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**Department:
Public Works**
REPUBLIC OF SOUTH AFRICA

CONSTRUCTION WORKS: SPECIFICATIONS

GENERAL SPECIFICATION

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General Specification

(read with PW371-B)

NOTE

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SANS NUMBERING IN CONSTRUCTION STANDARDS

SANS specification: *SANS* and number, e.g.
SANS 227 burnt clay masonry units.

SANS code of practice: 1 plus four digits, e.g.
SANS 10082 Timber buildings.

SANS BS standard: *SANS* and number, e.g.
SANS 6927 Building construction - Jointing products - Sealants - Vocabulary

SANS EN standard: 5 plus four digits, slash EN plus number, e.g.
SANS 50197-1 / EN 197-1 Cement Part 1: Composition, specifications and conformity criteria for common cements.

SANS ISO standard: *SANS* and number, slash ISO and number, e.g.
SANS 140 / ISO 140 Acoustics - Measurement of sound insulation in buildings.

SANS SM (standard method): *SANS* and 5 or 6 plus three digits, e.g.
SANS 5900 Warpage and squareness of refractory bricks.
SANS 6056 Sulphide content of water.

There is no longer a distinction between a specification, a code of practice, or a standard method; they are now all referred to as *standards*.

Standards should be based on the consolidated results of science, technology and experience, and aimed at the promotion of optimum community benefits.

Units, symbols, meaning of terms

Units of measurement, symbols

The units of measurement are metric units as standardised by the "Système International d'Unités" (SI). Note that the comma is the decimal indicator in Europe and South Africa, formally adopted by the *ISO* and the *IEC* as well, and that numerals are grouped into groups of three for readability, separated by a space, e.g. 1 233,55.

The following unit symbols (not abbreviations) are used in this document:

°C	degrees Celsius	L	litre
g	gram	m	metre
H _z	Hertz	m ²	square metre
h	hour	m ³	cubic metre
d	day		
kN	kilonewton	mm	millimetre
kPa	kilopascal	MPa	megapascal
kW	kilowatt	t	tonne

Meaning of terms

The following terms, highlighted in *italics* in the text of this publication, are explained as follows:

AAAMSA

Association of Architectural Aluminium Manufacturers of South Africa

according to manufacturer's instructions

the manufacturer's instructions at the time of tender

applicable standard

a national or recognised standard applicable to the works, implying that the relevant standard is a contract document, a copy of which has to be kept in the site office for reference

ARP

a Recommended Practice prepared by SSA

as specified

as specified in the Particular Specification or in the drawings or in the scope of work

BS

British Standard

CKS

Coordinating Specification prepared by SSA , mainly for the procurement of products for the use of government departments

coastal region

area between the coastline and an imaginary line 30 km inland, including the entire area of jurisdiction of any local authority falling within this region

competent person

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, as further defined in SANS 10400

comply

meet specified standards

drawings

the drawings forming part of the contract documents, and any modification thereof or additions thereto delivered to the contractor during the execution of the works

EN

European Norm

IEC

International Electrotechnical Commission

Invoked standard

standard that is called upon for guidance in the proper execution of the works on site, typically national codes of practice (SANS 10 000 series), not deemed a specification nor a contract document; *invoked* implies that the relevant standard be obtained and a copy kept in the site office for reference; whether a standard is to be invoked is a decision to be taken by the specifier, depending on size, complexity and importance of the works, and on the level of sophistication of the builder

ISO

universal short name of the International Organization for Standardization, a worldwide federation of national standards bodies of which South Africa, Botswana and Zimbabwe are members and Namibia, Angola, Zambia and Mozambique are correspondent members

MOD AASHTO

an internationally accepted test to determine the density of compacted material like soil filling, expressed as a percentage of the maximum compaction of the filling at various moisture contents as determined in a laboratory

NBR

National Building Regulations

NRS

Rationalized User Specification prepared by SSA

PIESA

Power Institute of East and Southern Africa

SABS

South African Bureau of Standards

SANS

South African National Standard

specification data

data required by SANS 2001 Construction Works standards without which the specification is incomplete. *Specification data* listed in PW371 is simplified and generally accepts default values or requirements – consult Annex A of the relevant SANS 2001 standard for the complete list

NOTE: Data required by SANS materials and product standards, listed in Annex A of each standard as “Notes to Purchasers”, are deemed *specification data* in both parts of PW371.

SSA

Standards South Africa, a division of the SABS

suitable

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

VC

Compulsory Specification (technical regulation) prepared by SS.

1 Earthworks

1.1 Site clearance

Applicable standard: SANS 2001-Construction Works Part BS1: Site clearance.

1.2 Earthworks (general)

Applicable standard: SANS 2001-Construction works Part BE1: Earthworks (general).

2 Concrete works

2.1 Structural works

Applicable standard: SANS 2001-Construction works Part CC1: Concrete Works (structural).

2.2 Minor works

Applicable standard: SANS 2001-Construction Works Part CC2: Concrete Works (minor works).

2.3 Foundations

Applicable standard: SANS 2001-Construction Works Part CM2: Strip Footings, Pad footings and Slab-on-the-ground Foundations for Masonry Walling.

2.4 Concrete floors and paving on the ground

Invoked standard when required: SANS 10109 Concrete Floors

- a) floor: direct-finished one course slab as specified below, or as designed and constructed to SANS 10109 under direction of a *competent person* (civil engineering) when specified
damp-proof under-surface membrane
- b) material: polyolefin: SANS 952 type C: 0,25 mm thick
- c) cutting: straight and square or to shape; use sharp instruments
- d) joints: minimum, lapped and sealed with pressure sensitive tape.
fabric reinforcement
- e) welded steel fabric: SANS 1024
- f) in large mats, overlap 300 mm, place near top surface
- g) do not cross over construction or day joints.
preparation
- h) prepare thresholds before casting floor by casting concrete of same thickness, material and finish as specified for floor, in all door openings; thresholds to have keyways
- i) prepare for contraction, construction and isolation joints; in case of columns, place edge forms diagonally to column
- j) lay damp-proof membrane with sheet overlaps of 200 mm over entire floor area
placing
- k) place, compact, level, strike off, and wood float concrete floors to thickness, level, and/or gradient as specified
finishing
- l) direct-finish by means of delayed trowelling technique:
 - leave surface undisturbed until bleeding has ceased and surface has stiffened so that foot pressure barely indents the surface (2 – 4 hours)
 - remove bleed water and laitance
 - hand trowel using pressure, or power trowel
 - steel trowel to produce a smooth finish, or wood float to produce a slip-free surface
 - do not add water or neat cement.

Joints

Contraction joints:

- m) spacing and pattern: <4,5m in both directions

- n) saw joints with a mechanical concrete saw to blade width and a depth of one quarter of the slab thickness
- o) saw only after concrete has hardened sufficiently but before shrinkage cracking can occur (between 4 and 48 hours after placement depending on temperature).

Construction or day joints:

- p) cast at end of day's casting or where concreting has stopped for more than 45 minutes
- q) type: keyed, keyed-and-tied, dowelled, or reinforced butt joints as directed, or as specified
- r) keyways: trapezoidal or rounded; coat joint face of keyways with suitable debonding agent like lime wash or bitumen
- s) dowels: 16 mm diameter x 300 mm length plain round mild steel dowels to SANS 920, placed at mid-depth of the slab at 300 mm spacing; coat dowels for two-thirds of their length with a bond-breaking compound
- t) round off all construction joint edges to a radius of 3 mm.

Isolation or movement joints:

- u) position: where floors abut fixed structures like walls, columns, sumps or inspection chambers, or in external floors or paving at spacing <4,5 m in both directions
- v) forming: 20 mm thick compressible material like polystyrene
- w) sealing: leave joints open or seal as specified; seal with suitable elastomeric material; ream sawn joints to width and depth as required and *according to the sealant manufacturer's instructions*.

2.5 Strongrooms

Strongrooms: SANS 10052, of fire rating, burglar resistance and wall thickness class as specified

3 Masonry

3.1 Masonry walling

Applicable standard: SANS 2001-Construction Works Part CM1: Masonry Walling

Specification data:

burnt clay masonry units

a) burnt clay masonry units: SANS 227

- class of common units: NFP for general masonry above damp-proof level to be plastered; NFX for masonry exposed to damp or in contact with the ground (e.g. foundation walls, manholes), or for fair face work
- nominal dimensions: 222 x 103 x 76 mm, or as specified
- nominal compressive strength: to table 1 of SANS 2001-Construction Works Part CM1
- uniformity of colour and texture of face units: provide sample of 20 units
- grade of efflorescence: normal for internal walls not exposed to damp; special for visible unplastered foundation walls, retaining walls and free-standing walls
- limits of water absorption: 6—14%
- limits of moisture expansion: 0,20%
- required marking: designation on each dispatch or consignment note

concrete masonry units

b) concrete masonry units: SANS 1215

- nominal compressive strength: SANS 2001-Construction Works Part CM1 table 1
- average drying shrinkage: normal (0,06%)
- required marking: designation on each dispatch or consignment note

mortar

c) sand: to SANS 1090 when specified

reinforcement

d) brick reinforcement in corrosive areas:

- in coastal regions: galvanized to SANS 935 or 121, or stainless steel
- in tidal splash zones: stainless steel
- non-metallic ties (engineered polymer) may be used instead of stainless steel

e) metal tie type: butterfly or modified PWD

work

f) single leaf bond: stretcher

g) multi leaf bond: stretcher and brickforce, or as specified

h) reference panel: required

i) position of control and articulation joints: as specified

j) degree of accuracy: II

additional requirements

k) wall ties in partial fill insulated cavity walls

- to have drip in centre of residual cavity
- tie spacing: SANS 10164 (2,5/m² or 600 mm vertical, 660 mm horizontal, staggered)
- tie spacing around openings and construction joints: <300 mm vertical

l) tie mortar cover: 15 mm minimum to outside face of mortar joint

- m) ancillary fabricated components for masonry, e.g. ties, brackets, lintels, shelves, anchors, meshwork: galvanized to SANS 121 in coastal regions
- n) clay facing units: obtain from manufacturer/supplier agreement on the following in writing:
 - the required application e.g. type of building, finish etc.
 - the degree of exposure to weather conditions, proximity to the sea etc.
 - track record of the preferred brick in the area of the building
 - an undertaking or warranty that the bricks delivered will be *suitable*
 - colour expectations in the case of face bricks
 - acceptable levels of breakage during delivery to site
- o) common solid masonry mortar joints:
 - rake out for receiving plaster
 - flush off where walls are to be bagged or fair-faced
- p) hollow masonry mortar joints:
 - do not rake out for receiving plaster.

3.2 Glass blockwork

materials

- a) glass blocks: BS EN 1051
- b) mortar: class II

laying

- c) bond: straight horizontal and vertical joints
- d) coat surface on which first course is laid with bitumen emulsion or similar material to permit movement of blocks
- e) reinforce every fifth horizontal joint, and vertical joints at 1 m maximum centres, with 25—65 mm wide corrosion resistant metal strips or mesh, nailed to the adjacent walls or columns, or with 6 mm diameter hot dip galvanized reinforcing rod drilled 50 mm deep into surrounding structure
- f) allow 15 mm clear space at sides and top of glass block panel; fill front of space with polyurethane backing strip and silicone sealant
- g) joints: 10 mm, strike back and smooth
- h) use a waterproof grout if wall is exposed to rain.

3.3 Stone masonry

3.3.1 Rubble

- a) natural stone: local koppieklip
- b) size: between 150 and 600 mm in section
- c) mortar: class III
- d) lay stones on their natural quarry beds
- e) joints: 25 – 50 mm wide cement mortar class II, finished 25 mm deep square recessed
- f) bond: mainly large stones to homogeneous random pattern
- g) level up tops of walls with selected long and flat stones; keep wall faces even
- h) use through stones every 1 m² in double-faced walls
- i) ties: build in wire ties at 3 per m² where rubble walls are to be joined to brick-, block-, or concrete work
- j) reference panel: required

3.3.2 Dimension stone

- a) natural stone with high compressive strength and good durability, sourced from an acceptable local quarry
- b) pointing: rake out exposed joints 12 mm deep and fill with *suitable* grout
- c) clean down, cover up to prevent soiling during progress of remaining work, remove covering upon completion and clean down again
- d) reference panel: required.

3.4 Masonry-type facings

- a) waterproofing: coat wall face with bituminous compound before covering with facings
- b) matching when relevant: lay out slabs of natural stone to match veining, colour and texture, number each slab and fix in same relative position
- c) attachment devices: 20 x 3 mm L-shaped stainless steel bonding lugs shot-nailed to background at 1 m intervals and staggered
- d) support shelf: 100 x 100 x 8 hot dip galvanized steel continuous angle bolted to structure with 30 x 6 flat steel hangers at 1,5 m intervals
- e) grouting, fixing of cramps, engaging cramps in dovetailed metal channels secured to backing with through-bolts or cramps, adjustment in cramps, attachment of lintels and soffits, alignment of joints and facings: SANS 10073
- f) clean down, cover up to prevent soiling during progress of remaining work, remove covering upon completion and clean down again
- g) joints: 3 mm wide between panels, sealed with suitable sealant of acceptable colour – see section 7.

4 Structural timberwork

4.1 Structural timberwork (flooring)

Applicable standard: SANS 2001- Construction Works Part CT1: Structural Timberwork (flooring).

additional requirements

- a) exposed faces of sawn timber: planed, sandpapered, and arris rounded to 3 mm radius.

4.2 Structural timberwork (roofing)

Applicable standard: SANS 2001-Construction Works Part CT2: Structural Timberwork (roofing).

Specification data:

- a) pole preservation treatment marking: metal identification tag with hazard class on each pole.
- b) discontinue timber members on both sides of fire walls.

4.3 Structural laminated timber

- a) structural laminated timber: SANS 1460
- b) required marking on each piece: application, exposure class, type, appearance and finish, stress grade, e.g. S2GP5.

4.4 Timber buildings

Timber buildings: SANS 10082.

5 Structural steelwork

5.1 Structural steelwork

Applicable standard: SANS 2001-Construction Works Part CS1: Structural Steelwork

Specification data:

additional items

- a) hot dip galvanized fasteners (M8–M64): *SANS 10684*
variations
- b) temporary fittings and holes for lifting: to be removed or filled up where visible after installation
- c) cut edges: grind smooth and straight where prominent or as indicated.

5.2 Sundry steelwork

5.2.1 material

- a) structural steel tubes: *SANS 657* part 1, and mark-bearing
- b) steel tubes for furniture *SANS 657* part 4, and mark-bearing
- c) steel wire rope (cables) *SANS 2408*
- d) shackles: *SANS 2415*
- e) thimbles: *SANS 2262*.

5.2.2 welding

- a) all visible welds: continuous, grind smooth
- b) dress all cut edges and holes to remove dross, burrs and irregularities.

5.3 Coating

- a) preparation of steel surfaces: *SANS 10064*

hot dip galvanizing

- b) hot dip galvanized coatings on prefabricated iron and steel products: *SANS 121 / ISO1461*
 - steel composition: for industrial/mining purposes: Si 0,125 — 0,30% with P < 0,02%; for architectural purposes: Si 0,03 with P < 0,01% or Si 0,15 — 0,25% with P < 0,02%
- c) do not bend or form articles after hot dip galvanizing

paint or varnish

- d) corrosion protection of structural steel of not less than 3 mm thickness by paint or varnish *SANS 12944*
 - source all paint from one manufacturer
 - paint system testing: laboratory tests to *SANS 12944-6*
 - discuss surface smoothness with all parties before commencing painting.

5.4 Fire protection

Protect structural steel against fire to comply with the required fire resistance as set out in *SANS 10400-T* table 17, as specified

5.5 Light steel frame building

Light steel frame building: *SANS 517*.

6 Insulation, sealants, seals

6.1 Thermal insulation

6.1.1 Materials

- a) required R-value/thickness: SANS 204
- b) fire performance classification of thermally insulated building envelope systems: SANS 428
rigid board
- c) expanded polystyrene (EPS) board: SANS 1508, type regular when covered, flame retardant when exposed
- d) extruded polystyrene (XPS) board, density 32kg/m³, compressive strength 160–310 kPa depending on thickness
- e) expanded polyurethane (EPU) board: SANS 1383
fibre mats or batts
- f) fibrous thermal insulation mats or batts: SANS 1381-1
reflective foil
- g) reflective foil: SANS 1381-4
metal faced insulation panels
- h) metal faced panels bonded to an insulation core: SANS 1530 and mark-bearing
loose fill
- i) loose fill (pellets/granules): SANS 1381-2
- j) cellulose loose fill (wood based): SANS 1381-6
pipe insulation
- k) bonded preformed mineral fibre pipe sections: SANS 1445-3, mark-bearing with expected maximum service temperature and exposure conditions; provide an adequate vapour barrier to pipe sections intended for use in temperatures below ambient.

6.1.2 Installation

masonry cavity wall insulation

- a) to form a neatly arranged, continuous and uniform thermal barrier, continuous with roof/ceiling insulation
- b) handle boards with care; cut with a sharp knife or fine-tooth saw
- c) install in heights to fit between wall ties – do not prick over ties
- d) stagger vertical joints
- e) rigid board horizontal joints: square in full-fill cavity construction, shiplapped or tongue and grooved in partial fill construction
- f) full fill cavity construction:
 - cavity width: equal to required insulation thickness
 - fill with rigid insulation board or fibre batts
- g) partial fill cavity construction:
 - fill with rigid insulation board only
 - hold insulation tightly against outer face of inner leaf with suitable retaining discs or extra wire ties
 - maintain a residual cavity of >35 mm to permit moisture drainage
- h) loose fill:

- fill existing wall cavities by pumping/blowing loose fill insulation through holes drilled in outer leaf, by specialist installer; refill holes after completion to match surrounding brickwork
- i) butt insulation tight against window/door frames
masonry wall external face insulation
- j) patent system of EPS external insulation bonded and mechanically fixed to dry, sound and flat surface, finished with reinforced polymeric plaster, or as specified
- k) by registered specialist strictly to supplier instructions
non-masonry wall insulation
- l) to SANS 204
pitched roof/ceiling insulation
- m) reflective foil under roof covering: with air space of >25 mm between foil and solid surfaces and with reflective surface facing down
- n) bulk insulation: cut neatly to fit snugly between rafters
- o) keep bulk insulation clear of incandescent and halogen downlighters/transformers
- p) observe electrical and other safety issues, e.g. defect wiring, adequate lighting for workmen
flat roof insulation
- q) material: rigid EPS insulation density 32D
floor insulation
- r) under floor slab insulation (in case of in-slab heating as required by SANS 204): required when specified
pipe insulation
- s) cover insulation exposed to weather and sunlight with protective material as recommended by insulation manufacturer/supplier
- t) tightly mitre bends and tees.

6.2 Vapour barriers

- a) type and position as specified.

6.3 Sound absorption

installation

- a) to a rational design
- b) airborne sound absorption:
 - fix battens to wall
 - fill space between battens with mineral fibre mats
 - fix perforated board / spaced hardwood slats to battens

6.4 Joint fillers/sealants

6.4.1 Materials

- a) building construction jointing and sealant products vocabulary: SANS 6927
- b) compatible with surfaces and materials they come into contact with; do not use material containing bitumen or volatile material with thermosetting chemically curing sealants.
- c) life expectancy: >30 years
- d) use fungus-proof sealant in all wet areas, e.g. between ceramic wall tiles and kitchen cupboards, baths, wash-basins and shower floors

- e) two-part gun grade polysulphide sealants: *SANS 110*
- f) one part low modulus silicone rubber sealant: *SANS 1305*, type 1 for building joints
- g) one part high modulus fungus proof silicone rubber sealant: *SANS 1305*, type 2 for glazing and sanitary ware
- h) two-part polyurethane base sealant: *SANS 1077*, type 1 pouring grade, self-levelling
- i) two-part polyurethane base sealant: *SANS 1077*, type 2 gun grade, non sag
- j) preformed elastomeric compression joint seals: *SANS 1023* type 1
- k) rubber or flexible PVC waterstop seals in construction and expansion joints in concrete structures where movements of up to 15 mm is expected: *CKS 388/389*, of type, dimension and workmanship as specified in these standards
- l) backing: closed-cell expanded polyethylene cord or strip.

