

Transnet Rail Infrastructure Manager
an Operating Division **TRANSNET SOC LTD**
[Registration Number 1990/000900/30]

REQUEST FOR QUOTATION (RFQ) ERACMM-PRC-48399

**FOR THE SUPPLY, DELIVERY AND INSTALL OF HANDRAILING FOR BRIDGES BETWEEN
ELUBANA AND IDONDOTHA UNDER DEPOT ENGINEERING OF RICHARDS BAY**

RFQ NUMBER	: ERACMM-PRC-48399
ISSUE DATE	: 22 OCTOBER 2025
COMPULSORY SITE BRIEFING DATE	: 29 OCTOBER 2025
CLOSING DATE	: 05 NOVEMBER 2025
CLOSING TIME	: 10h00am
TENDER VALIDITY PERIOD	: 28 JANUARY 2026

Note to the bidders:

Bidders are required to ensure that electronic bid submissions are done at least a day before the closing date to prevent issues which they may encounter due to their internet speed, bandwidth or the size of the number of uploads they are submitting. Transnet will not be held liable for any challenges experienced by bidders as a result of the technical challenges. Please do not wait for the last hour to submit. A Bidder can upload 30mb per upload and multiple uploads are permitted.

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T1.1 Tender notice and invitation to tender

SECTION 1: NOTICE TO TENDERERS

1. INVITATION TO TENDER

Responses to this Tender [hereinafter referred to as a **Tender**] are requested from persons, companies, close corporations or enterprises [hereinafter referred to as a Tenderer].

DESCRIPTION	For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay <i>(service)</i>
TENDER DOWNLOADING	This RFP may be downloaded directly from National Treasury's e-Tender Publication Portal at www.etenders.gov.za free of charge To download RFP and Annexures: - Click on "Tender Opportunities"; - Select "Advertised Tenders"; - In the "Department" box, select Transnet SOC Ltd. Once the tender has been in the list, click on the 'Tender documents' tab and process to download all uploaded documents. The RFP may also be downloaded from the Transnet Portal at https://transnetetenders.azurewebsites.net (please use Google Chrome to access Transnet link/site) free of charge (refer to section 2, paragraph 3 below for detailed steps)
COMPULSORY BRIEFING SESSION	A Compulsory Tender Clarification meeting point will be from Transnet - Malahle House, 4 Kiewiet Road at Empangeni Depot on 29 October 2025 at [12:00 PM] for a period of ±30 minutes) thereafter will proceed to site where service will be done. For directions contact Sizakele Mazibuko on 073 777 7131 For commercial enquiries: Matete Kutumela by email to: matete.kutumela@transnet.net [Tenderers to provide own transportation and accommodation]. The Compulsory Tender Clarification Meeting will start punctually and information will not be repeated for the benefit of Tenderers arriving late.



	A Site visit/walk will take place, tenderers are to note: • Tenderers are required to wear safety shoes, goggles, long sleeve shirts, high visibility vests and hard hats. • Tenderers without the recommended PPE will not be allowed on the site walk. • Tenderers and their employees, visitors, clients and customers entering Transnet Offices, Depots, Workshops and Stores will have to undergo breathalyser testing. • All forms of firearms are prohibited on Transnet properties and premises. • The relevant persons attending the meeting must ensure that their identity documents, passports or drivers licences are on them for inspection at the access control gates. Certificate of Attendance in the form set out in the Returnable Schedule T2.2-1 hereto must be completed and submitted with your Tender as proof of attendance is required for a compulsory site meeting and/or tender briefing. Tenderers are required to bring this Returnable Schedule T2.2-1 to the Compulsory Tender Clarification Meeting to be signed by the <i>Employer's</i> Representative. Tenderers failing to attend the compulsory tender briefing will be disqualified.
CLOSING DATE	10:00 am on 05 November 2025 Tenderers must ensure that tenders are uploaded timeously onto the system. If a tender is late, it will not be accepted for consideration

2. TENDER SUBMISSION

Transnet has implemented a new electronic tender submission system, the e-Tender Submission Portal, in line with the overall Transnet digitalization strategy where suppliers can view advertised tenders, register their information, log their intent to respond to bids and upload their bid proposals/responses on to the system.

- a) The Transnet e-Tender Submission Portal can be accessed as follows:

Log on to the Transnet eTenders management platform website

(<https://transnetetenders.azurewebsites.net>);

- Click on “ADVERTISED TENDERS” to view advertised tenders;
 - Click on “SIGN IN/REGISTER – for bidder to register their information (must fill in all mandatory information);
 - Click on “SIGN IN/REGISTER” - to sign in if already registered;
 - Toggle (click to switch) the “Log an Intent” button to submit a bid;
 - Submit bid documents by uploading them into the system against each tender selected.
 - **Tenderers are required to ensure that electronic bid submissions are done at least a day before the closing date to prevent issues which they may encounter due to their internet speed, bandwidth or the size of the number of uploads they are submitting. Transnet will not be held liable for any challenges experienced by bidders as a result of the technical challenges. Please do not wait for the last hour to submit. A Tenderer can upload 30mb per upload and multiple uploads are permitted.**
- b) The tender offers to this tender will be opened as soon as possible after the closing date and time. Transnet shall not, at the opening of tenders, disclose to any other company any confidential details pertaining to the Tender Offers / information received, i.e. pricing, delivery, etc. The names and locations of the Tenderers will be divulged to other Tenderers upon request.
- c) Submissions must not contain documents relating to any Tender other than that shown on the submission.

3. CONFIDENTIALITY

All information related to this RFQ is to be treated with strict confidentiality. In this regard Tenderers are required to certify that they have acquainted themselves with the Non-Disclosure Agreement. All information related to a subsequent contract, both during and after completion thereof, will be treated with strict confidence. Should the need however arise to divulge any information gleaned from provision of the Works, which is either directly or indirectly related to Transnet’s business, written approval to divulge such information must be obtained from Transnet.

4. DISCLAIMERS

Tenderers are hereby advised that Transnet is not committed to any course of action as a result of its issuance of this Tender and/or its receipt of a tender offer. In particular, please note that Transnet reserves the right to:



Description Of The Service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bayt

- 4.1. Award the business to the highest scoring Tenderer/s unless objective criteria justify the award to another tenderer.
 - 4.2. Not necessarily accept the lowest priced tender or an alternative Tender;
 - 4.3. Go to the open market if the quoted rates (for award of work) are deemed unreasonable;
 - 4.4. Should the Tenderers be awarded business on strength of information furnished by the Tenderer, which after conclusion of the contract is proved to have been incorrect, Transnet reserves the right to terminate the contract;
 - 4.5. Request audited financial statements or other documentation for the purposes of a due diligence exercise;
 - 4.6. Not accept any changes or purported changes by the Tenderer to the tender rates after the closing date;
 - 4.7. Verify any information supplied by a Tenderer by submitting a tender, the Tenderer/s hereby irrevocably grant the necessary consent to the Transnet to do so;
 - 4.8. Conduct the evaluation process in parallel. The evaluation of Tenderers at any given stage must therefore not be interpreted to mean that Tenderers have necessarily passed any previous stage(s);
 - 4.9. Unless otherwise expressly stated, each tender lodged in response to the invitation to tender shall be deemed to be an offer by the Tenderer. The Employer has the right in its sole and unfettered discretion not to accept any offer.
 - 4.10. Not be held liable if tenderers do not provide the correct contact details during the clarification session and do not receive the latest information regarding this RFQ with the possible consequence of being disadvantaged or disqualified as a result thereof.
 - 4.11. Transnet reserves the right to exclude any Tenderers from the tender process who has been convicted of a serious breach of law during the preceding 5 [five] years including but not limited to breaches of the Competition Act 89 of 1998, as amended. Tenderers are required to indicate in tender returnable on T2.2-16], **[Breach of Law]** whether or not they have been found guilty of a serious breach of law during the past 5 [five] years.
 - 4.12. Transnet reserves the right to perform a risk analysis on the preferred tenderer to ascertain if any of the following might present an unacceptable commercial risk to the employer:
 - *unduly high or unduly low tendered rates or amounts in the tender offer;*
 - *contract data of contract provided by the tenderer; or*
 - *the contents of the tender returnables which are to be included in the contract.*
5. Transnet will not reimburse any Tenderer for any preparatory costs or other work performed in connection with this Tender, whether or not the Tenderer is awarded a contract.

Description Of The Service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bayt

6. NATIONAL TREASURY'S CENTRAL SUPPLIER DATABASE

Tenderer are required to self-register on National Treasury's Central Supplier Database (CSD) which has been established to centrally administer supplier information for all organs of state and facilitate the verification of certain key supplier information. The CSD can be accessed at <https://secure.csd.gov.za/>. Tenderer are required to provide the following to Transnet in order to enable it to verify information on the CSD:

Supplier Number..... and Unique registration reference
number.....(**Tender Data**)

Transnet urges its clients, suppliers and the general public

to report any fraud or corruption to

TIP-OFFS ANONYMOUS: 0800 003 056 OR Transnet@tip-offs.com

T1.2 Tender Data

The conditions of tender are the Standard Conditions of Tender as contained in Annex C of the CIDB Standard for Uniformity in Engineering and Construction Service Contracts. The Standard for Uniformity in Construction Procurement was first published in Board Notice 62 of 2004 in Government Gazette No 26427 of 9 June 2004. It was subsequently amended in Board Notice 67 of 2005 in Government Gazette No 28127 of 14 October 2005, Board Notice 93 of 2006 in Government Gazette No 29138 of 18 August 2006, Board Notice No 9 of 2008 in Government Gazette No 31823 of 30 January 2009, Board Notice 86 of 2010 in Government Gazette No 33239 of 28 May 2010, Board Notice 136 of 2015 in Government Gazette 38960 of 10 July 2015 and Board Notice 423 of 2019 in Government Gazette No 42622 of 8 August 2019.

This edition incorporates the amendments made in Board Notice 423 of 2019 in Government Gazette 42622 of 8 August 2019. (see www.cidb.org.za).

The Standard Conditions of Tender make several references to Tender data for detail that apply specifically to this tender. The Tender Data shall have precedence in the interpretation of any ambiguity or inconsistency between it and the Standard Conditions of Tender.

Each item of data given below is cross-referenced in the left-hand column to the clause in the Standard Conditions of Tender to which it mainly applies.

Clause	Data	
C.1.1	The <i>Employer</i> is	Transnet SOC Ltd (Reg No. 1990/000900/30)
C.1.2	The tender documents issued by the <i>Employer</i> comprise:	
	Part T: The Tender	
	Part T1: Tendering procedures	T1.1 Tender notice and invitation to tender T1.2 Tender data
	Part T2 : Returnable documents	T2.1 List of returnable documents T2.2 Returnable schedules
	Part C: The contract	
	Part C1: Agreements and contract data	C1.1 Form of offer and acceptance C1.2 Contract data (Part 1 & 2)
	Part C2: Pricing data	C2.1 Pricing instructions C2.2 Price List
	Part C3: Scope of work	C3.1 Service Information
	Part C4: Affected Property	C4.1 Affected Property
C.1.4	The Employer's agent is:	Regional Procurement Manager
	Name:	Yvonne Scannell
	Address:	Nzasm Building

		Cnr of Minnaar and Paul Kruger Streets Pretoria 0001
	Tel No.	012 315 2059
	E – mail	Yvonne.scannell@transnet.net
C.2.1	Only those tenderers who satisfy the following eligibility criteria are eligible to submit tenders: Stage One - Eligibility with regards to attendance at the compulsory clarification meeting: An authorised representative of the tendering entity or a representative of a tendering entity that intends to form a Joint Venture (JV) must attend the compulsory clarification meeting in terms C2.7 Stage Two - Eligibility in terms of the Construction Industry Development Board: a) Only those tenderers who are registered with the CIDB, or are capable of being so prior to the evaluation of submissions, in a contractor grading designation equal to or higher than a contractor grading designation determined in accordance with the sum tendered or a value determined in accordance with Regulation 25 (1B) or 25(7A) of the Construction Industry Development Regulations, designation of 4 CE or higher class of construction work, are eligible to have their tenders evaluated. b) Joint Venture (JV) Joint ventures are eligible to submit tenders subject to the following: - every member of the joint venture is registered with the CIDB; - the lead partner has a contractor grading designation of not lower than one level below the required class of construction works under consideration and possesses the required recognition status; and - the combined Contractor grading designation calculated in accordance with the Construction Industry Development Regulations is equal to or higher than a Contractor grading designation determined in accordance with the sum tendered for a 4 CE - or higher class of construction work or a value determined in accordance with Regulation 25(1B) or 25(7A) of the Construction Industry Development Regulations - The tenderer shall provide a certified copy of its signed joint venture agreement. <i>Any tenderer that fails to meet the stipulated eligibility criteria will be regarded as an unacceptable tender.</i> Stage 3 - Functionality Criteria Only those tenderers who obtain the minimum qualifying score for functionality will be evaluated further in terms of price and the applicable preference point system. The minimum qualifying for score for functionality is 70 points. The evaluation criteria for measuring functionality and the points for each criteria and, if any, each sub-criterion are as stated in C.3.11.3 below.	

C2.7	The arrangements for a compulsory clarification meeting are as stated in the Tender Notice and Invitation to Tender. Tenderers must complete and sign the attendance register. Addenda will be issued to and tenders will only be received from those tendering entities including those entities that intends forming a joint venture appearing on the attendance register. Tenderers are also required to bring their RFP document to the briefing session and have their returnable document T2.2-1 certificate of attendance signed off by the Employer's authorised representative.
C.2.12	No alternative tender offers will be considered.
C.2.13.3	Each tender offer shall be in the English Language .
C.2.13.5 C2.15.1	The <i>Employer's</i> details and identification details that are to be shown on each tender offer package are as follows:
C.2.13.9	Telephonic, telegraphic, facsimile or e-mailed tender offers will not be accepted.
C.2.15	The closing time for submission of 05 November 2025 Location: The Transnet e-Tender Submission Portal: (https://transnetetenders.azurewebsites.net); <u>NO LATE TENDERS WILL BE ACCEPTED</u>
C.2.16	The tender offer validity period is 12 weeks after the closing date. Tenderers are to note that they may be requested to extend the validity period of their tender, on the same terms and conditions, if Transnet's internal evaluation and governance approval processes has not been finalised within the validity period.
C.2.23	The tenderer is required to submit with his tender: 1. A valid Tax Clearance Certificate issued by the South African Revenue Services. <u>Tenderers also to provide Transnet with a TCS PIN to verify Tenderers compliance status.</u> 2. A valid B-BBEE Certificate from a Verification Agency accredited by the South African Accreditation System [SANAS], or a sworn affidavit confirming annual turnover and level of black ownership in case of all black youth with 51% black ownership or more together with the tender; 3. A Valid CIDB CRS Number in order to confirm the correct and required designated grading 4 Proof of registration on the Central Supplier Database 5 Letter of Good Standing with the Workmen's compensation fund by the tendering entity or separate Letters of Good Standing from all members of a newly constituted JV. Note: Refer to Section T2.1 for List of Returnable Documents
C3.11	Only tenders that achieve the minimum qualifying score for functionality will be evaluated in further in accordance with the 80/20 preference points systems as described in Preferential Procurement Regulations. 80 where the financial value of one or more responsive tenders received have a value equal to or below R50 million, inclusive of all applicable taxes

Thresholds	Minimum Threshold
Functionality	70

Evaluation Criteria	Final Weighted Scores
Price	80
Specific Goals	20
Total Score:	100

Up to 100 minus W_1 tender evaluation points will be awarded to tenderers who complete the preferencing schedule and who are found to be eligible for the preference claimed. **Should the evidence required for any of the Specific Goals applicable in this tender not be provided, a tenderer will score zero preference points for that particular "Specific Goal".**

In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, the following preference points must be awarded to a bidder who provides the relevant required evidence for claiming points

Selected Specific Goal	Number of points allocated (80/20)
B-BBEE Level of contributor – Level 1 or 2	5
Entities that are at least 50% Black Youth Owned Entities	5
EME and QSE entities that are at least 51% Black Owned	5
Local Content and Production Steel Products designated at 100% - Steel Products for construction (Handrails) designated at 100% - Fully completed, declared, and signed LC Annexures C, D and E score full 5 points) - Incomplete, submitted blank or not submitted LC Annexures score zero points In case the suppliers do not meet required LC Thresholds DTIC Exemption letter will be required in support for scoring purposes Exemption process is attached as Annexure A	5
Non-Compliant and/or B-BBEE Level 3-8 contributors	0

Up to 100 minus W_1 tender evaluation points will be awarded to tenderers who complete the preferencing schedule and who are found to be eligible for the preference claimed. **Should the evidence required for any of the Specific Goals applicable in this tender not be**

provided, a tenderer will score zero preference points for that particular “Specific Goal”.

In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, the following preference points must be awarded to a bidder who provides the relevant required evidence for claiming points

The following Table represents the evidence to be submitted for claiming preference points for applicable specific goals in a particular tender:

Specific Goals	Acceptable Evidence
B-BBEE	B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
Entities that are at least 50% Black Youth Owned Entities	CI B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
EME or QSE 51% Black Owned	B-BBEE Certificate / Sworn-Affidavit / CIPC Certificate
Local Content and Local Production	Returnable Local Content and production Annexures

Note: Transnet reserves the right to carry out an independent audit of the tenderers scorecard components at any stage from the date of close of the tenders until completion of the contract.at any stage from the date of close of the tenders until completion of the contract.

The procedure for the evaluation of responsive tenders is Functionality, Price and Preference:

Only those tenderers who attain the minimum number of evaluation points for Functionality will be eligible for further evaluation, failure to meet the minimum threshold will result in the tender being disqualified and removed from any further consideration.

Functionality Criteria

The functionality criteria and maximum score in respect of each of the criteria are as follows:

(Please see CIDB Compiler guidance note T1.2 – Tender Data).

Functionality criteria	Maximum number of points
T2.2.2 Capability and ability to meet delivery schedule	30
T2.2.3 Management of CV 's and key personnel qualifications	30
T2.2.4 Proven experience in installing handrailing for bridges	40
Maximum possible score for Functionality	100

Functionality shall be scored independently by not less than 3 (three) evaluators and averaged in accordance with the following schedules:

	T2.2.2 Capability and ability to meet delivery schedule (1 month) T2.2.3 Management of CV 's and key personnel qualification T2.2.4 Proven experience in installing hand-railing for bridges Each evaluation criteria will be assessed in terms of scores of 0, 40, 70, 90, 100 The scores of each of the evaluators will be averaged, weighted and then totalled to obtain the final score for functionality, unless scored collectively. (See CIDB Inform Practice Note #9). Note: Any tender not complying with the above mentioned requirements, will be regarded as non-responsive and will therefore <u>not</u> be considered for further evaluation. This note must be read in conjunction with Clause C.2.1.
C.3.13	Tender offers will only be accepted if: 1. The tenderer or any of its directors/shareholders is not listed on the Register of Tender Defaulters in terms of the Prevention and Combating of Corrupt Activities Act of 2004 as a person prohibited from doing business with the public sector; 2. the tenderer does not appear on Transnet's list for restricted tenderers and National Treasury's list of Tender Defaulters; 3. the tenderer has fully and properly completed the Compulsory Enterprise Questionnaire and there are no conflicts of interest which may impact on the tenderer's ability to perform the contract in the best interests of the Employer or potentially compromise the tender process and persons in the employ of the state. 4. Transnet reserves the right to award the tender to the tenderer who scores the highest number of points overall, unless there are objective criteria which will justify the award of the tender to another tenderer. Objective criteria include but are not limited to the outcome of a due diligence exercise to be conducted. The due diligence exercise may take the following factors into account inter alia; the tenderer: a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement, b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract, c) has the legal capacity to enter into the contract, d) is not insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act, 2008, bankrupt or being wound up, has his affairs administered by a court or a judicial officer, has suspended his business activities, or is subject to legal proceedings in respect of any of the foregoing,

	e) complies with the legal requirements, if any, stated in the tender data and f) is able, in the option of the employer to perform the contract free of conflicts of interest.
C.3.17	The number of paper copies of the signed contract to be provided by the Employer is 1 (one).

T2.1 LIST OF RETURNABLE DOCUMENTS

These schedules are required for eligibility purposes:

T2.2.1 Stage One - Eligibility with regards to attendance at the compulsory clarification meeting:

- **(Certificate of Attendance at Tender Clarification and Site Meeting (fully completed and signed by Transnet Official))**

NB: Any tenderer that fails to meet the above stipulated eligibility criteria will be regarded as an unacceptable tender.

These schedules will be utilised for evaluation purposes:

T2.2.2 Capability and ability to meet delivery schedule

T2.2.3 Management of CV 's of key personnel

T2.2.4 Proven experience in installing hand-railing for bridges

T2.2 List of Returnable Schedules

2.1.3 Returnable Schedules:

General:

- T2.2.5 Health and Safety Questionnaire
- T2.2.6 Health and Safety Cost Breakdown
- T2.2-7 Authority to submit a Tender
- T2 2-8 Record of Addenda
- T2.2-9 Letter of Good Standing
- T2.2-10 Risk Elements
- T2.2-11 Schedule of proposed Subcontractor
- T2.2-12 Affected Property Establishment requirements

Agreement and Commitment by Tenderer:

- T2.2-13 CIDB SFU ANNEX G Compulsory Enterprise Questionnaire
- T2.2-14 Non-Disclosure Agreement
- T2.2-15 RFQ Declaration Form
- T2.2-16 RFQ – Breach of Law
- T2.2-17 Certificate of Acquaintance with Tender Document
- T2.2-18 Service Provider Integrity Pact
- T2.2-19 POPI Act form

Bonds/Guarantees/Financial/Insurance:

- T2.2-20 Insurance provided by the *Contractor*
- T2.2-21 Three (3) years audited financial statements

Transnet Vendor Registration Form:

- T2.2-22 Transnet Vendor Registration Form

2. Contract Data

2.1 C1.1 Offer portion of Form of Offer & Acceptance

2.2 C1.2 Contract Data Contract Data Part Two (Data by Contractor)

2.3 C2.2 Price List

T2.2-1: Eligibility Criteria Schedule: Certificate of Attendance at Tender Clarification Meeting

This is to certify that

(Company Name)

Represented
by:

(Name and
Surname)

Was represented at the compulsory tender clarification meeting

Held at:		
On (date)		Starting time:

Particulars of person(s) attending the meeting:

Name

Signature

Capacity

Attendance of the above company at the meeting was confirmed:

Name

Signature

**For and on Behalf of the
Employers Agent.**

Date

T2-2: Evaluation Schedule: Capacity and Ability to meet Delivery Schedule

Note to tenderers:

The Tenderer is required to demonstrate to the *Employer* that the tenderer has sufficient current and future capacity to carry out the work as detailed in the Service Information and that the tenderer has the capacity and plans in place to meet the required delivery schedule as required. To this end, the following must be provided by the Tenderer:

The tenderer shall provide the Proposed service plan/ Garnt chart showing but not limited to the following:

- Ability to execute the service in terms of the *Employer's* requirements and within the required timeframe indicating, in a logical sequence, the order and timing of the construction that will take place in order to Provide the Works clearly indicating the capacity & capability to achieve the dates stated in the Contract Data.
- Dates when the *Contractor* will need access to any part of the Site; submission & approval process & timing for Health & Safety Files, Environmental Files and Quality Files. In addition the Program must clearly demonstrate the procurement process for all long lead items if applicable.
- The *Contractor* indicates how he plans in achieving the following dates and clearly demonstrates them on the schedule - Start Date, Access Date, Planned Completion, Key Dates/Sectional Completion Dates & Completion Date. In addition, the Program clearly demonstrates adequate provisions for Time Risk Allowance (TRA). Time Risk Allowances are not float, are owned by the Tenderer, can be included in the activity duration and illustrated in the schedule in a code field or as an attachment.

Index of documentation attached to this schedule:

.....
.....
.....
.....
.....
.....

Note to tenderers:

Garn Chart

Tenderer must provide an electronic copy of the Gantt Chart in Ms Word or any other compatible software.

The table below is for information purposes only to indicate the method of scoring that will be followed to evaluate the previous experience relevant to project submitted by the Tenderer:

Scoring will be as follows;

Total Points 30	Capacity and Ability to meet Delivery Schedule
Score 0	0 = Did not submit any proof of delivery schedule
Score 40	40 = Contractor has indicated delivery schedule of > 3 months
Score 70	70 = Contractor has indicated delivery schedule of > 2 – 3 months
Score 90	90 = Contractor has indicated delivery schedule of > 1 - ≤ 2 months
Score 100	100 = Contractor has indicated delivery schedule of ≤ 1 month

NB: If the above information not provided, it will have a negative influence on your technical evaluation scoring

Signed	Date
Name	Position
Tenderer	

T2.2-3: Evaluation Schedule: Management of CV's of Key Personnel

The tender must be able to demonstrate that the project personnel have sufficient knowledge, experience and qualifications to provide the required services and submit the following documents as a minimum with the tender:

i. The qualifications of assigned key persons in relation to the scope of service will be evaluated. The following knowledge/ registration will be required:

ii.

- **Civil engineering technical knowledge in bridges and structures**
- **Service manager registered with Built Environment Professional Body**

ii Comprehensive CV's should be attached to this schedule:

As a minimum each CV should address the following, but not limited to

Personal particulars

- a. Name
- b. Place (s) of tertiary education and dates associated therewith
- c. Professional awards

lii Qualifications (degrees, diplomas, grades of membership of professional societies and professional registrations)

Name of current employer and position in enterprise

Overview of post graduate experience (year, organization and position)

Outline of recent assignments / experience that has a bearing on the Scope of Service

List of Key Persons assigned to the above disciplines

No.	Key Persons	Name and Surname	CV attached (Yes/No)
1			
2			
3			
4			
5			
6			

The scoring of the Management & CV's of Key Persons will be as follows:

The table below is for information purposes only to indicate the method of scoring that will be followed to evaluate the management of CV and qualification submitted by the Tenderer

Management of CV's of Key Personnel = 30
0 = No proof of technical knowledge in bridges and structures submitted
40 = CV's submitted but not related to civil technical knowledge in bridges and structures
70 = CV's submitted with no civil engineering technical knowledge in bridges and structures but service manager is registered with built environment professional body
90 = CV's submitted with civil engineering technical knowledge in bridges and structures but the service manager not registered with built environment professional body
100 = CV's submitted with civil engineering technical knowledge in bridges and structures and service manager registered with built environment professional body

NB: If the above information not provided, it will have a negative influence on your technical evaluation scoring

Signed

Date

Name

Position

Tenderer

T2.2-4 Evaluation Schedule: Previous Experience in installing handrailing for bridges

Note to tenderers:

Tenderers are required to demonstrate performance in comparable projects of similar size and nature by supplying the following:

- A list of past / current comparable projects in installing handrailing for bridges (previous PO's and completion certificates only (No Letter of award or appointment will be accepted))
- Construction of similar service as detailed in the Service Information with reference to:

- **Previous experience in installing handrail for bridges**

Sufficient references to substantiate experience indicated (Client name and contact details, project description, duration and contract value)

Index of documentation attached to this schedule

	DOCUMENT NAME
1	
2	
3	
4	
5	
6	
7	

Client	Client contact details	Project Description	Year of project completion	Contract Value	Subcontractors

NB: If the above information not provided, it will have a negative influence on your technical evaluation scoring

The table below is for information purposes only to indicate the method of scoring that will be followed to evaluate the previous experience submitted by the Tenderer

Previous experience in installing handrailing for bridges = 40
0 = Did not submit any proof of experience in installing handrailing for bridges
40 = Contractor has experience in installing handrailing for bridges and completed (1-2) projects and submitted previous PO's and/or completion certificates
70 = Contractor has experience in installing handrailing for bridges and completed three (3) projects and submitted previous PO's and/or completion certificates
90 = Contractor has experience in installing handrailing for bridges and completed four (4) projects and submitted previous PO's and/or completion certificates
100 = Contractor has experience in installing handrailing for bridges and completed five (5) projects and submitted previous PO's and/or completion certificates

Signed	_____	Date	_____
Name	_____	Position	_____
Tenderer	_____		

2.1.3 Returnable Schedules: General:

T2.2-5: Health and Safety Questionnaire

1. SAFE WORK PERFORMANCE			
1A. Injury Experience / Historical Performance - Alberta			
Use the previous three years injury and illness records to complete the following:			
Year			
Number of medical treatment cases			
Number of restricted workday cases			
Number of lost time injury cases			
Number of fatal injuries			
Total recordable frequency			
Lost time injury frequency			
Number of worker manhours			
1 - Medical Treatment Case	Any occupational injury or illness requiring treatment provided by a physician or treatment provided under the direction of a physician		
2 – Restricted Work Day Case	Any occupational injury or illness that prevents a worker from performing any of his/her craft jurisdiction duties		
3 – Lost Time injury Cases	Any occupational injury that prevents the worker from performing any work for at least one day		
4 – Total Recordable Frequency	Total number of Medical Treatment, Restricted Work and Lost Time Injury cases multiplied by 200,000 then divided by total manhours		
5- Lost Time Injury Frequency	Total number of Lost Time Injury cases multiplied by 200,000 then divide by total manhours		
1B. Workers' Compensation Experience			
Use the previous three years injury and illness records to complete the following (if applicable):			
Industry Code:		Industry Classification:	
Year			
Industry Rate			
Contractor Rate			
% Discount or Surcharge			
Is your Workers' Compensation account in good standing? (Please provide letter of confirmation)		☐ Yes ☐ No	
2. CITATIONS			
2A.	Has your company been cited, charged or prosecuted under Health, Safety and/or Environmental Legislation in the last 5 years?		
	☐ Yes ☐ No If yes, provide details:		

2B.	Has your company been cited, charged or prosecuted under the above Legislation in another Country, Region or State? ☐ Yes ☐ No If yes, provide details:
3. CERTIFICATE OF RECOGNITION	
Does your company have a Certificate of Recognition? ☐ Yes ☐ No If Yes, what is the Certificate No. _____ Issue Date _____	

4. SAFETY PROGRAM					
Do you have a written safety program manual?				☐ Yes	☐ No
If Yes, provide a copy for review					
Do you have a pocket safety booklet for field distribution?				☐ Yes	☐ No
If Yes, provide a copy for review					
Does your safety program contain the following elements:					
	YES	NO		YES	NO
CORPORATE SAFETY POLICY	☐	☐	EQUIPMENT MAINTENANCE	☐	☐
INCIDENT NOTIFICATION POLICY	☐	☐	EMERGENCY RESPONSE	☐	☐
RECORDKEEPING & STATISTICS	☐	☐	HAZARD ASSESSMENT	☐	☐
REFERENCE TO LEGISLATION	☐	☐	SAFE WORK PRACTICES	☐	☐
GENERAL RULES & REGULATIONS	☐	☐	SAFE WORK PROCEDURES	☐	☐
PROGRESSIVE DISCIPLINE POLICY	☐	☐	WORKPLACE INSPECTIONS	☐	☐
RESPONSIBILITIES	☐	☐	INVESTIGATION PROCESS	☐	☐
PPE STANDARDS	☐	☐	TRAINING POLICY & PROGRAM	☐	☐
ENVIRONMENTAL STANDARDS	☐	☐	COMMUNICATION PROCESSES	☐	☐
MODIFIED WORK PROGRAM	☐	☐			
5. TRAINING PROGRAM					
5A.	Do you have an orientation program for new hire employees?			☐ Yes	☐ No
If Yes, include a course outline. Does it include any of the following:					
	YES	NO		YES	NO
GENERAL RULES & REGULATIONS	☐	☐	CONFINED SPACE ENTRY	☐	☐
EMERGENCY REPORTING	☐	☐	TRENCHING & EXCAVATION	☐	☐
INJURY REPORTING	☐	☐	SIGNS & BARRICADES	☐	☐
LEGISLATION	☐	☐	DANGEROUS HOLES & OPENINGS	☐	☐
RIGHT TO REFUSE WORK	☐	☐	RIGGING & CRANES	☐	☐
PERSONAL PROTECTIVE EQUIPMENT	☐	☐	MOBILE VEHICLES	☐	☐
EMERGENCY PROCEDURES	☐	☐	PREVENTATIVE MAINTENANCE	☐	☐
PROJECT SAFETY COMMITTEE	☐	☐	HAND & POWER TOOLS	☐	☐
HOUSEKEEPING	☐	☐	FIRE PREVENTION & PROTECTION	☐	☐
LADDERS & SCAFFOLDS	☐	☐	CIVIL SAFETY	☐	☐

FALL ARREST STANDARDS	☐	☐	COMPRESSED GAS CYLINDERS	☐	☐
AERIAL WORK PLATFORMS	☐	☐	WEATHER EXTREMES	☐	☐

5B. Do you have a program for training newly hired or promoted supervisors? ☐ Yes ☐ No (If Yes, submit an outline for evaluation. Does it include instruction on the following:					
	Yes	No		Yes	No
EMPLOYER RESPONSIBILITIES	☐	☐	SAFETY COMMUNICATION	☐	☐
EMPLOYEE RESPONSIBILITIES	☐	☐	FIRST AID/MEDICAL PROCEDURES	☐	☐
DUE DILIGENCE	☐	☐	NEW WORKER TRAINING	☐	☐
SAFETY LEADERSHIP	☐	☐	ENVIRONMENTAL REQUIREMENTS	☐	☐
WORK REFUSALS	☐	☐	HAZARD ASSESSMENT	☐	☐
INSPECTION PROCESSES	☐	☐	PRE-JOB SAFETY INSTRUCTION	☐	☐
EMERGENCY PROCEDURES	☐	☐	DRUG & ALCOHOL POLICY	☐	☐
INCIDENT INVESTIGATION	☐	☐	PROGRESSIVE DISCIPLINARY POLICY	☐	☐
SAFE WORK PROCEDURES	☐	☐	SAFE WORK PRACTICES	☐	☐
SAFETY MEETINGS	☐	☐	NOTIFICATION REQUIREMENTS	☐	☐

6. SAFETY ACTIVITIES

Do you conduct safety inspections? Yes No Weekly Monthly Quarterly
☐ ☐ ☐ ☐ ☐

Describe your safety inspection process (include participation, documentation requirements, follow-up, report distribution).

Who follows up on inspection action items? _____

Do you hold site safety meetings for field employees? If Yes, how often?
Yes No Daily Weekly Biweekly
☐ ☐ ☐ ☐ ☐

Do you hold site meetings where safety is addressed with management and field supervisors?
Yes No Weekly Biweekly Monthly
☐ ☐ ☐ ☐ ☐

Is pre-job safety instruction provided before to each new task? ☐ Yes ☐ No

Is the process documented? ☐ Yes ☐ No

Who leads the discussion? _____

Do you have a hazard assessment process? ☐ Yes ☐ No

- Are hazard assessments documented? If yes, how are hazard assessments communicated and implemented on each project? Who is responsible for leading the hazard assessment process?

Does your company have policies and procedures for environmental protection, spill clean-up, reporting, waste disposal, and recycling as part of the Health & Safety Program?
☐ Yes ☐ No

How does your company measure its H&S success?

- Attach separate sheet to explain

7.	SAFETY STEWARDSHIP					
7A	Are incident reports and report summaries sent to the following and how often?					
		Yes	No	Monthly	Quarterly	Annually
	Project/Site Manager	☐	☐	☐	☐	☐
	Managing Director	☐	☐	☐	☐	☐
	Safety Director/Manager	☐	☐	☐	☐	☐
	/Chief Executive Officer	☐	☐	☐	☐	☐
7B	How are incident records and summaries kept? How often are they reported internally?					
		Yes	No	Monthly	Quarterly	Annually
	Incidents totaled for the entire company	☐	☐	☐	☐	☐
	Incidents totaled by project	☐	☐	☐	☐	☐
	• Subtotaled by superintendent	☐	☐	☐	☐	☐
	• Subtotaled by foreman	☐	☐	☐	☐	☐
7C	How are the costs of individual incidents kept? How often are they reported internally?					
		Yes	No	Monthly	Quarterly	Annually
	Costs totaled for the entire company	☐	☐	☐	☐	☐
	Costs totaled by project	☐	☐	☐	☐	☐
	• Subtotaled by superintendent	☐	☐	☐	☐	☐
	• 0Subtotaled by foreman/general foreman	☐	☐	☐	☐	☐
7D	Does your company track non-injury incidents?					
		Yes	No	Monthly	Quarterly	Annually
	Near Miss	☐	☐	☐	☐	☐
	Property Damage	☐	☐	☐	☐	☐
	Fire	☐	☐	☐	☐	☐
	Security	☐	☐	☐	☐	☐
	Environmental	☐	☐	☐	☐	☐
8	PERSONNEL					
	List key health and safety officers planned for this project. Attach resume.					
	Name	Position/Title		Designation		
	Supply name, address and phone number of your company's corporate health and safety representative. Does this individual have responsibilities other than health, safety and environment?					
	Name	Address		Telephone Number		
	Other responsibilities:					
9	REFERENCES					
	List the last three company's your form has worked for that could verify the quality and management commitment to your occupational Health & Safety program					
	Name and Company	Address		Phone Number		

T2.2-6 Health and Safety Cost Breakdown

Tenderer (Company)	Responsible Person	Designation	Date
Project/Tender Title	Project/Tender No.	Project Location / Description	

#	Cost element	Unit Cost (R)	# of Units	Total Cost (R)
1.	Human Resources			
2.	Systems Documentation			
3.	Meetings & Administration			
4.	H&S Training			
5.	PPE & Safety Equipment			
6.	Signage & Barricading			
7.	Workplace Facilities			
8.	Emergency & Rescue Measures			
9.	Hygiene Surveys & Monitoring			
10.	Medical Surveillance			
11.	Safe Transport of Workers			
12.	HazMat Management (e.g. asbestos /silica)			
13.	Substance Abuse Testing (3 kits @R500 pm)			
14.	H&S Reward & Recognition			

Total Health and Safety Estimate (R)	
Total Estimate Value (R)	
H&S Cost as % of Tender value	

T2.2-7 Authority to submit a Tender

Indicate the status of the tenderer by ticking the appropriate box hereunder. The tenderer must complete the certificate set out below for his category of organisation or alternatively attach a certified copy of a company / organisation document which provides the same information for the relevant category as requested here.

A - COMPANY	B - PARTNERSHIP	C - JOINT VENTURE	D - SOLE PROPRIETOR

A. Certificate for Company

I, _____ chairperson of the board of directors _____
_____, hereby confirm that by resolution of the board taken on _____ (date),
Mr/Ms _____, acting in the capacity of _____
_____, was authorised to sign all documents in connection with this tender offer and any contract resulting from it
on behalf of the company.

Signed

Date

Name

Position

Chairman of the Board of Directors

B. Certificate for Partnership

We, the undersigned, being the **key partners** in the business trading as _____
_____ hereby authorise Mr/Ms _____ acting in the capacity of _____
_____, to sign all documents in connection with the tender offer for Contract _____
_____ and any contract resulting from it on our behalf.

Name	Address	Signature	Date

NOTE: This certificate is to be completed and signed by the full number of Partners necessary to commit the Partnership. Attach additional pages if more space is required.

C. Certificate for Joint Venture

We, the undersigned, are submitting this tender offer in Joint Venture and hereby authorise Mr/Ms _____, an authorised signatory of the company _____, acting in the capacity of lead partner, to sign all documents in connection with the tender offer for Contract _____ and any contract resulting from it on our behalf.

This authorisation is evidenced by the attached power of attorney signed by legally authorised signatories of all the partners to the Joint Venture.

Furthermore, we attach to this Schedule a copy of the joint venture agreement which incorporates a statement that all partners are liable jointly and severally for the execution of the contract and that the lead partner is authorised to incur liabilities, receive instructions and payments and be responsible for the entire execution of the contract for and on behalf of any and all the partners.

Name of firm	Address	Authorising signature, name (in caps) and capacity

D. Certificate for Sole Proprietor

I, _____, hereby confirm that I am the sole owner of the business trading as _____.

Signed

Date

Name

Position

Sole Proprietor

T2.2-8 Record of Addenda to Tender Documents

This schedule as submitted confirms that the following communications received from the *Employer* before the submission of this tender offer, amending the tender documents, have been taken into account in this specific tender offer:

	Date	Title or Details
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Attach additional pages if more space is required.

T2.2-9 Letter/s of Good Standing with the Workmen's Compensation Fund

Attached to this schedule is the Letter/s of Good Standing.

- 1.
- 2.
- 3.
- 4.

Name of Company/Members of Joint Venture:

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

T2.2-10: Risk Elements

Tenderers to identify and evaluate the potential risk elements associated with the Service and possible mitigation thereof. The risk elements and the mitigation as identified thereof by the Tenderer are to be submitted.

If No Risks are identified "No Risks" must be stated on this schedule.

Tenderers are also to evaluate any risk/s stated by the *Employer* in Contract Data Part C1, and provide possible mitigation thereof.

Tenders to note: Notwithstanding this information, all costs related to risk elements which are at the Contractor's risk are deemed to be included in the tenderer's offered total of the Prices.

T2.2-11: Schedule of Proposed Subcontractors

- The tenderer is required to provide details of all the sub-contractors that will be utilised in the execution of the service.

Note to tenderers: .

- Tenderer to note that after award, any deviations from this list of proposed sub-contractors will be subject to acceptance by the *Service Manager* in terms of the Conditions of Contract.
- 00Provide information of the Sub-contractors below:

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work
% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships		Military Veterans
	☐	☐	☐	☐	☐	☐	☐	☐

•

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work
% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships		Military Veterans
	☐	☐	☐	☐	☐	☐	☐	☐

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work
% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships		Military Veterans
	☐	☐	☐	☐	☐	☐	☐	☐

•

Name of Proposed Subcontractor			Address		Nature of work		Amount of Worked	Percentage of work

Transnet Rail Infrastructure Manager

Tender Number: RFP ERACMM-PRC-48399

Description of the service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

% Black Owned	EME	QSE	Youth	Women	Disabilities	Rural/ Underdeveloped areas/ Townships	Military Veterans	
	☐	☐	☐	☐	☐	☐	☐	

T2.2-12: Affected Property Establishment Requirements

Tenderers to indicate their Affected Property establishment requirements:

This image shows a single page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is a vertical margin line on the left side, creating a narrow left margin. The paper appears to be from a notebook or a standard writing template.

T2.2-13 ANNEX G Compulsory Enterprise Questionnaire

The following particulars hereunder must be furnished.

In the case of a Joint Venture, separate enterprise questionnaires in respect of each partner/member must be completed and submitted.

Section 1: Name of enterprise: _____

Section 2: VAT registration number, if any: _____

Section 3: CIDB registration number, if any: _____

Section 4: CSD number: _____

Section 5: Particulars of sole proprietors and partners in partnerships

Name	Identity number	Personal income tax number

* Complete only if sole proprietor or partnership and attach separate page if more than 3 partners

Section 6: Particulars of companies and close corporations

Company registration number _____

Close corporation number _____

Tax reference number: _____

•

Section 7: The attached SBD 6 must be completed for each tender and be attached as a tender requirement.

Section 8: The attached SBD 4 must be completed for each tender and be attached as a requirement.

The undersigned, who warrants that he / she is duly authorised to do so on behalf of the enterprise:

- i) authorizes the Employer to obtain a tax clearance certificate from the South African Revenue Services that my / our tax matters are in order;
- ii) confirms that the neither the name of the enterprise or the name of any partner, manager, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears on the Register of Tender Defaulters established in terms of the Prevention and Combating of Corrupt Activities Act of 2004;
- iii) confirms that no partner, member, director or other person, who wholly or partly exercises, or may exercise, control over the enterprise appears, has within the last five years been convicted of fraud or corruption;
- iv) confirms that I / we are not associated, linked or involved with any other tendering entities submitting tender offers and have no other relationship with any of the tenderers or those responsible for compiling the scope of work that could cause or be interpreted as a conflict of interest; and
- v) confirms that the contents of this questionnaire are within my personal knowledge and are to the best of my belief both true and correct.

Signed

Date

Name

Position

Enterprise
name

SPECIFIC GOALS POINTS CLAIM FORM

This preference form must form part of all bids invited. It contains general information and serves as a claim for preference points for specific goals Contribution. Transnet will award preference points to companies who provide valid proof of evidence of as per the table below.

NB: BEFORE COMPLETING THIS FORM, BIDDERS MUST STUDY THE GENERAL CONDITIONS, DEFINITIONS AND DIRECTIVES APPLICABLE IN RESPECT OF SPECIFIC GOALS, AS PRESCRIBED IN THE PREFERENTIAL PROCUREMENT POLICY FRAMEWORK ACT, 2000.

1. GENERAL CONDITIONS

- 1.1 The following preference point systems are applicable to all bids:
- the 80/20 system for requirements with a Rand value of up to R50 000 000 (all applicable taxes included); and
- 1.2 The value of this bid is estimated to not exceed R50 000 000 (all applicable taxes included) and therefore the 80/20 preference point system shall be applicable. Despite the stipulated preference point system, Transnet shall use the lowest acceptable bid to determine the applicable preference point system in a situation where all received acceptable bids are received outside the stated preference point system.
- 1.3 The 80/20 preference point system will be applicable to this tender.
- 1.4 Preference points for this bid shall be awarded for:
- (a) Price;
 - (b) B-BBEE Status Level of Contribution.
 - (c) Any other specific goal determined in Transnet preferential procurement policy.
- 1.5 The maximum points for this bid are allocated as follows:

	POINTS
PRICE	80
SPECIFIC GOALS Refer to clause 3.2 below	20
Total points for Price and Specific Goals must not exceed	100

- 1.6 Failure on the part of a bidder to submit proof of specific goals together with the bid will be interpreted to mean that preference points for B-BBEE status level of contribution are not claimed.
- 1.7 The purchaser reserves the right to require of a bidder, either before a bid is adjudicated or at any time subsequently, to substantiate any claim in regard to preferences, in any manner required by the purchaser.

2. DEFINITIONS

- (a) **“all applicable taxes”** includes value-added tax, pay as you earn, income tax, unemployment insurance fund contributions and skills development levies;
- (b) **“B-BBEE”** means broad-based black economic empowerment as defined in section 1 of the Broad-Based Black Economic Empowerment Act;
- (c) **“B-BBEE status level of contributor”** means the B-BBEE status received by a measured entity based on its overall performance using the relevant scorecard contained in the Codes of Good Practice on Black Economic Empowerment, issued in terms of section 9(1) of the Broad-Based Black Economic Empowerment Act;
- (d) **“bid”** means a written offer in a prescribed or stipulated form in response to an invitation by an organ of state for the supply/provision of services, service or goods, through price quotations, advertised competitive bidding processes or proposals;
- (e) **“Broad-Based Black Economic Empowerment Act”** means the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (f) **“EME”** means an Exempted Micro Enterprise as defines by Codes of Good Practice under section 9 (1) of the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (g) **“functionality”** means the ability of a bidder to provide goods or services in accordance with specification as set out in the bid documents;
- (h) **“Price”** includes all applicable taxes less all unconditional discounts.
- (i) **“Proof of B-BBEE Status Level of Contributor”** means:
 - 1) B-BBEE status level certificate issued by an unauthorised body or person;
 - 2) A sworn affidavit as prescribed by the B-BBEE Codes of Good Practice;
 - 3) Any other requirement prescribed in terms of the B-BBEE Act.
- (j) **“QSE”** means a Qualifying Small EEnterprise in terms of a Codes of Good Practice under section 9 (1) of the Broad-Based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003);
- (k) **“rand value”** means the total estimated value of a contract in South African currency, calculated at the time of bid invitations, and includes all applicable taxes and excise duties.
- (l) **“Specific goals”** means targeted advancement areas or categories of persons or groups either previously disadvantaged or falling within the scope of the Reconstruction and Development Programme identified by Transnet to be given preference in allocation of procurement contracts in line with section 2(1) of the PPPFA.

3. POINTS AWARDED FOR PRICE

3.1 THE 80/20 PREFERENCE POINT SYSTEMS

A maximum of 80 points is allocated for price on the following basis:

80/20

$$P_s = 80 \left(1 - \frac{P_t - P_{\min}}{P_{\min}} \right)$$

Where

P_s = Points scored for comparative price of bid under consideration

P_t = Comparative price of bid under consideration

$P_{\min}$ = Comparative price of lowest acceptable bid

In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, the following preference points must be awarded to a bidder who provides the relevant required evidence for claiming points

3.2

Selected Specific Goal	Number of points allocated (20)
B-BBEE Level of contributor – Level 1 or 2	5
Entities that are at least 50% Black Youth Owned Entities	5
EME or QSE 51% Black Owned	5
Local Content and Local Production	5
Non-Compliant and/or B-BBEE Level 3-8 contributors	0

4. EVIDENCE REQUIRED FOR CLAIMING SPECIFIC GOALS

4.1 In terms of Transnet Preferential Procurement Policy (TPPP) and Procurement Manuals, preference points must be awarded to a bidder for providing evidence in accordance with the table below:

Specific Goals	Acceptable Evidence
B-BBEE	B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
Entities that are at least 50% Black Youth Owned Entities	CI B-BBEE Certificate / Sworn- Affidavit / B-BBEE CIPC Certificate (in case of JV, a consolidated scorecard will be accepted) as per DTIC guideline
EME or QSE 51% Black Owned	B-BBEE Certificate / Sworn-Affidavit / CIPC Certificate
Local Content and Local Production	Returnable Local Content and production Annexures

4.2 The table below indicates the required proof of B-BBEE status depending on the category of enterprises:

Enterprise	B-BBEE Certificate & Sworn Affidavit
Large	Certificate issued by SANAS accredited verification agency
QSE	Certificate issued by SANAS accredited verification agency Sworn-Affidavit signed by the authorised QSE representative and attested by a Commissioner of Oaths confirming annual turnover and black ownership (only black-owned QSEs - 51% to 100% Black owned) [Sworn- affidavits must substantially comply with the format that can be obtained on the DTI's website at www.dti.gov.za/economic_empowerment/bee_codes.jsp .]
EME	Sworn-Affidavit signed by the authorised EME representative and attested by a Commissioner of Oaths confirming annual turnover and black ownership Certificate issued by CIPC (formerly CIPRO) confirming annual turnover and black ownership Certificate issued by SANAS accredited verification agency only if the EME is being measured on the QSE scorecard

4.3 A trust, consortium or joint venture (including unincorporated consortia and joint ventures) must submit a consolidated B-BBEE Status Level verification certificate for every separate bid.

4.4 Tertiary Institutions and Public Entities will be required to submit their B-BBEE status level certificates in terms of the specialized scorecard contained in the B-BBEE Codes of Good Practice.

4.5 A person will not be awarded points for B-BBEE status level if it is indicated in the bid documents that such a bidder intends sub-contracting more than 25% of the value of the contract to any other enterprise that does not qualify for at least the points that such a bidder qualifies for, unless the intended sub-contractor is an EME that has the capability and ability to execute the sub-contract.

4.6 A person awarded a contract may not sub-contract more than 25% of the value of the contract to any other enterprise that does not have an equal or higher B-BBEE status level than the person concerned, unless the contract is sub-contracted to an EME that has the capability and ability to execute the sub-contract.

4.7 Bidders are to note that the rules pertaining to B-BBEE verification and other B-BBEE requirements may be changed from time to time by regulatory bodies such as National Treasury or the DTI. It is the Bidder's responsibility to ensure that his/her bid complies fully with all B-BBEE requirements at the time of the submission of the bid.

5. BID DECLARATION

5.1 Bidders who claim points in respect of B-BBEE Status Level of Contribution must complete the following:

6. B-BBEE STATUS LEVEL OF CONTRIBUTION CLAIMED IN TERMS OF PARAGRAPHS 6.1

6.1 B-BBEE Status Level of Contribution: . = ...(based on point distribution per Table 3.2)

6.2

(Points claimed in respect of paragraph 6.1 must be in accordance with the table reflected in table 3.2 and must be substantiated by relevant proof of B-BBEE status level of contributor.

7. SUB-CONTRACTING

7.1 Will any portion of the contract be sub-contracted?

(Tick applicable box)

YES		NO	
-----	--	----	--

7.1.1 If yes, indicate:

- i) What percentage of the contract will be subcontracted.....%
- ii) The name of the sub-contractor.....
- iii) The B-BBEE status level of the sub-contractor.....
- iv) Whether the sub-contractor is an EME or QSE

(Tick applicable box)

YES		NO	
-----	--	----	--

v) Specify, by ticking the appropriate box, if subcontracting with any of the enterprises below:

Designated Group: An EME or QSE which is at last 51% owned by:	EME √	QSE √
Black people		
Black people who are youth		
Black people who are women		
Black people with disabilities		
Black people living in rural or underdeveloped areas or townships		
Cooperative owned by black people		
Black people who are military veterans		
OR		
Any EME		
Any QSE		

8. DECLARATION WITH REGARD TO COMPANY/FIRM

8.1 Name of company/firm:.....

8.2 VAT registration number:.....

8.3 Company registration number:.....

8.4 TYPE OF COMPANY/ FIRM

- Partnership/Joint Venture / Consortium
- One person business/sole propriety
- Close corporation
- Company
- (Pty) Limited

[TICK APPLICABLE BOX]

8.5 DESCRIBE PRINCIPAL BUSINESS ACTIVITIES

8.6 COMPANY CLASSIFICATION

- Manufacturer
- Supplier
- Professional service provider
- Other service providers, e.g. transporter, etc.

[TICK APPLICABLE BOX]

8.7 Total number of years the company/firm has been in business:.....

8.8 I/we, the undersigned, who is / are duly authorised to do so on behalf of the company/firm, certify that the points claimed, based on the B-BBEE status level of contribution indicated in paragraph 6.1 of the foregoing certificate, qualifies the company/ firm for the preference(s) shown and I / we acknowledge that:

- i) The information furnished is true and correct;
- ii) The preference points claimed are in accordance with the General Conditions as indicated in paragraph 1 of this form;
- iii) In the event of a contract being awarded as a result of points claimed as shown in paragraph 6.1, the contractor may be required to furnish documentary proof to the satisfaction of the purchaser that the claims are correct;
- iv) If specific goals have been claimed or obtained on a fraudulent basis or any of the conditions of contract have not been fulfilled, the purchaser may, in addition to any other remedy it may have-
 - (a) disqualify the person from the bidding process;
 - (b) recover costs, losses or damages it has incurred or suffered as a result of that person's conduct;
 - (c) cancel the contract and claim any damages which it has suffered as a result of having to make less favourable arrangements due to such cancellation;
 - (d) if the successful bidder subcontracted a portion of the bid to another person without disclosing it, Transnet reserves the right to penalise the bidder up to 10 percent of the value of the contract;
 - (e) recommend that the bidder or contractor, its shareholders and directors, or only the shareholders and directors who acted on a fraudulent basis, be restricted by the National Treasury from obtaining business from any organ of state for a period not exceeding 10 years, after the *audi alteram partem* (hear the other side) rule has been applied; and
 - (f) forward the matter for criminal prosecution.

WITNESSES

1.
2.

CPM

SIGNATURE(S) OF BIDDERS(S)

DATE:

ADDRESS

BIDDER'S DISCLOSURE

1. PURPOSE OF THE FORM

Any person (natural or juristic) may make an offer or offers in terms of this invitation to bid. In line with the principles of transparency, accountability, impartiality, and ethics as enshrined in the Constitution of the Republic of South Africa and further expressed in various pieces of legislation, it is required for the bidder to make this declaration in respect of the details required hereunder.

Where a person/s are listed in the Register for Tender Defaulters and / or the List of Restricted Suppliers, that person will automatically be disqualified from the bid process.

2. Bidder's declaration

2.1 Is the bidder, or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest¹ in the enterprise, employed by the state? **YES/NO**

2.1.1 If so, furnish particulars of the names, individual identity numbers, and, if applicable, state employee numbers of sole proprietor/ directors / trustees / shareholders / members/ partners or any person having a controlling interest in the enterprise, in table below.

Full Name	Identity Number	Name of State institution

2.2 Do you, or any person connected with the bidder, have a relationship with any person who is employed by the procuring institution? **YES/NO**

2.2.1 If so, furnish particulars:

.....
.....

2.3 Does the bidder or any of its directors / trustees / shareholders / members / partners or any person having a controlling interest in the enterprise have any interest in any other related enterprise whether or not they are bidding for this contract? **YES/NO**

¹ the power, by one person or a group of persons holding the majority of the equity of an enterprise, alternatively, the person/s having the deciding vote or power to influence or to direct the course and decisions of the enterprise.

2.3.1 If so, furnish particulars:

.....
.....

