

Document Title:

WORKS INFORMATION

Project Title:

PROVISION OF FIRE SYSTEM PIPE INSPECTIONS AND REPAIRS AT HILLCREST PUMP STATION

REVISION: 00

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1. INTRODUCTION

Transnet Pipelines (TPL), a division of Transnet SOC Ltd, provides strategic pipeline infrastructure, with associated world-class pipeline logistics, for the petroleum and gas industries of South Africa. This is done in partnership with our customers and stakeholders thereby assuring the African sustainable development imperative. Established in 1965, TPL owns, maintains, and operates a network of 3 114 km of high-pressure petroleum and gas pipelines. TPL transports an average of 15 billion litres of fuel per annum. This includes diesel, unleaded petrol, aviation turbine fuel and crude oil.

The pipeline network and the liquid fuels network depots traverses five provinces, KwaZulu-Natal, Free State, Gauteng, North-West and Mpumalanga with only three available intakes stations at Durban, Sasolburg and Secunda. The pipeline is laid within the servitudes which traverse through many properties (private, state owned, local authorities) and the pump stations and delivery depots located in rural, industrial, and suburban areas along the pipeline routes.

The pipelines range from 6" (150mm) to 24" (600mm) in diameter. All the pipelines have been constructed in accordance with the American Code ASME B31.4. Pressure in the pipeline network is monitored 24 hours a day, 365 days a year in the control centre in TPLs' National Operating Centre (NOC).

TPL offers fully integrated supply chain solutions from source to destination with no independent injection point into the pipeline network and one active independent distribution point at Tarlton, strategically positioned to facilitate regional integration from mainly pipeline to road and rail.

2. BACKGROUND

The fire protection system at the Hillcrest depot, which consists of two critical pipe sections has been in service for decades and is essential for safeguarding operations involving combustible crude oil transfers. Recently, the Operations team identified a pipe leak in one section, likely caused by age-related corrosion and wear, compromising the system's integrity. Given the depot's role in transporting flammable crude oil, a fully operational fire system is vital for emergency response and regulatory compliance. The aging infrastructure now requires urgent assessment and repairs.

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3. SITE LOCATION

The Project will be performed in Transnet Pipelines Hillcrest Pump Station.

Address: Hillcrest Pump Station
 43 Shongweni Rd, Hillcrest
 3610

Coordinates: Long 30.76249741; Lat-29.79382957

4. PURPOSE

The purpose of this document is to define the scope of work for the appointed service provider, which includes excavations to expose the leaking pipe, inspecting the pipe, cutting out and replacing the damaged pipe, and restoring the area.

5. MATERIAL

5.1. Material Specification

Pipe replacement

Pipe Material	uPVC
Pipe Size	Φ160mm and Φ200mm
Class	Class 12

Refer to drawing WS 6.051 sheet 1 for fire piping layout.

6. SCOPE OF DESCRIPTION

The work information includes:

6.1 Provision of labour and Material for the following:

- 6.1.1 Carefully remove existing stones from the work area and stockpile them at a designated location for later use.

- 6.1.2 Excavate the area to provide clear access to the pipeline and allow for safe and efficient installation work.
- 6.1.3 Inspect the exposed pipe to accurately locate and assess the source and extent of the damage.
- 6.1.4 Cut out and remove all damaged portions of the pipe as identified during the inspection.
- 6.1.5 Rip and recompact the in-situ material to achieve 90% Modified AASHTO density.
- 6.1.6 Install a replacement pipe, using appropriate fittings to join pipe sections securely, following manufacturer specifications.
- 6.1.7 Connect the new pipe to the existing fire system at both ends, ensuring all connections are watertight.
- 6.1.8 Conduct a pressure test on the new pipe system to ensure there are no leaks.
- 6.1.9 Backfill the exposed area with bedding sand to the required levels prior to stone reinstatement, ensuring the bedding sand is compacted to 90% Modified AASHTO density. Should the originally excavated bedding sand be deemed unsuitable or spoiled, the Contractor shall supply, and place additional bedding sand as needed to restore the required backfill condition.
- 6.1.10 Reinstatement all previously removed stones to their original layout, ensuring a neat and stable finish.

6.2 Waste disposal.

- 6.2.1 Disposal of waste in accordance with Transnet’s Environmental Standards for Construction (009-TCC-CLO-SUS-11386) and the local municipality bylaws.

7. GENERAL REQUIREMENTS

- 7.1 Attending a site briefing before submission of the quotation to Transnet Pipelines by the Contractor is mandatory.
- 7.2 The dimensions in the drawings are based on the Employer’s typical design drawings. The Contractor must perform a full design compliant with all applicable SANS standards.
- 7.3 All works described in this scope of work represent works on existing facilities that will be in operation during the Contract. The Contractor must ensure minimal disruption to the facility users through prior planning and precaution.
- 7.4 The Contractor shall provide adequate and competent labour, supervision, tools, equipment, services, and testing devices for all necessary items to complete the work. Transnet Pipelines

reserves the right to terminate the Contract if the Contractor’s performance, supervision, tools, equipment, services, testing devices, or materials do not comply with specified requirements. The Contractor may only claim for work completed to the specified acceptable standard.

- 7.5 The Contractor is responsible for ensuring that all tools provided meet the specifications in the Tender Documents. Failure to meet specifications will require the Contractor to rectify the issue at no cost to Transnet Pipeline.
- 7.6 The successful Contractor is responsible for protecting all existing equipment and services related to the works. The Contractor must bear all costs for any damage caused to equipment or services due to their operations on the respective sites.
- 7.7 Only certified testing devices and measuring equipment with a valid calibration certificate from an approved calibration authority shall be used.
- 7.8 All individuals entering or exiting the site must sign in and out at the primary and secondary access points and undergo a Breathalyzer test. All vehicles entering or exiting the site will be subject to searches. All equipment, such as laptops, must be declared upon entry and exit.

8. HEALTH, SAFETY AND ENVIRONMENTAL MANAGEMENT.

8.1 Health and Safety Standard

The awarded Principal Contractor shall comply with the requirements of the Occupational Health and Safety Act 85 of 1993 and its promulgated Regulations and the following Transnet procedures: Transnet Contractor Management Procedure (TIMS-GRP-PROC-014) and Transnet Contractor Health and Safety Specification Guideline (TRN-IMS-GRP-GDL-014.3), as applicable to the scope of services. and any laws applicable in the terms of Health and Safety.

8.2 Contractor’s General Requirements for Health and Safety

The Principal Contractor is solely responsible for carrying out the work under the Contract having the highest regard for the health and safety of its employees, Transnet’s employees, and persons at or in the vicinity of the Site, the Works, temporary work, materials, the property of third parties and any purpose relating to the Principal Contractor carrying out its obligations under this Contract. Adequate provisions must be made available for health and safety such as medical surveillance and safety file.

(a). The Principal Contractor is required to develop and implement a Health and Safety Plan in accordance with the Contractor Health and Safety Specification Guideline (TRN-IMS-GRP-GDL-014.3). The Contractor to ensure that their Health & Safety Management plan as well as their Baseline Risk Assessment includes the management of communicable diseases.

(b). The Principal Contractor shall appoint a part-time Health and Safety Officer for the site, corresponding with the project's size and associated risks, encompassing all activities including overtime and weekend work. The Safety Officer must possess a National Diploma in Safety Management, Environmental Health, or an equivalent qualification, and be registered with the SACPCMP as a Construction Health and Safety Officer.

(c). The Principal Contractor shall ensure that all incidents are reported to the relevant Transnet Pipelines Depot Manager and investigated by the principal contractor in conjunction with the client's safety representative. Occurrences shall be reported immediately or before the end of the shift followed by a written report within 24 hours.

(d). The Principal Contractor shall ensure that a competent Supervisor is appointed for the project. Constant supervision is required on-site during the execution of works. Relevant training to be conducted for Supervisory staff i.e.: Any relevant Supervisory course, Incident Investigation, Legal Liability, and HIRA (Hazard Identification and Risk Assessments).

(e). The service provider is required to supply employees with protective clothing and equipment in accordance with the Occupational Health and Safety Act 85 of 1993 (OHSA). The personal protective equipment shall be appropriate for the potential hazard. Dromex DW – D59 FA, 100% cotton, flame retardant, and Acid-resistant SABS-approved Conti suit with long sleeves. Materials meeting the requirements of SANS 434, antistatic properties EN 1149 with silver reflective strip (50mm in width) on each sleeve around the upper arm and each leg, meeting the requirements for EN471. Safety footwear with steel toe protection, anti-static, slip-resistant, hydrocarbon resistant, and leather material. Hard hat with chin straps meeting requirements of SANS 1397:2003. The Principal Contractor shall conform to the Transnet Pipelines Standard Operating Procedure for Personal Protective Equipment (009-TPL-OPS-SHEQ-2096).

