



**NWE**  
**CONSULTING ENGINEERS**

PLATTEKLOOF HOUSE VALLEY 7536 TYGERBERG OFFICE PARK 163 UYS KRIGE DRIVE PLATTEKLOOF 7500 P O BOX 5263 TYGER

TEL: 021 914 2264 FAX: 021 914 2260 E-MAIL: [admin@nweng.co.za](mailto:admin@nweng.co.za) WEBSITE: [www.nweng.co.za](http://www.nweng.co.za)

---

**917ParWB\_17167**

**BLOCK B REFURBISHMENT**

**SOUTH AFRICAN MEDICAL RESEARCH COUNCIL**

FRANCIE VAN ZIJL DRIVE  
PAROW VALLEY  
CAPE TOWN

# **STRUCTURAL SPECIFICATION**

Internal Ref. No: 17167\_ParWB-S-TenderSpec

Date: 2019-06-14

Rev: 00

## **CONTENTS**

- 1 GENERAL
- 2 APPLICABLE STANDARDS
- 3 FOUNDATIONS
- 4 CONCRETE
  - 4.1 CONCRETE MIX DESIGN REQUIREMENTS
  - 4.2 REINFORCEMENT
  - 4.3 REINFORCEMENT ESTIMATES:
  - 4.4 TEMPORARY WORKS
  - 4.5 CONCRETE TESTS AND SURVEYS
- 5 MASONRY
  - 5.1 MASONRY UNITS
  - 5.2 MORTAR
  - 5.3 CAVITY TIES
  - 5.4 BRICKFORCE
  - 5.5 JOINTS IN MASONRY
  - 5.6 PRECAST PRESTRESSED CONCRETE LINTELS
- 6 STRUCTURAL STEEL
  - 6.1 MATERIAL
  - 6.2 ERECTION
  - 6.3 WORKSHOP DRAWINGS
  - 6.4 WELDING
  - 6.5 STEEL ANCHORAGE INSTALLATION
  - 6.6 CORROSION PROTECTION SPECIFICATION

## 1. GENERAL

These Specifications shall be read in conjunction with the following:

- All relevant structural engineering drawings provided with this tender.
- All applicable codes and specifications mentioned below under Section 2.

In the event of any discrepancy between these specifications and the codes, these specifications shall take precedence.

All latest editions of the codes, standards and specifications listed under Section 2 will be applicable. The Structural Engineers drawings shall be read in conjunction with all relevant architect's, consultant's and specialist's drawings. Any discrepancies shall immediately be referred to the engineer in writing prior to commencing with construction.

All work is to be executed in accordance with the latest Occupational Health and Safety Act.

Once appointed, it is the Main Contractors responsibility to ensure that all sub-contractors and relevant site personnel are in possession of this specification and have familiarised themselves with the content.

## 2. APPLICABLE STANDARDS

The relevant and latest sections of the following Standards and Codes (but not only limited to these) shall apply:

SANS 2001 – Construction Works  
SANS 282:2011 Bending dimensions and scheduling of steel reinforcement for concrete  
SANS 10164 – The structural use of masonry Part 1 + Part 2  
SANS 227 – Bunt clay masonry units  
SANS 285 – Calcium Silicate Masonry Units  
SANS 1215 – Concrete masonry units  
SANS 2001-CS1: - Construction works Part CS1: Structural steelwork  
SANS 2001-CM1 – Construction Works Part CM1: Masonry Walling  
SANS 2001-CC1 – Construction Works – Part CC1: Concrete Works (Structural)  
SANS 1431 – Weldable structural steel (Replaced by EN 10025 series)  
AWS D1.1 - Structural Steel Welding Code  
SANS 10144 - Detailing of Steel Reinforcement for Concrete  
SANS 1200 HB - Standardized specification for civil engineering construction Section HB: Cladding and sheeting  
SANS 121:2000 - Hot dip galvanized coatings on fabricated iron and steel articles — Specifications and test methods  
SANS 878 - Ready-mixed concrete.  
SANS 10160 - Basis of structural design and actions for buildings and industrial structures - Part 1 - 8  
SANS 5861+ 5862 + 5863 - Concrete tests  
SANS 10162 - The structural use of steel Part 1: Limit-states design of hot-rolled steelwork  
SANS 50197-1 - Cement – Part 1: Composition, specifications and conformity criteria for common cements.

