

# SCHEDULE OF WORK AND FINISHES.

## New Residence for: xxx xxx, Township

ALL WORK TO COMPLY WITH THE NATIONAL BUILDING REGULATIONS, (SABS 0400 1990), THE BONDHOLDER'S SPECIFICATION, THE NATIONAL HOMEBUILDERS REGISTRATION COUNCIL, AND THE DRAWINGS AS SIGNED BY BOTH PARTIES.

4 February 2019 | Revision 8 (Updated 2018-07-12)

### IMPORTANT NOTICE TO CONTRACTOR

Should any pages be found to be missing, or should any of the typing or details on the plans be indistinct, or any doubt or obscurity arise as to the meaning of any description, detail or particulars of any item in this specification or plans, or if there is contained in these any obvious errors, then the contractor must immediately inform the Principal Agent at the address hereunder and have them explained or rectified as the case may be.

*It is the responsibility of the contractor to issue his sub-contractors with a copy of the relevant section of this specification and to ensure that the sub-contractors comply with this specification.*

No claim whatsoever will afterwards be admitted by reason of the contractor having failed to comply with the foregoing instructions.

Approved in this schedule means approved by the Principal Agent and or Architect.

PREPARED BY:



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# NOTES

## Meaning of words

The following words appear often in the text of this specification. They are always highlighted in *italics*. The meaning of these words is important and are therefore explained:

*According to the manufacturer's instructions* means the manufacturer's instructions at the time of tender.

*Approval* means approval by the principal agent and /or architect in writing, and is limited to visual appearance of the work, material or components. Approval does not relieve the contractor from compliance with the specification.

*BS* means British Standard.

*Drawing(s)* means the drawing(s) forming part of the contract documents, and any modification thereof or additions thereto delivered by the Principal Agent to the contractor during the execution of the works.

*MOD AASHTO* refers to 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* means the National Building Regulations.

*Particular Specification* means a specification that is drawn up as a supplement to the General Specification to specify items for a particular contract not covered by the General Specification. The Particular Specification has preference over the General Specification.

*SABS* means the South African Bureau of Standards.

*SABS-CKS* refers to specifications prepared by the SABS, mainly for the procurement of products for the use of government departments.

*SABS EN* means a European Norm adopted by the SABS as a National Standard. (ENV is a voluntary norm)

*Specified* means as specified in a *Particular Specification*, on *drawings*, in the bill of quantities or in any other contract document.

*Competent Person* means a person who is qualified by virtue of his education, training, experience and contextual knowledge to make a determination regarding the performance of a building or part thereof in relation to a functional regulation or to undertake such duties as may be assigned to him in terms of these regulations, as defined in SANS 10400.

## Units of measurement, symbols

The units of measurement are metric units as standardised by the "Système International d'Unités" (SI). The following unit symbols are used in this document:

°C	Degrees Celsius	l	litre
g	Gram	m	metre
H <sub>z</sub>	Hertz	m <sup>2</sup>	square metre
h	Hour	m <sup>3</sup>	cubic metre
kN	Kilonewton	mm	millimetre
kPa	Kilopascal	MPa	megapascal
kW	Kilowatt	t	tonne

## Description of items

The description of an item implies the complete supply, assembly and operation of the item unless otherwise *specified*.

After tenders have been evaluated and a contract concluded, the successful tenderer may apply to the Principal Agent for the use of materials, products or components that do not comply to these standards. In these cases the Principal Agent shall expect any one or all of the following:

A sample for inspection

Proof of quality

Test reports

Capability reports on the factory

A saving in cost.

Applications for the use of other materials, products or components must be approved in writing by the Principal Agent before any such materials, components or products are ordered.

**Compliance with standards**

When so requested by the Principal Agent, provide evidence in the form of delivery slips, certificates or other written proof that material or components comply with the standards as laid down in this specification. Products that are specified as mark-bearing must bear the mark of the relevant standards body.

**Standards, latest edition**

Standards referred to in this specification are the latest edition, including all amendments, published three calendar months or longer before the closing date of tenders.

**Accuracy of building work**

Building work must comply with SABS 0155, accuracy level 2, except where specified otherwise.

**Principal Building Agreement**

The contract forming part of the contract documentation is the latest edition of the Principal Building Agreement or Nominated/Selected Subcontract Agreement, as compiled by the Joint Building Contracts Committee (JBCC). Refer to this document for the full intent and meaning of each clause, as specified.

**Preliminaries**

The preliminaries forming part of the contract documentation is the latest edition of the Preliminaries document, as compiled by the Joint Building Contracts Committee (JBCC). Refer to this document for the full intent and meaning of each clause, as specified.

## **A. PRELIMINARY AND GENERAL**

### **A1 CONTRACT SPECIFICATION.**

This Specification, together with any additional and/or special specification, will be the "Specification" as stated in the contract document. Whether signed or not, it is herewith agreed that the latest issue of the JBCC contract will be assumed to be the basis of contract.

All work to be done in strict adherence to the details shown on the "Standard Details" and the Contractor herewith declares that he is cognisant with the Standard Details" by Nico van der Meulen Architects..

### **A2 PLANS AND FEES**

The Employer will pay for the drawing up of the plans, and for plan-submission, sewer-, electrical- and water connection fees, as well as water and electricity consumed in the case of additions and alterations.

### **A3 PRIME COST (PC) ITEMS.**

The figure for Prime Cost items shall, unless otherwise defined herein or unless it relates to fees, be assumed to mean the wholesale price of the items specified, including builder's discount and V.A.T.

The Contractor accepts no responsibility for any items selected or negotiated by the Employer with the suppliers.

### **A4 SETTING OUT.**

The CONTRACTOR is to set out the Works..

The Contractor is advised to visit the site before submitting a tender and to acquaint themselves with the nature and extent and conditions under which the work has to be executed.

The Principal Agent is required to point out all survey pegs to the Contractor, or engage and remunerate a land surveyor to do so. The Contractor shall bear the costs for re-surveying the site, should the pegs become disturbed or lost.

The Contractor is to assume responsibility that all building and boundary lines are strictly adhered to.

### **A5 RESPONSIBILITY FOR COSTS.**

The Employer is responsible for the costs in respect of the following services **if the relevant information is not available at the time of tendering:**

Soil testing.

Blasting and any work where a compressor is required.

Special foundations, reinforcing, piles, and ground beams.

Test pits.

The Contractor must allow a provisional sum in respect of the reinforced concrete work if the engineer's plans are not available at the time of tendering.

The sum allowed for must be quantified and specified in the tender.

### **A6 VALUE ADDED TAX**

All priced items must include for VAT and no additional compensation will be recognized for VAT.

### **A7 ORDERING OF MATERIALS.**

The Contractor is warned that orders for materials or special articles are to be made as soon as possible and the Contractor will be held responsible for any delays in delivery of such materials. Delay in the supply of goods will not be considered to justify an extension in the contract duration.

### **A8 CONTRACT PRICE ADJUSTMENT.**

No escalation will be allowed for on this Contract and if any the Contractor should allow for it in his tender price.

### **A9 MATERIALS AND WORKMANSHIP.**

Materials and workmanship shall be the best of their respective kinds. Only undamaged materials may be used in the works. Work shall be to the satisfaction of the Principal Agent and shall be executed in accordance with the relevant manufacturers instructions.

Where descriptions of materials and or workmanship are given as to the approval of the Principal Agent, such approval must be obtained prior to commencement of the work.

The Contractor must obtain the necessary particulars from all sub-contractors regarding recesses, chases, sleeves, etc., which are to be built in, or allowed for during construction: No exposed pipes, conduits, vents, cables, etc. will be allowed anywhere on the project.

If the contractor fails to do this, the cost of rectification shall be borne by him.

This is also applicable to items covered by Provisional and Pc. items in which attendance by the Contractor is required.

- A10 **SURETIES**  
The Contractor shall provide surety to the satisfaction of the Principal Agent in accordance with the latest issue of the JBBC Contract.
- A11 **PLANT AND SCAFFOLDING**  
The Contractor shall provide and maintain all plant, tools, scaffolding labor, tackle, materials, etc., necessary for the due and proper performance of the work, and remove all plant on completion of the Contract, or when directed.
- A12 **VIEW SITE**  
The Contractor shall visit the site of the works and ascertain means of access, slope, type of soil or rock where visible, etc., as no claims for extra work in connection with this will be entertained, unless it is not visible at the time of inspection.
- A13 **RUBBISH**  
Clear and cart away all rubbish and superfluous material that may accumulate from time to time whether arising out of the works included in the contract or otherwise; and at completion clean all glass, scrub all floors and pavings, and leave the premises in a clean state and fit for immediate use and occupation.
- A14 **WORKMEN ON PREMISES**  
No workers are to be allowed to sleep on the premises without the express approval of the Principal Agent. If the site is located in a private estate the Contractor must acquire the rules and regulations applicable to the estate and allow for registering his staff and getting the necessary passes, etc., from the estate. The contractor must comply with the estate regulations and will be liable for all penalties imposed due to non-compliance.
- A15 **BLASTING OPERATIONS.**  
If blasting is necessary for the execution of any work, the Contractor shall take all responsibility for this and he is to observe all Government and municipal regulations. Cost of any such work shall be borne by the Employer if not allowed for in the documentation..
- A16 **LIGHTING AND WATCHING**  
The Contractor shall provide artificial lighting during construction should it be necessary for the proper and efficient execution of the Work.  
The Contractor shall at his cost supply a night watchman to guard the Work if deemed necessary, also during the builder's break.
- A17 **SHEDS AND STORAGE FACILITIES.**  
The Contractor shall erect and remove at completion sheds and storage facilities for the proper storage of materials.
- A18 **SAMPLES**  
The Contractor shall furnish such samples as may be called for by the Principal Agent, who may reject all materials or workmanship not corresponding with the approved sample.
- A19 **SUB-CONTRACTORS.**  
The names of all sub-contractors whom the contractor proposes as selected sub-contractors must be submitted to the Principal Agent for his approval before the signing of the contract.
- A20 **UNAUTHORIZED PERSONS**  
The Contractor shall at all times strictly exclude all unauthorized persons from the Works.
- A21 **NOTICE TO AUTHORITIES**  
The Contractor shall send all notices to the proper authorities and pay all fees and charges, and make all arrangements required for the connection of all public utilities such as sewer, water and electricity.
- A22 **DETAILS AND DRAWINGS.**  
The Contractor is required to study the drawings to satisfy himself of the nature and requirements of the Work, as no claim for extras in this connection will be entertained.  
Upon receipt of detail drawings for any work, the Contractor shall, before putting work in hand ascertain that the dimensions of any work already built conforms with the sizes for which details are given.  
In the event of these detail drawings not agreeing with work already built, the drawing shall at once be returned to the Principal Agent for amendments.

- A23 **TOILETS**  
Supply and erect proper toilets for use by the workmen to the satisfaction of the municipal authorities and maintain in a thoroughly clean and orderly condition. Remove at completion of works.
- A24 **VARIATIONS**  
Only variations authorized by the Principal Agent on his variation order form will be recognized for inclusion in the final account. Where verbal instructions are issued to the Contractor he must ensure that the written instruction is issued within 7 days.
- A25 **NOMINATED SUB-CONTRACTORS.**  
The Contractor shall draw up and sign sub-contract documents with all sub-contractors and submit these documents to the Principal Agent for inspection and approval prior to commencement of any work by nominated sub-contractors.
- A26 **CERTIFICATES AND PAYMENTS.**  
The Contractor shall be entitled to receive interim certificates from the Principal Agent at monthly intervals in respect of work done.
- A27 **WORKMEN'S COMPENSATION INSURANCE.**  
The Contractor and all sub-contractor shall insure their workmen in terms of the Workmen's Compensation Act of 1941 and any amendment thereof, and shall indemnify the Principal Agent from any claims thereunder and shall deposit with the Principal Agent proof of registration under the Workmen's Compensation Act.
- A28 **PUBLIC LIABILITY INSURANCE**  
The Contractor shall insure and shall remain insured in respect of public liability and common law liability until the issue of the certificate of completion of works.  
The public liability and common law liability policies shall contain clauses indemnifying the Principal Agent, Architect and Employer against risks arising out of this contract.
- A29 **WORK RISKS AND INSURANCE**  
The works, (including temporary works) and the materials and goods intended for incorporation in it and placed adjacent to it shall be at the risk of the Contractor for all risks of loss or damage howsoever caused, and the Contractor shall insure for all such risks.
- A30 **WATER AND POWER**  
The Contractor shall provide all water and power and artificial lighting to the works at his own expense and do all necessary temporary connections.
- A31 **DIMENSIONS**  
Plans are only to be scaled if no figured dimensions are supplied, and figured dimensions should be preferred over scaled dimensions. In case of any discrepancy, the Principal Agent must be contacted immediately to clarify or rectify any such problems.
- A32 **MOUNTING OF DRAWINGS**  
All drawings must be properly laminated in suitable material and kept in good condition.  
Updated drawings must immediately replace outdated drawings. Any drawing becoming bleached or otherwise obscured or damaged so that it cannot be properly read must be replaced as any error due to misreading of damaged drawings must be made good by the Contractor at his own expense.
- A33 **PROGRESS CHART, COMPLETION AND PENALTY FOR LATE COMPLETION.**  
  
The Contractor shall as soon as possible after the commencement of the Work, and not later than two weeks thereafter, prepare a progress chart, showing in graphic form the manner in which he proposes to achieve completion within the time laid down:  
The penalty for late completion shall be 1% of the contract value per day.
- A34 **SITE MEETINGS**  
Meetings will be held on site at intervals and at times and dates as will be arranged, at which the following will always be required to be present:  
The Architect  
The Principal Agent  
A senior member of the Contracting firm  
The general foreman or project manager.

A senior member of all sub-contracting firms engaged on the work at such time.  
Any other persons the Principal Agent requests the Contractor to arrange to be present.

**A35 SUPERVISION by the Principal Agent/ Architect**

The Principal Agent and /or Architect shall make such visits to the work as he may from time to time deem necessary. In the event of any matter arising which the Contractor considers of such importance that the either must be consulted, every reasonable attempt shall be made by the Contractor to communicate with both before proceeding with the point at issue.

The Principal Agent and/ or Architect is employed to ensure correct compliance with the terms of the contract, this specification, the drawings and proper building procedures in accordance with the best traditions of the various trades and adequate finishes as specified and to his satisfaction.

The Principal Agent and/ or Architect is thus in no way responsible for any act or omission on the part of the Contractor which may result in latent defects in materials or workmanship, and breach or neglect of the National Building Regulations, and the Contractor remains at all times responsible for any such breach whether same is discovered before or after the final certificate.

**A36. HEALTH AND SAFETY**

**A36.1 General**

The Contractor to provide for all necessary to comply with the relevant legislation and notify the Department of Labour as required by the Occupational Health and Safety Act.

Appoint a Health and Safety consultant to draw up an approved H & S Plan and maintain a copy and a register on site.

Erect an approved H & S notice board at the entrance to the Works.

Appoint a competent safety officer.

Allow enough time to plan, organise and control the work.

Observe what actually happens and act on dangerous practices.

Allow workers the freedom to report unsafe activities or conditions and address these reports.

**A36.2 Accidents**

If someone who is working on the site, has an accident, make sure that :

The nearest Labour Centre is immediately notified if the accident is fatal or involves a major injury, such as a fracture, amputation or loss of sight.

Report any work related accident which results in more than 14 days off work

Report if a member of the public is killed or sent to hospital as a result of an accident on the site or related to site activities.

**A36.3 Subcontractors.**

Periodically check the health and safety performances of all subcontractors on site and ensure they are inducted as per the H & S Plan

Supply all subcontractors (nominated, selected, domestic and direct) with a copy of the the Health and Safety Plan and ensure that they are competent before they start with the work.

Discuss the work with all subcontractors before they start before they start and ensure they are compliant with the H & S Plan

Ensure that they are provided with everything agreed to (e.g. safe scaffolds, the right plant, access to welfare, etc) and monitor their performance and remedy shortcomings.

**A36.4 Scaffolding**

Ensure that:

All scaffolds are erected, altered and dismantled by competent people.

All uprights are provided with base plates (and, where necessary, timber sole plates)

All uprights, ledgers, braces and struts are in position.

That the scaffold is secured to the building or structure in enough places to prevent collapse.

That there are sufficient guard rails and toe boards, or other suitable protection, at every edge to prevent falling.

Provide additional brick guards are to prevent materials falling from scaffolds.

Fully board the working platforms, and arrange the boards to avoid tipping or tripping.

Erect effective barriers and warning notices in place to stop people using an incomplete scaffold, e.g. where working platforms are not fully boarded.

Ensure the scaffold is strong enough to carry the weight of materials stored on it and evenly distribute this.

Maintain scaffolds properly.

Have a competent person safety officer inspect the scaffold regularly, at least once a week, and always after it has been altered, damaged and following extreme weather.

Record the results of inspections.

Ensure that proprietary tower scaffolds are erected and are used in accordance with suppliers' instructions.

Ensure that the wheels of tower scaffolds are locked when in use and that the platforms are empty when moved.

**A36.5 Ladders**

Ensure that ladders are correctly used to do the job and are in a good condition.

Ensure that ladders rest on and against a solid surface and not on or against fragile or insecure supports

Ensure that ladders are secured to prevent them slipping sideways or outwards, and rise a sufficient height above their landing place and that there are other hand-holds available and positioned so that users don't have to over-stretch.

**A36.6 Roofwork**

Supply edge protection to stop people or materials falling.

During industrial roofing, provide nets to stop people falling from the leading edge of the roof and from partially fixed sheets.

Ensure that nets are hung safely.

Identified fragile materials such as cement sheets and roof lights and prevent access to such areas.

Take precautions to stop workers falling through fragile materials when working on the roof.

Demarcate areas to keep workers away from the area below the roof work.

**A36.7 Excavations**

Ensure adequate support for the excavation, or has sloped, stepped or battered back to a safe angle.

Use safe methods for putting in the support, without people working in an unsupported trench.

Supply safe access into the excavation, e.g. a sufficiently long, secured ladders at regular intervals.

Erect barriers or other protection to stop people and vehicles from falling into excavations.

Provide properly secured stop blocks to prevent tipping vehicles from falling into excavations.

Do not allow vehicles to approach a trench to within a distance that can cause a collapse.

Ensure that the excavation does not affect the stability of neighbouring structures or services.

Store materials, remains (rubble) and plant away from the edge of the excavation to reduce the chance of a collapse.

Have the excavation regularly inspected by a competent person.

**A36.8 Manual Handling**

If heavy materials such as roof trusses, concrete lintels, curbstones or bagged products which could cause problems have to be moved by hand:

Use wheelbarrows, hoists, telehandlers, and other plant or equipment so that manual lifting of heavy objects is kept to a minimum.

Order materials such as cement and aggregates in 25 kg bags where possible.

Avoid the repetitive laying of heavy building blocks weighing more than 20 kg.

Have people instructed and trained how to lift heavy objects safely.

**A36.9 Traffic, vehicles and plant.**

Separate vehicles and pedestrians by barriers where possible.

Use barriers to separate work areas and raise awareness about the risk areas, and what to do about it.

Display warning signs and ensure there is adequate clearance around slewing vehicles.

Avoid reversing e.g. by using a one-way system and use properly trained banksmen.

Maintain vehicles and plant properly e.g. the steering, lights, reverse alarm, etc.

Inform the workers and provide training re the risks from hand-arm vibration (HAV) on site, and what they need to do to avoid those risks.

Identify and assess risks to workers from prolonged use of vibrating tools such as concrete breakers, angle grinders or hammer drills.

Reduce exposure to HAV by selecting suitable work methods and plant and use reduced-vibration tools wherever possible.

Ensure that vibrating tools been properly maintained and arrange health surveillance for people exposed to high levels of hand-arm vibration, especially when exposed for long periods.

**A36.10 Electricity and services.**

Have all necessary services provided on site before work begins and identify existing services present on site (e.g. electric cables or gas mains) and take effective steps to prevent dangerous work situations.

Preferably use low voltage for tools and equipment, e.g. battery operated tools or low voltage systems?

Protect cables and leads from damage and ensure all connections to the system are properly made and that suitable plugs are used.

Have tools and equipment checked by users and the safety officer and visually examined on site and regularly inspected and tested by a competent person.

Locate hidden electricity cables and gas lines and other services (e.g. with a locator and plans) and mark it, and take precautions for safe working.

Where there are overhead lines, has the electricity supply been turned off, and take other precautions such as providing 'goal posts' or taped markers

**A36.11 Public Protection**

Ensure that the work fenced off from the public and that roadworks barriered off and lit.

Ensure the public protected from the falling material.



When work has stopped for the day:

1. Ensure the perimeter of the site adequately protected.
2. All ladders removed or their rungs boarded so that they cannot be used.
3. All excavations and openings securely covered or fenced off.
4. All plant immobilised to prevent unauthorized use.
5. Bricks and materials safely stacked.
6. Flammable or dangerous substances locked away in secure storage spaces.

**A36.12 Access on site**

Ensure the safety of access to areas of work and safety at the work space.  
Demarcate access routes and ensure it is in a good condition and clearly signposted where necessary.  
Erect sufficient guard rails or other suitable edge protection to edges from which people could fall.  
Cover, guard or fence holes and clearly mark to prevent falls.  
Keep the site tidy and store materials safely.  
Ensure lighting is adequate in all work spaces.

**A36.13 Indemnity.**

***The Contractor herewith indemnifies the Employer, Principal Agent, Architect and all other consultants appointed in respect of any claims or legal action (civil and /or criminal) arising from injuries and /or fatalities on site.***  
***This indemnity is separate to the contract and will remain in force even if the contract is cancelled and will remain valid for a period of 5 years form the date of the Certificate of Completion.***

**A37 NOTICE BOARD**

The Contractor must provide a sturdy made Notice Board to be displayed on the site boundary. The wording and specification is to be approved by the Principal Agent.

**A38 PRIME COST AND PROVISIONAL SUMS.**

Allow provisional sums as set out at on page 77.

**Attendance and profit on theses items to be included in the tender, and will be fixed (based on allowed values) and not dependant on actual values of these items.**

# **SPECIFICATION & DETAILED SCHEDULE OF FINISHES.**

IN CASE OF ANY CONFLICT THE SPECIFICATION TAKE PRECEDENCE OVER THE DRAWING - UNLESS OTHERWISE AGREED IN WRITING.

ALL WORK TO BE DONE IN ACCORDANCE WITH THE LATEST ISSUES OF THE NATIONAL BUILDING REGULATIONS AND THE SPECIFICATION AND CODES OF PRACTICE OF THE SOUTH AFRICAN BUREAU OF STANDARDS AND THE NATIONAL HOME BUILDERS REGISTRATION COUNCIL.

## **1 Additions and Alterations to existing work.**

The builder must make provision for all the necessary, breaking, making good and carting away of rubble, etc. as well as moving/ modifying/ repairing any services, finishes etc., damaged by him.

### **1.1 Damage to remaining portions**

Prevent as far as possible structural or other damage to remaining portions of the building(s).

Make good all existing work damaged during alterations.

### **1.2 Services to remain operational**

Where so specified, existing services to remaining portions of the building(s) (electrical, telephone, data, gas, water supply etc.) must remain continuously operational during the entire duration of the contract.

Give timely notice to the Employer/principal agent if disconnection or alteration is necessary.

### **1.3 Disturbance**

Prevent disturbance and nuisance from dust and noise, as specified.

### **1.4 Recovered material**

Recover material for re-use as specified.

### **1.5 Fittings to be removed before painting**

If specified, or where so directed by the architect/principal agent, remove light fittings, ironmongery and other removable fittings that could be damaged; mark and store these items until after painting, and refix.

### **1.6 Ownership of demolished material**

Demolished material is the property of the contractor. No credit must be allowed to the employer, unless otherwise specified.

### **1.7 Joining of new work to existing work.**

Unless otherwise directed use straight joints where new work is joined to existing walls, with brickwork joined by hoop-iron connectors securely screwed to the existing brickwork and built into the new brickwork.

No teething will be allowed.

Create a straight plaster joint between new and existing plaster, fill joint with poly-sulphate filler and paint over.

Create a straight expansion joint where new surface beds join existing surface beds, with a 50 x2mm brass divider strip if so instructed.

Create a joint as per the engineer's specification where suspended slabs are joined.

## **2 Earthworks**

### **2.1 BENCH MARK**

Set up a site datum level based on an established bench mark, as directed by the architect/principal agent.

Maintain and protect this bench mark, and if necessary check levels on site to ensure it corresponds to the levels shown on the plans, before any site works are started. If any major discrepancy is found inform the Principal Agent.

### **2.2 SITE CLEARANCE**

#### **2.2.1 Permits**

Obtain, before commencing site clearance, all necessary permits for carrying out the work and pay all fees.

Obtain a rodent extermination certificate.

Hand over all permits, receipts and certificates to the architect/principal agent for safe-keeping.

#### **2.2.2 Demolition**

Demolish buildings and structures as shown on *drawings*, or as specified.