3 DECLARATION

I, the undersigned, (name)..... in submitting the accompanying bid, do hereby make the following statements that I certify to be true and complete in every respect:

- 3.1 I have read and I understand the contents of this disclosure;
- 3.2 I understand that the accompanying bid will be disqualified if this disclosure is found not to be true and complete in every respect;
- 3.3 The bidder has arrived at the accompanying bid independently from, and without consultation, communication, agreement or arrangement with any competitor. However, communication between partners in a joint venture or consortium² will not be construed as collusive bidding.
- 3.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications, prices, including methods, factors or formulas used to calculate prices, market allocation, the intention or decision to submit or not to submit the bid, bidding with the intention not to win the bid and conditions or delivery particulars of the products or services to which this bid invitation relates.
- 3.4 The terms of the accompanying bid have not been, and will not be, disclosed by the bidder, directly or indirectly, to any competitor, prior to the date and time of the official bid opening or of the awarding of the contract.
- 3.5 There have been no consultations, communications, agreements or arrangements made by the bidder with any official of the procuring institution in relation to this procurement process prior to and during the bidding process except to provide clarification on the bid submitted where so required by the institution; and the bidder was not involved in the drafting of the specifications or terms of reference for this bid.
- 3.6 I am aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to bids and contracts, bids that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and or may be reported to the National Prosecuting Authority (NPA) for criminal investigation and or may be restricted from conducting business with the public sector for a period not exceeding ten (10) years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

I CERTIFY THAT THE INFORMATION FURNISHED IN PARAGRAPHS 1, 2 and 3 ABOVE IS CORRECT.
I ACCEPT THAT THE STATE MAY REJECT THE BID OR ACT AGAINST ME IN TERMS OF PARAGRAPH 6 OF PFMA SCM INSTRUCTION 03 OF 2021/22 ON PREVENTING AND COMBATING ABUSE IN THE SUPPLY CHAIN MANAGEMENT SYSTEM SHOULD THIS DECLARATION PROVE TO BE FALSE.

.....
Signature

.....
Date

.....
Position

.....
Name of bidder

² Joint venture or Consortium means an association of persons for the purpose of combining their expertise, property, capital, efforts, skill and knowledge in an activity for the execution of a contract.

T2.2-14 NON-DISCLOSURE AGREEMENT

Note to tenderers: This Non-Disclosure Agreement is to be completed and signed by an authorised signatory:

THIS AGREEMENT is made effective as of day of 20..... by and between:

TRANSNET SOC LTD

(Registration No. 1990/000900/30), a company incorporated and existing under the laws of South Africa, having its principal place of business at Transnet Corporate Centre 138 Eloff Street , Braamfontein , Johannesburg 2000

and

.....
(Registration No.), a private company incorporated and existing under the laws of South Africa having its principal place of business at
.....
.....

WHEREAS

Transnet and the Company wish to exchange Information [as defined below] and it is envisaged that each party may from time to time receive Information relating to the other in respect thereof. In consideration of each party making available to the other such Information, the parties jointly agree that any dealings between them shall be subject to the terms and conditions of this Agreement which themselves will be subject to the parameters of the Tender Document.

IT IS HEREBY AGREED

IT IS HEREBY AGREED

1. INTERPRETATION

In this Agreement:

- 1.1 **Agents** mean directors, officers, employees, agents, professional advisers, contractors or sub-contractors, or any Group member;
- 1.2 **Bid or Bid Document** (hereinafter Tender) means Transnet's Request for Information [RFI] Request for Proposal [RFQ] or Request for Quotation [RFQ], as the case may be;
- 1.3 **Confidential Information** means any information or other data relating to one party [the **Disclosing Party**] and/or the business carried on or proposed or intended to be carried on by that party and which is made available for the purposes of the Bid to the other party [the **Receiving Party**] or its Agents by the Disclosing Party or its Agents or recorded in agreed minutes following oral disclosure and any other

information otherwise made available by the Disclosing Party or its Agents to the Receiving Party or its Agents, whether before, on or after the date of this Agreement, and whether in writing or otherwise, including any information, analysis or specifications derived from, containing or reflecting such information but excluding information which:

- 1.3.1 *is publicly available at the time of its disclosure or becomes publicly available [other than as a result of disclosure by the Receiving Party or any of its Agents contrary to the terms of this Agreement]; or*
- 1.3.2 *was lawfully in the possession of the Receiving Party or its Agents [as can be demonstrated by its written records or other reasonable evidence] free of any restriction as to its use or disclosure prior to its being so disclosed; or*
- 1.3.3 *following such disclosure, becomes available to the Receiving Party or its Agents [as can be demonstrated by its written records or other reasonable evidence] from a source other than the Disclosing Party or its Agents, which source is not bound by any duty of confidentiality owed, directly or indirectly, to the Disclosing Party in relation to such information;*
- 1.4 **Group** means any subsidiary, any holding company and any subsidiary of any holding company of either party; and
- 1.5 **Information** means all information in whatever form including, without limitation, any information relating to systems, operations, plans, intentions, market opportunities, know-how, trade secrets and business affairs whether in writing, conveyed orally or by machine-readable medium.

2. CONFIDENTIAL INFORMATION

- 2.1 All Confidential Information given by one party to this Agreement [the **Disclosing Party**] to the other party [the **Receiving Party**] will be treated by the Receiving Party as secret and confidential and will not, without the Disclosing Party's written consent, directly or indirectly communicate or disclose [whether in writing or orally or in any other manner] Confidential Information to any other person other than in accordance with the terms of this Agreement.
- 2.2 The Receiving Party will only use the Confidential Information for the sole purpose of technical and commercial discussions between the parties in relation to the Tender or for the subsequent performance of any contract between the parties in relation to the Tender.
- 2.3 Notwithstanding clause above, the Receiving Party may disclose Confidential Information:
 - 2.3.1 *to those of its above, provided that the Receiving Party shall ensure that such Agents are made aware prior to the disclosure of any part of the Confidential Information that the same is confidential and that they owe a duty of confidence to the Disclosing Party. The Receiving Party shall at all times remain liable for any actions of such Agents that would constitute a breach of this Agreement; or*
 - 2.3.2 *to the extent required by law or the rules of any applicable regulatory authority, subject to clause*
- 2.4 In the event that the Receiving Party is required to disclose any Confidential Information in accordance with clause above, it shall promptly notify the Disclosing Party and cooperate with the Disclosing Party

regarding the form, nature, content and purpose of such disclosure or any action which the Disclosing Party may reasonably take to challenge the validity of such requirement.

2.5 In the event that any Confidential Information shall be copied, disclosed or used otherwise than as permitted under this Agreement then, upon becoming aware of the same, without prejudice to any rights or remedies of the Disclosing Party, the Receiving Party shall as soon as practicable notify the Disclosing Party of such event and if requested take such steps [including the institution of legal proceedings] as shall be necessary to remedy [if capable of remedy] the default and/or to prevent further unauthorised copying, disclosure or use.

2.6 All Confidential Information shall remain the property of the Disclosing Party and its disclosure shall not confer on the Receiving Party any rights, including intellectual property rights over the Confidential Information whatsoever, beyond those contained in this Agreement.

3. RECORDS AND RETURN OF INFORMATION

3.1 The Receiving Party agrees to ensure proper and secure storage of all Information and any copies thereof.

3.2 The Receiving Party shall keep a written record, to be supplied to the Disclosing Party upon request, of the Confidential Information provided and any copies made thereof and, so far as is reasonably practicable, of the location of such Confidential Information and any copies thereof.

3.3 The Company shall, within 7 [seven] days of receipt of a written demand from Transnet:

3.3.1 *return all written Confidential Information [including all copies]; and*

3.3.2 *expunge or destroy any Confidential Information from any computer, word processor or other device whatsoever into which it was copied, read or programmed by the Company or on its behalf.*

3.4 The Company shall on request supply a certificate signed by a director as to its full compliance with the requirements of clause above.

4. ANNOUNCEMENTS

4.1 Neither party will make or permit to be made any announcement or disclosure of its prospective interest in the Tender without the prior written consent of the other party.

4.2 Neither party shall make use of the other party's name or any information acquired through its dealings with the other party for publicity or marketing purposes without the prior written consent of the other party.

5. DURATION

The obligations of each party and its Agents under this Agreement shall survive the termination of any discussions or negotiations between the parties regarding the Tender and continue thereafter for a period of 5 [five] years.

6. PRINCIPAL

Each party confirms that it is acting as principal and not as nominee, agent or broker for any other person and that it will be responsible for any costs incurred by it or its advisers in considering or pursuing the Tender and in complying with the terms of this Agreement.

7. ADEQUACY OF DAMAGES

Nothing contained in this Agreement shall be construed as prohibiting the Disclosing Party from pursuing any other remedies available to it, either at law or in equity, for any such threatened or actual breach of this Agreement, including specific performance, recovery of damages or otherwise.

8. PRIVACY AND DATA PROTECTION

- 8.1 The Receiving Party undertakes to comply with South Africa's general privacy protection in terms Section 14 of the Bill of Rights in connection with this Tender and shall procure that its personnel shall observe the provisions of such Act [as applicable] or any amendments and re-enactments thereof and any regulations made pursuant thereto.
- 8.2 The Receiving Party warrants that it and its Agents have the appropriate technical and organisational measures in place against unauthorised or unlawful processing of data relating to the Tender and against accidental loss or destruction of, or damage to such data held or processed by them.

9. GENERAL

- 9.1 Neither party may assign the benefit of this Agreement, or any interest hereunder, except with the prior written consent of the other, save that Transnet may assign this Agreement at any time to any member of the Transnet Group.
- 9.2 No failure or delay in exercising any right, power or privilege under this Agreement will operate as a waiver of it, nor will any single or partial exercise of it preclude any further exercise or the exercise of any right, power or privilege under this Agreement or otherwise.
- 9.3 The provisions of this Agreement shall be severable in the event that any of its provisions are held by a court of competent jurisdiction or other applicable authority to be invalid, void or otherwise unenforceable, and the remaining provisions shall remain enforceable to the fullest extent permitted by law.
- 9.4 This Agreement may only be modified by a written agreement duly signed by persons authorised on behalf of each party.
- 9.5 Nothing in this Agreement shall constitute the creation of a partnership, joint venture or agency between the parties.
- 9.6 This Agreement will be governed by and construed in accordance with South African law and the parties irrevocably submit to the exclusive jurisdiction of the South African courts.

Signed

Date

Name

Position

Tenderer

T2.2-15: RFQ DECLARATION FORM

NAME OF COMPANY: _____

We _____ do hereby certify that:

1. Transnet has supplied and we have received appropriate tender offers to any/all questions (as applicable) which were submitted by ourselves for tender clarification purposes;
2. we have received all information we deemed necessary for the completion of this Tender;
3. at no stage have we received additional information relating to the subject matter of this tender from Transnet sources, other than information formally received from the designated Transnet contact(s) as nominated in the tender documents;
4. we are satisfied, insofar as our company is concerned, that the processes and procedures adopted by Transnet in issuing this tender and the requirements requested from tenderers in responding to this tender have been conducted in a fair and transparent manner; and
5. furthermore, we acknowledge that a direct relationship exists between a family member and/or an owner / member / director / partner / shareholder (unlisted companies) of our company and an employee or board member of the Transnet Group as indicated below: *[Respondent to indicate if this section is not applicable]*

FULL NAME OF OWNER/MEMBER/DIRECTOR/

PARTNER/SHAREHOLDER:

ADDRESS:

Indicate nature of relationship with Transnet:

[Failure to furnish complete and accurate information in this regard may lead to the disqualification of your response and may preclude a Respondent from doing future business with Transnet]

We declare, to the extent that we are aware or become aware of any relationship between ourselves and Transnet (other than any existing and appropriate business relationship with Transnet) which could unfairly advantage our company in the forthcoming adjudication process, we shall notify Transnet immediately in writing of such circumstances.

6. We accept that any dispute pertaining to this tender will be resolved through the Ombudsman process and will be subject to the Terms of Reference of the Ombudsman. The Ombudsman process must first be exhausted before judicial review of a decision is sought. (Refer "Important Notice to respondents" below).
7. We further accept that Transnet reserves the right to reverse a tender award or decision based on the recommendations of the Ombudsman without having to follow a formal court process to have such award or decision set aside.
8. We have acquainted ourselves and agree with the content of T2.2-25 "Service Provider Integrity Pact".

For and on behalf of duly authorised thereto
Name:
Signature:
Date:

IMPORTANT NOTICE TO TENDERERS

Transnet has appointed a Procurement Ombudsman to investigate any material complaint in respect of tenders exceeding R5,000,000.00 (five million S.A. Rand) in value. Should a Tenderer have any material concern regarding an tender process which meets this value threshold, a complaint may be lodged with Transnet's Procurement Ombudsman for further investigation.

It is incumbent on the Tenderer to familiarise himself/herself with the Terms of Reference for the Transnet Procurement Ombudsman, details of which are available for review at Transnet's website www.transnet.net.

An official complaint form may be downloaded from this website and submitted, together with any supporting documentation, within the prescribed period, to procurement.ombud@transnet.net

For transactions below the R5,000,000.00 (five million S.A. Rand) threshold, a complaint may be lodged with the Chief Procurement Officer of the relevant Transnet Operating Division.

All Tenderers should note that a complaint must be made in good faith. If a complaint is made in bad faith, Transnet reserves the right to place such a tenderer on its List of Excluded Bidder

T2.2-16: REQUEST FOR PROPOSAL – BREACH OF LAW

NAME OF COMPANY: _____

I / We _____ do hereby certify that ***I/we have/have not been*** found guilty during the preceding 5 (five) years of a serious breach of law, including but not limited to a breach of the Competition Act, 89 of 1998, by a court of law, tribunal or other administrative body. The type of breach that the Tenderer is required to disclose excludes relatively minor offences or misdemeanours, e.g. traffic offences.

Where found guilty of such a serious breach, please disclose:

NATURE OF BREACH:

DATE OF BREACH:

Furthermore, I/we acknowledge that Transnet SOC Ltd reserves the right to exclude any Tenderer from the tendering process, should that person or company have been found guilty of a serious breach of law, tribunal or regulatory obligation.

Signed on this _____ day of _____ 20____

SIGNATURE OF TENDER

T2.2-17: Certificate of Acquaintance with Tender Documents

NAME OF TENDERING ENTITY:

1. By signing this certificate I/we acknowledge that I/we have made myself/ourselves thoroughly familiar with, and agree with all the conditions governing this RFQ. This includes those terms and conditions of the Contract, the Supplier Integrity Pact, Non-Disclosure Agreement etc. contained in any printed form stated to form part of the documents thereof, but not limited to those listed in this clause.
2. I/we furthermore agree that Transnet SOC Ltd shall recognise no claim from me/us for relief based on an allegation that I/we overlooked any tender/contract condition or failed to take it into account for the purpose of calculating my/our offered prices or otherwise.
3. I/we understand that the accompanying Tender will be disqualified if this Certificate is found not to be true and complete in every respect.
4. For the purposes of this Certificate and the accompanying Tender, I/we understand that the word "competitor" shall include any individual or organisation, other than the Tenderer, whether or not affiliated with the Tenderer, who:
 - a) has been requested to submit a Tender in response to this Tender invitation;
 - b) could potentially submit a Tender in response to this Tender invitation, based on their qualifications, abilities or experience; and
 - c) provides the same Services as the Tenderer and/or is in the same line of business as the Tenderer
5. The Tenderer has arrived at the accompanying Tender independently from, and without consultation, communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium will not be construed as collusive Tendering.
6. In particular, without limiting the generality of paragraph 5 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
 - a) prices;
 - b) geographical area where Services will be rendered [market allocation]
 - c) methods, factors or formulas used to calculate prices;
 - d) the intention or decision to submit or not to submit, a Tender;
 - e) the submission of a tender which does not meet the specifications and conditions of the tender; or
 - f) Tendering with the intention not winning the tender.

7. In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the Services to which this tender relates.
8. The terms of the accompanying tender have not been, and will not be, disclosed by the Tenderer, directly or indirectly, to any competitor, prior to the date and time of the official tender opening or of the awarding of the contract.
9. I/We am/are aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to tenders and contracts, tenders that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and/or may be reported to the National Prosecuting Authority [NPA] for criminal investigation. In addition, Tenderers that submit suspicious tenders may be restricted from conducting business with the public sector for a period not exceeding 10 [ten] years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.

Signed on this _____ day of _____ 20____

SIGNATURE OF TENDERER

T2.2-18: Service Provider Integrity Pact

Important Note: All potential tenderers must read this document and certify in the RFQ Declaration Form that that have acquainted themselves with and agree with the content.

The contract with the successful tenderer will automatically incorporate this Integrity Pact and shall be deemed as part of the final concluded contract.

INTEGRITY PACT

Between

TRANSNET SOC LTD

Registration Number: 1990/000900/30

("Transnet")

and

The Contractor (hereinafter referred to as the "Tenderer/Service Providers/Contractor")

PREAMBLE

Transnet values full compliance with all relevant laws and regulations, ethical standards and the principles of economical use of resources, fairness and transparency in its relations with its Tenderers / Service Providers/Contractors.

In order to achieve these goals, Transnet and the Tenderer / Service Provider hereby enter into this agreement hereinafter referred to as the "Integrity Pact" which will form part of the Tenderer's / Service Provider's / Contractor's application for registration with Transnet as a vendor.

The general purpose of this Integrity Pact is to agree on avoiding all forms of dishonesty, fraud and corruption by following a system that is fair, transparent and free from any undue influence prior to, during and subsequent to the currency of any procurement and / or reverse logistics event and any further contract to be entered into between the Parties, relating to such event.

All Tenderers / Service Providers / Contractor's will be required to sign and comply with undertakings contained in this Integrity Pact, should they want to be registered as a Transnet vendor.

1 OBJECTIVES

1.1 Transnet and the Tenderer / Service Provider / Contractor agree to enter into this Integrity Pact, to avoid all forms of dishonesty, fraud and corruption including practices that are anti-competitive in nature, negotiations made in bad faith and under-pricing by following a system that is fair, transparent and free from any influence / unprejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to:

- a) Enable Transnet to obtain the desired contract at a reasonable and competitive price in conformity to the defined specifications of the service, goods and services; and
- b) Enable Tenderers / Service Providers / Contractors to abstain from bribing or participating in any corrupt practice in order to secure the contract.

2 COMMITMENTS OF TRANSNET

Transnet commits to take all measures necessary to prevent dishonesty, fraud and corruption and to observe the following principles:

- 2.1 Transnet hereby undertakes that no employee of Transnet connected directly or indirectly with the sourcing event and ensuing contract, will demand, take a promise for or accept directly or through intermediaries any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the Tenderer, either for themselves or for any person, organisation or third party related to the contract in exchange for an advantage in the tendering process, Tender evaluation, contracting or implementation process related to any contract.
- 2.2 Transnet will, during the registration and tendering process treat all Tenderers / Service Providers with equity, transparency and fairness. Transnet will in particular, before and during the registration process, provide to all Tenderers / Service Providers the same information and will not provide to any Tenderers / Service Providers / Contractors confidential / additional information through which the Tenderers / Service Providers / Contractors could obtain an advantage in relation to any tendering process.
- 2.3 Transnet further confirms that its employees will not favour any prospective Tenderer in any form that could afford an undue advantage to a particular Tenderer during the tendering stage, and will further treat all Tenderers / Service Providers / Contractors participating in the tendering process.

- 2.4 Transnet will exclude from the tender process such employees who have any personal interest in the Tenderers / Service Providers / Contractors participating in the tendering process.

3 OBLIGATIONS OF THE TENDERER / SERVICE PROVIDER

- 3.1 Transnet has a '**Zero Gifts**' Policy. No employee is allowed to accept gifts, favours or benefits.

- a) Transnet officials and employees **shall not** solicit, give or accept, or from agreeing to solicit, give, accept or receive directly or indirectly, any gift, gratuity, favour, entertainment, loan, or anything of monetary value, from any person or juridical entities in the course of official duties or in connection with any operation being managed by, or any transaction which may be affected by the functions of their office.
- b) Transnet officials and employees **shall not** solicit or accept gifts of any kind, from vendors, suppliers, customers, potential employees, potential vendors, and suppliers, or any other individual or organisation irrespective of the value.
- c) Under **no circumstances** should gifts, business courtesies or hospitality packages be accepted from or given to prospective suppliers participating in a tender process at the respective employee's Operating Division, regardless of retail value.
- d) Gratuities, bribes or kickbacks of any kind must never be solicited, accepted or offered, either directly or indirectly. This includes money, loans, equity, special privileges, personal favours, benefit or services. Such favours will be considered to constitute corruption.

- 3.2 The Tenderer / Service Provider / Contractor commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its Tender or during any ensuing contract stage in order to secure the contract or in furtherance to secure it and in particular the Tenderer / Service Provider / Contractor commits to the following:

- a) The Tenderer / Service Provider / Contractor will not, directly or through any other person or firm, offer, promise or give to Transnet or to any of Transnet's employees involved in the tendering process or to any third person any material or other benefit or payment, in order to obtain in exchange an advantage during the tendering process; and
- b) The Tenderer / Service Provider / Contractor will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any employee of Transnet, connected directly or indirectly with the tendering process, or to any person, organisation or third party related to the contract in exchange for any advantage in the tendering, evaluation, contracting and implementation of the contract.

- 3.3 The Tenderer/Service Provider/Contractor will not collude with other parties interested in the contract to preclude a competitive Tender price, impair the transparency, fairness and progress of the tendering process, Tender evaluation, contracting and implementation of the contract. The Tenderer / Service Provider further commits itself to delivering against all agreed upon conditions as stipulated within the contract.

- 3.4 The Tenderer/Service Provider/Contractor will not enter into any illegal or dishonest agreement or understanding, whether formal or informal with other Tenderers/Service Providers/Contractors. This applies in particular to certifications, submissions or non-submission of documents or actions that are restrictive or to introduce cartels into the tendering process.

- 3.5 The Tenderer/Service Provider/Contractor will not commit any criminal offence under the relevant anti-corruption laws of South Africa or any other country. Furthermore, the Tenderer/Service

Provider/Contractor will not use for illegitimate purposes or for restrictive purposes or personal gain, or pass on to others, any information provided by Transnet as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

- 3.6 A Tenderer/Service Provider/Contractor of foreign origin shall disclose the name and address of its agents or representatives in South Africa, if any, involved directly or indirectly in the registration or tendering process. Similarly, the Tenderer / Service Provider / Contractor of South African nationality shall furnish the name and address of the foreign principals, if any, involved directly or indirectly in the registration or tendering process.
- 3.7 The Tenderer/Service Provider/Contractor will not misrepresent facts or furnish false or forged documents or information in order to influence the tendering process to the advantage of the Tenderer/Service Provider/Contractor or detriment of Transnet or other competitors.
- 3.8 Transnet may require the Tenderer/Service Provider/Contractor to furnish Transnet with a copy of its code of conduct. Such code of conduct must address the compliance programme for the implementation of the code of conduct and reject the use of bribes and other dishonest and unethical conduct.
- 3.9 The Tenderer/Service Provider/Contractor will not instigate third persons to commit offences outlined above or be an accessory to such offences.
- 3.10 The Tenderer/Service Provider/Contractor confirms that they will uphold the ten principles of the United Nations Global Compact (UNGC) in the fields of Human Rights, Labour, Anti-Corruption and the Environment when undertaking business with Transnet as follows:
- a) Human Rights
- Principle 1: Businesses should support and respect the protection of internationally proclaimed human rights; and
 - Principle 2: make sure that they are not complicit in human rights abuses.
- b) Labour
- Principle 3: Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining;
 - Principle 4: the elimination of all forms of forced and compulsory labour;
 - Principle 5: the effective abolition of child labour; and
 - Principle 6: the elimination of discrimination in respect of employment and occupation.
- c) Environment
- Principle 7: Businesses should support a precautionary approach to environmental challenges;
 - Principle 8: undertake initiatives to promote greater environmental responsibility; and
 - Principle 9: encourage the development and diffusion of environmentally friendly technologies.

d) Anti-Corruption

- Principle 10: Businesses should work against corruption in all its forms, including extortion and bribery.

4 INDEPENDENT TENDERING

- 4.1 For the purposes of that Certificate in relation to any submitted Tender, the Tenderer declares to fully understand that the word “competitor” shall include any individual or organisation, other than the Tenderer, whether or not affiliated with the Tenderer, who:
- a) has been requested to submit a Tender in response to this Tender invitation;
 - b) could potentially submit a Tender in response to this Tender invitation, based on their qualifications, abilities or experience; and
 - c) provides the same Goods and Services as the Tenderer and/or is in the same line of business as the Tenderer.
- 4.2 The Tenderer has arrived at his submitted Tender independently from, and without consultation, communication, agreement or arrangement with any competitor. However communication between partners in a joint venture or consortium will not be construed as collusive tendering.
- 4.3 In particular, without limiting the generality of paragraph 5 above, there has been no consultation, communication, agreement or arrangement with any competitor regarding:
- a) prices;
 - b) geographical area where Goods or Services will be rendered [market allocation];
 - c) methods, factors or formulas used to calculate prices;
 - d) the intention or decision to submit or not to submit, a Tender;
 - e) the submission of a Tender which does not meet the specifications and conditions of the RFQ; or
 - f) tendering with the intention of not winning the Tender.
- 4.4 In addition, there have been no consultations, communications, agreements or arrangements with any competitor regarding the quality, quantity, specifications and conditions or delivery particulars of the Goods or Services to which his/her tender relates.
- 4.5 The terms of the Tender as submitted have not been, and will not be, disclosed by the Tenderer, directly or indirectly, to any competitor, prior to the date and time of the official Tender opening or of the awarding of the contract.
- 4.6 Tenderers are aware that, in addition and without prejudice to any other remedy provided to combat any restrictive practices related to Tenders and contracts, Tenders that are suspicious will be reported to the Competition Commission for investigation and possible imposition of administrative penalties in terms of section 59 of the Competition Act No 89 of 1998 and/or may be reported to the National Prosecuting Authority [NPA] for criminal investigation and/or may be restricted from conducting business with the public sector for a period not exceeding 10 [ten] years in terms of the Prevention and Combating of Corrupt Activities Act No 12 of 2004 or any other applicable legislation.
- 4.7 Should the Tenderer find any terms or conditions stipulated in any of the relevant documents quoted in the Tender unacceptable, it should indicate which conditions are unacceptable and offer alternatives by written submission on its company letterhead, attached to its submitted Tender. Any such submission shall be subject to review by Transnet’s Legal Counsel who shall determine whether the proposed alternative(s) are acceptable or otherwise, as the case may be.

5 DISQUALIFICATION FROM TENDERING PROCESS

- 5.1 If the Tenderer / Service Provider / Contractor has committed a transgression through a violation of section 3 of this Integrity Pact or in any other form such as to put its reliability or credibility as a Tenderer / Service Provider into question, Transnet may reject the Tenderer's / Service Provider's / Contractor's application from the registration or tendering process and remove the Tenderer / Service Provider from its database, if already registered.
- 5.2 If the Tenderer / Service Provider / Contractor has committed a transgression through a violation of section 3, or any material violation, such as to put its reliability or credibility into question. Transnet may after following due procedures and at its own discretion also exclude the Tenderer / Service Provider / Contractor from future tendering processes. The imposition and duration of the exclusion will be determined by the severity of the transgression. The severity will be determined by the circumstances of the case, which will include amongst others the number of transgressions, the position of the transgressors within the company hierarchy of the Tenderer / Service Provider / Contractor and the amount of the damage. The exclusion will be imposed for up to a maximum of 10 (ten) years. However, Transnet reserves the right to impose a longer period of exclusion, depending on the gravity of the misconduct.
- 5.3 If the Tenderer / Service Provider / Contractor can prove that it has restored the damage caused by it and has installed a suitable corruption prevention system, or taken other remedial measures as the circumstances of the case may require, Transnet may at its own discretion revoke the exclusion or suspend the imposed penalty.

6 TRANSNET'S LIST OF EXCLUDED TENDERERS (BLACKLIST)

- 6.1 The process of restriction is used to exclude a company/person from conducting future business with Transnet and other organs of state for a specified period. No Tender shall be awarded to a Tenderer whose name (or any of its members, directors, partners or trustees) appear on the Register of Tender Defaulters kept by National Treasury, or who have been placed on National Treasury's List of Restricted Suppliers. Transnet reserves the right to withdraw an award, or cancel a contract concluded with a Tenderer should it be established, at any time, that a tenderer has been restricted with National Treasury by another government institution.
- 6.2 All the stipulations around Transnet's blacklisting process as laid down in Transnet's Supply Chain Policy and Procurement Procedures Manual (CPM included) are included herein by way of reference. Below follows a condensed summary of this blacklisting procedure.
- 6.3 On completion of the restriction procedure, Transnet will submit the restricted entity's details (including the identity number of the individuals and registration number of the entity) to National Treasury for placement on National Treasury's Database of Restricted Suppliers for the specified period of exclusion. National Treasury will make the final decision on whether to restrict an entity from doing business with any organ of state for a period not exceeding 10 years and place the entity concerned on the Database of Restricted Suppliers published on its official website.
- 6.4 The decision to restrict is based on one of the grounds for restriction. The standard of proof to commence the restriction process is whether a "*prima facie*" (i.e. on the face of it) case has been established.
- 6.5 Depending on the seriousness of the misconduct and the strategic importance of the Goods/Services, in addition to restricting a company/person from future business, Transnet may decide to terminate some or all existing contracts with the company/person as well.

- 6.6 A Service Provider or Contractor to Transnet may not subcontract any portion of the contract to a blacklisted company.
- 6.7 Grounds for blacklisting include: If any person/Enterprise which has submitted a Tender, concluded a contract, or, in the capacity of agent or subcontractor, has been associated with such Tender or contract:
- a) Has, in bad faith, withdrawn such Tender after the advertised closing date and time for the receipt of Tenders;
 - b) has, after being notified of the acceptance of his Tender, failed or refused to sign a contract when called upon to do so in terms of any condition forming part of the Tender documents;
 - c) has carried out any contract resulting from such Tender in an unsatisfactory manner or has breached any condition of the contract;
 - d) has offered, promised or given a bribe in relation to the obtaining or execution of the contract;
 - e) has acted in a fraudulent or improper manner or in bad faith towards Transnet or any Government Department or towards any public body, Enterprise or person;
 - f) has made any incorrect statement in a certificate or other communication with regard to the Local Content of his Goods or his B-BBEE status and is unable to prove to the satisfaction of Transnet that:
 - (i) he made the statement in good faith honestly believing it to be correct; and
 - (ii) before making such statement he took all reasonable steps to satisfy himself of its correctness;
 - g) caused Transnet damage, or to incur costs in order to meet the contractor's requirements and which could not be recovered from the contractor;
 - h) has litigated against Transnet in bad faith.
- 6.8 Grounds for blacklisting include a company/person recorded as being a company or person prohibited from doing business with the public sector on National Treasury's database of Restricted Service Providers or Register of Tender Defaulters.
- 6.9 Companies associated with the person/s guilty of misconduct (i.e. entities owned, controlled or managed by such persons), any companies subsequently formed by the person(s) guilty of the misconduct and/or an existing company where such person(s) acquires a controlling stake may be considered for blacklisting. The decision to extend the blacklist to associated companies will be at the sole discretion of Transnet.

7 PREVIOUS TRANSGRESSIONS

- 7.1 The Tenderer / Service Provider /Contractor hereby declares that no previous transgressions resulting in a serious breach of any law, including but not limited to, corruption, fraud, theft, extortion and contraventions of the Competition Act 89 of 1998, which occurred in the last 5 (five) years with any other public sector undertaking, government department or private sector company that could justify its exclusion from its registration on the Tenderer's / Service Provider's / Contractor's database or any tendering process.
- 7.2 If it is found to be that the Tenderer / Service Provider /Contractor made an incorrect statement on this subject, the Tenderer / Service Provider / Contractor can be rejected from the registration process or

removed from the Tenderer / Service Provider / Contractor database, if already registered, for such reason (refer to the Breach of Law Form contained in the applicable RFX document.)

8 SANCTIONS FOR VIOLATIONS

8.1 Transnet shall also take all or any one of the following actions, wherever required to:

- a) Immediately exclude the Tenderer / Service Provider / Contractor from the tendering process or call off the pre-contract negotiations without giving any compensation the Tenderer / Service Provider / Contractor. However, the proceedings with the other Tenderer / Service Provider / Contractor may continue;
- b) Immediately cancel the contract, if already awarded or signed, without giving any compensation to the Tenderer / Service Provider / Contractor;
- c) Recover all sums already paid by Transnet;
- d) Encash the advance bank guarantee and performance bond or warranty bond, if furnished by the Tenderer / Service Provider / Contractor, in order to recover the payments, already made by Transnet, along with interest;
- e) Cancel all or any other contracts with the Tenderer / Service Provider; and
- f) Exclude the Tenderer / Service Provider / Contractor from entering into any Tender with Transnet in future.

9 CONFLICTS OF INTEREST

9.1 A conflict of interest includes, inter alia, a situation in which:

- a) A Transnet employee has a personal financial interest in a tendering / supplying entity; and
- b) A Transnet employee has private interests or personal considerations or has an affiliation or a relationship which affects, or may affect, or may be perceived to affect his / her judgment in action in the best interest of Transnet, or could affect the employee's motivations for acting in a particular manner, or which could result in, or be perceived as favouritism or nepotism.

9.2 A Transnet employee uses his / her position, or privileges or information obtained while acting in the capacity as an employee for:

- a) Private gain or advancement; or
- b) The expectation of private gain, or advancement, or any other advantage accruing to the employee must be declared in a prescribed form.

Thus, conflicts of interest of any Tender committee member or any person involved in the sourcing process must be declared in a prescribed form.

9.3 If a Tenderer / Service Provider / Contractor has or becomes aware of a conflict of interest i.e. a family, business and / or social relationship between its owner(s) / member(s) / director(s) / partner(s) / shareholder(s) and a Transnet employee / member of Transnet's Board of Directors in respect of a Tender which will be considered for the Tender process, the Tenderer / Service Provider / Contractor:

- a) must disclose the interest and its general nature, in the Request for Proposal ("RFX") declaration form; or
- b) must notify Transnet immediately in writing once the circumstances has arisen.

9.4 The Tenderer / Service Provider / Contractor shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any committee member or any person involved in the sourcing process, where this is done, Transnet shall be entitled forthwith to rescind the contract and all other contracts with the Tenderer / Service Provider / Contractor.

10 DISPUTE RESOLUTION

10.1 Transnet recognises that trust and good faith are pivotal to its relationship with its Tenderer / Service Provider / Contractor. When a dispute arises between Transnet and its Tenderer / Service Provider / Contractor, the parties should use their best endeavours to resolve the dispute in an amicable manner, whenever possible. Litigation in bad faith negates the principles of trust and good faith on which commercial relationships are based. Accordingly, following a blacklisting process as mentioned in paragraph **Error! Reference source not found.** above, Transnet will not do business with a company that litigates against it in bad faith or is involved in any action that reflects bad faith on its part. Litigation in bad faith includes, but is not limited to the following instances:

- a) **Vexatious proceedings:** these are frivolous proceedings which have been instituted without proper grounds;
- b) **Perjury:** where a Tenderer / Service Provider / Contractor make a false statement either in giving evidence or on an affidavit;
- c) **Scurrilous allegations:** where a Tenderer / Service Provider / Contractor makes allegations regarding a senior Transnet employee which are without proper foundation, scandalous, abusive or defamatory; and
- d) **Abuse of court process:** when a Tenderer / Service Provider / Contractor abuses the court process in order to gain a competitive advantage during a Tender process.

11 GENERAL

- 11.1 This Integrity Pact is governed by and interpreted in accordance with the laws of the Republic of South Africa.
- 11.2 The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the law relating to any civil or criminal proceedings.
- 11.3 The validity of this Integrity Pact shall cover all the tendering processes and will be valid for an indefinite period unless cancelled by either Party.
- 11.4 Should one or several provisions of this Integrity Pact turn out to be invalid the remainder of this Integrity Pact remains valid.
- 11.5 Should a Tenderer / Service Provider / Contractor be confronted with dishonest, fraudulent or corruptive behaviour of one or more Transnet employees, Transnet expects its Tenderer / Service Provider / Contractor to report this behaviour directly to a senior Transnet official / employee or alternatively by using Transnet's "Tip-Off Anonymous" hotline number 0800 003 056, whereby your confidentiality is guaranteed.

The Parties hereby declare that each of them has read and understood the clauses of this Integrity Pact and shall a Tenderer by it. To the best of the Parties' knowledge and belief, the information provided in this Integrity Pact is true and correct.

I duly authorised by the tendering entity, hereby certify that the tendering entity are **fully acquainted** with the contents of the Integrity Pact and further **agree to abide by it** in full.

Signature

Date

T2.2.19 PROTECTION OF PERSONAL INFORMATION (For normal contract)

1. The following terms shall bear the same meaning as contemplated in Section 1 of the Protection of Person information act, No.4 of 2013. ("POPIA"):

consent; data subject; electronic communication; information officer; operator; person; personal information; processing; record; Regulator; responsible party; special information; as well as any terms derived from these terms.

2. Transnet will process all information by the Respondent in terms of the requirements contemplated in Section 4(1) of the POPIA:

Accountability; Processing limitation; Purpose specification; Further processing limitation; Information quality; Openness; Security safeguards and Data subject participation.

3. The Parties acknowledge and agree that, in relation to personal information that will be processed pursuant to this RFQ, the Responsible party is "Transnet" and the Data subject is the "Respondent". Transnet will process personal information only with the knowledge and authorisation of the Respondent and will treat personal information which comes to its knowledge as confidential and will not disclose it, unless so required by law or subject to the exceptions contained in the POPIA.
4. Transnet reserves all the rights afforded to it by the POPIA in the processing of any of its information as contained in this RFQ and the Respondent is required to comply with all prescripts as detailed in the POPIA relating to all information concerning Transnet.
5. In responding to this bid, Transnet acknowledges that it will obtain and have access to personal information of the Respondent. Transnet agrees that it shall only process the information disclosed by Respondent in their response to this bid for the purpose of evaluating and subsequent award of business and in accordance with any applicable law.
6. Transnet further agrees that in submitting any information or documentation requested in this RFQ, the Respondent is consenting to the further processing of their personal information for the purpose of, but not limited to, risk assessment, assurances, contract award, contract management, auditing, legal opinions/litigations, investigations (if applicable), document storage for the legislatively required period, destruction, de-identification and publishing of personal information by Transnet and/or its authorised appointed third parties.
7. Furthermore, Transnet will not otherwise modify, amend or alter any personal data submitted by the Respondent or disclose or permit the disclosure of any personal data to any third party without the prior written consent from the Respondent. Similarly, Transnet requires the Respondent to process any personal information disclosed by Transnet in the bidding process in the same manner.
8. Transnet shall, at all times, ensure compliance with any applicable laws put in place and maintain sufficient measures, policies and systems to manage and secure against all forms of risks to any information that may be shared or accessed pursuant to this RFQ (physically, through a computer or any other form of electronic communication).

9. Transnet shall notify the Respondent in writing of any unauthorised access to information, cybercrimes or suspected cybercrimes, in its knowledge and report such crimes or suspected crimes to the relevant authorities in accordance with applicable laws, after becoming aware of such crimes or suspected crime. The Respondent must take all necessary remedial steps to mitigate the extent of the loss or compromise of personal information and to restore the integrity of the affected personal information as quickly as is possible.
10. The Respondent may, in writing, request Transnet to confirm and/or make available any personal information in its possession in relation to the Respondent and if such personal information has been accessed by third parties and the identity thereof in terms of the POPIA. The Respondent may further request that Transnet correct (excluding critical/mandatory or evaluation information), delete, destroy, withdraw consent or object to the processing of any personal information relating to the Respondent in Transnet's possession in terms of the provision of the POPIA and utilizing Form 2 of the POPIA Regulations.
11. In submitting any information or documentation requested in this RFQ, the Respondent is hereby consenting to the processing of their personal information for the purpose of this RFQ and further confirming that they are aware of their rights in terms of Section 5 of POPIA.

Respondents are required to provide consent below:

YES		NO	
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12. Further, the Respondent declares that they have obtained all consents pertaining to other data subject's personal information included in its submission and thereby indemnifying Transnet against any civil or criminal action, administrative fines or other penalty or loss that may arise as a result of the processing of any personal information that the Respondent submitted.
13. The Respondent declares that the personal information submitted for the purpose of this RFQ is complete, accurate, not misleading, is up to date and may be updated where applicable.

Signature of Respondent's authorised representative: _____

Should a Respondent have any complaints or objections to processing of its personal information, by Transnet, the Respondent can submit a complaint to the Information Regulator on <https://www.justice.gov.za/inforeg/>, click on contact us, click on complaints.IR@justice.gov.za

T2.2-20: Insurance provided by the *Contractor*

Clause 83.1 in NEC3 Term Service Contract (June 2005) (amended June 2006 and April 2013) requires that the *Contractor* provides the insurance stated in the insurance table except any insurance which the *Employer* is to provide as stated in the Contract Data.

Please provide the following details for insurance which the *Contractor* is still to provide. Notwithstanding this information all costs related to insurance are deemed included in the tenderer's rates and prices.

Insurance against (See clause 83.1 of the TSC)	Name of Insurance Company	Cover	Premium
Liability for death of or bodily injury to employees of the <i>Contractor</i> arising out of and in the course of their employment in connection with this contract			
Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger and Unauthorised Passenger Liability indemnity with a minimum indemnity limit of R5 000 000.00			
Insurance in respect of loss of or damage to own property and equipment.			

T2.2-21-: Three (3) years audited financial statements

Attached to this schedule is the last three (3) years audited financial statements of the single tenderer/members of the Joint Venture.

NAME OF COMPANY/IES and INDEX OF ATTACHMENTS:

.....

.....

.....

.....

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T2.2-22 SUPPLIER DECLARATION FORM

VENDOR REGISTRATION

1.	Proof of Banking Details	Stamped/Certified by the Bank, Dated and Less than 3 months old	
		Confirmation of Bank Letter must contains the Name and Signature of Bank Official.	
		If online verification is possible (e.g. FNB) – printout of online verification	
2.	TAX Certificate and VAT Registration	Current SARS TAX Compliance Status Verification PIN document (obtainable from SARS eFiling) (TAX Status Must Be "Compliant/Active" when verified with SARS)	
		Copy of "SARS VAT 103" form / SARS confirmation for proof of VAT registration	
		If No VAT; Affidavit or Solemn Declaration on VAT Registration Status to be submitted	
3.	Proof of registration	Company registered before 1 May 2011: CM1 – Incorporation of a Company Company registered after 1 May 2011: CoR 14.3 – Company Registration Certificate	
4.	Proof of Ownership / Management	Company registered before 1 May 2011 - CM29 – Contents of Register of Directors, Auditors and Officers Company registered after 1 May 2011 - CoR 15.1 Memorandum of Incorporation -MOI - CoR 39 – Contents of Register of Directors, Auditors and Officers Clear certified copy of Identity Document/s of Directors. If company has >5 directors, only 5 IDs are required	
5.	BBBEE	EME (Turnover below R10m)	
		- EME Affidavit signed by EME - NO certificates by SANAS accredited BBBEE verification agency accepted - NO accountant letters are accepted	
		QSE (Turnover between R10m and R50m)	
		IF >51% black owned - QSE Affidavit signed by QSE or Certificate by SANAS accredited verification agency - NO accountant letters are accepted	
		IF < 51% black owned, certificate by SANAS accredited BBBEE verification agency	
		Large enterprise (Turnover above R50m)	
		Certificate by SANAS accredited BBBEE verification agency	
6.	Proof of CSD registration	Non-compliant (No certificate / In process of certification / Level 9 certificate) Confirmation that supplier is not BBBEE compliant. An email is sufficient.	
		MAAA number	

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ANNEXURE A: SUPPLIER DECLARATION FORM

Important Notice: all organisations, institutions and individuals who wish to provide goods and/or services to organs of the State must be registered on the National Treasury Central Supplier Database (CSD). This needs to be done via their portal at <https://secure.csd.gov.za/> before applying to Transnet.

CSD Number (MAAA xxxxxx):

Company Trading Name						
Company Registered Name						
Company Registration No Or ID No If a Sole Proprietor						
Company Income Tax Number						
Form of Entity	CC	Trust	Pty Ltd	Limited	Partnership	Sole Proprietor
	Non-profit (NPO's or NPC)	Personal Liability Co	State Owned Co	National Govt	Provincial Govt	Local Govt
	Educational Institution	Specialised Profession	Financial Institution	Joint Venture	Foreign International	Foreign Branch Office

Did your company previously operate under another name?
(If **YES** state the previous details below)

Yes

No

Trading Name						
Registered Name						
Company Registration No Or ID No If a Sole Proprietor						
Form of Entity	CC	Trust	Pty Ltd	Limited	Partnership	Sole Proprietor
	Non-profit (NPO's or NPC)	Personal Liability Co	State Owned Co	National Govt	Provincial Govt	Local Govt
	Educational Institution	Specialised Profession	Financial Institution	Joint Venture	Foreign International	Foreign Branch Office

Your Current Company's VAT Registration Status
(please attach relevant supporting document for VAT)

VAT Registered

Not VAT Registered

VAT Registration Number

If **Exempted from VAT registration**, state reason and submit proof from SARS in confirming the exemption status

If your business entity is not VAT Registered, please submit a current original sworn affidavit (see example in Appendix I). Your "Non VAT Registration Status" must be renewed and confirmed annually.

Company Banking Details

Account Holder Name			
Bank Account Number		Universal Branch Code	
Company Physical Address			
		Code	
Company Postal Address			
		Code	
Telephone Number		FAX Number	

Transnet Rail Infrastructure Manager

Tender Number: RFP ERACMM-PRC-48399

Description of the service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

E-Mail Address	
Company Website Address	

Company Contact Person													
Designation													
Telephone Number													
Main Product / Service Supplied e.g. Stationery / Consulting /Labour etc.													
Is your company a Labour Broker?		YES						NO					
How many personnel does the business employ? (please state number)		Full Time						Part Time					
Please Note: Should your business employ more than 2 full time employees who are not connected persons as defined in the Income Tax Act, please submit a sworn affidavit, as per Appendix II.													
Most Recent Financial Year's Annual Turnover		<R10 Million EME						>R10 Million <R50 Million QSE			>R50 Million Large Enterprise		
Does your company have a valid Proof of B-BBEE Status?							YES			NO			
Please indicate your Broad Based BEE status (Level 1 to 9)				1	2	3	4	5	6	7	8	9	
Majority Race of Ownership (please selected correct Majority Ownership for your company)						Black			White				
BBBEE Score		% Black Ownership		% Black Women Ownership		% Black Disabled person(s) Ownership							
% Black Youth Ownership		% Black Unemployed		% Black People Living in Rural Areas		% Black Military Veterans							
Please Note: Please provide proof of B-BBEE status as per Appendix III and IV: - Large Enterprise and QSEs with less than 51% Black Ownership need to obtain a B-BBEE certificate and detailed scorecard from an accredited rating agency; - EMEs and QSEs with at least 51% black ownership may provide an affidavit using the templates provided in Appendix III and IV respectively; - Black Disabled person(s) Ownership will only be accepted if accompanied with a certified letter signed by a physician on the physician's letterhead confirming the disability; - A certified South African identification document will be required for all Black Youth Ownership.													
Supplier Development Information Required													
EMPOWERING SUPPLIER				YES	☐	NO		☐					
FIRST TIME SUPPLIER				YES	☐	NO		☐					
SUPPLIER DEVELOPMENT PLAN				YES	☐	NO		☐					
DEVELOPMENT PLAN DOCUMENT				If Yes - Attach supporting documents									
ENTERPRISE DEVELOPMENT BENEFICIARY				YES	☐	NO		☐					
SUPPLIER DEVELOPMENT BENEFICIARY				YES	☐	NO		☐					
GRADUATION FROM ED TO SD BENEFICIARY				YES	☐	NO		☐					
ENTERPRISE DEVELOPMENT RECIPIENT				YES	☐	NO		☐					
By signing below, I hereby verify that I am duly authorised to sign for and on behalf of firm / organisation and that all information contained herein and attached herewith are true and correct													
Name and Surname				Designation									
Signature				Date									

Affidavit or Solemn Declaration as to VAT Registration Status

Affidavit or Solemn Declaration

I, _____ solemnly swear/declare that;
_____ is not a registered **VAT vendor** and is not required to register as a VAT vendor because the combined value of taxable supplies made by the provider in any 12 month period **has not exceeded or is not expected to exceed R1 million threshold**, as required in terms of the Value Added Tax Act.

Signature: _____

Designation: _____

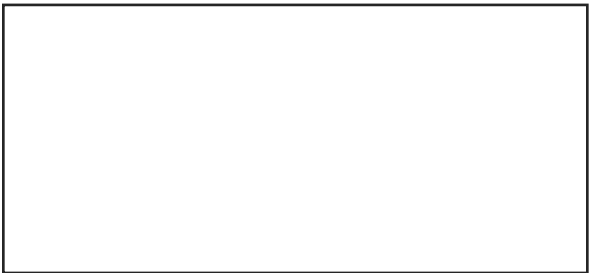
Date: _____

Commissioner of Oaths

Thus signed and sworn to before me at _____ on this the _____ day of _____ 20____,

the Deponent having knowledge that he/she knows and understands the contents of this Affidavit, and that he/she has no objection to taking the prescribed oath, which he/she regards binding on his/her conscience and that the allegations herein contained are all true and correct.

Commissioner of Oaths (Signature & Stamp)



Example of an Affidavit or Solemn Declaration as to number of employees

Affidavit or Solemn Declaration

I, _____ solemnly swear/declare

that; _____

employs **Three or more full time employees**, which employees are engaged in the business of rendering the services of the organisation and are not connected persons as defined in the IncomeTax Act.

Signature: _____

Designation: _____

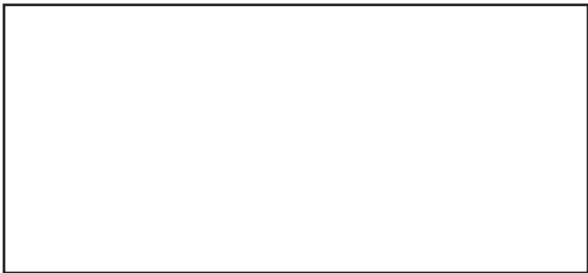
Date: _____

Commissioner of Oaths

Thus signed and sworn to before me at _____ on this the _____ day of _____ 20 _____,

the Deponent having knowledge that he/she knows and understands the contents of this Affidavit, and that he/she has no objection to taking the prescribed oath, which he/she regards binding on his/her conscience and that the allegations herein contained are all true and correct.

Commissioner of Oaths (Signature & Stamp)



SWORN AFFIDAVIT: B-BBEE for EXEMPTED MICRO ENTERPRISE

I, the undersigned, _____

Full name & Surname	
Identity number	

Hereby declare under oath as follows:

1. The contents of this statement are to the best of my knowledge a true reflection of the facts.
2. I am a Member / Director / Owner of the following enterprise and am duly authorized to act on its behalf:
- 3.

Enterprise Name:	
Trading Name (If Applicable):	
Registration Number:	
Enterprise Physical Address:	
Type of Entity (CC, (Pty) Ltd, Sole Prop etc.):	
Nature of Business:	
Definition of "Black People"	As per the Broad-Based Black Economic Empowerment Act 53 of 2003 as Amended by Act No 46 of 2013 "Black People" is a generic term which means Africans, Coloureds and Indians –) Who are citizens of the Republic of South Africa by birth or descent; or) Who became citizens of the Republic of South Africa by naturalization- i. Before 27 April 1994; or i. On or after 27 April 1994 and who would have been entitled to acquire citizenship by naturalization prior to that date

4. I hereby declare under Oath that:

- The Enterprise is _____% **Black Owned** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013;
- The Enterprise is _____% **Black Woman Owned** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013;
- The enterprise is _____% **Black youth owned**; as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013;

Appendix III

- **The enterprise is _____% black disabled owned;** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013;
- **The enterprise is _____% by Black people living in rural and under developed areas** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013;
- **The enterprise is _____% by military veterans** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013;
- Based on the management accounts and other information available for the _____ financial year, **the income did not exceed R10, 000,000.00 (ten million rand).**

Please confirm on the table below the B-BBEE level contributor, **by ticking the applicable box.**

100% black owned	Level One (135% B-BBEE procurement recognition)	
More than 51% blackowned	Level Two (125% B-BBEE procurement recognition)	
Less than 51% blackowned	Level Four (100% B-BBEE procurement recognition)	

5. I know and understand the contents of this affidavit and I have no objection to take the prescribed oath and consider the oath binding on my conscience and on the Owners of the Enterprise which I represent in this matter.
6. The sworn affidavit will be valid for a period of **12 months** from the date signed by commissioner.

Deponent Signature

.....

Date

.....

Commissioner of Oaths

.....
Name & Surname

Signature & Stamp

SWORN AFFIDAVIT: B-BBEE for QUALIFYING SMALL ENTERPRISE (Generic)

I, the undersigned, _____

Full name & Surname	
Identity number	

Hereby declare under oath as follows:

- The contents of this statement are to the best of my knowledge a true reflection of the facts.
- I am a Member / Director / Owner of the following enterprise and am duly authorized to act on its behalf:

Enterprise Name:	
Trading Name (If Applicable):	
Registration Number:	
Enterprise Physical Address:	
Type of Entity (CC, (Pty) Ltd, Sole Proprietor etc.)	
Nature of Business:	
Definition of "Black People"	As per the Broad-Based Black Economic Empowerment Act 53 of 2003 as Amended by Act No 46 of 2013 "Black People" is a generic term which means Africans, Coloureds and Indians –) Who are citizens of the Republic of South Africa by birth or descent; or) Who became citizens of the Republic of South Africa by naturalization- i. Before 27 April 1994; or i. On or after 27 April 1994 and who would have been entitled to acquire citizenship by naturalization prior to that date

3. I hereby declare under Oath that:

- The Enterprise is _____% **Black Owned** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,
- The Enterprise is _____% **Black Woman Owned** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,
- The enterprise is _____% **Black Youth owned;** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,



- **The enterprise is _____% black disabled owned;** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,
- **The enterprise is _____% by Black people living in rural and under developed areas** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,
- **The enterprise is _____% by military veterans** as per Amended Code Series 100 of the Amended Codes of Good Practice issued under section 9 (1) of B-BBEE Act No 53 of 2003 as Amended by Act No 46 of 2013,
- Based on the Financial Statements/Management Accounts and other information available on the latest financial year-end of _____, the annual **Total Revenue was between R10,000,000.00 (Ten Million Rands) and R50,000,000.00 (Fifty Million Rands),**

Please Confirm on the below table the B-BBEE Level Contributor, by ticking the applicable box.

100% Black Owned	Level One (135% B-BBEE procurement recognition level)	
At least 51% Black Owned	Level Two (125% B-BBEE procurement recognition level)	

4. I know and understand the contents of this affidavit and I have no objection to take the prescribed oath and consider the oath binding on my conscience and on the Owners of the Enterprise which I represent in this matter.

5. The sworn affidavit will be valid for a period of **12 months** from the date signed by commissioner.

Deponent Signature

.....

Date

.....

Commissioner of Oaths

..... **Name and Surname**

C1.1 Form of Offer & Acceptance

Offer

The Employer, identified in the Acceptance signature block, has solicited offers to enter into a contract for the procurement of:

For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

The tenderer, identified in the Offer signature block, has

<i>either</i>	examined the documents listed in the Tender Data and addenda thereto as listed in the Returnable Schedules, and by submitting this Offer has accepted the Conditions of Tender.
<i>or</i>	examined the draft contract as listed in the Acceptance section and agreed to provide this Offer.

By the representative of the tenderer, deemed to be duly authorised, signing this part of this Form of Offer and Acceptance the tenderer offers to perform all of the obligations and liabilities of the *Contractor* under the contract including compliance with all its terms and conditions according to their true intent and meaning for an amount to be determined in accordance with the *conditions of contract* identified in the Contract Data.

The offered total of the Prices exclusive of VAT is	
Value Added Tax @ 15% is	
The offered total of the Prices inclusive of VAT is	
(in words)	

This Offer may be accepted by the Employer by signing the Acceptance part of this Form of Offer and Acceptance and returning one copy of this document including the Schedule of Deviations (if any) to the tenderer before the end of the period of validity stated in the Tender Data, or other period as agreed, whereupon the tenderer becomes the party named as the *Contractor* in the *conditions of contract* identified in the Contract Data.

Signature(s)

Name(s)

Capacity

**For the
tenderer:**

(Insert name and address of organisation)

Name &
signature of
witness

Date

Tenderer's CIDB registration number:

Acceptance

By signing this part of this Form of Offer and Acceptance, the Employer identified below accepts the tenderer's Offer. In consideration thereof, the Employer shall pay the Contractor the amount due in accordance with the *conditions of contract* identified in the Contract Data. Acceptance of the tenderer's Offer shall form an agreement between the Employer and the tenderer upon the terms and conditions contained in this agreement and in the contract that is the subject of this agreement.

The terms of the contract, are contained in:

Part C1	Agreements and Contract Data, (which includes this Form of Offer and Acceptance)
Part C2	Pricing Data
Part C3	Scope of Work: Service Information

and drawings and documents (or parts thereof), which may be incorporated by reference into the above listed Parts.

Deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Returnable Schedules as well as any changes to the terms of the Offer agreed by the tenderer and the Employer during this process of offer and acceptance, are contained in the Schedule of Deviations attached to and forming part of this Form of Offer and Acceptance. No amendments to or deviations from said documents are valid unless contained in this Schedule.

