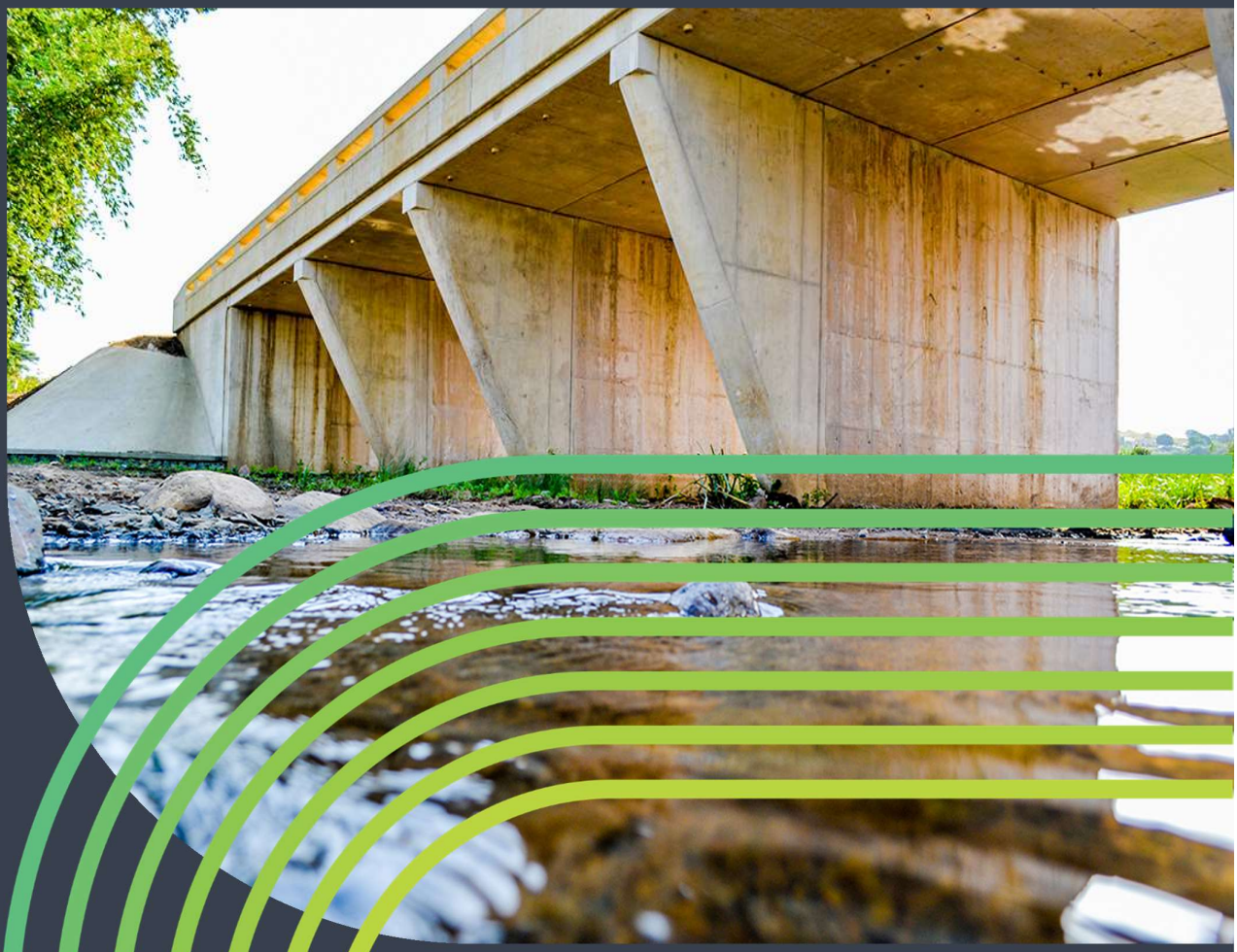
CIVIL SPECIFICATIONS



NAIDU CONSULTING
ENGINEERING DEVELOPMENT

Contract Number:

19/1/9/1/57 TB (22)

Project name:

Ntshongwe Police Station

Client

South African Police Services

Report Title

Ntshongwe SAPS Police Station - Particular Specifications for Sectional Steel Tanks – S13A

Document Status	Date
Revision 1	**17/10/2024**

SOUTH AFRICAN POLICE SERVICE
Department of Police

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17 October 2024

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LIST OF ABBREVIATIONS

NC	-	Naidu Consulting (Pty) Ltd
SABS	-	South African Bureau of Standards
SANS	-	South African National Standards
EN	-	European standards

SCOPE

This specification covers the requirements for sectional steel tanks with covers and ventilation intended for the storage of potable water constructed of square pressed steel plate sections bolted together, and installed on a custom-made tank stand with foundations in the case of an elevated tank, or a suitable foundation with upstand beams/walls in the case of a tank at ground level. The specification also covers the design and construction of tank stands and foundations.