## 3. FOUNDATIONS

Foundations have been designed for the following allowable bearing pressure: 125 kPa

All founding depths and foundation excavations shall be approved by the geotechnical engineer and structural engineer on site before any concrete may be cast.

Foundation levels shown on the structural engineer's drawings are preliminary, and may vary depending on the site conditions once excavations commence.

As built levels of all foundations must be forwarded to the engineer for his records. All foundations are located centrally under columns or walls unless shown otherwise.

Cast 15MPa blinding under all reinforced foundations if it is determined by the engineer that ground conditions are not up to standard. Minimum thickness of blinding to be 50 mm.

No excavations shall undermine any existing foundations.

#### 4. CONCRETE

All concrete shall conform to the requirements of the latest edition of SANS 2001-CC1.

The position and method of forming any construction joints shall be submitted to the Engineer for approval prior to construction.

Refer to architect, electrical and mechanical Engineer's drawings to verify positions of downpipes, duct penetrations, recesses etc. as required by them prior to casting. Any discrepancies shall immediately be referred to the engineer.

Concentrations of a large number of sleeves or services to be cast into a concrete element will not be allowed. Position and spacing to be agreed with the engineer prior to casting.

No chasing of services into the concrete structure will be allowed. No core drilling will be allowed without prior approval from the engineer. Any penetrations not shown on the drawings must be brought to the attention of the engineer prior to casting.

All exposed corners of concrete elements to have 20x20 chamfer or as per architect's specification.

##### 4.1 CONCRETE MIX DESIGN REQUIREMENTS

Concrete Strength:

Element	28 days – fcu (MPa)	Aggregate (mm)
Mass concrete/blinding	15	19
Foundations	30	19
Surface beds	30	19
Beams	30	19
Slabs	30	19
Columns	30	19
Walls	30	19

The contractor shall submit a mix design and report by a recognised concrete laboratory, to indicate that suitable materials and mix proportions will be used. The mix design is to be submitted to the Engineer for his records and approval prior to commencing with construction. Cement composition and specifications to be according to SANS 50197-1 – Cement.

Max slump for all concrete to be 75mm unless otherwise approved by the engineer. No pumping of concrete shall be allowed without prior approval from the engineer.

All concrete shall be continuously cured for 7 days by an approved method. This method to be submitted to the engineer for his records.

##### 4.2 REINFORCEMENT

The contractor is responsible for checking and ensuring that the reinforcement is fixed and maintained in the correct position before and during the casting of concrete.

All reinforcement must be inspected by the engineer before concrete is cast. The engineer shall be given 24h advance notice of an inspection. Inspections will only be carried out once all the relevant reinforcement has been properly fixed, the spacer blocks have been positioned, the shuttering has been cleaned out and the contractor has checked and approved the reinforcement.

No alterations may be made to the structure or the reinforcement without prior approval from the engineer.

Bending dimensions and scheduling of steel reinforcement for concrete all to be done according to SANS 282. (R) - denotes mild steel bars (fy - 250 MPa) ; (Y) - denotes high-yield bars (fy - 450 MPa)

Mill certificates for reinforcement bars to be submitted to the engineer for his records.

Welding of high-yield (Y) reinforcement is not allowed. Mild steel (R) reinforcement may be welded only if instructed in writing by the Engineer.

Concrete cover:

Element	min cover (mm)
Foundations	75
Columns	40
Beams	30

Slabs	30
Walls	40

#### 4.3 REINFORCEMENT ESTIMATES:

RC Foundations:	60 kg/m <sup>3</sup>
RC Columns:	160 kg/m <sup>3</sup>
RC Surface Bed Ground Level:	As shown on structural drawings
RC Surface Bed Elevated Level:	70kg/m <sup>3</sup> including mesh reinforcement

#### 4.4 TEMPORARY WORKS

Removal of formwork in normal to hot conditions (Refer to SANS 2001: CC1 - Table 2):

Type of structural Element	Time to removal
Member or formwork of:	
Beam sides, walls & unloaded columns.	1 day

Extent of back propping and sequence to be discussed with the engineer before commencement of works. The contractor shall be responsible for the design and maintenance of all temporary structures, including formwork and support work.