Remove all material and rubble within one metre of the perimeter of the building, including floors, screen walls, services and manholes, down to 150 mm below ground level.

#### **2.2.3 Dust and noise**

Use methods that keep dust, noise and vibration to acceptable levels, and which leave adjoining structures safe, to the *approval* of the local authority.

#### **2.2.4 Services**

Give notice to the architect/principal agent and the local authority regarding the disconnection of electric cables, water pipes and telephone cables, and leave safe.

Cut sewer-pipes and seal to the approval of the local authority.

#### **2.2.5 Trees etc.**

Remove trees and shrubs, vegetable matter, rubble, garbage, wire fences etc., all as shown on *drawings* or as directed by the architect/principal agent.

Remove tree roots where these occur under buildings or paving under construction. Fill stump holes with approved filling material as specified in this section.

Protect trees to be preserved: No trees to be removed without first obtaining permission from the Principal Agent/ Architect,

#### **2.2.6 Topsoil**

Remove topsoil over the building area to a depth of 150 mm and temporarily store on site for later use as garden soil.

#### **2.2.7 Recovered materials**

Recover materials for re-use as specified.

#### **2.2.8 Cleaning site at completion**

At completion of the works, dig up concrete or mortar mixing platforms, and clean the site of all surface and buried rubble.

### **2.3 DEFINITIONS OF EXCAVATED MATERIAL**

#### **2.3.1 Classification of material excavated by hand**

**Soil** means soil which can be removed with hand tools and includes sand, made-up ground, gravel, clay, shale and loose stones not more than 75mm wide

**Soft rock** means rock which can be loosened by hand pick axe or crow- bar and includes hard shale, compact gravel-stone, stone of equal hardness and boulders at least 75 mm wide and with a volume of not more than 0,03 m<sup>3</sup>

**Hard rock** means granite, quartzite, sandstone, solid shale, slate and rock just as hard or harder, as well as boulders with a volume of at least 0,03 m<sup>3</sup>

### 2.3.2. Classification of material excavated by machine

**Soft excavations** means excavations in material which can be efficiently removed by

Backactor with fly wheel power of approximately 0.10 kW per millimetre of tined-bucket width

Without the assistance of pneumatic tools

Rubber tyred front end loader with a mass of about 15 t and flywheel power of  $\pm 100$  kW, without ripping or stockpiling

**Intermediate excavations** means excavations in material which can be efficiently removed by

Back actor with flywheel power of more than 0.10 kW for every millimetre of tined-bucket width with the assistance of pneumatic tools

Be loaded by rubber tyred front end loaders with a mass of about 15 t and flywheel power of  $\pm 100$  kW, without ripping or stockpiling

**Hard rock excavations** means excavations in material which cannot be efficiently removed without blasting, or by wedging and splitting

**Boulder excavations class A** means excavation in material which contains more than 40 % by volume of boulders between 0,03 m<sup>3</sup> and 20 m<sup>3</sup> in size, in a matrix of softer material or smaller boulders

**Boulder excavations class B** means excavation in material which contains less than 40 % by volume of boulders between 0,03 m<sup>3</sup> and 20 m<sup>3</sup> in size, in a matrix of softer material or smaller boulders.

## 2.4 EXCAVATIONS

### 2.4.1 Class of excavation material assumed

Assume all excavations are in material classified as *soil* or as *soft excavations*, unless specified differently in the bill of quantities: Confirm this during site inspection before tendering and qualify if found to be different.

Notify the architect/principal agent if harder material is encountered

### 2.4.2 Blasting

If blasting is required, obtain written *approval* from the architect/principal agent and carry out the work in compliance with the latest state and local authority regulations. If blasting in the vicinity of other structures a proper photographic survey of these properties must be carried out to avoid claims for damages due to blasting.

### 2.4.3 Excess soil

Spread excess soil over the site, or keep aside for filling later if required, or cart away to a suitable dumping site to be found by the contractor, outside the boundary of the site, all as directed by the architect/principal agent.

### 2.4.4 Bulking

Provide for bulking of excavated material.

### 2.4.5 Banking

Cut and trim sloping banks at 30° to the horizontal, or as specified.

### 2.4.6 Excavation for foundations

Excavate for foundations to at least 450 mm below the level of the adjoining natural ground, or down to firm natural ground or to solid rock, or to a depth as specified.

Minimum width of trenches in stable soil is 600 for external walls and 450 for internal non-load bearing walls: sizes to be confirmed by consulting engineer in the case of multi-storey houses.

Only the architect/principal agent will determine firm natural ground.

If excavations for foundations are dug too deep, fill up with 10 MPa concrete at own expense.

Form steps in trench bottoms with horizontal and vertical surfaces where necessary, except where there is solid rock. Steps must be in multiples of brick or block courses.

Clean the bearing area of solid rock and provide steps or dowels to prevent lateral movement.

Give sufficient notice to the architect/principal agent and structural engineer for *approval* of foundation excavations before concrete is cast.

All excavations to foundations to be inspected by the inspector of the local authority and the necessary certificates obtained.

Foundations to walls around smaller atriums to be "boot leg" with the concrete sited under the building, and not protruding into the atrium.

Foundations to boundary walls to be "boot leg" with the concrete sited on the site and not protruding into council or neighbouring properties.

#### **2.4.7 Reducing levels**

Excavate to reduced levels as specified or to a depth determined by the architect/principal agent.

#### **2.4.8 Risk of collapse**

Maintain all excavated faces up to 1,5 m deep where necessary or when instructed by the architect/principal agent, against collapse by means of planking, strutting or other appropriate methods.

Maintain excavations deeper than 1,5 m in accordance with government safety regulations.

#### **2.4.9 Storm- and ground water**

Protect excavations against flooding by stormwater or seepage by pumping or baling.

The Contractor will be responsible for the cost hereof

### **2.5 FILLING**

#### **2.5.1 Filling material**

Use approved clean earth or gravel without clay or organic matter for general filling work under floors, paving, etc.

Provide test results of the filling material well in advance of ordering, if so directed by the architect/principal agent.

Allow for reduction of volume as a result of compaction.

Use hardcore consisting of broken stone, brick or concrete ranging in size from 25 to 75 mm, well consolidated by ramming, under floors or against basement walls, where specified, and with the *approval* of the architect/principal agent.

#### **2.5.2 Blinding material**

Use sufficient sand, fine gravel or other approved fine material to fill voids and provide a close smooth surface of

Hardcore which is to receive concrete

Surfaces which are to receive damp proof membranes and where there is a likelihood that the membrane will be damaged

Where specified.

#### **2.5.3 Inspection of foundation excavations**

Do not fill around the foundation structure before this has been inspected and *approved* by the architect/principal agent.

#### **2.5.4 Filling**

Ensure that foundation walls are adequately braced or have adequate strength to withstand the horizontal pressures resulting from compaction.

Spread, level and compact filling under floors at optimum moisture content in layers not exceeding 150 mm thick, to a density of at least 90 % MOD AASHTO.

Fill against the outside of foundation walls with a minimum fall of 1:30 away from the building(s) over a distance of at least 1,5 metres, or as specified.

Finish sloping banks at a maximum gradient of 30° to the horizontal, or as specified.

#### **2.5.5 Topsoil**

After the site has been cleaned at completion of the works, spread, level and lightly consolidate topsoil temporarily stored on site, or carted in as directed, in one layer at least 75 mm thick.

#### **2.5.6 Stormwater removal**

Shape ground levels to avoid the damming of storm water, as directed by the architect/principal agent.

## **2.6 TERMITE CONTROL**

### **2.6.1 Soil poisoning**

Poison the soil against the inside of foundation walls and under floors with Chlordane soil insecticide to comply with SABS 1165:

By a certified pest control contractor

Not when soil is excessively wet

Do not disturb treated surface

Do not bury scraps of timber in ground fill

Treat foundation trench bottoms before casting

Treat every 300 mm backfill before compacting

Treat full length of pipe and cable trenches inside the building and for a distance of 3 m outside the building

Take necessary health precautions on site

### **2.6.2 Guarantee**

Obtain a written guarantee from the pest control contractor for ten years for the effectiveness of the treatment, and hand over to the architect/principal agent.

## 3 CONCRETE, FORMWORK AND REINFORCEMENT

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### 3.1 MASS CONCRETE

#### 3.1.1 Cement

Cement must comply with SABS ENV 197-1, strength class 32,5, or higher as specified.

Type, composition and strength of the cement must be shown on the bag or the delivery slip of bulk cement. Bags must be SABS-mark bearing.

Keep bagged cement in a dry store. Always use the oldest cement first. Do not use bagged cement with lumps that cannot be crumbled by hand.

#### 3.1.2 Aggregates

Natural or crushed sand for use in concrete must comply with SABS 1083.

Stone for use in concrete must comply with SABS 1083.

Supply aggregate test results if required by the architect/principal agent.

#### 3.1.3 Water

Water must be clean and free from injurious amounts of acids, alkalis, organic matter, and other substances that could impair the strength or durability of concrete. Have water tested if in doubt.

#### 3.1.4 Concrete mix

Mix cement, sand and stone by volume or by mass to produce the specified compressive strength at 28 days.

Mix proportions may be arrived at by a process of mix design, by the use of recognised tables of trial mixes with South African aggregates, or *according to the cement manufacturer's instructions*.

Mixing of concrete may be done by hand or by machine.

Add just enough water to produce a workable consistence. Measure consistence with the standard slump test as described in SABS Method 862-1:1994 and as directed by the architect/principal agent.

#### 3.1.5 Low-density structural or insulating concrete

Aggregate of low density must comply with SABS 794 as specified. Cement must comply with SABS ENV 197-1, strength class 32,5 or higher. Mix 5 volumes aggregate and one volume cement, or 4 volumes of coarse aggregate to 2 volumes of fine aggregate to one volume of cement.

Patent low-density mixes by specialist suppliers may be used with the *approval* of the architect/principal agent.

#### 3.1.6 No-fines concrete

Mix 200 to 300 l of 20 mm stone to comply with SABS 1083 with one bag (50 kg) of cement complying with SABS ENV 197-1, strength class 32,5 and between 18 and 22 l of water per bag of cement.

Mix ingredients by machine.

Place and compact the concrete by rodding. Do not vibrate.

#### 3.1.7 Ready-mixed concrete

The contractor may purchase ready-mixed concrete, in which case the following applies:

It must conform to SABS 878

The supplier is responsible for the quality of the material and the design of the mix

Delivery tickets must be kept for inspection

At least three test cubes from every 50 m<sup>3</sup> of concrete must be prepared and tested as described hereunder.

#### 3.1.8 Testing

Cast concrete test cubes of size and quantity, and at intervals or of batches as specified, in accordance with SABS test methods 861-2 and 861-3.

Have these test cubes tested for compressive strength by an approved laboratory, all according to SABS test method 863.

#### 3.1.9 Notice

Give timely notice to the architect/principal agent before casting of concrete is to commence.

### 3.1.10 Pumping

Obtain prior *approval* from the architect/principal agent if it is intended to place concrete by pumping.

### 3.1.11 Curing

Cure concrete by means of a liquid membrane-forming curing compound at an approved rate, by ponding with water, or by covering with polyethylene or similar vapour-proof material in large sheets. Cure for 7 days, and longer when the ambient temperature falls below 10 °C.

### 3.1.12 Surface beds

Use 20 MPa concrete for surface beds to be covered with a screed. Cast to thickness of 120 mm, or as *specified*. Place, compact, strike off level with the top of foundation walls and leave as is. Do not trowel, so as to provide a good key for the screed.

Cast concrete surface beds without contraction joints, or cast in 200 x 200 x 4 mm welded steel mesh, placed near the top surface, if *specified*

Use large mats. Overlap mats by at least 300 mm.

### 3.1.13 Floors

Cement for concrete floors must be type CEM 1 to comply with SABS ENV 197-1

Aggregate for concrete floors must comply with SABS 1083. Aggregate for industrial floors must in addition conform to the following requirements:

Coarse aggregate must comply with the 10% fine aggregate crushing test (10% FACT) values, as specified in table 5 of SABS 1083

The maximum nominal size of the coarse aggregate shall be the lesser of 25% of the thickness of the floor slab and 37,5 mm

If the nominal size of the coarse aggregate exceeds 26,5 mm, a coarse aggregate of smaller maximum size must also be incorporated in the concrete mix

Do not use coarse aggregate smaller than 19 mm

During the work the fineness modulus of the fine aggregate must not vary by more than 0,20 from that on which the original mix design was based, unless the mix proportions are adjusted accordingly

When bleeding is likely to be excessive, consider the use of a suitable fine blending sand, or a different sand, or a water-reducing admixture, or air-entrainment.

Use 20 MPa concrete for direct-finished one-course concrete domestic floors. Cast floors to 120 mm thickness, or as *specified*.

50 mm Thick Poly-Urethane or medium density Polystyrene foam is to be installed on top of approved of SABS waterproof membrane and 20mm wide around the edges of floor slabs at ground floor level.

Protect the insulation against damage during casting: Use planks to walk on.

Reinforce the floors with welded steel mesh to comply with SABS 1024. Ensure that the reinforcement is near the top surface. Use large mats. Overlap by at least 300 mm where necessary. Do not cross over construction or day joints.

In the case of industrial floors, arrange a pre-construction meeting with all parties involved to discuss and agree all aspects of the work, especially the type and number of finishing operations which must take place within the proper period.

Prepare thresholds by casting concrete of same thickness, material and finish as specified for floors, in all door openings. Domestic thresholds may have plain edges. Industrial floor thresholds must have keyways.

Place, compact, level, strike off, and wood float concrete floors to a level surface and finish as follows:

Leave the finish undisturbed until bleeding has ceased and the surface has stiffened so that foot pressure barely indents the surface (several hours)

Remove bleed water and laitance on the surface

Complete edging and hand-jointing operations where relevant

Power float the surface to produce a level surface

Power trowel immediately after floating to produce a smooth, hard surface

In the case of domestic floors, concrete may be cast in room-size panels, with butt joints against thresholds. In the case of industrial floors, form contraction, construction and isolation joints as described below. In the case of columns, cast the concrete against edge forms placed diagonally to the column, and afterwards fill in the area between the column and the concrete already cast.

### 3.1.14 Joints in floors

Form joints in concrete floors as follows:

*Contraction joints*

Provide contraction joints in an agreed pattern or as *specified*. Saw contraction joints with a mechanical



concrete saw to a width of 3 mm and a depth of one quarter of the slab thickness. Saw only after the concrete has hardened sufficiently but before shrinkage cracking can occur (between 4 and 48 hours after placement).

#### *Construction or day joints*

Cast construction joints at the end of the day's casting or where concreting has stopped for more than 45 minutes. Construction joints must be keyed, keyed-and-tied, or dowelled or reinforced butt joints as specified. Keyways must be trapezoidal or rounded keyways. Dowels must be 16 mm diameter x 300 mm length plain round mild steel dowels that comply with SABS 920, or as specified, placed at mid-depth of the slab at 300 mm spacings. Dowels must be coated for two-thirds of their length with a bond-breaking compound. The joint face of keyways must be coated with a suitable debonding agent like lime wash or bitumen. Round off all construction joint edges to a radius of 3 mm.

#### *Isolation or movement joints*

Form isolation joints where floors abutt any fixed structure like walls, columns, sumps or inspection chambers, with 20 mm thick compressible material like polystyrene or bitumen-impregnated softboard.

Seal joints only when and as specified, otherwise leave joints open. Seal joints with a suitable elastomeric material as described under **WATERPROOFING**. Ream sawn joints to width and depth as specified and according to the sealant manufacturer's instructions.

### **3.2 Paving**

Use 20 MPa concrete. Cast paving to thicknesses as specified.

Cast paving with a minimum fall of 1:100, or to levels as specified.

Brush the surface, after the concrete has stiffened sufficiently, with a stiff brush or similar to leave a coarse surface. Prepare a sample panel for approval, as specified.

Form construction joints as described above at 3,5 m maximum centres in both directions, or to pattern as specified. Round off edges of panels.

### **3.3 Channels and spill basins**

Use 15 MPa concrete.

Cast rainwater channels and spill basins on well rammed earth filling to the specified profile, width and thickness. Lay channel floor to an even fall of 1:250 minimum or as specified. Keep tops of channel sides level with brick courses and/or paving.

Neatly form angles and sweeps around gulleys without changing the channel profile. Form stop-ends at tops of gradients.

Cast rainwater channels with isolation joints against walls and with keyed construction joints at 1,8 m maximum centres.

Cast concrete spill basins to shape, size and finish as specified.

Finish rainwater channels with 1:3 cement:sand plaster, rounded on salient angles. Maintain joints in plaster over joints.

Rainwater channels may be precast, to the *approval* of the architect/principal agent.

### **3.4 REINFORCED CONCRETE**

#### **3.4.1 Materials**

Use materials, and mix and cast reinforced concrete according to the instructions of the engineer.

#### **3.4.2 Sleeves**

Cast into slabs and beams galvanised mild steel or plastic sleeves of diameter suitable to house service pipes up to 100 mm in diameter. Larger service pipes or ducts must be formed to sizes as specified.

#### **3.4.3 Special works**

Leave holes and/or openings where required by special works under separate contract. Take instructions as regards these holes and openings from the architect/principal agent.

#### **3.4.4 Ties**

Where brickwork butts against concrete, cast in 600 x 30 x 1,2 mm galvanised mild steel ties 150 mm deep, at about 500 mm centres.

Where concrete walls are to be lined with brickwork, cast in 4 mm diameter galvanised crimp wire ties in a staggered pattern 1 m apart every third course.

### 3.4.4 Reinforced concrete lintels

Use 20 MPa concrete or as specified by the engineer. Cast lintels in situ or precast as specified. Cast lintels to full width of wall and 200 mm longer on both ends of width of opening to be spanned, or as *specified*, and to the following depths and reinforcement:

Clear or daylight span	Depth of reinforced concrete lintel	Mild steel reinforcement 40 mm from bottom, for each half brick width of soffit
smaller than 1 m	1 block or 3 brick courses or 200 mm minimum	None
1 - 1,5 m	1 block or 3 brick courses or 200 mm minimum	Two 12 mm diameter
1,5 - 2 m	2 blocks or 4 brick courses or 300 mm minimum	Two 16 mm diameter
larger than 2 m	As <i>specified</i>	As <i>specified</i>

## 3.5 OFF-SHUTTER CONCRETE

### 3.5.1 Aggregates

Supplies of sand and stone for off-shutter concrete must be uniform throughout the contract. Be sure that adequate quantities of rock of the desired colour is established before work begins. Consider stockpiling.

Keep grading of aggregates constant throughout the contract.

### 3.5.2 Pigments

Use inorganic synthetic pigments, if *specified*.

Add pigment dosages by mass and mix thoroughly into dry concrete materials.

### 3.5.3 Formwork

Discuss the type of formwork, the fixing of reinforcement and selection of spacer blocks, and the detailing of joints and tie-bars with the architect/principal agent and the engineer before any shuttering is ordered or brought on site.

Use formwork that will achieve the following surface finishes, as *specified*. Prepare a sample panel of at least 1 m<sup>2</sup> for *approval*, as *specified*. The sample panel must include all salient points like construction or day joints, splayed edges and tie-bar treatment.

- Rough:** If no treatment of the concrete surface after removal of the formwork is required, and the surface is within the degree of accuracy 3 to comply with SABS 0155
- Smooth:** If small defects like honeycombing, irregularities and discolouration can be made good according to approved methods, and the surface is within degree of accuracy 2 to comply with SABS 0155. Make this formwork of metal or wrot timber. Fit shutter bolts and joints in a regular pattern to the approval of the architect/principal agent. Strike horizontal day joints true and level with a trowel.
- Special:** Smooth, dense well-compacted concrete showing the slight grain marks of planed boards or smooth plywood with well-fitted joints and sound arises, with a surface within degree of accuracy 1 to comply with SABS 0155. Make good any blemishes.

Formwork must be grout-tight, properly supported, and coated with a suitable release agent.

Formwork ties permanently cast in are subject to approval. Tie-wires are not permitted.

Splay visible edges to columns and slabs, or as *specified*.

Form drips to bottoms of exposed slabs, lintel or beam edges.

### 3.5.4 Reinforcement

Cut and bend reinforcement correctly and fix with the necessary supports and cover blocks to ensure that position and cover to steel is maintained during casting and compaction.

Ensure minimum cover of reinforcement is 25 mm. Allow extra cover over steel reinforcement if material is to be removed from the surface by tooling or abrasive blasting.

### 3.5.5 Placing

Ensure personnel adequate in number and sufficiently skilled are available to carry out the work

Ensure all equipment necessary for mixing, transporting and vibrating concrete is in working order.

Ensure concrete quantities are adequate for the planned placement.

Cast walls and columns in single lifts not less than one storey in height.

Take special care with the bottom 200 mm of a new lift, for example by increasing the proportion of sand in the mix or by reducing the stone content by  $\pm 20\%$ .

#### **3.5.6 Curing**

Maintain constant stripping times to assist in achieving colour uniformity.

#### **3.5.7 Bush hammering or tooling**

Heavy bush hammering is not permitted before the concrete has attained a compressive strength of at least 25 MPa.

#### **3.5.8 Abrasive blasting**

Blast two to three days after casting, and keep this age constant throughout the work.

Do not blast to a depth more than one-third to one-half the smallest size stone.

Take the necessary precautions to protect the public and the blasting operators.

#### **3.5.9 Sealing of off-shutter concrete.**

Seal all exposed concrete with an approved sealer to the manufacturer's specification as early as possible.

### **3.6 PRECAST CONCRETE UNITS**

#### **3.6.1 Casting**

Precast concrete units may be cast on or off site in approved conditions. Submit proposals for casting procedures to be used.

#### **3.6.2 Patents**

Where relevant, exempt the employer of any claims for infringement of patent rights, design or trade names regarding precast systems used in this work, and pay all due patent holder's monies.

#### **3.6.3 Samples**

Submit samples on site of every required architectural finish for approval, as specified. Do not start production before samples have been approved.

#### **3.6.4 Marking**

Mark every unit indelibly so as to identify its location.

#### **3.6.5 Storing**

Store units separately on their designed end bearing surfaces in the position they will adopt when built in. Cure for at least 10 days.

#### **3.6.6 Handling**

Handle units so that strain, deformation and damage is kept to a minimum.

#### **3.6.7 Damaged units**

Report minor and hair cracks. Repair of these defects may be permitted depending on exposure.

#### **3.6.8 Building in precast units**

Build in units not before 21 days after casting. Bed and joint units solidly in 1:3 cement:sand mortar. Key joints and tint if necessary to match other facings.

### **3.6.9 PRECAST PRESTRESSED CONCRETE LINTELS**

#### **Lintels**

Precast prestressed concrete lintels must comply with SABS 1504.

Lintels for exposed work must be uniform in colour and texture, and free from imperfections.

#### **3.6.10 Laying lintels**

Lay lintels with a bearing length of at least 200 mm in 1:5 cement mortar. Prop lintels at 1,5 m centres for at least seven days after brickwork has been completed.

#### **3.6.11 Reveals**

Cut the faces of lintels above reveals to make provision for face brick faggots when used in face brick walls.

## 4 MASONRY

### 4.1 BRICKS AND BLOCKS

#### 4.1.1 Clay bricks

Clay bricks must conform to SABS 227:

Face bricks must be class FBS, FBX or FBA as specified, or to match existing face bricks, with a minimum compressive strength of 17 MPa

Common bricks must be class NFP with a minimum compressive strength of 7 MPa for general single-storey work; class NFX with a minimum compressive strength of 10,5 MPa for double storey structural walls, free-standing walls and retaining walls

Grade of efflorescence: standard grade for internal walls that will not become damp; special grade for visible unplastered foundation walls, retaining walls or free-standing walls

Water absorption limits must be 6-14%

Moisture expansion limits must be 0,015%

Work size must be as specified.

#### 4.1.2 Calcium silicate bricks and blocks

Calcium silicate bricks and blocks must comply with SABS 285:

Colour of facing units must be as specified

Work size: as specified.

Class: internal unit with an average compressive strength of 7 MPa for non-loadbearing internal work, general purpose unit with an average compressive strength of 14 MPa for general work, facing unit with an average compressive strength of 21 MPa for facing work, or engineering unit with an average compressive strength of 35 MPa for special work.

#### 4.1.3 Concrete bricks and blocks

Concrete bricks and blocks must conform to SABS 1215:

Colour, size, profile and surface texture: as specified

Compressive strength: 3,5 MPa for general single-storey work; 7,0 MPa for double storey structural walls, free-standing walls and retaining walls

Average drying shrinkage: 0,06%.

#### 4.1.4 Proof of quality

Despatch or consignment notes of bricks and blocks delivered to site must state the specified requirements and must be kept or shown when requested by the architect/principal agent.

#### 4.1.5 Samples

Supply a sample of 20 clay face bricks and six of every other type of clay brick for *approval*. Supply one sample of every type of concrete block. Keep these units on site for reference.