(f). Before commencing operations or accessing any Transnet site, the Principal Contractor must submit a Contractor Compliance File for review and approval by Transnet Pipelines. The submission requirements will be aligned with the contractor's scope of services.

(g) The principal contractor, upon receiving approval of their safety file, must ensure that all employees designated to work on the project undergo Safety, Health, and Environmental (SHE) induction training, specifically addressing the site-specific hazards at the time of entry. No individuals working for or on behalf of the principal contractor will be permitted to enter the facility without completing the induction process.

(h) The Contractor will be subjected to the Transnet Pipelines permit-to-work process related to the on-site risks identified as well as the changing conditions.

Note: This contract is for structural maintenance, therefore Construction Regulations requirements must be adhered to.

8.3 Contractor compliance File Requirements (Minimum Requirement)

- 8.3.1 A valid Letter of Good Standing with the Workman’s Compensation.
- 8.3.2 Proof of relevant insurances to carry out work.
- 8.3.3 Contractor Health & Safety Plan correlating with Transnet Contractor Management Procedure (TRN-IMS-GRP-PROC-014) submitted and approved.
- 8.3.4 Copies of TPL & Contractor’s health, Safety & Environmental Policies
- 8.3.5 Mandatory agreement as per section 37.2 of the OSHACT. Act 85 of 1993 and CR 5.1(K)
- 8.3.6 Legal appointments as per the Occupational Health and Safety Act such as;
 - Sec. 16(2) – Delegated Authority (Assistant to the CEO)
 - CR 8(1) – Construction Manager
 - CR 8(7) – Construction Supervisor
 - CR 8(5) – Construction Safety Officer
 - CR 9(1) – Risk assessment
 - CR 23. (d)(k) – Vehicle operator and Inspector
 - GSR 3.4 – First aider
 - CR 13(1)(a) – Excavation Supervisor
 - Sec 24, GAR 9(2) – Incident Investigator

8.3.7 Risk Assessments, Method statements, and Safe Working Procedures

8.3.8 Employee Induction packs shall include the following documents:

- Employee scope of work.
- Proof of site-specific induction (Contractor).
- Copy of ID Document.
- Abbreviated CV for the management and Legal appointees.
- Proof of competence
- Valid entry medical certificate of fitness done by an Occupational Health Practitioner aligned with job roles and responsibilities (e.g., work at height, in confined spaces etc.).

8.3.9 Project Specific Risk Assessment indicating the full scope of work and risk profile.

8.3.10 Project specific Organogram of reporting structure including contact details.

8.3.11 Copy of nominated responsible person to conduct inspections and proof of their competency.

8.3.12 Copy of equipment registers to be used with copy of each item’s inspection checklist.

8.3.13 The Service Provider shall furnish the client with Periodic medicals every twelve months, as well as the Exit Medicals done by an Occupational Health

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- Mandatory agreement as per section 37.2 of the OSHACT. Act 85 of 1993 and CR 5.1(K) appointment
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- Risk Assessments, Method statements, and Safe Working Procedures
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- Copy of ID Document.
- Abbreviated CV for the management and Legal appointees.
- Proof of competence

- Valid entry medical certificate of fitness done by an Occupational Health Practitioner aligned with job roles and responsibilities (e.g., work at height, in confined spaces, etc.).
- Project-specific risk Assessment indicating the full scope of work and risk profile.
- Project-specific Organogram of reporting structure, including contact details.
- Copy of nominated responsible person to conduct inspections and proof of their competency.
- Copy of equipment registers to be used with copy of each item’s inspection checklist
- The Contractor shall furnish the client with Periodic medicals every twelve months, as well as the Exit Medicals done by an Occupational Health Practitioner at the end of the contract.

9. Security Screening

9.1 The appointed Contractor to be screened prior to accessing and executing the scope of services at the TPL sites. The following documentation will be requested from the Contractor:

- Company Tax clearance certificate
- CIPC Registration
- Copies of ID of directors
- Fingerprint of company directors (use SAP 91) to be found at local SAPS.
- Copies of ID of employees who will be working on site.
- Fingerprints of employees who will be on site (use SAP 91) to be found at local SAPS.

9.1.1 The appointed Contractor must note that once the requested documents are submitted, SSA will take +/- two weeks to complete the screening.

10. APPLICABLE TECHNICAL STANDARDS

The Contractor must comply with the following standards:

- 10.1 SANS 2001-BE1: Earthworks.
- 10.2 SANS 200-BE: Site Clearance.
- 10.3 SANS 2001-EM1: Cement plasters
- 10.4 SANS 2001-CC2: Concrete Works (Minor Works)
- 10.5 SANS 4427: Plastics piping systems for water supply and for drainage and sewerage under pressure - Polyethylene (PE).

10.6 SANS 10252: Water supply and drainage for buildings

Part 1: Water supply installations for buildings

10.7 009-TCC-CLO-SUS-11386: Transnet’s Standard Operating Procedure for Construction Environmental Management

10.8 Construction Regulations, 2014

10.9 TRN-IMS-PROC-014: Transnet Contractor Management Procedure

10.10 PL890 Bedding and Padding Specification

All other applicable Standards and Specifications not mentioned above should be applied during the execution of project activities.

8.5. ENVIRONMENTAL MANAGEMENT REQUIREMENTS

The *CONTRACTOR* shall at all times comply with Environmental Requirements prescribed by law as they may apply to construction activities. The *CONTRACTOR* shall comply with the provisions of the National Environmental Management Act 107 of 1998, National Water Act 36 of 1998, National Environmental Management: Waste Act 59 of 2008 and any other applicable environmental legislation. The *CONTRACTOR* perform duties of the employer and is in every respect responsible for compliance with the provisions of the Acts. The *CONTRACTOR* will be responsible for environmental rules that TPL may require to be implemented and shall comply with the Transnet Contractor Management Procedure (TRN-IMS-GRP-PROC-014). The *CONTRACTOR* is required to compile and submit a Contractor Compliance File to TPL, that will include, but not limited to Environmental Management Plan (EMP) that is specific to the service/ project. The EMP is project specific and addresses the projects potential environmental impacts and their mitigation measures. Site access and commencement of execution of the scope of work will be subject to the review and approval of the Contractor Compliance File.

The *CONTRACTOR* shall perform all activities within the site and working areas having due regard to the environment and to environmental management practices as more particularly described within the aforesaid Project scope. The *CONTRACTOR* to implement sound waste management practices as defined in the EMP.

8.5.1. Waste Management

The *Contractor* is responsible for the collection, removal and disposal of all waste, wastewater and effluent from ablution facilities generated from the Site as a result of Site activities at the permitted

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landfill site. The Contractor shall be familiar with the waste management requirements as outlined in the EMP. Proof of the permit for the landfill site shall be obtained and kept on file, for review by the Employer or the Employer’s Environmental representative. A waste manifest shall be retained for record purposes for each load of waste disposed.

8.5.2. Hazardous Substances

The Contractor shall observe all applicable legislation, including specific requirements of the EMP relating to the handling, storage and transportation of hazardous substances as defined in the Hazardous Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), the EMP, the local Bylaws, and any other applicable legislation.

The Contractor shall, as a minimum, comply with the following requirements:

- Storage and use of hazardous materials shall be strictly controlled to prevent environmental contamination, in accordance also with the materials safety data sheets (MSDS’s).
- Accidental spillage of any fuel or hazardous substances shall be cleaned up immediately using the most appropriate methodologies, equipment and material.
- No vehicles or machines shall be serviced or refueled on site except at designated servicing or refueling locations.

8.5.3. Management of Ablution Facilities

The Contractor shall comply with the National Environmental Management Waste Act (Act 59 of 2008) and the EMP. The Contractor shall provide sufficient ablution facilities in compliance with all relevant health and safety standards and codes. Enough toilets shall be provided to accommodate the number of personnel working in any given area.

8.5.4. Incident Reporting

The Contractor shall immediately notify the Employer of any environmental incidents on Site. The Contractor shall be responsible for investigating all environmental incidents, instituting the required remedial measures and issuing of close-out reports. All costs associated with the prevention, control, cleaning and remediation of any environmental incidents, spills or releases resulting from the Contractor’s activities shall be to for the Contractor’s own account.

The Contractor shall maintain a register of all environmental incidents. Close-out reports shall be submitted to the Employer and Employer’s Environmental representative within 14 days of occurrence of

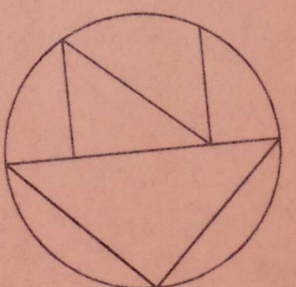
the incident. Case-specific extensions may be considered at the sole discretion of the *Employer*.

