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Edition 4

SOUTH AFRICAN NATIONAL STANDARD

The application of the National Building Regulations

Part Q: Non-water-borne means of sanitary disposal

WARNING

This document references other documents normatively.

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Table of changes

Change No.	Date	Scope

Foreword

This South African standard was prepared by National Committee SABS/TC 060, *Standards which address the National Building Regulations (NBRS)*, in accordance with procedures of the South African Bureau of Standards, in compliance with annex 3 of the WTO/TBT agreement.

This document was approved for publication in July 2021.

This document supersedes SANS 10400-Q:2017 (edition 3.1).

This document should be read in conjunction with SANS 10400-A.

Compliance with this document cannot confer immunity from legal obligations.

Compliance with the requirements of this document will be deemed to be compliance with the requirements of part Q of the National Building Regulations, issued in terms of the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977).

SANS 10400 consists of the following parts, under the general title *The application of the National Building Regulations*:

Part A: General principles and requirements.

Part B: Structural design.

Part C: Dimensions.

Part D: Public safety.

Part F: Site operations.

Part G: Excavations.

Part H: Foundations.

Part J: Floors.

Part K: Walls.

Part L: Roofs.

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Foreword *(concluded)*

Part M: Stairways.

Part N: Glazing.

Part O: Lighting and ventilation.

Part P: Drainage.

Part Q: Non-water-borne means of sanitary disposal.

Part R: Stormwater disposal.

Part S: Facilities for persons with disabilities.

Part T: Fire protection.

Part V: Space heating.

Part W: Fire installation.

Part XA: Energy usage in buildings.

Annex A is for information only.

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The application of the National Building Regulations

Part Q:

Non-water-borne means of sanitary disposal

The following extracts from The National Building Regulations are reproduced in this part of SANS 10400 for ease of reference.

NATIONAL BUILDING REGULATIONS

AZ2 – DEFINITIONS

In these regulations any word or expression to which a meaning has been assigned in the Act, shall bear that meaning and, unless the context indicates otherwise –

"acceptable", "adequate" or "satisfactory"

means acceptable, adequate, or satisfactory –

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

"action"

means an assembly of concentrated or distributed mechanical forces acting on a building or the cause of deformations imposed on the building or constrained in it;

"Agrément certificate"

means a certificate that confirms fitness-for-purpose of a non-standardised product, material or component or the acceptability of the related non-standardised design and the conditions pertaining thereto (or both) issued by the Board of Agrément South Africa;

"air duct"

means any pipe, tube, conduit or enclosed space used or to be used in any building for the transmission of air in an artificial ventilation system;

"applicant"

means any person who makes an application;

"application"

means an application contemplated in section 4 of the Act;

"approval"

means -

- (a) approval by any local authority, including approval contemplated in section 7(7)(b) of the Act; or
- (b) approval by the review board on appeal to the review board in terms of the Act;

"approved"

means -

- (a) approved by any local authority; or
- (b) approved by the review board on appeal to the review board in terms of the Act;

"artificial ventilation system"

means a system in which air is caused to circulate through a room by means of a mechanical apparatus which forces air into or extracts air from such room;

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"branch discharge pipe"

means a horizontal discharge pipe conveying the discharge from one or more sanitary fixtures to a discharge stack;

"Board of Agrément South Africa"

the body that operates under the delegation of authority of the Minister of Public Works;

"building envelope"

means the elements of a building that separate a habitable room from the exterior of a building or a garage or storage area;

"building line"

in relation to a site, means a line prescribed in any town planning scheme or any other law designating the boundaries of the area of the site outside of which the erection above ground of any building is prohibited;

"capacity"

of any storage tank means the volume of such tank between the operating level of the water contained in such tank and the invert of the outlet from the tank;

"carport"

means a building intended to provide shelter for a motor vehicle, caravan or boat and having a roof but having walls on not more than two sides;

"certified thermal calculation software"

means software certified by the Board of Agrément South Africa in terms of Agrément South Africa's Energy Software Protocols as being fit for thermal modelling or calculation purposes in terms of these regulations;

"chemical closet"

means a closet with a fixed pan, the excreta from which pass into a tank where they are acted upon by chemicals which sterilize and break them down;

"chimney"

means that part of a building which forms part of a flue, but does not include a flue pipe;

"cleaning eye"

means any access opening to the interior of a discharge pipe or trap provided for the purposes of internal cleaning, and which remains permanently accessible after completion of the drainage installation;

"combustible"

means the opposite of non-combustible;

"common drain"

means that portion of a drain which conveys sewage other than or in addition to that sewage which emanates from the site through which such drain runs;

"communication pipe"

means any pipe in a water supply system to which any water installation is connected;

"competent person"

means a person who is qualified by virtue of his education, training, experience and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of these regulations;

"connecting sewer"

means a pipe vested in the local authority which connects a drain to a sewer;

"conservancy tank"

means a covered tank used for the reception and temporary retention of sewage and which requires emptying at intervals;

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"contaminated land"

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

"deemed-to-satisfy provision"

means non-mandatory requirement, the compliance with which ensures compliance with a functional regulation;

"discharge pipe"

means a pipe which conveys the discharge from a sanitary fixture to a drain, and includes a soil pipe, a waste pipe, a discharge stack, a branch discharge pipe or a fixture discharge pipe;

"discharge stack"

means any vertical discharge pipe which conveys the discharge from two or more sanitary fixtures and which is connected directly to a drain;

"dolomite land"

means land underlain by dolomite or limestone rock directly or at a shallow depth less than:

- (a) 60 m in areas underlain by limestone;
- (b) 60 m in areas underlain by dolomite where no de-watering has taken place and the local authority has jurisdiction, is monitoring and has control over the groundwater levels over the areas under consideration; or
- (c) 100 m in areas underlain by dolomite where de-watering has taken place or where the local authority has no jurisdiction or control over groundwater levels.

"drain"

means that part of any drainage installation outside a building and which is below ground level, but shall not include the following –

- (a) any discharge pipe;
- (b) that portion of a discharge stack which is below ground level;
- (c) the bend at the foot of a discharge stack;

"drainage installation"

means any installation vested in the owner of a site and which is situated on such site and is intended for the reception, conveyance, storage or treatment of sewage, and may include sanitary fixtures, traps, discharge pipes, drains, ventilating pipes, septic tanks, conservancy tanks, sewage treatment works, or mechanical appliances associated therewith;

"dwelling house"

means a single dwelling unit and any garage and other domestic outbuildings thereto, situated on its own site;

"dwelling unit"

means a unit containing one or more habitable rooms and provided with adequate sanitary and cooking facilities;

"emergency route"

means that part of an escape route which provides fire protection to the occupants of any building and which leads to an escape door;

"escape door"

means that door in an escape route which, at ground level, leads directly to a street or public place or to any approved open space which leads to a street or public place;

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"escape route"

means the entire path of travel from the furthest point in any room in a building to the nearest escape door and may include an emergency route;

"exit door"

means any door that is a component of an escape route from any room;

"fire installation"

means any water installation which conveys water solely for the purpose of fire-fighting;

"fire resistance"

means the shortest period for which a building element or component will comply with the requirements for stability, integrity and insulation when tested in accordance with SANS 10177-2;

"fixture discharge pipe"

means a discharge pipe which conveys the discharge from a single sanitary fixture;