#### 4.1.6 Storage

Unload bricks and blocks carefully to prevent chipping and breakage. Stack on prepared level areas and protect from staining or marking.

### 4.2 MORTAR

#### 4.2.1 Cement

Common cement must comply with SABS ENV 197-1, strength class 32,5, or masonry cement to comply with SABS ENV 413-1, type MC 12,5X or 22,5X.

Type, composition and strength of the cement must be shown on the bag or the delivery slip of bulk cement. Bags must be SABS-mark bearing.

Keep bagged cement in a dry store. Always use the oldest cement first. Do not use bagged cement with lumps that cannot be crumbled by hand.

#### 4.2.2 Sand

Natural or crusher sand for mortar to comply with SABS 1090. Supply grading test results if required by the architect/principal agent.

Obtain sand from one source throughout the duration of the works.

Store sand in a way that will avoid contamination by foreign matter.

#### 4.2.3 Mix proportions

Mix proportions for cement:sand mortars must be as follows.

Class	Minimum compressive strength MPA	Application	Cement:sand (common cement)	Cement: sand (masonry cement)
I	10	High strength structural work (multi-storey loadbearing)	1:4 or 50kg. to 130 litres	1:3 or 50kg. To 100 litres
II	5	Normal loadbearing work, parapets, balustrades, retaining structures, freestanding walls and walls exposed to dampness	1:6 or 50kg to 200 litres	1:5 or 50kg to 170litres
III	1,5	Unexposed single storey non loadbearing walls	1:9 or 50kg to 300 litres	1:6 or 50kg to 200 litres

#### 4.2.4 Mixing

Mix ingredients dry on a clean surface or by means of a mechanical mixer. Mix thoroughly until colour is uniform. Add water to give the desired plasticity. Use within 2 hours.

### 4.3 BRICK AND BLOCKWORK

#### 4.3.1 Bond

Use full bricks or blocks wherever possible.

Build common brickwork in stretcher bond with header courses at every tenth or specified layer, wherever practical. Build face-brick work in stretcher bond or as specified. Build half-brick walls, skins of cavity walls, and blockwork in stretcher bond.

Tie brick- or blockwork to concrete columns with 600 x 30 x 1,6 mm galvanised iron ties cast into concrete at about 500 mm centres. Fix ties not cast into concrete with 40 mm shot nails.

Tie brickwork linings to concrete walls with 4 mm diameter galvanised crimped wire ties cast 75 mm into concrete and built 75 mm into brickwork, spaced in a staggered pattern 1 m apart every third course.

Reinforce intersections of block walls which cannot be bonded, with metal mesh to comply with SABS 190 Part 2 as recommended by the manufacturer of the masonry unit.

#### 4.3.2 Laying bricks and blocks

Lay bricks on a full bed of mortar.

Lay concrete blocks according to the recommendations of the Concrete Manufacturers' Association. Obtain a copy and keep on site for reference.

Lay hollow concrete blocks on shell bedding except first courses on foundations, where damp proof courses occur, and in columns, where all horizontal joints must be filled solid.

Fill all vertical joints solid.

Construct corners of walls accurately. Check height of courses with a gauge rod. Joints must be 10 -12mm thick.

Carry up work evenly.

Keep perpend and angles plumb.

Wet clay bricks before laying only if they are highly porous. Do not wet concrete bricks or blocks.

Flush off joints in common brickwork.

Rake out joints 10 mm deep where a mechanical key is required for plastering.

Build half-brick or half-block beam filling in between roof timbers and hard up against roof covering

Install brickforce in every course up to floor level and every third course up to top of doors and windows, and every course above that.

Install brickforce to every course in parapet walls, and every third course in screen, boundary and freestanding walls.

Build foundation walls with mortar that has an approved waterproofing compound added up to at least 170mm above finished ground levels. Plaster foundation walls all the way to the foundation with plaster mix with an approved waterproofing additive added.

#### **4.3.3 Freestanding walls.**

Build freestanding walls with mortar that has an approved waterproofing compound added up to at least 170mm above finished ground levels. Plaster foundation walls all the way to the foundation with plaster mix with an approved waterproofing additive added.

Install brickforce in every course up to 170mm above ground level and every third course after that.

Create expansion joints as specified., but no further apart than 4,5m.

#### **4.3.4 Cavity walls**

Build cavity walls with a clean cavity.

Tie the two brick skins with galvanised mild steel wall ties, of the butterfly or modified PWD-type to conform with SABS 28, spaced in a staggered pattern at 2½ ties per m².

Close the cavity at sills, reveals and lintels, and at the top of the wall as specified.

Leave cross joints open in the outer skin of brickwork, at centres not exceeding 1 m, at damp proof course level at floors and lintels.

#### **4.3.5 Face-brick work**

Sort face bricks to ensure proper mixing within the colour range. Prepare mortar in a consistent manner to ensure face-brickwork with a uniform appearance.

Cut face bricks with a cut-off saw.

Prepare a sample panel for *approval*, as specified. Maintain and protect until bricklaying is complete.

Wherever possible, tool horizontal and vertical joints of face-brick or face-blockwork after mortar has stiffened so as to compact the mortar and improve the weatherproofness of the wall. Joints must be keyed, vee, flush, weathered, struck or recessed as specified.

Clean face-brick work as the work progresses.

#### **4.3.6 Smoke flues**

Build smoke flues as per plan,, as straight up as possible, with easy bends where necessary.

Line flues with refractory firebricks where so specified, one half brick thick, bedded and jointed in approved fire cement.

Parge flues in ordinary brickwork with cement plaster.

Build in conduit to top of chimney to gas barbeque for extractor fan.

#### **4.3.7 Building in**

Set up and securely strut door and window openings. Ensure that the openings are as specified and are perfectly square and plumb.

Grout pressed steel door frames solid at backs as work proceeds.

Build in 30 x 1,2 mm galvanised steel straps or 4 mm diameter double twisted galvanised wire roof anchors at least 600 mm deep into brickwork. Bend the bottom end of the strap into the horizontal joint. Provide the looped bottom end of the wire anchor with a short length of reinforcing rod to prevent the anchor being pulled out.

Build in all electrical conduits, boxes and distribution boards. Ensure boxes and boards are built in level, plumb and at the specified depth in the wall and height above floor level.

#### **4.3.8 Movement joints**

Form vertical movement joints in freestanding walls not further apart than 3,6m.

Form vertical movement joints in walls, or horizontal joints in cladding panels in reinforced concrete framed structures with 10 mm polystyrene or bitumen-impregnated softboard as specified.

#### **4.3.9 Special works**

Leave holes and/or openings where required by special works under separate contract. Take instructions as regards these holes and openings from the architect/principal agent.

### **4.4 LINTELS**

#### **4.4.1 Reinforced brick lintels**

Build reinforced brick lintels as follows, suitable for light (class A or C) or heavy (class B) roofs, with a maximum truss or beam span of 10 m:., or install concrete beam to engineer's specification:

Clear or daylight span	Depth of lintel - number of brick courses	Span of roof supported by lintel, m		Number of mild steel reinforcing bars x mm diameter
		Class A/C	Class B	
2 m	4	6	4	2 x 8 or 3 x 6
	5	8	6	
	6	10	8	
3 m	5	6	4	3 x 8 or 4 x 6
	7	8	6	
	8	10	8	
	9	---	10	
4 m	7	6	4	4 x 6
	9	8	6	
	11	10	8	
	12	---	10	

Build in reinforcing bars in the first horizontal joint above the bottom course. Length of reinforcing rods must be the clear span plus 300 mm on each side. Reinforcing must have 40 mm cover in the outer skin.

If the lintel is in face-brick work, the first course must be brick-on-edge, or as specified.

In the case where lintels in cavity walls are sheltered from rain by for example projecting eaves, fill the cavity with concrete. In the case where lintels in cavity walls are exposed to rain, provide a stepped dampproof course and open cross joints as described under *cavity walls*.

Support lintels for at least 21 days.

#### 4.4.2 Reinforced block lintels

Use U-shaped concrete lintel blocks with a depth of 190 mm.

Block lintels must have a bearing length at each end of 200 mm.

Place reinforcement at bottom of block lintels as specified, and fill solid with 20 MPa concrete.

### 4.5 CONCRETE BLOCK AND CLAY BRICK PAVING

#### 4.5.1 Concrete blocks

Precast concrete segmental blocks must comply with SABS 1058 of type, class, nominal thickness and colour as specified.

#### 4.5.2 Clay pavers

Burnt clay paving units to comply with SABS 1575 of class and work size as specified.

#### 4.5.3 Samples

Keep samples on site showing range of colours and texture agreed upon, for reference.

#### 4.5.4 Sand for flexible paving

Sand for bedding and jointing of flexible paving must be free of soluble salts or contaminants likely to cause efflorescence or staining, and have a moisture content of 5-8 %.

Bedding sand must comply with the following 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

Jointing sand must pass a 1,18 mm sieve and contain 10-50 % material passing a 0,075 mm sieve.

Provide written proof that the sand conforms to the above grading limits.

#### 4.5.5 Mortar for rigid paving

Mortar for rigid paving must be class I mortar.

Use a minimum water and a sand with a fineness modulus in the region of 2,2 - 4,0 to minimize permeability.

#### **4.5.6 Subgrade**

Excavate to achieve specified finished levels and falls.

Remove soft spots and biodegradable material and replace with approved filling material.

Complete installation of all sub-soil drainage pipes.

Compact to 90% MOD AASHTO. Take special care to compact trenches and around manholes. Stabilise with 5% cement prior to compaction if necessary.

#### **4.5.7 Sub-base for flexible paving**

Sub-base material and construction must be as specified by the engineer.

Form the paving surface profile on the finished surface of the sub-base. Do not make up irregularities in the surface with bedding sand.

#### **4.5.8 Concrete sub-base for rigid paving**

Concrete for the sub-base of rigid paving must be 10 MPa concrete to thickness and reinforcement as specified.

Lay concrete on prepared subgrade, and form to paving surface profile.

Cure concrete for 8 days.

#### **4.5.9 Edge restraints**

Edge restraints must be kerbs, edgings, channels or other approved edge strips as specified.

#### **4.5.10 Infill concrete**

Infill concrete must be 25 MPa concrete with 10 mm aggregate.

#### **4.5.11 Weed killer**

Treat the area to be paved with approved weed killer if specified.

#### **4.5.12 Levels, falls, pattern**

Ensure all kerbs and edge restraints are completed and levels and falls are correct. Agree laying patterns with the architect/principal agent before laying any paving. In the absence of an agreed pattern, lay pavers in herringbone pattern

#### **4.5.13 Flexible paving**

Install 300 wide by 450 deep 20mpa concrete beams parallel to contours not further than 5 m apart on sloping driveways to retain the paving.

Lay 0,25 mm smooth green polyolefin membrane to comply with SABS 952 type C over full area to be paved.

Lay pavers true to line and level on a loose and evenly spread sand bedding of compacted thickness of  $25 \pm 10$  mm. over membrane. Lay full units first. Joints must be between 2 and 6 mm wide.

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.

Compact the surface as soon as practicable and not closer than 1 m from free edges or working faces with a 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 m<sup>2</sup>. Make sufficient passes to compact the sand bedding to between 15 and 35 mm thickness. Make at least two passes, or as specified.

Brush joint filling sand into joints after the first pass. Remove excess sand on completion.

#### **4.5.14 Rigid paving**

Clean base concrete.

Set out pavers to approved pattern with string, templates or gauge rods, or dry lay the entire area.

Brush a 1:1 cement:fine sand slurry over the surface.

Dip clay pavers with a high absorption rate in water before laying. Otherwise do not wet pavers.

Butter each paver, bed solid in mortar, and fill joint in one operation.

Tool joints flush or bucket handle to approval.

Provide 10 mm movement joints at 4,5 m intervals at right angles, against buildings or edge restraints, around manholes, columns, or as specified. Fill movement joints with polysulphide or silicone rubber sealant.

#### **4.5.15 Cutting**

Cut pavers with a masonry disc cutter.



#### 4.5.16 Tolerance

Gradual allowed deviation under a 3 m straight edge is 10 mm maximum.

Allowed difference in level between adjacent units is 3 mm maximum.

Allowed deviation of line of pattern is 15 mm in 3 m maximum.

#### 4.5.17 Cleaning

Leave the paving clean and free from stains.

#### 4.5.18 Trial section

Prepare a trial section of agreed size for approval, if specified.

### 4.6 CONCRETE KERBS AND CHANNELS

#### 4.6.1 Kerbs and channels

Precast concrete kerbs and channels must comply with SABS 927, of types as specified. Nominal length must be 1000 mm maximum for straight or curved kerbs with a maximum radius of more than 20 m, or 500 mm maximum for curved kerbs with a radius between 4 and 20 m, or 300 mm maximum for radii up to 4 m.

In situ concrete channels must be of 30 MPa concrete, to profile as specified.

#### 4.6.2 Mortar

Mortar must be class I mortar.

#### 4.6.3 Bedding material

Bedding material must be crushed stone, sinter, slag, sand or *approved* porous material with a particle size of 13 mm maximum.

#### 4.6.4 Backing concrete

Backing concrete must be 15 MPa concrete.

#### 4.6.5 Joint sealant

Joint sealant, where specified for movement joints, must be polysulphide to comply with SABS 110.

#### 4.6.6 Laying

Excavate trenches for kerbs and channels to below the required level and refill with at least 70 mm of bedding material. Compact to required level and slope to at least 90 % MOD AASHTO.

Bed kerbs and channels on 50 mm bedding material with 10 mm joints filled with mortar. Wet joints well before jointing.

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.

Support backs of kerbs with a layer of well-compacted backing concrete.

Fill behind kerbs with approved material in layers not exceeding 150 mm, wet and compact to 90 % MOD AASHTO.

Protect concrete against damage and discolouration.

#### 4.6.7 Tolerance

The maximum allowed deviation of any edge, centre line or vertical surface from specified position is 25 mm

The maximum allowed deviation of any invert level is 10 mm.

### 4.7 PRECAST CONCRETE PAVING SLABS

#### 4.7.1 Slabs

Paving slabs must be precast natural colour concrete paving slabs to comply with SABS 541, to size as specified.

#### 4.7.2 Laying

Treat ground underneath concrete paving slabs with an approved weed-killer and install 0,25 mm smooth green polyolefin membrane to comply with SABS 952 type C as specified.

Lay slabs on 50 mm clean river sand with a 1:100 fall away from the building or as specified. Fill joints with class I cement mortar and strike off with a jointer.

## **4.8 RUBBLE WALLING**

### **4.8.1 Stone**

Stone must be approved natural stone varying in size between 150 and 600 mm in section.

### **4.8.2 Mortar**

Mortar must be class III mortar.

### **4.8.3 Bond**

Bond must be uncoursed, but with homogeneous pattern. Prepare a sample panel for approval, as specified.

### **4.8.4 Laying**

Bed stones solid in mortar.

Build in wire ties at 3 per m<sup>2</sup> where rubble walls are to be joined to brick- or blockwork. Level up tops of walls with selected long and flat stones.

Keep wall faces even.

### **4.8.5 Jointing**

Make joints 25 - 50 mm wide and deep, square recessed.

## **4.9 STONework**

### **4.9.1 Specialist contractors**

This work must be done by specialist contractors.

Arrange a meeting between the specialist contractor and the architect/principal agent to discuss every aspect of the work, well in advance of ordering of materials.

### **4.9.2 Stone**

Type, colour and finish and size of stone panels must be as specified.

### **4.9.3 Sub-construction**

The sub-construction must be corrosion-free structural grade aluminium horizontal rails fixed to extruded brackets of the same material and anchored to the building frame.

### **4.9.4 Stone panels**

Attach stone panels with machine grooves in top and bottom edge to the aluminium rail sub-construction.

### **4.9.5 Joints**

Seal joints between panels with silicone compound of approved colour, *according to manufacturer's instructions*.

## **4.10 Retaining walls.**

Build retaining walls according to engineer's details, with approved waterproofing on the filled side, with an agricultural drain as per the standard specifications. Build dry wall on the inside where indicated.

Approved waterproofing additive to be added to the concrete and plasticizer if required to get proper compaction.

If retaining wall is a freestanding wall top of wall is to be waterproofed with approved membrane type waterproofing and 100mm diameter weepholes to be installed just above finished ground level on the lower side at maximum 3,0m intervals.

## 5 WATERPROOFING

### 5.1 DAMP-PROOF COURSES AND MEMBRANES

#### 5.1.1 Polyolefin damp-proof course

0,375 mm black embossed polyolefin damp proof course to comply with SABS 952, type B

Lay damp-proof course in unjointed lengths where possible and with full corner laps over full width of wall, level with the top of floors and not less than 150 mm above finished ground level, and under copings and in parapet walls as specified.

Lay damp-proof course under jointed window sills (for example tiles and bricks) and tuck in under window profiles.

Lay damp-proof courses in cavity walls as follows:

Staggered over the two brick skins of the cavity and so that the inner layer is level with the top of floors and the outer layer one brick course lower but not less than 150 mm above finished ground level. Support the damp-proof course fully on concrete or mortar filling, or

In two separate layers on each brick skin at floor level. Terminate the cavity between the two brick skins one (or two) courses lower than the damp-proof course

Staggered over cavity wall lintels where exposed to rain

Vertically over full height of window or door frames between the two leaves of cavity walls and in line with the frame, and tucked into frame

Wherever the cavity is breached

#### 5.1.2 Polyolefin damp-proof membrane

0,25 mm smooth green polyolefin membrane to comply with SABS 952 type C.

Lay damp-proof membrane under concrete surface beds or concrete floors. Fold membrane up against the foundation walls.

Lay damp-proof membrane in the largest practical sizes with 200 mm laps. Seal laps *according to the manufacturer's instructions*.

#### 5.2.3 Polyolefin under-roof-tile membrane

0,25 mm white polyolefin membrane to comply with SABS 952 type E, grade 1, or as specified.

Lay membrane horizontally over rafters prior to battening, with minimum overlaps of 150 mm, and fix with clout nails to rafter centres.

Terminate the membrane  $\pm 25$  mm beyond the external walls and fold down against gable walls. Lay a 600 mm strip under the main membrane under valleys, and over the main membrane over hips and ridges.

375 Microns embossed polyethylene damp-proofing is to be installed under all walls at a minimum height of 150mm above the finished ground level and directly above floor level to the full width of the walls with overlaps of at least 100mm at junctions, corners, etc.

See detail of dampcourse sloping to the outside of cavities in cavity walls.

Damp-proofing to be installed under all window sills and turned up at the back of the window, or plastered sills to be waterproofed with an approved waterproofing system.

A damp-proofing membrane is to be installed to all differences in floor level and to be tucked in at least 300mm under the lower floor slab and taken over the higher slab to act as a dampcourse. (See Standard detail)

In the event where retaining walls are required between differing floor levels, and in cellars, damp-proofing is to be done by a company approved by the Principal Agent in accordance with the consulting engineers instructions and the Contractor must provide for this

## 5.2 WATERPROOFING

### 5.2.1 Material and application

Waterproofing materials must be one of the following, as specified:

Modified bitumen sheeting, consisting of a polyester core impregnated with polymer modified bitumen, of type APP (Atactic polypropylene) wax modified bitumen membrane, or type SBS (Styrene Butadiene Styrene) rubber modified bitumen membrane, as specified and of 4 mm thickness. Apply in a single layer for exposed surfaces, and in a double layer for applications where the sheeting is covered with stone, paving, tiles etc.

Seal laps by heat fusion.

Reinforced liquid waterproofing compounds must be acrylic or styrene/acrylic of approved colour, or rubberised bitumen, as specified, reinforced with a non-woven needle-punched polyester or polypropylene fibre fabric with a mass of 125 - 150 g/m<sup>2</sup>.

Apply in five coats, i.e. primer, bed coat, saturation coat and two top coats, or *according to the manufacturer's instructions*.

Synthetic waterproofing membranes must be high density polyethylene, polypropylene alloys, chlorosulphinated polyethylenes, or polyvinyl chlorides, as specified. Apply synthetic waterproofing membranes in a single layer for exposed or covered applications. Seal laps by heat welding.

### 5.2.2 Quality control

Prior to the awarding of the waterproofing contract:

A certificate of competency from the relevant manufacturer of the waterproofing material must be provided for *approval*.

The waterproofing contractor, when specified, must present a Quality Assurance and/or Quality Control (QA/QC) programme, setting out the quality control procedures and duties of all parties involved. This must include the date of manufacture of the waterproofing material, the signed acceptance of the surface, daily testing and the final commissioning of the waterproofing system.

During the course of the works the manufacturer of the waterproofing material must inspect regularly, and upon completion of the installation must certify in writing that the application has been done *according to the manufacturer's instructions*.

### 5.2.3 Preparation

Surfaces to receive waterproofing must conform to the minimum substrate requirements as set out in SABS 021 and the minimum requirements as set by the South African Waterproofing Institute:

Screeds must be a minimum of 40 mm thick and laid to a minimum fall of 1:70, or as specified.

Fillets, coves and chamfers must be provided where horizontal and vertical surfaces meet

Screeds must be clean, smooth, even and stable. Cracks up to 0,3 mm are acceptable

Moisture content of the screed must be less than 7%

Outlets must have a minimum diameter of 100 mm: See Standard Details for NvdM outlets and installation.

Outlets to comply with Standard Details.

The area to be waterproofed must be free of traffic and without protrusions.

Organize a pre-installation meeting with the manufacturer of the waterproofing material, the architect/principal agent, and the waterproofing contractor well in advance of installation to review products, procedures, quality control and guarantees, and so that clarity may be reached on construction details, for example grooves, flashings and outlets. These works procedures must be signed off by the waterproofing contractor and the manufacturer.

### 5.2.4 General application

Waterproofing must be applied according to SABS 021 and *according to the manufacturer's instructions*.

Waterproofing must be applied by trained artisans, or, when specified, by a contractor who is a member of the Waterproofing Federation of South Africa.

Provide slip layers, blinding layers, metal lathe, ventilators, movement joints etc. as necessary and *according to the manufacturer's instructions*.

Dress the waterproofing down into patent type stormwater outlets.: See Standard Details

Take up waterproofing at least 150 mm above roof level or to the level of the damp proof course if present, tuck into grooves where provided, and counter-flash, or as specified.

Take waterproofing under sliding/hinged doors and windows to floor level and up behind doors and up sidewalls to prevent water ingress under and next to such inserts: See Standard Details.

Approved waterproofing to be applied to all vertical surfaces of a building where any type of cladding is to be applied. This does not apply to freestanding walls.

Top surface of all beams, parapets, retaining walls and free standing walls to be waterproofed with approved waterproofing system.

### 5.2.5 Showers

Floors to showers above ground level to be tanked by waterproofing specialist approved by Principal Agent and walls to **all showers** to be sealed with two coats Dampseal before tiling.

No upstand walls are to be built to any shower: Floor to slope min. 30 mm from edges of shower to waste.

### 5.2.6 Testing

Where waterproofing is applied to a horizontal surface, and before applying the protection layer, one of the following tests must be performed:

Floodtest all balconies for a minimum of 48 hours before tiling, including testing of waterproofing under all doors/ windows that extend to the floor. If the waterproofing fails, repair and re-test until it passes.

A spark, vacuum or air pressure test, using approved testing apparatus

Where waterproofing is applied to a vertical surface, a spark or vacuum test must be performed, whichever is easier.

Provide the architect/principal agent with a certificate that the waterproofing treatment was handed over in a watertight and workmanlike condition.

#### **5.2.7 Protection**

Protect the waterproofing surface with one of the following as specified:

Paint the surface of bituminous-based systems with a heavy brush of bituminous based aluminium paint to comply with SABS 802

Paint other systems with an *approved* ultra-violet block. In the case of acrylic or styrene/acrylic this UV block must be an enriched titanium tiocide dispersion applied in two coats in cross directions

Lay a specified geocomposite drainage layer having a minimum mass of 210 g/m<sup>2</sup> on the waterproofing, followed by an 80 mm thick layer of light coloured non-absorbent natural stone of 15 mm nominal size. Keep the stone back from outlets, gutters and water shedding edges and bond the stone in these areas with a thinly applied cold dressing compound

Lay a specified geocomposite drainage layer having a minimum mass of 210 g/m<sup>2</sup> or a high density polyethylene and polypropylene scrim compatible with the dynamic load of the final finish on the waterproofing, followed by tiles of specified type and thickness, layed in cement-sand mortar or on a screed. Screed and/or tiles and mortar must be cast or placed in panels of 12 m<sup>2</sup> maximum, separated by movement joints, and separated from bounding walls at the perimeter by isolation joints. The isolation joints must proceed through the screed onto the waterproofing system

Lay tiles of specified type and thickness on patent adjustable underlay pads in order to keep the tile clear of the waterproofing.

#### **5.2.8 Guarantee**

Provide an approved insurance backed guarantee from the manufacturer / insurance company for the waterproofed area including flashings, skirtings, outlets, expansion joints and other details for a minimum period of 10 years on general surfaces, and 5 years on retaining walls and plant boxes

If any finish installed over the waterproofing is to be removed due to leaks it shall be replaced by the contractor/guarantor at no charge.