8.5.5. Rehabilitation

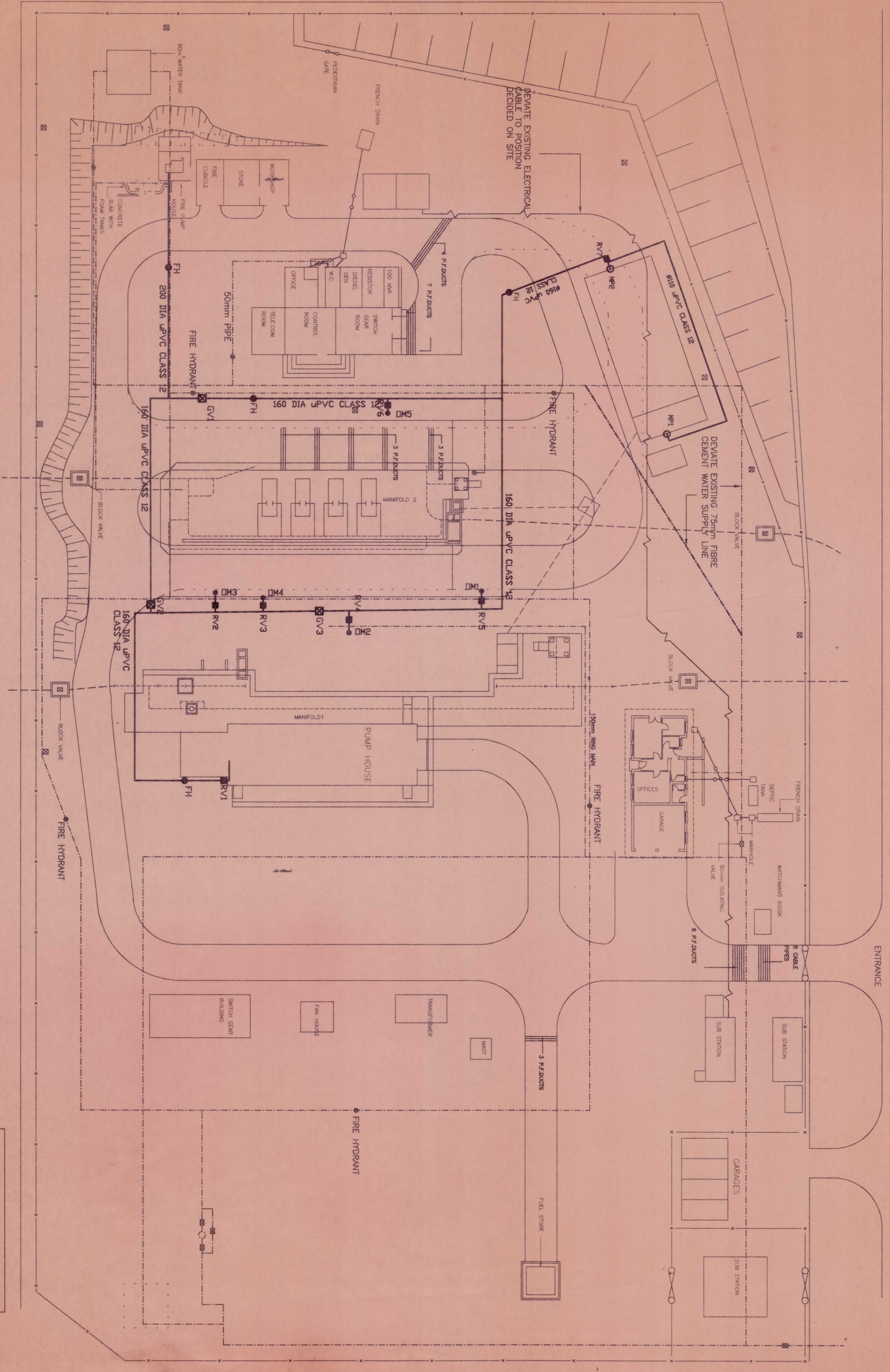
The Contractor shall be responsible for reinstatement and rehabilitating all areas to the satisfaction of the Employer.

The above requirements shall be applicable to the main CONTRACTOR, its CONTRACTORS and suppliers. All personnel will be required to attend site specific induction prior to commencement with their activities.

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SHONGWENI ROAD



ENTRANCE

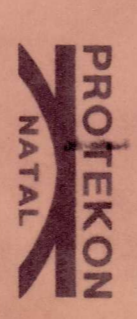
- GENERAL
1. ALL WRITTEN DIMENSIONS TO TAKE PREFERENCE OVER SCALED DIMENSIONS
 2. ALL LEVELS AND DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK COMMENCES

NOTES:

- 1) Scale of drawing is 1:300
- 2) Position of existing pipework is diagrammatic and where necessary precise position is to be determined on site.

DRAWING SCHEDULE

SHEET	DESCRIPTION
1	SITE PLAN: PROPOSED STRUCTURE
2	SITE PLAN: SERVICES
3	SITE PLAN: DRAINAGE
4	SITE PLAN: HAZARDOUS WORK AREA
5	MANIFOLD 1: SETTING OUT DETAIL
6	MANIFOLD 2: SETTING OUT DETAIL
7	FENCING DETAIL
8	REINFORCEMENT DETAILS
9	EFFLUENT DETAIL SHEET 1
10	EFFLUENT DETAIL SHEET 2
11	OIL SEPARATOR DIMENSIONS
12	SPILL BASIN DETAIL
13	SPILL BASIN DETAIL
14	FUEL STORE DETAIL
15	FUEL STORE DETAIL
16	EXTENSIONS TO FOAM PUMPHOUSE
17	FIRE FIGHTING WS 6.052.1
18	FIRE FIGHTING WS 6.052.2
19	FIRE FIGHTING WS 6.052.3
20	FIRE FIGHTING WS 6.052.4
21	FIRE FIGHTING WS 6.052.5
22	FIRE FIGHTING WS 6.052.4
23	FIRE FIGHTING WS 6.052.5
24	
25	



PROTEKON
NATAL
ARCHITECTS, ENGINEERS, QUANTITY SURVEYORS
PROJECT MANAGEMENT

88, ROAD BAYVIEW
BOX 1073, DURBAN
TEL: 031 361-5917
FAX: 031 361-5918

A BUSINESS UNIT OF TRANSCENT LTD. REG. NO. 90/00960/06

HILLCREST PUMPSTATION
UPGRADE

SITE PLAN:
SERVICES

CLIENT
PETRONET

SIGNED	DATE	CHECKED	DATE
<i>[Signature]</i>	9/4/11/15	<i>[Signature]</i>	SEPTEMBER 94

DESIGNED: D.SCOTT
MANAGER

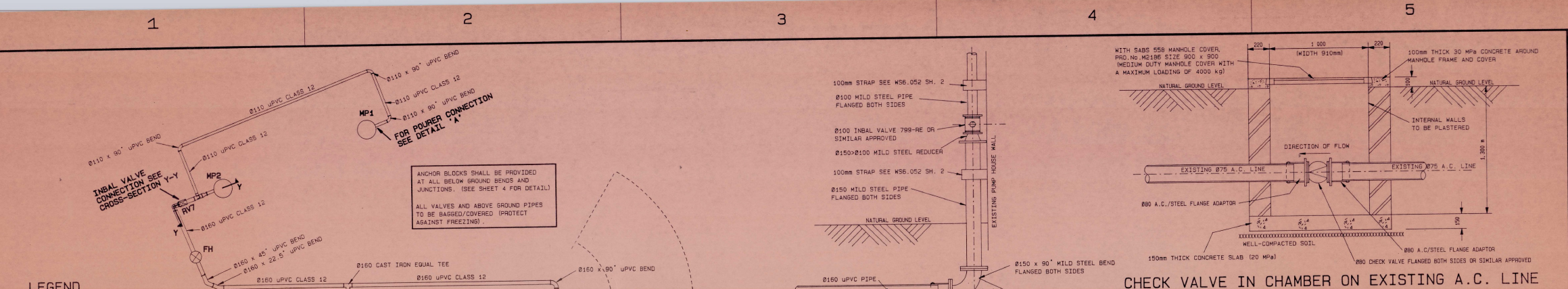
CAD REF: HILL
DATE: SEPTEMBER 94

PROJ. No. C77
REV.