"flammable"

means having a closed cup flash point lower than 90 °C;

"floor area"

in relation to a building or a storey thereof, means the total area enclosed within its external walls, exclusive of the area occupied by any lift shaft;

"flue"

means a passage which conveys the discharge of a heat generating appliance to the external air;

"flue pipe"

means a pipe forming a flue but does not include a pipe built as a lining into a chimney;

"foundation"

means that part of a building which is in direct contact with and is intended to transmit loads to the ground;

"foundation wall"

means that portion of a wall between the foundation and the lowest floor above such foundation;

"french drain"

means a trench filled with suitable material which is used for the disposal of liquid effluent from a septic tank or waste water;

"functional regulation"

means a regulation that sets out in qualitative terms what is required of a building or building element or building component in respect of a particular characteristic without specifying the method of construction, dimensions or material to be used;

"garage"

means an enclosed area which is used or intended to be used for the parking, storing, servicing or repairing of motor vehicles;

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"geotechnical site investigation"

the process of evaluating the geotechnical character of a site in the context of existing or proposed works or land usage, which may include one or more of the following:

- (a) evaluation of the geology and hydrogeology of the site;
- (b) examination of existing geotechnical information pertaining to the site;
- (c) excavating or boring in soil or rock and the systematic description of the soil and rock profiles;
- (d) determining the depth of any fill that might be present;
- (e) in-situ assessment of geotechnical properties of materials;
- (f) recovery of samples of soil or rock for examination, identification, recording, testing or display;
- (g) testing of soil or rock samples to quantify properties relevant to the purpose of the investigation;
- (h) evaluation of geotechnical properties of tested soils; and
- (i) reporting the results;

"gully"

means a pipe fitting incorporating a trap into which waste water is discharged;

"habitable room"

means a room used or designed, erected, adapted or intended to be used by persons for sleeping in, living in, the preparation or consumption of food or drink, the transaction of business, the rendering of professional services, the manufacture, processing or sale of goods, the performance of work, the gathering together of persons or for recreational purposes;

"industrial effluent"

means any liquid whether or not containing matter in solution or suspension which is given off in the course of or as a result of any industrial, trade, manufacturing, mining or chemical process or any laboratory, research or agricultural activity, and includes any liquid other than soil water, waste water or stormwater;

"inspection"

means the general inspection by a competent person of a system or measure or installation of a building, or part thereof, at such intervals as might be necessary in accordance with accepted professional practice to enable such competent person to be satisfied that the design assumptions are valid, the design is being correctly interpreted and the work is being executed generally in accordance with the designs, appropriate construction techniques and good practice but shall exclude detailed supervision and day-to-day inspection;

"inspection chamber"

means a chamber not deeper than 750 mm and of such dimension that access may be obtained to a drain without requiring a person to enter into such chamber;

"inspection eye"

means any access opening to the interior of any pipe or pipe fitting in a drainage installation provided solely for the purpose of inspection and testing, and to which permanent access after completion of the drainage installation need not be provided;

"load"

means the value of a force corresponding to an action;

"manhole"

means a chamber of a depth greater than 750mm and of such dimension that allows entry of a person into such chamber for the purpose of providing access to a drain;

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"minor building work"

as contemplated in section 13 of the Act means –

(a) the erection of any –

- (i) poultry house not exceeding 10 m² in area;
- (ii) aviary not exceeding 20 m² in area;
- (iii) solid fuel store not exceeding 10 m² in area and 2m in height;
- (iv) tool shed not exceeding 10 m² in area;
- (v) child's playhouse not exceeding 5 m² in area;
- (vi) cycle shed not exceeding 5 m² in area;
- (vii) greenhouse not exceeding 15 m² in area;
- (viii) open-sided car, caravan or boat shelter or a carport where such shelter or carport does not exceed 40m² in area;
- (ix) any free-standing wall constructed of masonry, concrete, steel, aluminium or timber or any wire fence where such wall or fence does not exceed 1,8 m in height at any point above ground level and does not retain soil;
- (x) any pergola;
- (xi) private swimming pool;
- (xii) change room, not exceeding 10 m² in area, at a private swimming pool;

(b) the replacement of a roof or part thereof with the same or similar material;

(c) the conversion of a door into a window or a window into a door without increasing the width of the opening;

(d) the making of an opening in a wall which does not affect the structural safety of the building concerned;

(e) the partitioning or the enlarging of any room by the erection or demolition of an internal wall if such erection or demolition does not affect the structural safety of the building concerned;

(f) the erection of any solar water heater not exceeding 6 m² in area on any roof or 12 m² when erected other than on any roof; and

(g) the erection of any other building where the nature of the erection is such that in the opinion of the building control officer it is not necessary for the applicant to submit, with his application, plans prepared in full conformity with these regulations;

"natural ventilation"

means the movement of air through a building due to natural causes;

"non-combustible"

means classified as non-combustible when tested in accordance with code of practice SANS 10177-5;

"occupancy"

means the particular use or the type of use to which a building or portion thereof is normally put or intended to be put;

"orientation"

means the direction a building envelope element faces, i.e. the direction of a vector perpendicular to and pointing away from the surface outside of the element.

"persons with disabilities"

means those persons who have long-term physical, mental, intellectual or sensory impairments which in interaction with various barriers might hinder their full and effective participation in society on an equal basis with others;

"population"

means the population determined in accordance with regulation A21;

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"prescriptive regulation"

means a regulation which describes in some detail an operation to be performed, or the dimensions of a building, building element or building component and the materials and method of construction to be used in such building, building element or building component;

"public place"

means any square, park, recreation ground or open space which -

- (a) is vested in the local authority; or
- (b) the public has the right to use; or
- (c) is shown on a general plan of a township filed in a deeds registry or a Surveyor-General's office and has been provided for or reserved for the use of the public or the owners of erven in such township;

"rational assessment"

means assessment by a competent person of the adequacy of the performance of a solution in relation to requirements including, as necessary, a process of reasoning, calculation and consideration of accepted analytical principles, based on a combination of deductions from available information, research and data, appropriate testing and service experience;

"rational design"

means any design by a competent person involving a process of reasoning and calculation and which may include a design based on a standard or other suitable document;

"reference building"

means a hypothetical building that is used to determine the maximum allowable heating load for the proposed building.