6.4.2 Installation

preparation

- a) joints: clean and dry
- b) insert backing strip to ensure correct sealant thickness
- c) apply correct primer to sides of joints
- d) apply bond-breaking material where required
- e) edges: mask to ensure neat and clean edges

sealing

- f) according to manufacturer's instructions
- g) fill foremost part of movement joints to thickness not less than half the width of the joint
- h) seal joints around door and window frames, movement joints, joints between walls and columns, floor joints, and other joints where sealing is indicated or to the requirements of *SANS 204*
- i) finish: neatly and smoothly to acceptable profile.

6.5 Architectural seals

- a) compatible with door/window construction and other hardware
- b) not to impede normal use of door/window

materials

- c) fasteners: as supplied with product, colour matched where visible
- d) seals: replaceable; replacement seals to be available

installation

- e) according to manufacturer's instructions.

7 Roof covering, cladding

7.1 General

underlay

- a) reflective foil laminate: SANS 1381-4 class B (reinforced, one surface reflective), and mark-bearing
- b) polyolefin undertile membrane: SANS 952 type E, 0,25 mm, and mark-bearing
- c) installation: according to manufacturer's instructions.

7.2 Tile roofing/cladding

7.2.1 Materials

- a) concrete roof tiles and accessories: SANS 542 and mark-bearing
- b) clay roof tiles: SANS 632 and mark-bearing
- c) natural slate tiles: from a *suitable* quarry, with two holes per tile, drilled (not punched)
- d) fibre cement slates: SANS 803, and mark-bearing
- e) metal roofing tiles: SANS 1022, and mark-bearing
- f) accessories: to match roofing material, as supplied by manufacturer/supplier
- g) fixing materials: hot dip galvanized steel SANS 121 in inland regions, or stainless steel grade 304 in *coastal regions* or corrosive atmospheres, except for clay tiles where all fixings shall be stainless steel
 - length of nails: to penetrate battens to a minimum depth of 25mm
 - steel wire: 1,6 mm diameter, galvanized
- h) mortar for bedding and pointing: 3 sand to 1 cement, pigmented to match tiles.

7.2.2 Roof tiling

Invoked standard when required: SANS 10062 Fixing of Interlocking Roof Tiles

Invoked standard when required: Concrete Roof Tiles – Technical Manual, published by the Concrete Manufacturer's Association (CMA)

preparation

- a) install gutter brackets, metal valley linings before tiling

laying

- b) according to manufacturer's instructions
- c) abutments and verges: half tiles in case of interlocking tiles, tile-and-a-half tiles in case of plain tiles/slates
- d) hips and valleys: cut and dress tiles/slates to neat line, overhanging valley gutters by 50 mm, unless specified as butt joined to conceal the valley gutter
- e) roof overhang into gutter: 50 mm measured from eaves to inside edge of gutter
- f) avoid contact of metal roofing tiles with other metals, cement products or treated timber

roof underlay

- g) lay reflective foil underlay with reflective surface facing downwards
- h) lay underlay across rafters/beams, stretch to a sag of ± 40 mm and nail down with battens/purlins or with hot dip galvanized clout nails, or *according to manufacturer's instructions*
- i) work from eaves upwards with 150 mm minimum overlap; join lengths of underlay at their ends over one rafter space

- j) extend underlay 20mm over tilting batten or fascia board or, in open eaves, over beam-filling on exterior wall; cut neatly around chimneys, pipes, cables etc.
- k) take underlay over ridges and lap underlay on opposite side by 200 mm
- l) valley and hip underlay: lay strip of underlay along full length, beneath the main underlay in the case of valleys, over main underlay in the case of hips, and nailed to valley/hip counter battens
- m) seal all lap joints.

7.3 Profiled sheet roofing/cladding

Applicable standard: SANS 1200-HB Cladding and sheeting

Applicable standard: SANS 10237 Roof and side cladding

7.3.1 Metal sheet

profile

- a) corrugated: 17,5 mm deep, 76 mm pitch, exposed fixing



- b) box rib (IBR) 36 mm deep, 172 mm pitch, exposed fixing



- c) interlocking box rib: >40 mm deep, <180 mm rib centres with beading rolled into trough bottom, concealed fixing, or the subject of an active Agrément Certificate



- d) rib-trough/standing seam: >32 deep, 250 mm seam centres, with beading rolled into trough bottom, concealed fixing, or



- e) the subject of an active Agrément Certificate

steel

- f) hot dip zinc coated coil sheeting: *SANS 3575*, coating grade Z275 for rural and urban inland regions or Z600 for *coastal regions* or aggressive atmospheric conditions
- g) Aluminium/zinc alloy coated sheet: *SANS 9364/SANS 14788*, coating grade AZ150 for rural and inland regions or AZ200 for *coastal region* or aggressive atmospheric conditions
- h) wet-storage stain prevention of zinc-coating (white rust): oil protection required; report wet-storage stain and do not fix until inspected and/or treated
- i) required coating marking: thickness, material quality and coating thickness on the reverse side of each sheet at 1 m intervals

aluminium alloy

- j) natural mill finish aluminium alloy: *SANS 903* type 3004- temper H14 or alloy A1-Mn1 or A1-Mg2

- k) required marking: thickness on each sheet

stainless steel

- l) stainless steel: grade 304

prepainted metal

- m) prepainted metal sheet: *SANS 1845*

- n) required prepainting marking: at 1m intervals on underside of sheet, or on delivery slip: trade name, type

7.3.2 Fibre-cement sheet

- a) fibre-cement sheet: SANS 685/9933
- b) thickness: 5 mm
- c) profile: corrugated 57 mm deep, 178 mm pitch (Big-six)

7.3.3 Glass-reinforced polyester sheet

- a) glass-reinforced polyester sheet: SANS 1150
- b) required marking: trade name, type, class, light-transmission grading, mass, weather side in case of type 1, on each sheet.

7.3.4 Polycarbonate sheet

- a) grade: sheeting grade with a co-extruded layer of UV stabilised polymer on the weathering side

7.3.5 Fasteners and washers

- a) fasteners and washers: SANS 1273.

7.3.6 Installation

Invoked standard when required: SANS 10237 Roof and Side Cladding

- a) installation: *according to manufacturer's instructions* or to an active Agrément certificate preparation

- b) ensure that

- roof and or wall structure is aligned and grouted
- roof pitch is as required
- purlins are spaced correctly
- framework is square
- face of framework is free of protrusions
- adjacent building work is complete, including gutters and painting

fixing in general

- c) cold cut in preference to abrasive disc cutting; remove swarf without damaging coating exposed fixing
- d) holes in sheets: drilled, not punched
- e) hole size: oversize to accommodate thermal movement, especially in the case of polymer sheeting
- f) corrugated metal sheets: on crests of all outermost and middle corrugations, at overhangs and at end laps on every second crest
- g) box ribbed sheets: on crest of every second and fourth rib, with side laps stitched at 900 mm centres with 6 mm diameter self-tapping screws
- h) fibre-cement roof or cladding: 7 mm diameter hot dip galvanized drive screws to wood purlins, 8 mm diameter hot dip galvanized hook bolts to steel angle purlins
- i) all screws and bolts provided with bituminous or plastic washers with hot dip galvanized steel cups
concealed fixing
- j) patent fixing with concealed clips supplied by roof sheet manufacturer, nailed or screwed to purlins
- k) allow for expansion and contraction of the sheet without straining the securing points
- l) holes in sheets: prohibited

- m) button punching, if required by manufacturer: through interlocking ribs at 150 mm either side of fixing clip and at mid-span between purlins

lapping

- n) end laps: SANS 10400-L Table 1
- o) side laps: one and a half corrugations or one rib
- p) seal side and end laps to prevent air infiltration and leakage
- q) fixing order: opposite to the direction of prevailing rain-bringing wind
- r) end laps in case of translucent sheets: >200 mm
- s) glass-reinforced polyester or polycarbonate sheets laid single width between metal sheets of similar profile may be supported on same purlins as metal sheet; in case of two or more sheets laid side-by-side: support roof sheets at <0,8 m, side cladding at <1,5 m, or *according to manufacturer's instructions*

trough ends on metal trough roofs with slopes less than 15°

- t) bend down trough ends 15 mm at eaves to form drip; bend up trough ends 30 mm at high ends to form stop-end
- u) bend with *suitable* tool (not hammer) without tearing the sheet.

7.3.7 Miscellaneous

- a) finish roof with necessary ridging, closers, upturns, downturns, drips and capillary interstices to provide a watertight and vermin and insect proof construction
- b) of similar material and fasteners as roofing

ridging

- c) for corrugated metal roof sheeting: 460 mm girth with roll-top, lapped 225 mm at heading joints and beaten into corrugations; close roll-top at bottom of hips and at gable ends
- d) for box-rib roof sheeting (lapped or interlock) and for standing seam roofing to fall >7°: 430 mm girth without roll-top, lapped 225 mm at heading joints and provided with serrated closers
- e) for standing seam roofing to fall <7°: saw or snip top 12 mm of seams and bend single-length sheet over ridge; cover cuts with rib caps set in *suitable* sealant
- f) for fibre-cement roofing: fibre cement corrugated or plain adjustable or fixed ridges; fill corrugations under plain wings of fibre-cement ridging with 1:5 cement:sand mortar

movement joints

- g) arrange sheets or cover strips, or both, over expansion joints in order that watertightness is ensured under all conditions and that joints are free to move

tolerances

- h) alignment of purlins and girts: mismatch between abutting ends <3 mm in any direction
- i) misalignment of side joints and end joints over the whole of the finished face of the sheeting and cladding, and any misalignment of the edges of fascias, ridging, etc.: <3 mm
- j) contact faces between purlin or girt and sheeting or cladding: in the same plane or, in the case of curved sheeting and cladding, in a tangential plane.

7.4 Fully-supported metal sheet roofing and cladding

material

- a) copper roofing sheet: 0,6 mm x 600 mm wide high purity cold rolled copper SANS 404/405
- b) boarding: 20/22 mm thick solid tongue-and-groove softwood to SANS 629 of genus Pinus, flooring grade, light density group, non-endmatch
- c) roofing felt: range 111 containing 80 % wool, density 333 g/m²
- d) fixing clips: 0,6 mm x 40 mm wide copper

- e) clout nails: hard drawn copper wire 2,8 mm diameter x 22 mm with barbed shank
- f) screws: brass, flat head

laying

- g) screw softwood boarding onto battens with counter-sunk brass screws
- h) nail roofing felt with butt joints onto boarding with copper clout nails
- i) lay copper sheet with both edges bent up 90 degrees to form troughs 510 mm wide
- j) form double welted standing seams in direction of fall
- k) fold into seams clips at 300 mm centres formed of same material and nailed to boarding with copper clout-head nails
- l) lay 100—120 mm wide sheet at eaves, nail to boarding with copper nails and bend down with roof covering to form drip
- m) bend sheet up at parapet walls, ventilation pipes and chimneys and counter flash with copper set in silicon sealer
- n) form gutters and spouts from copper sheet of 0,6 mm thickness; provide movement joints in gutters every 10 m
- o) fix all copper securely but do not restrict thermal movement; finish nails and screws flush when covered by copper.

7.5 Thatch roofing

- a) thickness and minimum mass of thatching: SANS 10400-L
- b) lightning protection: required (See Electrical Work).

7.6 Flashings

material

- a) flashings and counter-flashings: metal; reinforced liquid membrane is prohibited
- b) fibre-cement roofs: 6 mm fibre-cement apron flashing finished off with metal counter-flashing against walls, or sill or U-flashing where required in vertical cladding, all *according to manufacturers instructions*
- c) tiled roofs: steel sheet hot dip galvanized class Z275 for inland regions, or class Z600 or copper for coastal/corrosive regions, thickness 0,6 mm
- d) sheet metal roofs: material similar to roofing sheets
- e) side-wall flashings: >75 mm high, >200 mm wide or to cover > two ribs of profiled metal sheeting
- f) head-wall flashings: purpose made flashings incorporating serrated closers and poly closers to suit metal roof profile where required, manufactured to roof angle - do not bend on site
- g) counterflashings: >150 mm high, with anti-capillary fold
- h) end laps: >150 mm for flashing; >75 mm for counter flashings
- i) flashing nails: same material as flashing
- j) flashings for pipes >50 mm diameter: tapered sheet metal collar of diameter to fit around pipe, soldered or sealed to holed flange at same angle as pitch of roof
- k) flashings for pipes <50 mm diameter: tapered sheet metal collar only

fixing

- l) cut, join, lap and form sheet metal flashings, concealed gutters and valleys to roof and vertical surfaces and around protruding pipes to make a watertight finish
- m) fix flashings to walls with 75 mm long flashing nails with a 20 mm hook
 - at ends and at 400 mm centres in between
 - drive flashing nail into wall above line of flashing turn-up, and use hook of flashing nail to keep flashing in position – do not drive nail through flashing
- n) fix flashings to roof sheets at <600 mm centres or on each alternate rib

- o) lay undertile flashings under roof tiles on battens at gable, parapet or chimney walls, to discharge onto roof covering or into eaves gutters
- p) chimney gutters on high side of chimney: support gutters on *suitable* boarding; turn up 100 mm against chimneys and > 225 mm up the roof slope; lap chimney gutters onto side flashings or undertile flashings
- q) fix counter-flashings in 25 mm deep formed joints in masonry or pre-formed into concrete, keep in place with short rolls of cut-off sheet metal, and fill joint solid with 1:3 cement:sand mortar; do not puncture counter-flashings
- r) pipe flashing >50 mm diameter: fix flange to roof sheet by means of roof screws similar to those used to fix the roof sheets, or by means of pop rivets; pipe flashings <50 mm: solder collar to roof sheet; seal collars around pipe with *suitable* clamp and sealant
- s) valley linings:
 - ridging turned around, without roll for steep slopes, or with roll for low slopes
 - lap valley linings 225 mm minimum
 - discharge valley linings into eaves gutters
 - fold back valley lining sides to form open bead in the case of slate and tile covered roofs
- t) exposed verges of corrugated steel roofs: finish with roll flashing.

7.7 Fascias and barge boards

fibre-cement

- a) fibre-cement sheets: *SANS 803*

fixing

- b) drill, countersink and screw sheets at 750 mm maximum centres with 5 x 50 mm sherardized screws
- c) screw fascias and barge boards to purlins, tilting battens or verge battens, and into ends of roof beams; in case of purlins, build stub beams into gable walls between purlins to carry verge battens
- d) cover joints of boards with 50 mm girth x 0,5 mm thick H-profile galvanized sheet metal cover strips.

8 Waterproofing

Invoked standard when required: SANS 10021 The waterproofing of buildings.

Invoked standard when required: SANS 952 annex C: Notes on use, installation and protection of film (supplement to SANS 10021).

8.1 Materials

reinforced bitumen membrane (RBM)

- a) flexible polyester and/or fibreglass reinforced APP polymer modified bitumen membrane: BS EN 13707 or the subject of an active Agrément certificate
- b) anti-root: in all planted areas
- c) bonding: heat-fused on primed surfaces

self-adhesive plastic membrane (APM)

- d) flexible polyethylene or polypropylene film backed SBS modified asphalt/bitumen adhesive compound: BS EN 13967 or the subject of an active Agrément certificate
- e) bonding: cold applied on primed surfaces

reinforced liquid membrane (RLM)

- f) of light colour
- g) reinforcement: non-woven needle-punched polyester or polypropylene fibre fabric with a mass of 125—150 g/m² for roofs and 95—100 g/m² for parapet walls

slip/protection layer

- h) bituminous felt: SANS 92 or 0,25 mm HDPE sheeting: SANS 952 type D

geomembranes

- i) thermoplastic sheeting: SANS 1526

cavity drainage membrane

- j) patent 0,5 mm thick polypropylene or HDPE sheet with studs 5–8 mm high at close centres to an active Agrément certificate

outlets

- k) roof outlets: patent cast iron flanged fullbore outlets with removable dome gratings, epoxy finish
- l) small balcony outlets: straight lengths of PVC pipe with chamfered ends and flanged inlets to accommodate waterproofing dressing without loss of bore or adherence
- m) shower outlets: special flanged shower outlet with trap and grating.

8.2 Preparation

substrate surfaces

- a) free of traffic and protrusions
- b) clean, smooth but not polished, even, stable and surface dry
- c) cracks in cementitious surfaces up to 0,3 mm are acceptable
- d) plywood: exposure class 1 (marine), with open butt joints
- e) sand-cement screeds: minimum 35 mm thick when laid directly onto concrete; minimum 50 mm thick when laid on insulation boards or slip/protection layers; 20 mm minimum as top layer on foamed-cement screeds

falls

- f) roofs: minimum actual fall including valleys: 1:80; maximum fall without precautions, including gravel protection: 10°

corners

- g) pencil rounded

parapet walls

- h) except when covered with copings with overhang, ensure tops of parapet walls slope towards roof

upstands

- i) ensure upstand beams >170 mm above waterproofed surface are provided on both sides of movement joints and at intersections with masonry walling

drips/downstands

- j) ensure drips are provided in roof slab soffits at edge of overhangs by means of ≥12 mm deep grooves or downstands
- k) in winter rainfall areas where roof slab edge is flush with external face of masonry cavity wall, ensure a continuous PVC angle drip is provided against soffit of concrete slab, centred on wall cavity

movement joints

- l) prepared to suit membrane system

balconies

- m) ensure balconies are at a sufficiently lower level than door thresholds to allow for screed/ topping, when required, and have sufficient fall to outlet(s)
- n) ensure internal floor finish stops against continuous metal edge strip fixed onto concrete floor in line with inside face of door frame
- o) do not fix door frames, balustrades or handrails before thresholds and upstands are waterproofed

dpc's

- p) ensure dpc's in walls are at the termination level of waterproofing turn-ups or above the level of trafficable surface finishes

services

- q) plant, equipment, planter boxes, water features, benches etc. on roofs and balconies: install only on separate bases on completed roof waterproofing; ensure these bases do not obstruct flow of water to outlets
- r) pipes and conduits penetrating waterproofing: avoid, place in ducts; if unavoidable, do not cluster, ensure pipe(s) protrudes at 90° for > 200 mm before changing direction; provide pipes with stiff flanges screwed or bolted to substrate

outlets

- s) in position before commencing waterproofing
- t) set lower than their surroundings to prevent ponding
- u) roof outlets: set >200 mm away from upstands.

8.3 Application

- a) apply waterproofing system *according to manufacturer's instructions*, including priming procedures, to leave roof, internal wet areas like showers and plant rooms, and below-ground structures in a watertight condition
- b) slip/protection layers, blinding layers, metal lathe, ventilators etc.: as required
- c) apply basement/retaining wall waterproofing to face to be back-filled
- d) protect waterproofing after installation against puncturing movement joints
- e) maintain movement joints in structure
- f) cap movement joints with waterproofing, or with a metal cover strip fixed to the sides to allow movement
- g) in the case of waterproofing caps, loop waterproofing into movement joint, lay backing cord in loop and cover movement joint and upstands with special expansion joint membrane.

8.3.1 system

- a) on exposed concrete roofs: 4 mm RBM
- b) on exposed timber roofs: 2 or 3 mm base sheet plus 4 mm RBM
- c) on balconies <10m²: 4 mm RBM
- d) on balconies >10m², terraces, walkways: 2 or 3 mm base sheet plus 4 mm RBM, or cementitious or acrylic RLM
- e) on parking decks: 5 mm RBM
- f) on planters: 4 mm anti-root RBM
- g) on roof gardens: 2 or 3 mm base sheet plus 4 mm anti-root RBM
- h) on concrete box gutters: 4 mm RBM
- i) on timber box gutters: 2 or 3 mm base sheet plus 4 mm RBM
- j) on parapet walls, freestanding walls: RLM
- k) rewaterproofing: 3 or 4 mm RBM
- l) on below ground surfaces, vertical or horizontal, above or below water table: 2 or 3 mm base sheet plus 4 mm RBM, or single layer APM.