DWG. No. PTKD.401.J.43-1
SHEET
CIVIL: 2 OF 23

UNDERGROUND SERVICES

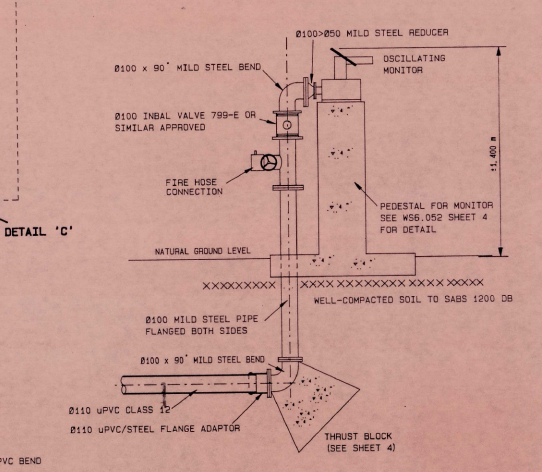
FUEL PIPE	---
ELECTRICAL	---
SEWERAGE	---
WATER	---
NEW WORK:	---
WATER PIPE	---
FIRE FIGHTING	---



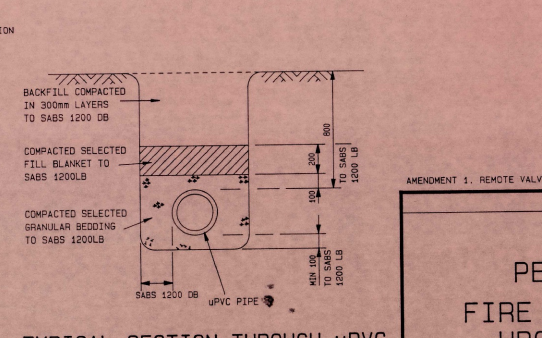
- LEGEND**
- GV1 Ø150 GATE VALVE (MAINTENANCE)
 - GV2 Ø150 GATE VALVE (MAINTENANCE)
 - GV3 Ø150 GATE VALVE (MAINTENANCE)
 - RV1 Ø100 REMOTE CONTROL VALVE INBAL 799-RE OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH PRESSURE REDUCING SET TO 520 KPa AND MANUAL OVERRIDE FACILITY)
 - RV2 Ø100 REMOTE CONTROL VALVE INBAL 799-E OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH MANUAL OVERRIDE FACILITY)
 - RV3 Ø150 REMOTE CONTROL VALVE INBAL 799-E OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH MANUAL OVERRIDE FACILITY)
 - RV4 Ø100 REMOTE CONTROL VALVE INBAL 799-E OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH MANUAL OVERRIDE FACILITY)
 - RV5 Ø100 REMOTE CONTROL VALVE INBAL 799-E OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH MANUAL OVERRIDE FACILITY)
 - RV6 Ø100 REMOTE CONTROL VALVE INBAL 799-E OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH MANUAL OVERRIDE FACILITY)
 - RV7 Ø150 REMOTE CONTROL VALVE INBAL 799-RE OR SIMILAR APPROVED (ELECTRICALLY OPERATED WITH PRESSURE REDUCING SET TO 315 KPa AND MANUAL OVERRIDE FACILITY)
 - OM1 OSCILLATING MONITOR CHUBB HDM-26-AB400 OR SIMILAR APPROVED (MAX THROW 10m / MIN THROW 0.1m)
 - OM2 OSCILLATING MONITOR CHUBB HDM-26-AB200 OR SIMILAR APPROVED (MAX THROW 5m / MIN THROW 7.8m)
 - OM3 OSCILLATING MONITOR CHUBB HDM-26-AB400 OR SIMILAR APPROVED (MAX THROW 10m / MIN THROW 0.1m)
 - OM4 OSCILLATING MONITOR CHUBB HDM-26-AB400 OR SIMILAR APPROVED (MAX THROW 10.4m / MIN THROW 0.1m)
 - OM5 OSCILLATING MONITOR CHUBB HDM-26-AB400 OR SIMILAR APPROVED (MAX THROW 10.4m / MIN THROW 0.1m)
 - MP1 HEX 600 MULTI NOZZLE POURER OR SIMILAR APPROVED
 - MP2 HEX 600 MULTI NOZZLE POURER OR SIMILAR APPROVED
 - FH FOAM/WATER FIRE HYDRANT

PIPE NETWORK
NOT TO SCALE

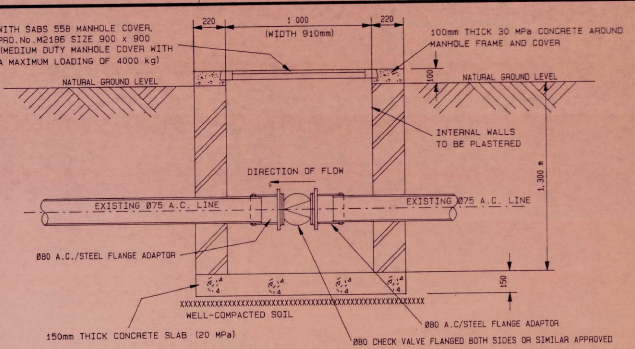
REMOTE VALVE CONNECTION AT PUMP HOUSE
DETAIL 'C'
SCALE 1:20



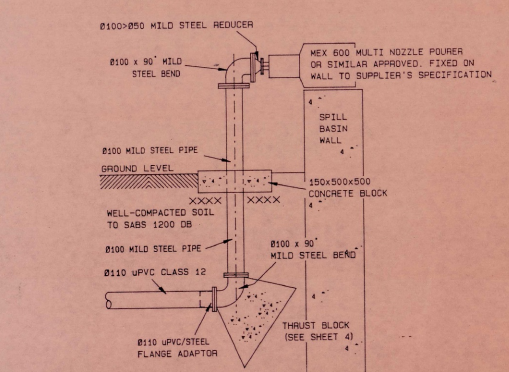
REMOTE VALVE CONNECTION AT MONITOR
DETAIL 'B'
SCALE 1:20



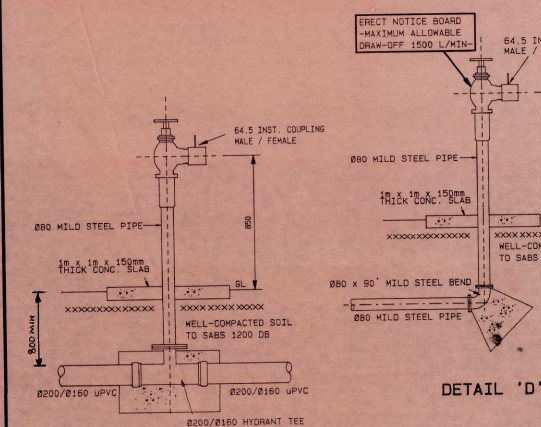
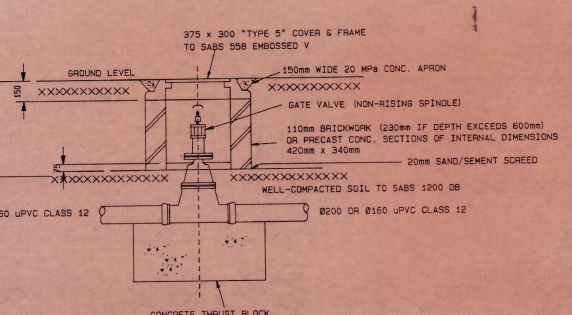
CHECK VALVE IN CHAMBER ON EXISTING A.C. LINE
DETAIL 'E'
SCALE 1:20



POURER (MP1) DETAIL AT SPILL BASIN
DETAIL 'A'
SCALE 1:20

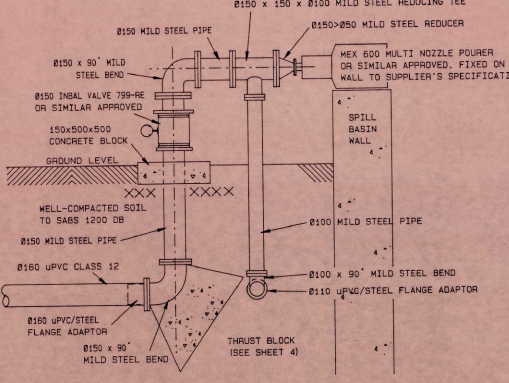


VALVE CHAMBER (VC) FOR GATE VALVE

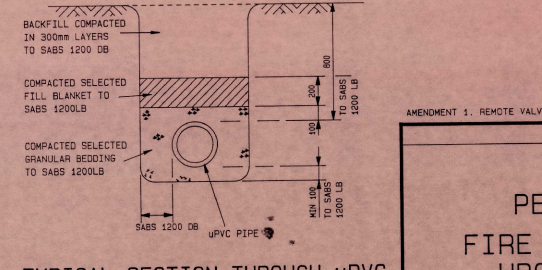


DETAIL OF FIRE HYDRANTS
NOT TO SCALE

POURER (MP2) AND VALVE CONNECTION AT SPILL BASIN CROSS-SECTION Y-Y
SCALE 1:20



TYPICAL SECTION THROUGH UPVC PIPE SHOWING BEDDING DETAILS
SCALE 1:20



FOR SITE LAYOUT SEE WS6.052 SHEET 1
FOR SPRINKLER DETAILS AND LAYOUT SEE WS6.052 SHEET 2
FOR FIRE PUMP HOUSE, THRUST BLOCK AND PEDESTAL DETAIL SEE WS6.052 SHEET 4
FOR VALVE SETTINGS SEE WS6.052 SHEET 5

TRANSNET		JOHANNESBURG		TRANSNET	
HILLCREST					
PETRONET		PROTEKON		PETRONET	
FIRE FIGHTING		WATER		BRANDBLUS	
UPGRADING				OPGRADERING	
FOAM FIRE FIGHTING				SKUIM BRAND-	
SYSTEM				BESTRYDINGSSTELSEL	
PIPE LAYOUT, VALVES AND HYDRANT DETAILS					
DESIGNED	K. JANKOWITZ	PLAN NO. / No.	WS 6.052	SH.	3 of 5
CHECKED		FILE / LEER	WS/6/321	AMEND.	1
DRAWN	M. J. SIM	DATE	16/05/2010		
CHECKED					
MANAGER	PROTEKON WATER				
RESTAURER	PROTEKON WATER				

TRANSNET PIPELINES

CIVIL TECHNICAL DOCUMENT

BEDDING AND PADDING SPECIFICATION

Document number	PL 890
Version number	1.0
Effective date	01 May 2024
Review date	01 April 2029

DOCUMENTATION SIGN-OFF SHEET

I, the undersigned hereby approve this specification.