The tenderer shall within two weeks of receiving a completed copy of this agreement, including the Schedule of Deviations (if any), contact the Employer's agent (whose details are given in the Contract Data) to arrange the delivery of any securities, bonds, guarantees, proof of insurance and any other documentation to be provided in terms of the *conditions of contract* identified in the Contract Data at, or just after, the date this agreement comes into effect. Failure to fulfil any of these obligations in accordance with those terms shall constitute a repudiation of this agreement.

Notwithstanding anything contained herein, this agreement comes into effect on the date of award.

Unless the tenderer (now *Contractor*) within five working days of the date of such receipt notifies the Employer in writing of any reason why he cannot accept the contents of this agreement, this agreement shall constitute a binding contract between the Parties.

Signature(s)

Name(s)

Capacity

**for the
Employer**

(Insert name and address of organisation)

Name &
signature of
witness

Date

Schedule of Deviations

Note:

1. To be completed by the Employer prior to award of contract. This part of the Offer & Acceptance would not be required if the contract has been developed by negotiation between the Parties and is not the result of a process of competitive tendering.
2. The extent of deviations from the tender documents issued by the Employer prior to the tender closing date is limited to those permitted in terms of the Conditions of Tender.
3. A tenderer's covering letter must not be included in the final contract document. Should any matter in such letter, which constitutes a deviation as aforesaid be the subject of agreement reached during the process of Offer and Acceptance, the outcome of such agreement shall be recorded here and the final draft of the contract documents shall be revised to incorporate the effect of it.

No.	Subject	Details
1		
2		
3		
4		
5		
6		
7		

By the duly authorised representatives signing this Schedule of Deviations below, the Employer and the tenderer agree to and accept this Schedule of Deviations as the only deviations from and amendments to the documents listed in the Tender Data and any addenda thereto listed in the Tender Schedules, as well as any confirmation, clarification or changes to the terms of the Offer agreed by the tenderer and the Employer during this process of Offer and Acceptance.

It is expressly agreed that no other matter whether in writing, oral communication or implied during the period between the issue of the tender documents and the receipt by the tenderer of a completed signed copy of this Form shall have any meaning or effect in the contract between the parties arising from this Agreement.

For the tenderer:

For the Employer

Signature

Name

Capacity

On behalf
of

(Insert name and address of organisation)

(Insert name and address of organisation)

Name &
signature
of witness

Date

Transnet Rail Infrastructure Manager
Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay



C1.2 Contract Data

Part one - Data provided by the *Employer*

Clause	Statement	Data
1	General	
	The <i>conditions of contract</i> are the core clauses and the clauses for main Option:	
	dispute resolution Option	A: Priced contract with price list W1: Dispute resolution procedure X2: Changes in the law X18: Limitations of Liability Z: Additional conditions of contract
	of the NEC3 Term Service Contract (June 2005) (and amended June 2006 and April 2013)	
10.1	Transnet SOC Ltd	Transnet SOC Ltd Transnet Corporate Centre 138 Eloff Street Braamfontein Johannesburg 2000 Transnet Rail Infrastructure Manager Supply Chain Services- Pretoria Nzasm Building Corner Minaar and Paul Kruger Street Pretoria 0001 012 315 2059 012 315 2125
	Transnet SOC Ltd	Transnet Rail Infrastructure Manager
10.1	The <i>Service Manager</i> is (name):	Sithandokuhle Khoza
	Address	4 Kiewiet Road Empangeni KZN 3880
	Tel	035 906 7151



Transnet Rail Infrastructure Manager

Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of polycrete hand-railing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

e-mail

Sithandokuhle.khoza@transnet.net

11.2(2)	The Affected Property is	Three railway concrete bridges between Idondotha and Elubana stations. Km 180, Km 186 and Km 187.
11.2(13)	The <i>service</i> is	Supply, delivery and installation of polycrete handrails onto three railway concrete bridges.
11.2(14)	The following matters will be included in the Risk Register	1 Fall protection plan and harnesses 2 Fire prevention 3 Pollution prevention 4 Working under electricity wires 5 Wild animals and insects
11.2(15)	The Service Information is in	The Scope of Services
12.2	The <i>law of the contract</i> is the law of	the Republic of South Africa subject to the jurisdiction of the Courts of South Africa.
13.1	The <i>language of this contract</i> is	English
13.3	The <i>period for reply</i> is	2 weeks
2	The Contractor's main responsibilities	(If the optional statement for this section is not used, no data will be required for this section)
21.1	The <i>Contractor</i> submits a first plan for acceptance within	2 weeks of the Contract Date
3	Time	
30.1	The <i>starting date</i> is.	05 January 2026
30.1	The <i>service period</i> is	One month after the issuing of the purchase order and within the current financial year
4	Testing and defects	No additional data is required for this section of the <i>conditions of contract</i>.
5	Payment	
50.1	The <i>assessment interval</i> is	After completion of the service
51.1	The <i>currency of this contract</i> is the	South African Rand.
51.2	The period within which payments are made is	Payment will be effected on or before the last day of the month following the month during which a valid Tax Invoice and Statement were received.
51.4	The <i>interest rate</i> is	The prime lending rate of the Standard Bank South Africa.
6	Compensation events	Not applicable



Transnet Rail Infrastructure Manager

Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of polycrrete hand-railing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

7	Use of Equipment Plant and Materials	No additional data is required for this section of the <i>conditions of contract</i>.
8	Risks and insurance	
80.1	These are additional <i>Employers</i> risks	
83.1	The minimum limit of indemnity for insurance in respect of loss and damage to property (except goods, plant and materials and equipment) and liability for bodily injury or death of a person (not an employee of the <i>Service Provider</i>) caused by activity in connection with this contract for any one event is:	Whatever <i>Contractor</i> deems necessary as the <i>Employer</i> is not carrying this indemnity.
83.1	The minimum limit of indemnity for insurance in respect of death of or bodily injury to employees of the <i>Contractor</i> arising out of and in the course of their employment in connection with this contract for any one event is:	As prescribed by the Compensation for Occupational Injuries and Diseases Act No. 130 of 1993 and the <i>Contractor's</i> common law liability for people falling outside the scope of the Act.
83.1	Motor Vehicle Liability Insurance comprising (as a minimum) "Balance of Third Party" Risks including Passenger and Unauthorised Passenger Liability indemnity with a minimum indemnity limit of R 5 000 000	
83.1	The <i>Contractor</i> liability to the <i>Employer</i> for indirect or consequential loss including loss of profit, revenue and goodwill, is limited to:	The Total of the Prices.
83.1	For any one event, the <i>Contractor</i> liability to the <i>Employer</i> for loss of or damage to the <i>Employers</i> property is limited to:	The Total of the Prices.
83.1	The <i>Contractor</i> total liability to the <i>Employer</i> for all matters arising under or in connection with this contract, other than the excluded matters, is limited to:	The Total of the Prices.
9	Termination	There is no Contract Data required for this section of the <i>conditions of contract</i>.
10	Data for main Option clause	
A	Priced contract with price list	
20.5	The <i>Contractor</i> prepares forecasts of the final total of the Prices for the whole of the <i>service</i> at intervals no longer than	4 weeks.



Transnet Rail Infrastructure Manager

Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of polycrrete hand-railing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

20.4	The <i>Contractor</i> prepares forecasts of the total Defined Cost for the whole of the <i>service</i> at intervals no longer than	4 weeks.
11	Data for Option W1	
W1.1	The <i>Adjudicator</i> is (Name)	Both parties will agree as and when a dispute arises. If the parties cannot reach an agreement on the <i>Adjudicator</i>, the chairman of the Association of Arbitrators will appoint an <i>Adjudicator</i>.
W1.2(3)	The <i>Adjudicator nominating body</i> is: If no <i>Adjudicator nominating body</i> is entered, it is	The Association of Arbitrators (Southern Africa)
W1.4(2)	The <i>tribunal</i> is:	Arbitration
W1.4(5)	The <i>arbitration procedure</i> is The place where arbitration is to be held is The person or organisation who will choose an arbitrator - if the Parties cannot agree a choice or - if the arbitration procedure does not state who selects an arbitrator, is	The Rules for the Conduct of Arbitrations of the Association of Arbitrators (Southern Africa) Pretoria The Chairman of the Association of Arbitrators (Southern Africa)
12	Data for secondary Option clauses	
X2	Changes in the law	No additional data is required for this Option
X18	Limitation of liability	
X18.1	The <i>Contractor's</i> liability to the <i>Employer</i> for indirect or consequential loss is limited to	Nil.
X18.2	For any one event, the <i>Contractor's</i> liability to the <i>Employer</i> for loss of or damage to the <i>Employer's</i> property is limited to	The deductible of the relevant insurance policy
X18.3	The <i>Contractor's</i> liability for Defects due to his design of an item of Equipment is limited to	The cost of correcting the defect.



Transnet Rail Infrastructure Manager

Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of polycrrete hand-railing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

X18.4	The <i>Contractor's</i> total liability to the <i>Employer</i> , for all matters arising under or in connection with this contract, other than the excluded matters, is limited to	Total of the Prices.
X18.5	The <i>end of liability date</i> is	3 years after the end of the <i>service period</i>.
Z	<i>Additional conditions of contract</i>	
Z1	Obligations in respect of Termination	
Z1.1	The following will be included under core clause 91.1: In the second main bullet, after the word 'partnership' add 'joint venture whether incorporated or otherwise (including an constituent of the joint venture)'; and Under the second main bullet, insert the following additional bullets after the last sub-bullet: • commenced business rescue proceeding (R22) • repudiated this Contract (R23)	
Z1.2	Termination Table	The following will be included under core clause 90.2 Termination Table as follows: Amend "A reason other than R1 – R21" to "A reason other than R1 – R23"
Z1.3		Amend "R1 – R15 or R18" to "R1 – R15, R18, R22 or R23."
Z2	Right Reserved by Transnet to Conduct Vetting through SSA	



Transnet Rail Infrastructure Manager

Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of polycrrete hand-railing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

Z2.1	Transnet reserves the right to conduct vetting through State Security Agency (SSA) for security clearances of any Contractor who has access to National Key Points for the following without limitations: 1. Confidential – this clearance is based on any information which may be used by malicious, opposing or hostile elements to harm the objectives and functions of an organ of state. 2. Secret – clearance is based on any information which may be used by malicious, opposing or hostile elements to disrupt the objectives and functions of an organ of state. 3. Top Secret – this clearance is based on information which may be used by malicious, opposing or hostile elements to neutralise the objectives and functions of an organ of state.
Z3 Additional clause relating to Collusion in the Construction Industry	
Z3.1	The contract award is made without prejudice to any rights Transnet may have to take appropriate action later with regard to any declared bid rigging including blacklisting.
Z4 Protection of Personal Information Act	
Z4.1	The <i>Employer</i> and the <i>Contractor</i> are required to process information obtained for the duration of the Agreement in a manner that is aligned to the Protection of Personal Information Act

C1.2 Contract Data

Part two - Data provided by the *Contractor*

The tendering contractor is advised to read both the NEC3 Term Service Contract (June 2005) and the relevant parts of its Guidance Notes (TSC3-GN) in order to understand the implications of this Data which the tenderer is required to complete.

Completion of the data in full, according to Options chosen, is essential to create a complete contract.

[illegible]

Transnet
Contract number:
Description of the Service:

A Priced contract with price list		
11.2(12)	The <i>price list</i> is in	
11.2(19)	The tendered total of the Prices is	R.....

PART C2: PRICING DATA

Document reference	Title	No of pages
C2.1	Pricing instructions: Option A	1
C2.2	Price List	1

C2.1 Pricing instructions: Option A

1.1 The *conditions of contract*

1.2 How the contract prices work and assesses it for progress payments

Clause 11 in NEC3 Term Services Contract (TSC), June 2005 (with amendments June 2006 and April 2013) Option A states:

Identified 11
 and defined
 terms

- 11.2 (17) The Price for Services Provided to Date is the total of
- the Price for each lump sum item in the Price List which the *Contractor* has completed and
 - where a quantity is stated for an item in the Price List, an amount calculated by multiplying the quantity which the *Contractor* has completed by the rate.
- (19) The Prices are the amounts stated in the Price column of the Price List, where a quantity is stated for an item in the Price List, the Price is calculated by multiplying the quantity by the rate.

1.3 Measurement and Payment

- 1.3.1 The Price List provides the basis of all valuations of the Price for Services Provided to Date, payments in multiple currencies and general progress monitoring.
- 1.3.2 The amount due at each assessment date is based on activities and/or milestones completed as indicated on the Price List.
- 1.3.3 The Price List work breakdown structure provided by the *Contractor* is based on the activity/milestone provided by the Employer. The activities listed by the *Employer* are the minimum activities acceptable and identify the specific activities which are required to achieve Completion. **The Price List work breakdown structure is compiled to the satisfaction of the Employer with any additions and/or amendments deemed necessary.**
- 1.3.4 The *Contractor's* detailed Price List summates back to the activity/milestone provided by the *Employer* and is sufficient detail to monitor completion of activities related to the operations on the Accepted Plan in order that payment of completed activities may be assessed.
- 1.3.5 The Prices are obtained from the Price List. The Prices includes for all direct and indirect costs, overheads, profits, risks, liabilities, obligations, etc. relative to the contract.

C2.2 Price List

Item	Description	Unit	Qty	Unit Price	Total Price
1	Supply, deliver and install polymer concrete/ polycrrete handrailing at bridge Km 180	m	300		
2	Supply, deliver and install polymer concrete/ polycrrete handrailing at bridge Km 186	M	280		
3	Supply, deliver and install polymer concrete/ polycrrete handrailing at bridge Km 187	m	450		
Sub-Total (Excl. VAT)					
VAT @ 15%					
Gross Total (Incl. VAT)					

Delivery Time Commitment Clause:

Expected delivery Period (Specified by TRIM): _____

Expected delivery time Accepted (by Contractor) _____

Sign:

Date:

If expected delivery time is not accepted, complete and sign the clause below:

I _____, _____, Representative of _____ confirm
that _____ cannot be able to deliver these services within the expected delivery
time, hence Transnet Freight Rail is at liberty to source services elsewhere.

Sign:

Date:

C3: Service Information

1. Description of the service

- 1.1 This specification covers the supply, deliver and install hand-railing on three bridges between Idondotha and Elubana areas at Km 180, Km 186 and Km 187, respectively.
- 1.2 The steel hand-railing must be replaced with Polymer Concrete (polycrrete) material to minimize the vandalization after replacement.
- 1.3 The *Contractor* is responsible for the following:
- Supply and install handrailing as per the attached Specification herein.
 - Establishing the site and disestablishing after the completion of service.
 - Provide accommodation for their personnel should there be a need.
 - Provide transportation for their personnel.
 - Provide all required consumables and ablution facilities.
 - Provide security to guard their equipment and materials.

2. Drawings

Drawing number	Revision	Title
Not applicable		

3. Specifications

Specifications	Revision	Title
BBH6751 Specification for handrails	BBH6751 Specification for handrails	
E7/2 Specifications for service on, over and adjacent to Railway lines and near High Voltage Equipment.	E7/2 Specifications for service on, over and adjacent to Railway lines and near High Voltage Equipment.	
BBB 0481(Latest Version) Transnet Freight Rail Manual for Track Maintenance.	BBB 0481(Latest Version) Transnet Freight Rail Manual for Track Maintenance.	
TMH7 1988	TMH7 1988	
BBD 6241 Bridge Code	Bridge Code 1983	
Bridge Handbook 1988	Bridge Handbook 1988	

4. Constraints on how the *Contractor* Provides the Service

- 4.1. The *Contractor* shall not make use of any *Sub-Contractor* to perform the service or parts thereof without prior permission from the *Service Manager*.
- 4.2. The *Contractor* shall ensure that a safety representative is at site at all times.
- 4.3. Adopted from time to time and instructed by the *Service Manager*. Such compliance shall be entirely at his own cost, and shall be deemed to have been allowed for in the rates and prices in the contract.
- 4.3 The *Contractor* shall, in particular, comply with the following Acts and Transnet Specifications:-
- 4.3.1 The Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993. The *Contractor* shall produce proof of his registration and good standing with the Compensation Commissioner in terms of the Act.
- 4.3.2 The Occupational Health and Safety Act (Act 85 of 1993).
- 4.3.3 The explosive Act No. 26 of 1956 (as amended). The *Contractor* shall, when applicable, furnish the *Service Manager* with copies of the permits authorising him or his employees, to establish an explosives magazine on or near the site and to undertake blasting operations in compliance with the Act.
- 4.3.4 The *Contractor* shall comply with the current Transnet Specification E.4E, Safety Arrangements and Procedural Compliance with the Occupational Health and Safety Act, Act 85 of 1993 and Regulations and shall before commencement with the execution of the contract, which shall include site establishment and delivery of plant, equipment or materials, submit to the *Service Manager*.
- 4.3.5 The *Contractor* shall comply with the current Specification for Service On, Over, Under or Adjacent to Railway Lines and near High Voltage Equipment – E7/1, if applicable, and shall take particular care of the safety of his employees on or in close proximity to a railway line during track occupations as well as under normal operational conditions.
- 4.4 The *Contractor's* Health and Safety Programme shall be subject to agreement by the *Service Manager*, who may, in consultation with the *Contractor*, order supplementary and/or additional safety arrangements and/or different safe working methods to ensure full compliance by the *Contractor* with his obligations as an employer in terms of the Act.
- 4.5 In addition to compliance with clause 1.4 hereof, the *Contractor* shall report all incidents in writing to the *Service Manager*. Any incident resulting in the death of or injury to any person on the service shall be reported within 24 hours of its occurrence and any other incident shall be reported within 48 hours of its occurrence.
- 4.6 The *Contractor* shall make necessary arrangements for sanitation, water and electricity at these relevant sites during the installation of the equipment's.

- 4.7 The *Contractor* shall supply a **site diary** (with triplicate pages). This book shall be used to record any unusual events during the period of the work. Any delays to the work shall also be recorded such as delays caused by poor weather conditions, delays caused by permits being cancelled etc. The appointed *Service Manager* must countersign such delays. Other delays such as non-availability of equipment from 3rd party suppliers must be communicated to the *Service Manager* in writing.
- 4.8 The *Contractor* shall supply a **site instruction book** (with triplicate pages). This book shall be used to record any instructions to the *Contractor* regarding problems encountered on site – for example the quality of work or the placement of equipment. This book shall be filled in by the *Service Manager* and must be countersigned by the *Contractor*.
- 4.9 Both books mentioned above shall be the property of Transnet and shall be handed over to the *Service Manager* on the day of energising or handing over.
- 4.10 All processes or the manufacture and assembly of the product components must be subjected to a quality assurance system.
- 4.11 The *Contractor* will assume full responsibility for assuring that the products purchased meet the requirements of Transnet performance, and reliability, including purchased products from 3rd part suppliers/Manufacturers.
- 4.12 The *Contractor* shall prove to Transnet that his equipment or those supplied from 3rd party suppliers/manufacturers confirms to Transnet specifications.
- 4.13 The *Contractor* will remain liable for contractual delivery dates irrespective of deficiencies discovered during servicehop inspections.
- 4.14 The *Contractor* shall ensure that equipment to be supplied is suitable installation for coastal areas.
- 4.15 *Service Manager* reserves the right to award the contract based on delivery period due to the urgency of this substation.
- 4.16 *Service Manager* reserves the right to award the contract in portions pertaining different work execution specialisation.

5. Requirements for the programme

- | | |
|------------------------------|--|
| 5.1 Programme of work | : To be submitted by successful <i>Contractor</i> |
| 5.2 Format | : MSP |
| 5.3 Information | : How work is going to be executed and commissioned |
| 5.4 Site diary | : Successful <i>Contractor</i> to supply in triplicates carbon copies |
| 5.5. Personnel Qualification | : Civil engineering technical knowledge in bridges and structures
Service manager registered with Built Environment Professional Body |

6. Services and other things provided by the *Employer*

6.1 Transnet Rail Infrastructure Manager shall have personnel available during the work execution and issuing of work permits.

6.2 Upon successful completion of the service to the satisfaction of Transnet Rail Infrastructure Manager shall perform necessary quality tests on the installed equipment.

7 The *Contractor's* Invoices

7.1 When the *Service Manager* certifies payment following an assessment date, the *Contractor* complies with the *Employer's* procedure for invoice submission.

7.2 The invoice must correspond to the *Service Manager's* assessment of the amount due to the *Contractor* as stated in the payment certificate.

7.3 The invoice states the following:

- Invoice addressed to Transnet Limited;
- Transnet Limited's VAT No: 4720103177;
- Invoice number;
- The *Contractor's* VAT Number; and
- The Contract number

7.4 The invoice contains the supporting detail

7.5 The invoice is presented either by post or by hand delivery.

7.6 Invoices submitted by post are addressed to:

For the attention of:

Service Manager: Sithandokuhle Khoza

TRIM Technical Support Department
4 Kiewiet Road
Nyala Park
Empangeni

7.7 Invoices submitted by hand are presented to:

Transnet Freight Rail
4 Kiewiet Road
Empangeni
3880

Transnet Rail Infrastructure Manager

Contract Number: ERACMM-PRC-48399

Description of the Service: For the supply, delivery and install of polycrete handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

7.8 The invoice is presented as an original.

PART 4: Affected Property

Core clause 11.2(2) states

“Affected Property is property which

- Is affected by the work of the *Contractor* or used by the *Contractor* in Providing the Service
- is in the documents which the Contract Data states it is in.”

In Contract Data, reference has been made to this Part 4 of the contract for the location of the Affected Property.

Three railway concrete bridges between Idondotha and Elubana stations. Km 180, Km 186 and Km 187

1. Description of the Affected Property and its surroundings

1.1. General description

N/A

1.2. Existing buildings, structures, and plant & machinery on the Site

N/A

1.3 Subsoil information

N/A

1.4 Hidden services

N/A

1.5. Other reports and publicly available information

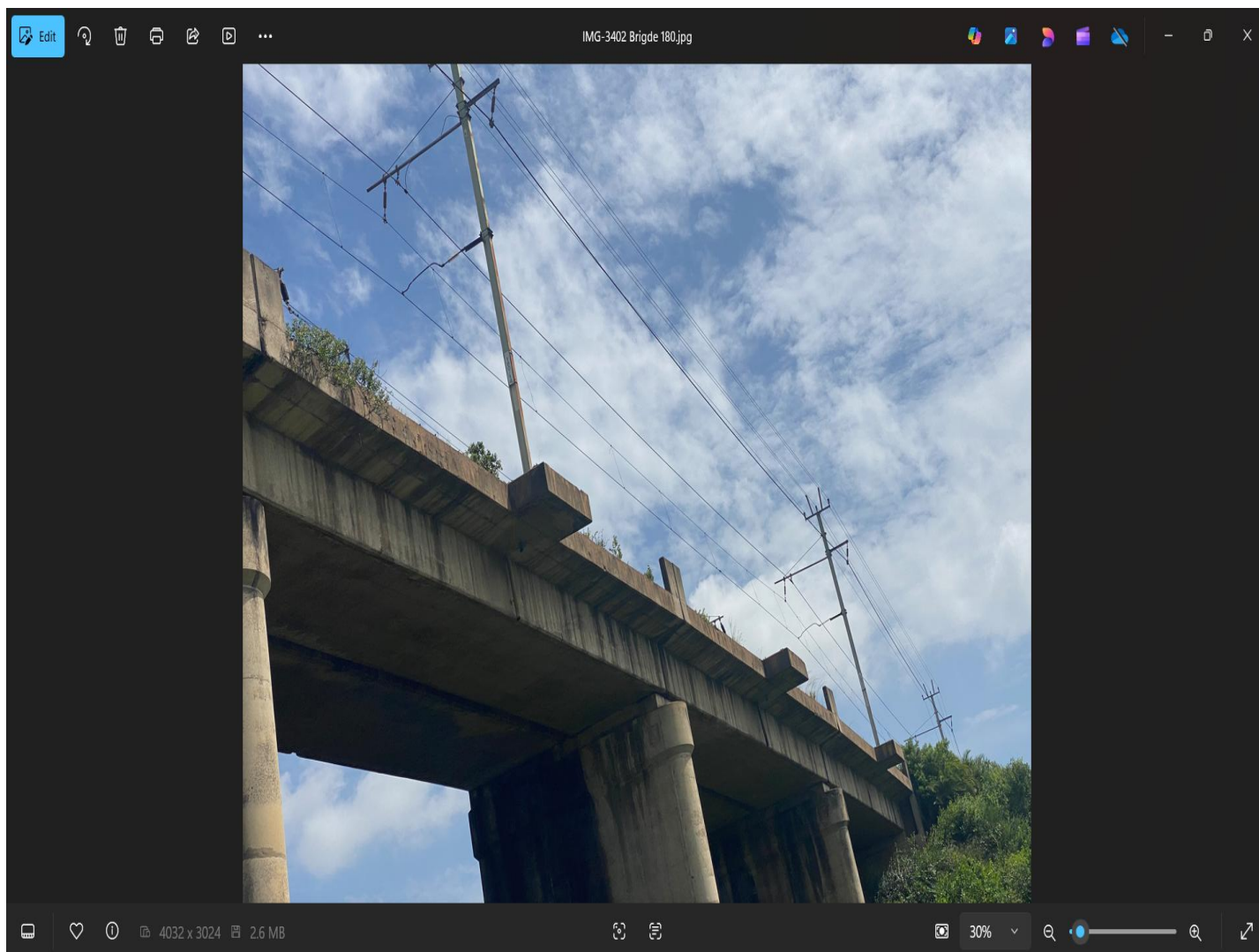
N/A



Transnet Rail Infrastructure Manager

Contract Number: RFQ ERACMM-PRC-48399

Description Of The Service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay

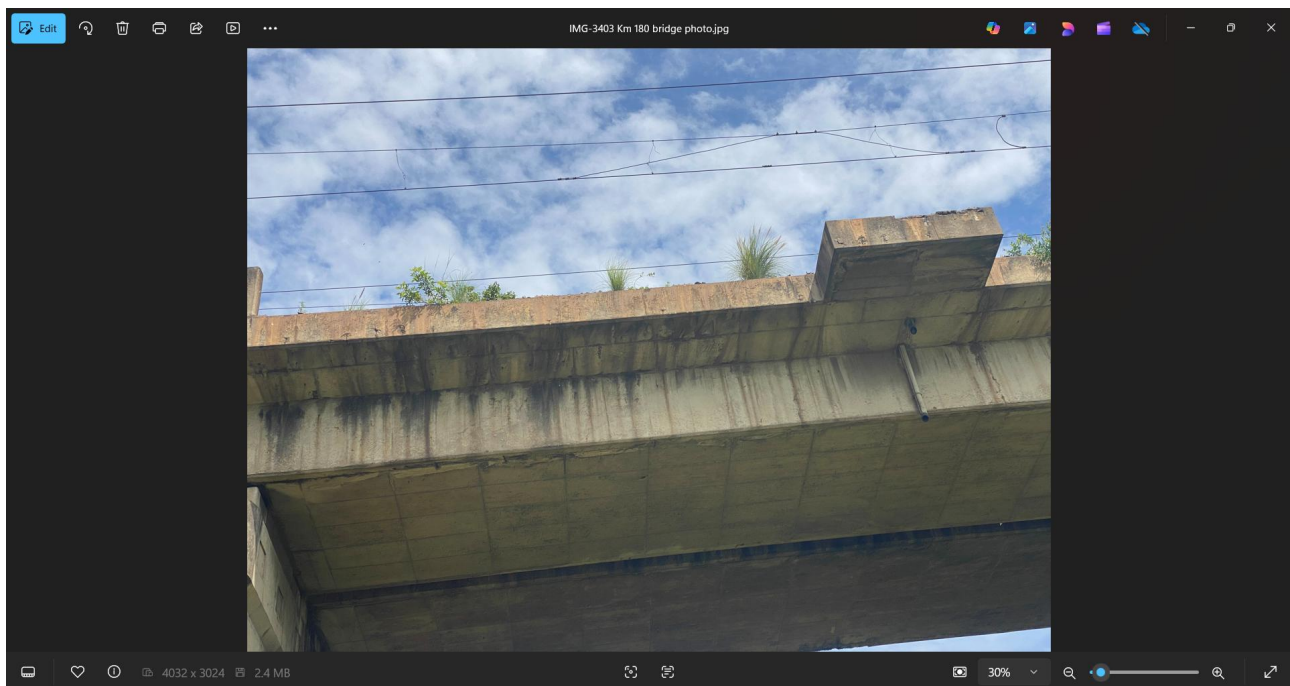




Transnet Rail Infrastructure Manager

Contract Number: RFQ ERACMM-PRC-48399

Description Of The Service: For the supply, delivery and install of handrailing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay



C.1 General

C.1.1 Actions

C.1.1.1 The employer and each tenderer submitting a tender offer shall comply with these conditions of tender. In their dealings with each other, they shall discharge their duties and obligations as set out in C.2 and C.3, timeously and with integrity, and behave equitably, honestly and transparently, comply with all legal obligations and not engage in anticompetitive practices.

C.1.1.2 The employer and the tenderer and all their agents and employees involved in the tender process shall avoid conflicts of interest and where a conflict of interest is perceived or known, declare any such conflict of interest, indicating the nature of such conflict. Tenderers shall declare any potential conflict of interest in their tender submissions. Employees, agents and advisors of the employer shall declare any conflict of interest to whoever is responsible for overseeing the procurement process at the start of any deliberations relating to the procurement process or as soon as they become aware of such conflict and abstain from any decisions where such conflict exists or recuse themselves from the procurement process, as appropriate.

Note: 1) A conflict of interest may arise due to a conflict of roles which might provide an incentive for improper acts in some circumstances. A conflict of interest can create an appearance of impropriety that can undermine confidence in the ability of that person to act properly in his or her position even if no improper acts result.

2) Conflicts of interest in respect of those engaged in the procurement process include direct, indirect or family interests in the tender or outcome of the procurement process and any personal bias, inclination, obligation, allegiance or loyalty which would in any way affect any decisions taken.

C.1.1.3 The employer shall not seek and a tenderer shall not submit a tender without having a firm intention and the capacity to proceed with the contract.

C.1.2 Tender Documents

The documents issued by the employer for the purpose of a tender offer are listed in the tender data.

C.1.3 Interpretation

C.1.3.1 The tender data and additional requirements contained in the tender schedules that are included in the returnable documents are deemed to be part of these conditions of tender.

C.1.3.2 These conditions of tender, the tender data and tender schedules which are required for tender evaluation purposes, shall form part of any contract arising from the invitation to tender.

C.1.3.3 For the purposes of these conditions of tender, the following definitions apply:

- a) **conflict of interest** means any situation in which:
 - i) someone in a position of trust has competing professional or personal interests which make it difficult to fulfill his or her duties impartially;
 - ii) an individual or tenderer is in a position to exploit a professional or official capacity in some way for their personal or corporate benefit; or
 - iii) incompatibility or contradictory interests exist between an employee and the tenderer who employs that employee.
- b) **comparative offer** means the price after the factors of a non-firm price and all unconditional discounts it can be utilised to have been taken into consideration;
- c) **corrupt practice** means the offering, giving, receiving or soliciting of anything of value to influence the action of the employer or his staff or agents in the tender process;

- d) **fraudulent practice** means the misrepresentation of the facts in order to influence the tender process or the award of a contract arising from a tender offer to the detriment of the employer, including collusive practices intended to establish prices at artificial levels;

C.1.4 Communication and employer's agent

Each communication between the employer and a tenderer shall be to or from the employer's agent only, and in a form that can be readily read, copied and recorded. Communications shall be in the English language. The employer shall not take any responsibility for non-receipt of communications from or by a tenderer. The name and contact details of the employer's agent are stated in the tender data.

C.1.5 Cancellation and Re-Invitation of Tenders

C.1.5.1 An employer may, prior to the award of the tender, cancel a tender if-

- a) due to changed circumstances, there is no longer a need for the engineering and construction works specified in the invitation;
- b) funds are no longer available to cover the total envisaged expenditure; or
- c) no acceptable tenders are received.
- d) there is a material irregularity in the tender process.

C.1.5.2 The decision to cancel a tender invitation must be published in the same manner in which the original tender invitation was advertised

C.1.5.3 An employer may only with the prior approval of the relevant treasury cancel a tender invitation for the second time.

C.1.6 Procurement procedures

C.1.6.1 General

Unless otherwise stated in the tender data, a contract will, subject to C.3.13, be concluded with the tenderer who in terms of C.3.11 is the highest ranked or the tenderer scoring the highest number of tender evaluation points, as relevant, based on the tender submissions that are received at the closing time for tenders.

C.1.6.2 Competitive negotiation procedure

C.1.6.2.1 Where the tender data require that the competitive negotiation procedure is to be followed, tenderers shall submit tender offers in response to the proposed contract in the first round of submissions. Notwithstanding the requirements of C.3.4, the employer shall announce only the names of the tenderers who make a submission. The requirements of C.8 relating to the material deviations or qualifications which affect the competitive position of tenderers shall not apply.

C.1.6.2.2 All responsive tenderers or at least a minimum of not less than three responsive tenderers that are highest ranked in terms of the evaluation criteria stated in the tender data shall be invited to enter into competitive negotiations based on the principle of equal treatment, keeping confidential the proposed solutions and associated information.

Notwithstanding the provisions of C.2.17, the employer may request that tenders be clarified, specified and fine-tuned in order to improve a tenderer's competitive position provided that such clarification, specification, fine-tuning or additional information does not alter any fundamental aspects of the offers or impose substantial new requirements which restrict or distort competition or have a discriminatory effect.

C.1.6.2.3 At the conclusion of each round of negotiations, tenderers shall be invited by the employer to revise their tender offer based on the same evaluation criteria, with or without adjusted weightings. Tenderers shall be advised when they are to submit their best and final offer.

C.1.6.2.4 The contract shall be awarded in accordance with the provisions of C.3.11 and C.3.13 after tenderers have been requested to submit their best and final offer.

C.1.6.3 Proposal procedure using the two stage-system

C.1.6.3.1 Option 1

Tenderers shall in the first stage submit technical proposals and, if required, cost parameters around which a contract may be negotiated. The employer shall evaluate each responsive submission in terms of the method of evaluation stated in the tender data, and in the second stage negotiate a contract with the tenderer scoring the highest number of evaluation points and award the contract in terms of these conditions of tender.

C.1.6.3.2 Option 2

C.1.6.3.2.1 Tenderers shall submit in the first stage only technical proposals. The employer shall invite all responsive tenderers to submit tender offers in the second stage, following the issuing of procurement documents.

C.1.6.3.2.2 The employer shall evaluate tenders received during the second stage in terms of the method of evaluation stated in the tender data, and award the contract in terms of these conditions of tender.

C.2 Tenderer's obligations

C.2.1 Eligibility

C.2.1.1 Submit a tender offer only if the tenderer satisfies the criteria stated in the tender data and the tenderer, or any of his principals, is not under any restriction to do business with employer.

C.2.1.2 Notify the employer of any proposed material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used by the employer as the basis in a prior process to invite the tenderer to submit a tender offer and obtain the employer's written approval to do so prior to the closing time for tenders.

C.2.2 Cost of tendering

C.2.2.1 Accept that, unless otherwise stated in the tender data, the employer will not compensate the tenderer for any costs incurred in the preparation and submission of a tender offer, including the costs of any testing necessary to demonstrate that aspects of the offer complies with requirements.

C.2.2.2 The cost of the tender documents charged by the employer shall be limited to the actual cost incurred by the employer for printing the documents. Employers must attempt to make available the tender documents on its website so as not to incur any costs pertaining to the printing of the tender documents.

C.2.3 Check documents

Check the tender documents on receipt for completeness and notify the employer of any discrepancy or omission.

C.2.4 Confidentiality and copyright of documents

Treat as confidential all matters arising in connection with the tender. Use and copy the documents issued by the employer only for the purpose of preparing and submitting a tender offer in response to the invitation.

C.2.5 Reference documents

Obtain, as necessary for submitting a tender offer, copies of the latest versions of standards, specifications, conditions of contract and other publications, which are not attached but which are incorporated into the tender documents by reference.

C.2.6 Acknowledge addenda

Acknowledge receipt of addenda to the tender documents, which the employer may issue, and if necessary apply for an extension to the closing time stated in the tender data, in order to take the addenda into account.

C.2.7 Clarification meeting

Attend, where required, a clarification meeting at which tenderers may familiarize themselves with aspects of the proposed work, services or supply and raise questions. Details of the meeting(s) are stated in the tender data.

C.2.8 Seek clarification

Request clarification of the tender documents, if necessary, by notifying the employer at least five (5) working days before the closing time stated in the tender data.

C.2.9 Insurance

Be aware that the extent of insurance to be provided by the employer (if any) might not be for the full cover required in terms of the conditions of contract identified in the contract data. The tenderer is advised to seek qualified advice regarding insurance.

C.2.10 Pricing the tender offer

C.2.10.1 Include in the rates, prices, and the tendered total of the prices (if any) all duties, taxes except Value Added Tax (VAT), and other levies payable by the successful tenderer, such duties, taxes and levies being those applicable fourteen (14) days before the closing time stated in the tender data.

C.2.10.2 Show VAT payable by the employer separately as an addition to the tendered total of the prices.

C.2.10.3 Provide rates and prices that are fixed for the duration of the contract and not subject to adjustment except as provided for in the conditions of contract identified in the contract data.

C.2.10.4 State the rates and prices in Rand unless instructed otherwise in the tender data. The conditions of contract identified in the contract data may provide for part payment in other currencies.

C.2.11 Alterations to documents

Do not make any alterations or additions to the tender documents, except to comply with instructions issued by the employer, or necessary to correct errors made by the tenderer. All signatories to the tender offer shall initial all such alterations.

C.2.12 Alternative tender offers

C.2.12.1 Unless otherwise stated in the tender data, submit alternative tender offers only if a main tender offer, strictly in accordance with all the requirements of the tender documents, is also submitted as well as a schedule that compares the requirements of the tender documents with the alternative requirements that are proposed.

C.2.12.2 Accept that an alternative tender offer must be based only on the criteria stated in the tender data or criteria otherwise acceptable to the employer.

C.2.12.3 An alternative tender offer must only be considered if the main tender offer is the winning tender.

C.2.13 Submitting a tender offer

C.2.13.1 Submit one tender offer only, either as a single tendering entity or as a member in a joint venture to provide the whole of the works identified in the contract data and described in the scope of works, unless stated otherwise in the tender data.

C.2.13.2 Return all returnable documents to the employer after completing them in their entirety, either electronically (if they were issued in electronic format) or by writing legibly in non-erasable ink.

C.2.13.3 Submit the parts of the tender offer communicated on paper as an original plus the number of copies stated in the tender data, with an English translation of any documentation in a language other than English, and the parts communicated electronically in the same format as they were issued by the employer.

C.2.13.4 Sign the original and all copies of the tender offer where required in terms of the tender data. The employer will hold all authorized signatories liable on behalf of the tenderer. Signatories for tenderers proposing to contract as joint ventures shall state which of the signatories is the lead partner whom the employer shall hold liable for the purpose of the tender offer.

C.2.13.5 Seal the original and each copy of the tender offer as separate packages marking the packages as "ORIGINAL" and "COPY". Each package shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

C.2.13.6 Where a two-envelope system is required in terms of the tender data, place and seal the returnable documents listed in the tender data in an envelope marked "financial proposal" and place the remaining returnable documents in an envelope marked "technical proposal". Each envelope shall state on the outside the employer's address and identification details stated in the tender data, as well as the tenderer's name and contact address.

C.2.13.7 Seal the original tender offer and copy packages together in an outer package that states on the outside only the employer's address and identification details as stated in the tender data.

C.2.13.8 Accept that the employer will not assume any responsibility for the misplacement or premature opening of the tender offer if the outer package is not sealed and marked as stated.

C.2.13.9 Accept that tender offers submitted by facsimile or e-mail will be rejected by the employer, unless stated otherwise in the tender data.

C.2.14 Information and data to be completed in all respects

Accept that tender offers, which do not provide all the data or information requested completely and in the form required, may be regarded by the employer as non-responsive.

C.2.15 Closing time

C.2.15.1 Ensure that the employer receives the tender offer at the address specified in the tender data not later than the closing time stated in the tender data. Accept that proof of posting shall not be accepted as proof of delivery.

C.2.15.2 Accept that, if the employer extends the closing time stated in the tender data for any reason, the requirements of these conditions of tender apply equally to the extended deadline.

C.2.16 Tender offer validity

C.2.16.1 Hold the tender offer(s) valid for acceptance by the employer at any time during the validity period stated in the tender data after the closing time stated in the tender data.

C.2.16.2 If requested by the employer, consider extending the validity period stated in the tender data for an agreed additional period with or without any conditions attached to such extension.

C.2.16.3 Accept that a tender submission that has been submitted to the employer may only be withdrawn or substituted by giving the employer's agent written notice before the closing time for tenders that a tender is to be withdrawn or substituted. If the validity period stated in C.2.16 lapses before the employer evaluating tender, the contractor reserves the right to review the price based on Consumer Price Index (CPI).

C.2.16.4 Where a tender submission is to be substituted, a tenderer must submit a substitute tender in accordance with the requirements of C.2.13 with the packages clearly marked as "SUBSTITUTE".

C.2.17 Clarification of tender offer after submission

Provide clarification of a tender offer in response to a request to do so from the employer during the evaluation of tender offers. This may include providing a breakdown of rates or prices and correction of arithmetical errors by the adjustment of certain rates or item prices (or both). No change in the competitive position of tenderers or substance of the tender offer is sought, offered, or permitted.

Note: *Sub-clause C.2.17 does not preclude the negotiation of the final terms of the contract with a preferred tenderer following a competitive selection process, should the Employer elect to do so.*

C.2.18 Provide other material

C.2.18.1 Provide, on request by the employer, any other material that has a bearing on the tender offer, the tenderer's commercial position (including notarized joint venture agreements), preferencing arrangements, or samples of materials, considered necessary by the employer for the purpose of a full and fair risk assessment.

Should the tenderer not provide the material, or a satisfactory reason as to why it cannot be provided, by the time for submission stated in the employer's request, the employer may regard the tender offer as non-responsive.

C.2.18.2 Dispose of samples of materials provided for evaluation by the employer, where required.

C.2.19 Inspections, tests and analysis

Provide access during working hours to premises for inspections, tests and analysis as provided for in the tender data.

C.2.20 Submit securities, bonds and policies

If requested, submit for the employer's acceptance before formation of the contract, all securities, bonds, guarantees, policies and certificates of insurance required in terms of the conditions of contract identified in the contract data.

C.2.21 Check final draft

Check the final draft of the contract provided by the employer within the time available for the employer to issue the contract.

C.2.22 Return of other tender documents

If so instructed by the employer, return all retained tender documents within twenty-eight (28) days after the expiry of the validity period stated in the tender data.

C.2.23 Certificates

Include in the tender submission or provide the employer with any certificates as stated in the tender data.

C.3 The employer's undertakings

C.3.1 Respond to requests from the tenderer

C.3.1.1 Unless otherwise stated in the tender Data, respond to a request for clarification received up to five (5) working days before the tender closing time stated in the Tender Data and notify all tenderers who collected tender documents.

C.3.1.2 Consider any request to make a material change in the capabilities or formation of the tendering entity (or both) or any other criteria which formed part of the qualifying requirements used to prequalify a tenderer to submit a tender offer in terms of a previous procurement process and deny any such request if as a consequence:

- a) an individual firm, or a joint venture as a whole, or any individual member of the joint venture fails to meet any of the collective or individual qualifying requirements;
- b) the new partners to a joint venture were not prequalified in the first instance, either as individual firms or as another joint venture; or
- c) in the opinion of the Employer, acceptance of the material change would compromise the outcome of the prequalification process.

C.3.2 Issue Addenda

If necessary, issue addenda that may amend or amplify the tender documents to each tenderer during the period from the date that tender documents are available until three (3) working days before the tender closing time stated in the Tender Data. If, as a result a tenderer applies for an extension to the closing time stated in the Tender Data, the Employer may grant such extension and, shall then notify all tenderers who collected tender documents.

C.3.3 Return late tender offers

Return tender offers received after the closing time stated in the Tender Data, unopened, (unless it is necessary to open a tender submission to obtain a forwarding address), to the tenderer concerned.

C.3.4 Opening of tender submissions

C.3.4.1 Unless the two-envelope system is to be followed, open valid tender submissions in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data. Tender submissions for which acceptable reasons for withdrawal have been submitted will not be opened.

C.3.4.2 Announce at the meeting held immediately after the opening of tender submissions, at a venue indicated in the tender data, the name of each tenderer whose tender offer is opened and, where applicable, the total of his prices, number of points claimed for its BBBEE status level and time for completion for the main tender offer only.

C.3.4.3 Make available the record outlined in C.3.4.2 to all interested persons upon request.

C.3.5 Two-envelope system

C.3.5.1 Where stated in the tender data that a two-envelope system is to be followed, open only the technical proposal of valid tenders in the presence of tenderers' agents who choose to attend at the time and place stated in the tender data and announce the name of each tenderer whose technical proposal is opened.

C.3.5.2 Evaluate functionality of the technical proposals offered by tenderers, then advise tenderers who remain in contention for the award of the contract of the time and place when the financial proposals will be opened. Open only the financial proposals of tenderers, who score in the functionality evaluation more than the minimum number of points for functionality stated in the tender data, and announce the score obtained for the technical proposals and the total price and any points claimed on BBEE status level. Return unopened financial proposals to tenderers whose technical proposals failed to achieve the minimum number of points for functionality.

C.3.6 Non-disclosure

Not disclose to tenderers, or to any other person not officially concerned with such processes, information relating to the evaluation and comparison of tender offers, the final evaluation price and recommendations for the award of a contract, until after the award of the contract to the successful tenderer.

C.3.7 Grounds for rejection and disqualification

Determine whether there has been any effort by a tenderer to influence the processing of tender offers and instantly disqualify a tenderer (and his tender offer) if it is established that he engaged in corrupt or fraudulent practices.

C.3.8 Test for responsiveness

C.3.8.1 Determine, after opening and before detailed evaluation, whether each tender offer properly received:

- a) complies with the requirements of these Conditions of Tender,
- b) has been properly and fully completed and signed, and
- c) is responsive to the other requirements of the tender documents.

C.3.8.2 A responsive tender is one that conforms to all the terms, conditions, and specifications of the tender documents without material deviation or qualification. A material deviation or qualification is one which, in the Employer's opinion, would:

- a) detrimentally affect the scope, quality, or performance of the works, services or supply identified in the Scope of Work,
- b) significantly change the Employer's or the tenderer's risks and responsibilities under the contract, or
- c) affect the competitive position of other tenderers presenting responsive tenders, if it were to be rectified.

Reject a non-responsive tender offer, and not allow it to be subsequently made responsive by correction or withdrawal of the non-conforming deviation or reservation.

C.3.9 Arithmetical errors, omissions and discrepancies

C.3.9.1 Check responsive tenders for discrepancies between amounts in words and amounts in figures. Where there is a discrepancy between the amounts in figures and the amount in words, the amount in words shall govern.

C.3.9.2 Check the highest ranked tender or tenderer with the highest number of tender evaluation points after the evaluation of tender offers in accordance with C.3.11 for:

- a) the gross misplacement of the decimal point in any unit rate;
- b) omissions made in completing the pricing schedule or bills of quantities; or
- c) arithmetic errors in:

- (i) line item totals resulting from the product of a unit rate and a quantity in bills of quantities or schedules of prices; or
- (ii) the summation of the prices.

C.3.9.3 Notify the tenderer of all errors or omissions that are identified in the tender offer and either confirm the tender offer as tendered or accept the corrected total of prices.

C.3.9.4 Where the tenderer elects to confirm the tender offer as tendered, correct the errors as follows:

- a) If bills of quantities or pricing schedules apply and there is an error in the line item total resulting from the product of the unit rate and the quantity, the line item total shall govern and the rate shall be corrected. Where there is an obviously gross misplacement of the decimal point in the unit rate, the line item total as quoted shall govern, and the unit rate shall be corrected.
- b) Where there is an error in the total of the prices either as a result of other corrections required by this checking process or in the tenderer's addition of prices, the total of the prices shall govern and the tenderer will be asked to revise selected item prices (and their rates if bills of quantities apply) to achieve the tendered total of the prices.

C.3.10 Clarification of a tender offer

Obtain clarification from a tenderer on any matter that could give rise to ambiguity in a contract arising from the tender offer.

C.3.11 Evaluation of tender offers

The Standard Conditions of Tender standardize the procurement processes, methods and procedures from the time that tenders are invited to the time that a contract is awarded. They are generic in nature and are made project specific through choices that are made in developing the Tender Data associated with a specific project.

Conditions of tender are by definition the document that establishes a tenderer's obligations in submitting a tender and the employer's undertakings in soliciting and evaluating tender offers. Such conditions establish the rules from the time a tender is advertised to the time that a contract is awarded and require employers to conduct the process of offer and acceptance in terms of a set of standard procedures.

The CIDB Standard Conditions of Tender are based on a procurement system that satisfies the following system requirements:	
Requirement	Qualitative interpretation of goal
Fair	The process of offer and acceptance is conducted impartially without bias, providing simultaneous and timely access to participating parties to the same information.
Equitable	Terms and conditions for performing the work do not unfairly prejudice the interests of the parties.
Transparent	The only grounds for not awarding a contract to a tenderer who satisfies all requirements are restrictions from doing business with the employer, lack of capability or capacity, legal impediments and conflicts of interest.
Competitive	The system provides for appropriate levels of competition to ensure cost effective and best value outcomes.
Cost effective	The processes, procedures and methods are standardized with sufficient flexibility to attain best value outcomes in respect of quality, timing and price, and least resources to effectively manage and control procurement processes.

The activities associated with evaluating tender offers are as follows:

- a) Open and record tender offers received
- b) Determine whether or not tender offers are complete
- c) Determine whether or not tender offers are responsive
- d) Evaluate tender offers
- e) Determine if there are any grounds for disqualification
- f) Determine acceptability of preferred tenderer
- g) Prepare a tender evaluation report
- h) Confirm the recommendation contained in the tender evaluation report

C.3.11.1 General

The employer must appoint an evaluation panel of not less than three persons conversant with the proposed scope of works to evaluate each responsive tender offer using the tender evaluation methods and associated evaluation criteria and weightings that are specified in the tender data.

C.3.12 Insurance provided by the employer

If requested by the proposed successful tenderer, submit for the tenderer's information the policies and / or certificates of insurance which the conditions of contract identified in the contract data, require the employer to provide.

C.3.13 Acceptance of tender offer

Accept the tender offer; if in the opinion of the employer, it does not present any risk and only if the tenderer:

- a) is not under restrictions, or has principals who are under restrictions, preventing participating in the employer's procurement;
- b) can, as necessary and in relation to the proposed contract, demonstrate that he or she possesses the professional and technical qualifications, professional and technical competence, financial resources, equipment and other physical facilities, managerial capability, reliability, experience and reputation, expertise and the personnel, to perform the contract;
- c) has the legal capacity to enter into the contract;
- d) is not; insolvent, in receivership, under Business Rescue as provided for in chapter 6 of the Companies Act No. 2008, bankrupt or being wound up, has his/her affairs administered by a court or a judicial officer, has suspended his/her business activities or is subject to legal proceedings in respect of any of the foregoing;
- e) complies with the legal requirements, if any, stated in the tender data; and
- f) is able, in the opinion of the employer, to perform the contract free of conflicts of interest.

C.3.14 Prepare contract documents

C.3.14.1 If necessary, revise documents that shall form part of the contract and that were issued by the employer as part of the tender documents to take account of:

- a) addenda issued during the tender period,
- b) inclusion of some of the returnable documents and
- c) other revisions agreed between the employer and the successful tenderer.

C.3.14.2 Complete the schedule of deviations attached to the form of offer and acceptance, if any.

C.3.15 Complete adjudicator's contract

Unless alternative arrangements have been agreed or otherwise provided for in the contract, arrange for both parties to complete formalities for appointing the selected adjudicator at the same time as the main contract is signed.

C.3.16 Registration of the award

An employer must, within twenty-one (21) working days from the date on which a contractor's offer to perform a construction works contract is accepted in writing by the employer, register and publish the award on the cidb Register of Projects.

C.3.17 Provide copies of the contracts

Provide to the successful tenderer the number of copies stated in the Tender Data of the signed copy of the contract as soon as possible after completion and signing of the form of offer and acceptance.

C.3.18 Provide written reasons for actions taken

Provide upon request written reasons to tenderers for any action that is taken in applying these conditions of tender but withhold information which is not in the public interest to be divulged, which is considered to prejudice the legitimate commercial interests of tenderers or might prejudice fair competition between tenderers.

The exemption process that **the dtic** follows is that if there is a particular designated product and the minimum threshold for local content cannot be met for various reasons, bidders must apply for exemption (when the tender is still open, before closing date). After checking with the industry, **the dtic** will then decide whether or not to grant an exemption. This is per tender. The exemption request must be on **the bidding company's signed letter-head** and cover the following:

The procuring entity/government department/state owned company,

Tender/bid number,

Closing date,

Item(s) for which the exemption is being requested for,

Description of the goods, services or works for which the requested exemption item will be used for and the local content that can be met,

Reason(s) for the request.

Attach specification issued by the procuring entity

Supporting letters from local manufacturers/sub-suppliers (if applicable)

Please note that it takes 3-5 working days for **the dtic** to process exemption letters and no requests for exemptions will be considered after the tender has closed.

The request should be addressed to the attention of:

Dr. Tebogo Makube
Chief Director: Industrial Procurement Unit
The Department of Trade and Industry
Private Bag X84,
Pretoria,
Gauteng,
0001

The request should be forwarded through email to Dr Makube on
TMakube@thedtic.gov.za and copy Ms Matidza (CMatidza@thedtic.gov.za)

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	2000	

Directors: A Sangqu (Chairperson) R Buthelezi M Debel B Jiya L Letsoalo FS Mufamadi D Patel B Sedupane MP Zambane
M Phillips* (Group Chief Executive) N Maphumulo* (Group Chief Financial Officer)

*Executive

Group Company Secretary: Ms S Bopape

www.transnet.net

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TRANSNET HAS A 'ZERO GIFTS' POLICY. NO EMPLOYEE IS ALLOWED TO ACCEPT GIFTS, FAVOURS OR BENEFITS

ANNEXURE C

Local Content Declaration - Summary Schedule

(C1)	Tender No.	ERACMM-PRC-48399
(C2)	Tender description:	RFP For the provision of supply, delivery and install of polycrete hand-railling For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay
(C3)	Designated product(s)	STEEL PRODUCTS AND COMPONENTS DESIGNATED AT 100%
(C4)	Tender Authority:	TRANSNET SOC LTD
(C5)	Tendering Entity name:	
(C6)	Tender Exchange Rate:	Pula EU GBP
(C7)	Specified local content %	STEEL PRODUCTS AND COMPONENTS DESIGNATED AT 100%

Calculation of local content

Tender item no's	Description of Items	Tender price - each (excl VAT)	Exempted imported value	Tender value-net of exempted imported content	Imported value	Local value	Local content % (per item)
1	Supply, deliver and install polymer concrete/ polycrete handrailing at bridge Km 180						
2	Supply, deliver and install polymer concrete/ polycrete handrailing at bridge Km 186						
3	Supply, deliver and install polymer concrete/ polycrete handrailing at bridge Km 187						

Signature of tenderer

Date:

ANNEXURE D

Imported Content Declaration - Supporting Schedule to Annex C

(D1)	Tender No.	ERACMM-PRC-48399		
(D2)	Tender description:	RFP For the provision of supply, delivery and install of polycrete hand-railing For Bridges Between Elubana And Idonotha under Depot Engineering of Richards Bay	Note: VAT to be excluded from all calculations	
(D3)	Designated Products:	STEEL PRODUCTS AND COMPONENTS DESIGNATED AT 100%		
(D4)	Tender Authority:	TRANSNET SOC LTD		
(D5)	Tendering Entity name:			
(D6)	Tender Exchange Rate:	Pula	EU R 9,00	GBP R 12,00

A. Exempted imported content

A. Exempted imported content				Calculation of imported content						Summary	
Tender item no's	Description of imported content	Local supplier	Overseas Supplier	Foreign currency value as per Commercial Invoice (D11)	Tender Exchange Rate (D12)	Local value of imports (D13)	Freight costs to port of entry (D14)	All locally incurred landing costs & duties (D15)	Total landed cost excl VAT (D16)	Tender Qty (D17)	Exempted imported value (D18)
(D7)	(D8)	(D9)	(D10)								
(D19) Total exempt imported value										R 0	
This total must correspond with Annex C - C 21											

B. Imported directly by the Tenderer

				Calculation of imported content						Summary	
Tender item no's	Description of imported content	Unit of measure	Overseas Supplier	Foreign currency value as per Commercial Invoice	Tender Rate of Exchange	Local value of imports	Freight costs to port of entry	All locally incurred landing costs & duties	Total landed cost excl VAT	Tender Qty	Total imported value
(D20)	(D21)	(D22)	(D23)	(D24)	(D25)	(D26)	(D27)	(D28)	(D29)	(D30)	(D31)
(D32) Total imported value by tenderer										R 0	

C. Imported by a 3rd party and supplied to the Tenderer

				Calculation of imported content						Summary	
Description of imported content	Unit of measure	Local supplier	Overseas Supplier	Foreign currency value as per Commercial Invoice	Tender Rate of Exchange	Local value of imports	Freight costs to port of entry	All locally incurred landing costs & duties	Total landed cost excl VAT	Quantity imported	Total imported value
(D33)	(D34)	(D35)	(D36)	(D37)	(D38)	(D39)	(D40)	(D41)	(D42)	(D43)	(D44)
(D45) Total imported value by 3rd party										R 0	

D. Other foreign currency payments

Calculation of foreign currency payments					Summary of payments	
Type of payment	Local supplier making the payment	Overseas beneficiary	Foreign currency value paid	Tender Rate of Exchange	Local value of payments	
(D46)	(D47)	(D48)	(D49)	(D50)	(D51)	

(D52) Total of foreign currency payments declared by tenderer and/or 3rd party

(D53) Total of imported content & foreign currency payments - (D32), (D45) & (D52) above

Signature of tenderer from Annex B

Date:

This total must correspond with Annex C - C 23

Annex E

Local Content Declaration – Supporting Schedule to Annex C

(E1) Tender No.	ERACMM-PRC-48399	Note: VAT to be excluded from all calculations
(E2) Tender description :	RFP For the provision of supply, delivery and install of polycrete hand-railing For Bridges Between Elubana And Idondotha under Depot Engineering of Richards Bay	
(E3) Designated products:	STEEL PRODUCTS AND COMPONENTS DESIGNATED AT 100%	
(E4) Tender Authority:	TRANSNET SOC LTD	
(E5) Tendering Entity name:		

Local Products (Goods, Services and Works)	A	Local suppliers	Value
	(E6)	(E7)	(E8)
1	Supply, deliver and install polymer concrete/ polycrete handrailing at bridge Km 180		
2	Supply, deliver and install polymer concrete/ polycrete handrailing at bridge Km 186		
3	Supply, deliver and install polymer concrete/ polycrete handrailing at bridge Km 187		
(E9) Total local products (Goods, Services and Works)			R 0

(E10) Manpower costs (Tenderer's manpower cost) R 0

(E11) Factory overheads (Rental, depreciation & amortisation, utility costs, consumables etc.) R 0

(E12) Administration overheads and mark-up (Marketing, insurance, financing, interest etc.) R 0

(E13) Total local content R 0

This total must

Signature of tenderer

Date:



A division of Transnet SOC Limited

RAIL NETWORK – TECHNICAL

SPECIFICATION FOR HANDRAILS

Author:	Mlungisi Phewa Chief Engineering Technician Rail Network – Technical	
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Date		September 2023

Circulation Restricted To:

Transnet Freight Rail

Approved third parties

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1.0 INTRODUCTION

- 1.1. Handrails provides support to pedestrians and individuals on bridges and culverts due to the height above ground level.
- 1.2. This specification entails the technical requirements for handrails manufactured by non-traditional materials (Composite Handrails) for both bridges and culverts.
- 1.3. The specification shall only be used for the procurement of composite handrails that will be installed on Bridges and culverts.