8.3.2 Termination

- a) dress down waterproofing onto flanges of roof outlets
- b) turn up waterproofing against walls, chimney or extractor flues, roof lights, pipes etc. to >170 mm above roof level, or to the level of the damp proof course if present, or to above finished heights of masonry or concrete planter boxes, plant bases, steps etc where these abutt walls
- c) counter-flash turn-ups against masonry walls with the same membrane as the waterproofing, tucked into >40 mm deep preformed grooves
- d) counter-flash turn-ups against concrete walls with galvanized steel, aluminium or copper profiled cover strip bedded in a mastic sealant and mechanically fixed at 150 mm centres to the wall
- e) lap and bond waterproofing to wall damp proof courses in regions with extreme weather conditions (e.g. coastal); materials must be compatible, e.g. bituminous
- f) clamp waterproofing around pipes with suitable clamps
- g) take up waterproofing against, over the top and 50 mm down the outer edge of perimeter upstands, parapet and freestanding walls
- h) continue waterproofing over thresholds of balcony doors exposed to rain, and take up against metal floor finish edge strip
- i) terminate below-ground waterproofing >170 mm above all finished ground levels.

8.4 Testing

- a) perform test(s) prior to application of surface finishes
- b) horizontal surfaces: a flood test of 48 hours or a spark, vacuum or air pressure test, using suitable testing apparatus
- c) vertical surfaces: a spark or vacuum test, whichever is easier.

8.5 Waterproofing surface finishes/protection

- a) allow three weeks for bituminous membranes to weather before covering
- b) not to contaminate rainwater harvesting when relevant
- c) slip/protection layer: single layer bituminous felt or double layer HDPE sheet
- d) tile, paving units or panel finish: cut neatly to fit tightly along perimeter.

8.5.1 Exposed roofs

paint

- a) on plain bituminous systems: heavy brush or two coats of bituminous based aluminium paint SANS 802
- b) do not apply on granular finishes
- c) on other systems: *suitable* ultra-violet block as recommended by waterproofing manufacturer
- d) on acrylic or styrene/acrylic: UV block of an enriched titanium tiocide dispersion applied in two coats in cross directions

crushed stone

- e) 50 mm thick layer of light coloured non-absorbent crushed stone of 25 mm nominal size on slip/protection layer or on insulation of required thickness (SANS 204)
- f) keep stone back from outlets, gutters and water shedding edges; bond stone in these areas with a thinly applied cold dressing compound

tiled insulation panels

- g) high-density polystyrene insulation panels of required thickness (SANS 204) faced on top with 300 x 300 x 7–10 mm thick fully-vitrified ceramic tiles of light colour, set in cementitious tile adhesive or in epoxy; panel size 600 x 1 200 mm; lay panels loose with tight butt joints.

8.5.2 Pedestrian traffic areas

topping

- a) ≥ 50 mm concrete topping on slip/protection layer with sealed isolation joints against fixed objects

tiles on screed

- b) ≥ 50 mm thick screed to SANS 2001-Construction Works Part EM2 on slip/protection layer; fix tiles in tile adhesive with sealed joints against fixed objects

tiles on waterproofing

- c) on bitumen systems: bed tiles in bitumen and stone chip key
- d) high-density polystyrene insulation panels of required thickness (SANS 204) followed by precast concrete tiles, size as specified, loose laid with tight butt joints

paving slabs on insulation panels

- e) 600 x 600 x 50 mm precast concrete paving slabs SANS 541 laid loose on high-density polystyrene insulation panels of required thickness (SANS 204) with tight butt joints

paving slabs on adjustable pads

- f) 600 x 600 x 50 mm precast concrete paving slabs SANS 541 laid on patent adjustable underlay pads to keep tiles 20 – 40 mm clear of waterproofing; joints between slabs: 5 mm, left open; paving surface: level or to follow gradient as specified.

8.5.3 Vehicular traffic areas

asphalt premix

- a) 50 mm compact layer of asphalt premix laid directly on to waterproofing
- b) ensure premix and waterproofing are compatible

brick/concrete pavers on sand bed

- c) brick or concrete pavers laid on 25 – 30 mm sand bed (see Section 21 External works)

concrete paving

- d) 75 mm in situ concrete paving on protection/slip layer (see Section 2 Concrete works)

8.5.4 Basement, retaining walls

- a) before backfilling, protect waterproofing with covering
- b) install agricultural drain encased in stone and wrapped in geotextile membrane below level of basement floor and to fall to stormwater system, or as specified
- c) backfill with clean filter sand except where cavity drainage membrane is installed, in which case backfill with excavated material.

9 Ceilings, linings, partitions, access flooring

9.1 Brandered ceilings

9.1.1 Branders, grounds

timber branders, grounds

Applicable standard: SANS 2001-Construction Works Part CT2: Structural Timberwork (roofing)

- a) sawn softwood brandering: *SANS 1783-4*
- b) Eucalyptus brandering: *SANS 1707-2*
- c) size, and span (truss or beam spacing):

Truss or beam spacing	Dimensions, mm	
	Soft wood	Eucalyptus
6.4 mm gypsum ceiling board		
<1000	38 x 38	32 x 32
1000 – 1200	38 x 50	38 x 38
1200 – 1400	50 x 75	38 x 50
4 or 6 mm fibre-cement ceiling board		
<1050	38 x 38	32 x 32
1050 – 1500	38 x 50	38 x 38

- d) where roof trusses or beams are spaced at more than the required spacing for the intended brandering size: increase brandering size, or support brandering by means of 38 x 114 mm sawn softwood ceiling joists hung between and parallel to trusses or beams on 38 x 38 mm hangers from 38 x 76 mm runners fixed at 1 500 mm centres at right angles and on top of tie-beams of trusses or on top of beams, or at right angles in between tie beams/beams
 - e) grounds for wall linings to masonry or concrete walls: 38 x 25 mm, fixed with suitable frame anchors
 - f) fix branders at right angles to roof trusses/beams and at centres *according to ceiling board manufacturer's instructions*
 - g) install larger brander dimension vertical
 - h) stagger brander end joints
 - i) fix brandering away from walls for fixing of coved cornices when relevant
 - j) install supporting timber where heavy light fittings are to be suspended
 - k) level out, starting from lowest point, using timber wedges where necessary
- steel branders
- l) patent hot dip galvanized steel sheet lipped channel brandering system including suspension brackets with adjusting slot
 - m) size or span: 1 200 mm maximum or according to manufacturer's instructions
 - n) nail or screw suspension bracket to side of timber truss/beam
 - o) level out by means of adjusting slot
 - p) perimeter trim: as specified

9.1.2 Fibre-cement and gypsum board ceilings

fibre-cement board

- a) fibre-cement ceiling board: *SANS 803*, 6 mm thickness

- b) brander spacing: 600 mm
gypsum board
- c) gypsum board: SANS 266, 6,4 mm thickness
- d) brander spacing: 400 mm (300 when plastered)
storing and handling
- e) store boards inside a building on a damp-proof membrane or a timber platform
- f) handle boards vertically by two men
cornices
- g) gypsum coved cornice: SANS 622
- h) polystyrene core coved cornice: paper covered
fixing
- i) according to manufacturer's instructions
- j) use longest board lengths possible
- k) pattern when visible: arrange boards symmetrically about room, at right angles to brandering, with cut boards along walls, or to pattern as specified
- l) lay fibre-cement boards ripple face down to hide nail heads
- m) nail boards to timber brandering with 38 mm hot dip galvanized clout nails or 32 x 2,5 mm diameter hot dip galvanized serrated ceiling nails at 150 mm centres
- n) screw boards to timber brandering with 25 mm drywall screws when surface is to be plastered
- o) screw boards to steel brandering with 25 mm drywall screws at 150 mm centres
- p) joints where ceiling is to be plastered: close butted and taped
- q) provide movement/control joints through ceiling as follows or as specified
 - a clean break of 15 mm through the complete ceiling structure and finish
 - in interior ceilings at <15m intervals and total area <225 m²
 - in exterior ceilings at <9m and total area <81m²
 - where ceiling framing changes direction
 - to coincide with structural joints
- r) nail and/or glue cornices to brandering and walls; fix wood cornices to walls with *suitable* frame anchors; mitre corner joints, splay all heading joints; join fibre-cement cornices with H-profile jointing strips.
plaster boards
- s) ensure building is enclosed before ceiling boards are fixed
- t) plaster entire ceiling with 3 – 6 mm patent lightweight plaster on same day as board has been erected
- u) finish plaster to smooth polished surface.

9.1.3 Wood board ceilings, lining

- a) thickness: to suit span and density
tongue and groove board
- b) tongue and groove wood board: SANS 1039
wood strip, trim
- c) hardwood: SANS 1099
plywood
- d) 3-ply: SANS 929, of exposure class, veneer species, grade etc. as specified

fixing

- e) secret nail tongue and groove boards with lost head oval wire nails; stagger all end joints
- f) nail strip and plywood with panel pins
- g) finish edges with wood cornice/trim of similar species and grade
- h) fix wall boards to grounds to prepared wall surfaces at centres to suit board thickness and layout
- i) where sound absorption insulation is placed between grounds, cover full surface with black shade cloth before fixing boards

hatches

- j) material, pattern: to match ceiling.

9.1.4 Hatches

- a) near equipment needing regular maintenance

timber hatch in timber brandered ceiling

- b) trim 650 x 650 mm minimum clear opening in ceiling, with 38 x 100 mm sawn softwood trimmers spiked to beams or trusses
- c) form hatch frame of brandering as for ceiling
- d) form trap door of brandering and ceiling board as for ceiling
- e) fillets to carry trap door in closed position: 50 x 13 mm hardwood nailed or screwed to ceiling around hatch opening; mitre corners
- f) hang trap door with one pair 75 mm steel hinges screwed to frame, so that trap door can open 180 degrees on to top of ceiling brandering, when specified

steel hatch in timber or steel brandered ceiling

- g) 0,6 mm pressed steel ceiling trap door, hinged to open 180 degrees onto ceiling, in 25 x 25 x 3 mm T-profile steel frame
- h) clear opening: >650 x 650 mm
- i) screw frame to ceiling brandering.

9.2 Suspended ceilings

performance

- a) fire resistance in minutes, tested to SANS 10177
- b) airborne sound insulation rating: SANS 717/10218
- c) deflection requirements: to South African Building Interior Systems Association (SABISA).
- d) structural performance requirements: safely support all anticipated loads, e.g. luminaires, smoke detectors, air grilles, wind loads, point loads

board

- e) mineral fibre board: EN 13964

suspension fittings

- f) patent suspension fittings of cold-formed hot dip galvanized steel T's, hold down clips, suspension rods and hooks, suspension clips, T suspension plates, lipped wall angles, shadowline wall angles and wall channel trim

installation

- g) according to manufacturer's instructions
- h) not before the building is enclosed, plasterwork has dried out, and services are in position and tested

- i) handle boards with clean gloves
- j) arrange grid symmetrically about rooms, with cut boards along walls, with straight joints in both directions, or to pattern as specified; edge perimeter infill units minimum size: half standard board width or length
- k) suspend main tees from structure by hot dip galvanized mild steel strapping or 2 mm diameter hot dip galvanized wire or by patent suspension rods or hooks combined with spring clips and suspension plates
- l) clip cross tees into main tees at the end of each board
- m) use fixers suitable to structural soffit: expanding anchors into concrete; bolts through holes in steel or with clips; screws to sides of timber into top third of beam/rafter/joist; shot nailing is prohibited
- n) level out
- o) hold down ceiling boards with patent hold-down tags or wedges
- p) provide extra hangers for light fittings, sound systems, air conditioning vents etc. as required

9.3 Partitions, linings

performance

- a) structural requirements: SANS 10160
- b) wall deflection requirements: to South African Building Interior Systems Association (SABISA)
- c) required fire resistance in minutes: SANS 10177
- d) required sound insulation grading: SANS 717/10218.

9.3.1 Materials

boards

- a) gypsum plasterboard: SANS 266
- b) fibre cement board: SANS 803

studs and tracks

- c) metal studs and tracks: hot dip galvanized steel with wall thickness and size complying with the structural requirements of the installed system
- d) timber studs: SANS 10082: for load-bearing or non-load-bearing walls as required

aluminium extrusions

- e) extruded aluminium sections: alloy 6063 or 6261 in temper T5 or T6, of wall thickness and strength to meet the structural requirements
- f) anodizing: SANS 1407

powder coating

- g) powder coating: SANS 1274/1578/1796/10322
- h) by applicators approved by the specified powder manufacturers

glass

- i) glass: SANS 1263/50572
- j) required marking in case of safety glass: permanently on each pane, visible after installation.

9.3.2 Drywall partitions, light weight internal walls

Frame system clad with gypsum or fibre cement board, doors, glazing, trims, skirtings etc. as specified.

9.3.3 Demountable partitions

Patent system complete with studs, braces, door and glazing frames, apertures, trims, skirtings, etc. as specified.

9.3.4 Cubicle partitions

Patent system complete with stiles, panels, doors and accessories, etc. as specified.

9.3.5 Operable partitions

- a) patent operable partitions consisting of full-height panels of 75 x 1200 mm, hung on tracks and manually operated to be stackable
- b) frames: aluminium alloy
- c) panels: medium density fibreboard backed with sound insulation materials
- d) hinges: recessed
- e) seals: all round each panel to achieve the required sound insulation

9.3.6 Installation

- a) according to manufacturer's instructions
- b) drywall linings to walls:
 - screwed to timber or steel grounds, or
 - glued to masonry or concrete walls without grounds.

9.4 Raised access flooring

Invoked standard when required: SANS 10021 The waterproofing of buildings

Invoked standard when required: SANS 952 annex C: Notes on use, installation and protection of film (supplement to SANS 10021)

raised access flooring

- a) raised access flooring: SANS 1549
 - fire resistance in minutes: SANS 10177
 - sound insulation grading: SANS 717/10218.

installation

- b) according to manufacturer's instructions.

10 Windows, doors, curtain walls, skylights, solar control

10.1 Performance

Unless specified otherwise, the following performance standards are required to be met:

mechanical performance

- a) mechanical performance of windows, doors, curtain walls and skylights in respect of wind action (deflection and structural strength), water penetration, air penetration and operation within the confines of the perimeter of the main frame, irrespective of the framing material: *SANS 613*
- b) design wind pressure: *SANS 10160*
- c) atmospheric temperature range: between -10°C and 35°C
- d) plastic, shrinkage and creep deflection of floor slabs: as specified

thermal performance

- e) U-value and Solar Heat Gain Factor, including permissible air leakage: *SANS 204*, or as supplied by the glazing manufacturer as verified according to the test method ASTM C 1199 and ISO 9050 for U-values, and given in NFRC / SAFIERA 100-2004 for SHGC values, or be custom product assessed from suppliers, manufacturers, industry associations (including their online resources), and from competent assessors, who must have assessed the products in the manner prescribed by SAFIERA, or be the subject of a rational design by a *competent person*.

10.2 General requirements

- a) fittings to be removable after windows have been glazed
 - burglar bars
- b) solid mild steel or aluminium alloy of pattern as specified
- c) kink bars at peg stays or latches where required
 - insect screens
- d) metal gauze screen frames: pressed steel with baked enamel finish, or extruded aluminium with natural anodised finish, filled with 1,5 x 1,5 mm mesh fibreglass gauze
- e) screens to outward opening sections:
 - attach to inside of window frame with studs or clips in such a way as to be readily removable
 - with sliding or hinged sections so as to allow access to opening stays and fasteners from the inside
 - screens to top-hung ventilators may be hinged for access to fasteners
- f) screens to inward opening sections and louvres:
 - deeper frames to allow opening of window/louvre, of a heavier gauge metal
 - fix to window frames with screws or rivets
- g) pivot type windows:
 - screen frames in two sections, one on outside and one on inside, with gap between sections filled with suitable rubber flashing fixed in a way as to be easily renewable
- building in
- h) fix frames upright, square and free from warp
- i) use lugs provided with the frame

- j) screw and plug where lugs cannot be built in or covered up
- k) brace door jambs with timber while building in
- l) fill space between backs of pressed steel door frames and wall solid with mortar
- m) prevent damage and staining of aluminium frames by wrapping with paper or plastic or covering with light tack tape; leave wrappings in place until all rough trades are finished
- n) avoid direct contact between aluminium and other metals or wet concrete by applying a separating coat of bituminous paint

inspection

- o) view scratches and blemishes on aluminium or coatings at a distance of three metres under normal and reasonable lighting conditions.

installation

- p) install according to manufacturer's instructions where applicable
- q) service units at completion and leave in perfect working order.

10.3 Steel framed units

Factory finish: prepared to SANS 10064 and primed with zinc phosphate SANS 1319 inland, or hot dip galvanized to SANS 121 / SANS 14713 in the *coastal region* or corrosive atmospheres.

10.3.1 Hot-rolled steel framed units

- a) hot-rolled mild steel framed units: SANS 727
 - weather bars: 1,6 mm thick to bottom of opening-in and vertically pivot hung ventilators, and to bottom of all opening out ventilators where they occur above other ventilators
 - frames: one piece construction except where to be coupled with standard coupling mullions and/or transoms
 - kicking plates: 1,6 mm steel plate fixed with metal beads
 - sills: fit outward opening doors with sills of door framing section (stepped), but inward opening doors with metal ties welded to frames, for embedding in thresholds (flush)

10.3.2 Cell windows

police type

- a) purpose made to forms, sizes and construction as shown on type *drawings* POL 27/2 and 27/4, including window frames of standard residential window sections with sashes hung on purpose made hinges, including pull handles, wing grip turn buttons and manganese steel bars set between window sections and/or into the core of hollow sections
- b) manganese steel bars: Y-steel with manganese content, heat treated to surface hardness of 50 on the Rockwell C scale with not less than 2 mm penetration on all four surfaces; no welding is allowed near the manganese bars during any stage of manufacture
- c) fixed screens: provide each window with a fixed mesh screen welded into a mild steel angle section frame fixed to walls with clamps bolted to wall, with bolt head welded to clamp after tightening
- d) factory finish: manganese steel bars are to be prepared and primed only (not galvanized) before set in position

correctional services type

- e) as for police type except that manganese steel is to have a surface penetration hardness of between 55 and 63 on the Rockwell C scale on all four surfaces, and no fixed screens are required.

10.3.3 Pressed steel clisco type window frames

Pressed steel clisco type window frames: SANS 1311

10.3.4 Pressed steel door frames

- a) pressed steel door frames: SANS 1129 additional clauses
- b) frames for continuous power floated floors without screeds or toppings to be suitable for surface placing without damage to the floor and without compromising proper building in of the frame or the fitment of standard doors
- c) steel thickness half wall width: 1,2 mm; steel thickness single rebate full wall width and frames for double swing doors: 1,6 mm
- d) frames for double swing doors: jambs with V-shaped centres to fit rounded edges of doors, and plain heads or transoms, holed and prepared to receive top centres of spring hinges
- e) buffers: two rubber buffers on lock side rebate of every frame.

10.3.5 Pressed steel door and frame combination

- a) doors: 1,2 mm pressed steel with 40 mm edge, > two V-shaped vertical ribs over full door height, and three horizontal rails
- b) frame: single rebate pressed metal door frame: SANS 1129
- c) lock box: 1,6 mm pressed steel
- d) hinges: 1 pair 100 mm steel.

10.4 Cold-rolled steel framed units

- a) patent cold-rolled tubular steel profile frame with integrated fittings and gaskets
- b) galvanized to 200g/m² and powder coated.

10.5 Aluminium framed units

- a) AAAMSA certified as to performance, glazing, surface finishing, hardware, fasteners, product certification and, when required, energy rating.

10.5.1 Windows and glazed doors

- a) Aluminium framed windows and glazed doors: as specified.

10.5.2 Skylights

- a) obtain a *competent person's* certificate on design loading compliance
- b) sloping glazing to have an overhang if shedding rainwater on significant vertical surfaces
- c) glazing bars to allow for water penetration and effective drainage to outside
- d) condensation: to be removed through guttered weep system
- e) screws and fixing bolts: covered with plastic head caps.

10.5.3 Curtain walling

Curtain walling: as specified.

10.6 Adjustable glass louvred windows

- a) standard: CKS 413
- b) operation: manual or remote control as specified
- c) for glass see Section 17
- d) fix louvre frames in fixed window frames with stainless steel or chromium plated brass dome-head screws
- e) fix after window frame has been painted, when relevant
- f) service louvres at completion and leave in perfect working order.