S13A 2 - SUPPORTING SPECIFICATIONS

S13A 2.1 Construction

The latest editions of the following specifications shall apply to manufacturing and construction work:

Specification	Title
SANS 2001-CC1:2012	Concrete (Structural)
SANS 2001-CS1:2017	Structural Steelwork
SANS 121	Hot dip galvanized coatings on fabricated iron and steel articles
SANS 1123	Pipe flanges
SANS 10104	Hand railing and balustrade (safety aspects)
SANS 10329	The design and construction of sectional steel tanks for storage of liquids at or above ground level
SANS 10313	The protection of structures against lightning

Design: The latest editions of the following design codes shall apply to the design:

Specification	Title
SANS 10160	The general procedures and loadings to be adopted in the design of buildings
SANS 10100-1	The structural use of concrete Part 1: Design
SANS 10162-1	The structural use of steel Part 1: Limit-states design of hot-rolled steelwork
SANS 10162-2	The structural use of steel Part 2: Limit-states design of cold-formed steelwork
SANS 10164-1	The structural use of masonry Part 4: Unreinforced masonry walling
SANS 10329	The design and construction of sectional steel tanks for storage of liquids at or above ground level
EN 1992	Design of concrete structures

S13A 3 MATERIALS

S13A 3.1 Members of pressed tank

The plate, stays, cleats and other steel members of the pressed tank shall be GR S355JR steel which shall be hot dip galvanized in accordance with **SANS 121**.

S13A 3.2 Tank stand

GR S355JR steel which shall be hot dip galvanized according to **SANS 121** shall be used for the tank stand.

S13A 3.3 Ladders

GR S355JR steel which shall be hot dip galvanized shall be used for the external ladder to the tank, and stainless steel 316 L for the internal ladder.

S13A 3.4 Handrails

Handrails shall be standard mild steel Mentis type which shall be hot dip galvanized.

S13A 3.5 Pipe connections

Pipe connections and flanges shall be mild steel which shall be welded to the appropriate panels of the tank, where after they shall be hot dip galvanized together with the panels to which they are attached.

Flanges shall be drilled to suit the flanges of the connecting pipes which will either be screwed or welded pipe flanges complying with **SANS 1123** for nominal pressures of 1600 kPa.

S13A 3.6 Vents

Vents and cowls shall be mild steel which shall be hot dip galvanized. Vents shall be fitted with stainless steel mesh to prevent entry of small animals and insects.

S13A 3.7 Raft slab foundation

The raft slab foundation for the proposed elevated tank is to be constructed as per the Structural Engineers design.

S13A 4 GEOTECHNICAL INVESTIGATIONS

A detailed geotechnical investigation was undertaken for the site, reference is made to geotech report 032-24.R01 Revision 1 dated 13 March 2024.

S13A 5 DESIGN

S13A 5.1 Tank stand

In the case of an elevated water tower, the tank stand shall be provided together with the tank and shall be custom-made for the tank offered. The stand shall be erected on a reinforced concrete foundation.

The tank stand shall be designed by the Supplier/Manufacturer. It shall be designed for all possible loads and load combinations acting on the tank and tank stand. Wind loads shall be determined according to the latest edition of **SANS 10160: The general procedures and loadings to be adopted in the design of buildings.**

Design of structural steel shall be in accordance with SANS 10162-1: The structural use of steel Part 1: Limit-states design of hot-rolled steelwork.

S13A 5.4 Pressed steel tank

S13A 5.4.1 Design standard

The design of the tank shall comply with the requirements of **SANS 10329: The design and construction of sectional steel tanks for storage of liquids at or above ground level** with the following amendments, additions or specific requirements:

S13A 5.4.2 General arrangement

The tank shall have a capacity as specified and shall be made up of the following components:

a) square pressed steel plates;
b) roof cover;
c) flanges welded to the steel plates for connecting pipes;
d) bell mouth for overflow;
e) bell mouth for outlet ;
f) scour;
g) access ladders;
h) water level indicator;
i) handrails;
j) Jointing material.