2.0 REFERENCED DOCUMENTS

- 2.1 BBB 0481 (Latest Version), Transnet Freight Rail Manual for Track Maintenance.
- 2.2 BBD 6241 Bridge Code.
- 2.3 BE 9080 Bridge Handbook

3.0 TERMS AND DEFINITIONS

For this specification the following definitions shall apply:

3.1 Supplier

An entity that wishes to be eligible to supply the composite handrails to TFR.

Manufacturer

An entity that produces the desired goods and may or may not be the supplier.

Handrail

A rail fixed to posts or a wall for people to hold on to for support.

Composite Handrail

A handrail manufactured from multiple non-traditional constituents.

Third party

An entity, person or group besides the two primarily involved in entities which are TFR and the manufacturer/supplier.

4.0 TECHNICAL REQUIREMENTS

4.1 Material Requirements

- 4.1.1 Composite Handrails consists of multiple constituents. These constituents could include any recycled plastics, rubber, bitumen with glass reinforced fibres and if steel material used should not exceed 15% of total material.

-
- 4.1.2 Reinforced fibres and other modifiers may be added to increase the mechanical properties of the handrail. The direction of the reinforced fibres shall be transverse and longitudinal of the Handrail to ensure mechanical strength.
- 4.1.3 The constituents of the handrail shall be at the manufacturer's discretion to enable the handrail to conform with the requirements of TFR. The constituents used within the handrail may not pose environmental concern and the supplier must specify the constituents source, testing, availability and quality.
- 4.1.4 The handrail should be able to withstand temperature change for all South African four seasons (temperature -15 to 70 °C), must not be affected by moisture, must be UV resistant, fire resistant, abrasion resistant, resist decaying and able to withstand chemical spills like fuel, oil etc.

4.2 Design Requirements

4.2.1 The manufacturer shall comply with the following minimum design criteria for Handrails for bridge and culverts:

- Accommodate all types of bridges and culverts (Concrete, steel and composite)
- The connections must be able to accommodate concrete and steel bridge/culverts
- Demonstrate a cost effective life cycle when compared to traditional handrails
- Handrail must not warp/ bend due to in service operation and must be able to withstand ultra-violet (UV). Surface deprivation due to the UV light may not result in the handrail being unusable.
- The lower 200mm section of the handrail must allow for kicker plate to prevent slipping underneath.
- Must be designed for the loads specified for Class II balustrades in TMH7, see Appendix for drawings:
- The distributed force q_p shall be 1.5kN per linear metre acting transversely, together with simultaneous vertical force of 1.5 kN/m acting vertically on each longitudinal member.
- A transverse force of 1.5 L kN, where L is the post spacing in metres at the centre of the upper rail, shall act each post independently of the longitudinal member forces specified.
- The handrail may not have any visible surface defects in general and internal voids/ porosity will not be permissible (max: Ø 12.5 mm).
- Linear expansion coefficient should be less than $5 \cdot 10^{-5}/^{\circ}C$.
- Fire resistant to mitigate the risk of handrail replacement due to welding, grinding, bush fires, train breaks etc.
- Must be able to perform the intended duties of the conventional handrails to support pedestrians crossing or working on a bridge or culvert.

-
- Where possible the handrails must be marked/ indented with the follow markings:
 - Supplier name
 - Transnet Logo (Transnet shall provide the description of the logo)
 - Manufacturing date and batch number

4.3 Dimensions and Tolerance Requirements

- 4.3.1 Dimensions and tolerances for Handrails are indicated in Table 1. The supplier must submit drawings of the handrails for approval by the Principal Engineer and it remains the responsibility of the supplier to ensure that the correct dimensions and tolerances is adhere to.

Table 1: Dimensions and Tolerances Handrails (mm)

	Handrails		
	Dimensions	Tolerances	
Length	Varies per bridge length	+5	-5
Height	1100	+5	-5
Vertical spacing of Horizontal Beams	Max 350	+5	+5
Horizontal spacing of vertical beams	Max 2500	+5	+5

Rails or steps which may reduce the effective height of 1100mm are not permitted

4.4 Performance Requirements

- 4.4.1 The handrail must be able to resist:
- Maximum nominal load of 1.5 kN/m, acting on the top beam,
- 4.4.2 The handrails must be tested according to TFR requirements as per this specification and/or according to the relevant ISO and SANS standards or equivalent.
- 4.4.3 TFR reserves the right to perform quality tests on the handrails and the supplier must provide all the required samples.

5 COMPLIANCE REQUIREMENTS

5.1 User Requirements

- 5.1.1 The constituents of the handrails shall be disclosed to TFR.
- 5.1.2 The handrails shall be eco-friendly and shall possess suitable microbicidal additives to resist termite, rot and bacterial growth.

5.1.3 The supplier shall provide Material Safety Data Sheets (MSDS) of the product as well as declare all other safety and environmental related issues pertaining to the product.

5.2 General Requirements

5.2.1 The manufacturer's handrail factory/plant shall possess an ISO 9001 (latest) or equivalent quality management system.

5.2.2 The supplier/manufacturer shall have approved testing methods for the product and must have a product manual.

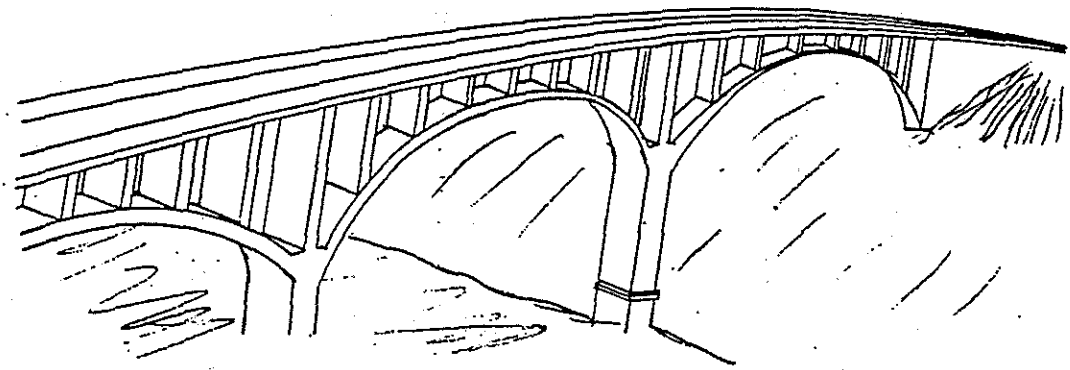
5.2.3 Extensive testing of the handrails shall be carried out for quality and consistency by the supplier prior to its implementation on the TFR railway lines.

5.2.4 The supplier/manufacturer must provide TFR with:

- The necessary maintenance procedure/ schedule or all relevant manuals,
- Warranty period,
- Drawings/ Dimensions,
- Technical properties,
- The expected life span of the handrails,
- Handling procedure,
- Installation methodology and manual
- Details of the constituents and all other relevant information as stipulated in this specification

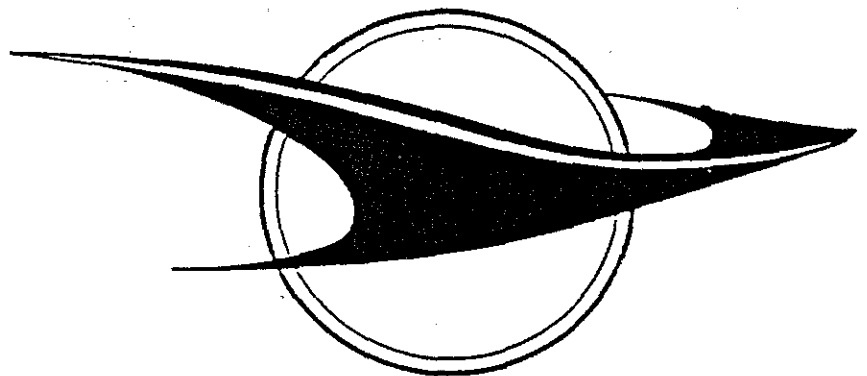
5.2.5 All drawings shall be signed by the Principal Engineer once the products has been approved.

BRIDGE HANDBOOK



COMPILED BY
CHIEF ENGINEER (INFRASTRUCTURE) AND
CHIEF ENGINEER (TECHNICAL ADVISORY SERVICES)
JOHANNESBURG

CIVIL



HANDBOOK B4

SEPTEMBER 1988

AH 0520G

BRIDGE HANDBOOK

CONTENTS

1. Planning and construction guidelines :
Level crossings and road/rail bridge structures.
2. Clearances.
3. Loads and design.
4. Culverts.
5. Footbridges.
6. Retaining walls and Reinforced Earth structures.
7. Tunnels.
8. Slab track.
9. Turntables.
10. Bridge and culvert inspection.
11. Bridge and culvert maintenance :
Repairs, strengthening and improvements.
12. Abnormal loads

AH 0520G

BRIDGE HANDBOOK

INTRODUCTION

BRIDGE OFFICE FUNCTIONS AND RESPONSIBILITIES

The Bridge Office provides designs and detailed drawings for rail or road bridges, footbridges, culverts, retaining walls, track slabs, turntables and tunnel linings and sets the design standards when others undertake the designs and drawings for these structures. The Bridge Office reserves the right to design all rail carrying bridge structures and approves the appointment of suitable consulting engineers for such work should this become necessary. In the case of culverts and retaining walls, Bridge Office type or catalogue drawings are available for use as explained further in the relevant chapters hereof.

The Bridge Office monitors all bridge and culvert site plans and working drawings and holds full records of all bridges.

Annual bridge and culvert inspections are monitored and spot inspections are made on site by Bridge Office staff. Repair methods and temporary track support structures are developed and the work monitored on site. The Bridge Office is intimately involved with all emergencies involving bridges and culverts and the Bridge Engineer takes control by agreement during major emergencies.

The Bridge Office provides a monitoring and advice service and sets standards with regard to clearances from the railway track. It also authorises the acceptance for transport by rail of all abnormal loads and in order to do so holds records of all structures foul of the minimum clearance profile.

REORGANISATION OF SATS

This handbook was prepared during the latter stages of the existence of the Chief Civil Engineer's department. With the reorganisation of SATS the Bridge Office has been divided such that the Bridge Engineer (responsible for planning; the inspection, maintenance and repair of bridges, culverts, tunnels and turntables; clearances and abnormal loads) becomes Director (Infrastructure) at Railways HQ and the Senior Design Engineer (Bridges) (responsible for design of bridges, culverts, tunnels, retaining walls and track slabs) becomes Director (Technical Advisory Services). The duties and responsibilities of the two sections of the Bridge Office remain basically unchanged and the present close liaison will continue.

In so far as submission of plans for approval are concerned the term "Bridge Office" used herein should be interpreted as follows:

- (i) Site plans for new bridges and alterations to bridges (6 m span or larger) to the Director (Infrastructure : Bridges) and general arrangement and working drawings to the Director (Technical Advisory Services : Bridges).
- (ii) Site plans for culverts and retaining walls (excluding pipe culverts up to 2 m diameter) and in the case of low cost projects (refer 3.1 of chapter 4), working drawings to the Director (Infrastructure : Bridges), who will arrange for the necessary working drawings to be prepared by the Director (Technical Advisory Services : Bridges).

Matters involving clearances, abnormal loads, retaining walls, tunnels, turntables and bridge and culvert repairs should be referred to the Director (Infrastructure : Bridges). In the case of the drawings referred to in 2 of Chapter 6 refer to the Deputy Director, T.A.S., Elandsfontein.

In 6 of Chapter 2 reference is made to the Chief Electrical Engineer regarding vertical clearances for electrification. The Chief Director (Infrastructure : Power Supplies) will handle such matters in the future.

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BRIDGE HANDBOOK

CHAPTER 1

PLANNING AND CONSTRUCTION GUIDELINES : PUBLIC LEVEL CROSSINGS AND BRIDGE STRUCTURES

INTRODUCTION

These guidelines are intended to assist the planner of a new railway line or road to determine whether a structure or a level crossing should be provided and what standards should apply for both immediate and future requirements. The guidelines can assist in clarifying the responsibilities of SATS and the road authority when negotiations involving the cost of a structure and provision for the future are contemplated, and may also be used when considering standards for changes or improvements to existing railway lines and public roads. Engineering judgement should naturally be applied when using the guidelines.

These guidelines were submitted in draft form to the General Manager, SATS, the National Transport Commission, the FLCC (see Cl. hereof) and each of the 4 Provincial Roads Departments. The document was acceptable to the above, subject to corrections which have subsequently been incorporated.

A. PUBLIC LEVEL CROSSINGS : VEHICULAR

- A1. Level crossings constitute a danger to the user, and where possible railways and roads should be planned to avoid their creation. The ideal railway line should have no level crossings, but in view of the high cost of grade separations a careful analysis should be made at each site to consider whether a grade separation can be justified or, if not, the type of level crossing and the protection which should be provided, i.e. signs only, signs and flashlights, or signs and flashlights plus automatic barriers. Where justified the above measures can be supplemented by the addition of bells and illumination of the crossing. A responsible planner should resist the automatic provision of a grade separation and make his decision based on all the factors involved.
- A2. Factors to be taken into account when considering a level crossing are -
 - (i) classification of railway line (main line or branch line), maximum speed of rail traffic at the crossing and whether the line is single or double;
 - (ii) classification of the road (secondary road, link road, local road), whether urban or rural, and the speed of road traffic;

- (iii) sight distances along road and rail routes approaching the crossing, i.e. visibility across each quadrant from rail vehicle to road vehicle and vice versa;
- (iv) the maximum dimensions of road vehicles using the crossing, especially their height, in relation to the height of the electrified contact wire;
- (v) the density of road and rail traffic;
- (vi) the probable cost of a grade separation;
- (vii) the possibility of a road connection to other crossings in the vicinity in order to keep the number of crossings to a minimum, depending on the cost of such an alternative. Level crossings closer than 1 km should be avoided.

A3. Guidelines are as follows:

(i) Ratings exceeding 10 000

Public level crossings should not be planned where the rating of the crossing P (see A4) exceeds 10 000. This figure is conservatively chosen to be one third of the minimum value for P set by the PLCC (refer Cl.), namely 30 000, below which a level crossing elimination scheme will not be listed for financing. Where it is clear that development is likely to take place in the area and the traffic figures are likely to increase substantially, the calculation should be based on an estimate of the future traffic volumes once the development is complete. The forecast period should not exceed 20 years.

The decision regarding the provision of a level crossing or a bridge should obviously be made together with the road authority, with an awareness of the limits of public funds, the constraints of maximum public safety, and all the circumstances prevalent at the site.

(ii) Overheight vehicles

Public level crossings should not be considered where vehicles, such as agricultural machines, have a height such that the allowable clearance under the electrified contact wire cannot be maintained. The clearance must be such as to allow safe passage of a vehicle of height 4,1 m, the legal maximum height.

(iii) Sight distance

Public level crossings should not be planned where the sight distance along the railway line is less than 800 m for a 100 km/h line and 330 m for a 40 km/h line. This is to allow for a 30 s safety interval. These sight distances are to points on the track which are clearly visible from anywhere along the road within 10 m from the level crossing, taken from 1,05 m above the road surface. Allowance should be made for the

possibility that vegetation could obscure the sight line. Addendum 1 hereto entitled "Sigafstand by Gelykvloerse Spoorkruisings", from the Transvaal Provincial Roads Department, can be used to determine safe sight distances and speeds for road vehicles at a level crossing.

(iv) Agreements

An agreement should be concluded with the authority requiring the crossing, to the effect that it will be responsible for eliminating the level crossing at its cost should the rating of the crossing exceed 10 000. The agreement should also cover the provision and maintenance of the protection required at the crossing, and make provision for improved protection should traffic increase beyond a defined volume. In the same way if SATS should require the crossing, it should be prepared to eliminate it if the rating exceeds 10 000 or provide improved protection should the defined volume be exceeded.

(v) Township development

Township development has a significant impact on road traffic volumes, and if it is clear that the traffic over a level crossing will increase as a result of the township development to the extent that elimination becomes essential, it must be made a condition of approval of the township scheme that the developer pays for the elimination of the level crossing.

A4. Protection

The PLCC (refer Cl.) provides for improved protection at existing level crossings in terms of Section 8bis of the Level Crossings Act.

For new public level crossings over existing lines the cost of providing and maintaining improved protection must be borne by the road authority. For level crossings over new lines the cost of providing protection must be covered by the SATS sanction for the new line.

The type of level crossing protection should mainly depend on the priority rating of the crossing calculated from the formula -

$$P = T \times V \times n$$

where P = priority rating
T = no. of trains per 24 hours
V = no. of road vehicles per 24 hours
n = factor varying from 1 to 5 determined as follows :

To the basic figure of 1 is added, when the distance along the railway line from the level crossing to a point which can be seen from another point 100 m along the road is

- less than 150 m; 0,75 points per quadrant
- between 150 and 299m; 0,50 points per quadrant
- between 300 and 600 m; 0,25 points per quadrant

An additional 0,50 points is added for multiple tracks and also if the crossing has a prominent accident history.

The decision regarding the type of protection to be provided should be made only after having taken all the relevant factors into account, but guidelines are as follows :

- a) P = less than 2000 : signs only.
- b) P = 2000 to 10 000 : use flashlights and signs.
- c) P = 10 000 or more : use automatic barriers, flashlights and signs.

Note : At all of the above the signs in accordance with Annexure 32 of the Permanent Way Instructions must be provided.

B. PUBLIC LEVEL CROSSINGS : PEDESTRIAN

B1. Capital Investment

Pedestrian level crossings are a danger to the user and should be avoided if at all possible. Footbridges or pedestrian subways require capital investment and it is therefore necessary to determine priorities in allocating available funds.

B2. Type of Crossing

Pedestrian crossings can be classified into 3 categories, namely the illegal crossing, the authorised crossing and the controlled crossing.

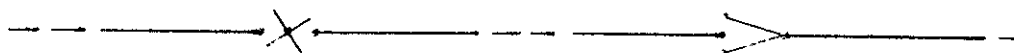
B2.1 The illegal or "trespass" crossing : Category A

This happens when pedestrians climb through the fence or even cut it in order to make access easier. This manner of crossing a railway line is trespassing and offenders are liable to prosecution. No surfacing or other aid intended to facilitate the crossing should be provided. All measures taken, such as the provision of boiler tubes as shown on Annexure 34 sheet 1 of the Permanent Way Instructions, are designed to minimise repair costs. Notices such as "CROSS THE LINE AT OWN RISK" must not be erected at these sites.

B2.2 The authorised crossing : Category B

As soon as any assistance is given, such as the provision of a rotating quadrant gate or bisected V opening in the fence as indicated below, illumination, surfacing, making up of a pathway, the display of a notice or any other facility in any way condoning the crossing of the railway line, the crossing becomes authorised. Before this is done contact should be made

with the local authority and a proper agreement entered into. This type of crossing is also known as the "own risk" crossing. At existing crossings arrangements should be made to enter into a formal agreement with the local authority in cases where this formality has been omitted.



B2.3 The controlled crossing : Category C

This type of crossing is normally provided with an automatic gate, flasher light and/or warning bell and SATS is responsible for the safety of pedestrians who conform to the measures provided. Where conditions so warrant the crossing should be illuminated.

B3. Agreement with Local Authority

- B3.1 At present agreements are concluded with local authorities or landowners for the maintenance of footbridges and pedestrian subways, where these are only for access from one side of the line to the other.
- B3.2 It is required that agreements should be entered into with local authorities or land owners in respect of all authorised and controlled crossings as detailed in B2.2 and B2.3.
- B3.3 When a local authority applies for a pedestrian crossing, an authorised crossing may be agreed to, provided -
 - a) a count indicates that the limits for an authorised crossing are not exceeded;
 - b) the local authority is prepared to pay the maintenance fee until such time as the agreed limits for an authorised crossing are reached;
 - c) the local authority is prepared to pay the higher maintenance fee for a controlled crossing if such a crossing is feasible; or
 - d) the local authority undertakes to finance a footbridge or pedestrian subway as soon as the agreed limits for an authorised pedestrian crossing have been reached.

The limits quoted above can be based on the guidelines given on Fig. 1, which can be adapted to suit the conditions on site with regard to visibility and the speed of trains. Fig. 1 has

FIG. 1

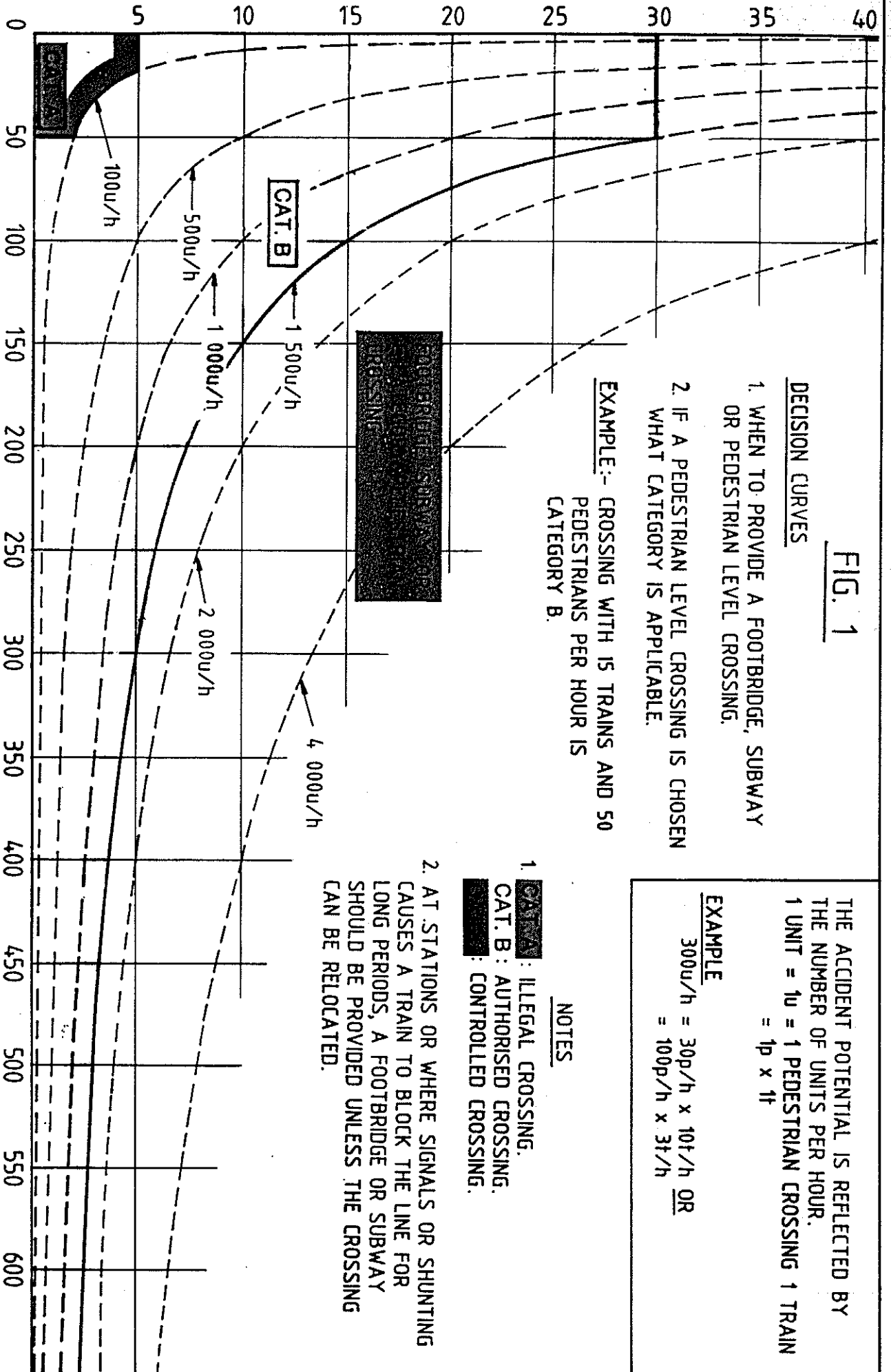
DECISION CURVES

1. WHEN TO PROVIDE A FOOTBRIDGE, SUBWAY OR PEDESTRIAN LEVEL CROSSING.
2. IF A PEDESTRIAN LEVEL CROSSING IS CHOSEN WHAT CATEGORY IS APPLICABLE.

EXAMPLE:- CROSSING WITH 15 TRAINS AND 50 PEDESTRIANS PER HOUR IS CATEGORY B.

PEDESTRIANS PER HOUR (PEAK)

TRAINS PER HOUR (PEAK)



THE ACCIDENT POTENTIAL IS REFLECTED BY THE NUMBER OF UNITS PER HOUR.

1 UNIT = 1p = 1 PEDESTRIAN CROSSING 1 TRAIN = 1p x 1t

EXAMPLE

$$300u/h = 30p/h \times 10t/h \text{ OR } 100p/h \times 3t/h$$

been prepared from statistics available for a number of pedestrian level crossings in the urban areas of the Western Cape.

- B3.4 When the number of pedestrians using an illegal or "trespass" crossing becomes excessive, the local authority should be approached and if necessary coerced into having matters legalised by entering into an agreement as outlined in B3.3.
- B3.5 As soon as the limits laid down for authorised crossings have been reached, SATS will determine whether it is feasible to convert the authorised crossing to a controlled crossing and advise the local authority accordingly, together with the amount of the higher maintenance fee. If allowed to, the local authority may then exercise their option to either pay the higher maintenance fee or to finance the construction of a footbridge or pedestrian subway.
- B3.6 The agreement should contain a clause empowering SATS to close the pedestrian crossing should the local authority fail to honour its obligations in terms of the agreement.

B4. Private Pedestrian Crossings

Private crossings are dealt with in the same manner as public crossings, but in this case the agreement must be entered into with the landowner.

C. BRIDGE STRUCTURES.

In terms of the regulations applied by the PLCC (see C1.), a level crossing is normally listed for elimination if the priority rating P (see A4) exceeds 30 000. As the cost of a level crossing elimination by a bridge structure is approximately 10 times the cost of providing the protection for a level crossing as described in A4(c), bridge structures should normally not be provided at crossings with a priority rating of less than 10 000. This recommendation would not apply to high density or high speed lines, and the engineer must consider all applicable circumstances when applying this standard.

Where a road crosses a railway line a different method of planning and financing a proposed bridge structure is used for each of the following cases:

1. Where road and rail exist, i.e. to eliminate an existing level crossing.
2. Where a public road exists and a new railway line is being planned.
3. Where a railway line exists and a new public road is being planned.
4. Where both a new railway line and a new public road are being planned.

5. Where improvements to an existing railway line or public road affect an existing level crossing.
6. Agricultural crossings (refer D).

Cases 1 to 5 above are dealt with as follows:

C1. Elimination of Level Crossings

The elimination of level crossings is dealt with by the Permanent Level Crossings Committee (PLCC), a statutory body which is appointed and acts in accordance with the Level Crossing Act (Act 41 of 1960). Proposals for the elimination of level crossings are financed from funds controlled by the PLCC in a priority order determined by that body in accordance with the regulations published in Government Gazette Extraordinary No. 65 of 16 August 1961, as amended. In the case of a level crossing eliminated at the cost of a provincial administration or SATS, as the case may be, the relevant authority may apply for a contribution, which varies according to the priority rating of the level crossing.

In Section 1(2) of the Act the phrase "to provide for anticipated future road or rail traffic requirements falling within the reasonable area of normal engineering planning" appears. The PLCC has defined the meaning of this phrase by the following definition, which must be applied when considering what allowance should be included in the scheme for future development :

The scheme shall include (quote) -

- (i) "a double lane roadway including shoulders either under or over the railway line or lines plus sidewalks if necessary, with the distinct understanding that additional lanes can be provided if the road at the time of detail planning of the scheme has a traffic count of 4 000 or more per 24 hours and if the provision of such additional lanes can in the opinion of the Committee be justified in terms of clearly planned and motivated details submitted by the road authority;
- (ii) all existing railway lines plus a railway maintenance road if so required by SATS, one additional railway line if so required by SATS in the event of the existing line being a single line and such further lines irrespective of the number of existing lines which in the opinion of the Committee can be justified in terms of clearly planned and motivated details submitted by SATS.

However, to prevent unnecessary expenditure being incurred on future requirements it is a proviso that road authorities and SATS must ensure that the decision to provide for future road or rail requirements in the bridge structure must be based on the results of an economic appraisal of design alternatives, as described in the SATS Bridge Code or an alternative economic appraisal acceptable to both parties. It is desirable that agreement be reached between the parties at the time of preparation of the site plan, confirmed by a

formal written agreement, that if the economic appraisal indicates that provision for future requirements which have been accepted by the parties as "falling within the reasonable area of normal engineering planning" should be delayed, the cost of such facilities shall be borne by the parties at a future date when actually required on the same basis of shared cost as if the facility had not been delayed. The cost of any facilities which may be necessary in the future and which are over and above those agreed as falling within the "reasonable area of normal engineering planning" at the date of the agreement shall be borne at the entire cost of the party requesting such additional facilities."
(End of quotation).

Concepts mentioned in the above quotation which may require clarification are:

"Reasonable area of normal engineering planning" means to decide whether provision should be made for the future and what should be provided.

"Economic appraisal of design alternatives" means to decide whether the provision for the future which has been decided upon is provided now or delayed until some future date when it is actually required.

C2. Existing Public Road and New Railway Line.

The bridge structure must be planned in liaison with the road authority and the cost of the structure is normally wholly borne by SATS.

(i) Rail over road bridge

In the case of a rail over road bridge it is initially only necessary to accommodate the existing railway lines and a possible SATS service road (see below). The abutments should however be designed to allow for easy extension to accommodate a wider deck, should additional lines be required in the future. In some cases it will be necessary to carry out an economic analysis to determine whether additional deck width should be provided for future lines now or in the future, but in cases of doubt the additional width should rather not be provided.

If the road authority requires provision to be made for the future in the form of an additional span or an opening wider than that required for the existing road, it should provide adequate evidence that it has allowed for the work in its forward planning and demonstrate that the additional opening is actually required. An economic appraisal as described in Clauses 4.3 and 4.6 of the Bridge Code must be carried out based on the road authority's forecast, and if shown not to be economic the additional opening should not be provided. The width of opening provided for the existing road should however allow for the road authority's up to date standards for a road with the same number of lanes as the existing road.

An agreement should be entered into whereby SATS undertakes to pay for the additional opening at a later date. The additional opening must be shown on the site plan, which will form part of the agreement. The validity of the agreement should be limited to 10 years and should include a clause to the effect that SATS will provide the bridge extension if the road authority provides proof that financial authority for the wider road has been granted. Refer to C.4 for additional safeguards which can be included in the agreement.

Depending on the foundation conditions, skewness of crossing and the design and layout of the bridge, it may in any case be cheaper to provide jack spans which could, at a later stage and after modifying the abutment, be used to accommodate additional road lanes and/or pedestrian walkways.

Allowance should be made for the SATS service road to be carried across the public road. If a limited access road is being crossed it will in most cases be necessary to provide additional deck width to accommodate the service road but in other cases it should be possible, by negotiation with the road authority, for a suitable grade crossing of the public road to be built.

When considering what provision should be made for additional road lanes in the future, due account should be taken of present road alignment. If the road is likely to be realigned within 10 years and the old alignment abandoned, no provision for any future additional road width should be made in the bridge structure, but the agreement should reflect that SATS should contribute an equivalent amount towards the cost of a new structure on the new road alignment should it be built within 10 years.

(ii) Road over rail bridge

In the case of a road over rail bridge it is initially only necessary to accommodate the existing roadway on the bridge. The provision of the bridge widening should be handled, in so far as the road authority is concerned, in the same way as for the road subway in C2(i). The abutments and piers should be designed to allow easy extension to accommodate a wider deck should the road authority require this provision for the future. An example of an economic analysis for the case of a road over rail bridge is given in Addendum 2.

Openings should be provided for the existing lines and a further economic analysis carried out to determine whether provision should be made for future lines either now, or by making use of jack spans, or at a future date. In the latter case the necessary allowance should be made in the longitudinal grading of the road. The Planning Section should be consulted in order to determine the number of lines required in the future.

C3. Existing Railway Line and New Public Road.

In this case it is generally the road authority who requires the bridge. Planning should proceed in the same way as in C.2, but the road authority must commit itself to pay for a bridge extension, postponed on the strength of an economic appraisal, when it is actually required by SATS. This is relatively easy in the case of rail over road bridges but for road over rail bridges the difficulties inherent in providing an additional span under an existing roadway will have to be taken into account. If the bridge extension is a clear possibility, but the forecast period is longer than 10 years, the road grading should allow for the provision of the bridge extension at some future date.

When considering what provision should be made for additional lines in the future, due account should be taken of present track alignment. If the additional lines are likely to be built on an improved alignment within 10 years no provision for these should be made in the bridge structure, but the agreement should reflect that the road authority should contribute an equivalent amount towards the cost of a new structure on the new railway alignment should it be built within 10 years.

The same conditions would apply regarding the validity of the agreement and the liability of the road authority as applied to SATS in C2(i). Refer to C4 for additional safeguards which can be included in the agreement.

C4. New railway line and new public road.

It often occurs that both the road authority and SATS are planning new routes at the same time. The pressure to obtain a decision regarding "who pays" and whether or not to provide the crossing structure is generally on the authority who decides to build first.

A case exists where, during the construction of a new line, SATS provided at its own cost and in good faith, a road over rail bridge and approaches based on firm statements of intent by a provincial road authority and two municipalities that the road would be built within 3 years. Ten years after its completion the bridge was still unused, but work on the construction of the road was in progress. Public capital was therefore idle for 10 years. Road authorities can identify similar cases seen from their point of view.

In order to avoid the recurrence of such cases it is necessary to examine each alternative and determine the most economical course of action, which should also be fair and acceptable to all parties.

- (i) SATS will normally be responsible for the cost of the structure when the railway line is built first and the road authority provides acceptable evidence that their route was planned and proclaimed before the act of Parliament authorising the railway line was passed.

The structure should, however, not be built unless the road authority undertakes to construct the road confirmed by formal agreement. The agreement should include a proviso to the effect that if the road is not constructed and opened to traffic within 5 years the road authority will accept responsibility for the full cost of the structure, including interest at Treasury rate for the 5 year period. The agreement must be signed before construction starts.

The structure should be designed to accommodate the number of tracks and road lanes required initially but the decisions regarding provision for the future should be carefully examined using the same principles as described in C1 and C3.

- (ii) If it is decided, under the circumstances described in (i) not to provide the structure until some later date, the vertical alignment of the railway line should, if possible and economic, be planned to accommodate the future structure. SATS should in this case be prepared to enter into an agreement to pay for the bridge in the future, using an agreement similar to that for 10 years, as described in the third paragraph of C2(i).
- (iii) Similar principles as in (i) and (ii) apply if the road is built first and it can be determined that the act of Parliament for the railway line predated the road construction. In this case the responsibilities of SATS and the road authority in (i) and (ii) are reversed.

The agreement should in all cases define what has been agreed upon as included in the "reasonable area of normal engineering planning", and state that the cost of facilities required over and above this agreed extent be borne by the party requesting the additional facilities.

C5. Where improvements to an existing railway line and public road affect an existing level crossing

The guidelines as in A3 (level crossing standards) and A4 (protection) can be used to determine whether the level crossing should remain, what type of protection should be provided, or whether a bridge structure should be built. Should it be decided to retain the level crossing, the opportunity should be taken to enter into an agreement with the road authority in order to allow for future traffic increases. The agreement should define the priority rating as T X V X N and require that the crossing be eliminated should the speed exceed 10 000. The cost of the elimination should be borne by the two parties in proportion to the percentage increase in traffic on each side.

D. AGRICULTURAL CROSSINGS.

D1. A crossing provided for the use of a landowner can be of three types :

- (i) A level crossing.
- (ii) A road over rail bridge or overpass.
- (iii) A culvert.

D2. The need for the crossing can arise under the following circumstances:

- (i) The landowner's property is divided as a result of the construction of a new railway line and the crossings are provided in lieu of the free access he enjoyed before the line was built. The provision of the crossings forms part of the compensation to the landowner for the land taken up by the new line.
- (ii) The crossing is provided as a result of development on the landowner's property at his request and at his cost.

D3. When deciding what type of crossing should be provided, the following factors must be taken into account:

- (i) The guidelines in A.3 where relevant.
- (ii) The location of embankments or cuttings.
- (iii) Whether vehicles, pedestrians and/or cattle will use the crossing.

D4. If it has been decided not to provide a level crossing, the cheapest structure will normally be a culvert provided through the rail embankment at a point where the embankment height is suitable.

- D5. (i) For pedestrian and cattle a 2 m x 2 m culvert is adequate. A larger opening will be necessary for horses.
- (ii) For vehicles a 4 m x 4 m opening is adequate, but in more intensively farmed areas where specialised agricultural implements are used a 5 m high x 5,5 m wide opening should be provided.

The 5,5 m width is as agreed with the Department of Agriculture and demands for greater widths should be resisted.

In cases where an overpass is more economic or cannot for other reasons be avoided, the width between parapet walls should be planned using the same criteria as for a culvert.

- (iii) In certain special cases a structure with a wider clear width and/or greater height can be provided where the landowner has special requirements which can be substantiated.
- (iv) In many cases the landowner requires the 5,5 m width (or wider), or the 4 m height for very infrequent movement of special plant at a particular stage in his farming activities. In such cases the possibility of providing a supervised crossing of level (by the Regional Manager's staff) over a temporary level crossing should be investigated.

E. FOOTBRIDGES

The pedestrian capacity design of footbridges is covered in the Bridge Code. This design should be carried out by the person preparing the footbridge site plan.

Under normal circumstances steps should be provided but at sites where it is expected that the bridge will be used for prams, invalid chairs and the like, ramps should be provided. At some sites it may be necessary to provide ramps to ensure that the bridge is used, i.e. ramps should be provided where the effort involved in crossing the line by a stepped footbridge is such that the public is tempted to take an easier route by cutting through the fences. Ramps can however cost up to twice as much as stairways.

Footbridges which have been provided for public access from one side of the line to the other should in all cases be the subject of an agreement with the local authority, or the landowner in the case of a rural crossing.

A pedestrian subway should be provided in lieu of a footbridge if economically justified, but in view of the problems associated with subways regarding lighting, drainage, the maintenance of cleanliness and the higher incidence of crime, a footbridge should preferably be erected where the estimated difference in cost is not significant.

See also Chapter 5.

SIGAFSTAND BY GELYKVLOERSE SPOORKRUISINGS

APPENDIX 1

Die bestuurder van 'n voertuig wat 'n gelykvloerse spoorkruising nader moet twee besluite neem:

1. Is daar voldoende sig van die kruising en van die naderende spoorvoertuig om veilig voor die kruising tot stilstand te kom?
2. Is daar voldoende sigafstand van naderende spoorvoertuie om die kruising veilig oor te steek?

Figuur 1 toon hierdie besluitnemingsposisies aan. Die bestuurder by A het genoeg tyd om sy voertuig tot stilstand te bring. Die afstand langs die pad is die som van die afstand gedurende reaksietyd van 2,5 sekondes afgeleë, die remafstand en die afstand tussen die bestuurder se oog en die spoor.

Hierdie afstand D_t word bereken volgens

$$D_t = D_p + D_b + D_c \quad \text{-----} \quad (1)$$

(waar D_t = totale afstand vanaf kruising

D_p = afstand gedurende reaksietyd 2,5 sek) afgeleë

D_b = remafstand (nat toestande)

D_c = afstand van bestuurder se oog tot spoor).

(a) Die afstand gedurende reaksietyd afgeleë is

$$\begin{aligned} D_p &= \frac{2,5 \, v_p}{3,6} \\ &= 0,69444 \, v_p \end{aligned} \quad \text{-----} \quad (2)$$

(waar v_p = padspoed in km/h)

(b) Die remafstand D_b is

$$\begin{aligned} D_b &= \frac{v_p^2}{2 \cdot f \cdot g} \end{aligned}$$

(waar v_p = padspoed in m/s
 f = wrywingskoëffisiënt (nat toestande)
 g = grawitasie-konstante 9,81 m/s²)

$$\therefore D_b = \frac{v_p^2}{254 \cdot f} \quad \text{-----} \quad (3)$$

(waar v_p = padspoed in km/h)

$$(c) D_c = 6,0 \text{ m}$$

----- (4)

Stel (2), (3) en (4) in (1)

$$D_t = \frac{V_p^2}{254 f} + 0,694 V_p + 6,0$$

----- (5)

Die tweede besluit laat die bestuurder toe om die kruising veilig te kruis. Die tyd wat 'n voertuig by punt A benodig om veilig te kruis is

$$\begin{aligned} T_p &= \frac{3,6 (D_t + D_v)}{V_p} \\ &= \frac{3,6 (D_t + 20)}{V_p} \\ &= \frac{3,6 D_t + 72}{V_p} \end{aligned}$$

----- (6)

(waar T_p = tyd vir voertuig om veilig te kruis (sek)

V_p = padspoed (km/h)

D_v = ekstra afstand vir voertuig om kruising oor te steek = 20 m)

Waardes vir D_t en T_p word in onderstaande tabel aangegee:

V_p	f	D_p	D_b	D_c	D_t	D_v	T_p
20	0,432	14	4	6,0	24	20,0	7,92
40	0,379	28	16	6,0	50	20,0	6,30
60	0,337	42	42	6,0	90	20,0	6,66
80	0,311	56	82	6,0	144	20,0	7,38
100	0,295	69	135	6,0	210	20,0	8,28
120	0,279	83	203	6,0	292	20,0	9,36

Die afstand wat die spoorvoertuig aflê gedurende die tyd wat die padvoertuig die kruising oorsteek, is

$$D_r = \frac{V_r \cdot T_p}{3,6} \quad (7)$$

(waar V_r = treinspoed (km/h)

T_p = tyd vir voertuig om kruising veilig oor te steek (sek)).

Die twee afstande D_t en D_r gemeet langs die pad en spoor onderskeidelik, definieer die sigdriehoek.

Waardes vir D_r word in onderstaande tabel aangegee:

TREIN= SPOED V_r (km/h)	PADSPOED V_p (km/h)						
	0	20	40	60	80	100	120
	AFSTAND LANGS SPOOR D_r (m)						
20	60	44	35	37	41	46	52
40	120	88	70	74	82	92	104
60	180	132	105	111	124	138	156
80	240	176	140	148	164	184	208
100	300	220	175	185	205	230	260
120	360	264	210	222	246	276	312
	AFSTAND LANGS PAD D_t (m)						
	6	24	50	90	144	210	292

Verwys ook na figure 2, 3 en 4.

By baie spoorkruisings is die verlangde sigdriehoek versper deur geboue, bome of deurgrawings. Dan is dit nie meer moontlik om die oorgang teen spoed veilig oor te steek nie, en is dit dikwels nodig vir padverkeer om by die kruising te stop. Van figuur 4 is dit duidelik dat die sigafstand langs die spoor by 'n padspoed = 0 aansienlik hoër is as by padspoed = 50 km/h.

Dit word aanvaar dat die bestuurder van 'n padvoertuig wat by die kruising stop se oog 6 m vanaf die naaste spoor is. Hy benodig 'n reaksietyd van 10,8 sekondes om die spoorvoertuig te sien en sy voertuig vanaf rus oor die kruising te versnel.

Vir hierdie geval word die benodigde sigdriehoek gedefinieer deur 'n afstand van 6m langs die pad gemeet en 'n afstand van $3.V_p$.

Dit is egter so dat baie spoorkruisings nie eers hierdie minimum sigdriehoek het nie, en derhalwe lewensgevaarlik kan wees ten spyte van lae verkeerstellings. Juis omdat die verkeerstellings laag is, staan die kruising 'n geringe kans om op die voorkeurlys geplaas te word.

Om die potensiële gevaar wat sodanige kruisings bied uit te skakel, word dit voorgestel dat alle kruisings ondersoek word om te bepaal of hulle aan die minimum vereistes voldoen. Indien nie, kan daar dikwels deur geringe koste aan te gaan, byvoorbeeld deur ontbasting of geringe grondwerke groot verbeterings te weeg gebring word.

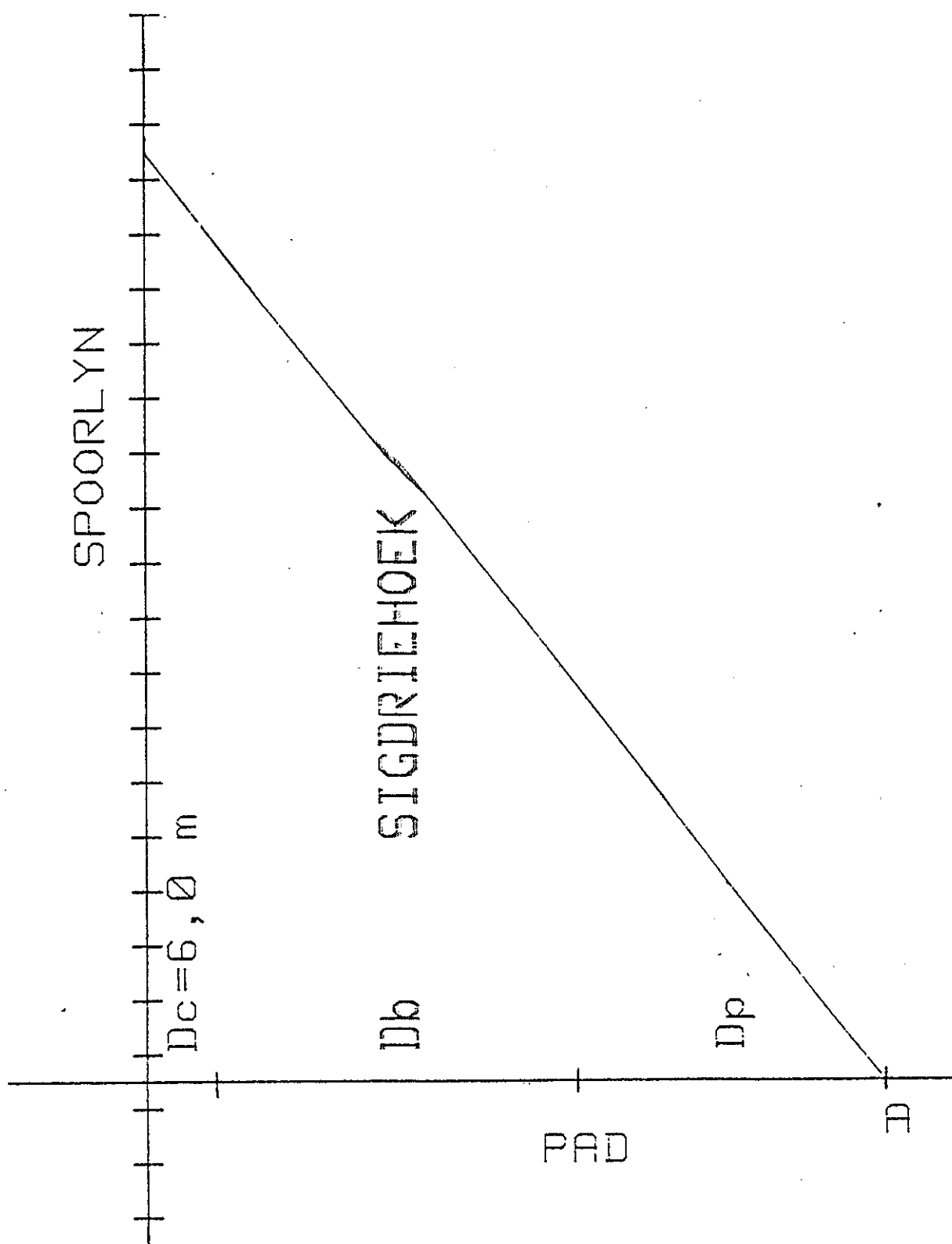
Dit is nie meer die beleid om nuwe spoorkruisings outomaties uit te skakel nie. Bogenoemde standarde kan dus op alle nuwe spoorkruisings toegepas word en alle bestaande kruisings kan verbeter word om aan hierdie standarde te voldoen.

In sommige gevalle mag dit nodig wees om die padaanlope horisontaal en/of vertikaal te verbeter ten einde die nodige sigafstand te verkry. Op plekke waar rangering naby die kruising plaasvind, word aanbeveel dat die padkruising weggeskuif word.

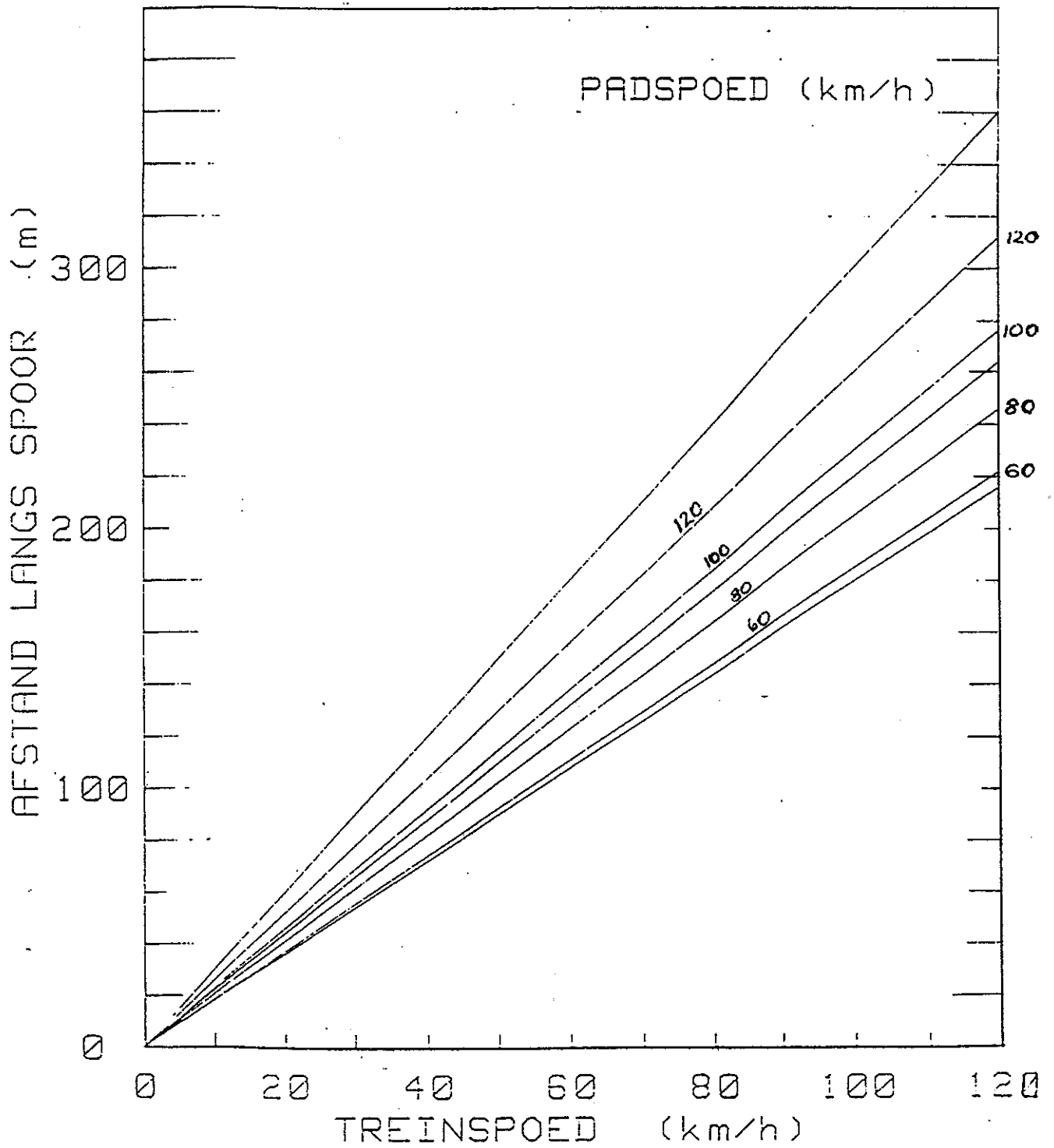
In gevalle waar die nodige sigafstand nie beskikbaar is nie, en verbeterings aan die pad of spoor groot uitgawes tot gevolg sal hê, word voorgestel dat indien moontlik, flikkerligte voorsien word, veral in stedelike gebiede.

'n Verdere punt wat aandag verg is die geometriese en konstruksie-standaarde wat by kruisings toegepas kan word. Wat veral belangrik is, is die toleransies op padhoogtes oor die kruising, hoogteverskil tussen spoor en pad, hellings en verkanting van die aanlope weerskante van die spoor, glyweerstand, en die materiale en digthede wat op die aanlope benodig word.