10.7 Wood framed units

- a) hardwood: SANS 1099, clear grade, of species as specified, for exterior or interior units
- b) softwood: SANS 1783-3, clear grade, of species as specified, for interior units only
- c) joints (structural): mortise and tenon
- d) rebated frames: shaped out of solid wood – lay-on door or casement stops are prohibited
- e) haunches: provide top rails of door frames with bevelled haunches for building in
- f) glazing beads: mitre corners; tack lightly in place before delivery
- g) lugs: 500 x 32 x 1,6 mm hot dip galvanized steel lugs for building in, twice screwed to the outside of frames at 300 mm from bottom and top and intermediately at not exceeding 900 mm apart
- h) dowels: provide bottom ends of door frame stiles with one 10 mm diameter steel dowel for building into thresholds
- i) in the case of exposed frames, shape bottom rails and beads to shed rainwater outwards; provide drips to head and bottom rails; provide capillary breaks around opening sections
- j) prepainting: one coat wood primer to backs of frames before building in.

10.8 PVC-U framed units

- a) PVC-U window and door frames for external use: SANS 1553.

10.9 Polymer concrete framed units

- a) polymer material: unsaturated polyester (UP) resin: SANS 713
- b) to comply with minimum safety, heat distortion and compressive strength requirements.

10.10 Wood doors

- a) wood doors: SANS 545 and mark bearing
- b) required marking on edge or top of each door: manufacturer, exposure class, performance class; in case of flush doors, position of coat rails ('CR') and closer blocks ('CB')
flush panel doors
- c) edge finish: concealed
additional clauses
- d) batten doors for external use, or framed panel and glass doors for external or internal use: 44 mm thick, of hardwood (including doors to be painted), mortise and wedge tenoned, with the tenon showing on the outside edge of styles; middle rails in such a position that a mortice lock will not destruct the tenon joint
- e) single swing double doors: with rebated meeting stiles
- f) weather bar with drip: required to exposed exterior doors
- g) veneer on pairs of doors: to match in grain and colour
- h) performance rating stamp on door: do not remove until inspected in the hung position
sealing
- i) seal doors, or knot and prime, on all four edges immediately after delivery on site (if not prefinished)
hanging
- j) timing: delay hanging of doors until all wet trades are done
- k) distortion or out-of-plumbness of frames: check and report before hanging door
- l) trimming: leave clear space of 2 mm (+0 mm -1 mm) above and along sides, and 6 mm (+0 mm -3 mm) under door; take off equal amounts from each side, top and bottom of flush doors when fitting; to reduce height of panel or framed doors, take off from bottom only

m) sealing: paint or seal trimmed edges before hanging.

10.11 Fire doors and fire shutters

- a) fire doors and fire shutters: SANS 1253
- b) installation: SANS 1253 Annex E.

10.12 Garage doors

up-and-over garage doors

- a) solid door panel of steel or wooden framework clad in weather boarding, tipping upward into horizontal open position; balanced by springs.

sectional overhead doors

- b) curtain of hinged panels sliding upwards and inwards in channel guides; balanced by springs.

10.13 Roller shutter doors

- a) curtain of interlocking slats or grilles running in channel guides from a spring loaded barrel, mounted overhead on steel support brackets; assembly bolted or welded to the building structure
- b) automatic operation to be supplied with light, safety reverse, manual override, and remote control
- c) electrical operation to include remote push button starter, limit switch assembly, emergency hand operator in event of power failure; electromagnetic brake.

10.14 Strongroom/record room doors, ventilators

strongroom and vault doors

- a) strongroom and vault doors: SANS 949
- b) required marking: manufacturer's name on outside of door; door category on inside of door.

fire-resisting record room doors

- c) fire-resisting record room doors: SANS 1015
- d) required marking: "FIRE RESISTANT ONLY" , manufacturer's door number

ventilators for strongrooms

- e) double ended steel telescopic ventilator sleeves of <127 x 127 mm internally and *suitable* for wall thickness, fitted with baffle plates and flame proof wire gauze screen; face plates < 225 x 225 mm on both sides, the outer face plate fitted with drop shutter mechanism operating from a fusible metal plug; sleeves and baffle plates not less than 2 mm thick

installation

- f) bolt strongroom door(s) to walls with lugs provided
- g) in openings formed in walls after plastering has been completed
- h) according to manufacturer's instructions
- i) grout in solid with class I mortar
- j) door to clear finished floor by 25 mm
- k) build in ventilator(s) into openings formed in the walls in class I mortar, grouted in solid.

10.15 Solar control

Solar control devices: as specified.

11 Plaster, screeds, toppings, terrazzo

11.1 Plaster

11.1.1 Cement plaster

Applicable standard: SANS 2001-Construction Works Part EM1: Cement Plaster.

Specification data:

- a) sands: SANS 1090
- b) admixtures: not permitted
- additional items
- c) form drip ledges on the exposed bottom edge of slabs and lintels
- d) maintain full width structural joints through the plaster
- e) score plaster surfaces to be tiled.

11.1.2 Gypsum plaster

- a) hardwall gypsum skimming plaster: proprietary retarded hemi-hydrate finishing plaster
- b) application: to supplier's instructions
- c) do not mix gypsum-based plaster with plaster made with common cement.

11.1.3 Lime plaster

- a) limes: SANS 523
- b) mix: consult SANS 523 annex C.

11.1.4 Insulating plaster

- a) aggregate of low density: SANS 794, density 800 – 960 kg/m³ (clinker), or as specified
- b) mix: 1:9 or according to supplier's instructions
- c) low-density foamed mixes by specialist suppliers: prohibited without permission.

11.1.5 Barite plaster

- a) plaster grade barium sulphate (BaSO₄)
- b) mix: one part cement to two parts sand to three parts barite by mass
- c) thickness: 15 – 30 mm.

11.1.6 Accessories

expanded metal

- a) expanded metal: SANS 190, hot dip galvanized in external plaster, stainless steel in corrosive atmospheres
- b) angle rounded corner protection: 1 500 x 1,0 x 35 mm girth strip

11.2 Screeds, toppings, terrazzo

Invoked standard when required: SANS 10109 Part 2 Finishes to Concrete Floors.

11.2.1 Materials

cement and aggregate

- a) cement for screeds: SANS 50197-1 type CEM I or CEM II
- b) cement for toppings: SANS 50197-1
- c) cement extenders: SANS 1491

- d) aggregate for screeds: concrete sand (not a plaster sand) passing through a 5 mm sieve; where a smooth surface is required, concrete sand may be blended with plaster sand in the proportion of 4:1

- e) aggregate for toppings: aggregate from natural sources: SANS 1083

Nominal aggregate size, mm	Minimum thickness of topping, mm
6,7	25
13	40
¼ thickness of topping, maximum 19	>40

- f) aggregate for terrazzo: marble aggregate consisting of equal parts of sizes ranging from 3 to 4 mm and 4 to 6 mm

proprietary surface treatments

- g) form: dry shakes, coatings or screeds as specified

- h) colouring pigment: BS 1014 or BS EN 12878

joint sealants

- i) sealants: see section 6

mesh reinforcement

- j) welded steel fabric for reinforcement of topping when specified: SANS 1024, of fabric reference number 193 or 245

water

- k) water for mixing: drinking water

edge, dividing, feature strips

- l) see Section 16 Hardware.

11.2.2 Mix

screed

- a) 1 part cement to 3½ parts sand, or 50 kg (one bag) cement to 130 L sand (two wheelbarrows)

- b) mixing: by hand or preferably by forced-action mechanical mixer for 3 minutes

- c) use within 45 min.

topping

- d) mix proportions may be arrived at by a process of mix design or by the use of recognised tables of trial mixes with South African aggregates

terrazzo

- e) 1 part cement to 2 parts marble aggregate

consistency

- f) slump: 40 – 50 mm as measured by the standard slump test SANS 5862

colouring pigment

- g) application: mix with dry cement, or add to freshly laid surface as a dry shake

11.2.3 Preparation

- a) ensure all piped services are in position in base; do not bury services in topping or screed
- b) ensure base concrete is hard and strong, free of cracks and reasonably accurate to required level; expose clean hard concrete by chipping if necessary and remove all dust, preferably using an industrial vacuum cleaner
- c) wet surface for four hours before laying, only if concrete is absorptive; remove free water before grouting (test concrete for absorptiveness by pouring a cupful of water onto the surface; if water is absorbed within a few minutes, suction warrants that the surface should be wetted; if not, do not wet)
- d) prepare bay forms for toppings to coincide with joints in base
- e) ensure edge/dividing/feature strips are in position.

11.2.4 Laying

- a) make up grout by mixing about $\frac{1}{2}$ L water per kg cement, or a proprietary bonding agent, and brush over surface 10 to 20 minutes before applying screed or topping; apply bonding agent *according to manufacturer's instructions*; use within 30 minutes of mixing
- b) spread mix, compact, and lightly wood-float to required thickness

screed

- c) lay guide strips of screed mix to establish levels
- d) lay screed in panels as large as possible in one operation without intermediate joints
- e) lay screeds not to be covered with a floor finish in panels not exceeding 9 m² or to acceptable pattern
- f) screed thickness: 25 – 50 mm
 - on stair treads: 20 mm
 - on stair risers and skirtings: 10 mm
 - on flat concrete roofs to receive waterproofing: minimum thickness 40 mm and to fall
- g) exposed salient angles: round to 20 mm radius

topping

- h) establish levels by means of bay forms
- i) cast bays in chequerboard fashion in panels not exceeding 9 m² or cast continuously and saw contraction joints as described under JOINTS
- j) topping thickness: 25 – 40 mm
- k) mesh reinforcement: place as close to the upper surface as is permissible

terrazzo

- l) spread screed mix, compact and lightly wood float to 25 mm thickness as described under Screed; set edge/feature/dividing strips into screed to form panels not exceeding 1 m², or to pattern as specified; while screed is still plastic, spread and compact terrazzo mix in bays to thickness of 15 mm and trowel to level surface.

11.2.5 Finishing

screeds and toppings

- a) ordinary finish: leave surface as finished by wood floats to smooth or non-slip finish
- b) hard finish
 - bull-float immediately after levelling before any excess moisture or bleed water appears on the surface
 - leave finish undisturbed for two to four hours (longer in cold weather), remove bleed water and laitance on surface
 - float again, and steel trowel until desired texture is obtained

- use power trowels if areas are large
 - finish with carpet-faced floats or soft brushes or broom to desired texture
- c) do not add water or dry cement at any stage; do not trowel too soon; avoid overtrowelling pigmentation
- d) integral application: lay mix in two thicknesses in one operation, the lower unpigmented thickness brought up to 6 mm of the finished level, and the upper pigmented thickness laid with the required amount of pigment mixed with the dry cement before adding water
- e) dry shake application: dry-shake pigment to the final surface and trowel in to an acceptable finish and pattern
- grinding and polishing
- f) grind surface after four days by wet mechanical process until aggregate is fully exposed and surface is even and smooth or non-slip as required
- g) grind small or awkward surfaces by hand with carborundum stone
- h) wash clean.

11.2.6 Joints

isolation joints

- a) against walls, columns or other fixed objects
- b) 20 mm wide through full thickness of topping, screed or terrazzo
- c) to coincide with isolation joints in base

intermediate sawn contraction joints

- d) in continuously cast unreinforced topping only
- e) saw halfway through topping thickness with concrete saw
- f) form panels not exceeding 9 m², or to pattern as specified
- g) arris-round top edges of joints with a radius of 3 – 5 mm

patent movement joint systems

- h) patent movement joint system with flexible inserts when specified
- i) fix through pre-drilled holes using cross-head stainless steel screws and plugs at 300 mm centres on both sides of joint.

11.2.7 Surface regularity

- a) degree of surface regularity: II (SANS 10155) 5 mm along a 3 m straight-edge in any direction, and gradual, or as specified
- b) deviation of floor finish from datum level: ±15 mm and gradual; less near door openings or other defined areas where levels must be accurate.

11.2.8 External thresholds

- a) remove one masonry course of foundation wall over width of door opening
- b) place metal edge strip against exposed surface bed
- c) cast concrete topping grade 20 threshold between reveals, sloping away from door, or lay precast threshold
- d) finish threshold with a non-slip finish or 75 mm wide reeding, stopped 100 mm from threshold ends (see drawing), or finish concrete to a non-slip finish.

11.2.9 Edge strips

- a) see Section 16 Hardware for material, size
- b) under internal doors

- where floor finish changes material or pattern
 - so placed that floor change is not visible when door is closed
 - top edge of strip to be level with finished floor
- c) under external doors
- top edge level with finished internal floor
 - with external exposed threshold 5 mm lower.

11.2.10 Skirtings

- a) 75 mm high of same material as floor finish and in same operation
- b) hollow rounded at junction between floor and skirting, top edge level with slightly rounded edge
- c) to project 10 mm from face brick and bagged wall surfaces, 5 mm from face of plastered walls, and flush with tiled wall surfaces.

11.2.11 Curing

- a) cure finish for at least seven days by
- uniform application of a liquid membrane-forming compound complying with AASHTO M148 type 1-D or type 2 to manufacturer's instructions, or
 - ponding water on surface, or
 - covering with sand which is kept moist, or
 - covering with plastic sheeting
- b) extend curing time in cold weather when ambient temperature falls below 10°C.

11.2.12 Inspection, testing and repair

- a) inspect screed or topping as late as possible in the construction program
- b) test adhesion of screed or topping to base by tapping surface with a hammer or end of a rod; hollow sound indicates lack of adhesion
- c) isolate rejected panels by sawing with a mechanical concrete saw in an acceptable pattern, remove and relay, using the same procedure as above, starting with preparation of the base.

11.2.13 sealing

- a) seal joints with a suitable elastomeric material when specified
- b) joints subjected to heavy traffic: fill with a *suitable* semi-rigid epoxy

12 Tiling

12.1 Materials

ceramic wall and floor tiles

- a) ceramic wall and floor tiles: SANS 1449
- b) porcelain tiles, fully vitrified: SANS 13006 group B1a, water absorption $\leq 0,5\%$
- c) moisture expansion limit: $<0,06\%$ for external floors, and for internal floors in wet and/or cold areas
- d) scratch hardness on the MOHS scale: >4 for walls; >7 for floors
- e) required marking on tile and/or packaging: trade name, country of origin, group, dimensions, class of resistance of glazed tiles to acids and alkalis, surface abrasion resistance of glazed tiles

stone tiles

- f) natural stone: from a South African quarry
- g) cast stone: BS 1217

concrete tiles

- h) precast concrete tiles: SANS 541
- i) terrazzo tiles: precast concrete with a terrazzo facing: BS EN 13748

mosaic

- j) tesserae glued to brown paper or water-resistant synthetic mesh fabric in squares of about 300 x 300 mm

profiled and decorative tiles

- k) skirting, dado, bullnose and other profiled or decorative tiles: as specified.

accessories

- l) movement joint strip: of depth that allows fixing to the substrate or background
- m) stair nosing and movement joint strip: with polyurethane or PVC infills.

adhesive

- n) proprietary adhesive BS EN 13007, of *suitable* type
- o) adhesive and associated systems: from one manufacturer

grout

- p) proprietary grout: BS EN 13007 of suitable type and colour
- q) use epoxy grout in areas where hygiene is important.

12.2 Tiling

Invoked standard when required: SANS 10107 Design and Installation of Ceramic Tiling

preparation

- a) complete all adjacent rough construction work and install and test all services in background before commencing tiling work
- b) examine backgrounds, remedy defects and allow to dry to equilibrium moisture content; remove dust, loose matter, efflorescence and laitance
- c) in the case of smooth and dense concrete: key surfaces with a priming agent as recommended by the adhesive manufacturer prior to application of the adhesive
- d) set out field, border and pattern, when relevant

bedding

- e) bed tiling units in adhesive *according to* tile and/or adhesive *manufacturer's instructions*
- f) use white tile adhesive for white marble or marble with a delicate colour
- g) bed field tiles with straight joints in both directions, or as specified
- h) cut wall field tiles only along edges and bottom of field
- i) continue floor patterns through openings connecting areas with similar tiling
- j) sills: joints to coincide with wall tile joints when of similar material
- k) external sills
 - lay tiles symmetrically about opening, with cut tiles at sill ends
 - to slope and projection as specified
 - tuck tiles under and behind drip in wood or aluminium window frames, and under leg of steel window frame
 - bed window frame lugs solid in mortar – do not remove or bend
- l) lay shower thresholds sloping towards shower
- m) return wall tiling into reveals of openings.

12.3 Jointing

joint width

- a) consistent throughout
- b) pressed ceramic tiles:
 - internal: 2 mm
 - internal for large format wall tiles: >3mm, regardless of any instruction from the tile manufacturer
 - external: >3 mm
- c) extruded floor tiles: 6 – 10 mm
- d) terrazzo tiles: 1,5 – 3 mm
- e) stone tiles: butt-joined

joint depth

- f) at least equal to thickness of tile but >6 mm

grouting and pointing

- g) grout joints of width <3 mm; point wider joints
- h) apply proprietary grout mixes *to manufacturer's instructions*
- i) use epoxy compound or acid-proof cement mortar if tiles are specified as acid-proof
- j) work grout into joints with a squeegee until joints are filled flush with surface
- k) tool joints to level surface slightly below tile edge.

12.4 Movement joints

in situ movement joints

- a) form by a temporary filler strip that is removed when tiling is sufficiently firm, leaving a clean and straight open joint
- b) seal with an elastomeric material – see section 6

preformed compression joint strip

- c) PVC or metal angle edges with *suitable* flexible infill
- d) extend to substrate and key into adhesive bed or fix through pre-drilled holes using *suitable* fixers as tiling proceeds
- e) level with, or slightly below, floor surface

- f) do not use in areas where hygiene is important
isolation (perimeter) joints
- g) isolation joint width: 10 mm
- h) form around perimeter of floor, columns, kerbs, steps and plant bases
- i) form joint adjacent to skirting in areas where hygiene is important
intermediate joints
- j) to same width as grouted tile joint
- k) position:
 - at 3 m centres maximum externally, or internally in wet areas or in areas where large thermal movement or vibration is expected
 - at 10 m centres maximum internally in areas of up to 500 m² of floor
 - at 5 m centres maximum internally in areas exceeding 500 m² of floor
 - over supporting walls or beams on suspended concrete or timber floors
 - where different background materials meet
- l) adjust spacing to coincide with structural features like columns
structural joints
- m) joint width: same as structural joint width in substrate
- n) to align with structural joints in the substrate or background
- o) in the case of structural joints in substrates or backgrounds being irregular, not straight, or not coinciding with that of the tiling: obtain a decision as to its treatment.

12.5 Cleaning

- a) sponge tiled surface with water and polish with clean, dry cloth
- b) do not use acid cleaners, scouring powder or abrasive cleaning materials
- c) protect absorbent floor finishes (for example quarry tiles) with an application of non-slip wax polish or *suitable* proprietary sealer.

13 Floor coverings, wall linings

13.1 Preparation

- a) complete all building operations that may damage the floor or lining before laying flooring or lining
- b) ensure embedded pipes, conduit, cables etc. are in position and tested
- c) ensure substrate is dry and clean; in case of porous or dusty base, apply primer to improve bond between base and adhesive when relevant
- d) rectify any defects in base; apply levelling or smoothing compounds only to repair minor surface irregularities, and *according to manufacturer's instructions*
- e) ensure edge/dividing/feature strips are in position when specified (see section 16)
- f) ensure sufficient acclimatisation period for the material, when relevant.

13.2 Materials

primers and adhesives

- a) primers, adhesives, additives, patching and repair compounds and waterproofing compounds shall be low-VOC proprietary products supplied by one manufacturer, suitable for the job at hand, compatible to the floor covering and substrate, applied in accordance with the manufacturer's instructions
- b) adhesive shall be single-pack elasticised adhesive or an adhesive as recommended by the manufacturer.

13.3 Thermoplastic and similar flexible covering

Invoked standard when required: SANS 10070 The Laying of Thermoplastic and similar Flexible Floor Covering Materials

13.3.1 Materials

- a) semi-flexible vinyl tiles SANS 581
- b) flexible vinyl flooring: SANS 786
- c) linoleum sheeting or tile: as specified
- d) rubber sheeting or tiles: recycled rubber of density between 800 to 1500 kg/m³, of light colour and of thickness, size, and texture as specified
- e) accessories: skirtings, trim, nosings etc. as specified.

13.3.2 Laying

- a) according to manufacturer's instructions
- b) set out pattern as specified; continue pattern through door openings connecting rooms with similar flooring
- c) weld joints in sheet flooring

finishing

- d) clean and polish floors with two coats polymer floor dressing SANS 1042.