"rodding eye"

means an access opening in a drainage installation provided for the purposes of gaining full-bore access to the interior of a drain for internal cleaning, and which remains permanently accessible after completion of the installation, but does not include an inspection chamber or manhole;

"sanitary fixture"

means a receptacle to which water is permanently supplied, and from which waste water or soil water is discharged;

"sewage"

means waste water, soil water, industrial effluent and other liquid waste, either separately or in combination, but does not include stormwater;

"sewer"

means a pipe or conduit which is the property of or is vested in the local authority and which is used or intended to be used for the conveyance of sewage;

"site"

means any erf, lot, plot, stand or other piece of land on which a building has been, is being or is to be erected;

"soil fixture"

means a sanitary fixture which receives and discharges soil water;

"soil pipe"

means a discharge pipe which conveys soil water;

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"soil water"

means liquid containing excreta;

"sprinkler system"

means an approved system of piping and sprinkler heads connected to a water supply which when actuated by the effect of fire automatically releases water;

"stairway"

means any part of a building which provides a route of travel between different levels in such building and is formed by a single flight or by a combination of two or more flights and one or more intervening landings;

"storage tank"

means any tank, other than any tank used for storage of hot water or any cistern serving a toilet pan or a urinal, which forms part of a water installation and is used for the storage of water;

"storey"

means that part of a building which is situated between the top of any floor and the top of the floor next above it, or if there is no floor above it that portion between such floor and the ceiling above it (any open work floor, catwalk or gallery being taken to be part of the storey in which it is situated), and in relation to a building -

- (a) the ground storey shall be taken as the storey in which there is situated an entrance to the building from the level of the adjoining ground or, if there is more than one such storey the lower or lowest of these;
- (b) a basement shall be taken to be any part of the building which is below the level of the ground storey;
- (c) an upper storey shall be taken to be any storey of the building which is above the level of the ground storey; and
- (d) the height expressed in storeys shall be taken to be that number of storeys which includes all storeys other than a basement;

"stormwater"

means water resulting from natural precipitation or accumulation and includes rainwater, surface water, subsoil water or spring water;

"stormwater drain"

means a pipe, conduit or surface channel situated on a site, which is used to convey stormwater to a suitable point of discharge;

"stormwater sewer"

means a pipe, conduit or channel, owned by or vested in the local authority, which is used for the conveyance of stormwater;

"street"

means any street, road, thoroughfare, lane, footpath, sidewalk, subway or bridge which –

- (a) is vested in the local authority; or
- (b) the public has the right to use; or
- (c) is shown on a general plan of a township filed in a deeds registry or a Surveyor-General's office and has been provided or reserved for use by the public or the owners of erven in such township;

"structural"

means relating to or forming part of any structural system;

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"structural system"

in relation to a building, means the system of constructional elements and components of any building which is provided to resist the loads acting upon it and to transfer such loads to the ground upon which the foundation of the building rests;

"structural wall"

means a wall forming part of any structural system;

"suitable"

means capable of fulfilling or having fulfilled the intended function or fit for its intended purpose;

"temporary building"

means any building that is so declared by the owner and that is being used or is to be used for a specified purpose for a specified limited period of time, but does not include a builder's shed;

"the Act"

means the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977);

"trained plumber"

means any person who in the trade of plumbing has, in terms of the Manpower Training Act, 1981 (Act No. 56 of 1981), passed a qualifying trade test or has been issued with a certificate of proficiency or has obtained a National Certificate in Construction Plumbing, National Qualification Framework level 3;

"trap"

means a pipe fitting or a part of a sanitary fixture which is designed to retain a water seal;

"ventilating pipe"

means a pipe which leads to the open air at its highest point and which provides ventilation throughout a drainage installation for the purpose of preventing the destruction of water seals, but does not include a discharge pipe;

"waste pipe"

means a discharge pipe which conveys waste water only;

"waste water"

means used water not contaminated by soil water or industrial effluent and shall not include stormwater;

"water fitting"

means any component, other than a pipe, of any water installation, through which water passes or in which it is stored;

"water installation"

means an installation used or intended to be used for the conveyance or storage of water in any building or on any site on which such building is situated and includes any pipe or any water fitting other than any water meter vested in the local authority;

"water seal"

means the water in a trap which acts as a barrier against the flow of any foul air or gas;

"water supply system"

means any system of structures, aqueducts, pipes, valves, pumps, meters or other appurtenances relating thereto which are vested in the local authority and are used or intended to be used by it in connection with the supply of water;

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"wind load"

means the force exerted by the action of wind;

National Building Regulations

Part Q: Non-Water-Borne Means of Sanitary Disposal Definitions

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:

- (a) it stores, conveys, processes and disposes of human body wastes and wastewater in such a way that the pathogens, pollutants and contaminants associated therewith do not compromise the health and safety of the original user or others; and
- (b) in the case of chemical or toilet a satisfactory means is available for the removal and disposal of sewage from such closets.

Q2 Permission

No person shall construct any pit toilet 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.
- (3) (a) The requirements of subregulation (1) shall be deemed to be satisfied where the design and construction, siting of, and access to such other means of sewage disposal complies with SANS 10400-Q: Provided however that where a local authority is of the opinion that the nature of the means of sanitary disposal is such that it is essential for such installation to be the subject of an approved rational design prepared by an approved competent person, such local authority shall, in writing, notify the owner of such building of its reasons for the necessity for such design and may require such owner to submit for approval plans and particulars of a complete installation based on such design.
- (b) The requirements contained in subregulation (2) shall be deemed to be satisfied where the number of receptacles is in accordance with the requirements for the provision of sanitary fixtures contained in regulation F11 or P2, as the case may be.

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1 Scope

This part of SANS 10400 specifies deemed-to-satisfy requirements for compliance with part Q (Non-Water-Borne Means of Sanitary Disposal) of the National Building Regulations.

2 Normative references

The following referenced documents, in whole or in part, are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies. Information on currently valid national and international standards can be obtained from the South African Bureau of Standards.

SANS 2001-CC1, *Construction works – Part CC1: Concrete works (structural)*.

SANS 2001-CC2, *Construction works – Part CC2: Concrete works (minor works)*.

SANS 2001-CM1, *Construction works – Part CM1: Masonry walling*.

SANS 2001-CM2, *Construction works – Part CM2: Strip footings, pad footings and slab-on-the-ground foundations for masonry walling*.

SANS 2001-EM1, *Construction works – Part EM1: Cement plaster*.

SANS 10252-2, *Water supply and drainage for buildings – Part 2: Drainage installations for buildings*.

SANS 10400-A, *The application of the National Building Regulations – Part A: General principles and requirements*.

SANS 10400-B, *The application of the National Building Regulations – Part B: Structural design*.

SANS 10400-C, *The application of the National Building Regulations – Part C: Dimensions*.

SANS 10400-K, *The application of the National Building Regulations – Part K: Walls*.

SANS 10400-L, *The application of the National Building Regulations – Part L: Roofs*.

SANS 10400-O, *The application of the National Building Regulations – Part O: Lighting and ventilation*.

SANS 10400-P:2010, *The application of the National Building Regulations – Part P: Drainage*.

SANS 30500, *Non-sewered sanitation systems – Prefabricated integrated treatment units – General safety and performance requirements for design and testing*.

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3 Definitions

For the purposes of this document, the definitions given in SANS 10400-A, SANS 10400-P (some of which are repeated for convenience) and the following apply.

3.1

chemical toilet

toilet with a fixed pan, the excreta from which pass into a tank where they are acted upon by chemicals which sterilize and break them down

3.2

grey water

domestic waste water excluding toilet water

3.3

pail toilet

toilet with a removable pail which is systematically emptied or replaced

3.4

ventilated improved pit toilet

VIP toilet

toilet which comprises a

- a) pit into which the excreta fall and from which the liquid fraction seeps into the surrounding ground;
- b) slab which covers the pit and which has two holes, one for the excreta to fall through and one for the vent pipe;
- c) superstructure which provides privacy and which prevents light from entering the pit;
- d) pedestal seat and seat cover;
- e) vent pipe which removes odour from the pit; and
- f) fly screen at the top of the vent pipe which prevents flies from entering the pit through the pipe and prevents flies that have entered the pit through the pedestal from leaving through the vent pipe

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4 Requirements

4.1 General

The functional regulation Q3 contained in part Q of the National Building Regulations (see annex A) shall be deemed to be satisfied where the non-water-borne sanitary disposal system has a closet in accordance with the requirement of 4.2 and

- a) complies with the requirements of 4.3 or 4.4,
- b) is the subject of a rational design or rational assessment performed by a competent person (sanitation) in accordance with annex B of SANS 10400-P:2010, and that complies with the principles for the design, installation and testing of sanitary drainage contained in SANS 10252-2 and SANS 30500 where applicable,
- c) is the subject of an Agrément certificate and the system, element or component is used within the scope, conditions and limitations prescribed in the certificate and the element or component is compatible with other elements or components of the drainage system, or
- d) comprises of pail toilets which are emptied by or on behalf of a local authority.