Provide full maintenance particulars.

### **5.3 JOINT FILLER/SEALANTS**

#### **5.3.1 Material**

Polysulphide sealants must be two-part gun-grade polysulphide to comply with SABS 110

Silicone rubber sealant for building joints must be one part low modulus silicone rubber sealant to comply with SABS 1305, type 1. Silicone rubber sealant for glazing and sanitary ware must be one part high modulus fungus proof silicone rubber sealant to comply with SABS 1305, type 2.

Polyurethane sealants must be two-part gun grade to comply with SABS 1077, type 2.

Preformed elastomeric compression joint seals must comply with SABS 1023 type 1.

#### **5.3.2 Preparation**

This work must be done by specialists.

When requested by the architect/principal agent, organise a pre-installation meeting with the sealant manufacturer, the architect/principal agent, and the sealant installer well in advance of installation to review products and procedures. Samples asked for must be in place and cured before this meeting.

Ensure joints are clean and dry. Apply correct primer to sides of joints.

Fill the joint with closed-cell expanded polyethylene cord or strip back-up and bond-breaking material as recommended by the sealant manufacturer, or as specified.

Mask edges of joints if necessary.

#### **5.3.3 Sealing**

Fill the foremost part of movement joints to a thickness of not less than half the width of the joint, with sealant of approved colour, *according to the manufacturer's instructions*.

Seal joints around door and window frames, movement joints, joints between walls and columns, floor joints, and other joints where sealing is indicated, and as specified.

Finish joints neatly and smoothly.

Fill joints in wet areas, for example between ceramic wall tiles and kitchen cupboards, baths, wash-basins and shower floors, with fungus-proof sealant.

## 6 ROOF COVERINGS

### 6.1 ROOF TILES

#### 6.1.1 Concrete and clay roof tiles

Concrete roof tiles must comply with SABS 542. Tiles and accessories must be of type, pattern, colour and surface coating category as specified.

Clay roof tiles must comply with SABS 632, and be of type and colour as specified.

Ensure that gutter brackets and gutters are installed before laying roof tiles.

Disperse roofing material stacks on the roof structure to avoid point loads.

Fix tiles *according to the manufacturer's instructions* applicable to locality and pitch, and to SABS 062

Nail all tiles at eaves projection and gable ends with galvanised clout nails penetrating the battens at least 25 mm. Nail the main body of the roof *according to the manufacturer's instructions*. Use 1,6 mm thick copper, aluminium or stainless steel nails in coastal regions.

The first row of tiles at the eaves and the last row of tiles at the ridge must be full tiles.

Bed concrete ridge and hip tiles on a polyolefin damp course in tinted 1:3 cement/sand mortar. Soak ridge tiles in water before bedding to improve bonding with mortar.

Fix verge tiles with 70 mm serrated galvanised nails. Fix all other fittings and accessories *according to the manufacturer's instructions*.

#### 6.1.2 Slate roof tiles

Roofing slates must be from an approved quarry, guillotined to the size and colour as specified, and drilled with two holes for fixing.

Ensure that gutter brackets and gutters are installed before laying roof tiles.

Disperse roofing material stacks on the roof structure to avoid point loads.

Lay slates to roofs with a minimum pitch of 30 degrees, and to vertical siding, with double overlap to a mass of approximately 70 kg/m<sup>2</sup> and a truss or beam spacing of 600 mm maximum.

Lay slates to roofs with a minimum pitch of 15 degrees with single overlap to a mass of approximately 35 kg/m<sup>2</sup> and a truss or beam spacing of 700 mm maximum. Lay under every row of tiles, stretching over three battens, a 3- or 5-ply bituminous felt underlay faced with 0,1 mm aluminium foil over half its width, so that the bottom of the underlay rests between two slates.

Lay a double course of slates at eaves, with a 50 mm overhang measured from the inside edge of the gutter.

Lay slates of equal thickness in one row.

Lay slates in broken bond with straight vertical joints.

Double nail slates to battens with 40 mm galvanised clout nails. Use copper nails in coastal regions.

Provide half slates at abutments and verges. Cut and dress slates at ridges, hips and valleys.

Lay approved soakers under ridge and hip slates.

#### 6.1.3 Fibre-cement roofing tiles

Fibre-cement slates manufactured with organic fibres, of specified size, colour and with the necessary fixing holes.

Store slates under cover and off the ground. Take care during handling to avoid chipping and breaking.

Ensure that gutter brackets and gutters are installed before laying roof tiles.

Lay fibre-cement slates to roofs with a minimum pitch of 17,5 degrees.

Lay a double course of slates at eaves, with a 50 mm overhang measured from the inside edge of the gutter.

Lay slates in broken bond with straight vertical joints.

Fix slates to roof battens with 40 mm galvanised clout nails (50 mm for end slates).

Fit copper disc rivets between large slates *according to the manufacturer's instructions*.

Lay ridge slates on a double soaker of glass fibre reinforced bitumen.

## 6.2 METAL PROFILED ROOFING AND CLADDING SHEETS

### 6.2.1 Material and finish

Galvanised steel: 0,6 mm thick mild steel sheet coated on both sides with class Z275 galvanising (commercial quality) to SABS 934, or AZ150 or AZ200 zinc alloy coating, or as specified.

Pre-painted galvanised steel: 0,6 mm thick mild steel sheet coated with class Z185 galvanising, primed with an epoxy-based primer, and painted with silicon polyester paint for normal exterior use, or with PVC for corrosive conditions, to 0,02 mm thickness, on one or both sides, all as specified, and applied under factory conditions.

### 6.2.2 Profile and length

Steel roof and/or cladding sheets must have one of the following profiles:

Corrugated, to be fixed from above: eight and a half or ten and a half corrugations per sheet width, not less than 17,5 mm deep at 76 mm centres. Sheets must be in long lengths

Box ribbed, to be fixed from above: five ribs per sheet width, rib depth and centres as specified. Sheets must be in single lengths for each roof slope

Interlocking box ribbed, to be fixed with clips from below: three ribs per sheet, with rib depth and centres as specified, and with male and female interlocking edge ribs. Sheets must be in single lengths for each roof slope

Interlocking seam ribbed, to be fixed with clips from below: three seam ribs per sheet, with rib depth and centres as specified, with beadings in between the ribs to provide the necessary stiffness, and with male and female interlocking edge seams. Sheets must be in single lengths for each roof slope.

### 6.2.3 Storing roof sheets

Store sheets off the ground and under cover to protect them from dust and moisture. Report wet-storage stain or white rust on galvanised sheet and do not fix until inspected.

### 6.2.4 Fasteners and washers

Fasteners and washers must conform to SABS 1273, be as corrosion resistant as the metal roofing, durable, and compatible with the material they come in contact with. Self tapping screws and blind rivets must have suitable seals or washers and not have holes.

### 6.2.5 End laps and purlin spacing

End laps and purlin spacing must be as specified.

### 6.2.6 Fixing

Ensure that gutter brackets and gutters are installed before laying roof sheets.

Fix roofing and cladding sheets strictly *according to the manufacturer's instructions*, and by a firm of specialists licensed by the manufacturer if so specified. Obtain a copy of the manufacturer's instructions and keep on site.

Do not order any sheet material or do any related work until every aspect thereof has been discussed with the architect/principal agent. Arrange such a discussion in advance so as not to delay the work.

Lay side laps away from prevailing storm winds.

Fix sheets to be fixed from above as follows

Drill all holes through sheets - do not punch

Fix to timber purlins with 65 mm galvanised steel roof screws with galvanised steel and neoprene flanged washers

Fix to steel purlins with 6 mm diameter galvanised hook bolts and nuts, and with similar washers

In the case of corrugated sheets, fix on the crests of all outermost and middle corrugations, at overhangs and at end laps on every second crest

In the case of box ribbed sheets, fix on the crest of every second and fourth rib, with side laps stitched at 900 mm centres with 6 mm diameter self-tapping screws with neoprene washers and galvanised steel caps, with approved sealing strip along full length of side laps

In the case of side cladding, fix with the rib against the girt.

Fix sheets to be fixed from below as follows:

Fix with concealed clips supplied by the roof sheet manufacturer, nailed or screwed to the top of purlins

In the case of seam ribbed sheets and if required by the manufacturer, button punch through the interlocking seam ribs at 150 mm either side of the fixing clip and at mid-span between purlins.

In the case of slopes less than 15°, bend down trough ends of ribbed roof sheets at the eaves, and bend up trough ends at the top ends of the slope.

### 6.2.7 Steel ridgings

Steel ridging sheets must be the same material as the roofing sheets and have a girth of approximately 450 mm.

Ridgings must be with or without roll top, and with downturned edges to suit ribbed or seamed profiles.

Lap ends of steel ridging 200 mm, cut and fit neatly at intersections of ridges, hips and valleys. Beat ridgings into corrugations of corrugated steel roof sheets. Close the roll top of ridging at the feet of hips. Fix ridging to purlins in the same way as the roof sheets, or *according to the manufacturer's instructions*.

Provide serrated closers where necessary.

### **6.2.8 Insulation**

Insulation for roofing and cladding sheets must be polyisocyanate or polystyrene panels, with flame retardent properties when used in exposed installations, and faced with a reflective aluminium foil on outer surface, and a white polyethylene or vinyl on the visible or inner surface, and of specified thickness, and of *approved* manufacture.

Fix insulating panels simultaneously with cladding or roofing sheets. Join panels with lap or tongue and groove joints, with flaps stapled at 150 mm centres with heavy galvanised staples, or with aluminium T- or H-section strips pop-riveted or screwed to girts or purlins, all *according to manufacturer's instructions* and as specified.

Support insulation boards at exposed eaves and gable ends with support flashings.

Architect/ principal agent to approve all details of flashings with the appointed sub-contractor, especially in the case of butterfly roofs.

## **6.3 METAL TILE ROOFING**

### **6.3.1 Metal roofing tiles**

Metal roofing tiles must comply with SABS 1022 and be of galvanised steel or aluminium alloy, and coated or uncoated as specified, and with matching accessories as supplied by the manufacturer.

### **6.3.2 Fixing**

Lay and fix tiles and accessories according to the manufacturer's instructions. Fix tiles with staggered side laps.

Fix metal roofing tiles to brandering with 40 - 50 mm serrated galvanised clout nails through the downturned front flange of the tile into the side of the batten.

Spot paint nail exposed heads and cut edges

### **6.3.3 Earthing**

Steel roofs to be earthed every 6 meters by a qualified electrician in accordance with SABS 0313

### **6.3.3 Guarantee**

Obtain from the manufacturer a written guarantee of 30 years on the substrate, and 15 years on the coating, when relevant.

## **6.4 SUPPORTED METAL SHEET ROOFING AND CLADDING**

### **6.4.1 Material**

Copper roofing sheet must be 0,6 mm x 600 mm wide high purity cold rolled copper to half hard temper.

Boarding must be 20/22 mm thick softwood tongue-and-groove.

Roofing felt must be range 111 containing 80 % wool, density 333 g/m<sup>2</sup>.

Fixing clips must be 0,6 mm x 40 mm wide copper clips.

Nails must be hard drawn copper wire clout nails 2,8 mm diameter x 22 mm with barbed shank.

Screws must be brass screws.

### **6.4.2 Laying**

Screw SA pine boarding with counter-sunk brass screws onto battens.

Nail roofing felt with butt joints onto boarding with copper clout nails.

Lay copper sheet with both edges bent up 90 degrees to form troughs 510 mm wide and form double welted standing seams in direction of fall.

Fold into seams cleats at 300 mm centres formed of the same material and nail to boarding with copper clout-headed nails.

Lay 100 - 120 mm wide sheet at eaves, nail to boarding with copper nails and bend down with roof covering to form drip.

Bend sheet up at parapet walls, ventilation pipes and chimneys and counter flash with copper set in silicon sealer.



Form gutters and spouts from copper sheet of thickness as specified. Provide movement joints in gutters every 10 m.

Fix all copper securely but do not restrict thermal movement. Finish nails and screws flush when covered by copper. All copper sheet work must be done by an *approved* specialist contractor.

## 6.5 FIBRE-CEMENT PROFILED ROOF AND CLADDING SHEET

### 6.5.1 Fibre-cement sheet

Fibre-cement sheets must be 6 or 7 mm thick, depending on profile, and to SABS 685, and to profile as specified.

Fibre-cement ridging must be in two halves so as to be adjustable to the roof slope, with collared end joints, and with plain or corrugated wings.

Fibre-cement flashings must be to same profile as roof sheets, with plain upstands and 300 mm minimum extension over the roof sheeting.

### 6.5.2 End laps and purlin spacing

End laps and purlin spacing must be as follows for different roof slopes:

Slope of roof, degrees	Minimum end lap in mm	Maximum purlin spacing in m
larger than 26	200	1,4
21-25	250	1,4
15-20	300	1,35

### 6.5.3 Fixing

Fix roofing and cladding sheets strictly *according to the manufacturer's instructions*. Obtain a copy of the manufacturer's instructions and keep on site.

Ensure that gutter brackets and gutters are installed before laying roof sheets.

Fix fibre-cement roof or cladding sheets with 7 mm diameter galvanised drive screws to wood purlins, or with 8 mm diameter galvanised hook bolts to steel purlins, all with malthoid or plastic washers with galvanised steel cups.

Drill all holes. Do not punch.

Lay side laps away from prevailing storm winds.

Fill the corrugations under plain wings of fibre-cement ridgings with 1:5 cement/sand mortar.

Fix flashings, bird proofing etc. *according to the manufacturer's instructions*.

## 6.6 GLASS-REINFORCED POLYESTER AND POLYCARBONATE ROOF AND CLADDING SHEETS

### 6.6.1 Sheets

Glass-reinforced polyester laminated sheets to comply with SABS 1150 type 2 (with weathering protection one side), class WF (with fire-retardant properties), mass not less than 1,4 kg/m<sup>2</sup>, and with opacity and colour as specified.

Polycarbonate sheets must be sheeting grade with a co-extruded layer of UV stabilised polymer and a mass of 1,6 kg/m<sup>2</sup>.

The profile must match that of the roofing/cladding sheet, or as specified.

Store sheets on pallets under cover.

### 6.6.2 Fixing

Lay side laps away from prevailing storm winds.

Fasteners for glass reinforced polyester must have malthoid or other approved soft washers.

Sheets layed in single width between steel sheets of similar profile may be supported on the same purlins as the steel sheet. When two or more polyester sheets are layed side-by-side, these sheets must be supported at not more than 0,8 m, and side cladding at not more than 1,5 m.

## **6.7 THATCH ROOFING**

### **6.7.1 Roof timber**

Roof timber must be round hardwood or pine poles with preservative treatment class, and of size as specified, to comply with SABS 457.

Battens must be 20-40 mm diameter poplar or wattle lathes in lengths not less than 3 m.

### **6.7.2 Thatch**

Thatch must be grass or reed of species as specified, without leaves and loose material. Thatch must be treated with a proprietary fire retardent product, when specified.

Store grass in well ventilated piles.

### **6.7.3 Fire protection**

Fire-resistant blanket must be approved aluminium foil or other non-combustible layer.

### **6.7.4 Roof structure**

Spike all joints in rafters and trusses with 150-200 mm wire nails.

Bolt main stress points with 12-24 mm diameter mild steel bolts, the diameter depending on the size of the roof. Securely anchor roof timber to walls.

Spike battens to roof structure with 75 mm wire nails.

### **6.7.5 Laying**

Comb thatching grass for the visible spray layer.

Lay thatching grass on battens and hold down with suitable poplar or wattle lathes.

Fasten with tarred sisal rope at distances of 75 mm to a total thickness of 150 mm.

Form valleys completely from thatch, with extra thickness to form gradual angles.

Form sheet metal flashings and secret gutters around chimneys.

### **6.7.8 Ridging**

Install ridging of thatch, of wire mesh and 1:4 plaster, finished with fabric-reinforced acrylic paint, or of *approved* fibreglass reinforced polyester, as specified.

### **6.7.9 Guarantee**

Obtain a written guarantee from the thatching contractor for the free of charge maintenance of the roof for a period of 5 years, storm damage excluded.

### **6.7.10 Lightning conductors**

Install an SABS specified and approved lightning conductor according to SABS 03:1986.

## **6.8 BOARDED ROOFS.**

### **6.8.1 Steel Beam Framing system.**

Install I beam structure as *specified* by structural engineer. Beams to be primed if instructed.

All members to be fixed in accordance with the engineers details.

If beams are to be inserted into either concrete work or brickwork a soft joint is to be formed all round the beam and at the end of the beam to make provision for expansion and contraction.

### **6.8.2 Cold rolled lipped channel support system.**

Install primed cold rolled lipped channels as specified at 610mm centre to centre to be laid as *specified* to fall, towards NvdM Parapet or Derbigum Outlet or gutter.

Attach to brickwork/ concrete or steel beams as per the engineer's detail or as per the Standard Details to falls and outlets as indicated.

Fall slope to be minimum 2% (1/50)

### **6.8.3 Boards for roofing.**

Install 22mm multi-laminated shutterboard onto cold-rolled lipped channels as per standard details.

Support boards against walls as per the standard details.

Screw boards to cold rolled lipped channels with self-drilling and self-tapping screws of appropriate length at 450mm centres along beams.

Screws to driven with the head flush with the boards.

Waterproof as specified.

50mm Suspended Lambda board skim plastered to be used as ceiling board or 170mm fibre wool insulation to be installed over suspended 9,5mm skimmed gypsum ceiling.

## **7 CARPENTRY AND JOINERY**

### **7.1 STRUCTURAL TIMBER**

#### **7.1.1 Timber**

All solid softwood structural timber must be stress-graded sawn softwood structural timber to comply with SABS 1783. Timber must be ordered in the size in which it must be used. The grade must be marked on each piece of timber. Finger-jointing for joining end-to-end lengths is allowed.

All structural laminated timber must comply with SABS 1460, of hardwood or softwood, exposure class, type, appearance and finish, adhesive type and exposure class, stress grade, and preservative treatment as specified.

Moisture content of structural timber may not exceed 170 g/kg.

Store timber neatly stacked under cover and off the ground.

Plane exposed woodwork and sandpaper to a smooth finish. Round all exposed angles of planed timber to a radius of 3 - 6 mm.

### **7.2 TIMBER ROOF SYSTEMS**

#### **7.2.1 Bolted roof truss system**

Fabricate bolted timber roof trusses with lapped members on site to designs as specified.

#### **7.2.2 Prefabricated roof truss system**

Prefabricated trusses and bracing must be designed by a competent professional engineer, to design as specified and according to SABS 0243, and be prefabricated under factory conditions by an approved specialist firm who must have a valid certificate of competence of the Institute for Timber Construction, under cover of a written guarantee.

Arrange to have the design prepared, and submit the design and guarantee for approval, before any work is started.

The design must show at least:

Sizes and grades of all timber components

Sizes of trusses

Nail plate sizes and positions

Special connections like hips, valleys, jack rafters etc.

Sizes and spacing of purlins or battens

Type of roof covering and design loads

Point loads and support, for example geysers

Bracing

In the case of nailed ceilings, the minimum size of tie beams must be 38 x 100 mm.

#### **7.2.3 Erection of trussed roof structure**

Erect and fix the roof structure according to SABS 0243:

Ensure wallplates are level and roof anchors in position

Mark truss positions on the wall plates

Handle trusses with care to avoid excessive lateral bending. Use tag lines, rigging, spreader bars or strongbacks where necessary

Hold first trusses upright with temporary bracing. Do not use gable walls to support trusses

Ensure trusses in position are vertical and at right angles to walls, with straight rafters and tie beams

Fix the necessary permanent bracing

In the case of trusses spaced at 1500 mm centres and either no ceiling or a suspended ceiling, fix continuous 38 x 76 bearers across the tie beams at centres as specified.

Dress anchors over truss rafters or purlins and fix with nails

Ensure all bracing is in position before carrying up any roofing material

Inspect the soundness of trusses after erection and report any visible damage to the architect/principal agent.

Install roof coverings as soon as possible to avoid weather damage.

Report any deviations from the original design and obtain approval. Do not make changes without the approval of the architect/principal agent.

#### **7.2.4 Certificate of approval of trussed roof structure**

In the case of prefabricated trusses, supply a certificate after erection, signed by the engineer who designed the structure, stating that the whole roof structure has been fabricated and erected to SABS 0243.

### 7.2.5 Wall plates

Wall plates must be sawn softwood structural timber grade S5, size 114 x 38 mm or as specified.

Paint wall plates with creosote to comply with SABS 1290.

Bed wall plates in long lengths in cement mortar and strap down where necessary to a level surface.

### 7.2.6 Gang planks

Nail two 150 x 38 mm softwood grade S5 gang planks onto tie beams when specified. Nail two 150 x 38 mm gang planks onto tie beams of two adjoining trusses on both sides of geysers.

### 7.2.7 Roof beams and lintels

Timber roof beams and lintels must be sawn softwood structural timber or structural laminated timber to size and grade as specified.

Pretreat beam ends and build in at least 100 mm into walls.

Dress anchors over beams or purlins and fix with nails.

### 7.2.8 Purlins and battens

Purlins must be of sawn structural softwood, grade S5, size 50 x 76 mm or as specified.

Battens must be of sawn structural softwood, to sizes as specified.

Plane all timber that will be visible, for example at roof overhangs.

Nail purlins and battens in long lengths and with staggered joints onto beams or trusses. Use 4 mm diameter galvanised wire nails, 120 mm long for purlins and twice the length of batten thickness for battens. Joints must be splayed and must occur on rafter centres.

Install battens on both sides of valleys for the fixing of valley gutters.

Install tilting battens at eaves to ensure that the first row of tiles lies at the same angle as the following rows of tiles.

Tie purlins to beams or trusses at every intersection with 3,25 mm diameter galvanised wire, or with galvanised steel hurricane clips or bent plate connectors.

### 7.2.9 Fascias and barge boards

Fascias and barge boards must be fibre-cement sheets must comply with SABS 803, type flat pressed, and to sizes as specified.

Drill, countersink and screw sheets at 750 mm maximum centres with 5 mm diameter x 50 mm cadmium plated screws.

Screw fascias and barge boards to purlins, tilting battens or verge battens, and into ends of roof beams. In the case of purlins, build stub beams into gable walls between purlins to carry the verge battens.

Cover end joints of fascias and barge boards with 50 mm girth x 0,5 mm thick H-profile galvanised sheet metal cover strips.

## 7.3 CORNICES, SKIRTINGS, RAILS

### 7.3.1 Cornices, skirtings, quarter rounds, rails

Cornices, skirtings, quarter rounds and dado, chair or picture rails must be as shown in Standard Details.

Fix steel angles as shown to walls in long lengths with welded joints, screwed and plugged as specified. Fix members at centres not exceeding 600 mm.. Touch up joints with body filler and sand perfectly smooth.

## 8 TIMBER DOORS

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### 8.1 Doors

Timber doors must comply with SABS 545 and be of type, handing, materials of construction, face and edge finish, size and position of coat rails and closer blocks, dimensions, performance class, interior/exterior grade, rebated pairs, weather bar and ironmongery as specified. Veneer on pairs of doors must match in grain and colour.

Batten doors for external use must be mortice and wedge tenoned, with the tenon showing on the outside edge of styles. Provide a sample batten door for approval.

Fire-doors and fire-shutters must comply with SABS 1253 and be of class, type, types of fastenings, type of closing device, direction of opening and size as specified.

### 8.2 Storage

Seal doors, or knot and prime, on all four edges immediately after delivery on site (if not prefinished).

Store doors flat (not on edge) on a level surface in a dry and well ventilated building.

### 8.3 Hanging

Delay hanging of doors until all wet trades are done.

Check distortion or out-of-plumbness of frames, and report to the architect/principal agent, before hanging door.

Hang doors to leave a clear space of 2 mm (+0 mm -1 mm) above and along the sides, and 6 mm (+0 mm -3 mm) under the door. Take off equal amounts from each side, top and bottom of flush doors when fitting. To reduce the height of panel or framed doors, take off from the bottom only.

Fit two hinges to every door leaf. Fit three hinges to doors weighing more than 20 kg, and doors which are exposed to large differences in humidity or temperature. Hang external doors on brass hinges of which the pins are not removable.

Paint or seal the top and bottom edges of doors after trimming to size and before hanging.

## 9 JOINERY

### 9.1 Preparation

Shop *drawings* must be provided for all joinery work. Discuss all aspects with the architect/principal agent before any work is put in hand.

Provide a sample of every typical finished surface showing its final appearance and smoothness, including edge strips, stopping and dowelling, as specified. These samples must be kept on site for reference.

Provide the architect/principal agent with the opportunity to inspect the joinery before any priming or decoration is done.

Do not start any joinery before sizes have been checked on site.

### 9.2 Joinery

Produce joinery in humidity conditions which resemble those of the building site, in workshops equipped with modern machinery manned by skilled joiners.

Use joints that are not wholly dependent on adhesive and that conceal the end grain of natural wood or the edge of laminated or particle board.