ROLE	CAPACITY/ FUNCTION	Name	SIGNATURE	DATE
Compiled by:	Senior Engineering Technician: Civil	S.N Cebekhulu		26 March 2024
Reviewed by:	Manager: Servitude	A.M Zulu		12 April 2024
Accepts document for adequacy and practicability. Comments:				
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1. GENERAL

1.1. Scope

- a) This specification covers the requirements for bedding and padding materials to be placed around and over the pipelines in the trench.
- b) The materials shall be compatible with the coatings selected for the pipeline, namely three-layer Polyolefin for the pipeline, the hot applied machine tape wrap applied over FBE or liquid systems for the weld joints, and the cold applied tape wrap over hot bends, fittings, and special installations.
- c) This specification sets out the requirements for and restrictions on the use of run-of-trench and imported material.

1.2. Related Specifications & Regulation

- a) The following specifications and regulation prescribe items of related Work:
 - i. TPL Construction Specification - PL 887.
 - ii. TPL Earthwork Specification – PL 889.
 - iii. Construction Regulation 2014.

1.3. Definitions

- a) Bedding: The material placed on the bottom of the trench after excavation, comprising of sifted material (200 to 300mm depth, varies as specified) prior to placement of the pipeline, or placed in conjunction with sandbags to achieve bedding.

- b) Padding: The material placed to the sides and above the pipe prior to runoff trench backfill and is inclusive of material otherwise referred to as "shading".

2. BEDDING/PADDING MATERIAL

2.1. Material Quality

- a) Screened and suitable excavated material from site or trench that meets this specification, may be utilized for bedding and padding if certified by a TPL Engineer.
- b) Material used for Bedding and Padding shall comply with the following:
 - i. Free of organic matter. Topsoil shall not be used for bedding and padding.
 - ii. Free of clods or peat.
 - iii. Free of physical or chemical contamination or hazardous materials including arsenic, cyanide, lead, mercury, selenium, and carbonaceous material such as coke, ash, or breeze.
 - iv. Material shall be free flowing – non-cohesive: i.e., material which is cohesive shall be excluded for Bedding and Padding purposes.
- c) Crusher run is not acceptable. However, site specific materials such as sugar dolerite and sandstone that have been crushed and screened and meet the requirements of this specification may be submitted to the Project Manager and Engineer for approval on a case-by-case basis.

2.2. Grading

- a) Bedding and Padding shall be sampled for analysis and the source of Material shall contain sufficient fines to provide close packing around the pipe.
- b) The diameter of the largest Pad sand particles shall not be greater than 1.5mm.

2.3. Testing of Material

- a) Grading tests shall be performed for the following:
 - i. Each new borrow pit area; and / or
 - ii. At any time, the source of material is changed.
 - iii. Samples of bedding / padding material shall be taken twice daily from the trench for testing.
- b) The test result shall be subject to the approval of TPL Project Engineer.

3. BEDDING AND PADDING BARS

- a) Bedding and Bedding Bars shall be prepared as follows:
 - i. After preparation of the trench and prior to placement of the pipe, bedding shall be placed in the trench, and care taken to achieve the minimum clearances after settlement of the pipe weight.
 - ii. Bedding shall provide a minimum of 200mm clearance unless otherwise specified. This may be achieved by use of sandbag bedding bars, continuous bedding, or intermittent bedding prior to lowering-in. Bedding bars or intermittent bedding shall be spaced, at distance not greater than 10m centres.
 - iii. In rock trench, sandbag bedding bars shall provide a minimum 300mm clearance, including at all projections of rock edges.

- iv. Bedding bars shall be made of sandbags which consist of Hessian bags filled with bedding compliant material, or polyurethane foam fitters. Bedding bars shall extend the full width of the trench.

4. PADDING

- a) After lowering of the pipe into the trench, padding shall be carried out in accordance with this specification and shall be used to cover the pipe to a minimum of 300mm, for the full width of the trench.
- b) Padding material shall not impinge directly onto the coated pipe when placed, but instead shall fall onto the trench bed or previously placed material and flow around the pipe.
- c) The padding sand shall be placed and compacted in layers until the cover over the pipeline measures 150 mm.

5. PIPELINE CONSTRUCTION PADDING MACHINE

- a) A padding machine, stationary screening plant, or mobile screening plant must be utilized to place screened material excavated from the trench as bedding and padding material wherever possible to meet the requirements herein. Samples of screened material from padding machine shall be submitted to a TPL Project Engineer or review and approval.
 - i. Material excavated from the trench may be rendered suitable for use as bedding and padding by screening.
 - ii. Screening must be carried out at the time of excavation or backfilling. A mobile screening plant may be utilized where appropriate.

- b) The padding machine shall be operated such that:
 - i. The particle size distribution in the layer complies with the maximum particle of 1.5mm.
 - ii. Segregation does not occur.

- c) When padding is being placed above the pipe, the machine shall be operated so that screened material shall not impinge directly onto the coated pipe. The material should fall onto the trench bed or onto previously placed material and flow around the pipe to comply with the construction specification.

6. IMPORTED BEDDING AND PADDING

- a) Imported Bedding and Padding material shall be utilized wherever:
 - i. Rock blasting is required.
 - ii. Excavated material contains sharp fragments which can damage the pipe coating.
 - iii. The TPL Project Engineer deems it necessary.

7. PADDING SAND

- a) Padding sand shall be used for the following:
 - i. All cathodic protection cable installations.
 - ii. Foreign pipeline and cable crossings, including sandbags.
 - iii. Valves and fittings, not installed within a chamber.
 - iv. All hot bends and specials, (Over-wrapped with cold applied tape).
 - v. Liquid Coated or FBE Field Joints, (Over-wrapped with cold applied tape).

- b) Padding sand material shall be fine sand or fine non-cohesive soil, free from stone, gravel organics and clod-forming material. Naturally occurring materials

including river sand, pit sand and weathered mine dump sand are permissible. Crusher run is not acceptable.

- c) The following are some examples of a suitable padding sand:
 - i. Plaster Sand
 - ii. Washed Umgeni River Sand (KZN)
 - iii. Suitable Leached Mine Sand (Gauteng Area)

- d) Site specific crushed and screened material such as sandstone and sugar dolerite which meets the requirements of this specification may be submitted to the TPL Project Engineer for approval on a case-by-case basis.

- e) Run-of-trench material may be used provided it is screened.

- f) Padding sand shall have a Whole Sample Plasticity Index of less than 6.

- g) The pH value of the tested sand shall not be less than 5,5.

- h) The diameter of the largest pad sand particle shall not be greater than 1,5mm.

- i) Sand padding for cables, crossings and cold applied tape-wrapped sections shall have the following grading analysis:

Note: Imported material for padding sand shall be sampled at source and submitted for laboratory analysis for screening and plasticity index and pH value.

8. STANDARD CROSSING CONDITIONS AND REQUIREMENTS

8.1. Minor Road Crossings (Road reserve less than 20m)

- a) The pipeline shall be exposed for the full width of the road reserve where the road crosses the pipeline servitude and extends to 3m on either side. The pipeline shall then be examined, primed, and double wrapped for this length.
- b) The cover over the top of the pipeline shall not be less than 1m nor more than 3m unless otherwise agreed to by TPL Engineer.
- c) The excavation and backfilling within the area of the pipeline servitude shall be undertaken by the applicant. Such excavation and backfilling shall be excavated by hand without the use of mechanical or power equipment. The pipeline shall be exposed to provide a minimum clearance of 750mm between the pipeline and the walls and 500mm between the bottom of the pipeline and the floor of the trench. Where exposed the pipeline shall not be left unsupported for length greater than 10m.
- d) In backfilling the excavation, the applicant shall provide a minimum of 150mm of selected soft padding around the pipeline where it was exposed in accordance with section 2 and 7 of this specification. The padding must be properly compacted by hand.