NOTE The South African government is committed to the eradication of pail toilets.

4.2 Closets

4.2.1 A closet shall be constructed with a floor, walls and a roof of material suitable for its purpose, and such closet shall be provided with a door or other means which shall ensure privacy of the occupant of such a closet.

4.2.2 A closet shall comply with the relevant requirements of SANS 10400-B, SANS 10400-C, SANS 10400-K, SANS 10400-L and SANS 10400-O.

4.2.3 Any pan or container and any other fitting related to a closet shall be suitable.

4.2.4 The minimum internal dimensions of a closet shall be

- a) width: 800 mm,
- b) length with door opening outwards: 1 100 mm,
- c) length with door opening inwards: 2 000 mm, and
- d) height: 1 900 mm.

NOTE These minimum dimensions are not necessarily suitable for people with disabilities (see SANS 10400-S).

4.2.5 The clear distance between the pedestal and a door in a closed position shall not be less than 0,6 m.

4.3 Chemical toilets

A chemical toilet shall be provided with a seat and a receptacle of such height that a space of not more than 25 mm is left between the underside of such seat and the top of the receptacle. The aperture in such seat shall be at least 25 mm less in every diameter than the corresponding diameter of the top of such receptacle and such aperture shall be fitted with a self-closing, fly-proof lid.

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4.4 Ventilated improved pit toilets

NOTE 1 The successful use of VIP toilets is as much dependent on correct technical construction as the extent to which communities find them acceptable, and have been informed about their correct use, limitations and maintenance requirements, as this unfamiliar technology requires changes in behaviour.

NOTE 2 Guidance on methods for assessing social acceptance can be found in Agrément South Africa's publication ACTMAP3 for sanitation systems.

4.4.1 VIP toilets shall

- a) be constructed to minimize odours and the attraction of flies by means of air movements, solar heating and light,
- b) not penetrate the water table,
- c) only be constructed where the percolation rate measured in accordance with SANS 10400-P does not exceed 50 mm/h and is not less than 2, 5 mm/h,
- d) not be built under or near trees,
- e) where the pit is to be emptied by a vacuum tanker, be lined as described in 4.4.12 and situated so that a vacuum tanker is able to approach it to within 30 m, and the surface upon which the tanker stands is not more than 2,0 m above the top of the pit,
- f) be situated downstream of, or more than 30 m away from, a well or water source,
- g) be located at least 3 m away from buildings, and
- h) where permanent, be located at least 2,75 m away from the erf boundary to allow access for maintenance.

NOTE 1 Regulation **Q2** prohibits the construction of any pit toilet without the permission of the local authority.

NOTE 2 Annex A describes the principles for the design and construction of VIP toilets. The effective volume of a pit for a typical rural household should be at least 2,5 m³ where it is to be emptied. For temporary toilets, the volume of the pit should be increased to at least 3,5 m³. Pits should provide for 0,5 m height of free board above the effective volume of the pit.

NOTE 3 For maximum efficiency, a pit should be large and deep. Round pits should have a diameter of 1 m to 1,5 m and square pits a width of 1 m to 1,5 m.

NOTE 4 Ideally VIP toilets should be located at least 5 m away from habitable buildings so as to avoid unpleasant odours.

4.4.2 Pits in unstable soils shall be fully lined with provisions for seepage as described in 4.4.12(d). Unlined pits shall be circular and shall not exceed 1,5 m in diameter.

NOTE Clause A.4 provides some guidance on the determination of soil stability.

4.4.3 VIP toilets that are to be emptied by the local authority shall have a capacity such that the cleaning interval is acceptable to such authority.

NOTE Annex A provides guidance on determining the capacity of VIP toilets.

4.4.4 VIP toilets 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 shall be provided.

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4.4.5 The hole in the floor slab shall have the same dimension or be larger than the inside dimension of the pedestal. The edges shall be smoothly finished off.

NOTE For ease of cleaning, particular attention should be paid to the finishing of the edges of the openings situated below the pedestals.

4.4.6 Measures shall be taken to prevent rainwater, soil, rubbish and other foreign material from entering the system. Separate provisions shall be made for the disposal of grey water and other household waste.

NOTE 1 Openings dissipate odours and allow the ventilation pipes of VIP toilets to function properly. Any such opening, or openings, should preferably be screened to prevent flies from entering the superstructure.

NOTE 2 Ideally, openings should face into the prevailing wind in order to pressurize the closet and induce air flow into the pit and out through the vent pipe. (See annex A.)

4.4.7 The closet shall be provided with an opening, or openings, of area at least 0,2 m² for the purposes of natural lighting and through ventilation. The inside of the closet, however, shall be suitably dark to discourage flies from exiting the pit via the pedestal.

4.4.8 The pits for VIP toilets shall be ventilated with a ventilation pipe of nominal diameter at least 100 mm.

NOTE Ideally, ventilation pipes should be located on the northern side of the superstructure. PVC pipes should either be painted or be manufactured with a special stabilizer which prevents damage due to ultra-violet radiation.

4.4.9 All ventilation pipes shall be screened with a corrosion-resistant material, which is resistant to ultraviolet radiation, to prevent insects from entering or from escaping from the pit. The apertures in the mesh of screens over the ventilation pipes shall be small enough to trap insects, but large enough to achieve proper ventilation of the pit. The construction shall be such that it is not possible for leaves and other debris to accumulate on top of the screen.

NOTE A square mesh with 2,25 mm apertures will ensure that all flies are trapped.

4.4.10 The ventilation pipe shall have a minimum internal diameter of 100 mm and shall be so installed that its open end is the greater of

- a) 2,5 m above the finished ground level, and
- b) 500 mm above the highest point of the roof.

NOTE 1 Ventilation for the pit is necessary for the proper functioning of the VIP toilet. When the temperature in the vent pipe is 2 °C warmer than the air in the closet, air flows up the pipe. When the temperature in the closet is higher than that in the vent pipe, the pit vents into the closet unless there is sufficient wind to siphon air from the vent pipe. The temperature within the closet can also be reduced should the roof be insulated or should a double-sheeted roof with a 50 mm airspace be provided. The resulting reduction in temperature reduces the closet's potential to draw air from the pit.

NOTE 2 Where wind cannot be relied upon to pressurize the closet, the vent pipes should be situated on the sunny side of the superstructure and be painted black. (See figure A.1.)

4.4.11 Pedestals, where provided, shall generally be between 350 mm and 450 mm in height.

NOTE In some communities, squatting plates may be provided instead of a pedestal. This is acceptable provided they have lids as described in 4.4.4.