Formwork + Permissible deviations (SANS 2001 – Table 1 + 11)

Classification	Elements
Rough (Degree of accuracy 3)	Foundations, footings, Columns (Below ground).
Smooth (Degree of accuracy 2)	All remaining elements not mentioned elsewhere.
Smooth and fair–Special (Degree of accuracy 1) documentation.	All off-shutter elements as indicated on architect's

The standard of concrete finish shall be to the architect's specification and/or drawings.

#### 4.5 CONCRETE TESTS AND SURVEYS

One set of concrete test cubes shall be prepared per 50m<sup>3</sup> of concrete cast, or any part thereof daily of every type cast. Generally, one concrete cube shall be tested at 7 days and three cubes at 28 days.

Depending on conditions on site, the sides of these cubes are to be protected to prevent excessive drying out. The cube results are to be forwarded to the Engineer immediately after testing and the cube results should be clearly labelled and referenced, indicating the cast date, which element type and specific elements were cast with the relevant concrete.

Saw-cut joints in surface beds shall be cut within 48 hours after casting concrete.

### 5. MASONRY

#### 5.1 MASONRY UNITS

All brickwork or blockwork to be laid to the requirements and tolerances of SANS 10164 Appendix B.

All structural brickwork or blocks shall have a nominal compressive strength of 14 MPa.

Water absorption of clay bricks not to exceed 12%.

Clay bricks shall comply with SANS 227 and shall be well saturated 2 hours before being used.

No clay bricks shall be laid within 6 weeks from removal from kiln.

Calcium silicate bricks shall comply with SANS 285; Bricks shall be laid slightly wetted but not saturated.

Concrete blocks shall comply with SANS 1215 and shall be laid dry.

#### 5.2 MORTAR

Class ii mortar shall be used throughout for load bearing masonry as per SANS 10164 and SANS 2001-CM1 Section 4.2.

#### 5.3 CAVITY TIES

For cavities smaller than 75mm galvanized butterfly ties complying with SANS 285 or approved polypropylene ties shall be built into cavity walls at a rate of 5 ties per m<sup>2</sup> minimum.

For cavities bigger than 75mm galvanised vertical twist type ties shall be used at a rate of 5 ties per m<sup>2</sup>.

Adjacent to columns, wall ties to be built into every second layer of brickwork.

In concrete blockwork brickforce shall be installed continuous throughout in every second course as well as in two courses below and above all windows and above all doors, extending 600mm past such openings.

#### **5.4 BRICKFORCE**

In clay brickwork, brickforce shall be installed continuously throughout in every third course as well as in two courses below and above all windows and above all doors, extending at least 600mm past such openings.

Galvanized hoop iron anchors (min 60 mm<sup>2</sup> section) shall be installed every 4th course between RC columns and masonry walls and extend min 600mm into masonry. Use 6mm nail plugs, no shot fixing will be allowed.

All brickforce shall be galvanized and comprise of hard drawn steel wire comprising two main diameter wires of diameter not less than 2.8mm spaced a constant distance apart and 2.5mm diameter cross wires spaced at longitudinal intervals of 300mm in ladder type brickforce.

#### **5.5 JOINTS IN MASONRY**

A slip joint of 2 layers 3-ply malthoid must be provided between all loadbearing brickwork and the concrete structure. A 10mm soft joint (jointex) must be provided between all non-loadbearing brickwork and the concrete structure.

Joints to be sealed in accordance with architect's specification. All brick walls to be set out according to architect's drawing. All brick walls to be built centrally on strip footings unless noted otherwise.

#### **5.6 PRECAST PRESTRESSED CONCRETE LINTELS**

Precast lintels to be propped during building of brickwork above, and to remain propped for a minimum period of 7 days.

All to be SABS approved.

