



SCOPE OF WORKS FOR THE DESIGN AND CONSTRUCTION OF THE CONCRETE FOUNDATION FOR A PANTOGRAPH INSPECTION TOWER, TAILORED FOR A TRANSNET ENGINEERING DEPOT ENVIRONMENT.

VARIOUS SITES

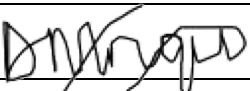
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Document Authorities

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PART 1: WORKS INFORMATION

Clause	Description
C3.1	Description of the Works
C3.1.1	Objective: The Contractor shall undertake the Design and Construct of a compliant, durable, and structurally sound reinforced concrete foundation system to support the new Pantograph Inspection Tower (PIT) at the specified Transnet Engineering depots (the Sites). The foundation must be designed to safely anchor the steel tower and withstand all operational, wind, seismic, and service loads as per SANS and Transnet standards.
C3.1.2	Scope of Work: The works include the professional design, submission for approval, site investigation, excavation, procurement of materials, construction of the foundation, and final site handover.
C3.2	Contractor's Design and Engineering Responsibilities
C3.2.1	Geotechnical Investigation: The Contractor shall perform a full geotechnical investigation at each Site to determine critical soil parameters (bearing capacity, settlement, water table, corrosivity) necessary for foundation design in accordance to SANS 10160-5 and SANS 10161.
C3.2.2	Structural Design: The Contractor shall design the reinforced concrete foundation in accordance with the geotechnical report, the Pantograph Inspection Tower's loading requirements, and relevant standards including SANS 10160 (Basis of Structural Design) and SANS 10100 (Structural Use of Concrete).
C3.2.3	Design Deliverables: Submission of all structural calculations, foundation drawings (including setting out and detail), reinforcement schedules, and a final Design Report signed by a professional structural engineer (Pr. Eng or Pr Tech Eng registered with ECSA) for Employer approval. The design report should cover in minimum the following: • Design Approach • Applicable Design codes (SANS Standards) • Design criteria • Design Assumptions • Construction materials • Design Methodology • Calculation and Analysis

Clause	Description
C3.2.4	Anchor Bolt Plan: Design, supply, and installation of the foundation anchor bolt assembly, ensuring correct size, projection, alignment, and embedment as required for the steel Pantograph Inspection Tower base plate (as per the Provisional Sum installation requirements).
C3.3	Site and Construction Management
C3.3.1	Site Establishment and Access: Mobilise the site, establish a secure working area, and comply with all Transnet rail, depot, and site access regulations.
C3.3.2	Permits and Clearances: Obtain all necessary work permits (e.g., Permit-to-Work, Hot Work Permit) and clearance from Transnet operations before commencing any work, especially near live rail lines or overhead equipment.
C3.3.3	Safety (OHS): Develop, implement, and maintain a site-specific Occupational Health and Safety (OHS) File compliant with the OHS Act 85 of 1993 and Transnet's specific safety standards. This includes Traffic Management, barricading, and Public Safety measures.
C3.3.4	Excavation and Backfill: Execute all excavation to the required design depths. Manage and dispose of all surplus excavated material off-site to approved disposal areas. Backfill the foundation area with material approved by the Engineer.
C3.4	Foundation Construction and Quality
C3.4.1	Reinforcement: Supply, cut, bend, and fix all steel reinforcement according to the approved design drawings and SANS 282 (Concrete Reinforcing Steel). Reinforcement must be inspected and approved by the Engineer/Supervisor before casting.
C3.4.2	Concrete Works: Supply and cast concrete to the specified strength (e.g., 30MPa) and slump, in accordance with SANS 1200 (Standardised specifications for civil engineering construction). This includes formwork, curing, and protection.
C3.4.3	Material Testing: Conduct regular material quality testing, including slump tests for concrete and compressive strength testing (7-day and 28-day concrete cube tests) by an accredited laboratory.
C3.4.4	Anchor Bolt Installation: Position and secure the anchor bolt cage precisely using a template to ensure zero tolerance for the mating steel structure.
C3.5	Tower Installation
C3.5.1	The Contractor shall execute the installation and final bolting down of the new Pantograph Inspection Tower steel structure onto the constructed foundation as directed by the Employer.