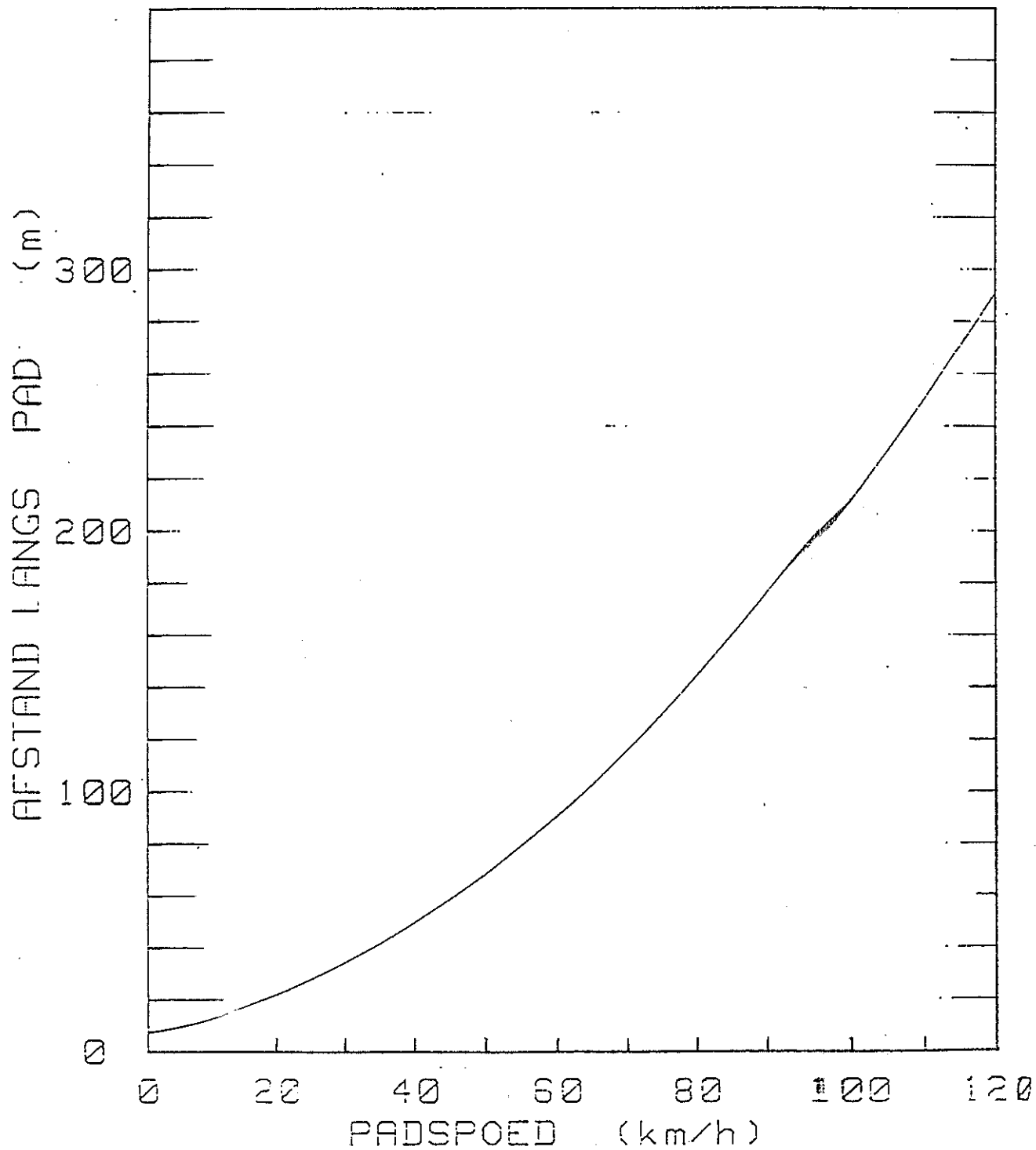
FIGUUR 1



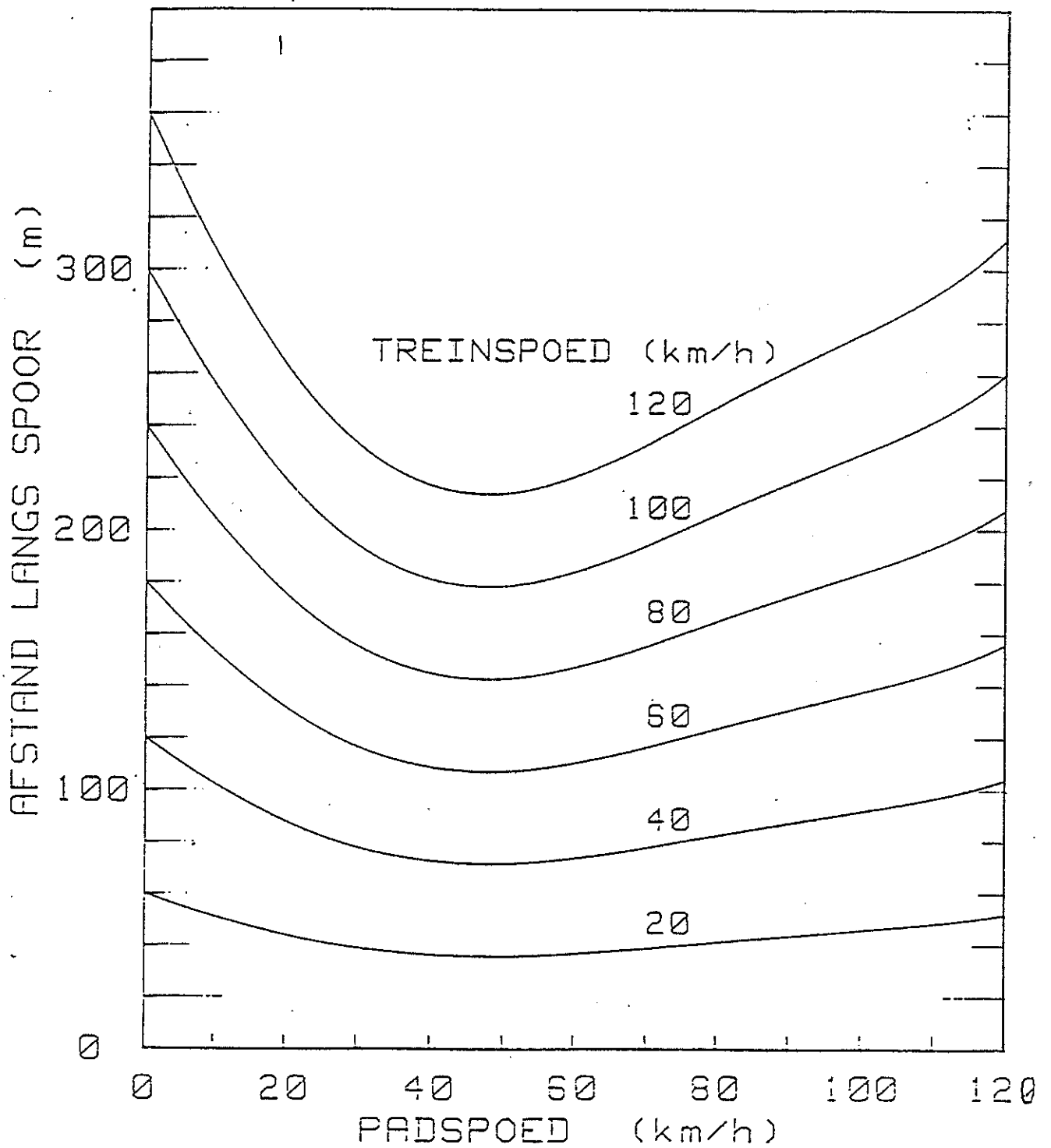
FIGUUR 2



FIGUUR 3

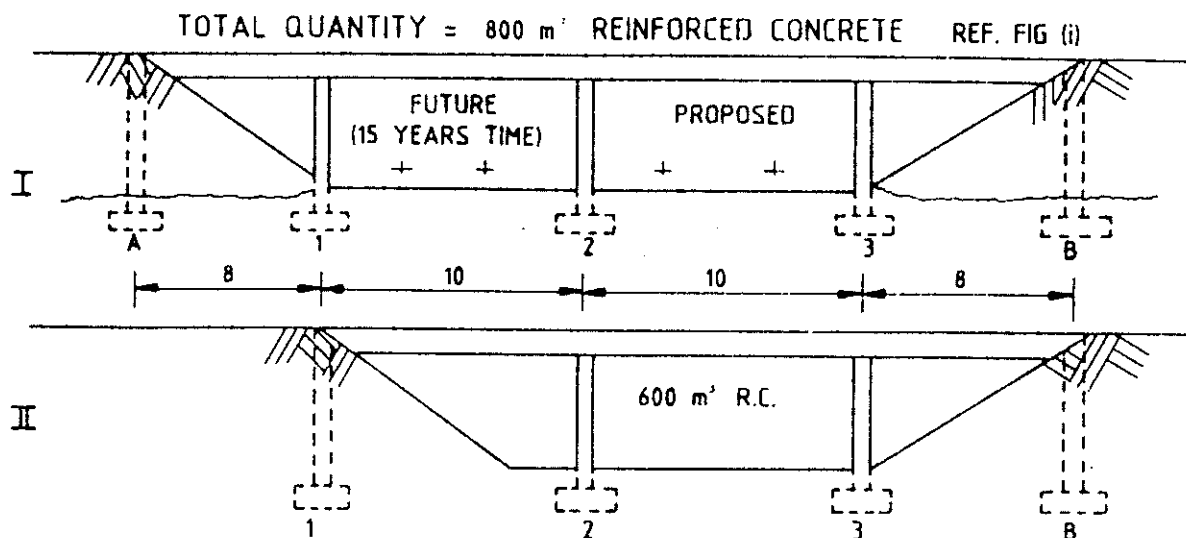


FIGUUR 4



PROVISION FOR FUTURE EXPANSION

EXAMPLE



QUESTION : SHOULD PROVISION FOR FUTURE TRACKS BE MADE NOW ?

COST OF ALTERNATIVE I

i) Deck : $36 \times 12 = 432 \text{ m}^2 @ R300/\text{m}^2$	= 130 000
ii) Piers : 3 @ R20 000	= 60 000
iii) Abutments : 2 @ R30 000	= 60 000
iv) Approach slabs : 2 @ R5 000	= 10 000
TOTAL	260 000

COST OF ALTERNATIVE II *

i) Deck : $28 \times 12 = 336 \text{ m}^2 @ R315/\text{m}^2$	= 106 000
ii) Piers : 3 @ R21 000	= 63 000
iii) Abutments : 1 @ R31 500	= 31 500
iv) Approach slabs : 2 @ R5 250	= 10 500
v) Strengthen pier 1 to serve as abutment	= 9 500
vi) Additional approach fill $1 000 \text{ m}^3 @ R3,50$	= 3 500

* All rates increased by 5% - See FIG. (i) **TOTAL 224 000**

COST TO CONVERT ALTERNATIVE II TO ALTERNATIVE I **

i) Demolish approach slab earwings and breast wall	= 5 000
ii) Remove earth fill $1 500 \text{ m}^3 @ R4,00/\text{m}^3$	= 4 500
iii) Construct new abutment	= 39 000
iv) Additional deck $96 \text{ m}^2 @ R390/\text{m}^2$	= 37 500
v) Approach slab	= 6 500
vi) Re-instate fill $500 \text{ m}^3 @ R5,00/\text{m}^3$	= 2 500
vii) Re-instate road $200 \text{ m}^2 @ R10/\text{m}^2$	= 2 000
viii) Provide 500 m surfaced road deviation with protected level crossing @ R100/m	= 50 000
TOTAL	147 000

** All rates increased by 30% - See FIG. (i)

NOTE: Present day rates to be used throughout - no allowance for inflation to be made in economic analysis

HC 0340 G

BRIDGE HANDBOOK

CHAPTER 2

CLEARANCES

1. GENERAL

Minimum clearances between moving rail vehicles and fixed structures alongside and above the track are laid down in Chapter 9 and Annexures 1 to 4 in the Permanent Way Instructions, as are minimum track centres. The conditions under which a fixed structure is considered foul are also defined and the required method of marking such foul structures is described. Clearances are determined by consideration of what the clearance gap between a vehicle on rails and either a fixed structure or another passing vehicle should be. The vehicle chosen has the theoretical dimensions defined by the vehicle profile for 1065 mm track in Annexure 5 of the Permanent Way Instructions, with bogie centres of 15 m and vehicle body length of 21,2 m. The increases of clearance with curvature as required by Annexure 1 have been calculated using the theoretical vehicle, described hereafter as a "maxi truck". The bogie centres and body length of a maxi truck are such that the centre offset between bogie centres on the inside of a curve is equal to the overhang offset on the outside of the curve.

2. HORIZONTAL CLEARANCES - FIXED STRUCTURES

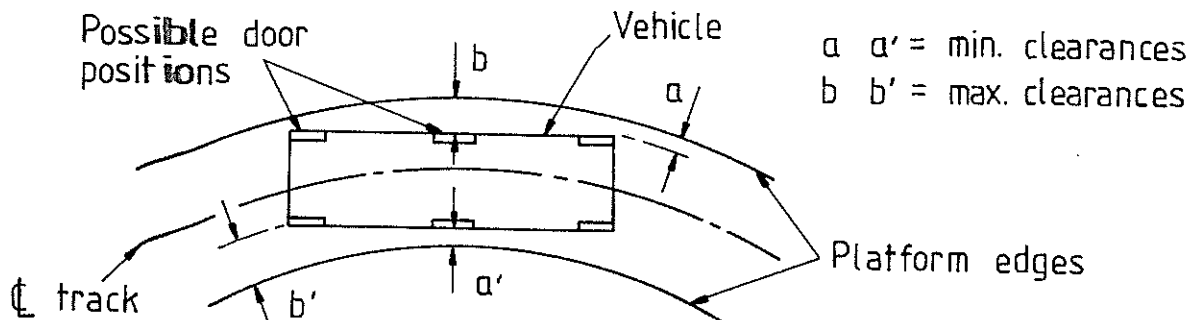
The minimum horizontal clearance is that below which a fixed structure is foul and is defined by the envelope described in Annexure 1 as the "structure gauge for workshop areas and temporary work".

The 300 mm difference between the required horizontal clearance to a fixed structure and the minimum clearance was introduced as a general requirement in 1962 to provide additional space for maintenance staff working on the track.

In the case of bridges over the railway line the horizontal clearance is laid down in the Bridge Code. A minimum of 3 m is required which provides additional space for handling of material, safety of staff and drivers visibility in what sometimes can be a long structure. An additional 300 mm is required where a drain must be accommodated.

3. PLATFORM CLEARANCES

The required clearances at platforms are shown in Annexure 4 of the Permanent Way Instructions. Because it is imperative, from a passenger safety point of view, that the space between platform and vehicle at each possible entrance door be kept as small as possible, the minimum gap is reduced with track curvature.



The clearances in Annexure 4 are based on a minimum clearance gap between maxi truck and platform edge of 80 mm for a 120 m radius curve, reducing to 60 mm for a 90 m curve. The minimum clearance gap in any situation can be horizontal, vertical or inclined.

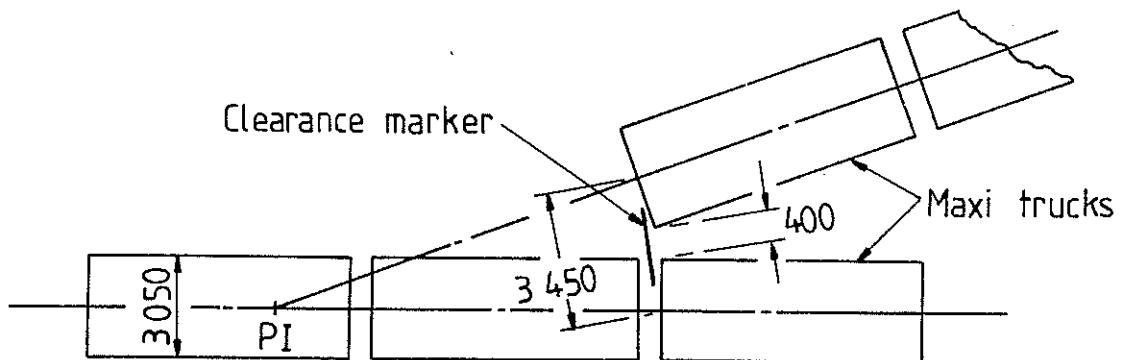
Due to changes in rail vehicle design from time to time the required horizontal distance from track centre line to platform edge was increased from 1296 mm (1915) to 1,448 mm (1942) and then to 1524 (1956), being rounded off to 1520 mm in 1984.

Certain of the older platforms still exist and in such cases the actual clearance gap may be checked by calculation as described on drawing BE 87-15 sheet 2. Where the gap is less than the minimum, action should be taken to correct the situation immediately.

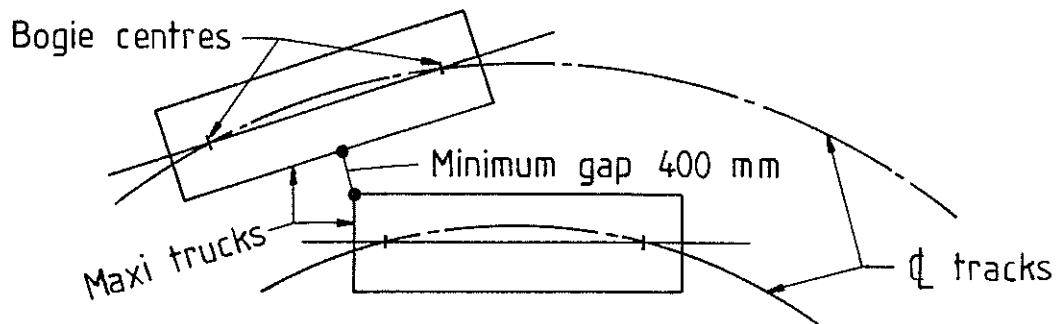
The step height between a normal passenger vehicle floor and a platform built according to Annexure 4 is 290 mm. There is a tendency to raise the track during ballasting operations, which has the effect of increasing the step height. Where large numbers of passengers are handled on commuter lines such an increased step height will slow down entry and exit rates and increase the possibility of injury to passengers. On such lines the platform height above rail should not be allowed to reduce below 810 mm i.e. the platform height and tolerance should be 860 mm + 20 - 50 mm above rail level for straight track.

4. HORIZONTAL CLEARANCES - PASSING VEHICLES

The minimum horizontal clearance gap between passing vehicles is 400 mm on SATS as against 305 mm for British Rail. The clearance gap of 400 mm can be seen to apply at the clearance marker, near where two tracks converge at a set of points and crossings, when a maxi truck is parked at the clearance marker and a train of maxi trucks passes on the adjoining line. It is theoretically possible for the clearance gap to be less than 400 mm at the clearance marker by placing the set of points and crossings on diverging curves, but this layout should never be allowed on main lines and fortunately only occasionally occurs in yards where speeds are low.



Track centres of 4 m allow sufficient clearance between passing vehicles on even the sharpest curves, but in some instances historical layouts have left us with track centres sometimes far less than 4 m. In cases such as this the layout should be checked to ensure that a minimum clearance between maxi trucks exists, but if an unsafe gap is found to occur action should be taken to correct the layout at the first opportunity. The curves on drawing BE 87-15 sheet 1 and the accompanying guide lines may be used to determine the clearance gap, but care must be taken to allow for any difference in cant which may exist between the adjacent tracks.



5. CLEARANCE ON PLATFORMS

The minimum clearance between the edge of a platform and any structure on the platform is 3m. This clearance allows a margin of safety for the passing of barrows and for a swinging vehicle door and should not be reduced.

6. VERTICAL CLEARANCES

The required vertical clearance above rail is as detailed on Annexure 2 of the Permanent Way Instructions. For electrified track the vertical clearance required is 4930mm, but to allow for possible increases in track standards an additional 150 mm should be allowed, thus making the required minimum 5080 mm which should be specified for all new structures over the railway line.

In some cases pressure is applied to provide footbridges with a higher clearance for various reasons. Such increases should be resisted due to the additional cost involved, but mainly in order to avoid unnecessary height gain for pedestrians to climb.

Track maintenance operations should not result in a clearance of less than 4930 mm and this minimum vertical clearance should be aimed at wherever physically possible. On certain older structures there are vertical clearances less than 4930, and in such cases every opportunity should be taken to increase the clearance where possible, in order to reduce the number of bottlenecks that are found whenever a route is investigated for the passage of abnormal loads, a fruitful source of SATS revenue.

In certain instances a bridge has to be constructed over or close to a set of points and crossings. If electrical sectioning of overhead equipment cannot be avoided the minimum vertical clearance must then be increased to $5650 + 150 = 5800$ mm. The Chief Electrical Engineer should be consulted in every such case and be requested to confirm that the additional height is or is not required.

7. ELECTRICAL CLEARANCE

Clearances to overhead electrical equipment are laid down in the SATS Safety Instructions for High Voltage Electrical Equipment. The interpretation of these instructions as applied to bridges and retaining walls may be found in the Bridge Code, but in cases of doubt the Chief Electrical Engineer or the Regional Engineer (Electrical) should be consulted.

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BRIDGE HANDBOOK

CHAPTER 3

LOADS AND DESIGN

1. General

With its high inland plateau and generally steep fall to coastal regions, South African rivers are in most cases fast flowing and not navigable. There are few bridges therefore with spectacular long or high spans as in other parts of the world. Nevertheless, there are many bridges of note in this country, both for road and railway use.

Before the Second World War most railway bridges in this country were of steel construction. A great number of steel bridges which include many 54 m and 47 m through truss spans are in use on main and branch lines today. Some of them date from the last century. The longest steel bridge, that over the Orange River at Upington, has an overall length of 1 067 m and consists of a combination of 9 m approach arches and 24 m and 30 m steel spans. The longest steel span, a 70 m Parker Truss over the Gamtoos River, and the highest, with rail level 76 m above the bed of the Van Stadens River Gorge, are both on the narrow gauge line between Port Elizabeth and Avontuur.

An early concrete bridge of note is the tied arch bridge over the Umhlatuzi River near Richards Bay, completed in 1946 and consisting of seven 36 m spans.

The improvement of grade and curvature standards to allow the running of modern, high capacity traffic, which dictates that valleys have to be crossed at higher levels than was necessary with the older lines, has resulted in the construction of several impressive viaducts and high river bridges. These include graceful multiple 33 m and 43 m open spandrel arch structures and multiple 30 m, 33 m, 40 m and 45 m concrete box girder bridges. An example of the latter is the Tugela River Bridge on the Natal North Coast, which consists of sixteen 30 m prestressed concrete box girder spans built on reversed horizontal curves and a change of grade. The longest and highest concrete bridges are respectively the 26/43 m span arch bridge over the Orange River at Bethulie (for both road and rail traffic) and the 11/45 m span concrete box girder viaduct for double line near Charlestown which has rail level 79 m above the floor of the valley. Other large concrete bridges are the White Umfolozi River bridge with 10/43 m arch spans and a height of up to 58 m above stream-bed and the Mhlalane viaduct with 16/34 m arch spans and a height of 45 m above stream bed. One of the advantages of using the abovementioned arches and box girders is that SATS has the formwork and supporting centering/girders necessary for their construction.

The incremental launching method of constructing continuous spans has become popular recently but can only be used on an alignment which is straight or of constant curvature. The longest continuous length in use at present is 495 m in the bridge over the Olifants river which has a total length of 1035 m. Pushing pre-fabricated bridge structures into final position under railway lines has become an efficient and favoured method of subway construction as virtually no disruption of rail traffic is caused. The largest subway constructed by this method measures 34 m x 34 m in plan.

2. Design Loading

The bridges erected on any particular line by the different railways in existence before 1910 when the SAR came into being were designed for the locomotives in operation over that line. This led to difficulties when the need arose to introduce heavier axle loads. It was decided in 1924 to carry out a survey and to recalculate and classify into strength categories all existing bridges and culverts. As a result, a standard main line loading for the design of new bridges and loading standards for strengthening existing bridges were developed in 1925 (1). The main line loading was modified in 1926 and, apart from a minor modification in 1930 to take advantage of the introduction of the 96 lb rail, remained in force as Class I loading until 1983. Due to the introduction of heavier axle loads on the ore exporting lines, it was then replaced by NR loading for the design of new bridges.

The following table indicates the order of some of the loading standards :

Loading	Approximate Previous Equivalent	Axle loads and spacing of drivers	Locomotives catered for
Narrow gauge	Narrow gauge	9 T at 3'-2"	NG Garratt
Class 4	1925 Light Branch	13,5 T at 4'-6"	GD, 6, 8, 24, 19C, 19D, 32, 35
Class 3	1925 Heavy Branch	15,5 T at 4'-9"	GEA, GMA, 34
Class 2	1926 Main Line	20 T at 4'-3" (single controlling axle 21 T)	GL, 16A, 25, 15F
Class 1	1930 Main Line	20 T at 4'-3" (single controlling axle 22 T)	GL, 16A, 25, 4E, 7E
NR	-	280 kN at 1,8 m	9E, 11E

1 T force = 2 240 lb force = 9,964 kN
12" = 1' = 0,3048 m

Dynamic effects were allowed for in the earlier bridges by application of a factor of the type $\frac{120}{90+L}$, L in feet, for speeds of 60 mph. In 1932

more accurate procedures, based on the recommendations of the Bridge Stress Committee and the work of Inglis, became available (2). These were applied using the characteristics of the 15 CA locomotive for hammerblow calculations, in association with Class I loading (3). Based on this new approach the carrying capacity of all bridges was re-assessed and in a number of cases bridges were reclassified into a higher class(4).

Although less than the loading used for the design of the bridges on the Sishen-Saldanha line, NR loading represents the heaviest loading used or likely to be used on that line as well as on the other lines of SATS. It also covers the load effects of any of SATS steam locomotives. However, except for very short or unusually long spans, NR loading is not much more severe than class I loading, in spite of the incorporation of a heavier axle load. This is illustrated by the fact that in a number of cases it has been possible to allow 28 t axle locomotives, closely resembling the NR design locomotive, to run over bridges designed for Class I loading. The dynamic factors for NR loading are based on extensive research carried out in Europe by the ORE.

Most of the bridges on the narrow gauge lines were designed for a much lower loading than the abovementioned. New bridges are however also designed for NR loading unless future conversion of the track to standard gauge is unlikely.

3. Design

The loads to be used and procedures to be followed in the design of bridge structures under or over a railway line or elsewhere on railway property, are laid down in the Bridge Code (5).

The code follows, as closely as possible, TMH-7, as this latter document is well known to bridge designers in South Africa. Only design procedures based on concrete as the basic material are covered in any great detail as concrete generally produces cheaper structures, especially when long-term costs are also taken into account. Steel bridges, where required, should be designed in accordance with BS 5400, but the bridge office should be consulted about the use of any other materials. The use of aluminium should be avoided as experience has shown it prone to being vandalised and stolen.

In keeping with overseas practice, the design of new bridges and culverts is based on a design life and a return period of the natural forces of 100 to 120 years. Replaceable items are however designed for a life of 30 to 50 years while bridges and culverts serving catchments of less than 100 km² are sized for only a 50 year flood. In the case of structures serving these smaller catchments, which represent a large proportion of the cost of a new line, the use of a reduced design flood return period is justified as the risk of flood damage, which should be small in individual cases, is limited by the application of the extant patrolling and operating instructions. Further, in the case of sites in the larger catchments, where a saving could possibly be effected by designing for a lesser flood return period than 100 years, an economic

analysis should be performed, taking into account the potential losses as a result of wash-aways. If economically justified, the return period may be reduced to 50 years, but only after consultation with the Bridge Engineer.

In cases where the economic life of a structure will be considerably less than 100 years, e.g. on lines exclusively serving a mine, savings are possible through the use of cheaper, less durable materials.

4. Track standards

Horizontal and vertical deck flexure and sidesway of piers under the worst combination of loading should still be small enough so that track geometry remains A standard.

Bridge substructures should have sufficient stiffness to keep longitudinal deck movements under braking and traction loads within acceptable limits. Such movements as well as expansion and contraction of the deck due to temperature variation generate large forces in the rails and could cause buckling of the track in the vicinity of expansion joints. As an added precaution in cases where track buckling could be a problem, such as on long continuous decks or on bridges with tall, slender piers, the lateral resistance of the track is increased by the provision of higher ballast kerbs and/or winged sleepers, or rail forces are kept low by provision of rail expansion devices (6). Care should be exercised by maintenance staff not to reduce this lateral resistance by raising the track or by substituting ordinary sleepers for the winged sleepers, without consulting the Chief Civil Engineer's office.

Where excessive embankment settlement is likely, such as at high and/or spill-through abutments, approach slabs are provided behind the abutments to reduce the risk of slacks developing in the track. In certain cases, approach slabs also assist in stiffening of abutments against longitudinal movement.

5. Bridge details

Bridge design and detailing is the subject of a vast literature and it is not the intention to repeat it here. Questions are often asked about the following :

- In addition to being designed to serve their primary structural function, major structural elements of bridges should be large and robust enough to reduce the risk of collapse, due to accidental or wilful damage, to acceptable limits.
- Bridge elements should also be designed so that they can be inspected easily and to ensure a minimum of maintenance. Exposed metal parts of concrete bridges that are difficult to replace, such as deck locating dowels, or that could seize up if corroded, such as electrification bolts, should be of stainless steel. Other exposed metal parts should be galvanised.

- Durability of the concrete is improved by limiting design crack widths, having adequate cover and avoiding alternate wetting and drying, for which purpose sound sealing of expansion joints and drainage should be provided.
- Bearings and expansion joints should be designed and constructed with care as, unless a structure has been designed to resist restraint forces, it can be seriously damaged by frozen or jammed up expansion devices.
- Service ducts on bridges are costly and often difficult to accommodate in the structural system. Alternative routes should therefore be investigated for the bulkier services such as water pipes. It is imperative that the needs of the service duct user are assessed correctly when the site plan is prepared as experience has shown that the ducts are often not used. Ducts covered by loose cover slabs are not used on railway bridges as the slabs are often removed and used for unlawful purposes.
- Balustrades or handrails are visually a dominating part of a bridge. They should therefore not only be functional but aesthetically pleasing. Balustrades next to road carriageways should function in such a manner that the consequences of a collision are minimized. The inner face of the New Jersey type balustrade is shaped so that when a vehicle strikes it at an oblique angle, the wheel travels up the slope and is then deflected back and downwards. Parapets on bridges over electrified lines also serve as safety screens against contact with the high voltage equipment and the regulations governing their construction must be strictly observed.

6. Drawings submitted for approval (see the Bridge Code)

- 6.1 The site plan serves as a master plan for the scheme involving the bridge. It defines the provisions being made for present needs and future developments, road and rail geometry and clearances, drainage, and division of costs. It reflects the requirements of other interested parties, such as cable ducts, support for water pipes, and street lighting. The geotechnical information of the site is also shown. The site plan must therefore -
- (a) be suitable for inclusion in and forming the basis of the formal agreement covering the scheme, between SATS and the other authority, if any;
 - (b) contain all information required for completion of the structural design work.

It should preferably not reflect any other information as this may cause confusion.

The procedures laid down for consultants for the preparation of site plans should also be followed when such plans are prepared by regional or resident engineers. To ensure that the most practical bridge system for the site is employed, the bridge office should be contacted at an early stage, as laid down in 8.2 of the Bridge Code.

- 6.2 The general arrangement drawing serves as a technical summary of the details of the scheme and is usually the first sheet of the working drawings. In addition to the general lay-out, it must show the loading for which the bridge has been designed, the loading intensity under the foundations, the details of fixing electrification equipment and the construction method of foundations where this could put the safety of trains at risk. The preparation of general arrangement drawings in this way ensures that selected vital information is made available quickly to the staff concerned. As for the site plan, the display of irrelevant information should be avoided.
- 6.3 Working drawings must be submitted whether the constructing authority bears the full cost of the scheme or not. This is necessary so as to ensure that SATS involvement in future maintenance and/or replacement of parts will be a minimum.

References

1. Clark, W.H. : The (British) Inst. of Civ. Eng. (1929) : Paper No. 81 : South African Railway Bridges : Inspection and recalculation of existing bridges.
2. Clark, W.H. : Proc. of S.A. Soc. of Civ. Eng. (1931) : Impact on girder bridges.
3. A summary of procedures is given in : Pippard and Baker : The analysis of Engineering Structures.
4. Jensen, R : Proc. of SA Soc of Civ. Eng. (1934) : New method of calculation and classification of railway bridges in South Africa.
5. South African Transport Services : BRIDGE CODE (1983).
6. De Wet, H : Railway bridge design : Track-structure interaction (lecture given to Witwatersrand branch of SA Inst. of Civ. Eng., 6th June, 1984).

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BRIDGE HANDBOOK

CHAPTER 4

CULVERTS

1. BRIDGE CODE

The structural, dimensional and hydrological requirements of culverts and underpasses are dealt with in Part I, clause 21 and Part II, section E of the Bridge Code. Further information regarding the sizing of agricultural underpasses is given in chapter I hereof.

2. CONSULTATION WITH THE DEPARTMENT OF AGRICULTURE AND WATER SUPPLY

The General Manager has instructed that the siting of new culverts must be discussed with the relevant government agricultural department dealing with such matters in order to avoid subsequent complaints concerning erosion or other problems arising out of the choice of site.

3. CONCRETE CULVERTS

3.1 Design

The design requirements for culverts, introduced in 1983 in terms of the revised Bridge Code, differ considerably from those in use previously. Further information in this connection is given in Chapter 3. The "type" drawings for culverts, listed below, are therefore no longer valid and should no longer be used, except as follows :

- (i) In the case of low cost projects such as extensions/alterations to an existing culvert, those drawings marked with an asterisk may, if applicable, be used for preparation of site plans and working drawings. Both the site plans and working drawings should be submitted to the Bridge Office for approval.
- (ii) In all other cases, the drawings may be used as catalogue drawings for estimating purposes and for guidance during preparation of site plans. Site plans should be referred, for approval, to the Bridge Office, who will prepare the necessary working drawings.

When preparing site plans, bear in mind that openings need not be restricted to the listed dimensions - any opening size, as dictated by function, may be used. Site plans should show the hydraulic requirements, expected founding conditions, allowable bearing pressures and Z values. The meaning of Z is explained in 3.2.7.

*BE 5303 M	Abutments and piers for culverts.
*BE 8537 M sheet 1	Reinforced concrete culvert deck (H.T. reinforcement)
*BE 75-69	Rail and concrete culvert deck
*BE 76-124 sheets 1-13	Concrete deck for culvert with narrow abutments (Earth fill on culvert restricted to 150 mm)
*BE 8560 M	Culvert deck for cases demanding minimum deck thickness.
*BE 9227 sheets 1 and 2	Widening of culverts
*BE 76-115	Construction method for replacing rail girder span with rail and concrete deck.
BE 8767	Portal Type Culverts Z
sheet 1	2 x 2 m 0 to 10 m
1A	2 x 2 m 10 to 22,5 m
1B	2 x 2 m 22,5 to 30 m
2	3 x 3 m 0 to 10 m
2A	3 x 3 m 10 to 22,5 m
2B	3 x 3 m 22,5 to 30 m
3	4 x 4 m 0 to 10 m
3A	4 x 4 m 10 to 22,5 m
3B	4 x 4 m 22,5 to 30 m
4	5 x 5 m 0 to 10 m
BE 8767	Portal type culverts Z
sheet 4A	5 x 5 m 10 to 22,5 m
4B	5 x 5 m 22,5 to 30 m
5	5,5 x 5 m 0 to 10 m
6	2 x 1,2 m 0 to 10 m
7	6,6 x 6 m 0 to 5 m
*BE 8768	Base slab - portal type culverts Z
sheet 1	2 to 5 m span 0 to 10 m
2	2 to 5 m span 10 to 22,5 m
3	2 to 5 m span 22,5 to 30 m
4	5,5 span 0 to 10 m
4	6,6 m span 0 to 5 m
BE 8857	Double box type culverts Z
sheet 1	2 x 2 m 0 to 10 m
1A	2 x 2 m 10 to 22,5 m
1B	2 x 2 m 22,5 to 30 m
2	3 x 3 m 0 to 10 m
2A	3 x 3 m 10 to 22,5 m
2B	3 x 3 m 22,5 to 30 m
3	4 x 4 m 0 to 10 m
3A	4 x 4 m 10 to 22,5 m
3B	4 x 4 m 22,5 to 30 m
4	5 x 5 m 0 to 10 m
4A	5 x 5 m 10 to 22,5 m
4B	5 x 5 m 22,5 to 30 m
5	2 x 1,2 m 0 to 10 m

3.2 Guidelines for preparation of site plans

- 3.2.1 Framed structures such as those detailed on drawing BE 8767 and BE 8857 are generally more suitable under high fills or on weak founding material which would otherwise require raft foundations or abnormally large footings.

- 3.2.2 Listed drawings of framed structures do not include single box culverts as it has been found that portals on base slabs form an adequate substitute at no extra cost. Under high fills, the portal on base slab should be appreciably cheaper. An added advantage of the portal is the fact that narrow footings can be provided when suitable rock founding material is encountered, thus enabling substantial savings to be effected.
- 3.2.3 Where rock is not encountered, savings can usually be effected by building double box culverts of equivalent size in place of portals on base slabs. This becomes clear when comparing concrete and steel quantities.
- 3.2.4 Where rock is encountered which enables base slabs under portals to be omitted, a double portal will be cheaper than a single portal with the same area of opening and a single portal cheaper than a double box, provided the value of Z is less than 20 m. Metricated drawings of double portals are not available.
- 3.2.5 For values of Z greater than 20 m the double box tends to become the most efficient structure, irrespective of founding conditions.
- 3.2.6 When the height of fill above a culvert is small, the culvert consisting of separate abutments and piers and a simply supported deck as detailed on drawings BE 5303 is often cheaper than a framed structure and is normally easier to construct under existing lines. However, due to their high cost the use of raft foundations shown on this drawing should be confined to short extensions of existing culverts or where a small isolated culvert is required.
- 3.2.7 When culverts are founded on rock or on a cushion of soil less than 1 m thick, the effective height of fill above the culvert for which the culvert should be designed is greater than the actual height of fill. The effective height of fill Z may be found from the equation

$$Z = kh$$

where $k = 1,50 - 0,68 b/h$ or 1,0, whichever is greater,
b = overall width of culvert in metres,
h = actual height of fill above culvert in metres.

Values of k may also be found by interpolation from Table 1. The actual loads due to earth fill can be up to 25% higher than the loads corresponding to a height of fill equal to Z. This should however not cause concern if factors of safety comply with normal practice.

TABLE I

Values of k when thickness of cushion of soil below foundation is less than 1 m.

b(m)	h(m)								
	1	5	10	15	20	25	30	35	40
1	1,24	1,36	1,43	1,45	1,47	1,48	1,48	1,48	1,48
2	1	1,23	1,36	1,41	1,43	1,45	1,45	1,46	1,47
3	1	1,09	1,30	1,36	1,40	1,42	1,43	1,44	1,45
4	1	1	1,23	1,32	1,36	1,39	1,41	1,41	1,43
5	1	1	1,16	1,27	1,33	1,36	1,39	1,40	1,41
6	1	1	1,09	1,23	1,30	1,34	1,36	1,38	1,40
7	1	1	1,02	1,18	1,26	1,31	1,34	1,36	1,38
8	1	1	1	1,14	1,23	1,28	1,32	1,34	1,36
9	1	1	1	1,09	1,19	1,26	1,30	1,33	1,35
10	1	1	1	1,05	1,16	1,23	1,27	1,31	1,33

When the cushion of soil between the culvert foundation and rock exceeds 1 m, the effective height of fill Z may be taken to be equal to the actual height of fill above the culvert H in all cases.

- 3.2.8 Use of concrete culvert decks to BE 8560 can be advantageous with low height of formation above stream bed, particularly when open tops are replaced by decks.
- 3.2.9 When the size of new opening required is 3 m² or less, the provision of one or more pipes generally offers the cheapest solution. Pipe culverts may, however, be unsuitable in areas where the risk of blockage at the entrance by floating debris is great.
- 3.2.10 When culvert extensions are required merely in order to cope with improved ballast standards and it is unlikely that additional tracks will be built, culverts may be extended by using the low cost methods shown on drawings BE 9227 sheets 1 and 2. The raising of ballast walls is an inadequate solution because one is then invariably faced with an overspill of fill and ballast over the wing walls, leading to blockage of the opening and possible overloading of the wing walls.
- 3.2.11 Culvert wing walls should be based on the type retaining walls, described in chapter 6.
- 3.2.12 Where it is expected that railway staff will walk alongside trains, such as in station yards and on the approaches to stations, the length of the culvert must be sufficient to allow safe passage of staff on the formation outside the ballast profile.
- 3.2.13 For culverts under private sidings, refer to the private siding handbook. The structural adequacy of the culvert is the responsibility of the owner of the siding.

4. PIPE CULVERTS

Working drawings for pipe culverts should be prepared in accordance with drawing BE 84-09. It is not necessary to submit such drawings to the Bridge Office for approval.

5. PRECAST CULVERT UNITS

5.1 Precast portal culvert units of up to 4 m span, specially designed for SATS loading, are available from firms specialising in the manufacture of precast concrete. Known suppliers are Suprocra and Fraser Fyfe. Appendix A shows the available sizes. Their use merits consideration in the following instances :

- (i) Culverts close to the source of supply of precast units, where transport costs will be advantageous.
- (ii) Long culverts where high utilisation of cranes is ensured.
- (iii) Culverts for which construction time is severely limited and over which trains have to pass within 48 hours.
- (iv) Culverts to be installed under existing railway lines by jacking. In this case special arrangements are required to ensure that the culvert sections are designed to withstand jacking forces.

5.2 Precast units to SABS 986 are for road use and must not be used under railway track.

5.3 Normally slabs on which precast culverts are supported should be cast-in-situ in accordance with drawings approved by this office. If precast slabs are to be used in place of in-situ concrete, the procedure proposed to ensure uniform bedding must receive prior approval by this office.

5.4 The procedure to be followed when ordering precast portal culverts is as follows :

Requirements must state the size (including alternative size if applicable) as well as the required Z value and must specify -

- (i) that precast units be capable of carrying SATS Class I loading (Class I will be replaced by NR loading from a date to be advised);
- (ii) that they be manufactured in accordance with drawings approved by the Chief Civil Engineer;
- (iii) that the relevant drawing number and date of approval by the Chief Civil Engineer be quoted when tendering;
- (iv) that each unit be marked "SAR" and with the permissible Z value on the inside of the unit;

(v) the jacking forces, if the culvert is to be installed by jacking.

All tenders must be forwarded to the Chief Civil Engineer for recommendation.

- 5.5 Precast units must be installed strictly in accordance with the manufacturer's instructions, which will have been approved by this office. The "SAR" and permissible Z value mark must be checked before the unit is installed. Special care must be taken to ensure that filling on both sides of the culvert takes place simultaneously.

6. METAL CULVERTS

The use of corrugated galvanised metal pipes or arch rings such as manufactured by "Armco" may be allowed, if economically justified, under the following circumstances :

- (i) Under roads, e.g. roads adjacent to railway lines or approach embankments to road over rail bridges.
- (ii) Under non-electrified railway lines more than 50 km from the sea or from an industrial area, provided that local conditions are such that neither the material surrounding nor the water flowing through the pipe is corrosive or likely to become so as a result of development in the area.
- (iii) Subject to strict control of the type of material used in the surrounding fill, the method of filling and the compaction procedure, all of which should be in accordance with the manufacturer's instructions.
- (iv) Under railway lines with a life limited to 30 years or less.

Each case, where the use of metal culverts under a railway line is proposed, must be submitted to the Chief Civil Engineer for approval.

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APPENDIX 3

PRECAST PORTAL CULVERT UNITS

Precast portal culvert units are available from firms specialising in the manufacture of precast concrete. The nominal sizes and Z values of units for which drawings have been approved in this office are given on the following pages.

The firms are -

Fraser Fyfe (Pty) Ltd
P.O. Box 14407
WADEVILLE
1407

Rocla (Pty) Ltd
P.O. Box 92
ROODEPOORT
1725
(Tel.: 011-672-6621)

The firms can be contacted for the addresses of branch manufacturing facilities which they may have on the Witwatersrand and other areas of the Republic.

PRECAST PORTAL CULVERTS WITH BASE SLABS

<u>Nominal size</u> (Span x height)	<u>Fraser Fyfe ex Balfour</u> (max Z) (m)	<u>Rocla</u> (max Z) (m)
600 x 450	-	5,0
600 x 600	-	5,0
750 x 450	-	5,0
750 x 600	-	5,0
750 x 750	-	5,0
900 x 450	7,5	5,0
900 x 600	7,5	-
900 x 750	-	5,0
900 x 900	7,5	5,0
1200 x 600	7,5	-
1200 x 900	7,5	15,0
1200 x 1200	7,5	7,5
1500 x 600	-	5,0
1500 x 900	7,5	-
1500 x 1000	-	10,0
1500 x 1200	7,5	5,0
1500 x 1500	7,5	10,0
1800 x 900	7,5	5,0
1800 x 1200	7,5	10,0
1800 x 1500	7,5	-
1800 x 1800	7,5	10,0
2000 x 500	1,0	-
2000 x 800	1,0	-
2000 x 1000	7,5	10,0
2000 x 1200	7,5	-
2000 x 1500	7,5	15,0
2000 x 1800	-	15,0
2000 x 2000	7,5	10,0
2100 x 1000	-	5,0
2400 x 1200	7,5	4,0
2400 x 1500	7,5	4,0
2400 x 1800	7,5	-
2400 x 2100	5,0	-
2400 x 2400	7,5	1,0
2500 x 1000	7,5	-
2500 x 1250	7,5	-
2500 x 1500	7,5	10,0
2500 x 2000	-	10,0
2500 x 2500	7,5	10,0
3000 x 600	-	5,0
3000 x 1000	7,5	-
3000 x 1250	1,0	-
3000 x 1500	5,0	10,0
3000 x 2000	7,5	10,0
3000 x 2500	7,5	10,0
3000 x 3000	7,5	10,0
4000 x 2000	-	5,0

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PRECAST PORTAL ARCH CULVERTS WITH BASE SLABS

Nominal size (Span x height)	Fraser Fyfe ex Balfour (max Z) (m)	Rocla (max Z) (m)	Fraser Fyfe ex Carletonville (max Z) (m)
600 x 450	-	-	7,0
600 x 600	-	-	7,0
750 x 450	-	-	7,0
750 x 600	-	-	7,0
750 x 750	-	-	7,0
900 x 450	-	6,5	7,0
900 x 600	5,0	6,5	6,75
900 x 750	-	-	6,75
900 x 900	-	6,5	6,75
1200 x 450	-	6,0	6,0
1200 x 600	-	6,0	6,5
1200 x 900	11,0	6,0	6,5
1200 x 1200	-	6,0	6,5
1500 x 600	-	6,0	5,8
1500 x 900	-	6,0	6,3
1500 x 1200	-	6,0	6,3
1500 x 1500	5,0	6,0	6,3
1800 x 900	-	6,0	6,0
1800 x 1200	-	6,0	6,0
1800 x 1500	1,0	6,0	6,2
1800 x 1800	-	6,0	6,2
2000 x 1000	5,0	-	-
2000 x 1500	5,0	-	-
2000 x 2000	5,0	-	-
2100 x 1200	-	-	5,6
2100 x 1500	-	-	5,6
2100 x 1800	-	-	6,0
2100 x 2100	-	-	6,0
2400 x 1200	-	-	5,6
2400 x 1500	-	-	5,6
2400 x 2400	-	-	5,6
2500 x 1500	5,0	-	-
2500 x 2000	5,0	-	-
3000 x 1500	-	-	5,1
3000 x 1800	-	-	5,1
3000 x 2000	5,0	-	-
3000 x 2400	-	-	5,1
3000 x 2500	5,0	-	-
3000 x 3000	5,0	-	5,1

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BRIDGE HANDBOOK

CHAPTER 5

FOOTBRIDGES

1. DESIGN

The methods and parameters for determining the pedestrian capacity and for the structural design of a footbridge are covered in Part I clause 19 and Part II section D of the Bridge Code.

2. STANDARD DESIGNS

Standard structural steel footbridge designs have been used by SATS since its inception. The designs have been developed from time to time as a result of experience in use as well as to make use of new materials and methods when they have become available.

The present designs, shown on type drawings BE 9115, 9116 and 9112, for standard widths of 2,2 m, 3,4 m and 4,4 m respectively, are modular designs in structural steel allowing any combination of span and stairway layout.

The modular design system lends itself to re-use of the bridge at other sites. Second hand footbridges are therefore stored at the bridge yard, Bloemfontein for possible re-use as directed by the Chief Civil Engineer.

3. EFFECT OF SITE ON TYPE AND DESIGN

(i) At stations

It is often necessary to alter a footbridge to suit changing circumstances. These may include changes in the track layout, the platform itself, the structures on the platform, passenger volumes and the directions taken by pedestrians. For this reason a modular design which allows such changes to be implemented easily is best for footbridges serving stations.

(ii) Between stations

The design of footbridges between stations does not need to be modular and should therefore be dictated by the requirements of the site and those of the users, as well as by economics and aesthetics. The materials used should be those best suited to the most economical design, taking the environment into account, particularly at sites near the sea. The economic advantage to be gained by using a second hand footbridge should also be taken into account.

4. MAINTENANCE

The maintenance of a painted steel structure over electrified lines is difficult and expensive, often involving night work. As footbridges are often a feature of station structures a badly maintained footbridge will reflect a poor image of SATS.

Consideration should be given to the erection of a re-usable scaffold system which can be erected on both sides of the footbridge span under occupation and which will allow repairs, cleaning and painting to be carried out over live electrification equipment.

Cleaning and painting should be carried out in accordance with specification S310.

5. RELEASEMENTS

When existing footbridges are to be dismantled the Chief Civil Engineer should be approached for disposal instructions for the released material.

6. SITE PLANS

Footbridge site plans require the approval of the General Manager when situated away from a station. For footbridges at stations however, it is sufficient to endorse the site plan to the effect that the station yard plan has been approved by the General Manager, quoting reference and date, on condition that the station yard plan in fact does show the proposed footbridge.

AH 0517G

BRIDGE OFFICE HANDBOOK

CHAPTER 6

RETAINING WALLS AND REINFORCED EARTH STRUCTURES

1. RETAINING WALLS

1.1 Design

For low cost projects, the available type drawings should be used for preparation of working drawings, as detailed in 1.2. For larger projects, it is possible that cost savings may be effected by using special designs in place of the "type" designs and, for this purpose, site plans, showing the applicable forcing conditions, should be submitted to the Bridge Office.

1.2 Type drawings

1.2.1 Details of type retaining walls are given in drawing BE 9080 sheets 1 to 8.

<u>Drawing</u>	<u>Angle to top edge of Rail or Road Embankment</u>	<u>Slope of Backfill (β)</u>	<u>Height Range (m)</u>
BE 9080 SH 1	90°	0°	1 - 6
SH 2	60°	18° 30'	1 - 6
SH 3	45°	25° 10'	1 - 6
SH 4	30°	30°	1 - 6
SH 5	Parallel (sloping fill)	33° 40'	3,5 - 6
SH 6	" " "	"	1 - 3
SH 7	Parallel (Top at formation level)	0°	3,5 - 6
SH 8	" " " "	"	1 - 3

The slope of backfill, β is measured at right angles to the wall, see Fig. 1. For values of β other than those listed, select the sheet for the nearest higher slope. The angle β should never exceed 33° 40'.

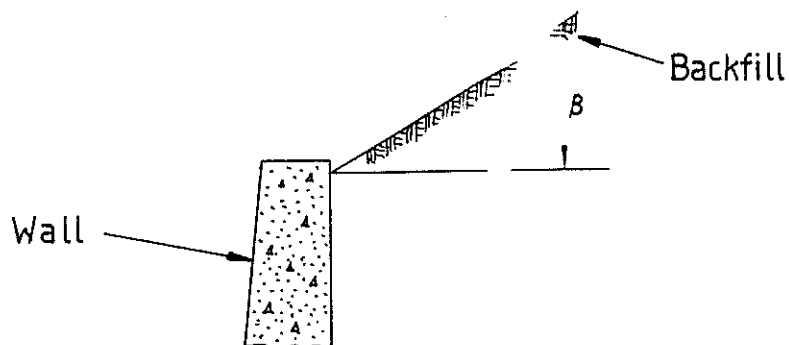


Fig. 1

- 1.2.2 Effects due to rail or road surcharge on the embankment have been taken into account.

When fill behind a wall is level and there is no possibility of rail or road surcharge occurring behind the wall at any time, details from sheet 1 may be used. When in doubt, walls retaining level fills should be as shown on sheets 7 and 8.

Heavier loading, e.g. that due to heavy fork lift trucks, may require special designs.

- 1.2.3 The method of extracting information for working drawings is described in the examples in Appendix 4.

All working drawings must show the backfill slope as well as the surcharge load (road, rail or specified fork lift truck) and must be forwarded to the Chief Civil Engineer for approval, quoting file reference W19/11/59.

2. TYPICAL DRAWINGS : CULVERT WING WALLS

The Central Yard Construction prepared a set of undimensioned typical drawings for culvert wing walls which cover about 80% of possible situations. These drawings can save up to 80% of drawing office time, if suitable for the site, and are available from the Resident Engineer, Reef Construction, Elandsfontein.

3. REINFORCED EARTH

- 3.1 The Reinforced Earth type of retaining wall is a proprietary system which can often lead to considerable savings, and may in some instances present the only practical solution at reasonable cost.
- 3.2 The system consists of a vertical wall of thin interlocking precast concrete panels anchored to the compacted earth fill by galvanised steel strips laid horizontally. It is more economical than reinforced concrete for walls higher than 3m and, where poor foundation conditions exist, even less than this height.
- 3.3 Reinforced earth structures may be used for bridge abutments and to support roads and buildings, but the use of the system close to railway lines can only be allowed where -
- i) the line is not expected to be electrified or
 - ii) the collapse of the retaining wall will not endanger the railway line.

These limitations are due to the potential effect of electrolytic corrosion on the structural integrity of a Reinforced Earth wall by possible stray return currents from an electrified railway line. The collapse of a retaining wall adjacent to or supporting a railway line cannot be entertained, and the use of Reinforced Earth can therefore not be permitted in these situations if the railway line is electrified. All proposals for the use of Reinforced Earth structures must be referred to the Chief Civil Engineer for approval.

- 3.4 The owner of any Reinforced Earth structure near a railway line must consider the consequences of collapse and design accordingly.

APPENDIX 4

1. EXAMPLE

A wing wall at 45° to the top edge of embankment has a maximum height of 6,3 m, a minimum height of 1,4 m and is 10,5 m long. Allowable ground bearing pressure is 300 kPa.

2. PROCESS

- 2.1 Draw elevation of the stem to scale and indicate position of standard heights nearest to each end as shown by the dashed lines (See Fig. A1).

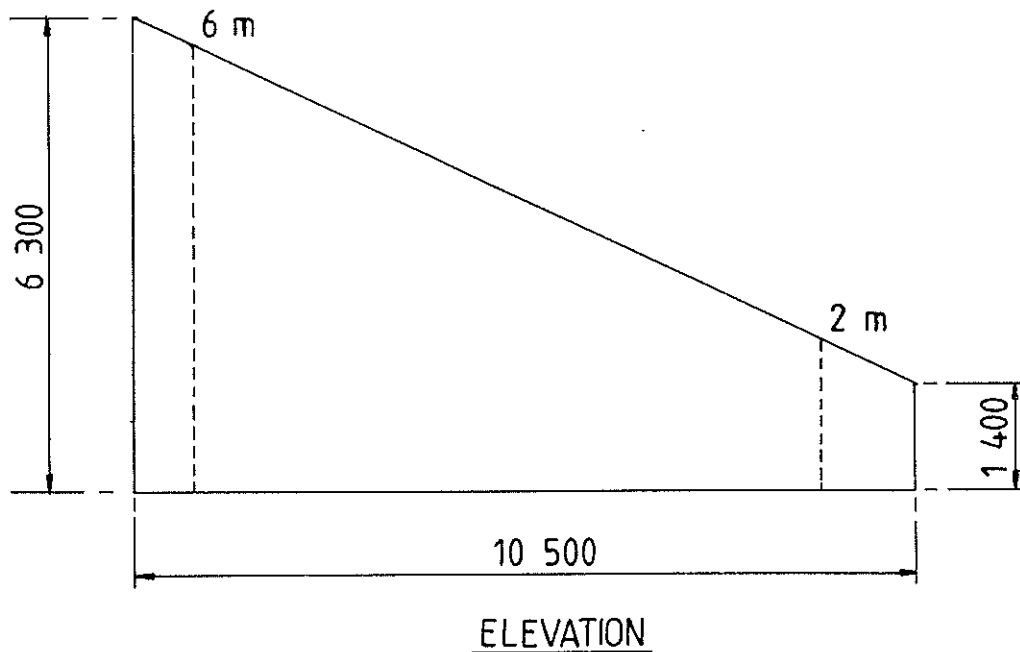
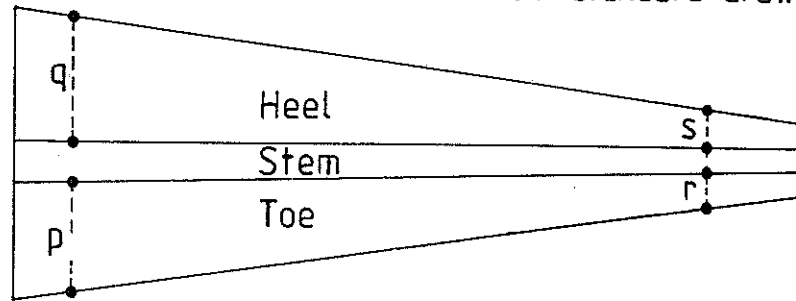


Fig. A1

- 2.2 Plot toe and heel dimensions given for the standard heights in plan. Connect the plotted points and extend the lines to the ends of the wall. Dimensions obtained by scaling at the ends of the footing may be rounded to the next 50 mm (See Fig. A2).