13.4 Wood flooring, solid and laminate, on solid substrates

Invoked standard when required: SANS 10043 The installation of wood and laminate flooring.
Traffic class when relevant: as specified.

13.4.1 Materials

- a) unpack solid wood panels, store dry and under cover, allow free air circulation to bring panels to equilibrium moisture content

solid wood strip, block, parquet, mosaic

- b) density: >640 kg/m³ at moisture content of 12 %
- c) strip to be tongued, grooved and end-matched
- d) block dimensions: face width 57—90 mm, length 200—500 mm, thickness >20 mm
- e) parquet flooring: >6 mm thick

faced plywood or fibreboard

- f) factory assembled in panels of random lengths, and in widths up to 300 mm depending on species
- g) thickness: not less than 18 mm when laid on battens
- h) edges: tongue and grooved to produce a tight sliding fit and a flush joint on face side of strip, and end-matched

decorative melamine laminate

- i) decorative melamine laminate flooring: EN 13329
- j) thickness: 8 mm
- k) *suitable* for floating application to a fully supporting substrate
- l) provided with patent interlocking system
- m) built-in insulating underlay: when specified

adhesive

- n) single-pack elasticised adhesive or an adhesive as recommended by the manufacturer

battens

- o) battens: sawn softwood timber to comply with SANS 1783-4, size 40 x 20 mm minimum thickness
- p) battens for sprung floors: 50 x 50 mm laminated softwood

damp proof membrane

- q) over-slab damp proof membranes shall be new polyolefin film to SANS 952 class C or an Agrément certificated polyethylene sheet at least 0,2 mm thick.

movement joints

- r) patent movement joint strip: see Section 16.

13.4.2 Installation

preparation

- a) ensure partitions are in place before floating floors are laid

installation in general

- b) not over underfloor heating without written approval of the flooring manufacturer and/or the installer
- c) lay panels or strips in same direction as angle of light incidence; where this is not important, lay parallel to longest side of room
- d) continue pattern through door openings connecting rooms with similar flooring
- e) movement joints: allow 20 mm clear space against all fixed objects including door frames, and every 10 m in both directions
- f) stop or cut back plaster finish on walls short of finished floor level when required to ensure skirting covers the joint

nail down

- g) lay damp-proof membrane over concrete substrate on the ground; lap sheets by 300 mm
- h) fix battens at 400 mm centres to substrate except in case of sprung floors where battens are to be laid floating on *suitable* resilient pads
- i) secret-nail flooring strips to battens through the tongue at an angle of 45°; header joints may occur in the spaces between battens, provided that each length of flooring is nailed to at least two supports; header joints to be random staggered
- j) fill space between battens with cement:sand mix when underfloor heating is installed

glue down

- k) spread adhesive evenly on substrate with a serrated trowel
- l) place panels accurately on setting out lines
- m) tap firmly in position within open time of adhesive

floating

- n) lay damp-proof membrane over concrete substrate on the ground; lap sheets by 300 mm
- o) lay foam underlay as recommended by manufacturer over entire floor area
- p) join panels with patent click jointing system; random stagger end joints
- q) use manufacturer's accessories for intermediate joints, movement joints, skirtings, split-level treatments, nosings, and marrying to other flooring materials

finishing solid flooring

- r) when relevant, ensure adhesive has completely cured before starting sanding operations
- s) sand with mechanical floor sander in one operation (fine only) to smooth and even surface
- t) finish untreated wood floors with one coat clear wax polish

finishing faced plywood or fibreboard panels

- u) prefinished panels: clean down
- v) panels having to be sanded: make absolutely certain of the process before attempting this work, and obtain prior permission.

13.5 Textile flooring

Invoked standard when required: SANS 10186 The Installation of Textile Floor Coverings.

Invoked standard when required: SANS 13746 Textile Floor Coverings – Guidelines for Installation and Use on Stairs.

Invoked standard when required: SANS 2424 Textile floor coverings – vocabulary.

13.5.1 Materials

textile flooring

- a) textile flooring (pile construction): SANS 1375
- b) textile flooring (needle punched construction): SANS 1415

carpet underlays

- c) carpet underlays: SANS 1419, with location grade similar to location grade of floor covering
- accessories and fixing materials
- d) as recommended by carpet manufacturer
- e) use non-flammable contact adhesive where fire ratings are critical.

13.5.2 Installation

- a) according to manufacturer's instructions

- b) use coverings from same production run to ensure uniform colour and texture
- c) agree on direction of seams and pile; pile to lie down stairs; place longitudinal seams away from traffic areas; place cross seams in crotch of stairs
- d) start full widths on door side of room; finish carpets under doors within thickness of closed door
- e) cover exposed carpet edges with *suitable* metal edging strip
- f) to prevent bow-wave effects under wheels, for example in medical institutions, stick carpet to floor with suitable adhesive
- g) use protective stair nosing on carpet tiles and fibre-bonded coverings
- h) stair nosings to have minimum radius of 12,5 mm; if less, use protective nosing
- i) secure covering by carpet gripper lengths at each crotch riser and tread or by means of adhesive
- j) ensure continuity of level between covering and stair nosing; fix nosing to *suitable* spacers, e.g. hardboard or plywood strips with adhesive and screws
- k) nosings to be wide enough (60—100 mm) to prevent rocking.

13.6 Epoxy flooring

- a) type: seamless epoxy mortar floor
- a) epoxy mortar: epoxy resin mixed with *suitable* aggregate of specified colour and size application
- b) according to manufacturer's instructions
- c) scabble or sandblast surface to provide necessary grip
- d) prime surface with low-viscosity epoxy
- e) apply final epoxy finish after 10 h by trowel or by self-levelling, to thickness and finish as specified
- f) prepare sample panel
- g) stop finish against metal strips on both sides of movement joints.

14 Painting, paperhanging

Invoked standard when required: SANS 10305 Painting of Buildings part 4, 5, 6

Invoked standard when required: SANS 12944 Paints and varnishes – corrosion protection of steel structures by protective paint systems

14.1 Materials

- a) *suitable* for intended purpose and for surface to which it is to be applied
- b) restrict all paint to one manufacturer where possible; complete paint systems – primer, undercoat and finishing coat – to be as recommended by the same manufacturer
- c) containers to reach site unopened, bearing SANS -mark and specification number when specified
- d) exterior quality for exterior work
 - primers
 - e) alkali-resistant plaster primers: SANS 1416
 - f) primers for interior and exterior wood: SANS 678.
 - g) zinc phosphate primers for steel: SANS 1319.
 - h) pretreatment, wash or etching primers (one or two-pack) for metals: of *suitable* quality
 - i) primer-sealers, penetrating primers, masonry sealers, bonding liquid and universal primers for plaster, concrete, brick, block and stone: of *suitable* quality or the subject of an active Agrément Certificate
 - undercoats
 - j) universal undercoats: SANS 681
 - finishing paints
 - k) alkyd high gloss finishing paint: SANS 630
 - l) decorative paint for interior use: SANS 515
 - m) emulsion paint: SANS 1586
 - n) textured emulsion wall coating: SANS 1227
 - o) aluminium paint, general purpose: SANS 682
 - p) micaceous iron oxide paint, masonry paint, cement paint and lime-wash: of *suitable* quality or the subject of an active Agrément Certificate
 - varnishes, varnish stains, stains, sealers
 - q) varnish or varnish stains for interior use: SANS 887
 - r) stains: water-borne or solvent-borne
 - s) sealers: water-borne acrylic exterior quality, *suitable* for application on the material to be coated; sealers for wood to contain fungicides that inhibit the development of blue-stain fungi
 - bituminous and tar-based coatings
 - t) bituminous aluminium paint: SANS 802
 - u) other bitumen-based coatings: of *suitable* quality or the subject of an active Agrément Certificate
 - specialized coatings
 - v) two-pack epoxy primers, two-pack coal-tar epoxy coatings, one and two-pack epoxy and polyurethane coatings, cellulose coatings, and vinyl primers, undercoats and finishes: of *suitable* quality or the subject of an active Agrément Certificate

knotting, stopping, fillers

- w) knotting for the treatment of knots in wood: quick-drying resin solution or an aluminium primer
- x) stopping and fillers: *suitable* to fill holes and imperfections in the material to be painted
- y) fillers: oil-based, emulsion-based or supplied in powdered form

stirring

- z) stir paint materials before use and at intervals during use unless the manufacturer's instructions state otherwise

thinning

- aa) thin paint only to improve penetration or facilitate application, for example on surfaces of high or variable porosity, or for spray application; thinner type and proportion: as recommended by the manufacturer

two-pack materials

- bb) observe manufacturer's instructions regarding mixing proportions, induction period (standing time), pot life and the possible extension of pot life.

14.2 Preparation of surfaces

- a) allow time for the drying of surface moisture
- b) ensure work by other tradesmen that might affect painting has been completed
- c) inspect factory-primed components to ensure that the primer is in satisfactory condition; if not, take remedial action
- d) remove excess pipe jointing material
- e) when specified, remove hardware, light fittings and other removable fittings that can be contaminated; mark, store and refix after completion
- f) mask fittings that cannot be removed
- g) seal cracks between frames, skirtings, cornices etc. and walls with paintable acrylic sealant
- h) protect surfaces not to be painted

cleaning

- i) clean all surfaces of dirt, grease, soot, mould and marks –spare no time or effort
- j) limit cleaning to dry abrading and dusting when possible
 - by means of stiff brush (not wire), abrasive paper, emery cloth, steel wire wool or nylon fibre pads as required
 - always sandpaper wood in direction of grain
 - remove pencil marks and other surface discolouration
 - in the case of window frames, take care not to scratch the glass, especially with abrasive paper
 - dusting: after dusting down, sweep or vacuum floors; do not sweep or dust whilst painting is in progress
- k) remove superficial dirt by washing only if required
 - with a solution of sugar soap, household detergent, cleaning powder or mild soap
 - use proprietary cleaning materials strictly in accordance with the manufacturer's instructions
 - rinse surfaces with clean water before the solution dries
 - allow to dry before coating
 - proprietary emulsion cleaners or degreasing solutions may be used for removing heavy deposits of oil or grease

existing coatings

- l) keep only when in a sound condition and compatible to the coating to be applied

- m) remove completely or partially any coating under condition of poor adhesion, flaking, peeling, blistering, cracking, crazing and severe chalking or powdering, and when adhesion is generally sound but with a rough surface
- n) remove completely if the coating to be applied is not compatible with the existing one; seek specialist information from the manufacturer in case of doubt
- o) remove by burning off or by the use of paint removers, washing, scraping, abrading, steam, abrasive blast cleaning or other *suitable* method
 - burning off
- p) burn off using blowtorch or hot-air gun
- q) take care not to burn or crack the background
- r) remove all flammable materials from the work area
- s) use other methods on wood that is to be refinished with a clear coating system, on carved or heavily moulded woodwork, or for removal of highly flammable coatings
- t) means of extinguishing fires shall be readily available when burning off
 - paint removers
- u) type: *suitable* for the removal of the coating at hand
- v) alkaline (or caustic) type paint removers: do not use on zinc or aluminium
- w) solvent type paint removers: use under conditions of proper ventilation and the removal of possible sources of ignition
- x) apply paint removers liberally and in sufficient applications to enable easy removal
- y) clean surface when removal is complete, in *according to manufacturer's instructions*
 - abrasive blast cleaning
- z) abrasive blast cleaning: SANS 10064
 - aa) take care not to damage the background
 - bb) mask surrounding surfaces
- treatment of organic growth
 - cc) remove mould (mildew) and algae (green and black stains) before painting by scraping or brushing, blast-cleaning or high-pressure water cleaning, followed by the application of a *suitable* fungicidal wash like a solution of 1 part bleach to 4 parts water or, in the case of proprietary materials, as directed
 - dd) apply washes in dry weather
 - ee) apply a further application of fungicidal wash after removal of the dead organisms to delay re-establishment of the growth.
 - ff) allow to dry before overcoating.

14.3 Colours

- a) colours of undercoats to match finishing coat but with enough difference to be able to distinguish between coats
- b) prepare colour samples of finishing coats before any bulk paint is purchased
- c) identification colour marking (e.g. pipes transporting different fluids/gases): SANS 10140.

14.4 Preparation for painting

- a) select paint systems most suited to the environment, compatible with substrate and other components of the system
- b) follow manufacturer's instructions; observe manufacturer's recommendations in respect of temperature and its relation to curing time and pot life
- c) sandpaper all coats of paint and varnish and leave time to dry before next coat is applied

- d) do not paint when conditions are unsuitable, for example dust, insufficient light, direct sunlight or inclement weather; do not apply paint if the ambient temperature is $<10>35^{\circ}\text{C}$, or if the relative humidity is $<10>85\%$
- e) spray-paint only where this is the accepted method; mask all surrounding surfaces when spray-painting; do not spray paint in windy weather.

14.5 Knotting, stopping, filling and priming

- a) knotting: to cover wood knots
- b) stopping: for stopping up holes, wide cracks, open joints and similar imperfections, including the repair or removal and replacement of defective glazing putties
- c) use cement plaster or a proprietary plaster repair product for stopping holes in plaster; spot prime all plaster repairs, fillers etc. on walls with a masonry primer once fully cured
- d) fillers: for filling and levelling, for example shallow depressions, open grain, surface roughnesses, nail and screw heads, fine cracks and restoration of the original film thickness where this was locally damaged
- e) apply stopping and fillers by flexible putty knife on broad surfaces, and by brush on mouldings; allow surfaces to dry; rub down to a smooth surface
- f) prime or seal woodwork to be built in before building in; this applies to structural timber, all frames, all six sides of a door, and to rebates and backs of beads in glazing apertures.

14.6 On-site pre-treatment and priming of non-ferrous metals and stainless steel

aluminium

- a) smooth aluminium surfaces (sheets, extrusions and aluminized steel): degrease, and lightly abrade or pretreat with a twin-pack vinyl wash primer, followed by one coat zinc phosphate primer
- b) rough aluminium surfaces (castings and sprayed metal coatings): lightly abrade, remove dust and dirt; sprayed metal coatings might require washing; pretreat sprayed metal coatings with a wash primer or etching primer immediately after application of the coating, followed by one coat zinc phosphate primer

zinc and zinc aluminium alloy, sprayed coatings

- c) zinc sheet, zinc-coated steel (hot dip galvanized, sherardized or electroplated), and zinc aluminium alloy coated steel (hot dip): degrease, and lightly abrade or pretreat with a wash or etching primer, followed by one coat zinc phosphate primer
- d) sprayed zinc and zinc aluminium alloy coatings: wash if required, and pretreat with a wash or etching primer, preferably immediately after application of the coating, followed by one coat zinc phosphate primer
- e) where hot dip galvanized steel was unavoidably welded on site, clean joint and repair coating using a zinc rich paint or epoxy

copper, brass and bronze

- f) copper, brass and bronze coatings: degrease, and lightly abrade or pretreat with a wash or etching primer

lead

- g) lead: wet abrade and pretreat with a wash or etching primer

cadmium coatings

- h) cadmium coatings: degrease, and lightly abrade or pretreat with a wash or etching primer

tin coatings

- i) tin coatings: degrease and lightly abrade
chromium and nickel coatings
- j) chromium and nickel coatings (if corroded): abrade and pretreat with a wash or etching primer
stainless steel
- k) stainless steel: degrease, and lightly abrade or pretreat with a wash or etching primer.

14.7 Application of paint

- a) apply paint by brush, roller or spray-gun as required
brush or roller
- b) prime wood surfaces by brush only, well worked in
- c) clean brushes and rollers after use and hang to dry
spray gun
- d) spray painting is allowed only where this is the accepted method of application
- e) spray paint by air spray, airless spray or electrostatic spray of appropriate type, *suitable* to the material and type of work
- f) mask or otherwise protect adjacent surfaces not to be sprayed
- g) do not spray-apply conventional primers for building surfaces
- h) clean spraying equipment every time after use, or when changing the paint colour, by spraying copious amounts of thinner or solvent through the spray gun
general
- i) apply paint coats according to manufacturer's instructions
- j) allow paint coats to dry before applying subsequent coats
- k) colours: to sample
- l) tints of undercoats: distinguishable from succeeding coats.
- m) minimise waste from paint and associated materials: buy only enough paint for the job; store with lid tightly closed; minimise brush or roller cleaning by wrapping in plastic between coats; brush or roll the applicator onto newspaper before cleaning; do not pour cleaning liquids straight down the drain – allow solids to settle before doing so; dispose solids as garbage.

14.8 Paint systems for on-site application

Paint system and colour: as specified.

14.8.1 Cement-based surfaces, brick and stone

(cement plaster, concrete, brick, block and stone; fibre-cement goods; cement-based boards, tiles and panels; glass-fibre reinforced cement (GRC) cladding)

alkyd paint

- a) one coat alkali-resistant primer; or, for plaster only,
- b) a water-thinned primer, followed by, for interior work only,
- c) one universal undercoat and one coat alkyd gloss finish; or
- d) two coats alkyd semi-gloss or matt finish; or, for exterior work
- e) one universal undercoat and one or two coats alkyd gloss finish

emulsion paint

- f) a water-thinned first coat of emulsion paint on surfaces of high or variable porosity; and, for interior work only,

- g) two coats matt, high-opacity finish "contract" emulsion paint *SANS* 1586 grade 4; or
- h) one coat ditto, spray applied; or, for exterior work
- i) two or three coats matt or semi-gloss finish general purpose emulsion paint, or
- j) for fibre-cement roofs in *coastal areas*, an anti-fungicidal paint textured emulsion paint
- k) *suitable* primer; and, for interior work only,
- l) one coat sand-textured paint, over-painted if required masonry paint
- m) *suitable* primer; and
- n) mineral type masonry paint for interior or exterior work; or, for exterior work only,
- o) two coats smooth or fine-textured solvent-borne or emulsion-based masonry paint; or
- p) one or two coats heavy-textured solvent-borne masonry paint; or
- q) one coat heavy-textured emulsion-based masonry paint. cement paint
- r) two coats cement paint for interior or exterior work
- s) not on gypsum plaster masonry sealers
- t) one or two coats according to manufacturer's instructions lime wash
- u) two coats lime wash, applied with a 200 mm block brush.

14.8.2 Ferrous metals

- a) (clean iron and steel; total film thickness should be 115 to 145 μm) alkyd paint on blast-cleaned surfaces
- b) two coats solvent-borne primer; and
- c) one coat solvent-borne undercoat; and
- d) two coats alkyd gloss finish alkyd paint on manually cleaned surfaces
- e) two coats etching primer (one-pack or two-pack) or zinc phosphate primer; and
- f) one coat solvent-borne undercoat; and
- g) two coats alkyd gloss finish alkyd paint on factory primed surfaces
- h) inspect primer for soundness and touch up where required, and
- i) one coat solvent-borne undercoat; and
- j) two coats alkyd gloss finish alkyd paint on cast iron
- k) remove bitumen until clean, sound substrate is achieved
- l) paint one coat metal primer, and one coat high gloss alkyd paint, or
- m) two coats general purpose semi-gloss emulsion paint micaceous iron oxide paint on blast-cleaned or manually cleaned surfaces
- n) two coats micaceous iron oxide paint, high-build type

aluminium paint on blast-cleaned or manually cleaned surfaces

(fencing material)

- o) two coats aluminium paint

heat-resistant paint

- p) heat-resistant paint system on steel: of *suitable* type, applied according to manufacturer's instructions.