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4.4.12 Permanent VIP toilets shall be constructed in accordance with the details shown in figures 1 to 3, and in accordance with the following:

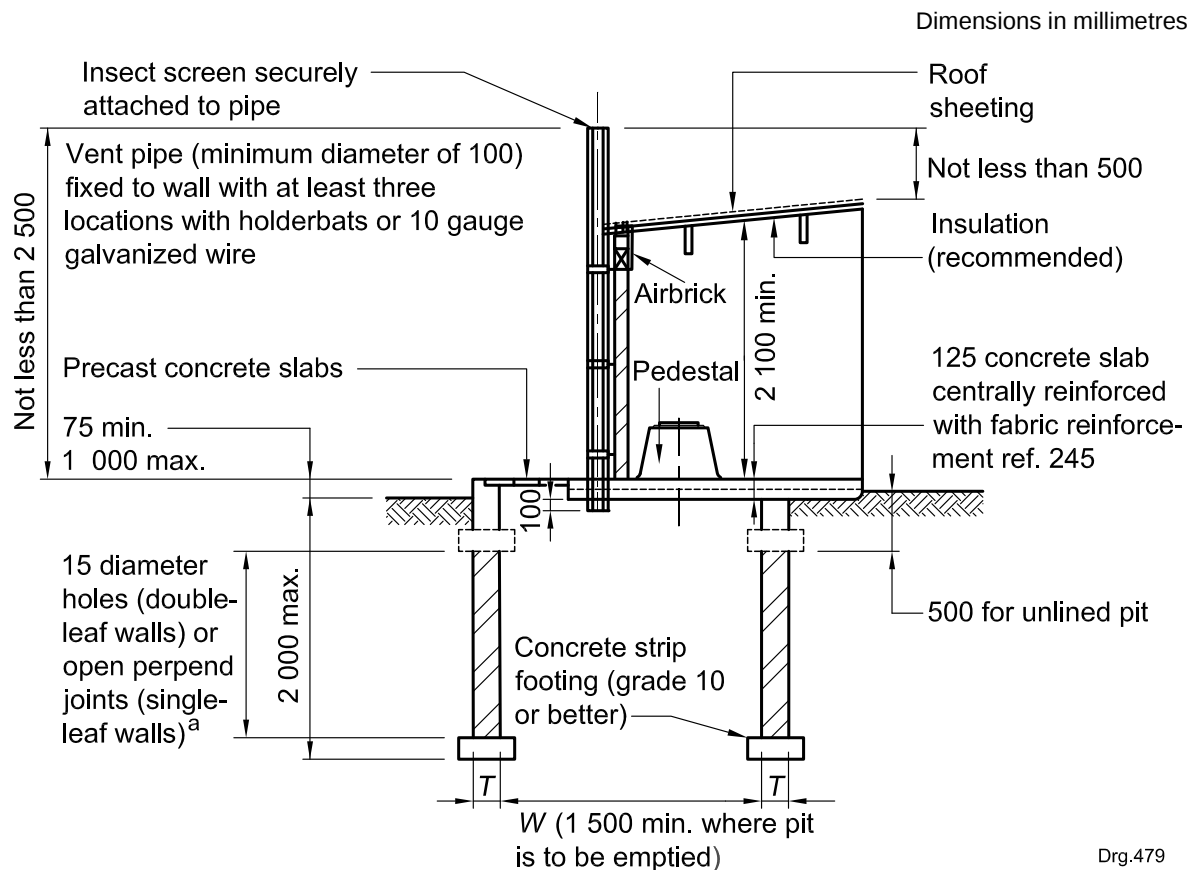
- a) The floor level shall be at least 75 mm above the surrounding ground level. In cases where the groundwater level is high or the soil is rocky, the floor slab may be lifted to a maximum height of 1,5 m above the surrounding ground.
- b) In multiple toilets, separate pits shall be constructed beneath each opening.
- c) The internal walls between pits shall be not less than the thickness of the pit walls.
- d) Openings of 15 mm in diameter, that extend through the pit walls in double-leaf construction or open perpend joints in single-leaf construction shall be provided at vertical and horizontal centres not exceeding 400 mm and 900 mm, respectively, from 500 mm below ground level to the bottom of the pit. The walls between pits shall not contain any such openings.
- e) The portion of the internal walls of the pits that is raised above the ground shall be plastered in accordance with the requirements of SANS 2001-EM1.
- f) All concrete work shall be in accordance with the requirements of SANS 2001-CC1 or SANS 2001-CC2.
- g) Masonry walling and related foundations shall be in accordance with the relevant requirements of SANS 2001-CM1 and SANS 2001-CM2.

NOTE The upper 500 mm of the pit should be impervious to surface water, hence the requirement for openings to be provided from 500 mm below ground level.

4.4.13 Solid and hollow concrete and calcium silicate masonry units shall have a nominal compressive strength of not less than 10,5 MPa and 7,0 MPa, respectively. Burnt clay masonry units shall have a nominal compressive strength of not less than 14,0 MPa and a water absorption of not more than 12 %.

4.4.14 The cores of all hollow masonry units shall be solidly filled with grade 10 infill concrete in the wall separating the pits.

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T = wall thickness
 W = distance between pit end walls

Type of masonry unit	T	W , max.
Solid	110	1 300
	140	1 750
	190	2 500
	220	2 500
Hollow	140	1 300
	190	1 750

The pit shall be lined up to 500 mm below ground level in stable soils and fully lined in unstable soils or where the pit shall be emptied.

Closet walls shall be 90 mm or thicker.

Roofs shall have a 100 mm (min.) overhang and shall be fixed to a 38 mm × 76 mm wall plate tied to the walls in accordance with the requirements of SANS 10400-K.

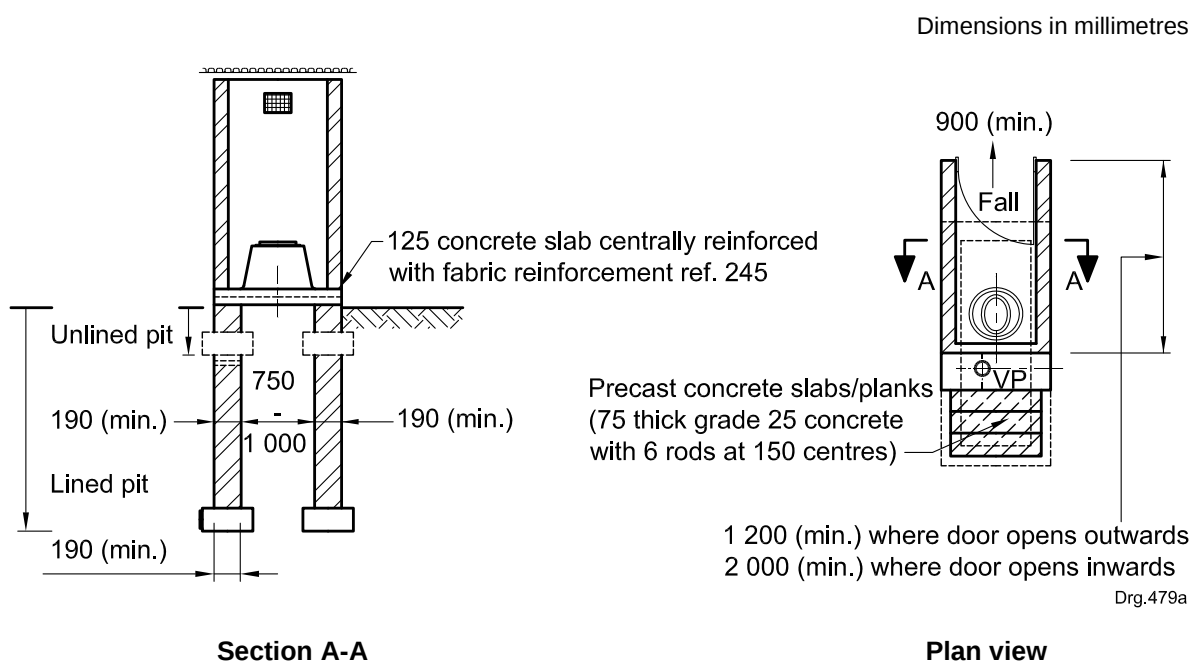
Strip foundations shall be 200 mm deep and 450 mm wide.