Dimensions corresponding to p,q,r and s are obtained from standard drawing

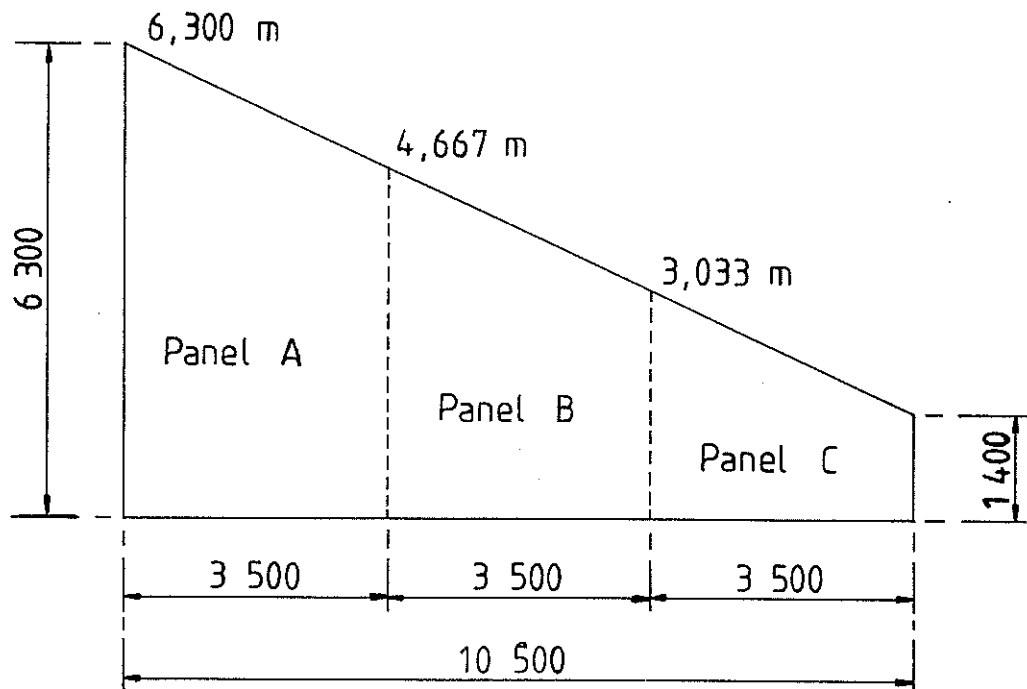


PLAN

Fig. A2

- 2.3 Divide the stem of the wall into panels for reinforcement. Panels should be as long as possible but the variation in height in any panel must not exceed 2 m. This gives three panels, in this example, with maximum heights of 6,300 m, 4,667 m and 3,033 m respectively (see Fig. A3).

Note that maximum height should not exceed 6,500 m.



ELEVATION

Fig. A3

The standard height to be chosen for reinforcement of a panel is the height which is nearest to a panel's maximum height. Therefore panels A, B and C will be reinforced to details shown for 6m, 5m and 3m standard heights respectively.

- 2.4 Foundation thickness must correspond to the standard height selected for reinforcement. Hence in this example foundation thicknesses for panels A, B and C are 450 mm, 350 mm and 300 mm respectively. Keep top of footing level and provide for stepping in the excavation.

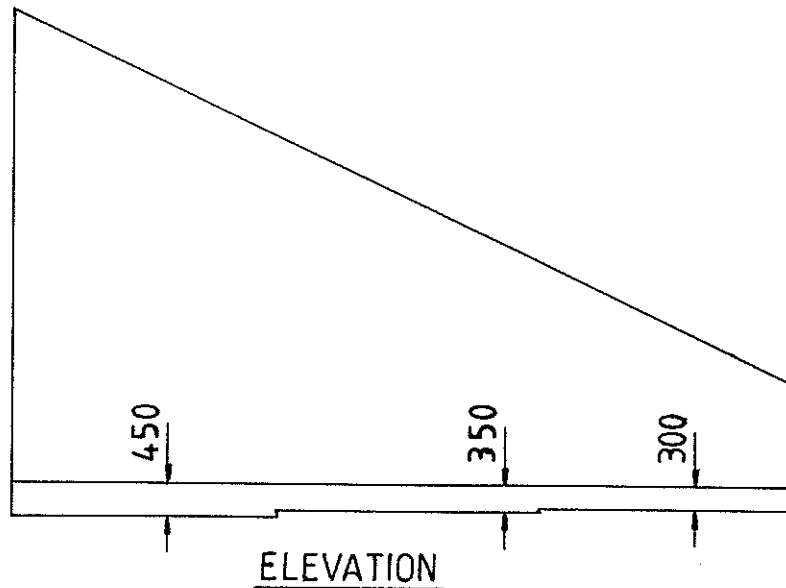
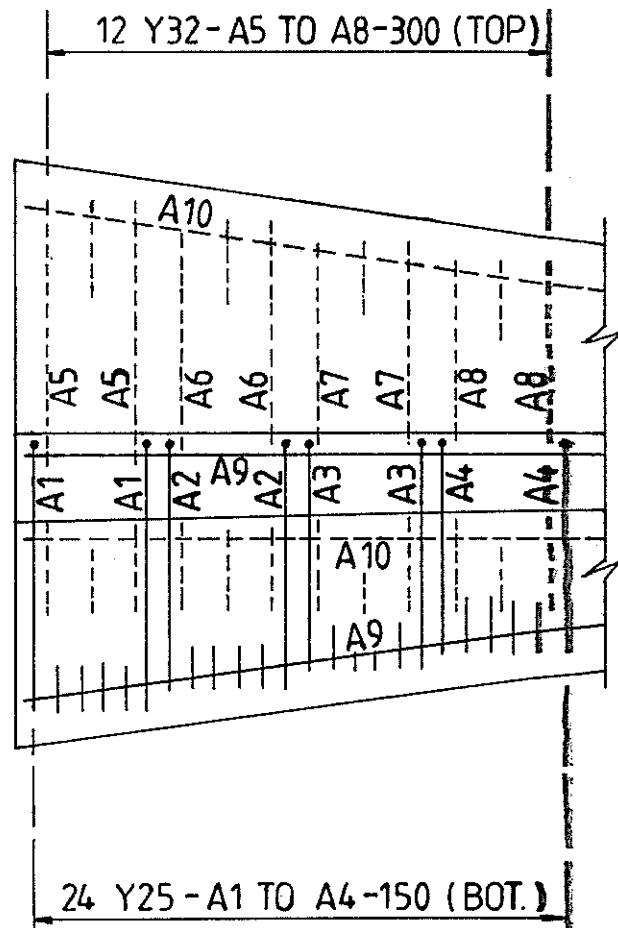


Fig. A4

- 2.5 Keep foundation key (if required) of constant dimension over length of each panel, the back of the key being in the same vertical plane as the back of the stem. Note that no foundation key is required on rock.
- 2.6 No joints are required between panels except as directed on the type drawing. Movement joints are required at a spacing not exceeding 3 times the overall height or 10 m. The type drawings will be amended correspondingly in due course.
- 2.7 Distribution reinforcement may be altered to facilitate placing and must not be interrupted at junctions between panels. Bars may be lapped provided the length of the lap is not less than 42 times the bar diameter.
- 2.8 Draw in reinforcement in elevation, plan and section to facilitate preparation of bending schedules. To avoid an excessive number of different bar lengths, similar bars should be grouped. Bar groups must be limited in such way that not more than 250 mm at the edge of any section remains unreinforced (see Fig A5).

- 2.9 Show position of earth fill behind walls on all sections through wall.
- 2.10 Reprint all relevant notes from the standard drawing on the working drawing and include a note indicating the allowable ground bearing pressure.
- 2.11 Figure A5 shows a typical plan on the working drawing.



PART PLAN OF FOOTING

Fig. A5

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BRIDGE HANDBOOK

CHAPTER 7

TUNNELS

1. General

S.A. Transport Services has more than 170 railway tunnels with a total length exceeding 100 km. The 13,330 km Hex River tunnel is the longest. Other notable tunnels are the Boughton twin tunnels (6,023 km each), the Hidcote twin tunnels (4,030 km and 3,233 km) and the Overvaal tunnel (3,896 km). Most tunnels have profiles for single track. Where the line was subsequently doubled the second tunnel was usually constructed at 12,2 m (40') centres, so as to keep stresses caused by overburden in the intermediate rock low and to prevent damage due to blasting in the adjacent tunnel. Cross-cuts are provided at 500 m spacing. In certain cases on lines built double at the outset, double track tunnels were provided where they proved to be cheaper than twin tunnels.

Very few of the existing tunnels are unlined. Most tunnels have concrete linings of at least 300 mm thick, although a reduced thickness of 200 mm was provided in some cases where the rock was very competent. To ensure adequate clearance for rolling stock, a deviation of only 50 mm in the position of the inside surface of the lining is tolerated.

Since 1966, single track tunnel widths have been increased from 4 570 mm (15') on straights to 4 920 mm and the track placed 150 mm off the tunnel centre line. This makes improved drainage, provision of a walkway and better placing of services possible. At the same time, the use of track slab in tunnels was introduced.

The profiles adopted for single and double track tunnels, shown on BE82-35, have cross-sectional air spaces of 25.5 m² and 60.7 m² respectively. The latter has curved walls so that its lining can withstand not only vertical loading but a substantial lateral loading as well. The nominal clearances of the standard profiles exceed the clearances laid down for workshop areas in Annexures 1 and 2 of the Permanent Way Instructions by 150 mm. This provides 100 mm for the placing of services as well as for the 50 mm construction tolerance.

Before 1960 most tunnels were constructed departmentally. Although the methods used were sometimes primitive, remarkable successes were achieved.

2. Functional Requirements

A train is subjected to a larger resistance inside a tunnel than outside as it acts almost like a piston in a tube. The additional power output required to maintain speed varies with the cross-sectional area, the wall roughness, the length of tunnel and the speed of the train and can become significant in long, single track tunnels. As the air flow between tunnel wall and train is poor, diesel locomotives can experience oxygen starvation. This places a limit on the number of units that can operate in a consist without overheating in a particular tunnel, the limit depending on the grade and length of the tunnel. The Mechanical and Electrical departments should therefore be consulted about tunnel geometry during the planning stage. Bearing in mind that the additional cost of a larger tunnel opening may be off-set by lower operating costs, a double track tunnel may be found more economical than two single track tunnels even though it has more "wasted space."

Economic analyses of the relative cost of ballasted and slab track should be undertaken for each tunnel. Consideration should also be given to -

- the possibility that pumping conditions could arise in wet areas due to abrasion by the ballast and/or weathering of the rock ;
- the health hazard created in long, poorly ventilated tunnels by internal combustion machines required for maintenance of ballasted track.

Generally, the long term benefits of slab track make it attractive for tunnels longer than 500 m.

The provision to be made for drainage is determined from the geological information, assuming that a minimum amount of surface water will be allowed to enter at the high end of the tunnel.

The requirements of the Electrical and Signals and Telecommunication departments are shown on drawing BE 82-35. As high a standard of lighting as could be economically justified should be provided to improve the safety and efficiency of maintenance in tunnels.

3. Geological Considerations

During the period when tunnels were being constructed departmentally it was possible to deal with problems due to changing rock conditions as they arose. Subsequently, in order to enable contractors to tender realistically and to compensate them fairly for underground conditions, the material to be tunnelled through must be accurately described during the pre-tender stage and monitored for variations from that description, as excavations progress.

Items requiring description are the following :

- (i) Overall stability of and possible occurrence of mineral resources in the region, factors which may affect or tunnel location.
- (ii) The most advantageous portal positions, as starting tunnelling is often dangerous,
- (iii) Rock and/or soil types and degree of weathering of rock.
- (iv) Likelihood of fiery mine conditions.
- (v) Possibility of encountering groundwater.
- (vi) Rock mechanics test data including the unconfined compressive strength (UCS), the geodurability and, if possible the stress state of the rock.
- (vii) Rock quality designation (RQD, an indicator of the amount of jointing present), jointing, direction of layering or rock mass rating (RMR) or Q index.

The RMR is an assessment of rock in accordance with the Geomechanics Classification system developed by Bieniawski at the CSIR ... It is a quantity between 0 and 100 according to which rock is classified into one of 5 classes. The Q-index of rock is an assessment on a scale of 0,001 to 1000 according to a system developed by Barton, Lien and Lunde at the Norwegian Geotechnical Institute (NGI 2). Both RMR and Q-index can be determined by an experienced geotechnical engineer or geologist and give an indication of the ability of the rock to support itself around an excavated opening. Factors taken into account in their determination are the RQD, block size, nature of joints and amount of underground water present. Both have been related to support measures required in underground excavations. The NGI Q-system is preferred because of its greater sensitivity.

The geotechnical aspects of tunnelling are described in greater detail in the geotechnical handbook.

4. Lining Design

4.1 General

Tunnel support/linings may be provided -

- (a) for cosmetic and/or psychological reasons;

- (b) to create a suitable environment in the tunnel so that it can function as intended. This may include provision of drainage, control of water infiltration or exfiltration, and a smooth surface for improved air or water flow;
- (c) to maintain safe underground conditions. This includes structural support of the opening and, where necessary, sealing of the rock from the atmosphere to reduce the rate of weathering.

From a structural point of view, support can be one of 2 types :

- (i) support systems which are installed with a pre-load are called active, e.g. tensioned rock bolts;
- (ii) support systems which generate a resistance only in response to soil or rock deformation/movement are termed passive.

Forces are generated in the support/lining by its interaction with the surrounding ground, due to the effects of combinations of -

- (i) stress-induced deformations and fracturing;
- (ii) swelling conditions;
- (iii) the weight of loose material; and,
- (iv) water pressure.

The effective load on a lining is a function of, amongst others, the stiffness of the lining and the method of construction. In soft ground a stiff lining would be installed immediately after excavation and it would have to carry the full dead load due to loose material. In hard rock a thin lining may be installed, when convenient, which may hardly carry any load at all. In rock of intermediate strength it may be possible to have a short unsupported section between the tunnel face and the support. A medium stiffness support consisting of steel arches, shotcrete and rock bolts may be appropriate as it does not only have to support any loose material that may be present but must also accommodate deformations due to readjustment of the stress field in the rock mass.

After excavation of an opening in rock, the surrounding rock mass undergoes deformations and readjustment of stresses. The deformations can be strongly influenced by the presence of geological discontinuities. Where the nature of rock layering, and roughness of joints and block size of jointed rock are unfavourable, large movements can take place, including dangerous rock falls or slides. In intact rock, deformations may remain elastic, but on the other hand, fracturing may occur in highly stressed regions. The stress patterns in intact rock which prevail after excavation show that the

most highly stressed regions are at or near the surface of the walls and roof of the opening. Because the rock is unconfined at these surfaces, these regions are also the weakest and will fracture first. In openings in unweathered massive rock with few joints there will probably be no fracturing if the ratio of overburden pressure to UCS is less than 0,1, while major fracturing will probably occur if the ratio exceeds 0,3. If any fractured rock is allowed to fall out, the fracturing process may continue until the entire opening is closed up. It follows that to allow use being made of the self-supporting properties of rock, a shape of opening should be chosen around which favourable stress patterns are achieved so as to reduce stress-induced fracturing. Also, movement of loosened rock should be restricted so that it can assist in the arching process. Active support is ideal for this purpose as it is effective, without any movement having to take place, mainly by generating frictional resistance at joints. Usually, movement and readjustment of stresses are only significant within 3 diameters from the opening. The convergence and/or progressive loosening process may finish rapidly or may continue for many months.

Calculation from theoretical principles of how the total effective load will be shared between rock mass and lining is not easy. One of the simpler methods of calculation is the simplified rock-support interaction analysis (RSIA) presented by Hoek and Brown (3). Simplifying assumptions made are that the tunnel cross-section can be represented by a circular opening and that before commencement of excavation the ratio of the horizontal and vertical stresses in the rock is unity. Factors taken into account are the stiffness of the support and the amount of convergence that has already taken place at the instant when the support becomes effective, which amount is a function of the length of the unsupported excavation between the face and the effective support.

In general, calculations cannot be entirely reliable as the rock conditions and physical constants involved are usually not known with a great deal of accuracy. Further, it is difficult to account for the time-lag between excavation and provision of support. The most economical solution may be obtained by installing support, selected say on the basis of RSIA, monitoring the deformations of the rock and lining after installation and using this information to adjust the initial support provided and to select procedures for subsequent excavations under similar conditions. This approach is particularly of value under conditions of high stress where it may be uneconomical to provide sufficient support to prevent stress-induced fracturing. A stiff but yielding type of passive support such as provided by a close pattern of long untensioned rock anchors together with mesh and shotcrete is then used to control post-failure deformation. When convergence measurements indicate the completion of fracture zone formation, a final lining is installed.

The concept of using the rock mass to (largely) support itself and adjusting the support measures on the strength of monitoring rock deformations forms part of what has been called the New Austrian Tunnelling Method (NATM). It appears however, that in South African railway tunnels, which are typically near the surface and in hard rock, very little convergence takes place after excavation (4). Monitoring, which is costly, should therefore be limited to regions in which no previous experience has been gained or to built-up areas where claims for damage to buildings are expected.

The support design loads proposed by Terzaghi are applicable to steel or concrete arch supports installed in small to medium sized tunnels after all deformations and loosening of rock have already taken place (2) (5). The stiffness of the support and initial stress state of the rock are not taken into account in determining the design loads. Use of these loads usually leads to conservative results. Accurate support pressures are predicted in case of poor rock, but overestimates may occur in more competent rock.

Among the empirical methods of support design, is the so-called Q-system of Barton et al which relates the Q-index of rock to support measures required, as well as final pressures exerted thereon by the rock mass (2). The tabulated recommendations are based on the application of shotcrete and/or rockbolting immediately after excavation, so that major loosening of rock is prevented and the rock mass itself becomes the main load bearing component. The system is applicable only to openings shaped in such a way that arching can develop. Application of the system involves selection of a factor, the Equivalent Support Ratio (ESR) which takes account of the length of time that the opening will be in use, the inclination of the surface being supported and presumably also the economic and strategic consequences of collapse. For railway tunnels, this ratio should be 1,6 and 1,0 for the construction and the permanent conditions respectively. The overall factor of safety provided by the system is reputedly 2 or more. Hoek and Brown have modified the recommendations slightly so as to make them more universally applicable than the original, which were compiled for the Scandinavian environment (3).

Another empirical method is the RMR-system of Bieniawski (1). A feature of this system is the attempt to relate the RMR to stand-up time of an unsupported span. Reasonable correlation exists between the support recommendations of these 2 empirical methods (6). Reasonable correlation between them and the results of RSIA has also been reported.

2 Support in practice

Tunnels are usually driven using two phases of support/lining. Various combinations of terms are commonly used to describe these two phases including -

- (a) initial support - final lining;
- (b) temporary (safety) support - permanent lining (support);
- (c) primary support - secondary support (lining)

Each of these sets of terms represents a different design concept. It is very important that the designer and the construction engineer have a clear understanding of the design concept being adopted and also that this design concept be clearly described in the contract. The different terms have different meanings and should not be used interchangeably.

Set (a) : Initial and final indicate a time sequence of first and last without specific further meaning.

Set (b) : Temporary (safety) support provides stability and safety during construction and is not expected to be effective permanently. It is installed concurrently with the excavation advance. It normally consists of end-anchored rock bolts, Split Set stabilizers or Swellex bolts, wire mesh, shotcrete and steel arches with lagging and handstone packing. It is designed and installed by the contractor for his own protection and less rigid quality control measures are exercised by the engineer. Bolts are normally less than half the tunnel diameter in length, and are often required only to hold isolated unstable rock wedges or blocks in place.

Permanent lining (support) satisfies the long term user requirements such as structural support, protection of the rock mass against weathering where necessary, control of water and an acceptable environment in the tunnel so that it can function as intended. In determining its characteristics the existence of any temporary support that may be present is ignored because of the short design life of the latter. It normally consists of a formed concrete lining, 200 - 300 mm thick which may or may not be reinforced.

Set (c) : Primary lining (support) provides stability and safety during construction, and also major structural support which acts for the entire life of the tunnel. It is installed concurrently with the excavation advance.

It normally consists of-

- (i) fully grouted bolts which are often tensioned and, in case of railway tunnels, are approximately half the tunnel diameter in length, and/or,
- (ii) wire mesh and shotcrete, or,
- (iii) steel arches with lagging, back-filled with concrete.

It is designed and specified by the tunnel owner. Rigid quality control by the engineer during and after installation is required.

Secondary lining (support) is that which is required to convert the primary lining to a form suitable for the long term use of the tunnel. The secondary lining (support) may consist of a formed concrete lining, usually unreinforced, or additional applications of shotcrete, finished off to an acceptable standard.

Some experts, including Bieniawski, maintain that temporary and primary support are one and the same thing and that both eventually form part of the permanent support. The temporary/primary support is then designed to function for the entire design life of the tunnel and to carry all the loads that will ever act on it, while the final concrete lining merely acts as a cosmetic finish and to protect the rock-mass from weathering. This view leads to overdesign and is not supported.

The distinct difference between temporary and primary support is further highlighted by the following :

- (i) Temporary support normally consists of shorter bolts which can be installed quickly and cheaply off the muckpile or from a platform above the jumbo, without intense supervision and without disrupting the tunnelling cycle. On the other hand, primary support, consisting of longer bolts, can normally not be installed without disrupting the excavation cycle and requires costly supervision. It adds significantly to the final cost of the project unless its presence makes the installation of a formed concrete lining unnecessary.
- (ii) Temporary support is mostly designed on an experience/trial and error basis depending on the experience and courage of the mine captain, although it must also always satisfy the requirements of the Mines and Works Act. Kirsten has recently developed the so-called Q-NATM system which is a useful tool for assessing whether the right level of temporary support has been installed (7)(8). It is based on the assumption that the support recommendations derived from the Q-system refers to primary/permanent support. The temporary support recommended by the Q-NATM system is approximately 50% of the support recommended by the Q-system ($ESR = 1,6$), so that the factor of safety for the former is of the order of 1, which factor Kirsten considers provides sufficient safety in the mining environment. Use of the Q-NATM-system in practice has indicated that the recommendations are reasonably conservative and that the system can be used with confidence. However, no empirical formula should be allowed to take the place of the alert and experienced eye, looking out for possible unstable wedges or blocks endangering the lives of the workmen. It should be noted that Kirsten uses a different nomenclature.

Primary lining (support) is usually designed using Barton's Q-system or the RMF system after Bienawski. In deep, stress-controlled situations the RSIA method may be more appropriate.

Set (b) represents the concept most commonly adopted for railway tunnels. For special permanent lining designs, SATS usually uses the formulas proposed by Terzaghi. The 200 - 300 mm thick concrete lining which is usually provided as permanent support may be over-conservative in certain cases but ensures a long trouble-free life for the tunnel even if disturbances such as nearby blasting or earth tremors should take place. A 300 mm thick concrete lining is sufficient for most applications but the Bridge Office should be approached for designs for special cases. These include highly stressed regions, swelling conditions and areas where slides, poor rock or very soft rock occur.

The concept represented by set (c) has not been adopted on SATS tunnels and is for economic reasons not recommended. Exceptions would be where a primary support can be provided which makes the installation of a formed concrete lining unnecessary, such as in case of very competent rock.

5. Construction

Tunnel construction practice including the use of explosives and measures required for compliance with the Mines and Works Act, is well documented and it is not necessary to describe it here. It is necessary, however, that engineers should be aware of those aspects of tunnel contracts about which misunderstandings may easily occur. Some of them are described below.

The cost of drilling, blasting, reinstatement of services and mucking does not vary significantly with rock conditions and tenderers can price these items with sufficient accuracy. The same applies to the provision of permanent support provided that overbreak is limited. On the other hand, the type of temporary support required and whether it should be installed before or after mucking, or independently at some distance back from the face, strongly influence costs. The contractor should therefore be compensated according to the amount of work required to maintain safe working conditions. This is done on SATS contracts by varying the rate for excavation on the basis of the temporary support requirement. Ideally, there should be a rate for excavation in the schedule corresponding to every possible type of temporary support. To be practical, the number of pay items for excavation is usually limited to between 2 and 4, each item (class) including for a defined range of temporary support types.

In earlier SATS contracts the responsibility for and the cost of temporary support was borne entirely by the contractor. Later contracts provided payment items for temporary support systems which removed some of the financial risks from the contractor. At the same time it unfortunately gave him an incentive to oversupport. The problems are now usually overcome as follows :

In terms of the Mines and Works Act, the contractor is responsible for safety and must decide on the temporary support required. If the engineer agrees that the choice of temporary support was correct, that temporary support is paid for and used to determine the class of excavation. Should the engineer not agree with the contractor's decision, the Q-NATM-system is used to determine the amount of support that should have been provided and payment is made accordingly. If necessary, the engineer may order more support to be provided.

The above-mentioned classification of excavation may also be used to adjust the completion time of the contract.

For contract purposes, overbreak is usually defined as that portion of excavation beyond the theoretical excavation profile (payline) which does not exceed the payline by more than 300 mm, while other over-excavation is termed excessive overbreak. Overbreak is made good using concrete cast monolithically with the lining concrete. Excessive overbreak is made good as directed, usually by 20 MPa concrete or dry-stone packing.

To discourage careless blasting, payment is made for excavation and making good of overbreak per m² of the lining surface, it being considered that the rate covers the costs arising from any amount of overbreak up to the limit of 300 mm. Payment for excavation and making good excessive overbreak is made only if the excessive overbreak occurred due to reasons beyond the control of the contractor and not because of carelessness or overblasting.

6. As-built Details

On completion, all as-built details of tunnels should be forwarded to the Bridge Office for safe-keeping.

7. Inspections and Maintenance

Tunnels should be inspected thoroughly once a year during the bridge and culvert inspection. In addition, unlined tunnels should be inspected once a month.

References

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AH 0442G

BRIDGE HANDBOOK

CHAPTER 8

SLAB TRACK

1. Many types of slab track exist all over the world. These include continuous or discontinuous types, those with track fastenings fixed directly to the slab and those where the rails are fastened to concrete or timber blocks, or sleepers which are then in turn fixed to the slabs. In some cases, a ladder-shaped structure is used in place of a slab (1) (2).

SATS has used slab track extensively in recently built tunnels and has also constructed it on bridge. For running line slab track, it has always used designs which require that rail fastenings be fixed directly to the slab concrete. For such slabs, if continuous, it is important that cracking of the concrete due to shrinkage or temperature variation be controlled, as the cracks invariably run through the insert positions and can become so large that the fastenings work loose. Crack control has been achieved by the debonding of longitudinal reinforcement in strategic locations, or by the indentation of the slab halfway between fastenings at 3 to 5 m intervals so as to confine cracking to innocuous locations. A continuous slab without the above-mentioned types of crack control but in which cracking is controlled by a designed amount of longitudinal reinforcement, usually placed near the neutral axis, has however been found to give good results.

In tunnels the slab is constructed on top of a floor slab which is usually founded on rock. An additional upstand slab forming part of the floor is sometimes used, its height being determined by drainage considerations. Where the floor slab is likely to be often submerged, water may penetrate in between floor slab and track slab. In such situations, the track slab should be dowelled to the floor slab so as to reduce the likelihood of support deterioration by pumping. In other areas dowels may be omitted, but the surface of the floor slab should be roughened so as to ensure sound bond with the track slab.

2. Although the practice here and overseas has been to restrict the use of slab track to tunnels and bridges, it also performs well on open formation. A short experimental section built in 1966 on the Fochville-Potchefstroom section performed well until it settled unacceptably due to poor drainage and foundation material. On open formation the slab concrete will experience greater shrinkage and temperature ranges than in a tunnel. Further, in the absence of a rock foundation, the slab will undergo larger deflections and therefore has to be designed, together with the formation to play an increased structural role (2). Where such slabs are required, the Bridge Office should be approached for a design.

3. Most SATS track slabs have a flat upper surface on which rail chairs with anchor pins are subsequently fixed in drilled holes. In a few cases, the British Rail Pact slab has been used, which has a profiled upper surface and is laid with a paving machine. The rails are continuously supported and held down by cast-in fasteners.
4. Where slab track and conventional track join, unacceptable track geometry may develop due to the great difference in flexibility of the two types of track. A gradual change in flexibility is obtained by the provision of transition slabs or beams, the latter being more popular.
5. Slab track is expensive and has to be laid with great care. A rail chair which allows errors in alignment of up to + 10 mm to be rectified, has been developed by SATS. Errors which cannot be rectified in this way have to be corrected by repositioning the chair. Slabs that have suffered excessive settlement have already been raised and grouted successfully.
6. In cases where rail fastenings have been grouted or cast in and are therefore not replacable, serious train delays may occur if fastenings are destroyed over a long distance during a derailment. This can be prevented by casting threaded nylon sleeves into the slab concrete, halfway between the fastenings. These spare sleeves are left blank after construction but can be used in conjunction with new screw-in fastenings when the need arises.
7. Whether slab track or conventional track should be used in a particular location should be decided on the strength of a cost analysis. Such cost analyses, which should include present day values of maintenance costs and take account of any savings on permanent way structures due to the lower overall height of slab track, have usually shown that although slab track may be cheaper in special situations, e.g. in tunnels and on bridges, it is more expensive on open formation. The range of application of slab track can only be extended if initial costs can be lowered. The search for a cheaper slab track has been vigorously pursued in recent years and has resulted in the development recently of the PAN slab system which shows promise of achieving costs comparable with those of ballasted track (3).
8. The Bridge Office is responsible for the design of track slabs for running lines in consultation with the Track Office, which is responsible for the design of the track fastenings. For track slabs in workshop areas and truck washout areas, the Structural Office should be consulted.

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AH 045.

BRIDGE HANDBOOK

CHAPTER 9

TURNABLES

1. Turntables for turning locomotives and carriages are usually installed at locations where it is not possible to accommodate either a balloon or a triangle.
2. The older turntables consist of two fishbellied plate girders supported on a central pivot and balanced by four peripheral wheels. Height adjustment can be made so that the wheels are just free of the peripheral rail when the superimposed load is perfectly balanced. This makes turning by manpower possible.

This design necessitates deep pits which become impossible to build in areas with high water tables and no drainage facility.

3. The diameters of the turntables still in use vary from a 15,8 m diameter at Luderitz (hand operated) to a 27,4 m diameter at Culemborg (articulated, power operated).
4. In 1973 a new 20 m diameter type turntable was developed for diesel locomotives with six 20 000 kg axles. The pit is shallow with a dish shaped floor which can be used where extremely poor founding conditions prevail. The substructure is comprised of two parallel flanged welded-up beams supported by a central pivot and four peripheral wheels.

The turntable is driven by a 5 kW 3 phase electric motor and a 30:1 reduction worm gearbox, shaft mounted on one of the peripheral wheels.

The turntable is locked in position by a spring loaded roller which engages into a notch and a locking rail. The lock is released by an electric hydraulic thruster which is interconnected with the starter control panel circuit.

5. The successful operation of the turntable depends on accurate alignment during installation, which requires specific procedures to be followed.
6. The Bridge office should be approached to assist with the following :

- Provision of drawings and an estimate of cost.
- Fabrication of steelwork.

---)Purchase of the electrical and mechanical components.

- Liaison between the Electrical, Mechanical and Civil departments for the correct assembly and installation.

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BRIDGE HANDBOOK

CHAPTER 10

BRIDGE AND CULVERT INSPECTION

1. GENERAL

All bridges and culverts are required to be inspected annually. The applicable circular has been updated from time to time and was last issued as No. 50427 of 1957-18 entitled "Inspection of Bridges, Culverts and Shallow Ash Pits" and has been renumbered GS-6. The circular is included as Appendix 5 of this handbook.

2. BEFORE INSPECTION

The district engineer should ensure that all inspection officers are fully aware of the purpose of the inspection, that the requirements of the inspection circular are known and understood by all and that all necessary equipment is available.

3. EQUIPMENT

A pair of binoculars is essential for an inspection team. By means of this instrument cracks in steel members or in concrete can in most cases be detected at a reasonably early stage without the use of scaffolding. In some instances it will be necessary to erect scaffolding or hire a "cherry picker" or "skylift" in order to allow closer examination of a problem area.

The engineering officer who is to carry out the inspection of bridges must have a camera available in order to record the nature of a problem. Photographic evidence can in many cases be all that is necessary to determine the nature of the corrective work, and it is highly valued by Bridge Office staff.

4. TRANSPORT

Travel by rail trolley is the best and often the only means of transport necessary to inspect culverts and small bridges. For larger bridges and those of the smaller structures, where access is difficult or problems have been encountered, there is not sufficient time to examine the structure properly when travelling by rail trolley. For these structures a road vehicle should be used. It is important that sufficient time be available to carry out a thorough inspection of every component of the structure.

5. FATIGUE FAILURES

Some structural steel bridges have been under traffic since 1880 and a large number date from the period 1900 to 1910. It is obvious therefore that particular attention should be paid by the inspecting officer to a search for fatigue cracks in the steel, because the structures are approaching the expected design life of 100 to 120 years. The Bridge Office is able from time to time to give a lead as to where to look for such failures, but it is not possible to give this indication for every bridge span and it is therefore necessary to rely on the vigilance of the inspecting officers in order to ensure rail traffic safety.

Failures can be expected in any member of a structure when a high frequency of reversal of stress occurs. The plates directly under sleepers, which are subjected to bending with the passage of each axle, and the stringer to cross girder connections are known suspect areas.

Elements in a truss bridge, particularly those in the vicinity of a bad rail joint, which aggravates the dynamic effects, should be carefully examined.

6. PERWAY STAFF

In terms of Chapter 3 of the Permanent Way Instructions, staff must also inspect and maintain bridges. Permanent way staff are "nearest to the action" and every opportunity should be taken to train them to inspect the bridges, maintain them to the extent expected on their sections in the normal course of daily duty, and immediately report any faults or unusual movements. Experience has shown that dangerous faults are most often discovered and reported by the local permanent way staff.

7. INSPECTION REPORTS

Every inspection report is examined in detail by Bridge Office staff and taken very seriously. It is expected that the district engineer will take a personal interest in the details of every inspection and report.

LVDW 0545G

APPENDIX

SOUTH AFRICAN TRANSPORT SERVICES

Chief Civil Engineer's Office
Johannesburg

Circular G5-6a
Reference W 19/37
Date 1986-07-16

INSPECTION OF BRIDGES, CULVERTS AND SHALLOW ASH PITS

1. This instruction is a revision of circular 50427 Chapter 7, Mining No. 31 of 18 July 1983 which was subsequently numbered G5-6 and cancels all previous circulars and directives on bridge and culvert inspection.
2. The District Engineer is responsible for the maintenance of the structural safety and condition of bridges and culverts including signal gantries over non-electrified lines and shallow ash pits.
3. A visual inspection of all the structures described above, and where necessary by hand tools, must be carried out annually, preferably before the onset of the local rainy season.
4. The district engineer may delegate the inspection of structures spanning less than 6 m jointly to the district supervisor and technical superintendent or their deputies, if he is satisfied that these officers are fully conversant with the inspection requirements set out herein.
5. The district engineer must inspect, or delegate the inspection to a competent engineering officer, all structures spanning 6 m or more and any structures spanning less than 6 m which have been reported as defective. The assistance of a technical superintendent (bridges) or technical supervisor (bridges) for the inspection of steel structures, especially truss bridges, should be considered by the district engineer.

6. A report in accordance with the notes set out in Appendix 1 and the format set out in Appendix 2 must be prepared, which must also indicate the remedial measures decided on by the district engineer. A copy of this inspection report must be submitted annually to the Chief Civil Engineer by the end of September.

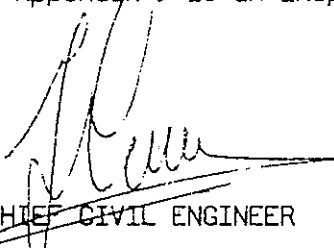
It is the responsibility of the district engineer to ensure that the remedial work decided upon is implemented.

7. At intervals, depending on the corrosive characteristics of the local climatic area but never more than 7 years, the district engineer must ensure that the following are opened up for a close inspection of concealed members to establish the extent of corrosion or other weaknesses :

- (i) The decks of all steel footbridges at selected critical points to examine girder flanges, floor members and bracings. (On electrified sections dead orders will be necessary).
- (ii) The trough floors of ballasted steel bridge decks to examine the upper surfaces of troughs, the connections between troughs and girders, and the girder flanges.

The determination of the frequency of these inspections, which should normally be carried out in conjunction with the painting programme, will be the responsibility of the regional engineer (civil). The services of the technical superintendent (bridges) or technical supervisor (bridges) are recommended for these inspections and for any remedial measures which may be necessary.

8. A proper record must be kept of all inspections, repairs and painting carried out in respect of each bridge.
9. Appendix 3 is an inspection guide for officers engaged on inspections.



for CHIEF CIVIL ENGINEER

Addressed : All Regional Managers, Works and Estates
Area Managers, Saldanha and Empangeni
All Resident Engineers, Construction
General Manager, Language Bureau, Johannesburg
All Regional Technical Liaison Officers
District Engineers, Maintenance
Chief Stores Superintendent, Material Inspection, Johannesburg
Chief Engineer (Signals and Telecommunication), Johannesburg
Chief Electrical Engineer, Johannesburg

Copies : All concerned Chief Civil Engineer's Office, Johannesburg

LVDW 0545G.

APPENDIX 1

METHOD OF REPORTING ON CONDITION OF STRUCTURES OVER OR
UNDER RUNNING LINES AS REVEALED BY ANNUAL INSPECTIONS

1. All bridges, culverts, shallow ash pits and other structures with openings greater than 700 mm must be listed as indicated on the attached specimen sheet.
2. Separate lists must be prepared for each section of line.
3. To assist in fixing the positions of structures, the station names must be interposed on the lists.
4. Descriptions must be brief but clear and to the point.
5. Positions of structures must be given to the nearest 0,02 km as indicated on the specimen sheet, and the span of each opening to the nearest 0,1 m.
6. Details of additional openings, as well as alterations to existing ones, must be recorded on the same sheets. Addition of such information is facilitated if the original list is prepared in double space typing.
7. Details of attention required, as determined during annual inspections, must be indicated in the "Remarks" column with symbols indicating the degree of urgency of the work. All structures that are in satisfactory condition should be referred to as "good".
8. One copy of the report with endorsements thereon must be forwarded to the Chief Civil Engineer's office each year as soon as possible after the inspections have been completed, but before the end of September each year.
9. Results of inspections of openings of 700 mm and under must be recorded separately, but need not be forwarded to the Chief Civil Engineer.

APPENDIX 2

SOUTH AFRICAN TRANSPORT SERVICES

BRIDGES, CULVERTS AND SHALLOW ASH PITS - ANNUAL INSPECTION

SECTION:

MONTH: YEAR:

1	1,23	1/2,8	Rail & Conc. Top	Good	
	2.20		<u>Elandskuil Station</u>		
2	3,16	2/4,5	Beam and Conc. Top	Rebuild south bearing sill	C
3	3,23	1/15	Up : P.G. Deck	North abutment bed plate skew. Adjust	
		1/15	Down : Prest. Conc. Deck	Good	D
4	4,10	1/6	Mas. Arch	Good	
5	4,17	1/9,5	R.C. Deck	South abut. cracked watch	A
		3/30,5	Through Steel	Paint steelwork	C
		1/9,5	R.C. Deck	Good	
	5,15		<u>Swartbult Station</u>		
6	5,27	1/0,9	R.C. Pipe	Clean out Repair endwall	D D

SYMBOLS DENOTING URGENCY OF WORK

"A" Minor repairs that can safely be left for an indefinite period.

"B" Repairs that can be safely left for 12 to 18 months.

"C" Repairs that should be carried out within 12 months.

"D" Repairs that are required without delay.

1. _____ 2. _____ Inspecting officers (culverts, i.e. up to 6 m span).

_____ Date.

_____ Inspecting engineering officer (bridges, i.e. 6 m span or longer)

_____ Date.

_____ District Engineer.

_____ Date.

INSPECTION GUIDE

The points listed below should be used as a guide by engineers and others engaged on bridge and culvert inspections. Items 1 to 19 deal with the track in relation to the bridge and items 20 to 52 with the bridge structure, the approaches and the opening. Where possible, the bridge should be watched during the passage of trains to detect any weaknesses.

The following equipment is essential for a thorough inspection :

- A tape.
- A camera.
- A ruler graduated in mm.
- A tape.
- A pair of binoculars.

A. STEEL BRIDGES AND OPEN TOP CULVERTS

WALK OVER THE SUPERSTRUCTURE AND LOOK FOR THE FOLLOWING :

1. Loose or missing bridge sleeper bolts.
2. Washers requiring replacement.
3. Incorrect fastening of bridge sleepers. (Fastening of sleepers to longitudinal members must be arranged in accordance with the Permanent Way Instructions).
4. Loose or missing coachscrews.
5. Sleeper plates requiring replacement by cast iron chairs. (See Permanent Way Instructions. Special cases must be referred to the Chief Civil Engineer).
6. Loose bridge sleeper packing plates. (Packing plates of scrap steel, tasonite or wood are not acceptable. Cases where permanent packing is required must be referred to the Chief Civil Engineer).
7. Bridge sleeper spacing too wide. (Standard spacing is 610 mm).
8. Bridge sleepers burnt out, screw-killed or severely cracked at ends.
9. Deterioration of running (longitudinal) timbers. (These should be replaced by transverse sleepers as soon as the timbers show serious signs of deterioration. Cases where this is necessary must be referred to the Chief Civil Engineer).
10. Inadequate protection of bridge sleepers by flat-iron or chequered cover plates. (Applicable on lines used by steam locomotives).
11. Plates forming sleeper protection or used on footwalks, not properly fastened down.

12. Bridge sleepers tapered to provide cant or checked out over flange plates and protruding rivets. (The bridge should be modified by fitting suitable steel packing plates or stools and countersinking rivets, where necessary, to allow the use of standard bridge sleepers. Cases where this is necessary must be referred to the Chief Civil Engineer).
13. Faulty vertical alignment of track due to large built-in bridge camber. (Refer to the Chief Civil Engineer).
14. Faulty running top on bridge and approaches, including slacks just off the bridge. (The thickness of bridge sleepers must not vary by more than 3 mm. Rail joints must be good and fishbolts tight).
15. Necessity to provide safety rails. (See Permanent Way Instructions).
16. Rail joints on or near bridges or culverts. (There must be no rail joints on spans of less than 7 m and rail joints must not be nearer than 3 m to a bridge bearing. A rail joint on the formation must be at least 3 m clear of a bridge or culvert).
17. Sleepers that should be behind the abutment wall but are bearing on the ballast wall. (See Permanent Way Instructions).
18. Distance between sleepers on either side of the ballast wall too great. (See Permanent Way Instructions).
19. Badly packed sleepers behind ballast walls. (See Permanent Way Instructions).
20. Inadequate formation width adjacent to abutments. (Wing walls must be added or raised where necessary).
21. Sills (girder beds), bearings and steelwork (bottom chords of trusses) covered with ash, ballast and dirt.
22. Loose or missing holding-down bolts.
23. Sliding and roller bearings corroded, frozen and not lubricated. (See Permanent Way Instructions).
24. Spalling of concrete in bearing sills and ballast walls.
25. Masonry bearing sills that are uneven, shaking or eroding. (If necessary, replace in concrete to drawing BE 8266/1).
26. Timber bearing sills. (These must be replaced in concrete - refer to the Chief Civil Engineer).
27. Corrosion of steelwork and necessity for repainting. In most cases painting should be limited to spot cleaning corroded areas, applying primer to those areas and one final overall coat for aesthetic reasons.
28. Faulty bridge drainage. (Water must not pool on bearing sills nor lie in troughs or bottom chords of trusses).

29. Severe corrosion in trough floors and/or adjacent supporting members. (If necessary, trough floors must be filled with concrete in accordance with drawings from the Chief Civil Engineer or completely replaced).
30. Excessive ballast on half-through plate girder spans causing overloading. Ballast depth under sleepers should not exceed the values for maximum Z on Annexure 7 of the Perway Instructions. If maximum Z is exceeded the track should be lowered or the bridge raised, and in the latter case the Chief Civil Engineer will provide the detailed drawings.
31. Track off centre on ballasted decks (on box and half-through plate girder spans), causing overloading of a main beam or a stringer beam. This condition occurs when the concrete deck is carried by the stringers and cross girders alone and the track is slewed off centre to accommodate a transition curve. The Chief Civil Engineer will provide detailed drawings to accommodate the raised track position, if structurally feasible.
32. Loose or missing rivets, especially at struts and bracing connections.
33. Cracks or breaks in steel members. Check particularly for cracks at or near riveted joints in trusses, and the top flanges of stringers under sleepers on all unballasted steel bridges.
34. Loose or sagged bracings.
35. Creep of the bridge spans.
36. Spreading of rails in rail girders.
37. Bridge handrails loose.
38. Timber footwalks badly secured or requiring repair. (Complete renewal of footwalks should be in steel in accordance with drawings from the Chief Civil Engineer).
39. Necessity to provide footwalk. (Generally, necessary when overall length of structure exceeds 6 m or when length is less than 6 m but height above streambed exceeds 2 m, and in all cases in or close to a station yard. When cost of providing footwalks is high, replacement of the steel bridge or open top culvert by concrete deck should be considered).
40. Damage caused by derailments, unfastened doors or displaced loads (usually serious in the case of truss spans).
41. Inadequate clearance. (Check if foul structure diagonal black and yellow stripes have been provided - refer Permanent Way Instructions).

EXAMINE THE BRIDGE/CULVERT FROM BELOW AND CHECK THE FOLLOWING :

42. Cracks as described in 33 which are not visible from above.
43. Corrosion of steelwork and necessity for painting (refer 27).
44. Faulty underdeck bracing and underside floor system, including tensioning faults in cases where turnbuckles are provided.

45. Any faults in sills which may not have been visible during inspection of the upper part of the bridge or culvert.
46. Weathering, cracking or shaking in masonry or concrete abutments, piers or wing walls.
47. Scouring of foundations. (Where piers are in water and there is any reason to suspect scour, probe for cavities around foundations).
48. Settled or cracked foundations.
49. Necessity for drop-inlets or anti-erosion cross-walls.
50. Scour or erosion of approach banks and necessity to provide protective work such as stone pitching or walls.
51. Trees, vegetation or other debris in watercourse which may form an obstruction to the flow of water.
52. Adequacy of bridge or culvert openings to pass floodwaters, as indicated by water marks or debris. Flood levels must be recorded.

B. REINFORCED CONCRETE BRIDGES & CULVERTS :

WALK OVER THE BRIDGE OR CULVERT AND CHECK THE FOLLOWING :

1. Deck drainage. (Keep formation water clear of bridge, and bridge water of the formation). Look for leaks in seals and waterstops in joints between and at the ends of spans. Bearing sills should be dry.
2. Foreign material in expansion joints which may prevent these from functioning correctly.
3. Surface crazing, cracking, spalling or encrustation of concrete, and exposed reinforcing steel, particularly in coastal areas. (Thin parapet members must be specially checked).
4. Corrosion of steel handrails, bearings, joint covers and other steel items and the necessity for repainting (refer A.27).
5. Necessity to add handrail. (Generally necessary when height exceeds 2 m above streambed and in all cases in or close to a station yard).
6. Vertical and horizontal alignment of track over decks and behind abutments.
7. Necessity to widen culvert top or extend opening to ensure efficient retention of ballast. Refer to Chief Civil Engineer for details of various methods which have been developed to do this economically.
8. Inadequate formation width adjacent to abutments. (Wing walls must be added or raised where necessary).

EXAMINE THE BRIDGE/CULVERT FROM BELOW AND CHECK THE FOLLOWING :

9. Overstrain, movement or other deterioration of elastic or patent bearings.

10. Check the deck drainage as in 1 above.
11. Dirt or debris on bearing sills.
12. Corrosion of exposed flanges in half-girder and concrete or rail and concrete decks.
13. Weathering, cracking and shaking in masonry or concrete arches.
14. Items A.45 to A.52.

C. PIPE CULVERTS

CHECK THE FOLLOWING :

1. Inadequate length. Refer to Chief Civil Engineer for details of various methods which have been developed to rectify this economically.
2. Sagging, distortion or cracking.
3. Weathering, cracking or shaking of masonry or concrete headwalls or wing walls.
4. Silting.
5. Inadequate approach or exit channel.
6. Scour.
7. Inadequate opening.

D. FOOTBRIDGES

CHECK THE FOLLOWING :

1. Horizontal alignment and any signs of sagging.
2. Buckling of panels, particularly at or near the joints.
3. Loose rivets and bolts.
4. Alignment of towers and trestles, and any movement or distortion of decks or stairways.
5. Slack or damaged bracing.
6. Corrosion, especially in underfloor members, and necessity for repainting.
7. Badly seated or displaced stairway treads or floor slabs.
8. Asphalt deck surface for wear, potholing, kicking out or thickness exceeding the design thickness.
9. Adequacy of deck drainage.

10. Openings in decks or sides where wires can be pushed through to make contact with live wires.
11. Settled or cracked foundations.

E. SHALLOW ASH PITS

CHECK THE FOLLOWING :

1. Cracks or excessive corrosion in running rails.
2. Cracked or excessively corroded pedestals,
3. Loose rail or pedestal fastenings.
4. Cracked floor, indicating foundation failure.
5. Condition of side and end walls.
6. Drainage.

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BRIDGE HANDBOOK

CHAPTER 11

BRIDGE AND CULVERT MAINTENANCE : REPAIRS,
STRENGTHENING AND IMPROVEMENTS

1. REPAIRS

1.1 Emergencies.

The most urgent work usually necessary on any bridge structure results from damage caused by derailments, abnormally large or loose loads, washaways or sabotage. Such incidents could either destroy the structure entirely, or leave it in an unserviceable condition.

1.1.1 Information required.

The Bridge Engineer must be notified immediately after local senior engineering staff have visited the site and assessed the situation.

The following information is required :

- (i) The section of line and km distance.
- (ii) The type of structure.
- (iii) A description of the damaged components and their relative positions within the structure.
- (iv) What operating arrangements have been made; whether a speed restriction has been applied or trains have been stopped.
- (v) What arrangements have already been effected to restore traffic.

The office and home telephone numbers of the Bridge Engineer and key members of his staff are known by each Regional/Area Engineer (Civil).

1.1.2 The Bridge Engineer will prescribe the interim and permanent repair methods and in extreme cases assume control of the project by agreement.

1.1.3 The following bridging material is held in stock specifically to deal with emergencies :

Secondhand Material

Steel bridge spans which could be used for span replacement or for temporary support systems, ranging in span lengths from 6 m up to 48 m, are available from the Bloemfontein and De Aar bridge yards. The designs vary from plate girder deck types for the shorter spans to truss through types for larger spans.

New Material

A versatile modular bridging system, adaptable for use as a bridge span with deck or through type configuration or as a trestle, is available to cater for situations where second hand material would be inadequate. Bridge spans of up to 85m long and trestles up to 45m high can be constructed. The ingenious use of interchangeable components and a few special members permits a choice of span lengths in increments of 0,625 m and trestle heights in increments of 2,5 m.

1.2 Corrosion.

1.2.1 The useful life of steel bridges can be successfully extended by replacing severely corroded members and/or protecting vulnerable areas with cover plates.

1.2.2 The deterioration of the condition of earlier reinforced concrete bridge decks in coastal areas is causing concern. The presence of sodium chloride, moisture and oxygen in relatively porous concrete initiates corrosion of the reinforcement. The expansion of the corroding metal causes spalling of the concrete leaving the reinforcement exposed, resulting in accelerated corrosion.

There are a number of proprietary compounds available to restore the spalled concrete and offer a measure of protection. However, once the concrete mass contains chlorides in sufficient quantity, a protective external cover on the reinforcement has a limited life and is of doubtful value.

Some bridges have been rescued in the short term by reinstating spalled concrete with epoxy mortar or sprayed concrete. Subsequent cracks were filled with a polysulphide sealer to extend the life of the repair.

1.2.3 Cathodic Protection.

Cathodic protection has been successfully applied to pipelines and sheetpiling and has been used in countries where bridges are adversely affected by de-icing salts. The concept is not new but previous attempts to apply the method to bridges were not very practical and of doubtful economic value. A conductive polymer anode has recently been developed and successfully used in the USA and Europe. The modern cathodic protection method for reinforced concrete consists of a small electric current passing through the structure, using the reinforcement as a cathode, with the patented polymer anode on the outside of the concrete. The imposed current causes the reinforcing steel to become cathodic, reverses the corrosion process and reduces the chloride content of the adjacent concrete by releasing chlorine gas. This protection method relies however, on an acceptably low resistance to the cathodic current flowing through the reinforcing steel network. Where this resistance is high cathodic protection is not practical.

1.2.4 The Bridge Office endeavours to follow the latest developments and should be consulted in all cases.

2. STRENGTHENING

Early railway bridges were designed to loading standards based on the relatively light axle loads of the locomotives and rolling stock of the day. Due to the ever increasing need for higher axle loading to cope with modern traffic demands there is an ongoing process of upgrading of existing bridges and culverts. Strengthening of steel bridges is achieved by either the addition of extra material to weak components or complete replacement using new or secondhand steelwork. Concrete structures are generally built to meet the higher loading standard.

One of the functions of the Bridge Office is to assess and record the carrying capacity of all bridge structures in order to determine the maximum axle loading which may be permitted. All requests for the use of heavier axle loads are directed through the General Manager's operating department to the Chief Civil Engineers' department for authorisation.

3. IMPROVEMENTS

- 3.1 With the advent of mechanical track maintenance, open top steel bridges and culverts have fallen into disfavour. Interruptions to the tamping process and the need for extra labour to tamp the approaches to open top structures incurs additional expenditure. For this reason there is an economic justification for the replacement of open tops, where the total length of the bridge is less than 15m, with ballasted top structures on main lines and more important branch lines. It is too expensive to replace spans on bridges longer than 15m on these grounds only.
- 3.2 Due to the increased formation widths required to accommodate higher standards for ballasted track, many of the ballasted top bridges and culverts are too narrow to contain the ballast. Consequently widening of decks, using various techniques to ensure the safety of the track, becomes necessary.
- 3.3 The difficulties in obtaining hardwood sleepers from neighbouring states for use on steel bridges necessitated the introduction of laminated softwood timber. In order to use the standard sizes, and obviate the need for notching and tapering, improvements to the seating for these sleepers are often necessary to accommodate curved track and to adjust levels.
- 3.4 Painting of steel bridges and culverts is necessary to prevent or retard corrosion and for aesthetic reasons. In view of the very high cost of complete paint systems, discretion should be exercised to avoid unnecessary expenditure. Removal of sound paint during the cleaning process should be avoided and spot cleaning and painting of areas particularly prone to corrosion should be adequate. Decorative painting is necessary for structures in the public eye, but a light paint system may be all that is necessary for this purpose. Paint systems are comprehensively described in specification S310.
- 3.5 The Bridge Office offers a service which includes inspection of all aspects related to bridges and culverts, and assistance for the preparation of schemes and drawings for bridge and culvert improvements.

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BRIDGE MANUAL

CHAPTER 12

ABNORMAL LOADS

1. ROUTE CLEARANCE

- 1.1 The Bridge Office holds records of actual clearances between the track centreline and objects which are foul of the minimum permitted clearances as laid down in Annexures 1 to 4 of the Permanent Way Instructions.
- 1.2 When a load which exceeds the requirements of Clause 229 of the Official Goods Tariff Book and is therefore classified as abnormal, (i.e. it will exceed the width or height of a maxi truck or cause the line axle load to be exceeded when placed on any SATS truck - see Chapter 2 hereof) the dimensions and mass of the load are forwarded to the General Manager (Operating Section) who determines from the Chief Mechanical Engineer and the Bridge Office whether the load can be accepted for the route chosen, together with the conditions of conveyance.
- 1.3 In order to clear the abnormal load through the route the calculation carried out by the Bridge Office requires the following parameters :
 - (i) The bogie centres and length of the truck.
 - (ii) The floor height of the truck.
 - (iii) The profile of the load, laterally and longitudinally, including allowance for lashing chains and packing material.
 - (iv) The clearances to foul structures on the route.
 - (v) The track radius and cant at each fouling point.
- 1.4 The railway track is not fixed and is often changed in position or its cant altered during maintenance operations. It is clear from the above that any change in the track position or cant at a fouling point will affect the safe clearance margin and be a determining factor in whether an abnormal load can be safely conveyed or not. For this reason the revised clearances to the fouling point must be given to the Bridge Office without delay. (A change in cant of 2 mm can reduce clearance to the top corner of the vehicle by 80 mm).

2. ACCEPTANCE OF ABNORMAL LOADS

- 2.1 A substantial number of abnormal loads have been recently regained from road haulage as a result of a revision of the conditions of acceptance and conveyance, and of the tariff structure both of which have been incorporated into the Official Goods Tariff Book, together with the use of a computer programme controlled by the Bridge Office. This latter programme is operated on a main frame computer and all route clearance data is held thereon.