14.8.3 Wood

alkyd paint on interior wood

(window joinery, skirtings, doors and frames)

- a) wood primer; and
- b) one coat universal undercoat and one coat alkyd gloss finish; or
- c) two coats alkyd gloss finish

alkyd paint on interior plywood doors

- d) water-borne primer, but check compatibility with water-repellant organic solvent preservatives; and
- e) one coat universal undercoat and one coat alkyd gloss finish; or
- f) two coats alkyd gloss finish

alkyd paint on exterior softwood and plywood

(window joinery, solid doors and frames, cladding, bargeboards, fascias and soffits)

- g) one coat solvent or water-borne semi-transparent primer (base coat); followed by
- h) one or two coats universal undercoat; and
- i) one or two coats alkyd gloss finish

textured coatings on exterior softwood and plywood

(window joinery, solid doors and frames, cladding, bargeboards, fascias and soffits)

- j) one coat solvent-borne or aluminium textured primer; and
- k) one or two coats emulsion or solvent-borne textured coating

alkyd paint on exterior hardwood

- l) one coat aluminium primer; and
- m) one or two coats universal undercoat; and
- n) one or two coats alkyd gloss finish (two coats externally)

paint on exterior plywood doors

- o) transparent preservative primer/base coat; and
- p) multi-coat paints formulated for improved performance according to manufacturer's recommendations, gloss finish

alkyd paint on wood fibre and particle board

(hardboard, mediumboard, medium density fibreboard (MDF) and softboard not factory-primed or sealed)

- q) one coat primer-sealer or water-thinned primer or aluminium primer; or
- r) one coat alkali-resistant primer for flame-retardant treated board; or
- s) one coat aluminium wood primer for bitumen-impregnated softboard; or
- t) one coat resin-based wood primer or primer-sealer or water-thinned primer or aluminium primer for particle board; and
- u) one coat universal undercoat and one coat alkyd gloss finish; or

- v) two coats alkyd semi-gloss finish

emulsion paint on wood fibre and particle board

(hardboard, mediumboard, medium density fibreboard (MDF) and softboard not factory-primed or sealed)

- w) no primer, except for absorbent board in which case first coats shall be thinned; or
- x) one coat alkali-resistant primer for flame-retardant treated board; or
- y) no primer for bitumen-impregnated softboard; or
- z) no primer for particle board, except for single layer board in which case a resin-based primer shall be applied; and

- aa) two or three coats semi-gloss finish general purpose emulsion paint

alkyd paint on softwood or hardwood gates and fences

- bb) one coat solvent-borne or aluminium primer; and

- cc) one or two coats universal undercoat; and

- dd) two coats alkyd gloss finish

transparent finish systems for wood (interior)

(interior general joinery, surfaces, linings and fittings)

- ee) decorative wood stain, as required; and

- ff) one or two coats interior alkyd, urethane or urethane/alkyd resin varnish, on worktops, or

- gg) one or two coats urethane varnish, two-pack or moisture-curing, for surfaces requiring exceptional abrasion resistance, or

- hh) one or two coats wood sealer *suitable* for interior use

transparent finish systems for wood (exterior)

(exterior window joinery, solid doors and frames, cladding, bargeboards, fascias and soffits)

- ii) two or three coats exterior wood sealer.

14.8.4 Plasterboard

(ceilings, bulkheads, partitions)

alkyd paint

- a) a primer–sealer or water-thinned primer; and
- b) one coat universal undercoat; and
- c) one coat alkyd semi-gloss finish; or
- d) two coats alkyd semi-gloss finish

emulsion paint

- e) two coats matt, high hiding, scrub resistant emulsion paint on walls
- f) two coats matt utility grade emulsion paint on ceilings and bulkheads.

14.8.5 Plastics

paint on unplasticized polyvinyl chloride (PVC-U)

(PVC-U cladding, window and door frames, gutters, down-pipes, waste and vent pipes and window frames)

- a) two-pack wash primer followed by conventional alkyd gloss or emulsion paint finish system; or
- b) a long-life coating of a specialized type, such as two-pack polyurethane or epoxy

paint on glass-reinforced polyester (GRP)

- c) remove wax coating; and

- d) one coat two-pack epoxy primer; and
- e) one coat two-pack polyurethane
paint on plastic coatings on metals
- f) paint systems on plastics coatings on metals shall be of a *suitable* type
paint on polystyrene
(ceiling tile or sheet)
- g) two coats matt utility grade emulsion paint
paint on glass
(glass, glazed brick, terracotta, faïence, ceramic tiles and vitreous enamel)
- h) a conventional alkyd gloss or emulsion paint finish system; or
- i) a long-life coating of a specialized type, such as two-pack polyurethane or epoxy.

14.8.6 Intumescent paint

Apply *suitable* intumescent paint on structural steelwork, electrical cables, PVC pipes, wood and thatch by brush, roller or spray where specified, to achieve the required fire resistance.

14.9 Paperhanging

wallpaper

- a) type, pattern, colour: as specified
preparation
- b) ensure plaster surfaces are mature and dry
- c) apply a primer coat on very porous plaster only
- d) remove loose or blistering paint on previously painted surfaces
- e) clean down, fill with *suitable* filler to a smooth surface
- f) knot, prime, stop and sand down wood surfaces
hanging
- g) hang wallpaper vertically with close-fitted and plumb vertical joints; no horizontal joints are allowed; ensure adjacent sheets match in pattern
- h) tightly fit wallpaper against skirtings, ceilings, door frames and windows
- i) apply patent wallpaper adhesive to the back of the wallpaper using a brush
- j) hang wallpaper while adhesive is still wet, position immediately
- k) roll lightly to remove air bubbles
- l) wipe spills with damp cloth.

15 Furniture, equipment, stairs, architectural metalwork

15.1 Joinery

15.1.1 Solid wood

hardwood

- a) hardwood: SANS 1099
- b) grade: clear and free of sapwood for visible faces; semi-clear for faces that will not be visible.
- c) required marking: trade name, grade (clear grade—red, semi-clear grade—blue) on one piece in each bundle

softwood

- d) softwood: SANS 1783-3
- e) grade: clear and free of sapwood for visible faces; semi-clear for faces that will not be visible.
- f) preservative treatment: required for exterior work
- g) required marking: trade name on one end, grade on other end (clear grade – black; semi-clear – red) on each piece

laminated timber

- h) laminated timber: SANS 1460
- i) preservative treatment: required for softwood exterior work
- j) required marking: application, exposure class, type, appearance and finish on each board

15.1.2 Wood board

plywood and composite board

- a) plywood and composite board: SANS 929
- b) required marking: trade name, exposure class, thickness, grade, preservative treatment on each board

decorative melamine-faced boards (MFB)

- c) decorative melamine-faced boards (MFB): SANS 1763
- d) required marking: SANS 1763 + 'MFB' + thickness + abrasion and lamina thickness + Z

fibreboard

- e) fibreboard: SANS 540
- f) required marking: type on each board.

particle board

- g) particle board: SANS 50312
- h) required marking: SANS 50312 / EN 312

oriented strand board (OSB)

- i) oriented strand board (OSB): SANS 472

15.1.3 Polymer laminate and solid surfaces

high pressure decorative laminates (HPL)

- a) high pressure decorative laminates (HPL): SANS 4586
- b) required marking: SANS 4586 + type + resistance, e.g. HPDL—SANS / ISO 4586—P333

continuous pressed laminates (CPL)

- c) continuous pressed laminates (CPL): SANS 1762/4586

polymer solid surfacing material

- d) synthetic work surfaces: consisting of acrylic and/or polyester resin and mineral fillers

- e) joints: seamless.

15.1.4 Stone surfaces

stone surfacing material

- a) stone type, thickness etc. as specified.

15.1.5 Miscellaneous

hardware, fasteners

- a) see section 16

adhesives

- b) terminology and classification: SANS 10183 part 1

- c) requirements for structural applications: SANS 10183 part 2

- d) requirements for non-structural applications: SANS 10183 part 3

- e) phenolic and aminoplastic resin SANS 1349.

steel tubes for furniture

- f) see Section 5.2.

15.1.6 Joinery

general

- a) joinery: manufactured in climate zone where joinery is to be installed

- b) joinery workshop: equipped with modern machinery manned by skilled personnel

- c) wood sizes as specified are exact finished sizes

- d) overall sizes: check on site before starting any joinery

- e) store materials in a safe and dry place

- f) apply proprietary materials according to manufacturer's instructions

- g) provide materials in single lengths whenever possible; place unavoidable joints over supports

- h) joints: mechanical (grooved, doweled, feathered, screwed, proprietary plates) plus adhesive; angle joints: to conceal end grain of natural wood or the edge of laminated or particle board

- i) arrises in solid wood: round slightly; vulnerable or exposed arrises: pencil round (3 mm radius)

- j) fixings: not visible except inside cupboards or drawers; in open units, or where unavoidable, use screws with matching caps; in natural solid wood surfaces with clear finishes, countersink to 6 mm below surface and glue in matching dowels

- k) exposed panel pin heads: punch and fill with stopping; stopping to match wood in case of clear finishes

- l) exposed edges of decorative laminate board: post formed

- m) use moisture resistant or exterior grade board in wet parts of joinery (e.g. sinks, wash basins) and all plinths

- n) edges of raw board cutouts: seal to prevent moisture ingress

grain, pattern

- o) grain or pattern: grain of all fitted visible clear-finished timber, or pattern of laminates when relevant, to run vertically on vertical surfaces and parallel to walls on horizontal surfaces, wherever practicable
- p) veneer on any one fitting to match in grain and colour; veneer on pairs of doors to match plinths
- q) form plinths with front and back members and full height cross members at <900 mm centres
- r) scribe plinths to floor and secure to wall to provide a level platform for carcasses

tops

- s) solid hardwood tops: boards in single lengths or, if not possible, with staggered end joints, jointed with grooved, cross-tongued and glued joints or with grooved rebated and glued joints stopped 25 mm back from visible ends
- t) moisture resistant particle board tops: faced with high pressure decorative laminates with postformed exposed edges
- u) screw tops to framework to allow for movement: with rebated hardwood clamps or metal cleats at 300 mm centres, screwed from underneath

backs

- v) backs to fittings: hardboard or as specified
- w) bevel all exposed edges

drawers

- x) drawers: 12 mm softwood front, sides and back, grooved for 6 mm tempered hardboard bottom, screwed to 16 mm drawer face, or as specified

shop painting

- y) deliver joinery on site fully painted, or as specified.

15.1.7 Fixing

- a) fix only after space is fully enclosed and secure, all wet work is complete and dry, and airconditioning, lighting, site and stormwater works are complete
- b) fix joinery to masonry or concrete walls with *suitable* frame fixing anchors; provide necessary blocking pieces and subframes to take up inaccuracies of wall and floor faces; where exposed hardwood is to be anchor fixed: sink and pellet screw heads
- c) in all food handling areas: seal all carcass joints with walls and floors, and cable entries, with silicone beads for vermin proofing

wood cornices, skirtings, quarter rounds, rails

- d) skirtings of 68 mm and higher: hollow-rounded at the back
- e) fix members to walls with concealed fixings at centres not exceeding 600 mm
- f) fix members in long lengths with splayed heading joints and mitred corner joints
- g) fix skirtings to walls, not to floor boards; nail quarter rounds to skirtings with panel pins.

shelf bands

- h) fix metal shelf bands to walls in a manner that will safely carry a working load of not less than 10,0 kN with a safety factor of 3
- i) use stainless steel anchors in areas within 1 km of the coastline
- j) start first band 100 mm away from corners of rooms or from other shelves which are at right angles.

15.2 Commercial kitchen cupboards

- a) commercial kitchen cupboards: SANS 1385
- b) required marking on casing of every unit: trade name, production lot
- c) sizes: supplier/manufacturer is responsible for checking sizes on site and for providing detail layout *drawings* before any work is started
- d) fix cupboards according to manufacturer's instructions
- e) seal all joints between work tops and walls
- f) inspect all cupboard components after fixing and leave in perfect working order
- g) protect cupboards from damage.

15.3 Commercial steel furniture

- a) commercial steel furniture: SANS 757
- b) powder coated finishes: SANS 1274.

15.4 Metal counters, balustrades, cladding, signs, street furniture

stainless steel

- a) austenitic stainless steel, grade as specified
- aluminium
- b) anodising: SANS 999
 - c) powder coating: SANS 1274
 - d) powder coating on external architectural aluminium: SANS 1796
 - e) surface finishing: SANS 10322
- prefinished sheet metal products
- f) prefinished sheet metal products: SANS 1845
- protection
- g) remove protective covering only once all other contractors are off site.

15.5 Stairs

Type, structure, treads, balustrades: as specified.

16 Hardware

16.1 General

- a) sherardizing on ferrous products: *SANS 53811*
- b) electroplating: *SANS 135/136/2081/2082*.

16.2 Fasteners

- a) fasteners: *SANS 1700*
- b) metal screws for wood: *SANS 1171*
- c) masonry anchors: proprietary expansion or chemical type
- d) plugs: proprietary plastic
- e) mild steel nails *SANS 820*
- f) required marking: protective coating on container.

16.3 Locks, latches, catches, bolts

- a) locks, latches (domestic type): *SANS 4*
padlocks
- b) padlocks: *SANS 1533*
keys
- c) supply two keys to every lock; no key must pass more than one lock unless master keyed
- d) master and grand master keys: as specified
- e) proprietary key control security systems: submit details.

16.4 Hinges

hinges for medium to heavy doors

- a) type: butt hinges for doors opening 90°; projecting hinges for doors opening 180° when frames are set back from wall faces.
- b) aluminium hinges: high tensile aluminium with fixed stainless steel pins in nylon bushes, and with nylon washers to each knuckle joint
- c) doors fitted with closers: provide low-friction bearing hinges
- d) size for steel, stainless steel, brass or bronze butt hinges for wood doors in wood frames:

Nominal hinge size L x w x t (mm)	Door leaves not exceeding any of the following		
	Mass (kg)	Width (mm)	Thickness (mm)
70 x 50 x 1,6	16	620	30
85 x 60 x 1,6	20	820	35
100 x 75 x 1,6	30	920	40
100 x 75 x 2,5	50	920	50
100 x 75 x 3,2	70	1020	50
125 x 100 x 3,2	80	1220	50

- e) size for aluminium hinges for aluminium doors, or for doors of other materials in aluminium frames, or to AAAMSA standards:

Nominal hinge size l x w x t (mm)	Door leaves not exceeding mass (kg)	Minimum construction	
		Knuckles	Screws/hinge leaf
100 x 70 x 3	30	3	3
100 x 80 x 3,5	50	5	4
130 x 50 x 3,4	75	Surface mount	3

- f) provide fixed pin or security hinges to exterior or security doors opening out
- g) number of hinges to
- doors not exceeding 2 040 mm high or 820 mm wide or 30 kg mass: 2
 - other doors: 3 for leaves between 2 040 and 2 340 mm high; 4 for leaves between 2 340 and 3 050 mm high
 - doors controlled by door closers: 3
 - fire doors: ...

16.5 Door closers

- a) single action overhead door closers SANS 1510
- b) floor springs, consisting of a floor spring unit set into the floor, bottom and top door strap: of size and finish as specified.

16.6 Pelmets, curtain rails, rods, blinds

- a) indoor venetian blinds: SANS 947
- cross-straps: flutter-proof
 - screws: cadmium-plated.

16.7 Edge, feature, dividing strips

- a) edge strips: 3 x 40 mm
- b) dividing/feature strips: 3 x 25 mm.

16.8 Sunken door matting

- a) place level with floor finish in a sunken panel edged with metal edge strip as specified.

16.9 Number/name plates

symbolic safety signs

- a) symbolic safety signs SANS 1186

signwriting

- b) hand-painted lettering and graphics by tradesman with recognised qualifications and demonstrated experience

installation

- c) install signage level and plumb, securely mounted with concealed theft-resistant fixings
- d) fix self-adhesive signs free of bubbles and creases.

16.10 Drawer runners, slides

- a) type, load capacity, extension: as specified.

16.11 Fixing

- a) deliver door hardware items, ready for installation, in individual complete sets for each door, as follows:
 - clearly labelled to show its intended location
 - in a separate dust and moisture proof package
 - including the necessary templates, fixings and fixing instructions
- b) verify correct handing on site before supplying
- c) fix hardware with matching screws
- d) fix locks, handles, latches etc. at 1 000 mm from finished floor level to centre line of hardware
- e) ease and adjust locks on completion
- f) hand over keys at completion; replace cylinders to which contractor had key access during construction with new cylinders with other keys
- g) label all keys with coloured plastic tags
- h) plug and screw curtain rail/rod brackets and tie-backs to wall
- i) project rails/rods 300 mm past reveals wherever possible, or continuous over windows occurring in series.
- j) fix safety signs according to SANS 1186
- k) protect hardware during construction.

17 Glazing

17.1 Materials

glass

- a) basic soda lime silicate glass (float glass): *SANS 50572*
- b) safety and security glass: *SANS 1263*, symbol 1 (impact), 2 (burglar/vandal) or 3 (bullet) engraved permanently and visible after glazing on each sheet
- c) pattern glass: when relevant, discuss direction of pattern before cutting
- d) low-emissivity glass (low-e): spectrally selective coated glass *BS EN 1096*
- e) glass louvres: 6,5 mm NS safety glass, regardless of length or width, with polished edges
- f) frameless doors: 10 mm thick safety glass for internal use; 12 mm thick safety glass for external use
- g) insulated glass (double glazing): factory-prepared sealed insulated glazing units (SIGU), consisting of two panes of clear float glass separated by a sealed spacer to entrap a dehydrated air gap, indelibly mark-bearing with the trade name of the assembler/manufacturer, visible after installation
- h) work on glass: *SANS 1817*

sealants

- i) sealants: see section 6.

17.2 Glazing

Invoked standard when specified: *SANS 10137* The installation of glazing materials in buildings.

17.2.1 Glazing in frames

Applicable standard: *SANS 2001-Construction Works Part CG1: Installation of Glazing*.

Specification data:

- a) glass type, size, thickness: see Section 17.1
- b) frames for glazing: see Section 10
- c) note on drawing: "type, size, thickness and marking to *SANS 10400-N*".

17.2.2 Structural glazing

gaskets and sealants

- a) elastomeric structural glazing and panel gaskets: *SANS 635*
- b) structural sealants to be compatible with extrusion surface, glazing tape and glass, backed by regular test reports regarding adhesion of sealant to aluminium frame in accordance with ASTM/C 794-80 (standard test for adhesion-peel of elastomeric joint sealants)
- c) adhesion of sealant to aluminium, whether anodised or organic coated:
 - capable of maintaining an ultimate adhesive bond strength between aluminium and sealant of 0,828 MPa
 - design stress not to exceed 0,138 MPa
 - structural sealant glazing contractor to check adhesion of cured sealant on representative test joints on site before proceeding with installation
 - checks to be carried out periodically throughout installation period.
- d) use only freshly manufactured sealant; use only compatible accessory materials as recommended by sealant manufacturer, for example degreasing solvents, primers, back-up material with integral bond breaker, spacer and setting blocks
- e) fill sealant cavities completely

quality assurance

- f) ensure disciplined quality assurance during all stages of fabrication and installation
- g) factory glazing is preferred over site glazing.

17.2.3 Protection and cleaning

- a) protect glass against harmful splashes and weld splatter
- b) clean glass as soon as practicable after installation with mild soap and water
- c) ensure cleaning materials are not harmful to plastic glazing materials and glazing compounds.

17.3 Mirrors

- a) silvered float glass mirrors: SANS 1236, class A
- b) privacy mirrors: clear glass with mirrored venetian strips for visual privacy and/or security
- c) stainless steel mirrors: 0,9 mm thick bright annealed mirrored stainless steel
- d) fasten glass mirrors with chromium plated mirror screws to wall and allow 3 mm air space at back for ventilation, or fix mirrors with vertical strips of double sided tape to allow for ventilation; support mirrors larger than 1 m² with additional clips, anchors or beads
- e) fasten stainless steel mirrors with screws and/or glue in acceptable manner.

18 Drainage, sewerage, water and gas supply, fire equipment, sanitary plumbing

18.1 Roof eaves drainage

18.1.1 Materials

galvanized steel

a) hot dip galvanized steel sheet: *SANS 3575/4998*:

- 0,6 mm for gutters up to 15 000 mm² (cross-sectional area) and domestic downpipes
- 0,8 mm for gutters up to 30 000 mm²
- 1,0 mm for gutters up to 50 000 mm²
- 1,2 mm for box gutters with a maximum girth of 1225 mm

b) nails, bolts and screws: zinc-plated or sherardized steel

c) brackets: mild steel strip hot dip galvanized *SANS 121* after manufacture:

- 32 x 3,5 mm for gutters up to 15 000 mm²
- 40 x 5,0 mm for gutters up to 30 000 mm²
- 40 x 6,0 mm for gutters up to 50 000 mm²

copper

d) copper sheet:

- 0,6 mm for gutters up to 15 000 mm²
- 0,8 mm for gutters up to 30 000 mm²
- 1,0 mm for gutters up to 50 000 mm²
- 1,2 mm for box gutters with a maximum girth of 1225 mm

e) brackets, nails, bolts and screws: copper or stainless steel

aluminium

f) aluminium sheet:

- 0,7 mm for gutters up to 15 000 mm²
- 0,8 mm for gutters up to 30 000 mm²
- 0,9 mm for gutters up to 50 000 mm²
- 1,0 / 1,2 mm for box gutters with a maximum girth of 1 225 mm

g) brackets, nails, bolts and screws: aluminium alloy or stainless steel

PVC

h) PVC-U gutters and downpipes: *SANS 11*

- brackets: aluminium alloy.

