable, resist water penetration and prevent condensation which may adversely affect fitness for purpose, and withstand any loads to which they are likely to be subjected without undue deflection, distortion or cracking, over the lifetime of the structure.

2.2 Foundations (Substructure)

Foundations shall be designed and constructed to resist differential displacement and to prevent the passage of moisture to the interior of housing units.

2.3 Walls (Superstructure)

Walls shall be designed and constructed to resist the penetration of water into the interior of housing units.

2.4 Roofs

Roofs shall be designed and constructed to resist rain penetration and to avoid the accumulation of rainwater thereon.

3 Behaviour in Fire

The combustibility and fire resistance characteristics of all floors, walls, roofs and ceiling assemblies shall be appropriate to the location and use of such elements.

4 Materials

Materials used in the construction of housing units shall be sufficiently durable and of a suitable quality for the purpose for which they are to be used.

5 Drainage

Drainage installations shall be designed and constructed so that the installation is capable of carrying the hydraulic design load and of being easily maintained.

6 Stormwater Disposal

Suitable means, preferably of a fail-safe nature, shall be provided for the control and disposal of stormwater in a manner which does not result in soil erosion or flooding which may detrimentally affect the structural performance of housing units.

Annexure 5: Specification data

The following specification data is required for procurement purposes.

1 Variations to the generic specification, if any

Delete and replace clauses or amend wording as deemed necessary.

Example: It may be necessary to amendment the text to make provision for temporary VIPs as the text currently makes provision for permanent pit linings.

2 Contract specific data

2.1 Mandatory attributes

Delete the data options that are not applicable / complete as indicated:

Attribute	Reference	Guidance on data required
Condensation	5.3	**Indicate:** Location: within SCCP Area / outside of SCCP Area
		Indicate: User performance level: 1 / 2 **(if in within SCCP Area)**
Fire safety	5.3	**Indicate:** User performance level: 1 / 2
Functionality (lighting)	5.5.11	**Indicate:** User performance level: 1 / 2
Functionality (ventilation)	5.5.12	**Indicate:** User performance level: 1 / 2
Moisture penetration (resistance to rain penetration)	5.6.1	**Indicate:** User performance level: 1 / 2
Sanitation (sanitary fittings)	5.7.1.1	**Indicate:** User performance level: 1 / 2
Sanitation options	5.7.1.1 5.7.2 5.7.3 5.7.4 5.7.5 5.7.6	**Indicate acceptable options:** Waterborne sanitation Septic Tank Conservancy tank On-site digester: French drain / small bore sewer Ventilated improved pit latrine
Structural safety (hail)	Table 6 (roof)	**Indicate:** User performance level: 1 / 2
Structural safety (soft body impacts)	Table 6 (walls)	**Indicate:** User performance level: 1 / 2
Structural safety (Sharp body impacts)	Table 6 (walls)	**Indicate:** User performance level: 1 / 2
Structural safety (Fittings)	Table 6 (walls)	**Indicate:** Nominate safe load for shelving, if required.
Structural serviceability (tilt)	Table 7 (house structure)	**Indicate:** User performance level: 1 / 2
Structural serviceability (settlement)	Table 7 (house structure)	**Indicate:** User performance level: 1 / 2
Structural serviceability (deflection)	Table 7 (roof)	**Indicate:** User performance level: 1 / 2
Structural serviceability (deflection)	Table 7 (walls)	**Indicate:** User performance level: 1 / 2
Structural serviceability (ground movements)	Table 7 (walls)	**Indicate:** Category of expected damage: 0 / 1 / 2

Structural serviceability (deflection)	Table 7 (floors)	**Indicate:** User performance level: 1 / 2
Structural serviceability (indirect actions)	Table 7 (floors)	**Identify** which floor areas are to be covered with carpets and flexible floor coverings / semi flexible or rigid tiles **or indicate** Category of expected damage: 0 / 1 / 2
Structural serviceability (deflection	Table 7 (floors)	**Indicate:** Category of expected damage: 0 / 1 / 2

2.2 Optional attributes

Indicate which of the following optional attributes are applicable:

Attribute	**Reference**	**Guidance on data required**
Acoustic (general)	5.9	**Indicate if required.**
Construction accuracy	5.10	**Indicate if required, and if so:** User Performance level 1 or 2
Water saving measures	5.11	**Indicate if required.**

Annexure 6: Community preference schedule

The community choices / performance expectations should be captured in the following schedule. This schedule should serve as the briefing to designers. The tabulation of the importance of desirable requirements and the attainment of superior user performance levels should form part of the tender evaluation criteria where the turnkey contracting strategy is pursued. This approach will reward tenderers who undertake to satisfy community preferences.

