



**RAND WATER**

**CIVIL CONSTRUCTION SPECIFICATIONS**

# 1 CIVIL CONSTRUCTION SPECIFICATIONS

## 1.1 Survey and Setting Out

### 1.1.1 Original Ground Profiles

Before commencing any work, the Contractor shall survey the original topography to the approval by the Design Engineer over the entire area to be occupied. The Contractor shall inform the Rand Water Civil Design Section in writing, at least 14 days before commencing such work, of his/her intention to perform such work.

The information so obtained shall be recorded in working drawings to be prepared by the Contractor and submitted to the Rand Water Civil Design Section.

### 1.1.2 Setting out Works

The Contractor shall be solely responsible for the correct setting out of the Works and shall employ experienced, qualified surveyors acceptable to the Rand Water Civil Design Section for this purpose.

The Contractor shall ensure that rocks and trees are not marked with paint or metal markers/tags, and that no trees are damaged unless authorised by Rand Water.

### 1.1.3 Excavated and Final Ground Profiles

The Contractor shall survey all excavated and final surfaces as required by the Rand Water Civil Design Section for the purpose of recording work-as-executed details:

- on completion of excavation or each excavation stage and prior to commencement of placing fill, backfill or concrete or other work; and
- on completion of placing fill, backfill or concrete or other work.

The information shall be agreed and recorded as set out above for original ground profiles.

## **1.2 Excavations and Earthworks**

- 1.2.1 The Contractor shall perform a service detection at the site of each chamber and take measures to anticipate and protect existing services which may be encountered during excavations
- 1.2.2 Prior to the commencement of excavations for chambers, the Contractor shall submit a detailed method statement to the Design Engineer for approval inclusive of the programme of operations, methods and plant to be used for executing each section or type of excavation, details of dewatering, pumping, shoring, drilling patterns, etc.
- 1.2.3 Excavations shall be undertaken in a safe manner in compliance with the regulations promulgated under the Occupational Health and Safety Act (Act 85 Of 1993) or any amendment thereof
- 1.2.4 Where vertical excavations are expected to be unstable, safety precautions to be observed by the Contractor shall include the sloping or stepping and shoring, timbering or otherwise supporting the sides of the excavations or any other provision as stipulated in regulation 11 of the Occupational Health and Safety Act (Act 85 Of 1993).
- 1.2.5 The shoring method adopted shall be compatible with the excavating, backfilling and construction method and shall not restrict the installation and construction.
- 1.2.6 Shores shall be designed to withstand the earth pressures exerted upon them from the side of the excavation which shall include the superimposed loading of construction equipment and plant.
- 1.2.7 The Design Engineer may require the Contractor to timber the sides of the excavation which may be considered to be in any way dangerous. Such timbering shall be left in place until the completion of the work at the point affected.
- 1.2.8 Timbering shall consist of open planking, wailings and substantial struts and shall be carried out in a workmanlike manner and to the satisfaction of the Design Engineer.
- 1.2.9 The Contractor shall allow for the removal of timbering immediately prior to backfilling or on the instructions of the civil design engineer.
- 1.2.10 Maintaining the sides of the excavations in a safe condition shall, at all times, be the sole responsibility of the Contractor. No under cutting of the sides will be allowed.
- 1.2.11 The Contractor shall design foundation materials and layerworks, taking the recommendations of the geotechnical investigation into account.
- 1.2.12 Minimum Rand Water requirements for foundation materials and layerworks provided in the standard drawing No. R028062 are also to be taken into consideration by the Contractor.
- 1.2.13 Excavations for foundations are to be approved by the Design Engineer prior to the backfilling and compaction of layerworks.

1.2.14 Once back-filling and compaction of foundation layerworks is completed, the Contractor shall appoint an independent laboratory, approved by Rand Water, to carry out relevant in-situ tests to establish the density, degree of compaction and bearing capacity of the soil mattress. Results are to be submitted to the Design Engineer for approval prior to the casting of any concrete.

### **1.3 Concrete**

1.3.1 All concrete mix designs for each class of concrete shall be approved by the Design Engineer prior to commencement of construction.

1.3.2 Concrete strength requirements at 28 days:

- Chamber roof: 60Mpa
- Chamber walls and base: 35Mpa
- Site Blinding: 15Mpa

1.3.3 Concrete mix design and construction methodology to ensure that chambers are water-tight.

1.3.4 Testing of Concrete

Unless otherwise directed by the Design Engineer, for each grade of concrete, one sample shall be taken from each days casting concrete for the purpose of compressive strength testing. The contractor shall prepare 6 test cubes, 150mm nominal size, from each sample. Three of each six test cubes shall be tested at 7 days after making and the remaining three cubes shall be tested at 28 days after making. All test results to be submitted at specified time lines to the Design Engineer for approval, in accordance with sans 878.