18.1.2 Gutters and downpipes

downpipes

a) with the necessary offsets and shoes

18.1.3 Installation

a) according to manufacturer's instructions where relevant

b) lap sheet metal gutter lengths >20 mm; seal with *suitable* sealant over full lap before riveting

- c) lay gutters in brackets to slight fall to outlets, nailed/screwed to roof timber at 2 m maximum centres in the case of sheet metal gutters, at 1 m in the case of U-PVC gutters, and at angles and outlets
- d) bolt sheet metal gutters to brackets close to underside of gutter bead with 6 mm diameter gutter bolts
- e) take measures to accommodate occasional overflow from eaves and box gutters, e.g. a weir overflow in the stop-end
- f) ensure gutters fall to outlets – no ponding is allowed
- g) fix downpipes to walls, 25 mm clear of finished wall face, seam towards wall when relevant, with 25 x 1,6 mm hot dip galvanized mild steel holderbats, bolted around pipe in two halves, and with 6 mm diameter hot dip galvanized steel spiral nail driven into wall, at least twice per downpipe length and at 2 m maximum centres
- h) where required, fit rainwater pipes to stormwater drains with sheet metal flange to fit into socket of drain pipe, riveted and soldered to pipe; join pipes to drains with cement mortar.

18.2 Flat concrete roof, balcony and floor drainage

18.2.1 Rainwater outlets

- a) type: patent outlet with grating, or pipe without grating as specified
- b) patent outlet type:
 - ductile iron consisting of flanged funnel-shaped head with outlet threaded to take standard mild steel hot dip galvanized pipes, and with removable domical gratings for roofs or flat gratings for car parks, secured by centre hook bolt
 - cast outlet heads with necessary pipework into concrete, at such a level that ponding does not occur after waterproofing
- c) outlet pipe without grating: 75 mm diameter minimum or one size larger than required by building regulations.

18.2.2 Floor outlets

- a) grating: removable and capable of taking heavy vehicle loading
- b) grease and solids trap: easy-clean
- c) with tapered bottom for installation on 100 mm diameter pipe or clamp coupling
- d) set at such a level that ponding does not occur after flooring is installed.

18.2.3 Outlet downpipes

- a) PVC-U pipes: *SANS 967*
- b) hot dip galvanized steel pipes with screwed ends: *SANS 62*
- c) hot dip galvanized malleable cast iron fittings: *SANS 14*.

18.3 Stormwater drainage

18.3.1 Earthworks

Applicable standard: SANS 2001-Construction Works Part DP1: Earthworks for buried pipelines and prefabricated culverts

18.3.2 Stormwater drainage

Applicable standard: SANS 2001 Construction Works Part DP5: Stormwater drainage pipes

- a) types of:
- b) concrete pipes and associated fittings: *SANS 677*
- c) fibre cement pipes and associated fittings: *SANS 819*

- d) PVC-U pipes and associated fittings: SANS 791/1601
- e) GRP pipes and associated fittings: SANS 1748-1
- f) PP pipes and associated fittings: SANS 8773
- g) PE pipes and associated fittings: SANS 4427
- h) diameters: as specified

culverts

- i) precast concrete culverts SANS 986 type portal.

18.3.3 In situ concrete stormwater channels

- a) concrete: grade 30
- b) cast rainwater channels and spill basins on well rammed earth filling
- c) lay channel floors to even fall of 1:250 minimum and as specified
- d) neatly form angles and sweeps around gulleys without changing channel profile
- e) form stop-ends at tops of gradients
- f) finish channels on exposed surfaces with 2:1 sand:cement plaster, trowelled smooth with rounded salient angles
- g) cast rainwater channels with isolation joints against walls and with keyed or doveled construction joints at 1,8 m maximum centres along it's length
- h) cast concrete spill basins: to shape, size and finish as specified.

18.3.4 Agricultural drains

- a) pipes: 100 mm diameter agricultural drain pipes
- b) pattern: main drain with branch spreader drains to pattern and lengths
- c) trenches: 600 mm wide x >700 mm deep at >2 m apart
- d) laying:
 - on 150 mm thick beds of clean, hard, durable stone graded from 35—75 mm, and covered after laying with same to 280 mm above tops of pipes
 - lay pipes with open joints
 - cover each joint with a flat stone to prevent infiltration of soil
 - plug lower end of main drain with 2:1 cement mortar
- e) filling: cover stone filling in trenches with *suitable* plastic sheeting and fill trenches with earth filling, lightly rammed.

18.4 Sewerage

18.4.1 Earthworks

Applicable standard: SANS 2001-Construction Works Part DP1: Earthworks for buried pipelines and prefabricated culverts.

18.4.2 Sewers (>160 mm)

Applicable standard: SANS 2001- Construction Works Part DP4: Sewers

Specification data:

- a) types of pipe, diameter, gradient etc.: as specified.

18.4.3 Sewers for buildings

Applicable standard: SANS 2001-Construction Works Part DP7: Sewers for Buildings

Specification data:

- a) type of pipe, diameter, gradient etc.: as specified.

18.4.4 Surface boxes, manhole covers, gulley gratings, frames

- a) polymer concrete surface boxes, manhole and inspection covers, gulley gratings and frames: SANS 1882, mark-bearing
- b) cast iron, cast steel, rolled steel combined with concrete gulley tops and manhole tops for vehicular and pedestrian areas: SANS 50124 / EN 124, mark-bearing
- c) installation: top of dished gullies >150 mm above finished ground level or 50 mm above permanent paving.

18.4.5 Grease interceptors

- a) material, type, capacity and size: to approval of the local authority or as specified.

18.4.6 Pit latrines

- a) construction: masonry, patent precast concrete, patent polymer
- b) waterless ventilated improved pit (VIP) latrine: consisting of a structurally lined and ventilated underground pit, floor slab, ventilated wall enclosure with roof and door, toilet pedestal, toilet seat and lid
- c) masonry type: as described in NHBRC Home Building Manual Part 11 and relevant details, internal size of pit 750 x 1 500 x 2 000 mm minimum deep; exposed end of floor slab covered with precast concrete panels
- d) patent type: installed to manufacturer's instructions or to the requirements of an active Agrément certificate
- e) to the approval of the local authority.

18.4.7 Conservancy tanks, septic tanks and french drains

- a) conservancy tanks, septic tanks and french drains: SANS 10400-P, of type, construction, capacity as specified.
- b) patent type installed to manufacturer's instructions or to the requirements of an active Agrément certificate.

18.5 Water supply

18.5.1 Earthworks

Applicable standard: SANS 2001-Construction Works Part DP1: Earthworks for buried pipelines and prefabricated culverts.

18.5.2 Below ground medium pressure pipelines

Applicable standard: SANS 2001-Construction Works Part DP2: Medium pressure pipelines

Specification data:

- a) type of pipe, size etc.: as specified.

18.5.3 Below ground water installation for buildings

Applicable standard: SANS 2001-Construction Works Part DP6: Below ground Water installations for Buildings.

Specification data:

- a) type of pipe, size etc.: as specified.

18.5.4 Above ground water installation

Invoked standard when required: SANS 10252 Water supply and drainage for buildings.

materials

- a) pipes, and associated fittings recommended by pipe manufacturer: material as specified, supplied from one source
- b) water supply and distribution system components: SANS 1808
- c) float valves SANS 752

installation

- d) pipes: according to manufacturer's instructions
- e) discuss measures to avoid unsightly pipework before any chasing or cutting for pipework is started
- f) fixing of pipes <20 mm: chased or surface fixed as specified
- g) fixing of pipes >20 mm: surface fixed or run in ducts
- h) surface fixing on internal walls: in straight horizontal and vertical runs to internal walls only, after plastering, with hot dip galvanized cast iron holderbats SANS 1209, or plastic holderbats for copper or polypropylene pipes, at centres *according to manufacturer's instructions*; leave clear space of 15 mm between pipe and finished wall
- i) surface fixing on external walls: prohibited except for a short distance of vertical rising main from ground level to floor level
- j) chasing:
 - not in wall faces that are to receive roof flashing (see Section 7 Roof coverings)
 - in solid masonry only, not deeper than one third of wall thickness vertically and not more than one sixth of wall thickness horizontally; avoid horizontal chasing where possible
 - in walls constructed of structural masonry and hollow blocks: only with permission, or locate pipes in cavities during construction
 - ensure chases, holes and recesses are made so as not to impair strength or stability of walls, or reduce fire resistant properties of wall
 - fill chases in masonry walls with class I or II mortar once pipes are in position
- k) fasten pipes firmly to roof timber
 - with hot dip galvanized mild steel or copper pipe clips screwed on
 - polypropylene hot water pipes: supported continuously
 - polypropylene pipes: not closer than one metre from hot water geysers
- l) use bends in preference to elbows if practicable; if a reduction in size of pipe takes place at an angle, the bend or elbow must be the size of the larger pipe
- m) no air may lodge in pipes; maintain a proper fall
- n) provide for expansion in long lengths of pipes
- o) insert long- screws or suitable couplings at convenient points to provide for alterations and repairs
- p) provide unions at in- and outlets to geysers

testing

- q) fill entire water reticulation system with water
- r) ensure air is evacuated
- s) pressurise water in system to one-and-a-half times the expected design working pressure by means of a pump and maintain pressure for four hours
- t) inspect system for leakages and repair
- u) inspect again after connecting to mains.

18.5.5 Water storage tanks

- v) accessories: inlet, outlet, overflow pipe connections, float valve of same bore as supply pipe
- w) drip tray in roof space: SANS 1848

18.6 Electric geysers and solar water heaters

18.6.1 Electric geysers

- a) geysers: SANS 151
- b) required marking: capacity, working pressure, mounting position, design, standing loss per 24h in kWh, moisture resistance class, colour coding (yellow—50 kPa, blue—100 kPa, black—200 kPa, brown—300 kPa, red—400 kPa, green—600 kPa)
- c) install: to SANS 10254 and according to manufacturer's instructions, including drip trays
- d) position geysers in roof spaces on firm timber bearers near ceiling hatch so that electric element can be reached through the hatch from a step ladder, whenever possible
- e) preset geyser thermostat to 50° C

18.6.2 Solar water heaters

- a) domestic solar water heaters: SANS 1307, mark-bearing.

18.7 Gas supply

Gas installation: SANS 10087.

18.8 Fire equipment

- a) all fire equipment to approval of local authority
fire hydrants
- b) fire hydrants: SANS 1128 part 1
fire hose reels
- c) fire hose reels: SANS 543, with 30 m long x 20 mm diameter light duty rubber fire hose, fixed base, couplings, connections, branch pipes and nozzles: SANS 1128 part 2
- d) fix reels against walls with *suitable* frame anchors or expansion bolts at a height of 2 100 mm from floor to spindle, or to height as specified
- e) enclose reel in security cupboard with clear acrylic cover and *suitable* closer when specified
portable fire extinguishers
- f) general purpose, non-refillable fire extinguishers: SANS 1322 and mark-bearing
- g) water, foam or dry powder rechargeable extinguishers: SANS 1910
- h) CO₂ type extinguishers: portable rechargeable carbon dioxide extinguishers: SANS 1567 and mark-bearing
- i) BCF type extinguishers: halogenated hydrocarbon fire extinguishers: SANS 1151 and mark-bearing
- j) hang extinguishers on wall hooks screwed and plugged to wall
- k) enclose in security cupboard with clear acrylic cover and *suitable* closer when specified.

18.9 Sanitary plumbing

18.9.1 Sanitary appliances

- a) fitted with waste, plug and chain as required
baths
- b) acrylic baths: SANS 1402 / 50198
- c) handles: when specified
basins
- d) glazed ceramic wash-hand basins: SANS 497

- e) stainless steel wash-hand basins: *SANS 906*

wash troughs

- f) stainless steel wash troughs: *SANS 906*

- g) concrete wash troughs

- reinforced concrete, with reeded front
- drainers to be of reinforced concrete with lip to fit over side of trough and fixed to trough with copper dowels and to wall with bracket supplied
- pedestals to be of reinforced concrete
- bed pedestals on floor, and trough on pedestals, with 1:2 cement-sand mortar

water closets

- h) glazed ceramic water closets: *SANS 497*

flushing cisterns

- i) glazed ceramic flushing cisterns: *SANS 497*

- j) plastic flushing cisterns: *SANS 821*

- k) cistern flush valves: *SANS 1509*

urinals

- l) glazed ceramic urinals: *SANS 497*

- m) stainless steel urinals: *SANS 924*

sinks

- n) glazed ceramic sinks: *SANS 497*

- o) stainless steel sinks with draining boards for domestic use: *SANS 242*

- p) stainless steel sinks for institutions: *SANS 907*

shower enclosures

- q) shower enclosures

- shower enclosures for domestic purposes: *SANS 549*
- glass: *SANS 1263*
- anodizing: *SANS 999*
- powder coating: *SANS 1274/1578/1796*

bains marie

- r) bains marie and hot cupboards: *SANS 1174*.

18.9.2 Taps, valves, showerheads

- a) water taps (metallic): *SANS 226*, class as suitable to dynamic supply pressure

- b) water taps (plastic bodies): *SANS 1021*, class as suitable to dynamic supply pressure

- c) taps for cold and hot water: mark-bearing blue and red respectively

- d) aerators: required

- e) wall type taps: with sliding flange

- f) single control mixer taps: *SANS 1480*

- g) flush valves: *SANS 1240*, type as specified.

- a) showerhead: type as specified.

18.9.3 Traps

- a) plastic waste traps: *SANS 1321*, part 1

- b) rubber waste traps: *SANS 1321* part 2.

18.9.4 Miscellaneous

- a) holders, shelves, cabinets: as specified

18.9.5 Fixing of sanitary fittings generally

- a) leave protective wrappings in position for as long as possible
- b) fix in a manner that will facilitate future removal
- c) install fittings to manufacturer's instructions
- d) fix appliances securely; use manufacturer's brackets and fixing methods wherever possible; use frame anchors for fixing brackets – do not screw and plug
- e) bed water closet pans in 1:3 cement-sand mortar; bed squatter pans in grade 10 concrete
- f) brick up open sides of build-in type baths
- g) bed acrylic baths in 1:5 cement:sand mortar on three rows of bricks, or bed solidly on dry river sand or concrete
- h) fix shower heads at 2 100 mm above shower floor level
- i) fix urinals at 610mm from floor to front lip of urinal bowl
- j) seal joints.

19 Electrical works

Invoked standard when required: SANS 10142–The wiring of premises.

19.1 Earthworks

Applicable standard: SANS 2001-Construction Works Part DP1: Earthworks for buried pipelines and prefabricated culverts.

19.2 Cable ducts (underground)

Applicable standard: SANS 2001-Construction Works Part DP3: Cable ducts.

19.3 Materials and installation

19.3.1 Wiring

conduits

- a) conduits: SANS 950/60614/61386
- b) embed in wall chases with cement mortar and clamps
- c) do not chase in wall faces that are to receive roof flashing (see Section 7 Roof coverings)
- d) fix on wall surfaces and in roof spaces with clamps
- e) embed in concrete surface beds
- f) do surface fixing level, plumb, neatly and in straight lines

conductors

- g) PVC isolated copper conductors: SANS 150

electric cables

- h) PVC armoured copper cable: SANS 1574/1411

distribution board and meter cabinets

- i) prepainted pressed steel with door and latch: SANS 1973, with isolator, earth leakage protection unit: SANS 767, and circuit breakers as required
- j) build in cabinets in walls, or surface mount, as specified
- k) label all functions in distribution board and provide legend card

switches and sockets

- l) switches: SANS 60669, including dimmer, remote-control, isolating and time-delay switches
- plug and socket systems

- m) 3 pin 16 Amp wall switch sockets: SANS 164

- n) boxes and enclosures with covers: SANS 1085/60670

- o) build in boxes for switches at 1 500 mm above floor level or as specified

- p) build in boxes for sockets at 300 mm above floor level except above work tops where these must be 1 200 mm above floor level or as specified

- q) telephone or television points: build in boxes at 300 mm above floor level or as specified; connect with conduit to roof space and through to roof overhang nearest telephone connection or television antenna; provide conduit with draw wire

19.3.2 Fittings

luminaires

- a) type: as specified

- b) luminaires: *SANS* 60598, complete with lamps, ballasts, control gear and earth terminals; control gear within luminaires to be mark-bearing
- c) fix luminaires at as late a stage as possible, and protect from damage
- d) earth all luminaires
 - stove, hob, oven, cooker hood
- e) stoves: *SANS* 153
- f) commercial kitchen extraction systems: *SANS* 1850.

19.4 Testing

- a) inform local authority at completion of electrical installation for inspection
- b) provide a copy of the electrical test certificate before handing over.

19.5 Lightning protection

To *SANS* 10313/*SANS* 61024.

20 Mechanical works

20.1 Installation

- a) install equipment and services level and plumb, fix securely and organise reticulated services neatly
- b) fix directly to structure where possible, independantly of suspended ceilings; trim around holes or penetrations through non-structural elements
- c) maintain fire and acoustic rating integrity of false ceilings etc.
- d) allow for movement in both structure and services
- e) conceal cables, ducts, trays, pipes etc. unless installed in plant spaces, ceilings, riser cupboards, etc. or as specified
- f) provide heavy items of equipment with permanent fixtures for lifting as recommended by the manufacturer.

20.2 Building penetrations

- a) do not embed pipes that operate under pressure in concrete or surfacing material
- b) seal penetrations through fire rated elements according to fire regulations
- c) seal penetrations through non-fire rated elements around conduits and sleeves, and around cables within sleeves; if the building element is acoustically rated, maintain the rating
- d) seal roof penetrations with metal upstand flashings and counter flashings – do not use fabric reinforced paint or bitumen
- e) provide primed metal or PVC sleeves with diameter sufficient to allow 12 mm space around interior pipe (or pipe insulation) or cable.

20.3 Location and access

Locate and arrange all services and equipment so that:

- a) tray and overflow pipe are provided to each tank, hot water heater and storage vessel
- b) fan coil units, valves or other potential leak sources are not located over rooms containing water sensitive equipment or finishes
- c) inspection and maintenance operations can be carried out with minimum inconvenience and disruption to building occupants or damage to the building structure or finishes
- d) services and equipment are readily accessible for inspection and maintenance and arranged so that inspection and maintenance can be carried out in a safe and efficient manner
- e) access is provided by catladders and catwalks from floor level to plant (including high level tanks) requiring regular inspection and maintenance, and/or where height of ceiling prohibits access from standing ladders
- f) equipment that requires inspection and maintenance in false ceilings with removable tiles is accessible, and, where this is not the case, by means of access panels
- g) the number of access panels is kept to a minimum – coordinate with other trades to use common access panels where feasible

20.4 Vibration suppression

Minimise transmission of vibration from rotating equipment to building elements by means of flexible connections, inertia bases, restriction of maximum rotation speed to 1500 r/min, isolation mountings or spring mountings.

21 External works

21.1 Paving

Invoked standard s when specified:

Precast concrete paving blocks—laying manual. The Concrete Masonry Association

Technical guide: Clay Pavers & Paving—selection and construction guidelines. Corobrik

Applicable standard: SANS 1200 MJ Standardized specification for civil engineering construction: Segmented paving.

21.1.1 Materials

units

- a) precast concrete segmental paving blocks: SANS 1058
- b) burnt clay paving units: SANS 1575
- c) precast concrete paving slabs: SANS 541.

in situ concrete

- d) in-situ concrete: see CONCRETE WORKS

sand for bedding and jointing of flexible paving

- e) free of soluble salts or contaminants likely to cause efflorescence or staining
- f) moisture content: 5 – 8 %
- g) grading limits:

Sieve size (mm)	% passing
9,25	100
4,75	95 – 100
2,36	80 – 100
1,18	50 – 85
0,60	25 – 60
0,30	10 – 30
0,15	5 – 15
0,075	0 – 10

- h) jointing sand: to pass a 1,18 mm sieve, containing 10 – 50 % material passing a 0,075 mm sieve

mortar for rigid paving

- i) sand with fineness modulus in the region of 2,2 – 4,0 to minimize permeability
- j) mortar: SANS 2001-Construction Works Part CM1, class I external, class II internal
- k) use minimum water

infill concrete

- l) infill concrete: grade 25/10 .