S13A 5.4.3 Panels

The nominal overall sizes of panels shall be 1220 mm x 1220 mm, 1200 mm x 1200 mm or 1000 mm x 1000 mm with flanged sides suitable for bolting the sections together.

The Contractor shall make up the tank to the length, width and depth as necessary using these standard nominal size panels to obtain a tank of the specified capacity, subject to a maximum depth of 4880 mm.

The nominal thickness of the steel plate used in the panels shall be as specified in Table 1.

Table 1: Plate Thickness

Depth of Tank (mm)	Plates	Plate Thickness (mm) min
1 000 to 2 440	Bottom; sides; ends	3
Over 2 440 and up to 3 660	Bottom; first tier of sides and ends Second and top tiers of sides and end	4,5 3,0
Over 3 660 and up to 4 880	Bottom; first tier of sides and ends Second tier of sides and ends Third and top tiers of sides and ends	6,0 4,5 3,0

S13A 5.4.4 Connections

Connections for the following shall be provided and be welded to the tank:

a) inlet with ball valve;
b) outlet with bell-mouth, the top of which shall be 50 mm higher than floor level;
c) scour;
d) overflow with bell-mouth.

Connections shall be welded to the tank plate preferably at areas free from embossment. The inlet and overflow pipe connection shall be double flanged, and the scour and outlet connection, single flanged. Flanges shall be drilled to suit flanges of connecting pipes complying with SANS 1123 for nominal pressures of 1600 kPa.

Flanged connections shall be made watertight by using suitable gaskets or gasket material.

S13A 5.4.5 Services in roof cover

The roof cover shall have an access hatch with size as specified and which shall have a lockable lid. The location of the opening shall preferably be alongside the handrail. Two vents fitted with cowls and mesh to prevent entry of small animals and insects shall be provided in the roof cover.

S13A 5.4.6 Access ladders

An internal and external access ladder shall be provided with the tank. These shall be located at positions agreed with the client. The external access ladder shall be protected by a safety cage from 2, 5 m above ground level, with landings protected with handrails at intervals of 9 m maximum. The internal access ladder shall be located at the access hatch in the roof cover. The design and construction of the ladders shall comply with the requirements of SANS 10104 and the Occupational Health and Safety Act (No 85 of 1993).

S13A 5.4.7 Handrail

A 1 m high handrail with top and knee bars shall be provided on the side of the tank where the access ladder is located and on both sides thereof, and with the handrail positioned as close as possible to the stringers of the access ladder projecting above the roof of the tank.

For tank stands of 10 m and higher, a walkway with handrails shall be provided along the circumference at the bottom of the tank to allow access to valves and pipes.

S13A 5.4.8 Water level indicator

The tank shall be provided with an effective water level indicator which shall show the level of the water in the tank without having to open the access hatch in the roof or cover of the tank.

S13A 6 CONSTRUCTION

S13A 6.1 Foundations

Founding recommendations for foundations as described in the geotechnical report shall be adhered to strictly. The surface upon which the foundation is to be found, shall be inspected and

approved by the registered geotechnical engineer or engineering geologist responsible for the geotechnical investigation and report.

Construction of the tank foundation shall comply with the requirements of SANS 2001-CC1:2012. The foundation shall be reinforced concrete with a minimum strength of 25 MPa/19 mm. A blinding layer with a minimum thickness of 75 mm and concrete strength of 15 MPa/19 mm shall be provided underneath footings of an elevated tank, and a polyethylene sheet of at least 250 micron thickness underneath raft and slab foundations. The top surface of the foundation shall receive a wood-floated finish. The classification of finishes to the sides of the foundation shall be as follows:

- surfaces covered completely by ground: rough;
- Surfaces partly or completely exposed: smooth.

The minimum concrete cover to reinforcement shall be as follows:

- in a surface in contact with soil: 50 mm;
- in a surface which is exposed completely: 30 mm.

S13A 6.2 Tank

S13A 6.2.1 General

The Contractor may undertake the assembly and erection of the sectional steel tank and the tank stand on his own if he has the necessary proven experience and facilities. The erection must however take place under the direct supervision of the supplier/manufacturer. Should the Contractor not have the necessary facilities at his disposal, he should make use of the facilities provided by the supplier/manufacturer.