Round all angles and edges slightly. Pencil round all vulnerable or exposed angles and edges.

Punch all exposed nail heads and fill with stopping that will match the wood after clear finish has been applied.

Countersink all exposed screw heads to 6 mm below the surface and glue in matching dowels. Countersink all other screws to 2 mm below surface and fill with stopping.

The grain of all fitted visible clear-finished timber, or the pattern of laminates when relevant, must run vertically on vertical surfaces and parallel to walls on horizontal surfaces, wherever practicable, unless specified otherwise. Veneer on any one fitting must match in grain and colour.

Knot and prime joinery one coat of primer, or brush apply one coat clear finish as specified under *PAINTING*, before delivery to site, as specified.

### **9.3 Timber door and window frames, sidelights, fanlights**

Frames, subframes and glazing beads for door and window frames must be of size and timber specie as specified.

Join frames with mortise and tenon joints.

Frames must be rebated out of solid wood. Do not lay on door stops.

Top rails of frames must be provided with bevelled haunches for building in.

Glazing beads must be tacked lightly in place.

Galvanised steel lugs for building in must be screwed to the outside of every stile.

Bottom ends of door frame stiles must be provided with one 10 mm diameter steel dowel for building into thresholds.

Head and bottom rails of windows and sidelights must be provided with a drip.

Paint backs of subframes one coat wood primer before building in.

### **9.4 Hardwood tops**

Solid hardwood tops must be glued together in wide boards with tongued and grooved joints stopping 25 mm from visible ends. Boards must be in single lengths or, if this is not possible, with staggered end joints.

Tops must be screwed to framework with rebated hardwood clamps or metal cleats at 300 mm centres, screwed from underneath.

### **9.5 Hardboard backs**

Fittings must be provided with hardwood backs when, and of thickness as specified. Bevel hardboard backs all round.

## 10 CEILINGS, PARTITIONS AND ACCESS FLOORING

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**Ceilings to be as specified:**

### 10.1 TIMBER CEILING BRANDERING

#### 10.1.1 Timber

Ceiling brandering must be sawn softwood brandering to comply with SABS 1783, or saligna.

#### 10.1.2 Size and spacing

Sizes of brandering for 6,4 mm gypsum board must be:

38 x 38 mm softwood or 32 x 32 saligna for roof truss spacing up to 1000 mm

38 x 50 mm softwood for truss spacing up to 1200 mm

50 x 50 mm softwood for truss spacing up to 1400 mm.

Sizes of brandering for 4 or 6 mm fibre-cement board must be:

38 x 38 mm softwood or 32 x 32 saligna for roof truss spacing up to 1050 mm

38 x 50 mm softwood up to 1500 mm.

Sizes of brandering for other board thicknesses must be as specified.

If trusses are spaced at 1400 to 1800 mm, support battens by means of 38 x 114 mm sawn softwood joists between trusses secured with 38 x 38 mm hangers from 38 x 76 mm runners at 1500 mm centres across the tie-beams of the trusses.

#### 10.1.3 Fixing

Nail brandering with staggered end joints at right angles with roof trusses and at centres recommended by the manufacturer of the ceiling boards, and at 38 mm centres away from walls for the fixing of cornices, with 75 - 100 mm wire nails.

Skew nail brandering additional to the normal nail at every intersection with roof timber.

Fix brandering, joists or runners with the larger dimension in the vertical position.

Install supporting brandering where light fittings are to be suspended.

Level out brandering, starting from the lowest point, using timber wedges where necessary.

### 10.2 FIBRE-CEMENT AND GYPSUM CEILINGS

#### 10.2.1 Boards

Flat, plain fibre-cement ceiling boards must comply with SABS 803, made from organic fibres, 4 or 6 mm thick as specified.

Flat gypsum ceiling boards must comply with SABS 266, and be 6,4 mm thick, or as specified.

Store boards on an even surface under cover and keep dry.

#### 10.2.2 Fixing

Install ceiling boards strictly *according to the manufacturer's instructions*. Upon request of the architect/principal agent, furnish written proof that the manufacturer has been consulted.

Use longest lengths possible to suit room. Arrange boards symmetrically about room, at right angles to timber brandering, with cut boards along walls, and to approved pattern or as specified.

Lay fibre-cement boards ripple face down to hide nail heads.

Nail boards to timber brandering with 38 mm galvanised clout nails or 32 x 2,5 mm diameter galvanised serrated ceiling nails at 150 mm centres.

Insert prepainted H-profile metal cover strips between boards.

In the case of plastered gypsum ceiling boards or 50mm Lambdaboard:

Ensure building is enclosed before ceiling boards are fixed

Fix wire scrim/ fibre mesh or self-adhesive brown paper tape over all joints  
Plaster the entire ceiling with 3 - 6 mm lightweight hemi-hydrate gypsum plaster the same day as the board has been erected. Finish plaster to a smooth polished surface.

### 10.3 CORNICES AND SHADOW LINES.

#### 10.3.1 Material and fixing

Cornices, if required, must be 75 mm wide coved gypsum cornice to comply with SABS 622, or 6 mm thick coved fibre cement cornice with inside and outside corner pieces, or foam moulded, hardwood or softwood cornices, to profile as specified.

Nail cornices to bracker with 38 mm galvanised clout nails at 300 mm maximum centres.

Nail cornices to walls with 38 mm hardened steel nails, or glue gypsum or fibre-cement cornices to walls with approved contact adhesive or 3-4 mm gypsum plaster.

Mitre corner joints, splay all heading joints. Join fibre-cement cornices with shaped metal H-profile jointing strips.

Install shadow line as specified: Shadow lines to be perfectly clean and straight.

### 10.4 PATENT SUSPENDED CEILINGS

#### 10.4.1 Boards

Boards for patent suspended ceilings must be 9,5mm gypsum to comply with SABS 266, or 50mm poly-urethane foam (Lambdaboard) ceiling panels to comply with SABS 637, of size, colour and finish as specified.

Store boards on an even surface under cover and keep dry.

Exterior ceilings to be 6mm fibre cement ceiling boards or waterproof gypsum boards.

#### 10.4.2 Suspension fittings

Suspension fittings must be patent approved roll-formed galvanised steel Tees, hold down clips, suspension rods and hooks, suspension clips, T suspension plates, lipped wall angles, shadowline wall angles and wall channel trim, with finish and colour, all as specified.

#### 10.4.3 Fixing

Use only *approved* specialist installers.

Fix suspended ceiling system strictly *according to the manufacturer's instructions*.

Do not start this work before the building is enclosed, plasterwork has dried out, and the services are in position and tested.

Arrange boards symmetrically about rooms, with cut boards along walls, with straight joints in both directions or to pattern as specified.

Suspend main tees from structure at centres *according to the manufacturer's instructions* with galvanised mild steel strapping or 2 mm diameter galvanised wire or by patent suspension rods or hooks combined with spring clips and suspension plates. Clip cross tees into main tees at the end of each board.

Level out the suspended ceiling.

Hold down ceiling boards or tiles with patent hold-down tags or wedges.

Provide extra hangers for light fittings, sound systems, air conditioning vents etc. as may be necessary.

Provide *approved* access to ceiling space where concealed Tee system is used.

Provide 12mm shadowline around all ceilings: Allow for tiling or wall cladding thickness when setting out shadow line.

#### 10.4.4 Skim Plastering

Fix wire scrim/ fibre mesh or self-adhesive brown paper tape over all joints

Plaster the entire ceiling with 3 - 6 mm lightweight hemi-hydrate gypsum plaster.

Finish plaster to a smooth polished surface and sand down if necessary.



## 10.5 CEILING INSULATION

Insulate ceilings as specified if 50mm Lambdaboard is not used as the ceiling boards.

### 10.5.1 Mineral fibre insulation

Insulation must be mineral fibre blanket or batts insulation to comply with SABS 1381 part 1, or cellulose loose fill thermal insulation to comply with SABS 1381 part 6, as specified.

Lay insulation over ceiling to thickness or depth as specified.

Fit blankets or batts snugly between roof trusses. Nail batts where necessary.

### 10.5.2 Reflective foil laminates insulation

Reflective foil laminates must comply with SABS 1381 part 4, class A (reinforced, with one side or both sides reflective as specified).

Lay foil on galvanised or PVC-coated span wires at recommended centres, and with 140 mm laps so that span wires support each lap. Draw foil tight and fix to bottom and top purlin by gluing, double-sided tape, or sheet steel straps pop-riveted to the purlin, all *according to manufacturer's instructions*.

## 10.6 WOODEN CEILING AND PANELLING BOARDS

### 10.6.1 Boards

Tongued and grooved timber boards of specie, grade, profile and size as specified, with matching ends, to comply with SABS 1039.

Secret nail boards with lost head oval wire nails or use hidden nails with a nail gun. Stagger all end joints.

Finish edges of ceiling with cornice of size and profile as specified.

## 10.7 CEILING HATCH

### 10.7.1 Timber hatch

Trim 650 x 650 mm minimum clear opening in ceiling with 38 x 100 sawn softwood trimmers spiked to beams or trusses.

Form hatch frame of brandering as for ceiling.

Form trap door of brandering and ceiling board as for ceiling.

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.

Provide 50 x 19 mm hardwood fillets nailed or screwed to ceiling around hatch opening, to carry trap door in closed position. Mitre corners of fillets.

### 10.7.2 Steel hatch

Approved 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. Clear opening must be at least 650 x 650 mm.

Drill frame twelve times and screw onto ceiling brandering.

## 10.8 DRYWALL PARTITIONS

### 10.8.1 Plasterboard

Plasterboard must be standard grade 12mm plasterboard to comply with SABS 266. If specified, board must be covered with paper backed vinyl of specified weight in grams per m<sup>2</sup>.

### 10.8.2 Studs and tracks

Studs and tracks must be 51 or 63,5 x 0,5 mm thick galvanised steel.

### 10.8.2 Aluminium extrusions

Extruded aluminium sections must be alloy 6063 or 6261 in temper T5 or T6. If specified, anodising must be in strict accordance with SABS 1247, and powder coating must be by applicators approved by the specified powder manufacturers, and in accordance with SABS 1247.

#### **10.8.3 Glass**

Glass must be as specified. Provide a warranty from the manufacturer against delamination and colour degradation for a period of at least five (5) years.

#### **10.8.4 Installation**

Install drywall partitions strictly *according to the material manufacturer's instructions*.

Partitions must conform to the specified fire ratings.

Partitions must conform to the appropriate deflection requirements as laid down by the South African Building Interior Systems Association (SABISA).

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## 11 STRUCTURAL STEELWORK

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### 11.1.1 Steel

Hot-rolled weldable structural steel must be grade 300W to comply with SABS 1431.

Cold-formed structural steel may be commercial quality steel only when specified, or with permission of the architect/principal agent.

High tensile steel must be grade 50.

Steel tubes must comply with SABS 657 part 1 and be of type, coating, grade, size and wall thickness as specified.

Steel tubes for furniture must comply with SABS 657 part 4, and be of material, type, grade, size, wall thickness and finish as specified.

Cor-ten steel must be of grade as specified.

Present the architect/principal agent with the supplier's test certificates if required.

### 11.1.2 Shop drawings

Arrange to have shop *drawings* prepared and submit for approval before any work is put in hand. Allow the architect/principal agent to inspect the steelwork at the steel fabricator's works.

### 11.1.3 Welding

Use only coded welders. Weld according to SABS 044. All welds must be continuous except where otherwise specified. Grind visible welds smooth.

### 11.1.4 Prepainting, galvanising

Prepare steel surfaces for priming according to SABS 064, and paint two coats of zinc phosphate primer to comply with SABS 1319, before leaving the workshop.

If so specified, structural steel components must be galvanised to comply with SABS 763 to specified thickness. Make good welded connections on site with zinc-rich paint while steel is still warm.

### 11.1.5 Fire protection

Protect structural steel against fire to comply with fire regulations.

### 11.1.6 Bolts

Bearing bolts for clearance holes must comply with SABS 135, or SABS 136, and be of metal and strength grade as specified.

High-strength friction-grip bolts must comply with SABS 1282, of strength grade and size as specified.

Drill or punch holes and ream to close tolerance.

Pretension bolts during installation to at least 70 % of their tensile resistance.

### 11.1.7 Rivets

Rivets must be mild steel rivets to comply with SABS 435.

## 11.2 ADJUSTABLE METAL LOUVRE FRAMES

### 11.2.1 Louvres and fixing

Adjustable glass louvre frames and mechanisms must be of galvanised steel to comply with SABS-CKS 413. The mechanism must be capable of being operated by the remote control system as specified. Glass louvres must be 115 mm wide, unless otherwise specified, with long edges polished.

Fit adjustable louvre frames after the fixed window frame has been painted, with stainless steel or chromium plated brass dome-head screws.

Service the louvres at completion and leave in perfect working order.

## 11.3 STEEL ROLLER SHUTTERS AND DOORS

### 11.3.1 Slats

Slats must be cold rolled interlocking Z275 galvanised mild steel sections of specified profile and in continuous lengths without joints, forming a weather proof curtain capable of withstanding a wind loading of 70 kPa. The mass of interlocking slats (excluding T-bar) must be 11,0 kg/m<sup>2</sup> for door spans smaller than 4500mm; 13,5 kg/m<sup>2</sup> for door spans of 4500-5500mm, and 16 kg/m<sup>2</sup> for door spans larger than 5500 mm.

### 11.3.4 Grilles

Grilles must be 10 mm diameter continuous mild steel bar without joints over the span of the door width and of specified profile, assembled by means of an approved shaped clip.

The mass of grilles (excluding T-bar) must be at least 13 kg/m<sup>2</sup>, depending on the profile.

### 11.3.5 T-bars

T-bars must be two cold rolled steel angles fitted back to back with a half slat in between, riveted together with 8 mm diameter mild steel rivets, or with 6 mm diameter steel screws, at 350 mm maximum centres (pop riveting is not acceptable)

Lifting handles must be provided on the T-bar of hand operated (push-up type) doors on the side from where it is to be operated: two of 25 x 5 mm flat mild steel bent to desired shape for doors of smaller than 1500 mm width; two of 40 x 40 x 3 mm mild steel angle, for doors of 1500 - 5500 mm width); two of 50 x 50 x 6 mm mild steel angle, for doors of 5500 - 6500 mm width)

### 11.3.6 Guides

Guides must be 3 mm minimum thickness cold rolled mild steel channel with minimum depth of 50 mm for doors smaller than 2500 mm width, 70 mm for doors 2500 - 6500 mm width. Specially fabricated guides must be provided for doors larger than 6500 mm wide.

Provide guides with the necessary bellmouths, 25 x 3 mm flat mild steel T-bar stoppers, and 50 x 5 mm mild steel fixing lugs with 11 mm diameter holes for fixing bolts.

### 11.3.7 End plates

End plates must be 4 mm minimum thick mild steel plate, fastened to supporting wall angles with not less than two 10 mm diameter bolts.

### 11.3.8 Barrel or shaft

Outer and inner tubes of barrels or shafts must be complete with springs, anchors, barrel end castings, ball bearings, stub axles and rings.

Allowable deflection of barrels is 4 mm/m maximum.

Torque safety factor of inner tube must be 3:1 minimum.

Torsion spring must be hard drawn spring steel wire to DIN 17223/1984 or BS 5216/1980. Adjust spring so that door, when stationary, does not move more than 200 mm up or down.

Barrel end castings and spring anchors must be grey cast iron.

Bearings must be high grade sealed ball bearings.

### 11.3.9 Canopy cover

Canopy covers must be 1 mm thick sheet steel for door spans of smaller than 3000 mm; 1,2 mm thick for door spans larger than 3000 mm.

Canopy covers must be hot-dip galvanised to comply with SABS 934, class Z275.

## 11.4 Wicket gates

Wicket gates must be of size 685 x 1830 mm or 685 x 1220 mm as specified, with a fill-in curtain similar to the door curtain, a cylinder night latch and/or provision for a padlock, as specified.

Electrically operated doors must have a power cut-off switch.

### 11.4.1 Operation

Operation must be manual or push-up, chain-operated, gear-operated or electrically operated, as specified.

Chain-operation must be by endless hand chain that will not foul the opening of the doorway, and hangs to within 1 m of the floor. Provide a chain lock on one of the guides.

Gear operation must be by gearbox and handle with locking system, to be installed 1 m from floor level.

Electrical operation must be by electrical motor and gearbox with emergency handle in the event of a power failure, isolator and control push buttons and limit switches.

#### **11.4.2 Fixing**

Bolt guides to wall with 10 mm diameter steel anchor bolts, rawl bolts or sleeve anchors

Weld guides to steel structure by means of a stitch weld.

Service shutters and doors at completion and leave in perfect working order.

### **11.5 STRONGROOM / RECORD ROOM DOORS AND VENTILATORS**

#### **11.5.1 Doors**

Strongroom doors must comply with SABS 949 and be of category, dimensions, fittings, and type and number of locks as specified.

Record room doors must comply with SABS 1015 and be of dimensions, finish and type of lock as specified.

#### **11.5.2 Ventilators**

Ventilators for strongrooms must be double ended steel telescopic ventilators for wall opening size and wall thickness as specified, with face plates on both sides, drop shutter mechanism operating from a fuseable metal plug, wire gauze and baffle plates.

#### **11.5.3 Installation**

Fix strongroom door in position with lugs provided, *according to the manufacturer's instructions*.

Ensure that the door will clear the finished floor by at least 5 mm.

Build in ventilator(s).

#### **11.5.4 Key**

Arrange with the manufacturer to have the key sent to the architect/principal agent by registered post, giving the following particulars:

Manufacturer's name

Manufacturer's door number

Class of door

Size of door

Name of contractor by whom ordered

Building and room where installed.

## 12 ALUMINIUM FRAME WINDOWS AND DOORS

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### 12.1 Glazed aluminium windows and residential sliding doors

Glazed aluminium alloy windows and sliding doors for external use must comply with SABS 1651 and be of type and dimension, handing, finish, type and quality of glass, colour of gaskets and weatherstrips, material and finish of hardware, insect screens, whether weatherstrips are to be renewable, additional security devices and performance class as specified.

### 12.2 Glazed aluminium shopfronts, entrances and screens

Glazed aluminium alloy shopfronts, entrances and screens must be of design and dimension, door types, finish of aluminium, type and quality of glass, colour of gaskets and weatherstrips, material and finish of hardware and performance class as specified.

### 12.3 Aluminium and finish

Aluminium extrusions must be alloy 6063 or 6261 in temper T5 or T6 to comply with BS 1474. Aluminium sheet must be alloy 1200 or 3004 or 5251 of appropriate temper to comply with BS 1470.

Shopfront profiles may be reinforced by inserting steel channels or tubes which are suitably treated to prevent corrosion and reaction with the aluminium alloy extrusions. These steel members must be properly fixed to the aluminium sections. Do not use wood as reinforcing.

Anodising must be to SABS 999, of finish, thickness and colour as specified.

Powder coating must be to SABS 1578 part 1 and 2, of type, thickness and colour as specified.

Provide a certificate that the finish conforms to the specified standards by an approved anodizer or powder applicator, who is a member of the Aluminium Federation of South Africa (AFSA).

Provide a written guarantee for 10 years from the anodizer/powder applicator against peeling and discolouration.

### 12.4 Glass

Glass must be of type, thickness and colour as specified.

### 12.5 Design

Design wind pressure and class designation must be as specified. The manufacturer is responsible for taking height of product head above ground into account when selecting products of appropriate performance. Atmospheric temperature range is between -10°C and 35°C. The plastic, shrinkage and creep deflection of floor slabs must be as specified.

### 12.6 Manufacture

Aluminium framed windows and doors must be manufactured according to the minimum requirements of the Association of Architectural Aluminium Manufacturers of South Africa (AAAMSA).

Use the smallest aluminium profiles allowed and preferably profiles which are deeper rather than wider to reduce the visible impact of the frames.

Each window and door must be marked with the mark and number of the test certificate issued by AAAMSA, or a copy of the latest performance test certificate for similar products must be provided.

The supplier is responsible for confirmation of opening sizes.

Frame parts must be joined by mechanical means or by welding. Joints may have flush, stepped or lapped surfaces. Mitred joints may only be flush. All joints must be sealed. Contact between incompatible materials is not allowed.

Accessories must be removable without having to remove the frames from the structure. Sliding members must be fitted so that no metal to metal sliding contact occurs.

Sealants must be compatible with aluminium, and fitted so that the performance of the sliding or swinging parts is not impaired by their deterioration.

Glazing beads, gaskets and glazing compounds must be compatible with the aluminium, its finish and with the glass. No putty is permitted.

Hardware and fittings must be resistant to atmospheric corrosion and be accessible for adjustment, repair and replacement after the window or door has been installed.

Fastenings must be compatible with aluminium and its finishes.

## **12.7 Installation**

Build in approved subframes if so specified.

Fit windows at the last possible stage in the building process to prevent damage and staining of the aluminium frames.

Install frames to floor level after waterproofing has been done to balconies and window cills: Waterproofing to project under the frames and wrap up behind the frame and on the side of the frame to prevent leaks.

*If this is not done an order will be issued to remove all such frames and to re-install after approval of waterproofing.*

Protect frames against impact or scratching by wrapping with paper or plastic or covering with a light tack tape, and leave these wrappings in place until all rough trades are finished.

Use fixings of aluminium or 304 grade stainless steel.

Avoid direct contact between aluminium and other metals or wet concrete by applying a separating coat of bituminous paint.

Install the window or door secure, sealed and undamaged.

Scratches and blemishes shall be viewed for inspection at a distance of three metres under normal and reasonable lighting conditions.

## **12.8 Water test**

After installation of all doors and windows and before the installation of any floor finishes a water test must be executed in the presence of the architect: Every window and door to be sprayed with a strong jet of water for at least 3 minutes, and the inside then checked for leaks.

## 13 PLASTERING

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Unless otherwise specified all exterior plaster will be a perlite / cement mix in accordance with the manufacturer's specification.

### 13.1 TOPPINGS, SCREEDS AND TERRAZZO

#### 13.1.1 Cement

Cement must comply with SABS ENV 197-1, strength class 32,5 or higher.

Type, composition and strength of the cement must be shown on the bag or the delivery slip of bulk cement. Bags must be SABS-mark bearing.

Keep bagged cement in a dry store. Always use the oldest cement first. Do not use bagged cement with lumps that cannot be crumbled by hand.

#### 13.1.2 Aggregate

Aggregate for toppings and screeds must comply with SABS 1083 for concrete. Supply grading test results if required by the architect/principal agent.

Aggregate for terrazzo must be marble aggregate consisting of equal parts of 3 to 4 mm and 4 to 6 mm, and of approved colour.

#### 13.1.3 Topping

Use stone of the following nominal size:

Nominal aggregate size, mm	Minimum thickness of topping, mm
6,7	25
13	30
19	larger than 40

Mix cement, sand and stone by volume or by mass to produce concrete of at least 20 MPa strength at 28 days, or as *specified*.

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.

Mixing of concrete may be done by hand, or preferably by forced-action mechanical mixers, for 3 minutes. If mixed by hand, mix the dry ingredients, then add just enough water to produce a workable consistence.

Measure consistence with the standard slump test as described in SABS Method 862-1:1994 and as directed by the architect/principal agent.

#### 13.1.4 Screeds

Mix proportion of cement-sand screeds must be 1 part cement to 3½ parts sand, or 50 kg (one sack) cement to 130 l sand. Add just sufficient water to achieve a plastic, workable consistence.

#### 13.1.5 Terrazzo

Mix proportion of terrazzo must be one part cement to two parts marble aggregate.

#### 13.1.6 Pigment

Colour pigment must comply with BS 1014, and be of *approved* colour. Add pigment to the cement before the aggregate is added, or apply pigments to the surface as a dry shake.

#### 13.1.7 Preparation

Ensure all piped services are in position in the base. Do not bury services in the topping or screed.

Ensure the base concrete is hard and strong, free of cracks and reasonably accurate to the required level.

Clean the surface by chipping if necessary and remove all dust.

Wet the surface only if the concrete is absorptive.

Prepare bay forms for toppings to coincide with joints in the base.



### 13.1.8 Laying

Lay toppings, screeds and terrazzo as follows:

Brush a grout consisting of a fluid mixture of equal volumes of cement and fine, clean sand, and water, or a proprietary bonding agent, over the surface 10 to 20 minutes before applying the topping. The bonding agent must be applied *according to the manufacturer's instructions*. Use within 30 minutes of mixing.

In the case of screeds, lay guide strips of the sand-cement mix to establish levels. Lay screeds in panels as large as possible in one operation.

In the case of toppings, establish levels by means of bay forms. Cast bays in chequerboard fashion.

In the case of toppings and screeds, spread the mix, compact, and lightly wood-float to a non-slip finish and to *specified* thickness.

In the case of terrazzo, spread the screed mix, compact and lightly wood float to within 16 mm of the finished floor level. Set the dividing strips as specified below into the screed to form panels not exceeding one square meter, or in pattern as *specified*. While the screed is still plastic, spread the terrazzo mix in the bays and trowel to a level surface.