By the above means customer confidence has to a large extent been restored.

- 2.2 A further programme is available which allows the local accepting office to determine, by means of an IBM P.C. or compatible, and within a few minutes, whether an abnormal load can be accepted or not. This programme is expected to reduce the acceptance period for 80% of abnormal loads from 4 days to a few minutes, further improve customer confidence and thus generate more traffic.

This programme increases the dependence of the Bridge Office on accurate information, and in turn makes it even more incumbent on Regional Engineers (Civil) to update the clearance information regularly and keep the Bridge Office informed.

3. CLEARANCE MEASUREMENT

- 3.1 Clearance measurement on SATS has thus far been confined to hand measurement, with the assistance of locally designed frames attached to motor trolleys. This method is slow, cumbersome and expensive and thus can only be carried out at long term intervals. As the track position and cant is not fixed, a measure of doubt exists regarding its actual position and cant during the periods between clearance measurements. In determining whether an abnormal load can be conveyed or not the Bridge Office is conservative in its calculations and allows a generous clearance margin to compensate for the doubtful position of the track and its cant.
- 3.2 Reduced clearance margins can be used for the determination of the conveyability of abnormal loads if regular clearance measurements could be done at shorter intervals, using an automatic clearance measuring vehicle.

Unfortunately the development of automatic clearance measuring systems is in its infancy. Systems using lasers or light beams combined with video computer or photographic recording have been investigated but at present are either too slow, too expensive and of doubtful accuracy, but development is proceeding in various parts of the world and will be monitored.

It is essential to continue to explore the various means whereby the SATS share of the profitable abnormal load market can be raised.



SOUTH AFRICAN TRANSPORT SERVICES

BRIDGE CODE

1983

HC 15/11/82 (Card Set No. 130/82)

(i)

AMENDMENTS

PAGE

DATE

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PART I : PROCEDURES, DRAWINGS AND DESIGN REQUIREMENTS

1. GENERAL.

- 1.1 This code covers the requirements of the South African Transport Services for the design and construction of railway bridges, road bridges, footbridges, service bridges and culverts. It supersedes the South African Railways "Code of Procedure for the Design and Construction of Road over Rail and Rail over Road Bridges (revised March 1971)" and consists of the following :
PART I : PROCEDURES, DRAWINGS AND DESIGN REQUIREMENTS
PART II : SPECIFICATION FOR LOADS
- 1.2 The design requirements are based on the principles of limit state design as detailed in TMH 7 : CODE OF PRACTICE FOR THE DESIGN OF HIGHWAY BRIDGES AND CULVERTS IN SOUTH AFRICA.
- 1.3 Codes and specifications referred to herein are listed at the end of Part I. The latest revisions are applicable.
- 1.4 The application and interpretation of this code must be entrusted only to appropriately qualified and experienced professional engineers and construction must be carried out under the direction of appropriately qualified supervisors.

2. DEFINITIONS

The following definitions apply :

Bridge	A structure with clear span lengths greater than 6 m measured square to the supports.
Culvert	A structure with clear span lengths of 6 m or less measured square to the supports.
Railway bridge	A bridge designed to carry rail loading
Road bridge	A bridge designed to carry road loading
Flyover	A rail over rail bridge
Footbridge	A bridge designed to carry pedestrians
Agricultural overpass	A bridge designed to provide access for farm implements over a railway line
Agricultural underpass	A culvert designed to provide access for farm implements under a railway line.

3. APPROVAL OF CONSULTANTS AND CONTRACTORS

Consultants or contractors appointed to design rail carrying structures must be experienced in this work and must be approved by the Chief Civil Engineer of the Transport Services.

4. PRELIMINARY INVESTIGATION

- 4.1 When bridge structures on the property of the Transport Services are contemplated, the latter's requirements must be ascertained from the System Manager or the Resident Engineer, Construction, concerned. Preliminary proposals must be examined on site with the System Civil Engineer or Resident Engineer, together with the System Electrical Engineer and the System Engineer (Signals and Telecommunications), or their representatives, and the representative of the road authority in order to -
- (i) select a suitable site for the bridge structure;
 - (ii) ensure that the requirements of the Transport Services, the road authority and other interested parties are included in the final scheme.
- 4.2 Consideration must be given to the provision of possible additional tracks, based on requirements for the next 20 years. The System Manager or the Resident Engineer will liaise with the Works Section and the Planning Section of the General Manager's Office before any preliminary plans are prepared, to determine the anticipated date when additional tracks or any other long term development proposals will be required. The designer must consider the cost of providing for future requirements and prepare an economic appraisal of the design alternatives.
- 4.3 When comparing the cost of providing for future requirements immediately or at a later date the uninflated cost of later additions, including associated costs such as establishment charges, deviations etc., should be discounted at a rate of 6 % per annum. Where it is clearly economical to provide for future requirements at the later date the structure should be detailed to facilitate, as far as practicable, such future additions. Details should be discussed with the Transport Services' representatives.
- 4.4 Where the forecast indicates that additional tracks will be required more than 20 years ahead, no provision other than the following should be made for these tracks :
- (i) Jack spans.
 - (ii) Grading of the road approaches to accommodate the additional opening in the absence of jack spans.
- 4.5 No provision for additional tracks must be made when it is unlikely that such tracks will follow the same alignment.
- 4.6 When an additional opening under a rail carrying structure is required by the road authority the designer must prepare his economic appraisal based on a forecast by the road authority. The decision regarding the extent of provision for the future must be taken in consultation with the System Manager or Resident Engineer and the road authority, taking all factors into account including the availability of funds.

- 4.7 The economic appraisal must be submitted together with the site plan when the latter is submitted for approval. Refer also to 8.2.
- 4.8 When necessary or advisable, provision must be made for an additional or enlarged opening under the road bridge or a road lane on the side of a railway bridge to accommodate maintenance vehicles which normally operate within the railway right of way. In the case of limited access roads, this provision is usually essential. Refer to 17.4.2 and 18.2.
- 4.9 Due consideration must also be given, inter alia, to the following :
- (i) The need for separate facilities for livestock.
 - (ii) Electrification and signalling requirements and the consequent need to increase horizontal and vertical clearances.
 - (iii) Possible re-alignment and/or regrading of railway lines.
 - (iv) The use of jack spans instead of wing or return walls (See 16.2).
 - (v) The number and size of ducts required in the bridge deck to accommodate services.
 - (vi) Electric lighting.
 - (vii) Method of construction.
 - (viii) Precautions and clearances to be maintained during construction and compliance with the Transport Services' safety instructions governing high voltage electrical equipment.
 - (ix) Possibility of slewing or deviating the track temporarily during construction or deviating the track permanently over or through the structure after construction.
 - (x) Allocation of responsibilities during construction, and supervision of the works.
- 4.10 Account must be taken of the desired resistance rating for the structure in terms of report B2 : RECOMMENDATIONS ON THE DESIGN, CONSTRUCTION, STRENGTHENING AND REPAIR OF BRIDGES, published by the National Transport Commission, Land Transport Directorate. This rating must be established in consultation with the Chief Civil Engineer and when applicable with the national or provincial road authority.
- 4.11 The general layout of the proposed bridge may, if considered necessary, be discussed with the Chief Civil Engineer's bridge office with a view to ascertaining its acceptability.

5. DESIGN RESPONSIBILITY

Approval of drawings does not indicate acceptance of any responsibility for the safety or adequacy of a bridge structure. Examination of drawings by the Transport Services is confined to checking that -

- (i) the lateral and vertical clearances are adequate;
- (ii) the structure is of suitable general design, is not likely to affect the safety of the track, and is likely to require little maintenance;
- (iii) the parapets are acceptable with regard to general size and design;
- (vi) suitable provision has been made for attachment of overhead electrical equipment;
- (v) the construction methods and clearances during construction are acceptable.

6. CONSTRUCTION AND MAINTENANCE AGREEMENT

An agreement covering the erection and future maintenance of structures and approaches on the property of, but not fully owned by the Transport Services, must be concluded before construction commences. Permission to start physical construction will be given only after this agreement has been concluded and, in cases where the Transport Services is financially involved, only after formal financial sanction has been issued. Refer also to 22.

7. DRAWINGS : GENERAL REQUIREMENTS

7.1 Drawing standards

To ensure adequate reproduction from microfilms, drawings must comply with SABS 0111 and have -

- (i) characters which must remain legible and unambiguous in the form of reduced copy or as an image on a microfilm viewing instrument and which must therefore be of uniform height and thickness; be black and of consistent density compatible with the line work; be of open form and devoid of serifs and other embellishments;
- (ii) a print reduction scale, 150 mm long and marked off in units of 10 mm;
- (iii) a camera alignment mark in the border at the midpoint lines of the drawing, in the form of an arrow or a thick line 25 mm long, i.e. the width of the border.

7.2 Standard drawing symbols

The standard drawing symbols shown in SABS 0111 and in the E13 Specification for Engineering Survey Work must be used to indicate details on the drawings.

7.3 Standard drawing sizes

All drawings, including bending schedules, must conform to size AO (841 mm x 1189 mm) with a margin of 25 mm in accordance with SABS 0111.

7.4 Title block

The following must be shown in the title block :

- (i) Section of railway line, e.g. "Queenstown - Blaney".
- (ii) Kilometrage of the bridge at the point of intersection.
- (iii) Names of stations, streets, rivers, roads and/or farm names and numbers where relevant.
- (iv) Bridge and drawing numbers and other information required by the road authority.

7.5 Space for signatures

An area of 150 mm wide by 200 mm high must be provided on the site plan and an area of 100 mm x 100 mm on the general arrangement drawing for the signatures of Transport Services officials whose approval of the drawings is required. This area should be reserved immediately above the title block.

7.6 Amendments

When a drawing is amended it must be distinguished by an amendment number. The date and nature of the amendment must be noted on the drawing.

7.7 Expiry of approval

Approval of all drawings will lapse if construction of a bridge has not been commenced within 5 years of the date of approval of the site plan.

8. SITE PLAN

8.1 Content

A typical site plan is illustrated in Annexure 11 sheets 1 and 2. The following must be included :

(a) A key plan showing -

- (i) the north point;
- (ii) cadastral data;
- (iii) roads with their numbers, names and destinations;
- (iv) railways with their destinations.

(b) A contoured locality plan showing -

- (i) survey data listed in Annexure 10, including the position, description and level of a permanent bench mark near the structure;
- (ii) contours;
- (iii) cadastral data, including road, rail and other service reserves;
- (iv) roads and railways (present and future) and their destinations;
- (v) road numbers or street names;
- (vi) access roads;

- (vii) drainage, road and rail;
- (viii) the full extent of all the works covered by the Agreement and, in the case of shared cost works, the limits applicable to the works to be shared;
- (ix) details of temporary or permanent rail and road deviations, using additional sheets if necessary.

(c) A longitudinal section of track showing -

- (i) rail levels;
- (ii) grades;
- (iii) beginnings and ends of vertical curves;
- (iv) beginnings and ends of horizontal curves and transitions;
- (v) points of intersection of straights;
- (vi) horizontal and vertical curve data;
- (vii) original ground line.

(d) A longitudinal section of road showing -

- (i) grades;
- (ii) beginnings and ends of horizontal and vertical curves;
- (iii) horizontal and vertical curve data;
- (iv) superelevation data;
- (v) points of intersection of straights;
- (vi) points of intersection of cross roads;
- (vii) original ground line.

(e) An elevation of the structure showing -

- (i) type of structure;
- (ii) track centres;
- (iii) provision for future tracks;
- (iv) rail levels;
- (v) soffit levels of decks;
- (vi) lateral and vertical clearances at tie points ;
- (vii) horizontal clearances between foundations and centre line of track, and depths of top of foundations below rail level when tracks are adjacent to abutments and piers;
- (viii) table drains.

(f) A plan of the structure showing -

- (i) angle of intersection;
- (ii) present and future track centres;
- (iii) road and rail curvature;
- (iv) lateral clearances at tie points;
- (v) wing wall layout ;
- (vi) the positions of lateral and vertical tie points ;
- (vii) the north point ;
- (viii) road and rail destinations;
- (ix) test hole positions.

(g) A diagrammatic section through the bridge deck showing -

- (i) leading dimensions with minimum details (in the case of rail carrying decks refer to Fig. 2);
- (ii) road shoulder and sidewalk widths;
- (iii) parapet and kerb heights;

- / -
- (iv) superelevation and/or camber;
 - (v) service ducts.

(h) A typical section through the approach road embankment showing -

- (i) superelevation and/or camber;
- (ii) widths of road lanes and shoulders;
- (iii) positions of guard rails;
- (iv) positions of longitudinal drains or mounds;
- (v) thickness and description of road foundation and surfacing layers;
- (vi) embankment slopes.

(j) Foundation test hole data showing -

- (i) nature of material;
- (ii) depth of strata;
- (iii) recommended founding level;
- (iv) allowable nett bearing pressure;
- (v) ground levels at each test hole position;
- (vi) position of the water table after 24 hours and available data on inflow;
- (vii) S.P.T. results;
- (viii) any other information pertinent to the foundation conditions on the site.

In cases where foundation conditions are complicated, a separate sheet may be necessary.

(k) An endorsement by the System Electrical Engineer or his deputy indicating -

- (i) the voltage and method of tensioning of existing or future overhead electrical equipment for which provision for attachment to the bridge deck might have to be made;
- (ii) in the case of auto tensioning, whether booster return conductors and/or feeder conductors are required;
- (iii) the maximum permissible spacing of electrification masts on rail carrying structures, if required.

No details of bolt groups must be shown.

(l) An endorsement indicating what future tracks are required and date required.

8.2 Design by the Transport Services

- 8.2.1 In cases where the design of the bridge is to be carried out by the bridge office of the Chief Civil Engineer, a sepia of a preliminary site plan including only the following information must be submitted direct to the Chief Civil Engineer for the attention of the bridge office :

- (i) Relevant basic information from (a) to (g) of 8.1 for the determination of the outline of the structure.
- (ii) Trial pit information, and/or anticipated founding conditions based on local knowledge.

8.2.2 The bridge office will arrange for the foundation investigation, amend the geometric layout of the bridge structure, if necessary, and return the amended sepia together with the foundation recommendation and profiles to enable the site plan to be completed. The economic appraisal described in 4 will in this case be carried out by the bridge office.

8.3 Extension to an existing bridge

The site plan for the extension to an existing bridge may be simplified by the omission of requirements in 8.1 which are not relevant, but essential information such as vertical and horizontal clearances, land boundaries, drainage proposals, foundation information and a cross section of the proposed deck must be shown. The original site plan and that of the bridge extension taken together must provide a complete picture and include all the information required under 8.1.

8.4 Combined drawings

The site plan and general arrangement drawing must not be combined as this results in unnecessary delay in approval and in the erroneous assumption that site plan approval includes approval of the general arrangement drawing.

8.5 Submission of site plans

Six prints of the site plan, signed by the road authority and/or other parties involved, must be submitted to the relevant System Manager or Resident Engineer, Construction, for approval locally and by the General Manager.

The prints must be folded to the shape and dimensions shown in Fig. 1.

8.6 Site plans forming annexures to agreements

A duplicate of the approved site plan forms an annexure to any maintenance agreement required (see 6). Where the parties have agreed to share costs, prints must be coloured to indicate the apportionment of costs as follows :

Red : the extent of the shared cost works.

Blue : work paid for solely by the Transport Services.

Brown : work paid for solely by the road authority or other party involved.

Green : future proposals.

Yellow : demolitions.

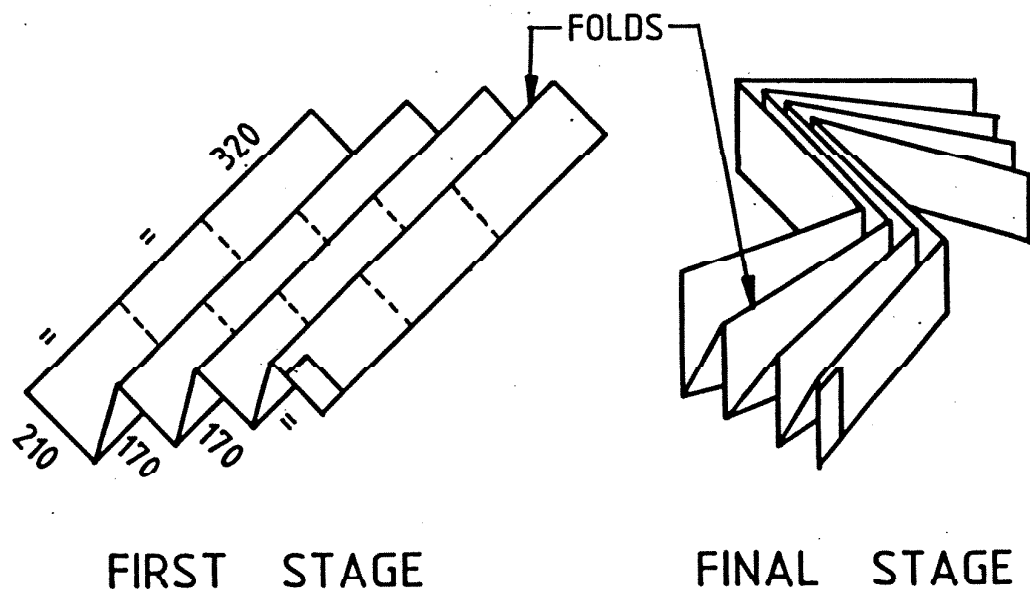
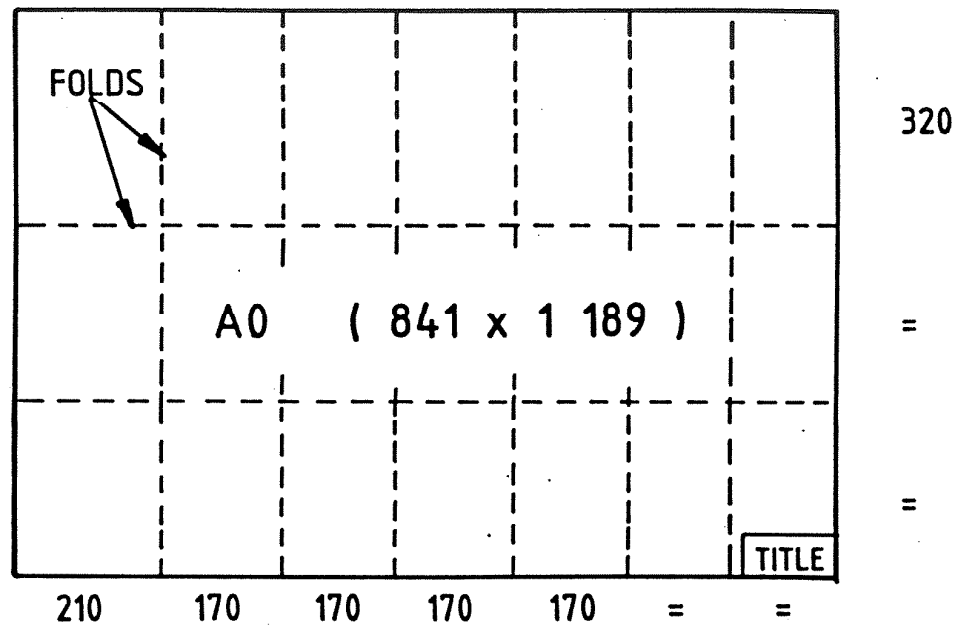


Fig. 1 FOLDING OF SITE PLANS AND
GENERAL ARRANGEMENT DRAWINGS

9. GENERAL ARRANGEMENT DRAWING

9.1 Commencement

The general arrangement drawing should not be prepared until the site plan has been approved by the Transport Services.

9.2 Content

This drawing must show the following :

- (i) Plan, elevation and cross section through the structure, showing an outline of the design with leading dimensions.
- (ii) Horizontal and vertical clearances at tie points.
- (iii) Type of foundations to be constructed and nett loading intensity.
- (iv) Method of construction of deep or piled foundations where located close to existing tracks.
- (v) Maximum length of excavation for shallow foundations to ensure compliance with 15.2.
- (vi) Details of provisions to be made to attach overhead electrification equipment to deck soffits and sides, in the format shown in Annexures 6 to 8, including bolt size and spacing and stainless steel specification. Fittings must be shown for both present and future tracks.
- (vii) An endorsement indicating the voltage and method of tensioning to which (vi) applies.
- (viii) Positions of holding down bolts for electrification masts in accordance with Annexure 9 and information given in terms of 8.1 (k) (iii).
- (ix) Details of the loading for which the bridge will be designed, including the loading on the parapets and impact loading on the piers.
- (x) A space for a list of numbers and titles of all working drawings. On completion of the working drawings this list must be added.

9.3 Submission

Three prints of the general arrangement drawing, signed by the road authority and/or other parties involved, must be submitted to the relevant System Manager or Resident Engineer, Construction, for approval by or on behalf of this officer, the Electrical Engineer concerned and the Chief Civil Engineer. Prints must be folded as shown in Fig. 1.

10. WORKING DRAWINGS

10.1 Commencement

The detailed design and the balance of the working drawings should not be prepared until the site plan and the general arrangement drawing have been approved by the Transport Services.

10.2 Content

10.2.1 The following must be included on the working drawings :

- (i) Concrete strength and aggregate size.
- (ii) Concrete cover to reinforcement nearest to concrete faces.
- (iii) Bearing design requirements.

10.2.2 For rubber or neoprene bearing pads, drawings should also indicate, inter alia -

- (i) a brief specification of the pads;
- (ii) the maximum compressive stress;
- (iii) the maximum compressive strain;
- (iv) the maximum shear strain.

10.2.3 For mechanical or metallic bearings, drawings should indicate, inter alia -

- (i) the relevant combinations of vertical and horizontal loads;
- (ii) the rotational and translational requirements and preset where required;
- (iii) the method of attachment including the mandatory provision of adaptor plates;
- (iv) the positions at which jacks are to be placed for replacement of bearings.

10.3 Submission

10.3.1 One set of prints of the working drawings, endorsed to the effect that they have been checked, and signed by the designer and by the road authority, where applicable, must be submitted to the Chief Civil Engineer for approval. Prints must not be folded but forwarded in a roll. A copy of the covering letter must be sent to the relevant System Manager or Resident Engineer, Construction.

10.3.2 In the case of railway bridges, fully detailed calculations must be submitted with the working drawings, when requested.

11. AS BUILT DRAWINGS

Working drawings must be amended to show details of the foundations as constructed and alterations, if any, made to

the structure during construction, so as to represent an accurate record of the structure as completed. As soon as possible after the completion of the structure(s), three complete sets of original silver microfilms of the "as built" drawings to specification CCE 9/84 must be forwarded to the System Manager or Resident Engineer, Construction, concerned.

12. HORIZONTAL CLEARANCES

- 12.1 New electrification masts and other masts must be clear of the structure gauge shown in full lines in Annexure 1, except in certain cases where, with the approval of the Chief Civil Engineer, the structure gauge shown in dashed lines may be applied.
- 12.2 The horizontal distance of new structures other than masts from the track centre line must be not less than -
- (i) 3 000 mm, or ✓
 - (ii) the clearance listed in Annexure 1, whichever is the greater.
- 12.3 Clearances as in 12.2 also apply to extensions of existing structures where such extensions exceed 4 m in length, measured along the track.
- 12.4 The clearances referred to in 12.2 must be increased to 3 300 mm -
- (i) where required for adequate visibility of drivers;
 - (ii) where table drains occur;
 - (iii) where required in station yards;
 - (iv) where 50 kV electrification applies.
- 12.5 Greater clearances may be necessary to facilitate the construction of deep or piled foundations or to accommodate services. A temporary track deviation should be considered when insufficient space is available to work at a safe distance from the track.
- 12.6 The top of any wall or platform in the vicinity of a bridge crossing 3 kV fixed or spring tensioned electrified track must, in addition to the requirements of 12.2, 12.3 and 12.4, also conform to the minimum requirements shown in Annexure 5. In the case of 3 kV and 25 kV auto tensioning, clearances to tops of walls within a horizontal distance of 5 m of the centre line of an existing or possible future railway line must be referred to the Chief Civil Engineer.
- 12.7 Should the horizontal clearances in 12.2 and 12.3 cause excessive cost, the clearance applicable to masts in terms of 12.1 may be applied provided written approval is obtained from the Chief Civil Engineer. Clearances given in Annexure 5 and referred to in 12.6 cannot be reduced.
- 12.8 The toe of an embankment adjacent to the track must be at least 3 300 mm from track centre line at the formation level defined in 13.5.
- 12.9 Positioning of shallow foundations must take account of 15.2.

13. VERTICAL CLEARANCES

- 13.1 Vertical clearance below new structures over electrified lines or lines which could be electrified later must be not less than the appropriate value of V in Annexure 2, enhanced by 150 mm to allow for future lifting of tracks. The increase of 150 mm may be waived with the prior written approval of the Chief Civil Engineer if future lifting is not practicable or when excessive additional cost is involved.
- 13.2 Vertical clearance below new structures over lines or portions of lines which can never be electrified must be not less than the value of S in Annexure 2, enhanced by 150 mm to allow for future lifting of tracks unless future lifting is not possible.
- 13.3 The enhancement of 150 mm referred to in 13.1 and 13.2 must be increased, as appropriate, if there is any likely change to rail, sleeper or ballast standards, or any likely change in gradient.
- 13.4 Vertical clearances to the top of a wall or platform must conform to the minimum requirements shown in Annexure 5.
- 13.5 Formation level may be taken as 700 mm below rail level.
- 13.6 A minimum of 1 000 mm must be allowed between rail level and the top of a foundation, for drains or services below formation level. This dimension must be increased where future lowering of the track is envisaged.

14. CLEARANCES ON NARROW GAUGE TRACK

Clearances referred to in 12 and 13 also apply to new structures adjacent to or over 610 mm gauge track unless it is clear that the improved standard will result in unjustifiable additional expenditure. If in doubt, written instruction should be obtained from the Chief Civil Engineer.

15. TEMPORARY CONSTRUCTION CLEARANCES

15.1 Clearances above rail level

In the case of 1 065 mm gauge track, any shuttering, prop or other temporary structure must be clear of the structure gauge indicated by dashed lines in Annexures 1 and 2 and of the full lines where no dashed lines are shown, i.e. at platform level and below. In addition, in the case of electrified track, structures must be clear of the full line given by dimension V in Annexure 2 or such other vertical clearance that may be stipulated by the System Electrical Engineer or his deputy. In the case of 610 mm gauge track, the clearances shown in Annexure 3 apply.

15.2 Clearances below rail level

Any construction operation, including shoring, below rail level must be such that all track-supporting material within 1 500 mm of the track centre line, measured horizontally, is left undisturbed.

16. DESIGN : GENERAL REQUIREMENTS

16.1 Bridge resistance

The design must be carried out taking into account the recommendations of the National Transport Commission's report B2. Cases where this would result in unpractical or uneconomical structures must be referred to the Chief Civil Engineer.

16.2 Jack spans

In the case of bridges over railway tracks, the provision of jack spans instead of wing or return walls is preferred, particularly at or near stations, as these improve visibility and may permit future addition of tracks or roads at relatively low cost. Consideration should be given to providing adequate horizontal and vertical clearances and suitable abutment configurations to permit the use of jack spans for such future additions. Cases where the provision of jack spans would be uneconomical must be referred to the Chief Civil Engineer. In the case of bridges on narrow gauge lines it will seldom be necessary to allow for future doubling if jack spans are provided.

16.3 Concrete cover

Minimum concrete cover to any reinforcement must be in accordance with Table 1 for severe and very severe exposure conditions as defined in SABS 0100, Part II.

TABLE 1 CONCRETE COVER TO REINFORCEMENT

EXPOSURE CONDITION	STRUCTURAL ELEMENT	COVER mm			
		25 MPa	30 MPa	40 MPa	50 MPa
Severe	Inside faces of factory made culvert elements.	-	-	30	30
	Precast pretensioned concrete beams, except soffits	-	-	30	30
	Concrete protected by permanent shutters which will not weather or corrode	30	30	30	30
	In situ concrete in contact with stone ballast	55	50	50	45
	All other concrete not listed above	50	40	40	35
Very severe	Any structural element	-	-	60	50

16.4 Abutments

16.4.1 Abutments must be so designed that each abutment can resist the full applied earth pressure without reliance on -

- (i) any propping effect of the superstructure, in the case of cantilever abutments;
- (ii) the presence of fill behind the opposite abutment of a framed structure over a waterway, bearing in mind the risk of removal of the fill on one side of the structure during a serious washaway.

Due to vibration created by train loading, no reliance may be placed on earth friction on the back of an abutment wall.

16.4.2 Permanent studs must be cast into abutments adjacent to tracks to indicate the designed rail level under the bridge.

16.5 Piers

16.5.1 Piers must have wall thicknesses not less than 600 mm. In the case of tall hollow supports this will only apply from 1 m below up to 4 m above ground, formation or water level.

16.5.2 In order to comply with the recommendations of report B2, wall-type piers are preferred, particularly in the case of supports between tracks where standard track centres often demand slender supports to maintain the desired lateral clearances. In the case of very wide bridges, 1 m wide gaps must be provided in the piers at approximately 6 m intervals.

16.5.3 Studs must be provided in piers adjacent to tracks as described for abutments in 16.4.2.

16.6 Bearing sills

Bearing sills must be dimensioned to give a minimum clear distance of 90 mm from edge of bearing to the vertical face of the sill. Suitable recesses or sufficiently large gaps must be provided between the sill and deck soffit to accommodate jacks for adjustment or replacement of bearings. These recesses or gaps must be protected from easy access by means of bolted steel plates or plastered brickwork. Adequate bursting reinforcement must be provided to prevent cracking or spalling of a sill under jack or bearing loads.

16.7 Rubber bearings

The design of rubber bearings must be in accordance with Technical Memorandum (Bridges) No. BE 1/76 or UIC code 772 R, subject to the average compressive stress not exceeding 10 MPa and the compressive strain not exceeding 10 %. For designs in accordance with UIC code 772 R the pressures required to satisfy the stipulated no-slip conditions may be multiplied by a reduction factor equal to $(\tan \gamma)/0,7$. In the case of railway bridges, superstructures supported on rubber bearings must be adequately restrained against excessive horizontal movements.

16.8 Decks

16.8.1 A cast-in-situ concrete deck over electrified lines should be avoided, even if vertical clearance in excess of the minimum is available, in view of the difficulty of installing the necessary falsework and formwork. A deck consisting of precast concrete beams and permanent shutter elements supporting cast in situ concrete often provides the cheapest solution. This construction should, however, not be repeated for spans clear of the tracks unless more economical.

16.8.2 Decks must be dimensioned to give a minimum clear distance of 90 mm from edge of bearing to the vertical face of the deck.

16.9 Deck deflections

Vertical deflections due to the application of live loading, including impact, must not exceed the following :

Rail bridges : 1 mm per metre of span.

Road bridges : 1,25 mm per metre of span.

17. DESIGN : RAILWAY BRIDGES

17.1 General

Railway bridges must be designed in accordance with TMH 7 : CODE OF PRACTICE FOR THE DESIGN OF HIGHWAY BRIDGES AND CULVERTS IN SOUTH AFRICA and the additional requirements specified herein. Railway loading is specified in Part 2.

17.2 Serviceability limit states

17.2.1 Reinforced concrete

Design crack widths must not exceed 0,20 mm . Where very severe exposure conditions exist, as defined in SABS 0100, Part II, design crack widths must not exceed 0,10 mm.

17.2.2 Prestressed concrete

Under design loads appropriate to the serviceability limit state, no tensile stress in the direction of prestressing is permitted in prestressed concrete structures or elements (Class 1 structures in terms of TMH 7).

17.3 Hydrological requirements

17.3.1 Design flood

17.3.1.1 Bridge openings must normally allow for the following design floods :

- (i) For catchment areas of 100 km² or greater the design flood must be 60 % of the maximum flood as calculated according to Report No. TR 105 published by the Department of Water Affairs.

- (ii) For catchment areas of less than 100 km^2 but more than 1 km^2 the design flood must be 50 % of the maximum flood as calculated according to Report No. TR 105. The dashed portions of the graphs shown in Figures 6a to 6e of the report may be used to calculate the design flood where applicable.
- (iii) For catchment areas smaller than 1 km^2 the design flood must be calculated according to Technical Report No. TR 102, published by the Department of Water Affairs, taking 50 years as the flood return period.

17.3.1.2 While 60 % and 50 % of the maximum flood from TR 105 cannot be associated with a fixed return period, there are strong indications that in most cases these floods will be equivalent or higher than the realistic 1 in 100 or 1 in 50 year floods respectively. This is especially valid in the drier parts of the Republic, but in the wetter Region 1 somewhat shorter than 100 and 50 year return periods can be expected. The designer must take these trends into account when determining the most effective and economic structure at the particular bridge site, aiming at no less than the realistic 100 and 50 year flood passing capabilities for the catchment areas defined in 17.3.1.1 paragraphs (i) and (ii) respectively.

17.3.1.3 When relaxation of the standards and guidelines given in 17.3.1.1 and 17.3.1.2 brings about considerable savings, smaller bridge openings may have to be considered in consultation with the Resident Engineer or System Civil Engineer concerned, taking into account -

- (i) the disruption to traffic due to flooding of the railway track or damage to the bridge and railway embankment;
- (ii) cost of reinstatement of the bridge and approaches to traffic.

17.3.1.4 Attention must be drawn, on the site plans, to any departure from the standards referred to in 17.3.1.1.

17.3.2 Freeboard

The design allowance for freeboard under the lowest part of the soffit of a bridge with a flood calculated in accordance with 17.3.1 must be one fifth of the depth of water, subject to a minimum of 300 mm and a maximum of 1 500 mm.

17.3.3 Site conditions

Due regard must be taken of the risk and consequences of flood damage and the flood history of the site, and the size of the openings increased accordingly as necessary.

17.4 Decks

17.4.1 Deck profile

The required deck profiles are shown in Fig. 2. Where super-elevation on curves is provided for in the ballast profile and not by tilting the deck, it may be necessary to increase the distance to the kerb on the outside of the curve in order to retain the ballast.

17.4.2 Maintenance road

When a maintenance road is provided on the deck, a 200 mm high kerb must be built with the roadside face of the kerb at a distance of 3 000 mm from the track centre line. An allowance for the road way of 4 000 mm must be made between the roadside face of the kerb and the inside face of the parapet.

17.4.3 Cable ducts

A minimum of three 150 mm diameter non-metallic pipes, strong enough to withstand the pressure of wet concrete without deformation, must be provided on each side of the bridge to accommodate signal, telecommunication and electrical cables. Fig. 3 gives an example of acceptable detailing of the pipe connections and drawing chambers, the latter being required at intervals not exceeding 60 m.

When open cable ducts are used they must be drained and filled with crusher run. Open cable ducts must be used only when pipe ducts are impractical.

17.4.4 Parapets

Parapets on all railway bridges except fly-overs must comply with the following :

- (i) The height above the side walk must be not less than 1 100 mm.
- (ii) The parapets must be robust and maintenance free.
- (iii) The lower 200 mm section of the parapet must provide a continuous barrier against spillage of ballast over the edge of the deck.

For parapets on fly-overs refer to 18.3.

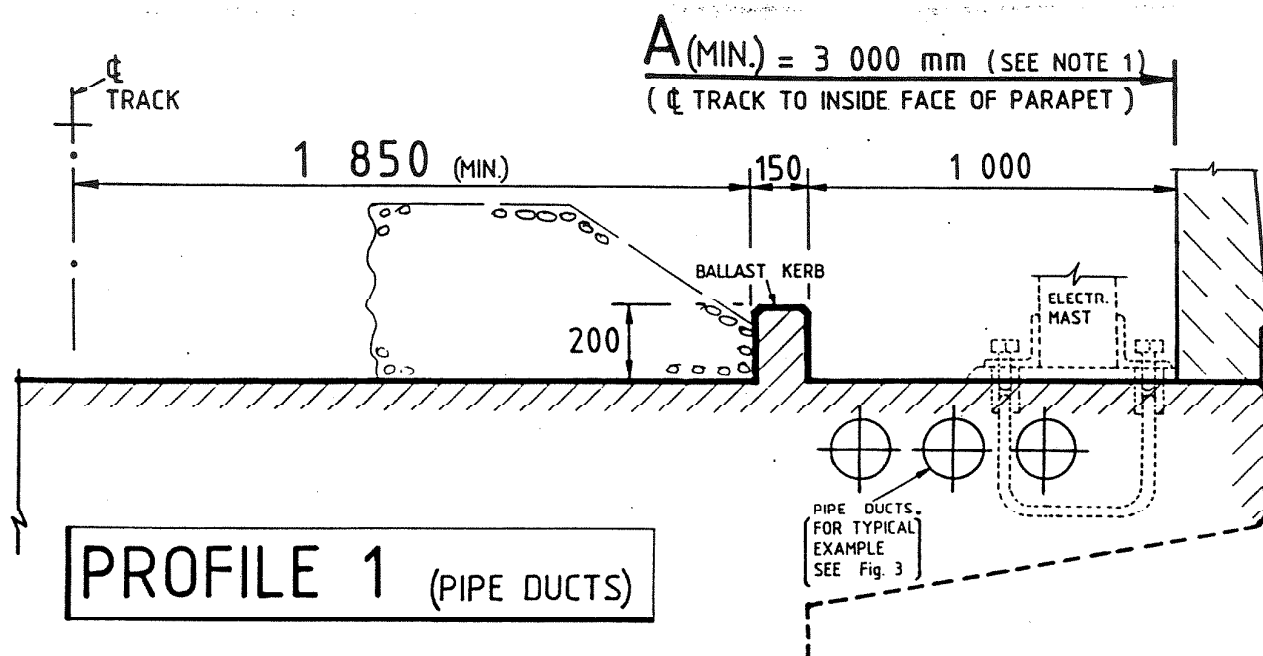
17.4.5 Deck drainage

17.4.5.1 Downlet drains must normally be provided adjacent to the abutment at the lower end of a bridge to prevent erosion of the embankments. All deck surfaces must have a fall of at least 1:100 towards drainage points. Changes in grade below sleepers will not be permitted.

17.4.5.2 Where the deck area of a bridge is larger than approximately 300 m² and in all cases where the average grade of the deck is flatter than 1:200, non-metallic pipe drains must be provided through the deck to discharge clear of the roadway or formation below. Where deck drainage is discharged into table drains from a height above formation level the table drains must be concrete lined.

17.5 Backfill behind abutments and wing walls

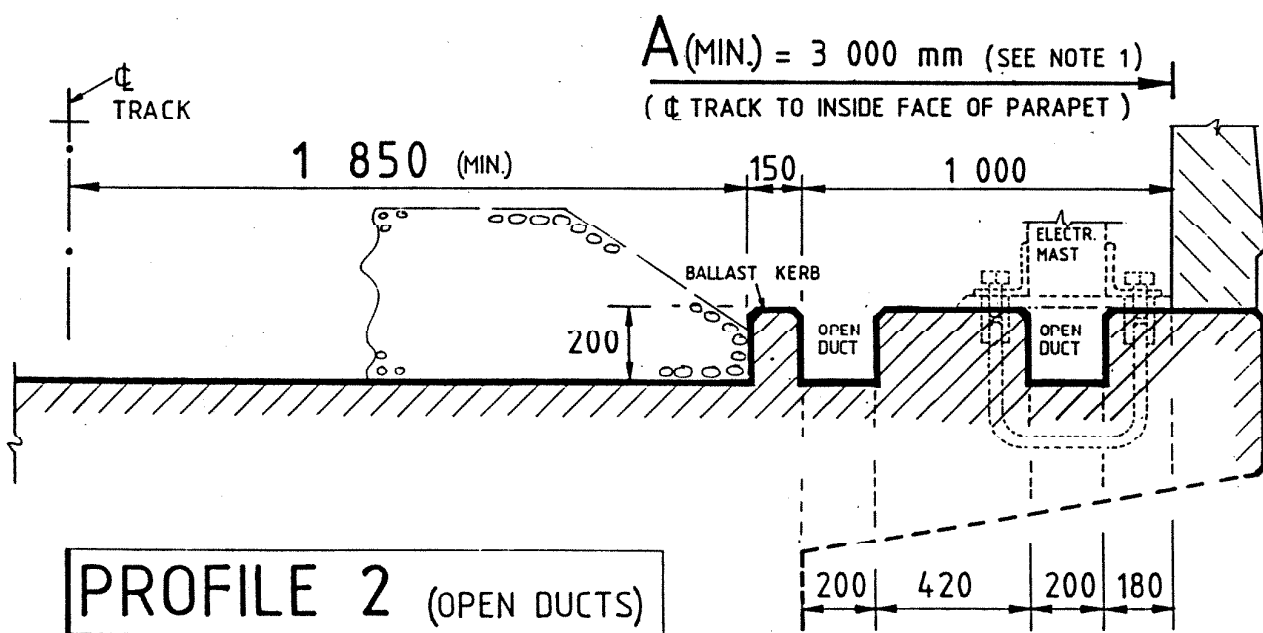
Only compacted selected material conforming to the requirements of specification E6 may be provided as fill behind abutments and wing walls and an endorsement to this effect must appear on the relevant drawings.



NOTE 1

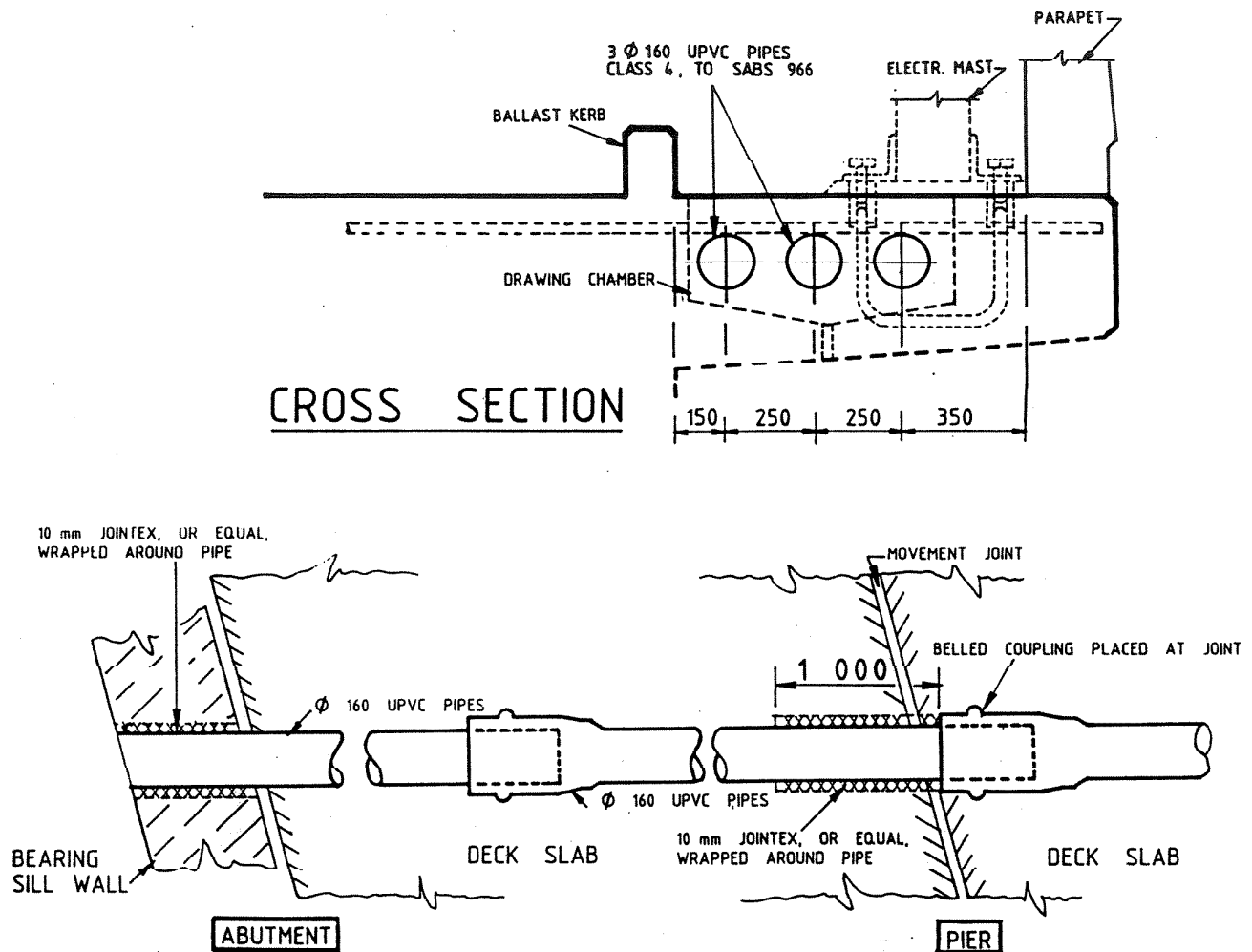
$A(\text{MIN.})$ MUST BE INCREASED WHERE:

- (i) ELECTR. MASTS ARE LOCATED ON INSIDE OF CURVE & TRACK RAD. < 800 m
(ADD 380 mm TO APPLICABLE DIMENSION L IN ANNEXURE 1)
- (ii) ELECTR. MASTS ARE LOCATED ON OUTSIDE OF CURVE & TRACK RAD. < 140 m
(ADD 380 mm TO APPLICABLE DIMENSION H IN ANNEXURE 1)



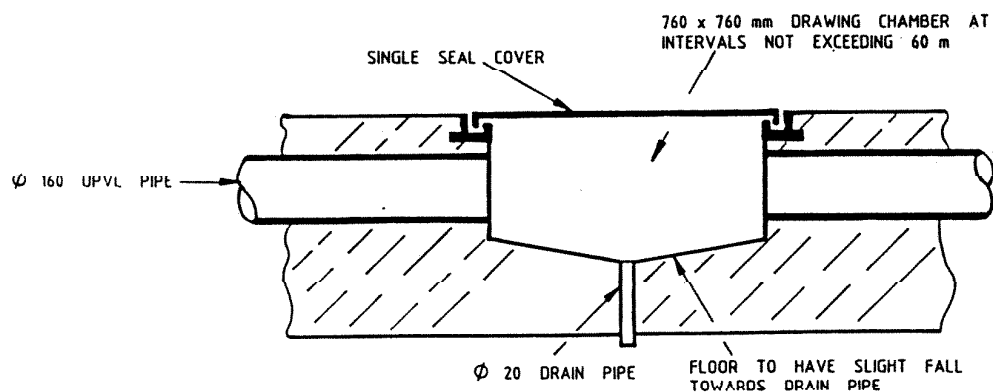
NOTE: OPEN DUCTS SHOULD BE USED ONLY WHEN PIPES ARE IMPRACTICAL

Fig. 2 STANDARD DECK PROFILES
FOR RAIL BRIDGES



NOTE PIPE COUPLINGS MUST BE AT LEAST 500 mm AWAY FROM BOLT GROUP FOR ELECTR. MASTS

SECTIONAL PLAN SHOWING PIPE COUPLINGS



DRAWING CHAMBER

Fig.3 PIPE DUCTS FOR SERVICES

17.6 Approach slabs

Approach slabs must be provided behind all spill-through abutments and behind all other abutments exceeding 5 m in height, measured from the top of the base slab or pile cap.

18. DESIGN : ROAD BRIDGES

18.1 General

18.1.1 Road bridges must be designed in accordance with the requirements of the road authority of the province in which the bridge is situated, or to such higher standards as may be laid down by the local road authority, and to the additional requirements specified herein.

18.1.2 Where the Transport Services is the road authority the Chief Civil Engineer will advise which design code is applicable.

18.1.3 Agricultural overpasses must have a minimum width of 5 500 mm between the inside faces of the parapets. In the case of New Jersey type parapets this minimum width must be provided at the upper intersection of the parapet face slopes, i.e. approximately 325 mm above finished road level.

18.2 Maintenance road When provision of a maintenance road through the bridge is required, an additional clear width of 4 m must be provided for this purpose. Where the road is adjacent to a railway track a width of 7 m from track centre line is adequate.

18.3 Parapets

18.3.1 Except as otherwise indicated in 18.3.5, parapets on bridges over present or future railway tracks must be of a closed type and not less than 1 500 mm in height, measured from the proposed or future sidewalk or road level. Closed parapets must extend 3 000 mm beyond the centre line of the outermost track, measured at right angles to the track.

18.3.2 Rails or steps which may reduce the effective height of 1 500 mm are not permitted.

18.3.3 The inside faces of parapets must be free of projections. Recesses in these faces must be not deeper than 15 mm and the lower edges of horizontal recesses must be chamfered at an angle of 60° to the horizontal. Ledges on the outside of the parapets are not permitted.

18.3.4 Butting faces of movement joints must be stepped in plan as a protection against possible contact with the overhead electrical equipment.

18.3.5 Open type parapets are acceptable only when the live catenary is more than 3 000 mm below the top of the deck and when pedestrian access to the roadway is prohibited.

18.3.6 As a protection to parapets other than the New Jersey type, kerbs must be provided on both sides of the bridge deck. The height of the kerb must be not less than 150 mm above the road surface and the distance from the face of the kerb to the inside face of the parapet must be not less than 500 mm.

18.4 Ducts

- 18.4.1 If services are required to be carried over the railway line, ducts must be provided in the sidewalk or, in the case of bridges without sidewalks, within the bridge deck structure below road level. Where, in consultation with the road authority, the possibility of future services crossing the railway line can be foreseen, ducts equivalent to a minimum of two 150 mm pipes must be provided and temporarily blocked.
- 18.4.2 Ducts may be omitted in cases where, in the opinion of the road authority, future services are unlikely to eventuate.

19. DESIGN : FOOTBRIDGES AND PEDESTRIAN SUBWAYS

- 19.1 The following principles and standards must be applied when designing footbridges :
- (i) Capacity of stairways : 50 persons per minute per metre width of stairway.
 - (ii) Capacity of level or sloped walkway: 100 persons per minute per metre width of walkway.
 - (iii) Capacity of a single ticket barrier : 25 persons per minute.
 - (iv) The stairways giving access to or exit from a footbridge must be critically examined in the light of present and possible future pedestrian volumes. Planning should take account of the result of this examination and the cost aspect.
 - (v) The following should be considered in the case of footbridges at passenger stations :
 - (a) The capacity of the walkway and stairways should, if practicable, be sufficient to enable all detraining passengers to enter a stairway within three minutes, taking into consideration that trains can arrive simultaneously.
 - (b) At how many platform faces can there be simultaneous train arrivals with maximum passenger discharge?
 - (c) Assuming such simultaneous train arrival is likely, what percentage of the full capacity of the footbridge walkway will be reached in a particular direction?
 - (d) Can the exit stairway from the footbridge cope with the flow in the direction considered in (c), taking into account that a potential danger area occurs at the top of a stairway ?

If the answer to (d) is no, then sufficient additional width of exit stairway must be provided or alternatively the stairway replaced by a ramp. If the answer to (d) is initially yes but expected to be no at a later stage, the footbridge exit should be planned to allow for a future additional stairway or for the stairway to be replaced by a ramp.

- 19.2 The principles in 19.1 apply in general also to pedestrian subways but the latter are not favoured and should only be resorted to in cases where the provision of a footbridge is impractical.
- 19.3 Footbridges must be structurally designed in accordance with TMH 7 subject to amendment of the applied loading as specified in Part II. Parapets must be provided in accordance with 18.3.1 to 18.3.4.
- 19.4 Concrete pedestals
- Steel trestles located within 4 m of a track centre line must be supported on concrete pedestals extending 1200 mm above rail level. The pedestals must be designed for impact loads as specified for supports adjacent to railway tracks in Part II.
20. DESIGN : SERVICE STRUCTURES
- 20.1 Structures carrying services must be designed in accordance with TMH 7 subject to the additional applied loading as specified in Part II of this code.
- 20.2 Parapets
- If maintenance staff require access to the service, parapets must be provided in accordance with 18.3, and the floor of the bridge must be sealed to prevent accidental contact with electrification wires. If maintenance occurs seldom and only by special arrangement with the System Electrical Engineer in terms of specification E7 Part II, the bridge may be blocked off at both ends by means acceptable to him. Under these circumstances closed parapets and a sealed floor may be omitted.
- 20.3 Concrete pedestals
- For structural steel supports the requirements of 19.4 apply.
21. DESIGN : CULVERTS AND UNDERPASSES
- 21.1 General
- Culverts under railway tracks must be designed in accordance with TMH 7 subject to the application of NR live loading and other loads as specified in Part II of this code.
- 21.2 Agricultural underpasses
- Agricultural underpasses for vehicular access must have a minimum width of 5,5 m and height of 5,0 m. The equivalent dimensions applying to cattle creeps are 2 m x 2 m.

21.3 Serviceability limit states

The requirements of 17.2 apply.

21.4 Hydrological requirements

21.4.1 Design flood

Culvert openings must allow for design floods calculated in accordance with 17.3.1. Pipe culverts should be not less than 900 mm in diameter.

21.4.2 Freeboard and storage

21.4.2.1 Pipe culverts

The freeboard in a pipe culvert must be designed to be at least 10 % of the diameter of the pipe and flooded inlets are not permitted. Ponding, or the utilisation of the storage available upstream of the inlet in order to reduce the flood peak, must be considered unless -

- (i) the culvert is situated in an urban or potentially urban area;
- (ii) the interests of the Transport Services or those of the owner of the adjoining property are adversely affected thereby.

21.4.2.2 Box and arch culverts

Box and arch culverts must normally be designed to allow a freeboard of 5 % of the height of the culvert opening, subject to a minimum of 100 mm. Ponding must be considered as described in 21.4.2.1. Flooded inlets are permitted only if -

- (i) the design flood level is at least 1 000 mm below track formation and not higher than 1,5 H above the upstream invert, where H is the height of the culvert opening;
- (ii) the track formation will not be overtopped until the flood is at least 1,5 times the design flood in terms of 17.3.1;
- (iii) the level above invert reduces from 1,5 H to H within 1 hour of cessation of precipitation.

21.4.3 Site conditions

Due regard must be paid to the factors referred to in 17.3.3.

21.5 Movement joints

Movement joints must be provided at intervals not exceeding 10 m along the length of the culvert. Vertical and horizontal keys must be provided at such joints unless it is clear that there is no danger of differential alignment or settlement, e.g. when founded on rock. All joints must be veed at the inner faces.

21.6 Simply supported decks

Simply supported decks must be fixed at abutments and piers subject to allowance for free movement on piers at intervals not greater than 10 m. On such piers, decks must be supported on 3 layers of roofing felt to SABS 92, type 60, and must be separated from one another by 3 layers of this felt.

21.7 Deck profile

Dimensional requirements and profiles are detailed in Fig. 4.

21.8 Handrails

Handrails, 1 100 mm high, must be provided where the height of earth bank above a culvert is not greater than 250 mm and the height of the culvert opening is 2 m or greater. In station yards handrails must be provided irrespective of opening height.

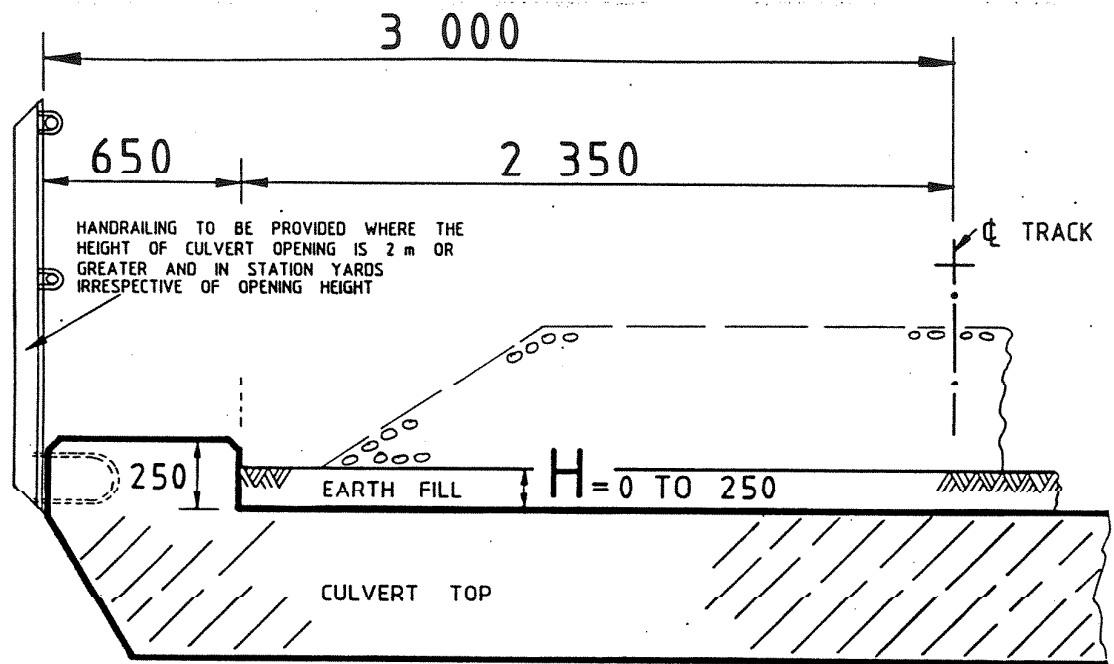
22. TENDER DOCUMENTS

22.1 Two copies of the draft tender documents must be submitted to the Transport Services for approval before tenders are invited.