Clause	Description
C3.5.2	The Contractor shall include all costs, including crane hire, lifting equipment, labour, and safety supervision for the lift, being paid against actual expenditure and substantiation.
C3.5.3	Electrical Installation (± 150 m length estimated)
C3.5.3.1	Lay cable ducts/conduit and main supply cable pulling, Install new earth pit and bonding at the tower, Installation of local distribution/control panel at the tower, Installation of conduits/wireways within the tower structure, Pre-commissioning electrical testing (Insulation, Earth, RCD), Final Commissioning, Lux level verification, and functional testing, Submission of As-Builts, CoC, and O&M Manuals
C3.6	Handover and Closeout
C3.6.1	As-Built Documentation: Provide As-Built Drawings for the completed foundation, certified by the Pr. Eng/Pr Tech Eng.
C3.6.2	Handover File: Compile and submit a comprehensive Handover File, including all quality control records (cube tests), safety certificates, and the final design certificate sign-off.

PART 2: DESIGN SCOPE OF WORKS (DESIGN ENGINEER)

The Contractor shall appoint a competent, registered **Professional Engineer (Pr. Eng)** to perform the full structural design of the tower foundation.

1.1 Pre-Design and Site Investigation

- a. Site Visit and Inspection:** Conduct a compulsory site visit to all specified depots (e.g., Skoonkaai, Vryheid, Ermelo, Capital Park, Pyramid, Thabazimbi.) to assess site-specific constraints, access limitations, and potential hazards, especially in active rail environments.
- b. Geotechnical Investigation (Soil Testing):**
 1. Perform a professional geotechnical investigation to determine the soil classification, water table, and **safe bearing capacity** at the exact location of the new tower foundation.
 2. Submit a full geotechnical report to the Transnet Project Manager for approval before proceeding with the foundation design.
- c. Load Assessment:** Obtain and verify the **final anchor bolt plan and foundation loading data** (dead loads, live loads, and critical wind/seismic/pantograph testing loads) from the Pantograph Inspection Tower supplier/manufacturer.
- d. Utility Clearance:** Coordinate with Transnet depot management to locate all existing underground services (electrical cables, air pipes, water, and sewerage) in the immediate and surrounding construction area before design and excavation.

1.2 Structural Foundation Design

- a. Design Standards:** The design must strictly comply with all applicable South African National Standards (SANS), including **SANS 10160** (Basis of Structural Design and Actions for Buildings and Industrial Structures), **SANS 10100-1** (The structural use of concrete), and all relevant Transnet Engineering specifications and safety standards (e.g., OHSACT, Construction Regulations).
- b. Foundation Type Selection:** Select the most appropriate and economical foundation type (e.g., spread footing, reinforced pad and pedestal, piled foundation, or drilled pier) based on the geotechnical report and tower loads.
- c. Structural Drawings and Calculations:**
 - Prepare and seal detailed **structural design calculations** demonstrating the foundation's stability, capacity, and serviceability under all loading conditions.
 - Produce **final, sealed, and approved construction drawings** for the foundation, detailing:
 - i. Plan and elevation views with all critical dimensions.
 - ii. Concrete strength grade (e.g., 30 MPa or higher), cover, and placement details.
 - iii. Full reinforcement detailing (size, spacing, cut-and-bend schedule, and placement tolerance).
 - iv. Specific placement and orientation of the **anchor bolts** and embedded items (critical for tower erection).
 - v. Design of any required **concrete plinth/pedestal** to lift the tower base above finished ground/apron level.

1.3 Submissions for Approval

- a. Submit the Geotechnical Report, Desing Report with Structural Calculations, and Final Construction Drawings to the Transnet Project Manager/Engineer for formal review and **written approval** prior to commencement of any construction work.

1.4 Locations

Item	Description & Locations	Quantities
	FOUNDATION AREAS	
1	Scoonkaai	1
2	Vryheid	1
3	Ermelo (New staircase & modification)	1
4	Ermelo	1
5	Capital Park	1
6	Pyramid	1
7	Thabazimbi	1

PART 3: CONSTRUCTION SCOPE OF WORKS

(Construction Contractor)

The Contractor shall provide all necessary labour, supervision, materials, equipment, and quality control to construct the approved foundation as a complete and finished work.