S13A 6.2.2 Sectional construction

Tanks shall be constructed by bolting the flanged plates together and ensuring watertight joints using approved jointing material or compounds.

S13A 6.2.3 Welding

All welds shall be acceptable fusion welds. The weld metal, the heat-affected zone, and the surrounding parent material shall be free of cracks. Weld faces shall be free of porosity, cavities and trapped slag, shall show no pronounced humps or craters, and shall merge smoothly in the adjacent surfaces of the parent plate without overlap or excessive undercut. The throat thickness of fillet welds shall be at least 4,5 mm. In the case of corner welds, the leg length shall be equal to the plate thickness.

S13A 6.2.4 Assembly

Unless otherwise specified, the tank and the tank stand shall be supplied in knocked-down form, ready for assembly on site, and complete with all the necessary components plus 5 % excess of bolts, nuts, washers and jointing compounds.

Care must be taken to ensure that no part of the steel sections is damaged in any way during transportation to the site and during erection. Any part where the galvanizing has been damaged must be removed from the site or repaired to the satisfaction of the Client before installation.

All welds done on site shall be properly galvanized before the work will be accepted by the Client.

S13A 6.2.5 Disinfection of the tank

On completion of construction but before commencement of testing, the tank shall be disinfected as follows:

a) The tank shall be flushed with clean water until all sediment and other foreign matter have been removed.

b) Potable water treated with sodium hypochlorite or calcium hypochlorite or chlorine gas shall be introduced into the tank. On completion of filling with chlorinated water the chlorine concentration in water sampled at any point shall not be less than 3 mg/ℓ free available chlorine.

After 24 hours retention of chlorinated water in the tank, samples drawn at any point shall contain not less than 0.5 mg/ℓ free residual chlorine and where necessary, additional chlorine shall be injected to maintain chlorine residuals.

S13A 6.2.6 Water-tightness test

The tank shall be watertight and will not be certified as complete until it has been proven by testing to be watertight.

Testing of the tank shall be done under the supervision of the Engineer. Upon completion of the erection and after installation of the pipe work, the tank shall be filled by gradual admission of water until the water level reaches the overflow level. The exact water level shall be marked on the wall of the tank, and the lid of the tank be closed. The tank shall be allowed to remain filled for 48 hours upon which a visual inspection shall be done on the tank. If a drop in the recorded water level has occurred, or if visible leaks have appeared at any time during the test, the test must be discontinued and remedial work is done. Thereafter the test shall be repeated. The tank will be deemed to be watertight if there are no signs of leakage or wet areas on the external faces of the tank, and if no drop in the water level has occurred.

S13A 6.3 Tank stand

S13A 6.3.1 General

The manufacturing and erection of the tank stand shall comply with the requirements of SANS 2001-CS1:2017.

S13A 6.3.2 Lightning protection

Lightning protection must be provided as an integral part of the tank stand by means of a suitable approved copper connector between the bottom of the tank stand legs and an approved earthing spike and shall comply with the requirements of SANS 10313.

S13A 8 MEASUREMENT AND PAYMENT

The method of measurement is the system of measurement set out in Clause 8 of the identified parts of SANS 1200 (Civil Engineering Construction) read in conjunction with the provisions of SANS 1200-A (General) and includes the following items:

S13A 8.1 Scheduled items

S13A 8.1.1 Reinforced concrete tank foundation

Ground level 92.50 msl, Top Water Level 110.55msl, 65 kilolitre tank capacity. Unit: Sum

The tendered sum shall include full compensation for the design and construction of a reinforced concrete foundation(s) for a steel sectional steel tank with the minimum capacity and height as specified, including excavations, preparations of the soil, a blinding layer or polyethylene sheet underneath foundations, anchor bolts in the case of an elevated tower, reinforced concrete or engineering brick upstand walls with steel plate in the case of a tank at ground level, all as specified in the Project Specification.