1.3.5 Concrete shall be clean, hard, non-porous and entirely free from honeycombing. The Contractor shall cut away, remove and replace, without compensation, any concrete that is honeycombed or porous, or that the Design Engineer may consider in any way of inferior quality.

1.3.6 Concrete finishes to floor and roof to have a smooth wood floated finishes.

1.3.7 All exposed sharp edges above ground level to have 20 X 20mm chamfers.

1.3.8 Curing of concrete shall be carried out strictly in accordance with SABS 1200G and the curing method statement to be approved by Design Engineer.

- 1.3.9 Construction joints to be scabbled and cleaned. Suitable openings shall be left in the shuttering temporarily to facilitate the removal of sawdust, shavings, nails, debris etc.
- 1.3.10 All levels of existing pipework to be confirmed on site.
- 1.3.11 All cast in Items to be supplied by contractor unless otherwise stipulated.

## **1.4 Formwork**

- 1.4.1 Correctly designed shuttering, centring, and casing, rigidly supported and braced, shall be erected. Particular care shall be taken that no movement of the formwork takes place while the concrete is being placed in position or after it has been placed in position.
- 1.4.2 Joints between forms shall be sufficiently tight to prevent leakage of fines and cement.
- 1.4.3 All formwork shall be approved by the Design Engineer before any concrete is placed.
- 1.4.4 Stripping of formwork shall be in accordance with SABS 1200 G.

## **1.5 Steel Reinforcement**

- 1.5.1 All reinforcement to be checked and approved by the Design Engineer prior to casting of any concrete
- 1.5.2 Spacing of roof slab reinforcement on top face to be 100mm c/c each way and cover to be at least 70mm.
- 1.5.3 Only concrete cover blocks, of the same strength as the structural concrete, to be used on site.
- 1.5.4 Concrete cover:
- Floor: 50mm
  - Walls: 40mm
  - Roof (bottom face): 30mm
- 1.5.5 The cover shall be measured from the face of the concrete to the outside of main reinforcement nearest the face of the concrete and is exclusive of any plaster or finishing material.
- 1.5.6 Minimum lap length to be 50 x diameter of the smaller bar.
- 1.5.7 Reinforcement detailing to comply with SANS 10144.

- 1.5.8 Bending of reinforcement shall be in accordance with SANS 282.
- 1.5.9 Reinforcement shall be fixed to comply with tolerances as specified in SABS 1200G.

## **1.6 Structural Steel and Sundry Items**

- 1.6.1 No through ties to be used.
- 1.6.2 All dimensions and levels to be checked on site prior to fabrication of steel.
- 1.6.3 Where temporary bracing or propping is necessary, the contractor shall be responsible for the design, erection, maintenance and removal of such supports.
- 1.6.4 All structural steel work shall be inspected, fabricated and erected in accordance with SABS 1200 H.
- 1.6.5 All steelwork shall be inspected at the fabrication workshop by designer before any corrosion protection is applied.
- 1.6.6 All steelwork to be hot dipped galvanised to SANS 121-2011 (heavy duty) by a SABS accredited galvaniser
- 1.6.7 All steel sections to be grade S355JR steel and shall comply with SANS 50025.
- 1.6.8 Fixings to the concrete shall be stainless steel "UPAT express anchor bolts EXA 16/110" or an approved equivalent. All other nuts and bolts shall be hot dipped galvanised.
- 1.6.9 All welds to be 6mm continuous fillet welds unless shown otherwise and to conform to SANS 10162: Part 1 and SANS 10044.
- 1.6.10 Electrodes for all welds shall be approved by the Design Engineer.
- 1.6.11 All welds to be metal arc welding executed by qualified welders. Supporting documentation to be submitted to the Design Engineer.
- 1.6.12 Welding shall be continuous, free from pin holes and weld slag. Stitch and spot weld is not permitted on articles to be galvanized.
- 1.6.13 Butt welds and splices shall develop the full strength of the joined elements.
- 1.6.14 Flooring shall be Rectagrid with bearer bars banded on all sides and cut outs.
- 1.6.15 Handrails and stanchions shall be "Andrew Mentis" ball type galvanised or approved equivalent all handrail stanchions to be side mounted "gooseneck" type stanchions are not permitted.

- 1.6.16 Cat ladders and grab rails to be supplied and installed by contractor (refer to drawing numbers A7406 and A9858).
- 1.6.17 All parts to be clearly marked for erection purposes.
- 1.6.18 All shop detail drawings of structural steelwork to be submitted to the Design Engineer for approval prior to fabrication