### **6. STRUCTURAL STEEL**

All structural steelwork shall comply with SANS 2001-CS1.

All structural steelwork shall be fabricated and erected in accordance with the latest edition of SANS 1200 H excluding Clause 8.

For structural steel fixed to concrete, allow 20mm tolerance for lining up.

Approved non-shrink structural grout shall be provided under all steel supported on concrete.

All design shall be accordance with SANS 10160 and SANS 10162.

#### **6.1 MATERIAL**

The steel structure shall be manufactured and erected according to SANS 1200 H degree of accuracy ii. The contractor shall at the commencement of the project acquaint himself with the availability and delivery time of the products and steel profiles specified on the drawings so that such material can be ordered ahead of time.

All Hot-rolled sections to be Grade S355 JR.

All cold-formed steel sections - min yield stress of 200 MPa.

All bolts to be grade 8.8.

All cold-formed steel sections and bolts to be hot-dipped galvanized unless noted otherwise.

Steelwork shall comply with the requirements of SANS 1431 for weldable structural steel.

A certificate from the steel manufacturer verifying the Grade of the Structural Steel shall be submitted to the engineer for his records.

#### **6.2 ERECTION**

The sequence of the erection of the structure is the responsibility of the contractor. The contractor shall ensure the stability of the structure during erection. Where temporary bracing or propping is necessary, the contractor shall be responsible for the design, erection, maintenance and removal (where necessary) of such supports.

The contractor to submit in writing his proposed erection method statement for the of the engineer's comment. It remains the contractor's responsibility to produce the final product in accordance with the Engineers design drawings.

### **6.3 WORKSHOP DRAWINGS**

All drawings are design drawings. Workshop drawings are to be prepared by the contractor and submitted to the engineer for approval prior to commencing with fabrication. The contractor must also prepare drawings showing all positions, levels and orientation of cast in plates and bolts.

Contractor to allow a minimum of 2 weeks for checking and approval of the workshop drawings by the engineer, the contractor should also allow for possible changes to workshop drawings.

All dimensions and levels to be checked on site by the contractor before commencing with workshop drawings and manufacture. Any discrepancies shall be brought to the attention of the engineer in writing.

### **6.4 WELDING**

All connections to be adequate to develop the full tensile capacity of the members.

All steel angles and I-beam members to be welded all round both sides. Allow for gusset plates if necessary, to ensure adequate welding length to develop full tensile capacity of the members. Centroids of all members to intersect, no eccentricities except for those shown on the engineers' design drawings shall be allowed.

All connection details to be approved by the engineer in writing prior to fabrication.

Use Class e70xx electrodes for all welding and all welding shall be done in accordance with AWS D1.1 structural welding code-steel.

Minimum weld size to be 6mm continuous fillet welds. Throat thickness not to be less than 0.7 x the thinner material thickness welded to.

All butt welds to be full penetration butt welds of full strength.

All welders shall be coded welders.

The contractor shall produce evidence acceptable to the engineer that welding procedures and welders have been tested in accordance with the requirements of SANS 1044, parts iii and iv.

### **6.5 STEEL ANCHORAGE INSTALLATION**

Cast-in holding down bolts or post-fixing, using mechanical or chemical anchors, to be approved by the engineer prior to commencing with installation. All fixings to be strictly in accordance with the manufacturer's specifications.

Penetrations and holes required in galvanized steel shall be pre-drilled before the steel is galvanized. No drilling is allowed on site in any galvanised steel members. No holes may be made in any structural members without the prior consent of the engineer. No site cutting or welding will be allowed unless approved or specified by the engineer.

### **6.6 CORROSION PROTECTION SPECIFICATION:**

Duplex system:

Pre-fabrication preparation:

Commercial blast steel to remove rust and mill scale

Post-fabrication & trial assembly:

Hot-Dipped galvanized to SANS 121:2000 (heavy duty) - un-passivated.

Micro-blast with garnet slag to achieve a water break free surface & rough profile.

Apply one coat of epoxy primer to a dft of 60 microns.

Apply one coat of re-coatable polyurethane finishing to a dft of 30 microns.

(Colour of paint to architect's specification.)