2.1 Site Preparation and Safety

- a. **Permits and Clearance:** Secure all necessary permits, including Transnet depot access permits, Work Permits, and a signed **Site Inspection Certificate** (as per Transnet requirements) before mobilizing.
- b. **Safety Plan:** Implement a site-specific **Health and Safety Plan** compliant with the OHSACT and Transnet's Contractor Management Procedures (TRN-IMS-GRP-PROC 014). This includes all necessary traffic control, demarcation, and adherence to "safe working in a depot" procedures.
- c. **Setting Out:** Accurately set out the foundation location and alignment using survey equipment, ensuring compliance with the approved drawings and the critical centerline/offset from the track.

2.2 Earthworks and Excavation

- a. **Excavation:** Excavate the foundation area to the design depth and dimensions. Shoring and dewatering must be provided as required to ensure a dry, stable, and safe excavation.
- b. **Bottom of Excavation:** Ensure the bottom of the excavation is clean, level, and on the undisturbed natural ground, as verified against the Geotechnical Report. Any over-excavation must be backfilled with lean concrete or other approved material.
- c. **Protection of Services:** Carefully excavate around and protect all existing underground services identified during the pre-design phase. Any damage must be immediately reported and repaired at the Contractor's expense.

2.3 Formwork, Reinforcement, and Embedded Items

- a. **Formwork:** Supply, erect, and brace robust formwork (timber, plywood, or steel) that is structurally sound, true to line and level, and free from movement during concrete placement.
- b. **Reinforcement (Rebar):**
 1. Fabricate and install all reinforcing steel (rebar) according to the approved design drawings, including correct size, spacing, and lap lengths.
 2. Ensure proper **concrete cover** is maintained using approved spacers/chairs.
 3. Obtain a formal **reinforcement inspection sign-off** from the Transnet Engineer or their representative *before* placing any concrete.
- c. **Anchor Bolts and Embedded Items:**
 1. Install the **tower anchor bolts** and base plate templates (if supplied) to the exact projection, orientation, and tolerance specified in the final approved drawings.
 2. The position of the anchor bolts is **critical** and must be checked for alignment (plumb) and elevation prior to concrete pour and secured against movement.

2.4 Concrete Works and Curing

- **Concrete Supply and Mix:**
 - a. Source and supply concrete with the specified characteristic compressive strength (e.g., C30/37 or as per design), slump, and approved mix design.

b. Submit concrete delivery notes and batch reports to the Engineer.

- **Concrete Pouring:**

- a. Pour the concrete in a continuous operation, ensuring proper compaction using mechanical vibrators to eliminate air voids and achieve a sound, well-compacted structure.

- b. Take **slump tests and cast compression test cubes** (e.g., 3 per day of pour) for laboratory testing as per SANS 10100-1 requirements.

- **Curing:** Immediately commence and maintain an adequate curing process (e.g., wet hessian, plastic sheeting, or curing compound) for a minimum of seven (7) days to achieve the required concrete strength and durability.

- **Finishing:** Finish the top surface of the pedestal/foundation to the required elevation and levelness, ready for the steel tower base plate installation, and apply a final float or power float finish as specified.

2.5 Post-Construction and Handover

- **Formwork Removal:** Carefully strip the formwork once the concrete has achieved the necessary stripping strength without causing damage to the foundation.

- **Backfilling and Compaction:** Backfill all excavated areas not covered by the foundation with suitable, excavated, or imported material in controlled layers, compacted to the specified density.

- **Site Cleanup:** Remove all surplus material, debris, equipment, and construction waste from the site, restoring the work area to a neat and safe condition, in compliance with Transnet's environmental and safety regulations.

- **Quality Control Documentation:** Submit a full handover file to the Transnet Project Manager, including:

- "As-Built" drawings.
 - Concrete test cube results (7 and 28-day strengths).
 - Reinforcement inspection checklists.
 - Safety file and close-out documentation.

- **Final Inspection:** Arrange and participate in the final joint inspection of the foundation with the Transnet Engineer prior to handover for the steel tower erection phase. The foundation must be accepted as structurally sound and correctly positioned to the specified tolerances.