8.2. Major Road Crossings (Road reserve greater than 20m)

- a) A culvert shall be constructed around the pipeline for the full width of the road reserve where the road crosses the pipeline servitude. The design and construction of the culvert shall be undertaken by the applicant's Registered Engineer and the designs must be submitted to TPL Engineer for approval. Refer to the drawing number, PL – 112876 for typical culvert layout.

- b) The pipeline shall be double wrapped for the full length of the culvert plus 3m on either side. TPL will supply the prime and wrapping tape and will arrange to examine, prime and double wrap the pipeline where necessary at the applicant's cost.
- c) The cover over the top of the pipeline shall not be less than 1m.
- d) The excavation and backfilling within the area of the pipeline servitude shall be undertaken by the applicant. Such excavation and backfilling shall be excavated by hand without the use of mechanical or power equipment. Where exposed the pipeline shall not be left unsupported for length greater than 10m.
- e) In backfilling the excavation, the applicant shall provide a minimum of 150mm of selected soft padding around the pipeline where it was exposed in accordance with section 2 and 7 of this specification. The padding must be properly compacted in layers by hand.

8.3. Railway Tracks and Canals Crossings

- a) Similar to 8.2 procedure – Regardless of the width of the rail reserve and/or canal, same condition pertains here as that for major roads i.e. a Culvert and double wrapping is required. This may however be relaxed by TPL Engineer in exceptional circumstances.

8.4. Underground Services (Cables, Pipes, etc.)

- a) The service shall cross below the pipeline with a minimum clearance of 300mm. The level must be maintained for a minimum distance of 3m on either side of the centerline of the pipeline.
- b) Where the service runs parallel to the pipeline it shall not encroach upon Transnet Pipeline servitude.

- c) No manhole or any other permanent structure shall be erected within the pipeline servitude.
- d) No joint in a service shall be situated within the pipeline servitude. Should this, however, not be possible the joint shall be placed such that they are equidistant from the centerline of the pipeline.
- e) All fragile services such as PVC pipes, earthenware, pitch fibre pipes and cables laid within the pipeline servitude shall be protected with concrete or similar protective sleeves for a distance of 3m on either side of the centerline of the pipeline.
- f) Steel pipes with 100mm diameter or larger two flexible test leads shall be provided by the applicant to enable the monitoring of possible Electrolytic corrosion to Transnet's pipeline. Each test lead shall comprise of a sufficient length of red PVC insulated wire of 35mm² section soldered or brazed onto applicant's service and suitably re-insulated. TPL shall provide two black test leads from its pipeline as well as the junction box. All test leads shall terminate inside this junction box. Cost incurred will be to the applicant's account.

TRANSNET PIPELINES

CIVIL TECHNICAL DOCUMENT

EARTHWORKS SPECIFICATION

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DOCUMENTATION SIGN-OFF SHEET

I, the undersigned hereby approve this procedure.




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ABBREVIATIONS

TPL	Transnet Pipelines
SANS	South African National Standard
TRH	Technical Recommendations for Highways
OMC	Optimum Moisture Content
Mod AASHTO	Modified American Association of State Highway and Transportation Officials
PI	Plasticity Index
CBR	California Bearing Ratio
OSHA	Occupational Safety and Health Administration
C3	Cement-stabilized material

DEFINITIONS

Earthworks	Activities involved in the excavation, transportation, placement, and compaction of fill materials or soils to prepare the earth for construction.
Optimum Moisture Content	Moisture content at which maximum dry density of soil is obtained for a specific compaction effort.
Mod AASHTO maximum dry density	Highest density obtainable when compaction is carried out on soil at varied moisture contents at the modified AASHTO compaction effort in accordance with the requirements of TMH1 – A7
Plastic Limit	Empirically established moisture content at the boundary between the plastic and semi-solid states.

Liquid Limit	Empirically established moisture content at the boundary between the liquid and the plastic states.
Plasticity Index	Difference between the liquid limit and the plastic limit.
California Bearing Ratio	Load in newtons, expressed as a percentage of standard values, required to allow a piston of 1 935 mm ² to penetrate a surface of a compacted material at a rate of 1,27 mm/min to depths of 2,54 mm, 5,08 mm, and 7,62 mm where the corresponding standard values for these depths are 13,344 kN, 20,016 kN and 25,354 kN, respectively.
Backfill	Material placed and compacted on top of the fill blanket to reinstate the excavated trench to the original level.
Retaining wall	Wall intended to resist the lateral displacement of materials
Geotechnical site investigation	Process of evaluating the geotechnical character of a site in the context of existing or proposed works or land usage.
Competent person (civil engineering)	<p>Person who</p> <ul style="list-style-type: none"> a. is registered in terms of the Engineering Profession Act ,2000 (Act No. 46 of 2000), as either a Professional Engineer or a Professional Engineering Technologist or a Professional Engineering Technician, b. has a tertiary qualification (Degree or Bachelor of Technology or Advanced Diploma or National Diploma) in civil engineering, and c. is generally recognized as having the necessary experience and training to undertake rational assessments or rational designs in the field of civil engineering.
Competent person (geotechnical)	Person who is registered in terms of the Engineering Profession Act ,2000 (Act No. 46 of 2000), as either a Professional Engineer

	<p>or a Professional Engineering Technologist, or a Professional Engineering Technician</p> <p>a. is registered as a Professional Natural Scientist in terms of the Natural Scientific Professions Act, 2003 (Act No. 27 of 2003), and has a BSc (Hons) degree or higher qualification in engineering geology,</p> <p style="text-align: center;">or</p> <p>registered as a Certificated Natural Scientist and has a recognized 3-year qualification or equivalent qualification at NQF 7 or higher and</p> <p>b. and has suitable experience in geotechnical site investigations or foundation design (or both)</p>
Collapsible soil	Soil with a high void ratio and with a low density that, when subjected to a combination of direct actions and an increase in soil moisture content, experiences sudden or rapid settlement.
Expansive soils	Fine-grained soil, the clay mineralogy of which is such that it changes in volume to varying degrees in response to changes in moisture content, i.e. the soil increases in volume (heaves or swells) upon wetting up and decreases in volume (shrinks) upon drying out.
Dispersive soils	Clay-rich soil that lose their structure and aggregate stability when exposed to water, causing individual clay particles to break apart and go into suspension.
Manifold	A centralized network of pipes, valves and fittings used to control and direct the flow of gas and hydrocarbons – between storage tanks and pipelines
Service roads	Roads inside the depots and alongside the servitude, constructed primarily to provide access for maintenance and operational activities. They may be surfaced with asphalt, gravel, paving

	blocks, concrete, or other materials based on functional requirements.
Construction / Haul roads	Roads outside the TPL depots used for temporary or low-traffic situations such as construction sites. They are specifically built for moving heavy loads such as trucks transporting materials or equipment.
C3	A moderately strong cement-treated granular material, where: C = Cemented material and 3= strength class (typically unconfined compressive strength between 3 and 6 MPa)
C35	Structural grade concrete, suitable for load-bearing applications with a compressive strength of 35 MPa (megapascals) at 28 days, testing using standard concrete cube (150 mm)
Type 1 masonry building	Building not used for storage or industrial purposes, and with masonry walls that are not supported by steel, concrete or reinforced masonry columns
Masonry	A building technique that uses bricks, clay, stone, or concrete to make structures.

1. GENERAL

1.1. Purpose

This document aims to define the general requirements for earthworks in and around Transnet Pipelines (TPL) facilities and along the pipeline routes within TPL's servitude . It encompasses earthworks activities such as site preparation, excavation, grading, backfilling, and specific requirements for stabilization and compaction. Additionally, it addresses other related aspects, including trench safety, material specifications where applicable, design requirements, and quality control measures like material testing.

1.2. Applicability

This specification is applicable to all Transnet Pipelines facilities, along the pipeline within TPL's servitude and the service roads/ access routes to the block valves chambers and the pipeline.

1.3. Reference Documents

Document Title	Document No.
Bedding and Padding Specification	PL 890
Construction Specification	PL 887
Construction works Part BE1: Earthworks (general)	SANS 2001-BE1: 2008
Construction Works Part BS1: Site clearance	SANS 2001- BS1:2008
Earthworks for Buried Pipelines and Prefabricated Culverts	SANS 2001 – DP1
The Application of the National Building Regulations Part G – Excavations	SANS10400 -G
The Application of the National Building Regulations Part H – Foundations	SANS10400 -H
Guidelines for Road Construction Materials	TRH14 :1985

Structural Design of Flexible Pavements for Interurban and Rural Roads	TRH 4
Occupational Safety and Health Administration – Trenching and Excavation Safety	OSHA 2226

**If any specific aspect of the work is not addressed by this specification or SANS Codes, any other standard practice specified by the Engineer shall be followed.