NOTE A gap may be left between the top of both sides of the wall and the underside of the roof as an alternative to the installation of an airbrick.

^a To be provided at vertical centres not exceeding 400 mm and horizontal centres not exceeding 900 mm to within 500 mm of ground level.

Figure 1 — Longitudinal section through a masonry VIP toilet

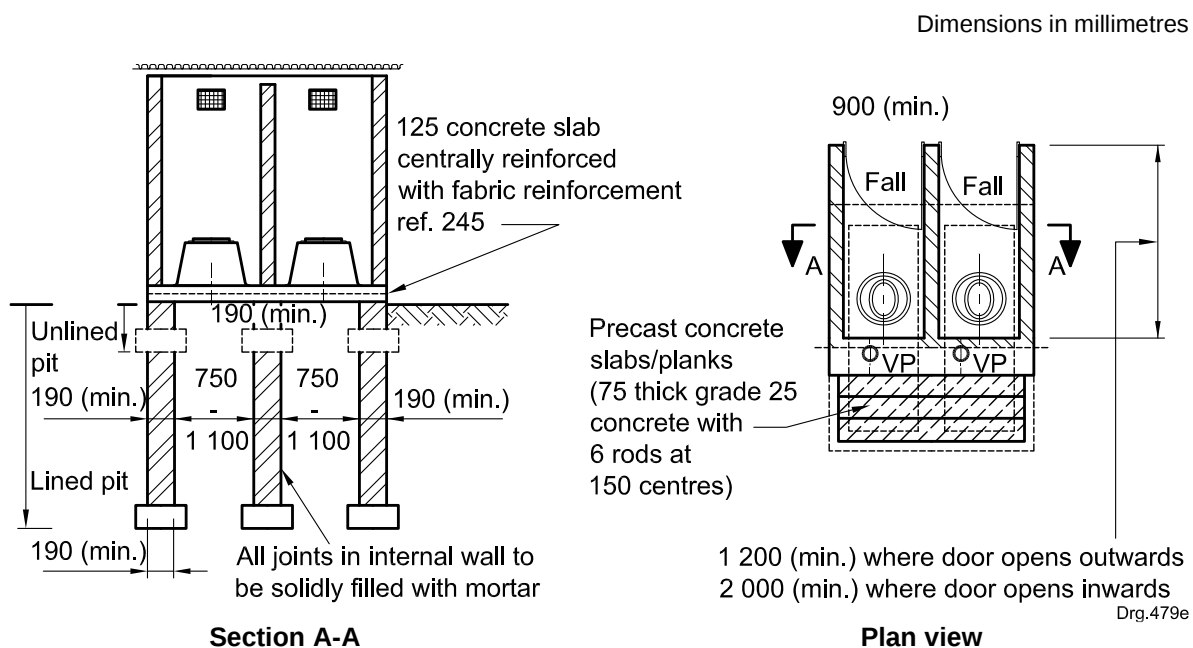
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VP = vent pipe

NOTE 40 mm cover to reinforcement (see figure 1).

Figure 2 — Plan view of and cross section through a single masonry VIP toilet



VP = vent pipe

The wall between pits shall have the same thickness as the pit wall.

NOTE 40 mm cover to reinforcement (see figure 1).

Figure 3 — Plan view of and cross section through a multiple masonry VIP toilet

4.5 Non-sewered sanitation systems — Prefabricated integrated treatment units

4.5.1 User requirements

The system shall be designed in such a way as to ensure that the users are able to use the system safely and in the manner intended by the manufacturer. The design and implementation of the system shall ensure that users with little or no literacy or those who do not have technical expertise are able to safely and effectively use the system frontend and perform routine user maintenance as intended by the manufacturer.

4.5.2 Design capacity

4.5.2.1 The system shall be capable of treating, at a minimum, human faeces and urine, menstrual blood, bile, flushing water, anal cleansing water, toilet paper, and other bodily fluids/solids. Manufacturers may identify additional categories of input as acceptable for treatment, such as water from hand washing, menstrual hygiene products, and/or organic household waste.

4.5.2.2 The design capacity with regard to human faeces and urine shall be indicated as expected uses per day (faecal uses/day and urine uses/day). The average amount of faeces (kg/use) and urine (L/use) per use shall be determined as the basis for capacity calculations and shall be clearly indicated. Additionally, the expected daily capacity for further input (such as water, menstrual hygiene products and organic waste) shall be indicated by the manufacturer (in units such as kg/day or L/day).

4.5.2.3 If the system is intended to accept menstrual hygiene products separately from other system inputs, then the provisions and instructions for the safe operation and maintenance of the disposal mechanism or device shall be provided. Cultural norms, existing practices, and aspirations regarding the disposal of menstrual hygiene products shall be considered.

4.5.2.4 A safety factor shall be incorporated into the design and indicated by the manufacturer in order to prevent overload. To indicate when the system is nearing maximum capacity (design capacity plus safety factor) the system shall be equipped with a visual or audible mechanism (or both) indicating to the user that the system is overloaded and therefore not usable. Should overload occur, the system shall enter into a safe state that prevents any hazards due to any overload.

4.5.2.5 The system shall remain operable after a period of system non-usage of 60 h without causing malfunctions or requiring additional efforts to resume operation that exceed normal operating procedures. Non-usage is when there is no intentional shut down of the system by the user. In addition, the system is not used nor has any human interaction for a period of 60 h.

4.5.2.6 Following restart after a short-term shut down (i.e. 60 h or less) specified by the manufacturer, the system shall be able to immediately accept input and return to normal operating state.

4.5.2.7 The sanitation system manufacturer shall provide precise instructions for preparing the system for long-term shut down (i.e. more than 60 h). The instructions shall describe the procedures for achieving safe and stable system shut down conditions. The manufacturer shall clearly indicate the duration of time necessary to complete the long-term shut down process. The long-term shut down process shall not require more than 10 h for completion. Required user interaction during shut down shall be minimized. Following restart after long-term shut down, the sanitation system shall be able to immediately accept input and be capable to return to normal operating state within the time specified by the manufacturer.

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4.5.2.8 The sanitation system shall allow continuous use without unreasonable waiting times between uses. The manufacturer shall specify the minimum wait time between uses in the user manual or as part of the equipment label or data plate.