S13A 8.1.2 Sectional steel tank

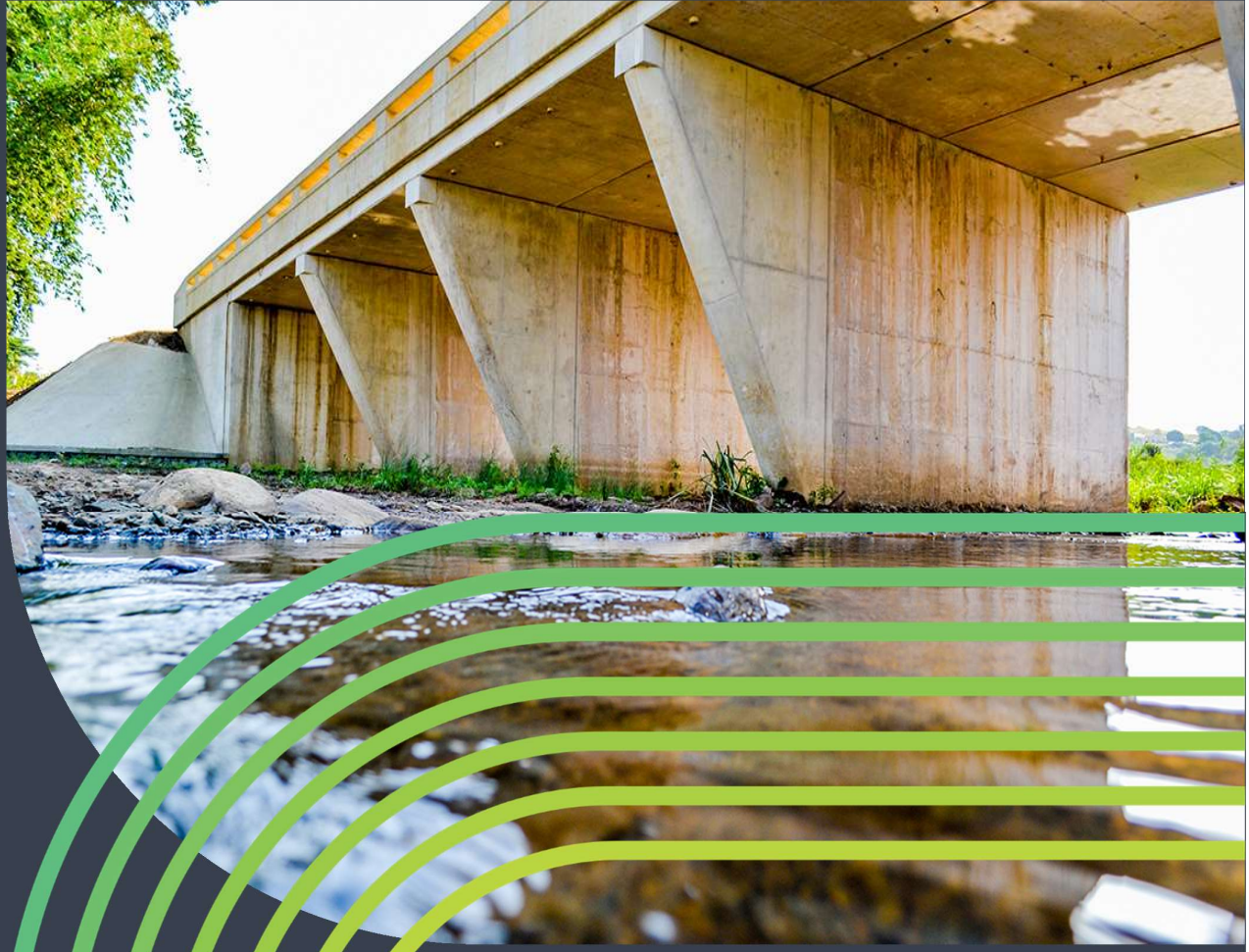
Ground level 92.50 msl, Top Water Level 110.55msl, 65 kilolitre tank capacity. Unit: Sum

The tendered sum shall include full compensation for the design, fabrication, delivery to site and erection of a steel sectional tank with the minimum capacity as specified, with cover, access hatch, vents and cowls, and flanged pipe connections, including top inlet, bottom outlet, scour and over-flow pipes, water level indicator, internal and external access ladders, walkway and handrails, including surface preparation and hot-dip galvanizing, sterilisation and water tightness test, all as specified.

S13A 8.1.3 Tank stand

15m high tank stand, 65 kilolitre capacity. Unit: Sum

The tendered sum shall include full compensation for the design, fabrication, delivery to site and erection of the structural steel stand, surface preparation and repair of damaged galvanized areas and lightning protection, as specified.



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