21.1.2 Preparation

subgrade

- a) excavate to achieve finished levels and falls as specified
- b) remove soft spots and biodegradable material and replace with suitable filling material
- c) complete installation of all sub-soil drainage pipes

- d) compact to 90% *MOD AASHTO*; take special care to compact trenches and around manholes – stabilise with 5% cement prior to compaction if necessary
sub-base for flexible paving
- e) sub-base material and construction: as specified by a *competent person*
- f) form paving surface profile on finished surface of sub-base – do not make up irregularities in surface with bedding sand
concrete sub-base for rigid paving
- g) sub-base concrete: grade 10 as described under CONCRETE WORKS, to thickness and with reinforcement as specified
weed killer
- h) treat area to be paved with *suitable* weed killer when specified
- i) take care that trees or shrubs that have to be retained are not affected
levels, falls, pattern
- j) ensure kerbs and edge restraints are complete and levels and falls are correct
- k) agree on pattern, edges, cutting of units etc. before laying.

21.1.3 Laying

flexible block/brick paving

- a) keep long axis square to line of traffic flow
- b) lay pavers true to line and level on loose and evenly spread sand bedding of compacted thickness 25 ± 10 mm
- c) lay full units first
- d) joints: 2 – 6 mm wide
- e) fill areas in which a full unit will not fit with clean-cut units or, if less than 25 % of a full unit, with concrete left for 24 h before compacting
- f) compact surface as soon as practicable, not closer than 1 m from free edges or working faces, with high frequency, low amplitude mechanical flat plate vibrator capable of producing a centrifugal force of 7 – 16 kN at a frequency of approximately 75 – 100 Hz on a plate size of $0,35 - 0,5 \text{ m}^2$; make sufficient passes to compact sand bedding to 15 – 35 mm thickness; make at least two passes
- g) brush joint filling sand into joints after first pass; remove excess sand on completion
- h) on grades exceeding 8%, cast concrete anchor beams across road as specified

flexible slabs

- i) lay slabs on 50 mm clean river sand
- j) joints: fill with class I cement mortar and strike off with jointer, or leave open when specified

rigid block paving

- k) clean base concrete
- l) set out pavers with string, templates or gauge rods, or dry lay entire area
- m) brush 1:1 cement:fine sand slurry over surface
- n) dip clay pavers with high absorption rate in water before laying; otherwise do not wet pavers
- o) butter each paver, bed solid in mortar, and fill joint in one operation
- p) tool joints flush or bucket handle
- q) form 10 mm movement joints at 4,5 m intervals at right angles in two directions, and against or edge restraints like buildings, manholes and columns
- r) fill movement joints with *suitable* sealant – see section 7

in situ concrete paving

- s) see section 2.4 Concrete Floors on the Ground

cutting

- t) cut pavers with a masonry disc cutter

accuracy

- u) gradual allowed deviation under 3 m straight edge: 10 mm maximum
- v) allowed difference in level between adjacent units: 3 mm maximum
- w) allowed deviation of line of pattern: 15 mm in 3 m maximum.

cleaning

- x) leave paving clean and free from stains.

21.2 Concrete culverts, kerbs, channels

21.2.1 Materials

- a) precast concrete culverts: *SANS 986*, type portal
- b) kerbs, edgings and channels: *SANS 927*
- c) mortar: *SANS 2001-Construction Works Part CM1*, class I
- d) bedding material: crushed stone, sinter, slag, sand or *suitable* porous material with a particle size of 13 mm maximum
- e) backing concrete: grade 15
- f) sealant: see Section 6 INSULATION.

21.2.2 Laying

- a) excavate trenches for kerbs and channels to below required level and refill with >70 mm of bedding material
- b) compact to required level and slope to density of >90 % *MOD AASHTO*
- c) bed kerbs and channels on 50 mm bedding material with 10 mm joints filled with mortar; wet joints well before jointing
- d) lay kerbs and channels in 1 000 mm maximum lengths for straight or curved kerbs with a radius of >20 m
- e) lay in 500 mm maximum lengths for curved kerbs with a radius between 4 and 20 m, or 300 mm maximum for radii up to 4 m
- f) provide 12 mm wide movement joints in channels at intervals not exceeding 20 m and leave open or fill with polysulphide when dry as specified
- g) support backs of kerbs with well-compacted backing concrete
- h) fill behind kerbs with suitable material in layers not exceeding 150 mm, wet and compact to 90 % *MOD AASHTO* density
- i) protect concrete units against damage and discolouration.

accuracy

- j) maximum deviation of any edge, centre line or vertical surface from specified position: 25 mm
- k) maximum allowed deviation of any invert level: 10 mm.

21.3 Concrete retaining blocks

Invoked standard when required: *SANS 207* Design and construction of reinforced soils and fills soil reinforcement

Invoked standard when required: *SANS 10409* Design, selection and installation of geomembranes

Invoked standard when required: Concrete Retaining Block Walls—Installation Manual, published by the Concrete Manufacturer's Association

blocks

- a) concrete retaining blocks: *SANS 508*

geomembranes

- b) thermoplastic geomembranes: *SANS 1526*

preparation

- c) ascertain position and depth of existing buried services before excavating; avoid damage
d) prepare level and compacted earth foundation trench of depth as specified
e) in case of walls not higher than 1,2 m, lay 300 x 75 mm deep layer of compacted granular base material like crushed rock or gravel
f) in case of walls higher than 1,2 m, lay concrete strip foundation of 150 mm thick and of width as specified
g) install behind wall when specified:
- perforated drain pipe with positive gravity flow to outlets
 - aggregate blanket drain
 - geofabric covering

placing

- h) stack units by hand, without mortar, true to line, level and in pattern as specified
i) place suitable granular backfill and compact
j) lay geofabric reinforcement when specified
k) clean wall, clear debris and pockets, ready to accept planting.

21.4 Gabions

Applicable standard: *SANS 1200* Standardized specification for civil engineering construction
Section DK: Gabions and pitching

materials

- a) hexagonal woven steel wire mesh gabions and revet mattresses: *SANS 1580*

laying

- a) prepare bases
b) assemble cages on site and fill with clean, hard, unweathered boulders or rock fragments with minimum size two-thirds of basket thickness or 300 mm, whichever is smallest.

21.5 Fencing

21.5.1 Line wire and chain-link mesh fencing

- a) zinc-coated fencing line wire (plain and barbed): *SANS 675*, of zinc coating class light for inland areas, heavy for coastal or corrosive regions
b) chain-link (diamond) mesh fencing and wire accessories: *SANS 1373 / 675 / 10244*

straining eye bolts

- c) straining eye bolts: 10 mm diameter x 300 mm threaded mild steel bolt with eye, washer and nut, hot dip galvanized to *SANS 121 / SANS 14713*
d) permanent wire pullers: prohibited

posts, stays, standards, droppers

- e) mild steel posts, stays, standards, droppers: *CKS 82*

- f) precast concrete posts: prestressed alkali aggregate reactive concrete
- g) wood posts, stays and droppers, preservative treated to SANS 1288 hazard class H4: hardwood SANS 457-3, 145—174 mm diameter posts and stays, 32—50 mm droppers
- h) posts provided with necessary holes for hinges, straining bolts, binding wire etc.

erection

- i) clear fence route; roughly level to obtain uniform gradient
- j) excavate holes 400 x 400 x 800 mm deep for posts and 300 x 300 x 600 mm deep for stays
- k) plant posts and stays in grade 15 concrete to 50 mm above ground level with chamfered top surface: at gates, ends, corners, intersections and at intermediate distances not exceeding 90 m, or at acute changes in level
- l) provide stays to all straining posts in direction of line of fence
- m) drive standards 450 mm deep into ground at 3 m centres
- n) thread straining wire through holes in standards at bottom, top and intermediate centres not exceeding 300 mm for wire fencing, or at intermediate centres not exceeding 600 mm for wire mesh fencing; bind around posts or straining eye bolts, and strain
- o) bind droppers to straining wire with binding wire
- p) cover with wire mesh when relevant, tension and bind securely to straining wire at every third mesh; join roll ends with a spiral to form a continuous fence; tie or clip welded mesh to straining wire at 300 mm centres; trim roll ends by overlapping 100 mm
- q) in the case of PVC-coated wire, take care not to crack or puncture the coating
- r) if ground is soft or post or stay cannot be securely fixed: improvise
- s) make good any damaged protective coatings
- t) do not cut preservative treated timber where it will be in the ground
- u) check fence on completion; grease hinges; cut off projecting bolt threads; burr over bolt ends to prevent nut removal, and coat with bitumen paint.

fencing gates

- v) steel gates with tubular frames and wire or mesh filling (for farm and domestic use): CKS 146
- w) hang gates on adjustable hinges
- x) provide gates with steel spring or U catches, drop bolts and locking devices
- y) drop bolts to drop in *suitable* length of pipe set in concrete to 30 mm above ground level

finish

- z) finish to gates and accessories: two coats bituminous aluminium paint SANS 682 grade 1 inland; hot dip galvanized SANS 121/14713 in *the coastal region* or corrosive atmospheres.

21.5.2 Weld mesh fencing

- a) material, mesh size, finish: as specified
- b) erection: according to manufacturer's instructions.

21.5.3 Barbed tape fencing

- a) barbed tape security barriers: SANS 1620, of material, form as specified
- b) erection: according to manufacturer's instructions.

21.5.4 Palisade fencing

steel

- a) steel palisade fences and gates: SANS 301-12
- b) pale points: forked or spiked
- c) panels: 3 m length, safety bolted to steel posts
- d) pales for heights up to 2,4 m for general purposes: corrugated and angle

- e) pales for heights of 3,0 m and 3,6 m for security purposes: corrugated
- f) plant posts in grade 15 concrete footings at 3 m centers or according to manufacturer concrete
- g) posts, rails and pales: steel reinforced precast concrete grade 30
- h) bolts: galvanized carriage bolts
- i) plant posts in 600 x 600 x 600 mm concrete base at approximately 2 m centres
- j) bolt rails to posts, two per bay
- k) bolt pales to rails, nine per bay
- l) countersink bolts on both sides and grout holes solid
- m) all to manufacturer's instructions.

21.5.5 Electric fencing

- a) electric fencing system: stranded wire on plastic or porcelain isolators on brackets, complete with energizer, batteries etc. as required
- b) wire: galvanized A grade high-tensile steel inland, or stainless steel for *coastal areas* or corrosive atmospheres
- c) electric fencing safety: SANS 10222-3 / 60335-2.

21.5.6 Gate automation

- a) electric gate motor with battery backup, crush protection, fine position control, remote control
- b) theft-resistant cages with padlock are required when specified.

21.5.7 Private swimming pool fencing

- a) private swimming pool fencing: SANS 1390, of height and protective coating as specified.

21.6 Precast concrete panel walling

- a) precast concrete posts and panels: SANS 1372
- b) plant posts 500 mm deep in grade 15 concrete at approximately 1,6 m centres
- c) slip in panels between posts, and level.

21.7 Swimming pools

Invoked standard when required: SANS 10209 The design and construction of swimming pools

- a) swimming pool: size, shape and finish as specified.

21.8 Timber decking

21.8.1 Materials

poles

- a) softwood: SANS 457-2
- b) hardwood: SANS 457-3
- c) preservative treated to SANS 1288 hazard class H3 when above ground, class H4 when in ground contact
- d) top diameter: colour marked
- e) required marking: metal tag with hazard class on each pole or bundle

sawn structural softwood

- f) sawn softwood SANS 1783-2 grade 5

sawn structural hardwood

- g) sawn hardwood (Eucalyptus) SANS 1707 grade 5

structural laminated timber

- h) structural laminated timber SANS 1460
- i) exposure class: 1 (exterior)
- j) type: G (stocklam)
- k) stress grade: 5
- l) preservative treatment of softwood: SANS 1288 hazard class H3
- m) fire retardant treatment: when specified
- n) required marking: on each piece a combination of code letters: application, exposure class, type, appearance and finish, stress grade, e.g. S2GP5.

deck boarding

- o) softwood: industrial planed wood: SANS 1783-3
- p) hardwood: planed strip flooring: SANS 281
- q) shape: rectangular (not tongue-and groove) with arrised edges
- r) in long lengths
- s) preservative treatment: SANS 1288 hazard class H3

fixings

- t) brackets, shoes, threaded rod etc: mild steel, hot dip galvanized to SANS 121/SANS 14713
- u) nails, bolts, nuts, washers: SANS 1700, hot dip galvanized to SANS 121/SANS 14713
- v) screws: countersunk head to SANS 1171, of material as specified..

balustrades

- w) material, construction as specified.

21.8.2 Installation

- a) poles: plant in ground, or fix on brackets cast into concrete footings as specified
- b) plant poles in 300 mm diameter holes in ground on a bed of gravel or concrete; fill holes with gravel, tamp and top up with a collar of 200 mm concrete, shaped sloping away from pole
- c) bolt the structure of poles, beams, joists, cross bracing and strutting to comply with SANS 10082; recess bolt heads, washers and nuts
- d) space joists at centres less than 20x deck plank thickness
- e) fix decking boards at right angles to joists with a space of 7 mm between boards
- f) fix boards with screws with countersunk heads; plug with matching wood when specified
- g) pre-drill holes if wood tends to split
- h) support board header joints on double joists; leave space for ventilation between board heads
- i) protect end grain with metal caps when specified
- j) chamfer or round top surfaces of rails to assist the shedding of rainwater; round all sharp edges.

21.8.3 Wood finish

- a) seal wood with one coat of *suitable* sealant or oil before installation
- b) seal all end-grain as work proceeds after sawing to length
- c) finish with three coats sealant or oil after installation.

21.9 Landscaping

21.9.1 Definition of terms

- a) *topsoil*: soil composed of 15—25 % clay, 10 % silt and 65—75 % sand with a minimum of 2% organic material, or red soil mixed with kraal manure in the ratio of 1 m³ kraal manure to 6 m³ red soil; topsoil to be free from omitrious matter and weed seeds

- b) *compost*: properly decomposed organic material, free from omitrious salts, waste products and impurities and with a pH-value between 4 and 7
- c) *fertilizer*: mixture of material complying with the specification under Law 36 of 1947; order and store in plastic bags.

21.9.2 Cleaning of site

- a) clean site for planting by removing existing grasses, weeds, foreign material and stone larger than 50 mm diameter before commencement of soil preparation
- b) clean site for hydroseeding by clearing out existing natural grasses without damage to the latter; remove loose foreign material from bare patches.

21.9.3 Preparation

soil for grass sods

- a) loosen existing topsoil throughout to a depth of 100 mm and mix thoroughly with 2:3:2 fertiliser in the ratio of 20 kg fertiliser to 150 m² of topsoil
- b) wet, level off and compact slightly on flat surfaces and mildly on inclined surfaces

soil for ground cover and shrub beds

- c) loosen existing topsoil throughout to a depth of 200 mm and mix thoroughly with 2:3:2 fertiliser in the ratio of 30 kg fertiliser to 150 m² of topsoil and with compost in the ratio of 6 m³ compost to 100 m² of topsoil
- d) wet, level off and compact slightly on flat surfaces and mildly on inclined surfaces

soil for shrubs

- e) dig 450 x 450 x 450 mm deep holes in soil for shrubs in bags 10 kg or larger and place excavated material aside
- f) fill holes with a mix of two parts excavated soil and one part compost
- g) add and mix throughout 500 g 2:3:2 fertiliser and 200 g bone phosphate per shrub hole
- h) compact slightly and allow for decrease in volume

soil for trees

- i) dig 900 x 900 x 900 mm deep holes in soil for trees and place excavated material aside
- j) finish base of hole with fall in general direction of slope of site
- k) fill holes with a mix of two parts excavated soil and one part compost
- l) add and mix throughout one kg 2:3:2 fertiliser and 300 g of bone phosphate
- m) compact slightly and allow for decrease in volume

soil for hydroseeding

- n) scarify all visible bare patches of existing soil 100 mm deep in both directions at 500 mm centres
- o) break up clods larger than 50 mm diameter, rake and level off.

21.9.4 Plant quality

- a) acquire all plant material from a registered nursery
- b) plants to be typical of their species or variety with normal densely developed branches and vigorous and healthy root system
- c) plants to be free from damaged parts, parasites, fungus, disfiguring knots, insects, pests and infestation
- d) grass sods to be approximately 1000 mm long and 500 mm wide and of uniform thickness; sods to be clipped short and soil base to be free from stones and clods
- e) ground covers to be well bushed with high leaf density and height of 300 mm above ground level, delivered ex nursery in minimum 4 kg bag containers

- f) shrubs to be multi-stemmed with generous side branches and well bushed to ground; shrubs to be >500 mm high as measured from crown of roots to outer leaf circumference, delivered ex nursery in minimum 4 kg bag containers except where specifically described otherwise in the bills of quantities
- g) trees to be >1,5 metre in height as measured from crown of roots to average top of tree (not to highest branch) and stem diameter >25 mm at ground level except where specified otherwise
- h) pruning wounds to be limited to 25 mm in size, showing vigorous bark growth all round
- i) replace all dead plants free of charge
- j) store plants under nursery conditions.

21.9.5 Planting

grass sods

- a) lay grass sods on wet prepared topsoil close together and fill joints and hollows with topsoil
- b) allow for area reduction
- c) roll surface to keep surface tolerance to a minimum and to allow a gradual change in slope at berms and embankments
- d) irrigate thoroughly after laying and rolling

ground covers

- e) plant ground covers in prepared topsoil and in holes somewhat larger than the plant bulb and at least 200 mm deep so that top of bulb coincides with finished level
- f) work edges of ground cover beds upwards to a height of 100 mm and compact
- g) irrigate thoroughly after planting

shrubs

- h) remove shrubs from containers and plant in backfilled holes so that top of soil originally in the containers is level with the finished ground level
- i) compact around shrubs and form 500 mm diameter x 150 mm deep soil dams around each shrub
- j) wet thoroughly after planting with 25 L of water per shrub

trees

- k) at distances from buildings, drains and freestanding walls that take into account the type of soil, especially expansive soils, and species and mature height of tree (see tree distance guidelines in SANS 10400-H Annex E)
- l) remove trees from containers and plant in backfilled holes so that top of soil originally in containers is level with finished ground level
- m) compact around trees and form 1000 mm diameter x 150 mm deep soil dams around each tree
- n) wet thoroughly after planting with 40 L of water per tree.

21.9.6 Hydroseeding

- a) on prepared soil
- b) water: 10 000 L per hectare
- c) fertiliser: lime at 4 t per hectare worked into the soil
- d) superphosphate: 0,3 t per hectare worked into the soil
- e) 2:3:2 at 0,5 t per hectare with seed mix
- f) LAN: 0,5 t per hectare worked into soil after 6 and 12 weeks
- g) anti-erosion compound: 200 kg per hectare with seed mix
- h) mulch: 400 kg per hectare with seed mix
- i) germinating agent: as per specialist's instruction
- j) seed mix: as specified.

21.9.7 Tree supports

- a) support every tree with 2,5 m long x 50 mm diameter treated eucalyptus stake driven 500 mm into soil
- b) tie each tree to stake with two steel wires sleeved in 300 mm long plastic hose-pipe section.

21.9.8 Precast concrete tree rings

- a) in two halves, size as specified
- b) place halves firmly and horizontally in soil dams around trees
- c) trim grass sods around tree rings where applicable.

21.9.9 Garden furniture

- a) garden furniture: type as specified.

21.9.10 River pebbles

Size, colour, mix as specified.

21.9.11 Maintenance

- a) maintain plant material for the specified period including at least three months of the growing season namely September to March period:
- b) keep all planted areas free from weeds and loosen soil around ground covers, shrubs and trees once every two weeks
- c) prune shrubs and trees regularly according to accepted horticultural practice.
- d) replace sick or dead plants immediately
- e) mow grass sod areas weekly and remove cut grass
- f) mow all hydroseeded veld grass areas once every 3 months and remove cut grass
- g) apply 2:3:2 fertiliser at a rate of 5 kg per 100 m² of grass sod area once monthly
- h) water planted areas once per week during September to March and once every fortnight during April to August as follows: shrubs 25 L at a time; trees 40 L at a time.