Communities should indicate their preferences in respect of the following. A weighting should be attached to each option selected to indicate the relative importance attached to the option. The sum of all weightings should equal 100.

Tenderers should be required to provide an undertaking that not less than 90% of houses in a development shall satisfy a nominated parameter to qualify for a preference. The preference schedule should form part of any contract entered into.

Part A: Basic parameters

Consideration	Issue	Parameter	Tick appropriate option	Weighting
Floor area	Size of house	32,5 m^2		
		35,0 m^2		
		37,5 m^2		
		40,0 m^2		
		42,5 m^2		
		45,0 m^2		
Toilet	Location	Internal		
		External		
Sanitation system	Type	None		
		Waterborne		
		Septic Tank		
		Conservancy tank		
		On-site digester		
		Ventilated improved pit latrine		
		Other (specify)		
Community facilities	Expenditure of any residual subsidy amounts	Community hall		
		Other (specify)		
		None		
Construction type	Easy to extend	Traditional materials ie concrete floors, masonry walls and timber roof trusses		
		Other (specify)		
Construction materials (only complete if the preference is for the use of traditional materials)	Preference for appearance	Masonry walls (plastered)		
		Masonry walls (face)		
		Masonry walls (bagged)		
		Sheeted roof		
		Tiled roof		
		Mono-pitched roofs		
		Pitched roof		
		Gable ends		
		No gable ends		
		Flat roof		
Storeys	Preference	Single storey		
		Double storey		

Erf size		Less than 100 m^2		
		150 m^2		
		200 m^2		
		250 m^2		
		300 m^2 or greater		
Variation in houses	Aesthetics	3 or more different floor plans		
		5 different floor plans		
		Different colour		
		Different roof types		

Part B: Parameters associated with mandatory attributes

Mandatory Attribute	Reference	Parameter	Tick appropriate option	Weighting
Condensation	5.3	UPL 1		
		UPL2		
Fire safety	5.3	UPL 1		
		UPL2		
Functionality (lighting)	5.5.11	UPL 1		
		UPL2		
Functionality (ventilation)	5.5.12	UPL 1		
		UPL2		
Moisture penetration (resistance to rain penetration)	5.6.1	UPL 1		
		UPL2		
Sanitation (sanitary fittings)	5.7.1.1	UPL 1		
		UPL2		
Structural safety (hail)	Table 6 (roof)	UPL 1		
		UPL2		
Structural safety (soft body impacts)	Table 6 (walls)	UPL 1		
		UPL2		
Structural safety (Sharp body impacts)	Table 6 (walls)	UPL 1		
		UPL2		
Structural serviceability (tilt)	Table 7 (house structure)	UPL 1		
		UPL2		
Structural serviceability (settlement)	Table 7 (house structure)	UPL 1		
		UPL2		
Structural serviceability (deflection)	Table 7 (roof)	UPL 1		
		UPL2		
Structural serviceability (deflection)	Table 7 (walls)	UPL 1		
		UPL2		
Structural serviceability (ground movements)	Table 7 (walls)	CED 1		
		CED 2		
Structural serviceability (deflection)	Table 7 (floors)	UPL 1		
		UPL2		
Structural serviceability (indirect actions)	Table 7 (floors)	UPL 1		
		UPL2		

Note: UPL = user performance level
CED= Category of expected damage

Part C Optional attributes

Optional Attribute	Reference	Parameter	Tick appropriate option	Weighting
Acoustic (general)	5.9	**-**		
Construction accuracy	5.10	UPL 1		
		UPL 2		
		House orientation option		
		Roof overhang option		
		House planning option		
		Thermal performance option		
Water saving measures	5.11	**-**		