4.5.2.9 Means of indication (visual or audible) or instruction to determine if the system is in a safe state shall be provided by the manufacturer.

4.5.3 Performance requirements

4.5.3.1 The sanitation system shall be such that when operated, maintained, and used, the requirements in are met under all operating conditions.

4.5.3.2 Solid output and effluent shall be fully treated within the sanitation system allowing for safe reuse or disposal. Solid output and effluent shall meet the requirements specified in SANS 30500 at all times including the start-up period when tested in accordance with SANS 30500.

4.5.3.3 In order to minimize odour emissions from the sanitation system, the requirements in SANS 30500 shall be met when tested in accordance with SANS 30500.

4.5.3.4 The system shall be designed for a serviceable life of a minimum of 10 y, at the loading rates or frequency stipulated by the manufacturer, assuming use and maintenance according to the manufacturer's specifications.

4.5.3.5 The system shall operate safely and reliably in ambient air humidity conditions at a minimum range from 20 % to 100 %. Technologies designed for use in environments with ambient air humidity below 20 % shall additionally demonstrate their capability to operate safely and reliably in these expanded ambient air humidity ranges.

4.5.4 Requirements for sanitation system components

4.5.4.1 Documentation of the performance adequacy shall be provided for any essential materials, equipment, components, connections, or joining elements that are not explicitly designed, commonly used or approved for use in sanitation systems.

4.5.4.2 The system shall be designed in such a way as to mitigate any risk of infection due to potential pathogens from human urine or faeces or the intermediate and residual products of the sanitation system.

4.5.4.3 All installations that contain, transport, or store liquids shall achieve water tightness, at a minimum. In cases where the results of a safety assessment indicate hazards that require mitigation through a higher degree of system tightness (e.g. potentially dangerous gases), technical tightness shall be achieved.

4.5.4.4 Visibly exposed materials and related joining elements, reservoirs and piping shall be smooth and easily cleanable. Thus, surfaces shall be:

- a) clear of pits and occlusions and have neither ridges nor crevices where organic materials could accumulate; and
- b) designed in such a way as to minimize projections, edges, and recesses.

4.5.4.5 Visibly exposed materials shall be designed in such a way as to ensure that faeces and residual substances can be removed by domestic household cleaning methods and without requiring the use of specialized chemical cleaning agents.

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4.5.4.6 The system shall minimize the use of chemical or biological additives (or both). Systems that do require such additives shall not necessitate their use in a manner or to a degree that exceeds acceptable health or environmental risks. The manufacturer of the sanitation system shall provide documentation concerning risks and instructions on proper use, handling, and storage of any additives necessary for system function.

4.5.4.7 Materials used for the system shall be structurally stable, durable, and, where relevant, watertight, and shall be resistant to the effects of local conditions for the intended use and reasonably foreseeable misuse as indicated in SANS 30500.

4.5.5 Technical requirements, installation, and maintenance

The system shall satisfy the technical, safety, installation, operational and maintenance requirements of SANS 30500 and be so certified by the manufacturer and installer.

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Annex A

(informative)

Ventilated improved pit toilets

A.1 Introduction

A.1.1 The VIP toilet is a simple, low-cost sanitation system that requires no water for its operation. Urine and small amounts of water used for cleaning the seats either seep through the walls of the pit into the surrounding soil or evaporate.

A.1.2 There are two types of VIP toilets, namely those with a permanent closet and those with a temporary closet. VIP toilets with a permanent closet are intended for permanent or long-term use, and have access to the pit for emptying purposes. Temporary VIP toilets are intended for short-term use and as such have a single pit and have no access to the pit for emptying purposes as these toilets are moved to a new pit as soon as the first pit is full.

A.1.3 A variation on the permanent VIP toilet is the ventilated improved double pit toilet in terms of which two pits are constructed side by side and are straddled by a single closet. The pits are then used alternatively, that is, the user moves the pedestal seat when the first pit is full to the second pit and caps the hole. After a minimum period of two years, the full pit can be emptied either manually or mechanically, provided that the wall separating the two pits does not allow seepage from one pit to the other.

A.2 Basic principles

A.2.1 Conventional pit toilets have two major disadvantages: they have an unpleasant odour and they attract flies. Both these disadvantages are minimized in the case of the VIP toilet, due to the pit being fitted with a ventilation pipe through which ventilation is induced by two elements of nature (see figure A.1)

- a) air movements over the top of the ventilation pipe which cause suction at the top end of the ventilation pipe so that air is withdrawn from the pit, and
- b) solar heating of the ventilation pipe. (Air heated in the ventilation pipe rises to be replaced by cooler air from the pit, which in turn is supplemented by air from the closet).

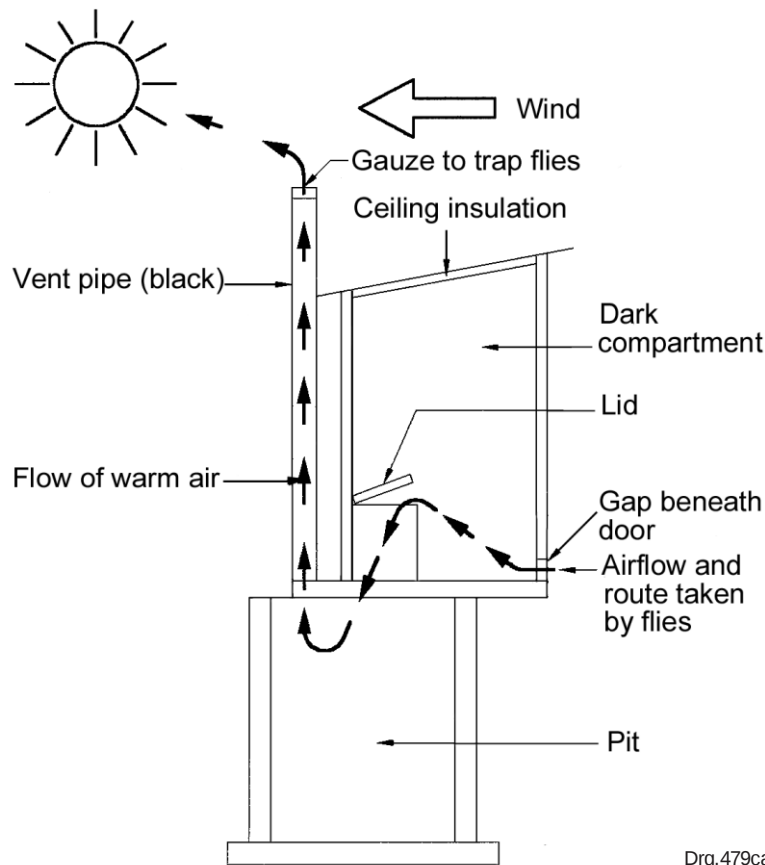
A.2.2 The following should be noted:

- a) Shaded closets discourage flies from exiting the pit via the seat opening.
- b) The lid to the seat reduces the amount of light entering the pit.
- c) Wind causes suction at the top end of the ventilation pipe so that air is drawn from the pit.
- d) Ventilation is induced by air pressure at the openings in the closet if located on the windward side of the closet.
- e) Solar heating of the ventilation pipe causes heated air to rise and creates an upward flow of air through the pipe.
- f) Flies entering the pit are attracted to the light at the top of the ventilation pipe by the mesh and are trapped at the top of the pipe when they try to exit.
- g) Insulation in the closet roof reduces the internal air temperature and, in doing so, reduces the closet's potential to draw air from the pit, provided that the closet is thermally sound.