2. SITE PREPARATION

2.1 Clearing

All areas in which excavation is to take place or that are to be covered by terraces , banks or structures shall be cleared in accordance with the requirements of SANS 2001 – BS1. The area shall also be stripped of all remaining vegetation and surface soil to depth of up to 150 mm. Unsuitable material shall be disposed of as specified in 2.3.

2.2 Conservation of Topsoil

When suitable topsoil is present within the area to be cleared, it, along with any grass or other appropriate vegetation, shall be preserved. If not used immediately or stockpiled, the topsoil must be set aside for future use.

2.3 Disposal

Surplus and unsuitable material shall be disposed of in accordance with Transnet's Environmental Standards for Construction and the local municipality by laws.

2.4 Geotechnical Site Investigations

The required level of detail of a geotechnical site investigation shall be governed by the project scope and may include one or more of the following:

- a. Evaluation of the geology and hydrogeology of the site.
- b. Examination of existing geotechnical information pertaining to the site.

- c. Excavation or boring in soil or rock and systematic description of the soil and rock profiles.
- d. Determining the depth of any fill that might be present.
- e. In-situ assessment of geotechnical properties of materials.
- f. Recovery of samples of soil or rock examination, identification, recording, testing or display.
- g. Testing of soil or rock samples to quantify properties relevant to the purpose of the investigation.
- h. Evaluation of geotechnical properties of tested soils.
- i. Reporting of the results.
- j. Providing recommendations and conclusions

2.4.1 Geotechnical Assessment Requirements

Prior to the commencement of any earthworks, geotechnical investigations and/or site surveys must be undertaken by a competent person (geotechnical or civil engineering) to assess ground conditions and mitigate potential risks. These assessments are particularly critical in areas where problematic soil types or site-specific challenges are anticipated.

2.4.1.1 Soil Conditions Requiring Investigation:

- Expansive soils
- Collapsible soils
- Highly compressible soils
- Dispersive soils
- Dolomitic terrain

2.4.1.2 Site Conditions Requiring Investigation:

- High water tables or wetland areas
- Poorly drained locations
- Previously undermined ground
- Sloped or steep terrain
- Proximity to existing infrastructure
- Sites intended to support heavy or large-scale structures
- Coastal or marine-adjacent environments

3. EXCAVATION

- 3.1. All excavations must be conducted in compliance with SANS 10400-G and the Occupational Safety and Health Administration (OSHA- Trenching and Excavation Safety) standards.
- 3.2. Excavation work shall be so executed that material from excavations shall be used in preference to materials from borrow pits and other sources.
- 3.3. Support systems like shoring, bracing, or underpinning must be provided when needed to ensure the stability of adjacent structures, including nearby buildings, walls, sidewalks, and pavements, during excavation.
- 3.4. A protective system is not required when excavation is made entirely in stable rock or when an excavation is less than 1.52 meters deep and a competent person has examined the ground and found no indication of a potential cave-in.
- 3.5. Material shall be transported directly to its final position without being stockpiled, and if stockpiling is unavoidable, materials intended for different uses shall be stockpiled separately.
- 3.6. No mechanical driven equipment may be used within the area of the pipeline servitude/s unless otherwise authorised by the Transnet Pipelines Servitude Officer.
- 3.7. No blasting is allowed within the pipeline servitude. Application to carry out blasting within 500m of the pipeline must be made to the Transnet Pipelines Servitude office in writing in terms of paragraph 17.1 chapter 10 of the regulations embodied in the Explosives Act and Regulations (Act 26 of 1956) as amended.

4. MATERIAL

- 4.1. The material properties of fill and backfill shall be in accordance with the requirements of TMH1– A3, TMH1 – A7 and TMH1- A8, as relevant.
- 4.2. Backfill material from trenches is to be used as stated in 3.2, and the backfill material shall:
 - a. be free from vegetations, roots, salts, rubbish, lumps, organic matter, and any other harmful chemicals etc. and shall be approved by the Engineer.

- b. be broken into pieces not exceeding 150mm size in any direction and mixed with fine materials consisting of decomposed rock, or any approved earth to fill the voids as far as possible and the mixture shall then be used for filling and
 - c. be able to be placed without significant voids and be so compacted as to avoid significant settlement.
 - d. not contain more than 10% of rock or hard fragments that are retained on a sieve of nominal aperture size 50 mm and shall not contain large clay lumps that do not break up under the action of compaction equipment.
- 4.3. Should the Engineer specify the use of granular materials and soils (G1 to G10) from borrow pits and other sources, the materials must conform to the TRH14 (1985) materials classification system and comply with the specifications listed in table 1 of Annexure A.
- 4.4. The use of these materials shall be supported by a material certificate, which must be submitted to the Project Manager.

5. COMPACTION

- 5.1. Unless otherwise specified in the scope of work, each layer on an embankment shall be compacted at OMC to a density of at least 90% of Mod AASHTO maximum dry density in the case of cohesive soil, or 98% in the case of non-cohesive soil.
- 5.2. Each trench shall be backfilled in layers of thickness (after compaction) that do not exceed 150 mm, and the material shall be compacted to the same density as that of the undisturbed surrounding ground, or to 90% of mod AASHTO maximum dry density, whichever is higher.
- 5.3. The tests required for soils and gravels vary according to their classification in terms of TRH14. The tests required for materials G4 to G10 are listed in table 2 of Annexure A.

6. FINISHING

6.1 Final Grading

On completion of earthworks to the finished level and of backfilling of all holes, trenches, etc., the whole surface shall be graded, shaped and compacted to final grades and levels.

6.2 Topsoiling

Where required in terms of the scope of works, topsoil shall be placed on level and slightly graded areas and shall be lightly compacted by wheeled vehicles or by tamping, and trimmed neatly to the required lines, grades and levels. The final thickness of topsoil after compaction shall be at least 75mm.

6.3 Grass or Other Vegetation

Where required in terms of the specification data, grass or other vegetation shall be planted after topsoiling has been completed. On completion of planting, the planted area shall be neatly trimmed and well-watered and not allowed to dry out until it is established, or for the period required in the scope of work.

7. EARTHWORKS REQUIREMENTS

This section outlines the general earthwork requirements for specific areas within and surrounding the TPL facilities and servitudes. It serves as a guide for typical earthwork specifications, unless otherwise directed by the Engineer.

7.1 Manifold Area

This section applies to areas beneath the concrete **within the manifolds**, such as:

- Surface beds
- Raft foundations
- Retaining walls
- Concrete channels
- Draw Boxes
- Manhole foundations
- Culverts

Unless otherwise specified by the Engineer, the standard earthworks for the areas listed above, as shown in figure 1, shall include:

- a. A 150 mm layer at the bottom of the excavation, ripped and recompact to 90 % Mod AASHTO.
- b. A minimum of three layers of G6 quality material compacted to 98 % Mod AASHTO in layers not exceeding 150 mm.
- c. A 50 mm thick blinding where applicable.

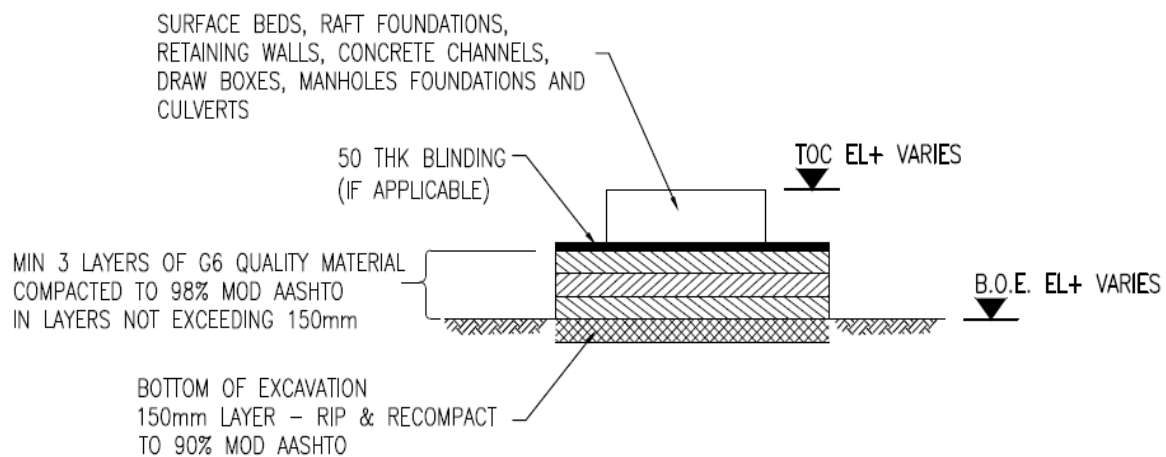


Figure 1: Typical Detail – Earthworks Section Under Concrete

7.2 Block Valve Chambers

Unless otherwise specified by the Engineer, the typical earthworks for a block valve (BV) chamber shall include the following:

- a. A 150 mm layer of in-situ material ripped and recompact to 93% Mod AASHTO.
- b. A minimum of two layers of G6 material compacted to 98% Mod AASHTO in layers not exceeding 150mm . Provided the in-situ material is suitable, it may be utilized.
- c. A 2mm thick HDPE liner .
- d. A maximum particle of 3mm is allowed beneath the HDPE liner. If the excavated soil is unsuitable , a stabilised sand blinding 50 mm (minimum) should be placed.