### 13.1.9 Finishing

Finish surfaces of toppings and screeds as follows:

Where a hard smooth finish is *specified*, leave finish undisturbed for about two to three hours (longer in cold weather), remove bleed water and laitance on the surface, and steel trowel until the desired texture is obtained. Use power trowels if areas are large.

Where a hard non-slip finish is *specified*, steel-trowel as above and subsequently lightly texture with carpet-faced floats or soft brushes.

Where a brushed surface is *specified* (for example to external finishes), lightly brush with a broom to achieve a non-slip texture.

Do not add dry cement at any stage. Do not trowel too soon, and avoid over-trowelling.

Where toppings are *specified* as tinted, lay the mix in two thicknesses in one operation, the lower thickness brought up to 6 mm of the finished level, and the upper thickness laid with the required amount of pigment added to the mix. Finish surface of terrazzo as follows:

Grind the surface after four days by a wet mechanical process until the aggregate is fully exposed and the surface is smooth and even. Grind small or awkward surfaces by hand with a carborundum stone.

Wash clean.

Prepare a sample panel for *approval*, as *specified*.

### 13.1.10 Joints

Form isolation joints through the full thickness of topping, screeds and terrazzo against walls, columns or other fixed objects, to coincide with isolation joints in the base, and 20 mm wide.

In the case of toppings, form intermediate contraction joints dividing the topping into panels not exceeding 9 m<sup>2</sup> by sawing halfway through the thickness of the topping with a mechanical concrete saw.

Arris-round the top edges of joints with a radius of 3 - 5 mm, and seal with an approved elastomeric material when so *specified*.

### 13.1.11 Accuracy

Deviation of the floor finish from datum level must be  $\pm 5$  mm but not near door openings, where levels must be accurate.

Maximum permissible deviation in surface regularity must be 5 mm along a 3 m long straight-edge in any direction and such deviation must be gradual.

### 13.1.12 Thresholds and stair treads

Form thresholds to external doors by removing 75 - 100 mm of the foundation wall over the width of the door opening, and casting a concrete topping threshold over the full width of the wall. Cast the threshold against a metal dividing strip under the door, as described below.

Provide thresholds and stair treads with 75 mm wide reeding, stopped 100 mm from the threshold ends.

### 13.1.13 Dividing strips

Floor dividing strips must be 3 x 25 mm brass, plastic or galvanised steel as *specified*.

Lay dividing strips under internal doors where the floor finish changes material or pattern, so that the floor change is not visible when the door is closed, with the top edge of the strip level with the finished floor.

Lay dividing strips under external doors, with the top edge level with the finished internal floor, and with the external threshold 5 mm lower to prevent rainwater from entering when the door is in a closed position.

### 13.2.1 Plastered Skirtings

Form 75 mm high skirtings of the same material as the floor finish and in the same operation, against walls, columns etc. where so specified, hollow rounded at junction between floor and skirting, and with level top edge with slightly rounded edge, or to shape as specified.

Skirtings must project 10 mm from face brick and bagged wall surfaces, 5 mm from face of plastered walls, and be flush with tiled wall surfaces, except where specified otherwise.

### 13.2.2 Steel recessed skirtings

Install steel recessed to all walls as per standard details. The skirting to be primed both sides after lugs are welded on, and must be straight, plumb and level.

Skirting must be properly joined with steel doorframes as per detail.

Plaster to be finished flush with the top lip.

Skirting to be painted a color as specified.

### 13.3 Curing

Cure the finish for at least seven days by ponding water on the surface, covering with sand which is kept moist, or with plastic sheet. Extend the curing time in cold weather, i.e. when the ambient temperature falls below 10 °C.

### 13.4 Inspection, testing and repair

Inspect the screed or topping as late as possible in the construction program. Test the adhesion of the screed or topping to the base by tapping the surface with a hammer or the end of a rod.

A hollow sound indicates lack of adhesion, in which case the architect/principal agent must decide whether repair work is necessary.

Isolated 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.

### 13.5 Finishing

Seal the floor with one coat non-slip wax polish if so specified.

## 13.2 PLASTER

**Unless otherwise specified all exterior plaster will be a perlite / cement mix in accordance with the manufacturer's specification.**

### 13.2.1 Cement

Cement must be common cement to comply with SABS ENV 197-1, strength class 32,5, or masonry cement to comply with SABS ENV 413-1, type MC 12,5X or 22,5X.

Type, composition and strength of the cement must be shown on the bag or the delivery slip of bulk cement. Bags must be SABS-mark bearing.

Keep bagged cement in a dry store. Always use the oldest cement first. Do not use bagged cement with lumps that cannot be crumbled by hand.

### 13.2.2 Sand

Natural or crusher sand for plaster must comply with SABS 1090, of fineness modulus as specified, when relevant.

Supply grading test results if requested by the architect/principal agent.

### 13.2.3 Lime

Lime must be hydrated lime to comply with SABS 523, putty plaster type for finish coats.

### 13.2.4 Barite

Barite must be plaster grade barium sulphate ( $\text{BaSO}_4$ ).

### 13.2.5 Gypsum plaster

All internal plaster to be two coat plaster, finished perfectly smooth. Gypsum plaster to be polished until hard and solid and not in the least powdery.

Hardwall gypsum plaster must be a retarded hemi-hydrate finishing plaster.

### 13.2.6 Barite plaster

Mix one part cement to five parts barite by weight.

### 13.2.7 Perlite

*All external plaster to be Perlite as per the manufacturer's specification. Applicators to be trained by supplier in correct procedure to plaster with Perlite*

### 13.2.8 Plaster on metal lathing

For plaster on metal lathing add ¼ kg of glass fibres to every wheelbarrow (65 l ) of the plaster mix.

### 13.2.9 Preparation

Complete all chased pipework, conduits, etc., and service outlets before plastering is commenced.

Ensure that the surface to be plastered does not deviate from the required plane by more than about 10 mm. Remove high areas by hacking or cutting. Fill low areas by applying undercoats of plaster not exceeding 15 mm in thickness, scored as described below.

Roughen concrete surfaces where necessary by hacking, and clean the surface with a wire brush.

In case the surface is very dense and non-absorbent, eg hard-burnt bricks or dense concrete, wet and slush with 1:1 cement:sand grout to form a key for the plaster. Add a polymer emulsion bonding agent to improve adhesion if necessary.

In case the surface is absorbent, wet the surfaces directly before plastering is commenced.

Fix 1500 x 1,0 x 35 mm girth galvanised angle rounded corner protection strips to comply with SABS 190 part 2 above skirting to external angles of interior walls where specified.

### 13.2.10 Plastering

**All external plaster to be Perlite as per the manufacturer's specification. Applicators to be trained by supplier in correct procedure**

**All internal plaster to be two coat plaster finished perfectly smooth and hard.**

Apply one coat plaster to surface, leave to stiffen, strike off with a striker board, and wood float to an even surface and to a thickness of 10 - 15 mm.

If plaster is to be applied in two coats, or is to be tiled, the first coat must be scored with roughly parallel lines about 20 mm apart and 5 mm deep to provide a key for the finishing coat or the tile adhesive.

Cement-sand finishing coats must be 5 - 8 mm thick. Gypsum finishing coats must be 3 - 5 mm thick.

Where a roughcast finish is specified, spatter onto the still green rendering coat the same mix with a spattermachine to achieve an approved finish.

Where a bagged finish is specified, spread the mix over the surface with a rolled-up sack until all holes and cracks have been filled.

Apply barite plaster in layers of 6-7 mm at a time, to a final thickness as specified. Float every layer well while setting to prevent the formation of cracks.

In the case of soft clay brickwork, the following applies:

Use a class III mix

Fill major depressions in the wall and score the surface of the plaster

Nail metal lathing or mesh to the wall with galvanised nails and spacers, as specified

Apply the first coat and score

Apply the finishing coat.

In the case of external plasterwork that has to be tiled, the following applies:

Nail metal lathing or mesh to the wall with galvanised or stainless steel nails and spacers, as specified

Apply the first coat and score.

Finish plaster with a wooden trowel, to an even and smooth finish.

Plaster single wall surfaces in one operation.

Protect surfaces against drying out for three days.

Form knife joints through full plaster thickness over movement joints and along the line of the damp proof course at floor level, with arris-rounded edges.

### 13.2.10 Plaster beads

Attach plaster beads to **all** external corners inside the building with drywall adhesive and finish with gypsum plaster flush with bead.

### 13.2.11 Accuracy

Permissible deviation of plaster work is 3 mm under a 2 m straight-edge in any direction.

## 14 FLOOR AND WALL TILES

### 14.1.1 Glazed ceramic wall tiles

Glazed ceramic wall tiles must comply with SABS 22, and be of size, thickness and colour as specified.

### 14.1.2 Ceramic floor and wall tiles

Ceramic floor and wall tiles must comply with SABS 1449, and be glazed or unglazed, of group A (split or quarry tiles), or group B (dust pressed tiles), and of size, shape, pattern or colour as specified.

### 14.1.3 Clay quarry tiles

Clay quarry tiles must be of approved quality, even in thickness, square, free from cracks, twists and blemishes, reasonably uniform in colour, and of specified size.

### 14.1.4 Terrazzo tiles

Terrazzo tiles must be of approved quality, and of pattern, colour and size as specified.

### 14.1.5 Natural stone tiles

Natural stone tiles must be slate, quartzite, marble, granite or other natural stone from an approved South African quarry, of size, colour, surface finish and edge finish as specified.

### 14.1.6 Mosaic tiles

Glass or ceramic mosaic must be of approved South African manufacture, and of colour as specified. Tesserae must be approximately 20 x 20 x 4 mm thick, fixed to brown paper in squares of about 300 x 300 mm.

### 14.1.7 Samples

Provide samples of every type and colour for approval. Keep samples on site for reference.

### 14.1.8 Adhesive

Adhesive must be of *approved* type, suitable for the tiling work at hand. Provide the architect/principal agent of copies of relevant product literature before any adhesive is purchased.

### 14.1.9 Preparation

Complete all adjacent rough construction work and install and test all services in the background before commencing tiling work.

Use only personnel experienced in this type of work.

Examine backgrounds, remedy defects and allow to dry to equilibrium. Remove dust, loose matter, efflorescence and laitence.

Roughen surface of backgrounds if not rough enough to provide a satisfactory bond, or wet and slush with a 1:2 cement:coarse sand mix, or apply a bonding agent.

Where the background to be tiled is of asbestos cement, plasterboard, fibre board or plywood sheets, cover joints with 75 mm wide scrim fixed with adhesive, and coat the whole surface with a suitable water-repellent.

### 14.1.10 Fixing tiles

Fix tiles in adhesive strictly *according to the manufacturer's instructions*.

Tile/ adhesive specification to be obtained for ALL exterior tiling from adhesive manufacturer and to be approved.

Tile/adhesive specification to be obtained for ALL tiling in pools or water features from adhesive manufacturer and to be approved.

Use a white tile adhesive for white marble or marble with a delicate colour.

#### **14.1.11 Fixing mosaic tiles**

Fix mosaic tiles as follows:

Fix mosaic sheets in adhesive as specified by adhesive manufacturer.

Beat the sheets to an overall flat surface

Wet the adhesive paper when the adhesive has started to set, and remove paper with a brush.

#### **14.1.12 Pattern**

Fix tiles with straight joints in both directions, or in agreed or specified pattern.

Cut tiles only along sides of wall panels and along floors.

The top row of wall tiles must be a full tile or mosaic.

#### **14.1.13 Angles**

Butt tiles at internal angles. Mitre tiles at external angles.

#### **14.1.14 Sills and thresholds**

Lay sill tiles to the specified slope and projection over finished wall faces. Where internal sills are specified as sloping, the sill line must coincide with full tiles on the wall surface. Lay external sill tiles symmetrically about the opening, with cut tiles at sill ends.

Lay shower threshold tiles sloping towards the shower.

#### **14.1.15 Grouting and pointing**

Grout joints of width less than 3 mm; point wider joints.

If proprietary grout mixes are used, apply *according to the manufacturer's instructions*.

Use epoxy compound or acid-proof cement mortar if surface is to be acid-proof, when specified.

Grout or point tiles fixed in adhesive after a time recommended by the manufacturer of the adhesive.

Grouting: Dampen joints and apply cement grout with a brush. Work the grout into the joints with a squeegee until joints are filled flush with the surface. Before grout hardens, pencil in the joints with a piece of wood or tool of width the same as that of the joint.

Pointing: Dampen joints and fill with cement:sand mortar with a pointing tool. Before mortar hardens, tool the joints to the specified finish.

#### **14.1.16 Movement joints**

Form 6 mm wide movement joints in tiling and through the full depth of the bedding coat:

Over movement joints in the background

At ceiling level

Vertically and horizontally at approximately 4,5 m centres

Where tiling is continuous over different backgrounds

Fill joints with sealant of approved type.

Use patent aluminium movement joint strips with synthetic rubber inserts for joints in floors, when specified. Fix strips through pre-drilled holes using stainless steel screws and plugs at 300 mm centres on both sides of joint.

#### **Cleaning**

Sponge the tiled surface with water and polish the tiled surface with a clean, dry cloth. Do not use acid cleaners, scouring powder or abrasive cleaning materials.

**All tiles, labour, adhesives and grout to walls and floors, included in PC items.**

## 15 PLUMBING

All work to comply with Part P of SABS 0400 and the local authority's regulations.

### 15.1 FLASHINGS AND LININGS

#### 15.1.1 Metal

Flashings, secret gutters, valley linings and chimney gutters must be of 0,6 mm thick commercial grade steel sheet with class Z275 galvanising to comply with SABS 934, or prepainted to match roof sheets, in lengths of 1800 mm, or of other metal and thickness as specified.

#### 15.1.2 Flashings

Flashings must be of the following sizes, or as specified:

175 x 50 mm undertile flashing  
175 x 50 mm overflashing  
25 x 100 mm cover flashing  
60 x 60 mm gable flashing  
19 or 32 mm diameter roll flashing

#### 15.1.3 Fixing

Cut, join, lap and form sheet metal flashings, secret gutters and valleys to roof and vertical surfaces to make a watertight finish.

Fix flashings to walls with 75 mm long flashing nails with a 20 mm hook. Fix flashings at ends and at 400 mm centres in between. Drive flashing nail into wall above the line of the flashing turn-up, and use the hook of the flashing nail to keep the flashing in position.

Lay undertile flashings against parapet or chimney walls on battens and under clay and concrete roof tiles. Undertile flashings must discharge into eaves gutters.

Chimney gutters must be turned up 100 mm against chimneys and at least 225 mm up the roof slope on battens or tilting fillets. Chimney gutters must be lapped onto side flashings or undertile flashings.

Fix counter-flashings in formed joints in masonry, keep in place with short rolls of cut-off sheet steel, and fill solid with 1:3 cement:sand mortar.

Fix and seal flashings around pipes with suitable clamps.

Valley linings must be ridgings 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.

### 15.2 EAVES GUTTERS AND DOWNPIPES

#### 15.2.1 Sheet metal

Eaves gutters must be of commercial grade steel sheet with class Z275 galvanising to comply with SABS 934, or other metal as specified, with beaded edges, angles, stopped ends and outlet nozzles where necessary, and to the following shapes, sizes and thicknesses, as specified:

Gutter shape	Gutter size, mm	Sheet thickness, mm	Size of bracket, mm
Half round	150	0,6	32 x 3,5
Square	125 x 125	0,6	32 x 3,5
Square	175 x 175	0,8	40 x 5
Square	225 x 225	1,0	40 x 6
Rectangular	150 x 100 deep	0,6	32 x 3,5
Rectangular	200 x 150 deep	0,8	40 x 5
Rectangular	250 x 200 deep	1,0	40 x 6

Sheet steel downpipes must be 0,6 mm thick commercial grade steel sheet with class Z275 galvanising to comply with SABS 934, or other metal as specified, seamed along the pipe length. Join pipe lengths, offsets, elbows and shoes with slip joints neatly soldered.

### 15.2.2 Fix sheet steel gutters as follows:

Lay eaves gutters in galvanised mild steel brackets of size as stated in table above (the 5 and 6 mm thick brackets must be hot-dip galvanised after manufacture), screwed twice to roof timber at 1000 mm maximum centres. Bolt the bracket to the gutter close to the underside of the gutter bead with a 6 mm diameter galvanised gutter bolt. Lay gutters in long lengths. Lap gutter lengths at least 20 mm and seal with *approved* sealant. Strengthen gutter angles with 50 mm wide strips of 0,6 mm galvanised sheet steel soldered over the internal mitres inside the gutter.

### Fix downpipes as follows:

Fix sheet steel downpipes to walls, 25 mm away from the finished wall surface, and with the seam at the back, with 25 x 1,6 mm galvanised mild steel clamps, bolted around pipe in two halves, and with 6 mm diameter galvanised steel lug with toothed end riveted to clamp and built into wall. Fix downpipes at least twice to walls and at 2 m maximum centres.

In the case of downpipes to be connected to stormwater drains, fit the end of each down-pipe with a 0,6 mm thick galvanised flange of diameter to fit into the socket of the drainpipe. Caulk the socket with cement-sand mortar.

### 15.2.3 uPVC

uPVC gutters and downpipes must comply with SABS 11, of size as *specified*.

Fix gutters and downpipes with brackets and holderbats *according to the manufacturer's recommendations*.

### 15.2.4 Fibre-cement

Fibre-cement gutters and downpipes must have a wall thickness of 6 mm, with spigot and socket end joints. Downpipes larger than 75 mm diameter, and all square downpipes must have a wall thickness of 8 mm. Sizes and profiles must be as *specified*.

Provide downpipes with the necessary swan-necks, branch pieces, plinth bends, radius bends and shoes.

Fix fibre-cement gutters and downpipes strictly *according to the manufacturer's instructions* and as follows:

Lay spigot ends onto socket ends in the direction of flow wherever possible

Drill bolt holes through socket and spigot ends

Clean joining surfaces of spigots and sockets, cover with suitable jointing compound and assemble

Secure gutter joints with 6 mm diameter galvanised gutter bolts with bolt heads on the inside of the gutter. Provide gutter bolts with felt washers and galvanised steel washers under the head. Provide a little compound under the washer. Tighten bolts until gutters are aligned, and remove surplus compound

Lay gutters on galvanised steel or aluminium alloy brackets as supplied by the manufacturer of the gutters, of the fascia type where fixed to fascia boards, or the purlin type if fixed to purlins, or purpose-designed for industrial gutters, as *specified*. Fix brackets at 1 m maximum centres and at angles and outlets. Fix brackets so that gutters will have a fall of 1:200 towards outlets

Fill downpipe joints with mastic compound if *specified*.

Fix downpipes to walls with galvanised steel or aluminium alloy holderbats, immediately below the collars. Build in ends of holderbats in walls with 1:3 cement-sand mortar.

## 15.3 ROOF AND FLOOR OUTLETS

### 15.3.1 Rainwater outlets

Minimum diameter of rainwater down pipes is 110mm, built into walls as per the Standard Details.

Rainwater outlets in flat concrete slabs must be as per the Standard Details

Outlets must be of type and size as *specified*.

### 15.3.2 Floor outlets

Floor outlets must be stainless steel as specified.

## 15.4 UNDER GROUND SOIL DRAINAGE

### 15.4.1 Vitrified clay pipes

Vitrified clay pipes must comply with SABS 559, without sockets, and with polypropylene and glass fibre sleeves with rubber seal ring couplings. Sizes as *specified* are internal diameters.

#### 15.4.2 uPVC sewer and drain pipes, and fittings

Unplasticised polyvinyl chloride sewer and drain pipes and fittings must comply with SABS 791, and be of heavy duty (SDR34) or normal duty (SDR51) class and size as specified.

Couplings must be push fit sockets with rubber seal rings. Sizes as specified are outside diameters.

#### 15.4.3 Laying under ground sewer pipes

Lay pipes as follows:

Excavate, lay and backfill in reasonable lengths and without delay. Assume excavations are in soil.

Notify the architect/principal agent if excavations are in harder material

Excavate the trench not wider than is necessary to lay, joint and backfill the pipe, or to width as specified, and to a depth of 100 mm below the required pipe level. The trench must be inspected by the architect/principal agent before bedding material is placed. Protect the trench against flooding

Bed the pipe true to line and grade on 100 mm minimum thickness approved granular material over the full trench width. Carefully compact the bedding to 90 % MOD AASHTO. Support the pipe uniformly and continuously

Install flexible compression joints *according to the manufacturer's instructions*. Make sure joints are clean before installing them.

Place backfill in the trench, up to the level of the top of the pipe and carefully compact to 90 - 95 % MOD AASHTO.

Ensure the moisture content of the backfill is within 2 % of its optimum moisture content

Fill over the pipe with a 300 mm thick layer of the same material and tamp lightly

Fill the remainder of the trench in layers not exceeding 300 mm with material from the trench excavations, but without organic material or boulders larger than 150 mm and compact to 90 % MOD AASHTO. Do not roll or use heavy mechanical compaction until at least 600 mm of material has been placed over the pipe. Fill in layers not exceeding 150 mm and compact to 93 % MOD AASHTO where the trench crosses roads or paving

Where pipes run under buildings, lay pipes with a minimum soil cover of 300 mm, or with 100 mm precast or cast-in-situ concrete slabs over the pipe, isolated from the crown of the pipe by a soil cushion not less than 100 mm thick, or with 100 mm concrete

Where drain gradient exceeds 1:5, provide concrete anchor blocks at bottom of gradient to secure pipe in place

Connect the sewer pipe to the sewer of the local authority where relevant.

#### 15.4.4 Cleaning eyes

Provide cleaning/rodding eyes where specified on *drawings* as "RE".

Construct cleaning eyes of pipe of the same material and diameter as the drain. Insert junction in drain, or bend in end of drain, and bring branch up to ground level with easy bends.

Fit top at ground level with PVC cover with letter "RE" on the cover, secured with non-ferrous metal screws. Encase bends and pipe in 15 MPa concrete not less than 100 mm thick and finish on top with 1:2 cement-sand mortar, troweled smooth and rounded on salient angles.

#### 15.4.5 Inspection eyes

Provide inspection eyes where specified on *drawings* as "IE".

Form inspection eyes in the drain by inserting an access pipe or bend with access lid.

When the letters "IE" on *drawings* are specified as being enclosed with a square, mark the position of the inspection eye with a precast concrete block with the letters "IE" formed in the top surface.

#### 15.4.6 Gulleys

Gulleys must be one of the following, as specified:

Vitrified clay gully trap with gully head to comply with SABS 559, with cast iron grating to comply with SABS 1115, or

Unplasticised polyvinyl chloride (uPVC) gully trap and head with polypropylene lid to comply with SABS 791, laid loose in the socket.

Lay gulleys as follows:

Encase gulleys in 15 MPa concrete, not less than 100 mm thick, and finish where exposed with 1:2 cement-sand mortar, flush with gully head and splayed on edges

Lay gully so that overflow height is at least 150 mm above the finished ground level

Provide precast concrete gully head where dished gulleys are indicated so that the top of the head is at least 150 mm above the finished ground level

Bed gratings in bitumen.

#### 15.4.7 Grease traps

Grease traps must be of stainless steel or reinforced fibreglass, of type, capacity and size as specified.



#### 15.4.8 Testing of sewers

Inspect and test the sewer in the presence of the architect/principal agent:

Inspect and test all under ground drains and fittings before covering with soil or encasing in concrete

Provide all necessary testing apparatus and labour

Inspect the inside of drains with a torch and mirror before performing the water or air test

Plug or seal all openings, fill all traps with water

Air test: Use an approved air test machine to raise the pressure in the pipe to 3,75 kPa. Lower the pressure to 2,5 kPa after two minutes. Switch off the machine and measure the time it takes for the pressure to fall to 1,25 kPa. This should be 2 minutes for a 100 mm diameter pipe, and 3 minutes for a 150 mm diameter pipe

Water test: Fill the pipe with water through the highest opening so that any part of the pipe is subjected to a pressure of at least 12 kPa and not more than 60 kPa. Allow ten minutes for absorption. Water loss should not be more than 6,0 l per 100 m of drain per hour for a 100 mm diameter pipe, or 9,0 l per 100 m of drain per hour for a 150 mm diameter pipe.

Drains may be tested in sections

Cement mortar joints must be at least 24 hours old before testing

Repeat the test after the whole drainage installation has been completed

Make good any defects should the test(s) fail and repeat until the system is sound and tight. Defective parts must be replaced, not patched up.

#### 15.4.9 Repair

Repair road or paving surfaces where disturbed by pipe-laying, when relevant.

### 15.5 ABOVE GROUND SOIL AND WASTE WATER DRAINAGE

#### 15.5.1 uPVC soil waste and vent pipes

Unplasticised polyvinyl chloride soil waste and vent pipes and fittings, for use above ground must comply with SABS 967. Joints must be push fit assembly or solvent weld type. Sizes as specified are outside diameters.