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A.2.3 Toilet doors, where provided, should preferably be self-closing and lockable from the inside and outside. They should be inward opening, as outward opening doors are susceptible to wind damage.

A.2.4 Door entrances should not face east or west so as to prevent direct sunlight from penetrating the interior.



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NOTE Solar radiation is far less effective than wind-induced ventilation in reducing unpleasant odours.

Figure A.1 — The concept behind ventilated improved pit toilets

A.3 Siting of VIP toilets

A.3.1 Human excreta can be a source of infection. Great care is necessary in siting pits so as to avoid possible pollution of the ground and water supplies.

A.3.2 A VIP toilet in an ideal soil, such as a sandy loam, at least 1 m above the highest seasonable water table, produces little spread of contaminants. If the pit penetrates the groundwater then bacteria, virus and chemical contamination might travel downwards and be laterally transported by groundwater. For this reason such penetration should be avoided.

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A.3.3 VIP toilets should preferably be located downhill from a well or water source to prevent possible contamination of water supplies. Where the pit has to be located uphill from the water source, it should be located at least 30 m away from it.

NOTE Further particulars in this regard may be found in the Department of Water Affairs and Forestry's *Protocol to manage the potential of ground water contamination from on-site sanitation* (see bibliography).

A.4 Field test for determining soil stability

A.4.1 As a guide, the following test can be conducted on a representative sample of soil taken from the pit wall to determine whether or not a pit should be fully lined:

- Place the representative sample in the palm of your hand or in the lid of a tin.
- Manually remove any stones, pebbles and large granules from the sample.
- Add a minimum amount of water and then knead the sample for 1 min to 2 min. Add more water if necessary.
- Press the dampened soil together and try to roll it between your fingers, or rub one palm over the other in order to determine if the sample consolidates and rolls.

A.4.2 If the sample crumbles on rolling, it generally means that the pit should be fully lined. The pit should also be lined if the soil contains large amounts of sand, silt or unigranular material (or a mixture of all three), or if the soil is loose and comes away from the walls when touched lightly.

A.4.3 If the soil consists of shale, layered rock or semi-weathered rock and is hard to excavate, the pit need not be fully lined.

A.5 Sizing of pits

A.5.1 Dry pits are pits found in permeable soils. Wet pits are found in less permeable soils where liquid, such as water and urine, seeps away more slowly. Excreta decompose more quickly in wet pits than in dry pits.

A.5.2 The effective pit volume of a VIP toilet (V) can be calculated as follows:

$$V = C \times P \times N$$

where

C is the solids accumulation rate per person per year given in table A.1 in cubic metres;

P is the number of people using the toilet;

N is the pit-cleaning interval in years or the desired lifespan of the pit (usually 10 years to 15 years).

A.5.3 The effective depth of the pit (d_e) can then be calculated as follows:

$$d_e = \frac{V}{A}$$

where

V is the effective pit volume, in cubic metres;

A is the internal cross-sectional area of the pit, in square metres.

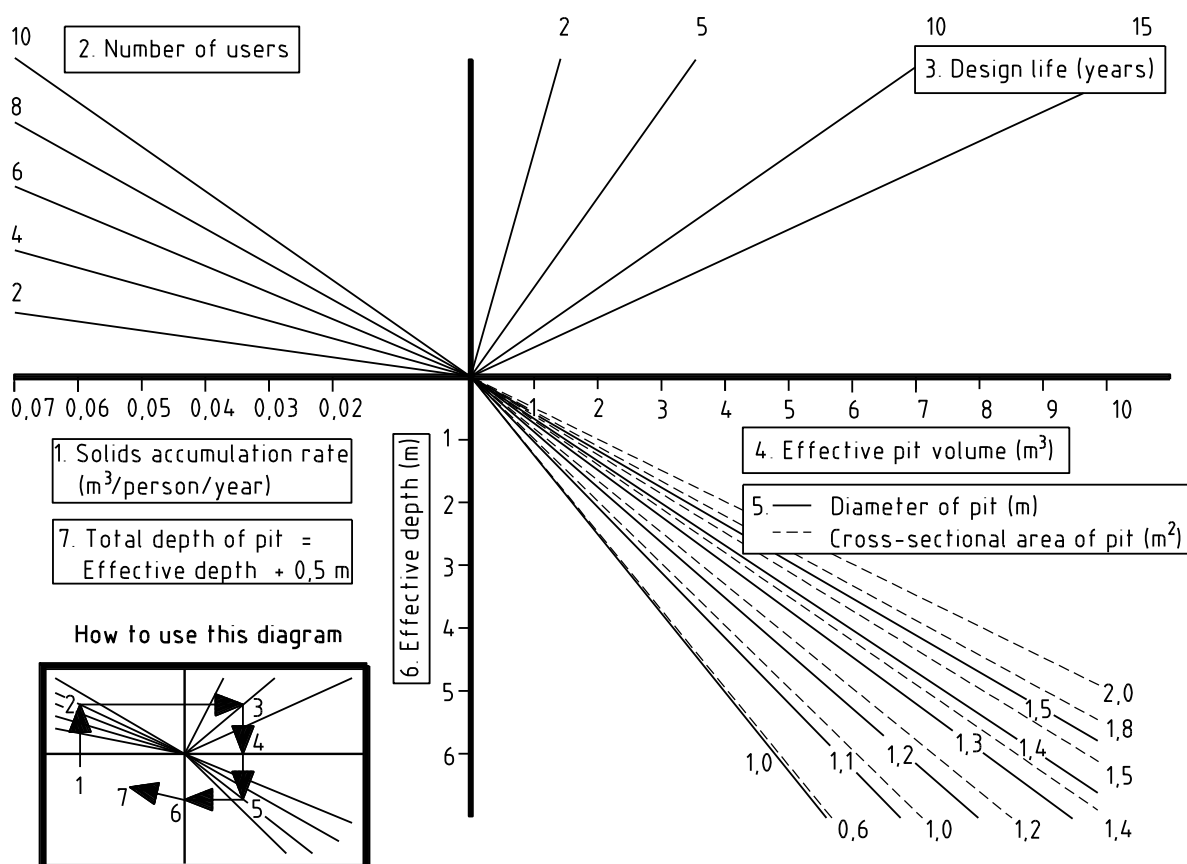
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A.5.4 A free board of 0,5 m shall be added to the effective depth of the pit (d_e) to allow free flow of air through the pit and to prevent overflow to obtain the depth of the pit (d).

A.5.5 Alternatively, the nomogram in figure A.2 can be used to determine the effective volume and total depth of each pit.

Table A.1 — Solids accumulation rate per person per year (C)

1	2	3
Anal cleaning material	Solids accumulation rate per person per year m^3	
	Wet pits	Dry pits
Soft paper, water, etc.	0,02 to 0,04	0,03 to 0,06
Bulky materials, e.g. corn cobs, newspaper, or cement bags	0,03 to 0,06	0,045 to 0,09



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Figure A.2 — Nomogram for determining the required pit depth

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