7.3 Buried Pipelines and Prefabricated Culverts

This section of the specification addresses earthworks for trenches for all types and sizes of buried pipelines, ducts, cables, and prefabricated culverts. All works shall be accordance with SANS2001 – DP1.

7.3.1 Selected Granular Material

Selected granular material shall, unless otherwise specified in the scope of work, be material of a granular, non-cohesive nature that is free draining, has a maximum aggregate size of 20 mm and has a compaction fraction that does not exceed 0.3.

7.3.2 Selected Fill Material

Selected fill material shall, unless otherwise specified in the scope of work, be material that has a PI that does not exceed 6 and that is free of vegetation, lumps and stones the largest dimension of which does not exceed 30 mm.

7.3.3 Fine Granular Material

Selected fill material all of which passes through a 6,70 mm sieve and not more than 10% of which passes through a 0,15 mm sieve.

7.3.4 Backfill Material

Backfill material shall be as indicated in 4.2.

7.3.5 Bedding and Padding

The bedding and padding materials to be placed around and over the pipelines in trenches shall be in accordance with the Transnet Pipelines Bedding and Padding Specification (PL 890).

7.4 Pavements

7.4.1 Service Roads

Service roads are surfaced with asphalt, gravel, paving blocks, or concrete, depending on functional requirements.

7.4.1.1 In areas subjected to loads from road traffic , the backfill shall have a PI that does not exceed 12 and a minimum CBR of 15% at specified density if the backfill is to be placed in the upper 150mm of the subgrade . If placed lower in the subgrade , the backfill must have a minimum CBR of 7%.

7.4.1.2 The road shall be suitably designed to withstand the maximum load imposed by all operational vehicles required for depot and/or servitude activities, and to allow for travel with reasonable ease and safety at a speed of 15 km/hr within the depot.

7.4.1.3 Where specified, a wearing course, complying with the following, shall be provided over the foundation layer:

- a. Thickness (minimum) : 150 mm
- b. Percentage by mass passing the 0.075 mm sieve : 10 to 40.
- c. PI : 8-17
- d. Compaction : 93 % Mod AASHTO maximum dry density in the case of cohesive soil or 98 % in the case of non-cohesive soil.
- e. Minimum CBR after compaction : 15

7.4.1.4 In all cases, effective drainage of the road shall be provided to prevent ponding. Unless otherwise specified, the cross fall shall be in a direction away from the earthworks.

7.4.1.5 Concrete Service Road

Unless otherwise specified by the Engineer, the typical earthworks for concrete service roads shall include:

- a. Subbase layer: 150 mm G7 compacted to 95% Mod AASHTO
- b. Base layer: 150 mm C3 compacted to 95% Mod AASHTO
- c. Surface layer: 190 mm reinforced concrete grade C35

7.4.1.6 Asphalt Service Road

Unless otherwise specified by the Engineer, the typical earthworks for asphalt service roads shall include:

- a. Subbase layer: 150 mm G7 compacted to 93% Mod AASHTO
- b. Lower subbase: 150 mm C3 compacted to 95% Mod AASHTO
- c. Upper base layer: 150 mm G1 compacted to 98% Mod AASHTO
- d. Surface layer: 40 mm asphalt continuously graded

7.4.2 Gravel/ Haul Roads

Unless otherwise specified by the Engineer, the typical earthworks for gravel roads shall include:

- a. Lower subbase layer: 150 mm G5 compacted to 93% Mod AASHTO dry density
- b. Base layer : 150 mm G5 compacted to 95% Mod AASTHO dry density
- c. Gravel surface layer: 150 mm wearing course gravel compacted to 95% Mod AASHTO dry density

7.5 Single-Storey Type 1 Masonry Buildings

7.5.1 Geotechnical investigations

7.5.1.1 Geotechnical site investigations shall be undertaken under the direction of a competent person (geotechnical), who shall document and formulate an opinion regarding the parameters upon which the design of the foundations is to be based and, in the case of a, shall classify the site in accordance with the descriptors contained in table 1 of 4.2.3 of SANS 10400 – H Foundations.

7.5.1.2 The competent person (geotechnical) shall investigate and advise on the necessity of installing subsurface drains on sites:

- a. in marshy areas
- b. that have shallow water tables, and
- c. that are to be terraced to the extent that the depth of cut below original ground level exceeds 0.75m .

7.5.2 Foundations

7.5.2.1 Foundations for all buildings shall be designed by a competent person to reduce total soil movements and shall be in accordance with SANS10400-H.

7.5.2.2 On sloping sites steeper than 1:4 where landslip is not a consideration, the site shall be cut or backfilled (or both) and compacted to not less than 93% Mod AASHTO density at -1% to +2% of optimum moisture content and benched into the in-situ material, under the supervision of a competent person (civil engineering) such that the fill-

- a. extends at least 1m beyond the face of the structure and has a side slope not steeper than 1:1 with respect to the horizontal, and the slope of the fill is covered with a lightly compacted material to reduce the external slope to 1:2 or flatter, or

- b. is retained by either a deepened reinforced concrete beam which forms an integral part of the slab, or by a masonry foundation wall in accordance with the requirements of SANS 10400 -B or SANS10400-K, as relevant.

ANNEXURE A

Table 1: Granular Materials and Soils Specification

Code	Material	Abbreviated Specification
G1	Graded crushed stone	Dense - graded unweathered crushed stone; Maximum size 37.5 mm, 86 - 88 % apparent relative density; Soil fines PI < 4
G2	Graded crushed stone	Dense - graded crushed stone; Maximum size 37,5 mm; 100 - 102 % Mod. AASHTO or 85 % bulk relative density; Soil fines PI < 6
G3	Graded crushed stone	Dense -graded stone and soil binder; Maximum size 37.5 mm, 98 - 100 % Mod. AASHTO; Soil fines PI < 6
G4	Crushed or natural gravel	Minimum CBR = 80 % @ 98 % Mod. AASHTO; Maximum size 37.5 mm, PI < 6
G5	Natural gravel	Minimum CBR = 45 % @ 95 % Mod. AASHTO; Maximum size 63 mm or 2/3 of layer thickness, Density as per prescribed layer usage, PI < 10
G6	Natural gravel	Minimum CBR = 25 % @ 95 % Mod. AASHTO; Maximum size 63 mm or 2/3 of layer thickness; Density as per prescribed layer usage; PI < 12;
G7	Gravel/ soil	Minimum CBR = 15 % @ 93 % Mod. AASHTO; Maximum size 2/3 of layer thickness; Density as per prescribed layer usage; PI < 12
G8	Gravel/ soil	Minimum CBR = 10 % @ 93 % Mod. AASHTO; Maximum size 2/3 of layer thickness; Density as per prescribed layer usage; PI < 12

G9	Gravel/ soil	Minimum CBR = 7 % @ 93 % Mod. AASHTO; Maximum size 2/3 of layer thickness; Density as per prescribed layer usage; PI < 12
G10	Gravel/ soil	Minimum CBR = 3 % @ 93 % Mod. AASHTO; Maximum size 2/3 of layer thickness; Density as per prescribed layer usage; or 90 % Mod. AASHTO.

Table 2: Materials Testing

Tests Required	Material Classification TRH14							Test Method
	G4	G5	G6	G7	G8	G9	G10	
Grading (sieve analysis)	x	x	x	x	x	x		SANS 3001-GR1 SANS 3001-GR2 SANS 3001-GR3
Moisture Content	x	x	x	x	x	x	x	SANS3001-GR20
Atterberg Limits	x	x	x	x	x	x		SANS 3001-GR10 SANS 3001-GR12
Strength (CBR)	x	x	x	x	x	x	x	SANS 3001-GR40
Swell (CBR)	x	x	x	x	x	x	x	
Flakiness Index	x							SANS 3001-AG4
Durability								
Soundness of Mudrocks and Shales (Venter Test)	x	x	x	x	x	x	x	SANS 3001-AG13
Durability Mill Index	x							SANS 3001-AG16
Soluble Salts								
pH & Electrical conductivity	x	x	x	x	x	x	x	TMH1 A20 & A21T (SANS 3001-GR32)