#### 15.5.2 Galvanised mild steel waste pipes

Galvanised mild steel waste, ventilation and anti-siphon pipes must be as described under WATER AND GAS SUPPLY, but fitted at angles and intersections with cast iron, brass or malleable cast iron bends and junctions. Bends and junctions to waste pipes must have inspection eyes where necessary.

#### 15.5.3 Fixing pipes above ground

Fix soil and waste water pipes above ground as follows:

Fix cast iron ventilation pipes to walls with hinged cast iron holder bats to comply with SABS 1209, and with general or heavy duty zinc coating as specified.

Fix uPVC ventilation and soilwater pipes with galvanised mild steel holder bats at centres *according to the manufacturer's instructions*

Provide open end of ventilation pipes with a galvanised wire- or uPVC balloon, or with vent valve to comply with SABS 1532, of approved function and size.

Discuss measures to be taken to avoid unsightly pipework on the outside of buildings with the architect/principal agent before any chasing or cutting for pipework is started. In general, waste pipes with a maximum diameter of 40 mm may be built into walls or cast into floors, with the necessary cleaning eyes. Stacks and ventilation pipes may be placed inside lavatories, store rooms or in easily accessible drainage ducts.

All rainwater downpipes to be tested by the plumber by inserting expanding plugs and filling the pipes with water for at least 48 hours, before any plastering take place

No exposed pipes allowed: Where ducts are indicated 12 mm thick fibre cement fascias to be used as covers only in areas where connections are done or inspection eyes are installed: Ensure that no timber is used to fix these to walls: rebate plaster and fit fibre cement flush with textured side to the outside and seal around edges with silicone after final inspections, or install aluminium angle to wall and screw cover to this with chromed screws.

**Plumber must install pipework in ducts and do all connections before brick-work is done where brick ducts are indicated**

## **15.6 BELOW GROUND STORMWATER DRAINAGE**

### **15.6.1 Concrete stormwater pipes**

Concrete stormwater pipes must be unreinforced concrete non-pressure pipes to comply with SABS 677 type SC, with ogee or plain ends as specified. Sizes as specified are internal diameters.

### **15.6.2 Laying concrete stormwater pipes**

Lay concrete stormwater pipes *according to the manufacturer's instructions*, and as follows:

Lay pipes on 100 mm minimum compacted granular bedding material. Fully support the pipe over its entire length.

Lay pipes accurately to lines and gradient

Joint ogee pipes with 1:2 cement mortar, well caulked in with a steel tool, and finish with a smoothly trowelled fillet, or with an approved external rubber collar

Joint butt joined pipes with mortar coated hessian band

Build pipes into walls of sumps, catchpits or inspection chambers with 1:2 cement-sand mortar. Lay pipes with top of bores at the same level where pipes enter or leave, with the invert of the largest pipe at the bottom of the sump, pit or chamber.

### **15.6.3 Bends and junctions**

Bends and junctions up to 150 mm diameter must be of vitrified clay as specified above.

Where one or more stormwater pipes are over 150 mm diameter, construct junction boxes over bends and junctions with 15 MPa concrete after the drains have been laid. Cast bottoms and sides of junction boxes 150 mm thick. Cast sides to slightly above the top level of the pipes. Cover box with a 80 mm thick slab of similar concrete, laid loose.

**All piping to be pressure tested for at least 14 days before covering of pipes.**

**Supply pipes to be 22 mm to all fittings and only to be reduced where tap connectors/ angle-valves are connected to the circuit.**

**16.1.1 Copper pipes**

Copper pipes for domestic water and gas supply must comply with SABS 460, class 0 for water or gas supply above ground, and class 2 or 3 for water or gas supply below ground.

Fittings must be copper-based capillary solder or compression fittings to comply with SABS 1067.

Join copper pipes as follows:

Cut pipe end square, ream, remove burrs and size if required

Clean bore of fitting and pipe with a ring brush or fine emery paper.

Capillary joints:

Apply flux to outside of pipe, twist to help distribute the flux over the two surfaces. Use flux carefully and sparingly

Apply flame to tube and fitting until heated. Remove flame and allow solder to be drawn into the joint until a

complete fillet of solder appears around the mouth of the fitting

Wipe joint clean.

**16.1.2 Compression joints:**

Slide fitting onto tube end until it stops against the inner shoulder.

Tighten capnut by hand

Tighten nut with a spanner until the fitting is difficult to turn on the pipe. Thereafter tighten fittings ½ turn.

**16.1.3 Flared joints:**

Slide coupling nut over end of pipe and insert flaring tool

Drive the flaring tool to expand the pipe end

Assemble joint by placing ferrule squarely between flared end of pipe and flare in fitting body, and engage coupling nut with fitting threads. Tighten with two spanners.

**16.1.4 UPVC pressure pipes**

Unplasticised polyvinyl chloride pressure pipes must comply with SABS 966, of class and size as specified.

Join uPVC pipes as follows, or as specified:

Slightly roughen joint faces

Apply solvent cement to joint faces

Insert pipe into socket and wipe clean

**16.1.5 Fibre cement pressure pipes**

Fibre cement pressure pipes and couplings must comply with SABS 1223, class C or as specified.

Cast iron fittings must comply with SABS 546, with rubber rings on each side of collar, and outer flange rings, tightened with bolts.

Fibre cement collars must be grooved internally and fitted with rubber spacer rings and/or rubber gaskets.

Use fibre cement or cast iron bends similar in quality to straight couplings, in all changes of direction.

Use cast iron collar-type T-connections for branches of 50 mm diameter and less.

Use saddlepieces supplied by the manufacturer for branches of 40 mm and less.

**16.1.6 Polypropylene pressure pipes**

Polypropylene pressure pipes must comply with SABS 1315, of type and pressure class as specified, and suitable for the conveyance of cold and hot water.

Fittings must be copper-based compression fittings to comply with SABS 1067.

Join polypropylene pipes as follows:

Cut pipe end square and remove burrs

Clean bore of pipe

Butt join pipe ends and fusion weld *according to the manufacturer's instructions*, or

Slide compression fitting onto tube end until it stops against the inner shoulder. Tighten capnut by hand. Tighten nut with a spanner until the fitting is difficult to turn on the pipe. Thereafter tighten fittings ½ turn.

### **16.1.7 Polyethylene pipes**

Black polyethylene pressure pipes must be low or high density as specified.

Low density polyethylene pipe must comply with SABS 533, type 1, of nominal inside diameter and used with insert couplings and clamps, or type 2, of nominal outside diameter and used with compression type couplings, and of nominal size and pressure class as specified.

High density polyethylene pipe must comply with SABS 533, type 3, of nominal inside diameter and used with insert couplings and clamps, or type 4, of nominal outside diameter and used with compression type couplings, and of nominal size and pressure class as specified.

Join pipes as follows:

Compression joints

Use approved compression fittings *according to the manufacturer's instructions*

Insert metal liner in pipe end to prevent collapse of the pipe

Screw nut of fitting hand tight, and then a further one-and-a-quarter turns to compress the ring into the pipe.

### **16.1.8 Insert joints**

Use approved compression fittings *according to the manufacturer's instructions*

Force spigot of insert piece into end of pipe. Soften pipe end if necessary by inserting in hot water

Clamp pipe to spigot with circular metal clamp.

### **16.1.9 Screwed joints**

Cut ends of pipe off square. Chamfer pipe end with a file. Cut thread on pipe ends with special dies, without oil and with a mandrel inserted in the end of the pipe to support it against the die. Thread only enough length necessary to enter the joint

Screw on galvanised malleable cast iron fittings, to comply with SABS 509, firmly hand-tight.

### **16.1.10 Laying pipes under ground**

A 32mm ring main to be installed around the footprint of the building.

Lay water supply pipes under ground *according to the manufacturer's instructions*, and as follows:

Lay water supply pipes 500 mm away from drains if parallel, 100 mm away if at right angles. Pipes of 75 mm diameter or less must have 450 mm minimum cover, larger pipes must have 750 mm minimum cover. Pipes must not have more than 1000 mm cover

Excavate trench 100 mm deeper than the required level. Backfill with compacted stable material to achieve a level bottom

Bed the pipe true to line. Support the pipe uniformly and continuously

Test the pipe for leakages before covering the pipe. Provide all necessary testing equipment. Fill pipes with water and evacuate all air. Pressurise the system to one and a half times the design pressure and maintain for at least 14 days. Fix all leaks

Fill over the pipe with selected soil and compact in layers not exceeding 300 mm. Tamp the first layer lightly and do not roll or use heavy mechanical compaction until at least 600 mm of material has been placed over the pipe.

Compact to 90% MOD AASHTO

### **16.1.11 Fixing pipes above ground**

Fix water or gas supply pipes above ground *according to the manufacturer's instructions*, and as follows:

Discuss measures to be taken to avoid unsightly pipework with the architect/principal agent before any chasing or cutting for pipework is started. In general no surface mounted water or gas piping is permitted on external walls. All other surface mounted pipes must preferably run in ducts or be so placed as to be unobtrusive if approved

Fix pipes larger than 22 mm diameter inducts firmly to walls with plastic holderbats for copper or polypropylene pipes, and to centres according to the manufacturer's instructions, to leave a clear space between the pipe and the finished wall

Embed pipes up to 22 mm diameter in walls. Chase neatly. Do not chase walls constructed of hollow blocks but locate pipes in the block cavities.

Chase solid walls not deeper than one third of the wall thickness vertically and not more than one sixth of the wall thickness horizontally.

Avoid horizontal chasing where possible.

Ensure that chases, holes and recesses are so made as not to impair the strength or stability of the wall, or reduce the fire resistant properties of the wall.

Fill chases in masonry walls with class I or II mortar once the conduits are in position

Fasten pipes firmly to roof timber with galvanised mild steel or copper pipe clips screwed on.

Support polypropylene hot water pipes in roof spaces continuously.

Do not install polypropylene pipes closer than one metre from hot water geysers.

Use bends in preference to elbows if practicable. If a reduction in the size of the pipe takes place at an angle, the bend or elbow must be the size of the larger pipe

No air may lodge in pipes. Maintain a proper fall

Provide for expansion in long lengths of pipes.

Insert long- screws or approved couplings at convenient points to provide for alterations and repairs.

Provide unions at in- and outlets of geysers.

#### **16.1.12 Insulation of pipes.**

Insulate any exposed pipes above ground with bonded preformed mineral fibre pipe sections to comply with SABS 1445 part 3, also in ducts and roof cavities.

Copper pipes must not be fitted directly against structural steel work, but must be insulated.

#### **16.2 Pressure-reducing valves.**

Individual 28mm Risers to be fitted from 32mm ring main to each geysaer.

Every geyser to be fitted with a pressure reducing valve. Total supply system to be balanced with **cold water supply taken after pressure reducing valves fitted to each geyser**, with stop valves in easily accessible positions.

Each geyser to be fitted with a non-return valve on the cold water supply and expansion pipe from geysers to run into sewer stack or gully:

#### **16.3 Water meters**

Water meters must be of the semi-positive rotary piston type, each with brass or bronze working chamber, hinged cover to cyclometer dial and screwed ends for coupling to water mains. Registration of consumption must be in kilolitres. Accuracy and rate of flow must be as follows:

Size of meter, mm	Accuracy within 2%, litres/hour	Continuous rated flow, litres/hour
15	22	900
20	27	1800
25	54	4100
40	109	7250

#### **16.4 Cleaning**

Flush the entire pipeworks before any valves or taps are connected.

Fill fibre-cement pipes with water containing 0,15 g/l calcium hypochlorite. Allow the solution to flow slowly into the pipe and let stand for 24 h. Flush fibre-cement pipes with clean water until a sample taken from the pipe complies with the requirements for drinking water of the local authority.

#### **16.5 Insulation**

Insulate pipes above ground with bonded preformed mineral fibre pipe sections to comply with SABS 1445 part 3, where specified. Foam insulation cannot be used where exposed to sunlight.

## 17 SUMPS, CATCHPITS, CHAMBERS, MANHOLES AND BOXES

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### 17.1 Bricks

Bricks must comply with SABS 227, class NFX (extra durable)

### 17.2 Concrete

Use concrete as described under CONCRETE, FORMWORK AND REINFORCEMENT:

15 MPa concrete for unreinforced work

20 MPa concrete for reinforced work.

### 17.3 Mortar

Use mortar as described under MASONRY. Mortar must be class I (1:3 cement:sand).

### 17.4 Plaster

Use plaster as described under PLASTERING. Plaster must be class I (1:3 cement:sand).

### 17.5 Gratings, covers, boxes

Cast iron covers and frames must comply with SABS 558 for inspection chambers, septic tanks and surface boxes, of type, size and duty class as specified.

Cast iron gratings and frames must comply with SABS 1115 for gulleys and stormwater drains, of type, size and duty class as specified.

### 17.6 Precast concrete catchpits and inspection chambers

Precast concrete or fibre cement catchpits and inspection chambers must comply with SABS 1294, of type and size, and whether step-irons are required, as specified.

Offload and stack manhole components in an upright position, not higher than 2m. Use lifting equipment *according to the manufacturer's instructions*.

### 17.7 Step-irons

Step-irons must comply with SABS 1294.

### 17.8 Excavations

Follow closely excavation, installation and backfilling operations of the pipes in order to minimise obstruction to traffic and possible stormwater damage.

Take the necessary safety precautions as required by law.

### 17.9 In-situ construction

Build catchpits, chambers, manholes, sumps and boxes to sizes and depths as specified or as required.

Build rainwater sumps and stopcock-, meter- and valve boxes with half brick walls on 100 mm unreinforced concrete bottoms and with 80 mm reinforced concrete top rebated for frame of grating and cover, or to full depth of cast iron boxes. Build insides to a fair face with flush joints. Plaster exposed surfaces only.

Build stormwater catchpits, manholes and sewer inspection chambers with one brick walls on 100 or 150 mm unreinforced concrete bottom and with 100 mm reinforced concrete cover slab rebated for frame of grating or cover. Plaster catchpits, manholes and chambers internally and on exposed surfaces.

Splay cover slab of sewer chambers and manholes away from manhole cover frames. Splay cover slab of stormwater catch pits towards grating frames.

Where stormwater surface channels discharge into catchpits, cast the cover slab as thick as the surface channel, and shape tops towards gratings.

Bench around half-round channels, bends and junctions of sewer chambers with unreinforced concrete finished smooth.

### 17.10 Precast construction

Excavate to required level. Lay a 50 mm thick concrete blinding layer if in-situ material conditions are unsuitable. Lay a 20 MPa unreinforced concrete foundation slab to specified thickness.

Set the starter section into the foundation slab or on 1:3 cement:sand mortar.

Lay acceptable channel fittings to the required line and level.

Fill around the channels with concrete and bench to the wall of the manhole at a slope of at least 1:6. Finish off benching with class I plaster.

Lower successive sections onto one another and seal and point neatly.

#### **17.11 Testing**

Test chambers for watertightness before backfilling

For precast concrete manholes:

Fill completely with water.

Allow to stand for 24 hours.

Refill and allow to stand for a second 24 hours.

If the second drop in water level is more than 150 mm, inspect for faults and rectify

#### **17.12 Backfilling**

Backfill around sumps, catchpits, chambers and manholes with selected fill material in layers not exceeding 300 mm in thickness, and compact to the same density as the fill over the pipeline.

Remove surplus material.

## 18 SANITARY APPLIANCES

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### 18.1 Appliances

Sanitary appliances must be of shape, size, colour, type, capacity and with accessories as specified.

Acrylic baths must comply with SABS 1402. Acrylic baths must carry a written guarantee against latent defects for a minimum of five years.

Ceramic hand wash basins must comply with SABS 497.

Stainless steel basins and wash troughs must be of 1,2 mm thick pressed stainless steel grade 304 to comply with SABS 906.

Ceramic water closets must comply with SABS 497.

Cisterns must be Gerberit type, recessed into walls, as specified.

Urinals must be glazed ceramic to comply with SABS 497, or stainless steel to comply with SABS 924, of type, dimension and finish as specified.

Drip sinks must be glazed ceramic to comply with SABS 497.

Stainless steel sinks with draining boards must be of satin polished stainless steel of specified grade, with sound-deadening material on the under side and with overflow, to comply with SABS 242 for domestic use, and with SABS 907 for institutions. Sinks and draining boards must have splashbacks and tiling keys along the back and at sides where against walls.

Concrete wash trough must be of reinforced concrete, with reeded front. Drainers must 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 must be reinforced concrete. Bed pedestals on floor, and trough on pedestals, with 1:2 cement-sand mortar.

### 18.2 Taps and valves

Water taps and stopcocks must comply with SABS 226 (metal), or SABS 1020 (plastics), of size and class, and whether aerator is required, as specified. Taps for cold and hot water must be marked blue and red respectively with plastic inserts.

Single control mixer taps must comply with SABS 1480.

Flush valves must comply with SABS 1240, of class and size as specified.

All taps to be installed perfectly level and perpendicular to the wall where indicated.

### 18.3 Traps and waste pipes

No reduction in any waste pipe to a diameter smaller than the waste outlet it is connected to shall be allowed: In particular the waste pipes to baths, showers, sinks, washing- and dishwashing machines shall be 50 mm along its total length, and will not be interconnected.

Waste traps must be plastic or rubber or as specified. Plastic waste traps must comply with SABS 1321, part 1, of specified type, size and depth of seal.

Rubber waste traps must comply with SABS 1321 part 2, of specified type, size and depth of seal.

### 18.4 Toilet roll holders, towel rails

Toilet roll holders must be chromium plated brass, or white glazed ceramic, or as specified.

Towel rails must be chromium plated brass or aluminium, of approved type, or as specified.

All toilet roll holders and towel rails to be installed perfectly level and perpendicular to the wall where indicated

### 18.5 STEAM ROOM:

Make provision for a 20 mm pipe to the steam room from a point to be indicated on site for a steam connection

### 18.6 SPRINKLER FEEDS

25 mm Copper pipes to be installed to each atrium and planter from the garden to act as connection pipes for the sprinkler system.

Such pipes to be terminated at least 300mm under the finished ground-level in the atriums and 75 mm below the top edge of any built-in planter. These feeds also to run all balconies.



## **18.7 MACHINE CONNECTIONS:**

Two under tile stopcocks above counter with outlets under counter next to (not behind) machines.

## **18.8 Fixing of sanitary fittings generally**

Leave protective wrappings in position for as long as possible

Fix in a manner that will facilitate future removal if necessary

Fix all appliances securely. Use manufacturers' brackets and fixing methods wherever possible. Use frame fixing anchors for fixing brackets. Do not screw and plug.

Bed water closet pans in 1:3 cement-sand mortar. Bed squatter pans in 10 MPa concrete

Build bath fronts up in brick masonry except where specified otherwise

Bed acrylic baths in 1:5 cement:sand mortar on three rows of bricks, or bed solidly on dry river sand or concrete.

Fix shower heads at 2100 mm above shower floor level, or as specified.

Screw and plug toilet roll holders and towel rails to walls.

## **18.9 ELECTRIC AND SOLAR GEYSERS**

### **18.9.1 Geysers and fixing**

Geysers must comply with SABS 151 and be of type, working pressure, capacity, kW rating and mounting position as specified.

Floors to geyser enclosures to be waterproofed before installation of geysers and a 75 mm outlet pipe must be supplied to outside to prevent flooding of house in case of leakage

Geysers must carry a guarantee on the tank, element, and thermostat for a period as per manufacturer..

Floors to geyser enclosures to be waterproofed before installation of geysers and a 75 mm outlet pipe must be supplied to outside to prevent flooding of house in case of leakage

Install geysers *according to the manufacturer's instructions*.

Position geysers on firm timber joists in roof space near a ceiling hatch so that the electric element can be reached from a step ladder through the hatch, whenever possible, or in position as specified.

Preset the geyser thermostat to 55° C.

## **18.20 FIRE EQUIPMENT**

### **18.20.1 Fire hose reels**

Fire hose reels must comply with SABS 543, with 30 m long x 20 mm diameter light duty rubber fire hoses, for corrosive conditions as specified, with fixed bases, and with couplings, connections, branch pipes and nozzles to SABS 1128 part 2.

Fix reels against walls with suitable frame fixing anchors or expansion bolts at a height of 2100 mm from floor to spindle, or to height as specified.

### **18.20.2 Fire extinguishers**

DCP type extinguishers must be portable rechargeable dry powder extinguishers to comply with SABS 810, of capacity and for corrosive conditions as specified.

CO<sub>2</sub> type extinguishers must be portable rechargeable carbon dioxide extinguishers to comply with SABS 1567, of capacity and for corrosive conditions as specified.

Water-type extinguishers must be water type portable fire extinguishers to comply with SABS 889, of capacity and for corrosive conditions as specified.

BCF type extinguishers must be halogenated hydrocarbon fire extinguishers to comply with SABS 1151, of capacity and for corrosive conditions as specified.

Hang extinguishers on wall hooks screwed and plugged to wall, in *approved* positions and height.

### **18.20.3 Fire hydrants**

Fire hydrants must comply with SABS 1128 and must be supplied to the *approval* of the local fire control officer.

## **18.21 STAND PIPES:**

10 taps: positions to be determined on site with Employer: also a female connection to each planter, balcony or atrium.

Supply direct feed to pool with cut-off valve to Principal Agent's satisfaction where indicated.

## 19 ELECTRICIAN

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### 19.1 ELECTRICAL INSTALLATION

All work to comply with SABS 0142, the latest Standard regulations and Specifications of the South African Institute of Electrical Engineers for the wiring of premises and local authorities regulations.

All work to be done by a registered and approved sub-contractor.

All work must be done under supervision of a registered electrician

Electrical symbols on drawings are as per the legend supplied.

Chase neatly after cutting walls with an angle grinder: Use sharp chisels.

Do not chase walls constructed of hollow blocks - locate services in the block cavities.

Chase solid walls not deeper than one third of the wall thickness vertically and not more than one sixth horizontally.

Avoid horizontal chasing where possible.

Ensure that chases, holes and recesses are so made as not to impair the strength or stability of the wall, or reduce the fire resistance properties of the wall.

Apply stainless steel mesh over chases wider than 150mm before plastering.

Fill chases with class 1 or 2 mortar once the conduits are in position.

All light switches, bell points, panic buttons and underfloor heating thermostats are to be installed 1,0m from finished floor level, except if steel frames are used, where switches must line up with the strike plate on the frame.

#### 19.1.2 GUARANTEE

Guarantee the efficient and safe working of the whole installation for 12 months after completion of the building. Lighting bulbs and tubes are excluded from this guarantee.

### 19.2 MATERIALS

#### 19.2.1 Conduits

All conduits to be installed before plastering commences, and the electrician shall be responsible for the cost of re-plastering total walls if chasing is done after plastering.

Conduits must be uPVC conduits to comply with SABS 950,

Fix conduits as follows:

Build in conduits in wall chases with cement mortar and clamps

Cast conduits under concrete surface beds, cavities to be formed in fill to avoid reducing the surface bed thickness.

No surface fixing will be allowed under any circumstances.

All conduits installed for telephone, alarm, intercom, television aerial, swimming pool cables, etc., to have draw-wires installed during installation of conduits and to be free of obstructions.

Electrician must ensure that all conduits are properly plugged and joined during installation to avoid ingress of mortar, etc.

#### 19.2.2 Conductors and cables

Copper conductors must be PVC isolated copper conductors to comply with SABS 150.

Main cable to be three phase, 120Amp per phase.

Electric cables must be PVC armoured copper cable to comply with SABS 150.

Lay electric cables as follows:

Excavate for cable 600 mm below finished ground level

**Trenches to be left open for Principal Agent's inspection before covering up. If cables are covered up without inspection, the electrician will open the trenches along its full length at his own cost, whether the cables are proved to be at the correct depth or not.**

Encase the cable in river sand. Backfill and compact in layers not exceeding 300 mm

Protect the cable with precast concrete cable protection slabs where necessary

Mark the cable route with approved markers

Notify the local authority for connection and give the necessary assistance.

### 19.2.3 Earthing.

Earth buildings with a steel roof at least every 6 meters in accordance with SABS 0313.

### 19.2.4 Distribution board and meter cabinets

Electrical distribution boards must be of prepainted (to approved colour) pressed steel with door and latch to comply with SABS 1180, and with isolator, earth leakage devices and circuit breakers.

Supply a sub-distribution board on every floor where indicated on plans, staff rooms, at pool pumps, irrigation pumps/ control box, and at any cottages, etc., not inside main building.

Cabinets to be approved by the Architect.

Meter cabinets must comply with SABS 908, of finish and with locking device as specified.

Build in cabinets in walls:

Supply three individual earth leakage devices per board; No 3 phase earth leakage devices will be allowed.

Label all functions in distribution board and provide a legend card.

The contractor must make provision for the design and installation of load shedding to prevent overload

### 19.2.5 Switches and sockets

Switches must be as specified:

Sockets must be 3 pin 16 Amp wall switch sockets to comply with SABS 163 and 164.

Fix switches and sockets in boxes with covers to comply with SABS 1084/1085. Build in boxes for switches at 1000 mm above floor level, or as specified.

Build in boxes for sockets at 170 mm above finished floor level except above work tops where these must be 1000 mm above floor level, or as specified.

All keypads and intercom points to be installed 1450 centre above finished floor level.

Telephone or television points: build in boxes with covers to comply with SABS 1084/1085 at 300 mm above floor level or as specified. Connect with conduit to roof space and through to roof overhang nearest the telephone connection or television antenna. Provide conduit with draw wire.

Alarm supply to be a dedicated line not passing through earth leakage systems

### 19.2.6 Luminaires

Provide luminaires as specified, complete with lamps, ballasts, control gear and earth terminals. Control gear within luminaires must bear the SABS mark.

Electrical contractor to install all luminaires.

Fix luminaires at as late a stage as possible, and protect from damage.

Earth all luminaires.

All connections/ cavities for luminaires to be allowed for in concrete slab if a suspended ceiling is not specified.

### 19.2.7 Stove, hob, oven, cooker hood

Stoves must comply with SABS 153, of model and type as specified.

Hobs, ovens and cooker hoods must be of model and type as specified.

Stove points: As shown, position to be supplied by kitchen manufacturer.

### 19.2.8 Geyser points:

Where indicated on plan. Geysers to be on timers installed in distribution boards.

### 19.2.9 Light points:

As per plan.

### 19.2.10 Plug points:

As per plan, all double.

### 19.2.11 Circuits on timer:

Underfloor/ under-carpet heating, geysers, pumps, garden & pool lights.

### 19.2.12 Tv. aerial conduit:

To all television points on plan (also in all bedrooms, study and staff rooms.)

### 19.2.13 Alarm conduit:

As per plan.

**19.2.14 Telephone conduit:**

As per plan.

**19.2.15 Intercom conduit:**

As per plan, and to gate.

**19.2.16 Sprinkler conduit:**

To all planters, balconies, atriums.

**19.2.17 Underfloor heating:**

To all rooms indicated on plan with thermostats: To be wired for contactors/ timers in distribution boards.

**19.2.18 Steam generator/ sauna**

Establish load and supply where indicated. (Usually three phase, 7,5kw.)

**19.2.19 Spa-bath:**

Establish load and supply connection where indicated: Usually 15ampere wall socket under bath.

**19.2.20 Cable to gate:**

Sub-distribution board as required.

**19.2.21 Timers to geysers:**

As shown

**19.2.22 Dedicated circuit:**

To alarm, gate and to computers, where indicated by Principal Agent: not connected to earth leakage detection unit.

**19.2.23 Light fittings:**

Supplied by the Employer, to be installed by electrician.

**19.2.24 Pool lights**

Install where indicated, supply transformers and timers, and commission.

**19.2.25 Pump: water feature**

Supply and install cabling, sub-board, timers to lights and pump and connect. Pump included in PC item for water feature.

**19.2.26 Pump: pool**

As water feature: one sub-board can be used if pumps are close enough. Pump included in PC Item for pool

**19.2.27 Timers to under-carpet heaters:**

Where under carpet / underfloor heating indicated

**19.3 TEST**

Inform the local authority at completion of the electrical installation for inspection.

Provide the architect/principal agent with a copy of the electrical test certificate before handing over.

**19.4 Alarm systems.**

**19.4.1** All conduit terminations for : passive infra red detectors, magnetic contacts, panic buttons, vibrators, smoke detectors, break glass detectors:

To be terminated by either of the following: T-piece, bend or cut off at determined position.

No boxes of any description to be used.

Conduit terminations for draw boxes, key pads and control panels to be 100x100 boxes.

Telephone jackpoint and dedicated 220V Ac supply to be supplied at control panel.

Unless otherwise instructed all loop conduits to be 20mm dia. and all risers 25mm.

**19.4.2 Intercom and audio systems**

All internal loop conduits to be 20mm dia. and terminated with a 50x100 box.

All conduits to video intercom systems from gate or other stations to power supplies to be 32mm dia.

All conduits for audio, and audio intercom system from gate station to power supplies to be 25mm dia.

## 20 GLAZING

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**ALSO SEE THE WINDOW SCHEDULE FOR AAAMSA SPECIFICATIONS.**

### 20.1 MATERIALS

#### 20.1.1 Glass

Glass must be of type and thickness as specified. See Window schedule.

Maximum pane sizes should not exceed the sizes specified on the window schedule.

Safety and security glass must comply with SABS 1263, part 1, 2 or 3. Each sheet of glass must be permanently engraved with the trade name of the laminator and the symbol '1' for safety glass, '2' for burglar-resistant glass, and '3' for bullet-resistant glass. These markings must be visible after glazing, and be situated in the left or right bottom corner of the installed sheet, unless otherwise specified.

Plastic glazing materials must be acrylic or polycarbonate to specified thickness.

**NO LIQUID LAMINATED GLASS WILL BE ALLOWED ON THE WORKS IN ANY APPLICATION.**

#### 20.1.2 Putty

Putty must comply with SABS 680 for use in primed metal or wooden frames.

#### 20.1.3 Sealants

Sealants must be one or more of the following, as specified:

Polysulphide to comply with SABS 110 (two part)

Silicone to comply with SABS 1305

Polyurethane to comply with SABS 1077.

#### 20.1.4 Gaskets, tape, setting blocks

Elastomeric structural glazing and panel gaskets must comply with SABS 635, of dimensions and thicknesses as specified.

Adhesive glazing tape must be treated cotton-based tape with self-adhesive coating on one or both sides, or adhesive velvet ribbon with adhesive coating on one side.

Setting and locating blocks must be of an approved resilient, non-absorbent, inert material.

#### 20.1.5 Fins.

Discuss fins as per the window schedule with the Architect and get written approval of thickness, size, positions and supports.

### 20.2 GLAZING

#### 20.2.1 Preparation

Allow an edge clearance of at least 3 mm all around panes up to 6 mm thick. Increase the edge clearance for thicker panes and with a minor dimension exceeding 1000 mm.

Do not cut or nip any glass thicker than 4 mm on site.

Discuss the direction of the pattern in obscure glass with the architect/principal agent before cutting.

Treat timber frames and beads with a wood primer to comply with SABS 678. Ensure that the primer is compatible with the glazing compounds.

Treat steel frames with a primer as described under PAINTING.

Seal relative areas of masonry and concrete frames with two coats of alkali-resistant sealer that is compatible with the compound.

Ensure frames are dry, clean, true and square before glazing.

Ensure rebates are free from projections, for example screws.

Fix steel beads with screws. Fix wood beads with pins. Allow for the thickness of the glass plus at least 3 mm of glazing compound on each face.

Check edges of solar and tinted glass. If damaged, reject before fixing.

### **20.2.2 Putty glazing**

Putty glaze as follows:

Place 25 - 75 mm long setting and location blocks and apply putty to rebate

Press glass into putty to form a solid backing at least 3 mm thick

Secure sprigs, clips or cleats at 500 mm centres around perimeter if required

Trim off excess back putty and finish to a smooth fillet

Apply front putty and finish to a splayed finish. Finish front putty approximately 2 mm below the sight line to allow for sealing of the edge of the putty to the glazing material by overlapping of the paint. Intercut corners neatly

Seal the putty to the glass with a light brushing.

### **20.2.3 Glazing with compounds**

Glaze with flexible compounds as follows:

Place 25 - 75 mm long setting and location blocks and apply compound to rebate

Press glass into compound to form solid backing at least 3 mm thick

Apply compound to glazed face as bedding for the beads

Insert distance pieces if required

Fix beads

Tool compound to a smooth chamfer on both sides.

### **20.2.4 Structural glazing**

Ensure liaison between the architect/principal agent, engineer, aluminium contractor, glazing contractor and sealant manufacturer at an early stage and throughout the course of the contract.

Adhesion of the sealant to the aluminium, whether anodised or organic coated, must be capable of maintaining an ultimate adhesive bond strength between the aluminium and the sealant of 0,828 MPa. The design stress must not exceed 0,138 MPa.

Use only freshly manufactured sealant.

Use only compatible accessory materials as approved by the sealant manufacturer, for example degreasing solvents, primers, back-up material with integral bond breaker, spacer and setting blocks.

Ensure that disciplined quality assurance prevails during all stages of fabrication and installation. Factory glazing is preferred over site glazing.

Fill the sealant cavity completely by applying the sealant in an approved manner.

It is the responsibility of the structural sealant glazing contractor to check the adhesion of the cured sealant on representative test joints on site before proceeding with the installation. These checks should be carried out periodically throughout the installation period.

### **20.2.5 Protection and cleaning**

Protect glass against harmful splashes and weld splatter.

Clean the glass as soon as practicable after installation with mild soap and water.

Ensure cleaning materials are not harmful to plastic glazing material and glazing compounds.

### **20.2.6 Warranties**

Provide a warranty by the manufacturer of the laminated safety glass and/or the hermetically sealed glazing units against delamination and colour degradation for a period of at least 5 (five) years.

Provide written proof that all stages of fabrication and installation of structural glazing have been executed with disciplined quality assurance in accordance with the relevant part of SABS ISO 9000.

Provide written proof that structural sealants are compatible with extrusion surface, glazing tape and glass, together with the regular test reports regarding the adhesion of the sealant to the aluminium frame in accordance with ASTM/C 794-80 (standard test for adhesion-peel of elastomeric joint sealants)

## **20.3 MIRRORS**

Mirrors must be one of the following, as specified:

Silvered float glass mirrors with chamfered and polished edges, to comply with SABS 1236, class A

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.

## **20.4 SKYLIGHTS**

### **20.4.1 Shape**

Skylights must be of shape and size as specified.

#### **20.4.2 Mounting**

Mounting must be flush, curb or integral, as specified.

#### **20.4.3 Operation**

Operation must be fixed or operable, as specified.

#### **20.4.4 Wind loading**

Wind loading must be of category as specified.

#### **20.4.5 Waterproofing**

Glazing bars must allow for water penetration and effective drainage to the outside.

Condensation must be removed through the use of a guttered weep system.

#### **20.4.6 Metal**

Metal must be one of the following:

Commercial alloy 6063 for extruded members

Commercial aluminium alloy 3103, copper, zinc alloy, lead or galvanised steel flat sheet for sills and flashings

Steel must be hot-rolled weldable structural steel, grade 300WA to comply with SABS 1431; Steel tubes must comply with SABS 657 part 1.

#### **20.4.7 Glass**

Glass must comply with SABS 1263 part 1.

Laminated glass or toughened glass must be to specified thicknesses.

#### **20.4.8 Plastics**

Plastic glazing material must be acrylic or polycarbonate to specified thickness.

#### **20.4.9 Hardware**

Hardware must be of aluminium, stainless steel or other corrosion resistant material which is compatible with adjoining materials.

#### **20.4.10 Weatherstripping, gaskets, sealants**

Gaskets, sealants, etc. must be of *approved* material and type.

#### **20.4.11 Finishes**

When specified, aluminium must be anodised to comply with SABS 999, of specified grade and colour.

Powder coating must comply with SABS 1274, of type, finish, colour as specified.

Steel must be galvanised to comply with SABS 763, of specified thickness

Paint must be alkyd enamel as specified under PAINTING.

#### **20.4.12 Drawings, testing and fixing**

The appointed skylight contractor must provide *drawings* showing design and installation details for *approval* by the architect/principal agent.

Securely anchor and seal the skylight(s).

If required by the architect/principal agent, test the skylight to the required performance class before installation.

Provide a test performance certificate

## **21 PAINTING**

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**All painting to be done to Plascon Specification and Plascon guarantee to be issued, unless otherwise instructed.**

### **21.1 Paint on woodwork**

In the case of existing woodwork that has to be redecorated, wash down if paint is still firm, or remove blistered or broken down paint with a blow-torch or paint remover. Scrape out cracks, holes and crevices and make good with hard stopping.

Sand down surfaces with suitable grit abrasive paper or cloth, or with steel wool.

Treat knots with wood knotting.

Stop nail and screw heads, and cracks, with suitable hard stopping.

Prime or seal joinery before building in. This applies to all frames, all six sides of a door, and to rebates and the backs of beads in glazing apertures.

Prime external structural timber before fixing.

Paint wood as follows:

Prime with wood primer to comply with SABS 678, type 2.

Paint one universal undercoat to comply with SABS 681, grade 1.

Finish with two coats alkyd enamel paint to comply with SABS 630, type 1 for interior use, or type 2 for exterior use, and of specified finish.

### **21.2 Clear finish on woodwork**

Sand down surfaces with suitable grit abrasive paper in the direction of the grain. Remove all pencil marks or other surface discolourations. Clean down existing hardwood that has to be redecorated.

Stop nail and screw heads and cracks with tinted stopping to match wood and rub down.

Stain wood if specified with approved stain. Apply stain *according to the manufacturer's instructions*. Provide a separate sample panel for approval of colour and application.

Prime backs of skirtings with clear varnish to comply with SABS 887 type 1 before being nailed to the wall.

Finish interior wood with one of the following clear finishes, as specified:

Apply three coats clear eggshell varnish for interior wood to comply with SABS 887 type 1.

Thin down the first coat with mineral turpentine *according to the manufacturer's instructions*, and allow each coat to dry overnight, or

Apply polyurethane varnish to comply with SABS 887 type 2.

Thin down the first coat with mineral turpentine *according to the manufacturer's instructions*, and allow each coat to dry overnight.

Finish exterior wood as follows:

Apply *approved* wood preservative to exposed exterior wood to saturate the surface, allowing each coat to soak in before applying further coats. Apply to end grain until no further soaking in takes place.

### **21.3 Alkyd paint on plaster**

Make sure walls are dry.

Remove loose paint from previously painted surfaces.

Fill and stop cracks on one coat plaster only with suitable filling or with plaster of the same mix, and rub down. Do not fill gypsum plaster.

Paint plaster as follows:

Apply one coat bonding liquid on gypsum plaster (two coat plaster)

Apply one coat alkali resistant plaster primer to comply with SABS 1416 on one coat plaster

Apply one universal undercoat to comply with SABS 681, grade 1

Finish with one or two coats alkyd enamel paint to comply with SABS 630, type 2, and of specified finish.

### **21.4 Emulsion paint on plaster**

Remove loose paint from previously painted surfaces.



Ensure complete drying depth of plaster before applying paint.

Rake out cracks and prime with emulsion paint to comply with SABS 1586 grade 2.

Paint walls as follows:

Apply one coat of approved plaster primer

Apply two coats emulsion paint to comply with SABS 1586, of grade and gloss designation as specified.

Paint plastered ceilings as follows:

Apply two coats emulsion paint to comply with SABS 1586, of grade and gloss designation as specified.

### **21.5 Emulsion paint on fibre cement fascias, barge boards, cladding**

Remove loose paint from previously painted surfaces.

Touch up steel screw heads and metal cover strips with zinc phosphate primer to comply with SABS 1319.

Touch up brass screw heads with vinyl wash primer to comply with SABS 723.

Paint fascias, barge boards etc. as follows:

Apply one coat of bonding liquid

Apply two coats emulsion paint to comply with SABS 1586, of grade and gloss designation as specified.

### **21.6 Emulsion paint on fibre cement and gypsum ceilings**

Remove loose paint from previously painted surfaces.

Touch up nail heads and metal cover strips with zinc phosphate primer to comply with SABS 1319. Spot fill all nail heads and indentations.

Paint ceilings as follows:

Apply two coats emulsion paint to comply with SABS 1586, of grade and gloss designation as specified.

### **21.7 Alkyd paint on structural steel**

In the case of structural steel that could not be factory primed, or where shop-primed steel has been damaged on site, or in the case of previously painted surfaces where the paint system has failed, prepare steel surfaces for priming to shiny metal state according to SABS 064.

In the case where painting will not be possible after fixing, paint steel components with the full paint system before fixing in positions.

Paint steel as follows:

Apply two coats of zinc phosphate primer to comply with SABS 1319.

Finish with two coats structural steel alkyd based paint to comply with SABS 684, type B or Hammerite to the manufacturer's specification if instructed.

### **21.8 Alkyd paint on non-structural steel**

Clean unpainted steel surfaces to shiny metal state by scraping or brushing. Remove loose paint from previously painted surfaces.

Paint steel as follows:

Apply one coat zinc phosphate primer to comply with SABS 1319.

Apply one universal undercoat to comply with SABS 681 grade 1.

Finish with two coats alkyd enamel paint to comply with SABS 630, type 2, or Hammerite to the manufacturer's specification if instructed.

### **21.9 Paint on galvanised steel**

Remove loose paint from previously painted surfaces.

Scrub and wash with galvanised iron cleaner. Rinse thoroughly with clean water.

Sand or abrade to remove any rust stains, wipe clean and treat affected areas with a rust remover.

Where galvanised steel was unavoidably welded on site, clean joint and cold galvanise to approval.

Paint galvanised steel with one of the following systems, as specified:

Apply one coat vinyl wash primer to comply with SABS 723, one coat universal undercoat to comply with SABS 681 grade 1, and finish with two coats alkyd enamel paint to comply with SABS 630, type 2, and of specified finish, or

Apply two coats emulsion roof paint to comply with SABS 940, or

Apply one coat vinyl wash primer to comply with SABS 723, and two coats emulsion paint to comply with SABS 1586 grade 1.

Paint galvanised fence posts as follows:

Apply one coat vinyl wash primer to comply with SABS 723, and two coats aluminium finishing paint to comply with SABS 682, grade 2.

#### **21.10 Alkyd paint on cast iron**

Remove bitumen until a clean, sound substrate is achieved.

Apply one coat vinyl wash primer to comply with SABS 723.

Finish with one coat alkyd paint to comply with SABS 630 type 2, or with two coats emulsion paint to comply with SABS 1586, of grade and gloss designation as specified.

#### **21.11 Paint on pvc**

Clean PVC thoroughly with a suitable degreasing agent. Abrade lightly. Remove loose paint from previously painted surfaces.

Paint PVC one of the following, as specified:

Apply one coat vinyl wash primer to comply with SABS 723, and two coats emulsion roof paint to comply with SABS 940, or

Apply one coat vinyl wash primer to comply with SABS 723, and two coats emulsion paint to comply with SABS 1586, of grade and gloss designation as specified.

#### **21.12 Intumescent paint**

Apply *approved* intumescent paint on structural steelwork, electrical cables, PVC pipes, wood and thatch by brush, roller or spray, as specified.

## **22 POOL AND FISHPOND**

### **22.1 Fishpond:**

**Pump and filters included in PC ITEMS: contractor to allow for building and waterproofing of water features.** Design and Installation by specialist

- 22.1.1 Floor to fishpond to be 150mm thick 20 MPa concrete reinforced with Ref 193 mesh. Floor to be cast as foundation and screed to floor and plastering to be one operation with no joints.  
Add Cemcrete waterproofing compound to concrete, mortar and plaster mix in accordance with manufacturer's instructions.
- 22.1.2 Waterproof inside of pond to be by approved specialist in accordance with manufacturer's instructions.
- 22.1.3 Corners to be rounded and floor to slope to 50 mm outlet with stop valve, and 50 mm suction pipe. All outlets to be fitted with tapered PVC outlets fitted with perforated grills.
- 22.1.4 Install bio filter and/or sand filter where instructed in accordance with manufacturer's instructions and connect to power supply.
- 22.1.5 All pipes to be installed, pressure tested and protected before casting of floor.
- 22.1.6 All lights to be built in, and proper sealing to be done around lights before plastering.

### **22.2 POOL:**

**As per plan: by Specialist: See PC. Items.**

**Where an overflow or retaining wall is indicated, the builder must build and plaster the ballast tank to the detail supplied.**

An expansion joint must be supplied between pool edge and pool surround.

All pipework to be at least 450 below finished ground level.

Lights as specified to be installed to pool as shown on plan.

Separate timers to be supplied to pool pump and lights.

In the case of an infinity edge, the pool builder must supply two pumps, both fitted with filters of appropriate size.

Supply and install a manifold on the return pipe from the ballast tank to detail.

Pool edges to be finished straight, level and plumb for the height of the tiles, without any bulges in the pool walls below that.

Ensure that the lights, weir and return pipes are properly installed and sealed.

Supply direct feed to pool with cut-off valve to Principal Agent's satisfaction where indicated at poolhouse.

## 23.0 PC. ITEMS:

All to be supplied by Employer:

All PC items to be installed by nominated sub-contractors except where otherwise specified:

Contractor to make provision for making good/ attending to the nominated sub-contractors and for profit on these items in his quote. All amounts exclude VAT.

AIRCON: @R3 000/m <sup>2</sup> (Winecooler) min. R15 000	0	R0,00
ALARM SYSTEM	item	R20 800,00
BALUSTRADES: @R3 000/ Lineal Metre	0	
BAR	0	R 0.00
BUILT-IN-CUPBOARDS: @R10 000/ Lineal Metre	0	R 220,000.00
CABINETS/BOOKSHELVES: @R7 500/ Lineal Metre	3	R 22,500.00
CLADDING (steel on framework): @R1 400/ m <sup>2</sup>	0	R 0.00
CLADDING (stone incl. labor): @R350/m <sup>2</sup>	0	R 0.00
COLD ROOM	0	R 0.00
COLD ROOM: freezer compartment	0	R 0.00
DOORS: All INTERNAL & yard gates, incl. hardware: contractor to install	8	R 47,600.00
DOOR - TIMBER BACK DOOR: contractor to install	0	R 0.00
DOOR - FIRE DOOR: contractor to install	0	R 0.00
DECKING @R950/ m <sup>2</sup>	49	R 46,550.00
DUMB WAITER	0	R 0.00
FIREPLACE: contractor to install	2	R 30,000.00
FIREPLACE SURROUND	item	R 25,000.00
FLOOR COVERINGS, CARPETS	item	R 0.00
FLOOR TILES& Timber floors incl. labour, adhesive & grout	item	R 191,200.00
FRONT DOOR: contractor to install	1	R 15,000.00
GARAGE DOORS: contractor to install	item	R 0.00
GATES: Driveway, count side gates as doors	0	R 0.00
INTERCOM SYSTEM	item	R 4,780.00
JACUZZI	0	R 0.00
KITCHEN CUPBOARDS R15 000 /lineal metre excluding appliances	0	R 0.00
LANDSCAPING, PERGOLA, ETC., Insert stand area	841	R 126,150.00
LIFT: State number of floors	0	R 0.00
LIGHT FITTINGS: electrician to install	item	R 62,400.00
MULTIBRAAI	0	R 0.00
PAVING BRICK: @200/m <sup>2</sup>	0	R 0.00
PAVING CONCRETE: @350/m <sup>2</sup>	18	R 6,300.00
PLAN & SUBMISSION:	1	R 0.00
POOL: without waterfeature/ spillover	0	R 0.00
POOL: extra to waterfeature, infinity edge	0	R 0.00
RAINWATER OUTLETS: Parapet outlet 110mm & 150mm dia.	6	R 4,446.00
<b>RAINWATER OUTLETS: Delta DOWN outlet 110mm dia</b>	1	R 219.45
<b>RAINWATER OUTLETS: Delta SIDE outlet 110mm dia</b>	0	R 0.00
<b>RAINWATER SPOUT: Stainless steel footplate</b>	0	R 0.00
SANITARY FITTINGS: plumber to install	item	R 76,200.00
FRAMELESS SHOWER CUBICLES & GLASS PARTITIONS /Lineal Metre	14	R 84,000.00
SOLAR GEYSERS	2	R 36,000.00
SOLAR HEATING TO POOL	0	R 0.00
SOUND SYSTEM	0	R 0.00
SPECIAL COATINGS/ WALLPAPER: @150m <sup>2</sup>	0	R 0.00
SPECIAL STAIRCASE	0	R 0.00
STOVE: hob & oven: Kitchen co. to install	1	R 50,000.00
STAFF STOVE	0	R 0.00
SUSPENDED SLABS: Contractor to allow if eng. dwgs are not available	0	R 0.00
TELEPHONE SYSTEM	1	R 9,500.00
TOWEL RAILS, soapdishes etc.: contractor to install	item	R 7,500.00
TOWEL RAILS: HEATED	item	R 12,000.00
VANITY CUPBOARD: @R8 000/ Lineal Metre	5	R 40,000.00
WALLTILES	item	R 50,000.00
WATER FEATURE	1	R 35,000.00
<b>TOTAL PC ITEMS</b>	<b>0.00</b>	<b>R22 221,13</b>

**ITEMS NOT INCLUDED:**

- |                                |                          |
|--------------------------------|--------------------------|
| Tennis court.                  | Valuation fees.          |
| Special foundations.           | Inspection fees.         |
| Water and electrical deposits. | Transfer costs.          |
| Interim interest.              | Bond registration costs. |

**THUS DONE AND SIGNED ON THIS THE .....AT .....**

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**Employer /s.**

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**FOR AND ON BEHALF OF CONTRACTOR.**

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**WITNESS.**

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**WITNESS.**

the institute recommends the use of the following typical project notice board on projects where the architect is appointed as principal agent and/or architect. It is recommended that if the format of this board is adopted, the recommendations for it's use to be followed.