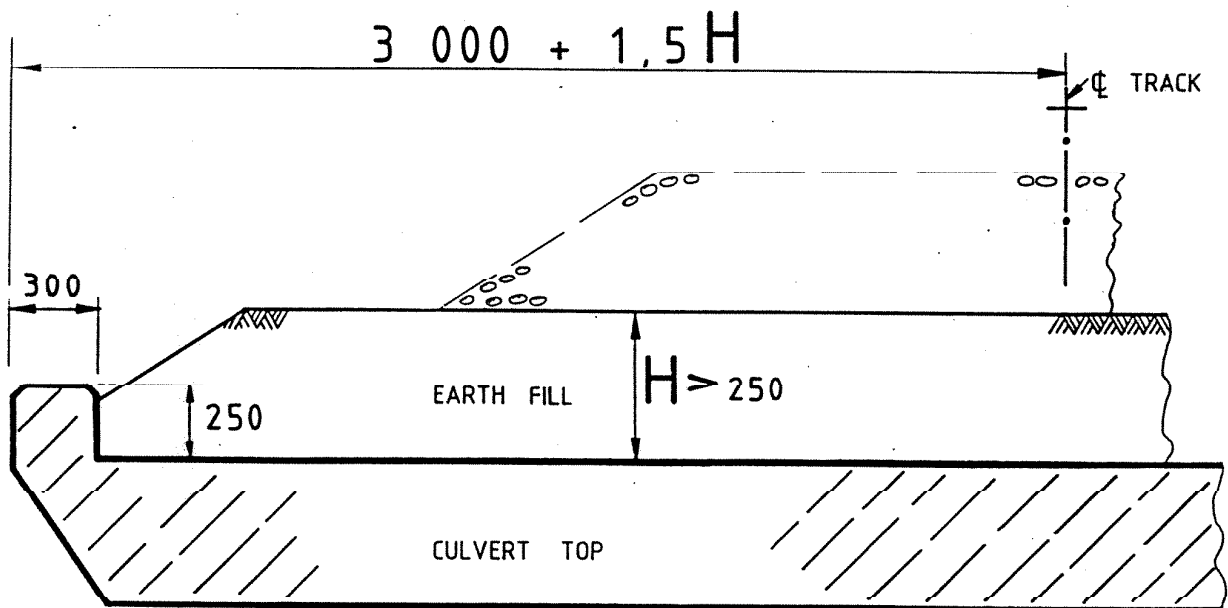
22.2 Tender documents prepared by road authorities, or on their behalf by consultants, will follow the general form used by the road authority but must include the Transport Services specification E7 Part II. In addition, specifications referred to in 22.4, 22.5 and 22.6 must be used where applicable. The Transport Services specifications must not be retyped but reproduced from updated master copies issued by the Chief Civil Engineer.

22.3 Where the Transport Services, or consultants appointed by the Transport Services, are controlling the work the basic Transport Services format for tender documents must be adopted and the following standard forms and specifications must be included where applicable. They must be bound in the order listed below :

- 1 Schedule of documents.
- 2 Notice to Tenderers.
- 3 Tender form (E4).
- 4 Site inspection certificate (form E4A).
- 5 Minimum communal health requirements (form E4B).
- 6 Statement of works successfully carried out by the tenderer (form E4C).
- 7 Schedule of plant and equipment (form E4D).
- 8 Agreement and conditions of contract (form E5).
- 9 Standard specifications which are relevant, including E7 Part I.
- 10 Special conditions and specifications.
- 11 Schedule of prices.
- 12 Schedule of drawings.
- 13 Drawings.



PROFILE 1 HEIGHT H OF EARTH FILL = 0 TO 250 mm



PROFILE 2 HEIGHT H OF EARTH FILL > 250 mm

Fig. 4 STANDARD CULVERT PROFILES

22.4 Structures carrying railway tracks must be constructed in accordance with the following Transport Services specifications where applicable :

E8 Concrete work
E17 Concrete bridges and culverts other than pipe culverts
E19 Pile foundations and sheet piling
E49 Concrete pipe culverts and drains
CCE 5/1 Bridge steelwork
CCE 5/2 Jacking of structures

22.5 Earthworks for railway formations and fencing must be in accordance with the Transport Services specifications E6 and E9 respectively.

22.6 As built drawings must be microfilmed in accordance with specification CCE 9/84.

23. APPLICABLE CODES AND STANDARDS

Reference is made in Parts I and II to the following codes and standard specifications :

TMH 7 : Code of practice for the design of highway bridges and culverts in South Africa.

BS 5400 : Steel, concrete and composite bridges, Part 2 : Specification for loads.

Report B2 : National Transport Commission, Land Transport Directorate : Recommendations on the design, construction, strengthening and repair of bridges.

Technical Memorandum (Bridges) No. BE 1/76, Department of the Environment, Highways Directorate : Design requirements for Elastomeric Bridge Bearings.

International Union of Railways (UIC) Code 772 R : Code for the use of rubber bearings for rail bridges.

SABS 0100 : Code of practice for the structural use of concrete : Part 2 : Materials.

SABS 0111 : Standards for drawings.

Report TR 105 : Maximum flood peak discharges in S.A. : Dept. of Water Affairs.

Report TR 102 : Southern African Storm Rainfall : Dept. of Water Affairs.

S.A. Transport Services Specifications :

E7 Parts I and II : Work on, under, over, adjacent to railway tracks.
E6 Earthworks.
E8 Concrete work.
E9 Fencing.
E13 Engineering survey work.
E17 Concrete bridges and culverts other than pipe culverts.
E19 Pile foundations and sheet piling.
E49 Concrete pipe culverts and drains.

CCE 5/1 Bridge steelwork.
CCE 5/2 Jacking of structures.
CCE 9/84 Microfilming of drawings.
CCE 3/10 Painting new structural steelwork.

24.

ACKNOWLEDGEMENT

Material from BS 5400 : Part 2, is reproduced in PART II hereof by permission of the British Standards Institution, 2 Park Street, London, W1A 2BS. British Standards can be purchased from the SABS in Pretoria.

PART II : SPECIFICATION FOR LOADS

A. GENERAL

NOTATIONS AND DEFINITIONS HEREIN ARE AS GIVEN IN TMH 7 UNLESS OTHERWISE INDICATED. ANY ACTIONS, LOADS AND PARTIAL LOAD FACTORS NOT SPECIFIED IN THIS PART MUST BE APPLIED WITHOUT AMENDMENT IN ACCORDANCE WITH TMH 7, PARTS 1 AND 2.

B. RAILWAY BRIDGES

B1. GENERAL

The rail loading specified in this part is based on BS 5 400 : STEEL, CONCRETE AND COMPOSITE BRIDGES, PART 2 : SPECIFICATION FOR LOADS, amended to suit local conditions.

B2. PRINCIPAL ACTIONS

B2.1 Superimposed dead load

B2.1.1 Nominal superimposed dead load. The nominal weight of the track structure, including ballast, must be taken as 35 kN/m. Service ducts may be considered as filled with concrete and no further allowance need be made for the weight of services.

B2.1.2 For the serviceability limit state the values of the factor γ_{fL} must be as in TMH 7. For the ultimate state the factor γ_{fL} must be 1,4; 1,2 and 1,2 for load combinations 1,2 and 3 respectively.

B2.2 Earth pressure on retaining structures

B2.2.1 Approximately theory for earth pressure

In place of the equivalent fluid pressures given in TMH 7 for Type I and Type II fill material which apply only when the required lateral movement to achieve those values can be obtained, the following equivalent fluid pressures must be considered in the case of unyielding structures or elements such as propped cantilevers and portal frames :

Type I	9,5 kPa per metre depth
Type II	13,5 kPa per metre depth

B2.2.2 The additional horizontal pressure due to railway loading on the fill immediately behind a retaining wall must be taken as 12 kPa in the case of yielding structures and 20 kPa in the case of framed or propped structures. This loading must be applied on the total length of the wall and on the total length of a side wall, but acting only on the part of the side wall more than $(b_1 - 1)$ metres below the formation level, where b_1 is the distance from the centre line of the track to the side wall.

B2.2.3 The vertical surcharge pressure due to railway loading must be taken as 32 kPa for the design of heels of retaining walls.

B2.3 Primary live loads

B2.3.1 Definition of NR rail loading. Nominal NR loading consists of one group of 280 kN concentrated loads preceded and followed by a uniformly distributed load of 100 kN/m. The arrangement of this loading is shown in Fig. 5.

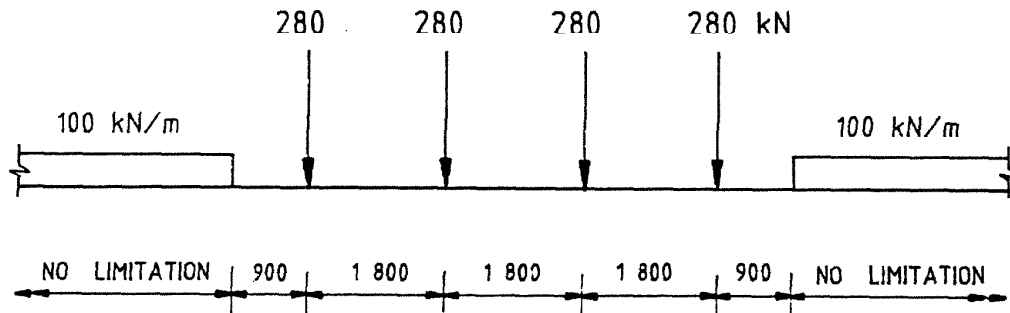


Fig. 5 NR LOADING

B2.3.2 Dynamic effects. The nominal NR loading defined in B2.3.1 is a static loading and must be multiplied by the appropriate dynamic factors in Table 2 to allow for impact, oscillation and other dynamic effects including those caused by track and wheel irregularities. L is the span.

In the case of multiple tracks the dynamic factor needs to be applied to a maximum of three tracks only.

TABLE 2. DYNAMIC FACTOR FOR NR LOADING

DIMENSION L (m)	DYNAMIC FACTOR FOR EVALUATING	
	BENDING MOMENT	SHEAR
Up to 3,6	2,00	1,67
3,6 to 67	$0,73 + \frac{2,16}{\sqrt{L} - 0,2}$	$0,82 + \frac{1,44}{\sqrt{L} - 0,2}$
Over 67	1,00	1,00

L is the span length for simply supported spans, and equals 1,2; 1,3; 1,4; 1,5 times the mean span for 2, 3, 4, 5 and more continuous spans respectively, or the longest span, whichever is greater. For portal frames and arches L equals half the span. For unballasted bridges enhanced dynamic factors must be used, details of which may be obtained from the Chief Civil Engineer.

- B2.3.3 Dispersal of concentrated loads. For ballasted track it may be assumed that two thirds of the concentrated load applied to the rails is transmitted to the bridge deck by the sleeper immediately below the applied load, and the remaining one third to the two sleepers on either side. The load from a sleeper may be assumed to be dispersed through the ballast at an angle of 5° to the vertical, giving a distribution over an area measuring 0,3 m x 2,0 m at the underside of the ballast. Further distribution through the deck may be taken into account, due allowance being made for the type of construction of the deck. This method of dispersal has been applied in the derivation of the equivalent uniformly distributed loads in Table 3.
- B2.3.4 Deck plates and similar local elements. Deck plates, top slabs of box girders or beam decks, and similar local elements must be designed to support a nominal load of 280 kN at any point of support of a rail. For ballasted track the total nominal load of 560 kN applied to both rails may be distributed to adjacent sleepers and through the ballast and deck as described in B2.3.3. These nominal loads shall be deemed to include all allowances for dynamic effects and lurching and must be applied over a width of 2,0 m measured at the underside of the ballast.
- B2.3.5 Application of NR loading. The nominal NR loading, amplified to allow for dynamic effects, must be applied to each track. In order to ascertain the maximum bending moments or shear, the distributed load must be applied to all lengths on the influence lines contributing to such maxima.
- B2.3.6 Elements supporting sidewalks and rail loading. The nominal live load on sidewalks carried by elements which also support rail loading must be taken as 5 kPa. Sidewalk loading must be considered in isolation and not in combination with the nominal rail loading. Permanent sidewalks must be checked for derailment loading as specified in B6.
- B2.3.7 The factor γ_{fL} to be applied to the nominal load given in B2.3.6 must be as follows :

	ULTIMATE LIMIT STATE			SERVICEABILITY LIMIT STATE		
Combinations	1	2	3	1	2	3
γ_{fL}	1,4	1,2	-	1,0	1,0	-

B3. SUPPLEMENTARY ACTIONS

B3.1 Secondary live loads

- B3.1.1 Nosing. An allowance must be made for the lateral loads applied by trains to the track. This must be taken as a single nominal load of 100 kN, acting horizontally in either direction at right angles to the track at rail level and at such a point in the span as to produce the maximum effect in the element under consideration.

TABLE 3

BENDING MOMENTS AND END SHEAR FOR NR LOADING (SIMPLY SUPPORTED SPANS)

SPAN m	EQUIVALENT UDL PER TRACK FOR DETERMINING BENDING MOMENTS		END SHEAR PER TRACK	
	STATIC kN/m	DYNAMIC kN/m	STATIC kN	DYNAMIC kN
1,0	300	600	156	260
1,2	267	533	168	280
1,4	243	486	180	300
1,6	225	450	192	320
1,8	211	420	204	340
2,0	200	400	216	360
2,2	191	382	228	380
2,4	183	367	240	400
2,6	177	354	251	420
2,8	171	343	263	440
3	167	333	275	458
4	164	317	381	617
6	162	274	594	867
8	159	247	757	1036
10	155	226	886	1158
12	149	207	1001	1261
14	144	193	1102	1352
16	140	182	1212	1453
18	137	173	1322	1555
20	134	165	1426	1650
22	131	159	1526	1741
24	129	153	1644	1851
26	127	149	1748	1947
28	125	145	1841	2031
30	124	141	1944	2125
32	123	138	2046	2218
34	121	135	2146	2309
36	120	133	2250	2403
38	119	130	2352	2495
40	118	128	2453	2588
45	117	124	2706	2817
50	115	120	2947	3035
55	114	117	3194	3255
60	113	115	3462	3500
65	112	112	3708	3719
70	111	111	3965	3965
75	110	110	4205	4205
80	110	110	4467	4467
90	109	109	4968	4968
100	108	108	5407	5407
120	107	107	6471	6471
140	106	106	7472	7472
160	105	105	8473	8473
180	104	104	9474	9474
200	104	104	10393	10393

B3.1.2 Centrifugal load. Where the track on a bridge is curved, allowance for centrifugal action of moving loads must be made in designing the elements, all tracks on the structure being considered occupied. The nominal centrifugal load F_c in kN/m per track must be calculated from the formula

$$F_c = P(V_t + 10)^2 / 127r$$

where P = the static equivalent uniformly distributed load for bending moment in kN/m
 r = the radius of curvature in m
 V_t = the greatest speed envisaged on the curve in question in km/h.

The load must be assumed to act radially at a height of 1,8 m above rail level.

B3.1.3 Longitudinal loads. Provision must be made for the nominal loads due to traction and braking as follows :

- (i) TRACTION : 20 kN/m per track, with a minimum of 200 kN and a maximum of 2 000 kN.
BRAKING : 15 kN/m per track, with no limiting value.

These loads must be considered as acting at rail level in a direction parallel to the tracks. No addition need be made for dynamic effects. No portion of the applied loads may be assumed to be transmitted by the track to resistances outside the bridge structure.

- (ii) Structures and elements carrying single tracks must be designed for the larger of the two loads produced by traction and braking acting in either direction.
- (iii) Where a structure or element carries two tracks, both tracks must be considered as being occupied simultaneously. Where the tracks carry traffic in opposite directions, the load due to braking must be applied to one track and the load due to traction to the other. Structures and elements carrying two tracks where traffic on both tracks can be in the same direction, either on a regular or intermittent basis, must be subjected to braking or traction on both tracks, whichever gives the greater effect. When braking on two tracks is considered, however, the braking load applied to the second track may be reduced to 10 kN/m.
- (iv) Where appropriate, consideration must be given to braking and/or traction, acting in opposite directions, producing rotational effects.
- (v) Where elements carry more than two tracks, longitudinal loads as described in (iii) and (iv) must be considered as applied simultaneously to two tracks only.

B3.2 Impact loads on bridge supports adjacent to railway tracks

B3.2.1 Bridge supports must be considered to be vulnerable to impact loads resulting from derailed vehicles if located within 5 m of the centre line of an existing or future track and not permanently protected as in the case of a support on a platform.

B3.2.2 The nominal impact loads are as follows :

- (i) A horizontal longitudinal load of 600 kN parallel to the direction of the track.
- (ii) A horizontal transverse load of 200 kN normal to the direction of the track.

One pair of such loads must be applied simultaneously to each support in turn at a height of 2 m above rail level. The transverse load must be distributed longitudinally over the length of a support, or over 2 m, whichever is less.

B3.2.3 Where, notwithstanding what is stated in 16.5.2 of Part I, column supports are contemplated for aesthetic reasons or otherwise, such columns must be designed for nominal impact loads up to five times the value stated in B3.2.2. Such cases must be referred to the Chief Civil Engineer for a decision.

B3.3 Loads on parapets

Parapets on bridges carrying railway tracks must be designed for the loads specified for Class II balustrades in TMH 7.

B4. LOAD COMBINATIONS

All loads that derive from rail traffic, including dynamic effects, nosing, centrifugal load and longitudinal loads, must be considered in combinations 1 and 2 described in TMH 7.

B5. DESIGN LIVE LOADS

B5.1 For primary and secondary railway live loads, γ_{FL} must be taken as follows :

	ULTIMATE LIMIT STATE			SERVICEABILITY LIMIT STATE		
Combinations	1	2	3	1	2	3
γ_{FL}	1,4	1,2	-	1,0	1,0	-

B6. DERAILMENT LOADS

B6.1 Railway bridges must be so designed that they do not suffer excessive damage or become unstable in the event of a derailment. The following criteria apply :

- (a) For the serviceability limit state, derailed coaches or light wagons with wheels displaced laterally to points up to 2 m from track centre line must cause no permanent damage.

- (b) For the ultimate limit state, derailed locomotives or heavy wagons remaining clear of the parapet must not cause collapse of any major element, but local damage may be accepted. A cantilevered concrete footwalk must be considered a major element.
- (c) For overturning or instability, a locomotive and one following wagon balanced on the outermost edge of the bridge or parapet must not cause the structure as a whole to overturn, but other damage may be accepted.

Design loads applied in accordance with B6.2 may be deemed to comply with these requirements.

B6.2 Derailment design load for NR loading

The following equivalent static design loads, with no addition for dynamic effects, must be applied when assessing the effects of derailments. These loads are to be considered in isolation and are not to be considered in combinations 1 and 2.

- (a) For the serviceability limit state, either
 - (1) vertical loads of 20 kN/m on each of two lines 1,0 m apart, parallel to the track and applied anywhere within 2 m of the track centre line; or, if the effect is greater,
 - (2) an individual concentrated vertical load of 100 kN anywhere within 2 m of the track centre line.
- (b) For the ultimate limit state, four concentrated vertical loads of 200 kN (ultimate) at 1,8 m centres on each of two lines 1,0 m apart, parallel to the track, applied anywhere on the deck up to a line 200 mm from a concrete parapet.
- (c) For overturning or instability, a vertical load of 100 kN/m applied on the outermost edge of the bridge or parapet, limited to a length of 20 m anywhere along the span.

Loads specified in (a) and (b) must be applied at the top surface of the ballast or other deck covering and may be assumed to disperse at 30° to the vertical onto the supporting structure.

B7. RESTRAINT ACTIONS

B7.1 Temperature effects

- B7.1.1 Adjustment for the presence of ballast. When calculating effective bridge temperatures the effect of ballast on railway bridges may be taken to be equivalent to that of 200 mm of road surfacing. Temperature differences for different types of construction carrying ballasted track are given in Fig. 6.

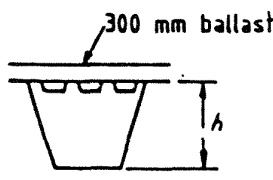
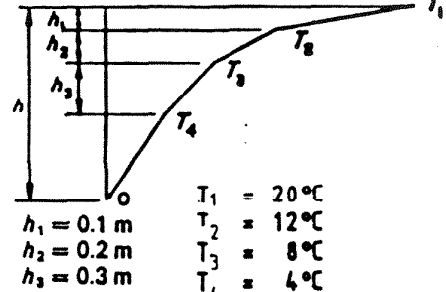
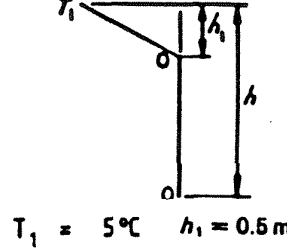
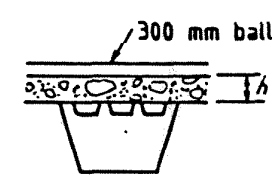
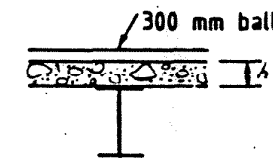
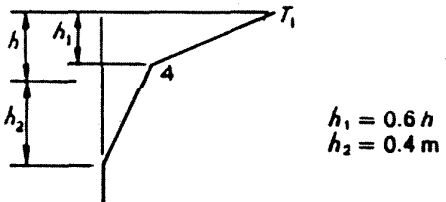
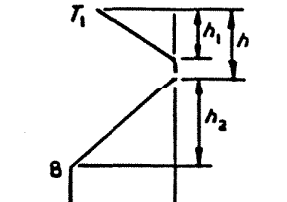
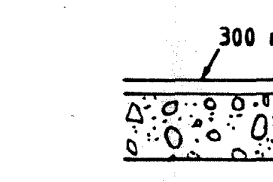
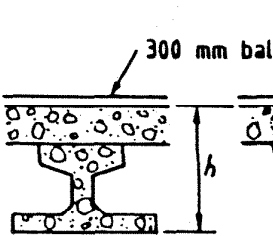
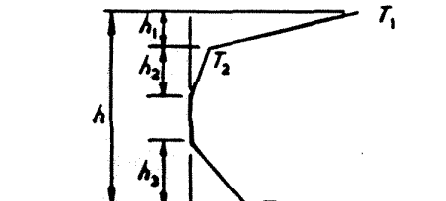
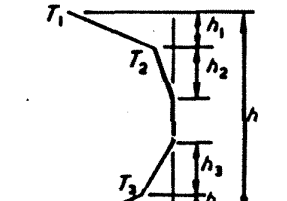
TYPE OF CONSTRUCTION	TEMPERATURE DIFFERENCE °C																																																						
	POSITIVE DIFFERENCE	REVERSE DIFFERENCE																																																					
1. Steel deck on steel box girders	  $T_1 = 20^{\circ}\text{C}$ $T_2 = 12^{\circ}\text{C}$ $T_3 = 8^{\circ}\text{C}$ $T_4 = 4^{\circ}\text{C}$ $h_1 = 0.1 \text{ m}$ $h_2 = 0.2 \text{ m}$ $h_3 = 0.3 \text{ m}$  $T_1 = 5^{\circ}\text{C}$ $h_1 = 0.5 \text{ m}$	2. Steel deck on steel truss or plate girders																																																					
3. Concrete deck on steel box, truss or plate girders	   $h_1 = 0.6 h$ $h_2 = 0.4 \text{ m}$ <table><tr><th>h</th><th>T₁</th></tr><tr><td>0.2</td><td>8.5</td></tr><tr><td>0.3</td><td>10</td></tr></table> <table><tr><th>h</th><th>T₁</th></tr><tr><td>0.2</td><td>1.6</td></tr><tr><td>0.3</td><td>2.7</td></tr></table>	h	T ₁	0.2	8.5	0.3	10	h	T ₁	0.2	1.6	0.3	2.7	4. Concrete slab or concrete deck on concrete beams or box girders																																									
h	T ₁																																																						
0.2	8.5																																																						
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   $h_1 = 0.3h \leq 0.15 \text{ m}$ $h_2 = 0.3h \geq 0.10 \text{ m}$ $h_3 = 0.3h \leq 0.25 \text{ m}$ $h_3 = 0.3h \leq (0.1 \text{ m} + \text{surfacing depth in metres})$ (for thin slabs, h_3 is limited by $h - h_1 - h_2$) <table><tr><th>h</th><th>T₁</th><th>T₂</th><th>T₃</th></tr><tr><td>0.2</td><td>3.7</td><td>2.0</td><td>-0.5</td></tr><tr><td>0.4</td><td>6.2</td><td>1.3</td><td>1.0</td></tr><tr><td>0.6</td><td>7.2</td><td>1.5</td><td>1.5</td></tr><tr><td>0.8</td><td>7.5</td><td>2.1</td><td>1.5</td></tr></table>  $h_1 = h_4 = 0.2h \leq 0.25 \text{ m}$ $h_2 = h_3 = 0.25h \leq 0.2 \text{ m}$ <table><tr><th>h</th><th>T₁</th><th>T₂</th><th>T₃</th><th>T₄</th></tr><tr><td>0.2</td><td>0.5</td><td>0.2</td><td>1.0</td><td>1.8</td></tr><tr><td>0.4</td><td>2.2</td><td>0.5</td><td>1.9</td><td>4.0</td></tr><tr><td>0.6</td><td>3.6</td><td>0.6</td><td>1.9</td><td>5.1</td></tr><tr><td>0.8</td><td>4.5</td><td>1.0</td><td>1.9</td><td>6.0</td></tr><tr><td>1.0</td><td>4.8</td><td>0.9</td><td>1.9</td><td>5.8</td></tr><tr><td>1.5</td><td>5.0</td><td>0.3</td><td>1.2</td><td>5.6</td></tr></table>	h	T ₁	T ₂	T ₃	0.2	3.7	2.0	-0.5	0.4	6.2	1.3	1.0	0.6	7.2	1.5	1.5	0.8	7.5	2.1	1.5	h	T ₁	T ₂	T ₃	T ₄	0.2	0.5	0.2	1.0	1.8	0.4	2.2	0.5	1.9	4.0	0.6	3.6	0.6	1.9	5.1	0.8	4.5	1.0	1.9	6.0	1.0	4.8	0.9	1.9	5.8	1.5	5.0	0.3	1.2	5.6
h	T ₁	T ₂	T ₃																																																				
0.2	3.7	2.0	-0.5																																																				
0.4	6.2	1.3	1.0																																																				
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0.8	7.5	2.1	1.5																																																				
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0.4	2.2	0.5	1.9	4.0																																																			
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1.0	4.8	0.9	1.9	5.8																																																			
1.5	5.0	0.3	1.2	5.6																																																			

Fig. 6

TEMPERATURE DIFFERENCE FOR
DIFFERENT TYPES OF CONSTRUCTION

C. ROAD BRIDGES

C1. NOMINAL LIVE LOAD

C1.1 Public roads

Road bridges must be designed for the loading specified by the relevant road authority. Where the Transport Services is the road authority, road bridges must be designed for NA, NB 36 and NC 30 x 5 x 40 loading.

C1.2 Agricultural overpasses

Agricultural overpasses must be designed for NA loading only.

C2. NOMINAL IMPACT LOAD ON PARAPETS

On road bridges or overpasses crossing tracks, New Jersey type parapets which are not protected from impact loads by kerbs must be designed for 1,5 times the loading specified for Class I balustrades in TMH 7.

C3. IMPACT LOADS ON BRIDGE SUPPORTS ADJACENT TO RAILWAY TRACKS

Bridge supports adjacent to railway tracks must be designed to carry the nominal impact loads specified in B3.2.

D. FOOTBRIDGES AND SERVICE STRUCTURES

D1. NOMINAL LIVE LOAD

D1.1 Footbridges

Footbridges must be designed for a nominal live load of 8 kPa irrespective of span length. In exceptional cases, where crowds cannot be envisaged, the loading intensity may be reduced to 5 kPa. These loadings include an allowance for the weight of electrical overhead equipment attached to the footbridge. A nominal horizontal live load of 30 kN which may act transversely in either direction at the centre of each span must be included in load combination 1 to cater for the action of underslung electrical overhead equipment.

D1.2 Service structures

Service structures must be designed for the nominal live loads specified in D1.1, except that in the case where access to the structure is restricted to maintenance staff only, the load intensity may be reduced to 3 kPa plus the load imposed by the service.

D2. IMPACT LOADS ON SUPPORTS ADJACENT TO RAILWAY TRACKS

- D2.1 Where pedestals are required below supports in terms of 19.4 of Part I, they must be designed for the nominal impact loads specified in B3.2. These loads must be taken to act at the top of the pedestals subject to a maximum height of 2 m above rail level.
- D2.2 In the case of structures which cannot be readily designed to carry the impact loads specified the Chief Civil Engineer must be consulted.

E. CULVERTS UNDER RAILWAY TRACKS

E1. GENERAL

Culverts under railway tracks must be designed in accordance with the approximate methods used in TMH 7 to assess the effects of vertical earth loading.

E2. HORIZONTAL EARTH PRESSURE

Horizontal earth pressure must be applied as described in B2.2.

E3. PRIMARY LIVE LOADS

NR loading may be applied as a uniformly distributed nominal load equal to that listed in Table 3 for a span of $(b_c + H)$ where b_c is the individual effective span of the culvert in metres, measured perpendicular to its supports, and H is the height of fill in metres above the top of the culvert. The dynamic factor by which this load must be enhanced is the value given in Table 2 for a span of $(b_c + H)$ multiplied by a factor $\left(\frac{b_c^2}{b_c + H}\right)$, subject to a minimum of 1.1. The load must be applied over a width of $(2 + 2H)$ metres measured at right angles to the track, subject to a maximum of 4 m. For precast culverts this width must be reduced to $(2 + H)$ metres, subject to the same maximum.

E4. SECONDARY LIVE LOADS

A nominal longitudinal braking or traction force $F_L = 20 (b_c - H)$ kN must be considered to act in association with the primary live load at the level of the top of the culvert over a width of $(2 + H)$ metres, measured at right angles to the track, subject to a maximum of 4 m.

E5. LOAD COMBINATIONS

The vertical and horizontal loads that derive from rail traffic, including dynamic effects, must be considered in combination 1 only.

E6. DESIGN LIVE LOADS

For primary and secondary railway live loads, γ_{fL} must be as follows :

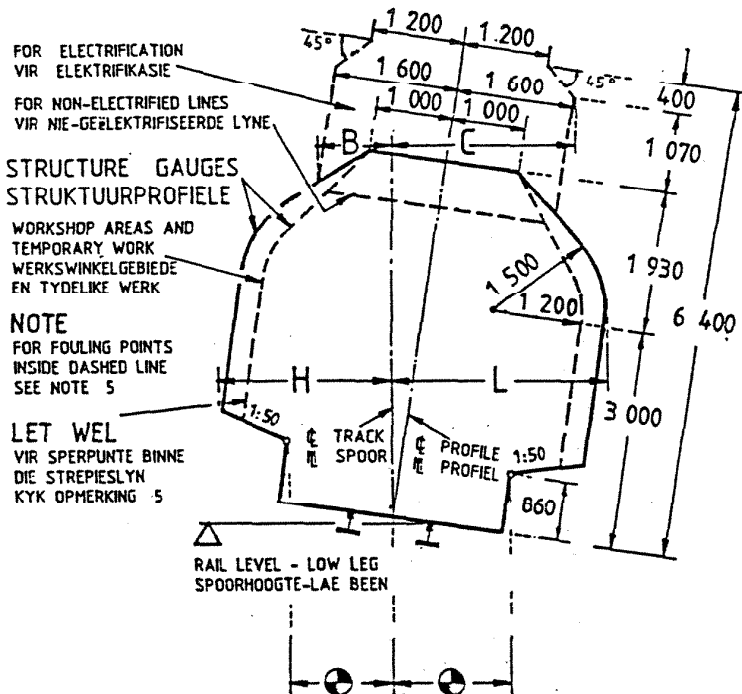
	ULTIMATE LIMIT STATE			SERVICEABILITY LIMIT STATE		
Combinations	1	2	3	1	2	3
γ_{fL}	1,5	-	-	1,0	-	-

E7. HANDRAILS

Where provided, handrails must be designed to resist a nominal load of 1.5 kN/m, acting on the top rail.

HORIZONTAL CLEARANCES HORIZONTAL VRY RUIMTES

TRACK GAUGE
SPOORWYDTE 1 065 mm



SEE PLATFORMS IN ANNEXURE 4
KYK PLATFORMS IN BYLAE 4

RADIUS m	B mm	C mm
90	1 130	2 100
300	1 250	1 900
600	1 340	1 830
1 000	1 380	1 760
2 000	1 440	1 660
3 000	1 500	1 600
5 000 AND OVER INCLUDING STRAIGHTS	1 600	1 600

STRAAL m	H WITH CANT mm	L WITH CANT mm	NO CANT H & L
90	2 730	3 090	2 780
100	2 700	3 030	2 750
120	2 650	2 970	2 700
140	2 620	2 920	2 660
170	2 590	2 870	2 630
200	2 570	2 820	2 600
250	2 550	2 790	2 580
300	2 540	2 760	2 560
350	2 530	2 730	2 540
400	2 520	2 710	2 530
500	2 510	2 680	2 520
600	2 500	2 660	2 510
800	2 490	2 620	2 500
1 000	2 480	2 600	2 490
1 200	2 480	2 580	2 490
1 500	2 480	2 550	2 480
2 000	2 480	2 500	2 480
3 000	2 470	2 470	2 470
5 000 EN DOR, REGUIT GEDEELTES INGESLUIT	2 460	2 460	2 460

1 USE OF TABLES

- H IS THE REQUIRED HORIZONTAL CLEARANCE ON THE OUTSIDE OF THE CURVE BASED ON MINIMUM CANT
- L IS THE REQUIRED HORIZONTAL CLEARANCE ON THE INSIDE OF THE CURVE BASED ON MAXIMUM CANT
- FOR CURVE RADI NOT SHOWN IN TABLES USE CLEARANCES FOR NEXT SMALLER RADIUS EXCEPT IN THE CASE OF B WHERE NEXT LARGER RADIUS APPLIES THE DISTRICT ENGINEER MAY INTERPOLATE WHEN NECESSARY
- FOR WORKSHOP AREAS AND TEMPORARY WORK CLEARANCES H AND L MAY BE REDUCED BY 300 mm

2 APPLICATION AT CURVES

APPLY CLEARANCES FOR CURVES UP TO POINTS 3m BEYOND THE ENDS OF THE CIRCULAR CURVE.
FOR TRANSITIONED CURVES, REDUCE CLEARANCES TO THE CLEARANCES FOR STRAIGHT TRACK AT A UNIFORM RATE OVER THE REMAINDER OF THE TRANSITION CURVE.

FOR NON - TRANSITIONED CURVES, REDUCE CLEARANCES TO THE CLEARANCES FOR STRAIGHT TRACK AT A UNIFORM RATE OVER A FURTHER 15m.

3 NEW STRUCTURES

SEE BRIDGE CODE

4 TUNNELS

SEE DRAWING BE 82-35

5 FOULING POINTS

SEE CLAUSE 9015 OF PERMANENT WAY INSTRUCTIONS

ALLOWANCE FOR CURVATURE IS BASED ON 15 000 mm BOGIE CENTRES AND 21 200 mm VEHICLE BODY LENGTH

1 GEBRUIK VAN TABELLE

- H IS DIE VEREISTE HORIZONTAL VRY RUIMTE AAN DIE BUITEKANT VAN DIE DRAAI GEBASEER OP MINIMUM KANTING
- L IS DIE VEREISTE HORIZONTAL VRY RUIMTE AAN DIE BINNEKANT VAN DIE DRAAI GEBASEER OP MAXIMUM KANTING
- VIR DRAAIE MET STRALE NIE IN TABELLE AANGETOON NIE GEBRUIK VRY RUIMTE VIR VOLGENDE KLEINER STRAAL BEHALWE IN DIE GEVAL VAN B WAAR DIE VOLGENDE GROTER STRAAL VAN TOEPASSING IS DIE DISTRIKSINGENIEUR MAG INTERPOLEER WANNEER NODIG
- VIR WERKSWINKELGEBIEDE EN TYDELIKE WERK MAG VRY RUIMTES H EN L MET 300 mm VERMINDER WORD

2 TOEPASSING BY DRAAIE

PAS VRYRUIMTES TOE VIR DRAAIE TOT 3m VERBY DIE ENTE VAN DIE SIKELVORMIGE DRAAI
BY OORGANGSDRAAIE, VERMINDER DIE VRYRUIMTES EWEREDIG TOT DIE VIR REGUIT SPOORLYNE OOR DIE RES VAN DIE OORGANGSDRAAI

BY DRAAIE SONDER OORGANGSDRAAIE, VERMINDER DIE VRYRUIMTES EWEREDIG TOT DIE VIR REGUIT SPOORLYNE OOR 'N VERDERE 15m.

3 NUWE STRUKTURE

KYK BRUGKODE

4 TONNELS

KYK TEKENING BE 82-35

5 SPERPUNTE

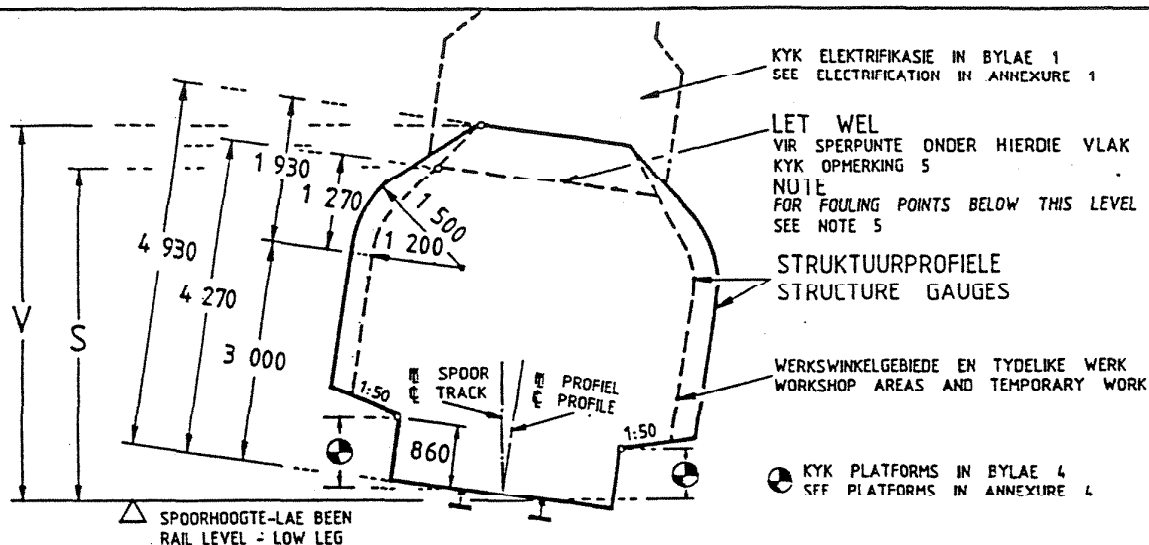
KYK KLOUSULE 9015 VAN SPOORBAANINSTRUKSIES

TOELATING VIR KROMMING IS GEBASEER OP 'N DRAAISTELHARTAFSTAND VAN 15 000 mm EN 'N VOERTUIGBAKLENGTE VAN 21 200 mm

VERTIKALE VRY RUIMTES
VERTICAL CLEARANCES

SPOORWYDTE
TRACK GAUGE

1 065 mm



LIGGING		NIE GEËLEKTRIFISEER NIE (KYK OPMERKING 1.2)	GEËLEKTRIFISEER (HUIDIG OF TOEKOMSTIG) ELECTRIFIED (PRESENT OR FUTURE)		LOCATION
		NOT ELECTRIFIED (SEE NOTE 1.2)	3 kV & 25 kV	50 kV (SISHÊN-SALDANHA)	
ALLE GEBIEDE BEHALWE HIERONDER DEUR * AANGEDUI	STRAAL m	S mm	V mm	V mm	RADIUS m
	100	4 470	5 050	5 400	100
	300	4 410	5 020	5 370	300
	600	4 370	5 000	5 350	600
	1 000	4 350	4 990	5 340	1 000
	1 500	4 310	4 960	5 310	1 500
	2 000	4 290	4 940	5 290	2 000
	3 000	4 270	4 930	5 280	3 000
5 000 EN OOR, REGUIT GEDEETES INGESLUIT	4 270	4 930	5 280	5 000 AND OVER INCLUDING STRAIGHTS	
* OOR OF NABY WISSELS EN KRUISINGS INDIEN DEUR DIE ELEKTRIESE HOOFINGENIEUR VERLANG, ONGEGAG STRAAL		—	5 650 130	6 000	* OVER OR NEAR POINTS AND CROSSINGS IF REQUIRED BY THE CHIEF ELECTRICAL ENGINEER RESPECTIVELY OF RADII

1 GEBRUIK VAN TABEL

- 1.1 V IS DIE VEREISTE VERTIKALE VRY RUIMTE BEHALWE WAAR VERMINDERDE VRY RUIMTE S VAN TOEPASSING IS
- 1.2 S IS DIE MINIMUM VERTIKALE VRY RUIMTE VIR:
(i) TYDELIKE WERK OOR NIE-GEELEKTRIFISEERDE LYN
(ii) STRUKTURE OOR NIE-GEELEKTRIFISEERDE LYN
- 1.3 VIR DRAAIE MET STRALE NIE IN TABEL AANGETOON NIE GEBRUIK VRY RUIMTE VIR VOLGENDE KLEINER STRAAL DIE DISTRIKSINGENIEUR MAG INTERPOLEER WANNEER NODIG

2 TOEPASSING BY DRAAIE

PAS VRYRUIMTES TOE VIR DRAAIË TOT 3m VERBY DIE ENTE
VAN DIE SIRKELVORMIGE DRAAI.
BY OORGANGSDRAAIË, VERMINDER DIE VRYRUIMTES EWEREDIG
TOT DIË VIR REGUIT SPOORLYNE OOR DIE RES VAN DIE
OORGANGSDRAAI.

BY DRAAIE SONDER OORGANGSDRAAIE, VERMINDER DIE
VRYRUIMTES EWEREDIG TOT DIE VIR REGUIT SPOORLYNE
DOR 'N VERDERE 15m.

3 NUWE STRUKTURE

KYK BRUGKODE

4 TONNELS

KYK TEKENING BE 02-35

5 SPERPUNTE

KYK KLOUSULE 9015 VAN SPOORBAANINSTRUKSIES

1 USE OF TABLE

- 1.1 **V** IS THE REQUIRED VERTICAL CLEARANCE EXCEPT WHERE REDUCED CLEARANCE **S** APPLIES
- 1.2 **S** IS THE MINIMUM VERTICAL CLEARANCE FOR:
- (i) TEMPORARY WORK OVER NON-ELECTRIFIED LINES
 - (ii) STRUCTURES OVER NON-ELECTRIFIED LINES
- 1.3 FOR CURVE RADI NOT SHOWN IN TABLE USE CLEARANCE FOR NEXT SMALLER RADIUS
- THE DISTRICT ENGINEER MAY INTERPOLATE WHEN NECESSARY

2 APPLICATION AT CURVES

APPLY CLEARANCES FOR CURVES UP TO POINTS 3m BEYOND THE ENDS OF THE CIRCULAR CURVE.
FOR TRANSITIONED CURVES, REDUCE CLEARANCES TO THE CLEARANCES FOR STRAIGHT TRACK AT A UNIFORM RATE OVER THE REMAINDER OF THE TRANSITION CURVE.

FOR NON - TRANSITIONED CURVES, REDUCE CLEARANCES TO THE CLEARANCES FOR STRAIGHT TRACK AT A UNIFORM RATE OVER A FURTHER 15m.

3 NEW STRUCTURES

SEE BRIDGE CODE

4 TUNNELS

SEE DRAWING BE 82-35

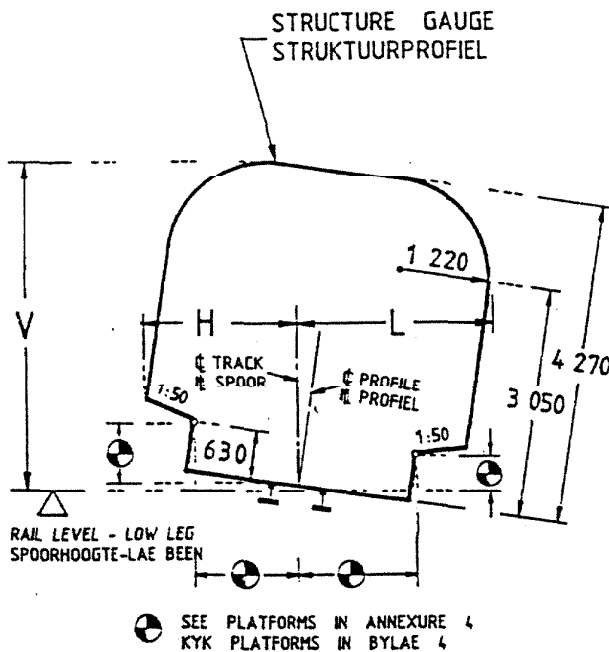
5 FOULING POINTS

SEE CLAUSE 9015 OF PERMANENT WAY INSTRUCTIONS

1990

CLEARANCES
VRY RUIMTESTRACK GAUGE
SPOORWYDTE

610 mm



RADIUS m	WITH CANT		NO CANT	V mm
	H mm	L mm	H & L mm	
50	2 370	2 490	2 400	4 320
70	2 310	2 420	2 330	4 310
100	2 260	2 370	2 280	4 310
140	2 220	2 340	2 250	4 310
200	2 200	2 300	2 220	4 300
300	2 190	2 270	2 200	4 300
500	2 180	2 230	2 190	4 290
700	2 170	2 200	2 180	4 270
1 000	2 170	2 170	2 170	4 270
2 000 AND OVER INCLUDING STRAIGHTS	2 160	2 160	2 160	4 270

1 USE OF TABLE

- 1.1 H IS THE MINIMUM HORIZONTAL CLEARANCE ON THE OUTSIDE OF THE CURVE BASED ON MINIMUM CANT
- 1.2 L IS THE MINIMUM HORIZONTAL CLEARANCE ON THE INSIDE OF THE CURVE BASED ON MAXIMUM CANT
- 1.3 V IS THE MINIMUM VERTICAL CLEARANCE
- 1.4 FOR CURVE RADII NOT SHOWN IN TABLES USE CLEARANCE FOR NEXT SMALLER RADII
THE DISTRICT ENGINEER MAY INTERPOLATE WHEN NECESSARY

2 APPLICATION AT CURVES

APPLY CLEARANCES FOR CURVES UP TO POINTS 3m BEYOND THE ENDS OF THE CIRCULAR CURVE.
FOR TRANSITIONED CURVES, REDUCE CLEARANCES TO THE CLEARANCES FOR STRAIGHT TRACK AT A UNIFORM RATE OVER THE REMAINDER OF THE TRANSITION CURVE.

FOR NON - TRANSITIONED CURVES, REDUCE CLEARANCES TO THE CLEARANCES FOR STRAIGHT TRACK AT A UNIFORM RATE OVER A FURTHER 15m.

3 NEW STRUCTURES

SEE BRIDGE CODE

4 TUNNELS

SEE DRAWING BE 82-35

5 FOULING POINTS

SEE CLAUSE 9015 OF PERMANENT WAY INSTRUCTIONS

1 GEBUIK VAN TABEL

- 1.1 H IS DIE MINIMUM HORIZONTAL VRY RUIMTE AAN DIE BUITEKANT VAN DIE DRAAI GEBaseER OP MINIMUM KANTING
- 1.2 L IS DIE MINIMUM HORIZONTAL VRY RUIMTE AAN DIE BINNEKANT VAN DIE DRAAI GEBaseER OP MAXIMUM KANTING
- 1.3 V IS DIE MINIMUM VERTIKALE VRY RUIMTE
- 1.4 VIR DRAAIE MET STRALE NIE IN TABELLE AANGEToON NIE GEBRUIK VRY RUIMTE VIR VOLGENDE KLEINER STRAAL
DIE DISTRIKSINGENIEUR MAG INTERPOLEER WANNEER NODIG

2 TOEPASSING BY DRAAIE

PAS VRYRUIMTES TOE VIR DRAAIE TOT 3m VERBY DIE ENTE VAN DIE SIKELVORMIGE DRAAI.
BY OORGANGSDRAAIE, VERMINDER DIE VRYRUIMTES EWEREDIG TOT DIE VIR REGUIT SPOORLYNE DOR DIE RES VAN DIE OORGANGSDRAAI

BY DRAAIE SONDER OORGANGSDRAAIE, VERMINDER DIE VRYRUIMTES EWEREDIG TOT DIE VIR REGUIT SPOORLYNE OOR 'N VERDERE 15m.

3 NUWE STRUKTURE

KYK BRUGKODE

4 TONNELS

KYK TEKENING BE 82-35

5 SPERPUNTE

KYK KLOUSULE 9015 VAN SPOORBAANINSTRUKSIES

ALLOWANCE FOR CURVATURE IS BASED ON 9 700 mm
BOGIE CENTRES AND 13 700 mm VEHICLE BODY LENGTH

TOELATING VIR KROMMING IS GEBaseER OP 'N DRAAISTELMANTAFSTAND
VAN 9 700 mm EN 'N VOERTUIGBAKLENGTE VAN 13 700 mm

PLATFORMS

VRY RUIMTES
CLEARANCES

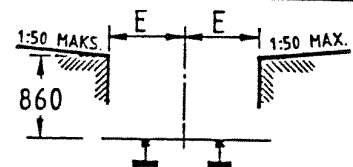
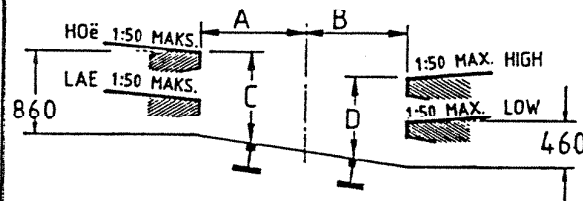
1

SPOORWYDTE
TRACK GAUGE

1 065 mm

PASSASIER / PASSENGERS

GOEDERE / GOODS



RADIUS	A	B	E	D	E
90	1 690	1 820	890	810	1 840
100	1 650	1 790	890	810	1 810
120	1 610	1 740	890	810	1 760
140	1 580	1 700	890	810	1 720
170	1 550	1 660	890	810	1 690
200	1 530	1 630	890	820	1 670
250	1 520	1 600	890	820	1 640
300	1 520	1 580	890	830	1 620
350	1 520	1 560	880	830	1 600
400	1 520	1 550	880	840	1 590
500	1 520	1 540	880	850	1 580
600	1 520	1 530	870	850	1 570
800	1 520	1 520	860	860	1 560
1 200	1 520	1 520	860	860	1 550
2 000	1 520	1 520	860	860	1 540
3 000	1 520	1 520	860	860	1 530
REGUIT	1 520	1 520	860	860	1 520

KANTING

GEEN KANTING
WORD VOORSIEN
NIE BEHALWE
WANNEER DIE
GOEDERE
PLATFORM
LANGS 'N
LOOPLYN IS

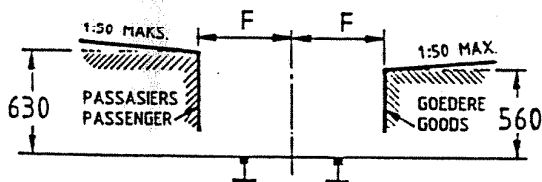
CANT

NO CANT TO
BE APPLIED
EXCEPT WHEN
THE GOODS
PLATFORM
IS ON A
RUNNING LINE

2

SPOORWYDTE
TRACK GAUGE

610 mm

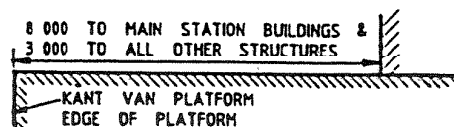
ALLE PLATFORMS
ALL PLATFORMS

(GEEN KANTING / NO CANT)

RADIUS	F
50	1 550
60	1 510
80	1 460
100	1 430
120	1 410
140	1 390
170	1 380

RADIUS	F
200	1 370
250	1 360
300	1 350
600	1 330
1 000	1 320
2 000	1 320
REGUIT	1 310

3

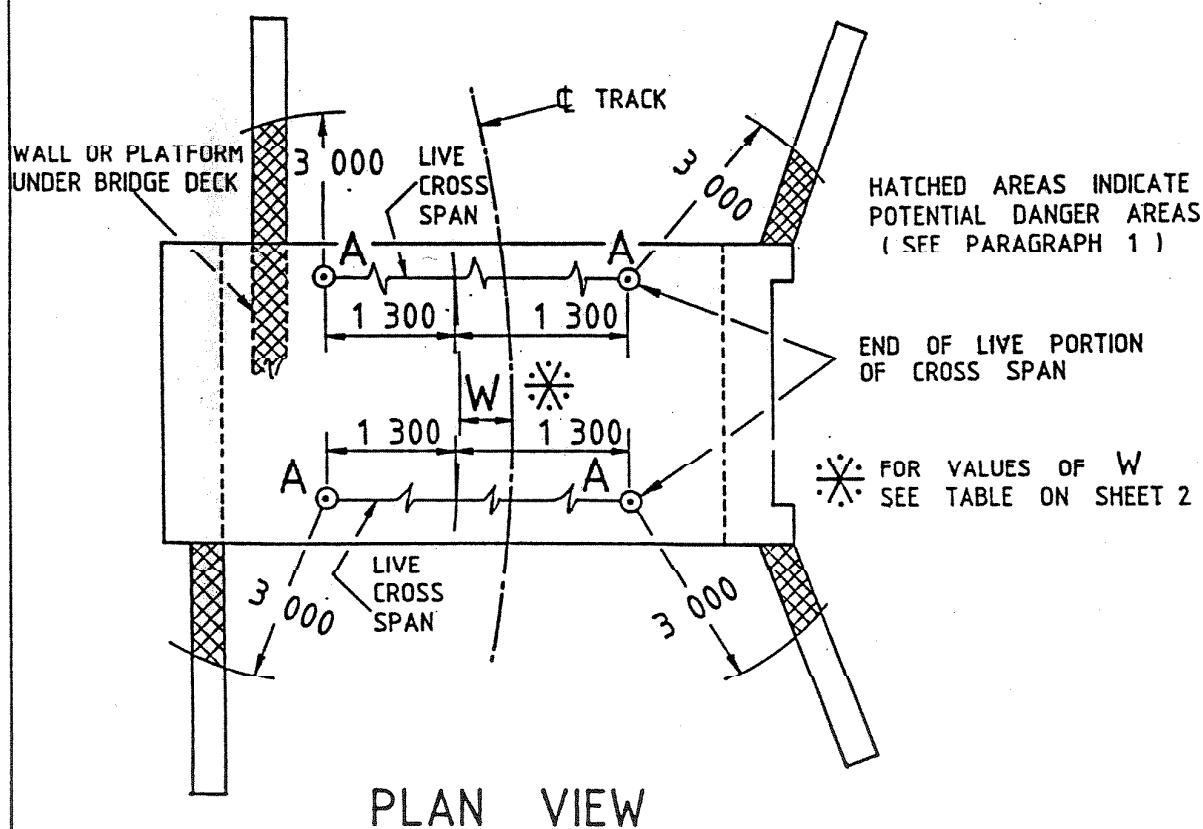
STRUKTURE OP PLATFORMS
STRUCTURES ON PLATFORMS1 065 EN 610 SPOORWYDTE
AND TRACK GAUGE

VIR DRAAIE MET STRALE NIE IN TABELLE AANGETOON NIE
GEBRUIK VRY RUIMTE VIR VOLGENDE KLEINER STRAAL
BEHALWE IN DIE GEVAL VAN C WAAR DIE VOLGENDE
GROTER STRAAL VAN TOEPASSING IS
DIE DISTRIKSINGENIEUR MAG INTERPOLEER WANNEER NODIG

FOR CURVE RADII NOT SHOWN IN TABLES USE CLEARANCE
FOR NEXT SMALLER RADIUS EXCEPT IN THE CASE OF C
WHEN NEXT LARGER RADIUS APPLIES
THE DISTRICT ENGINEER MAY INTERPOLATE WHEN NECESSARY

CLEARANCES REQUIRED FOR COMPLIANCE WITH HIGH VOLTAGE REGULATIONS 3 kV FIXED OR SPRING TENSIONING

1. The top of any wall or platform at a bridge crossing 3 kV fixed or spring tensioned electrified track must be clear of the clearance lines in diagram 1 on sheet 2 if the following 3 conditions apply simultaneously:
 - (i) Live cross spans are provided under the bridge deck.
 - (ii) The top of the wall or platform is less than 3 000 mm from the points marked "A" in the plan view below, measured horizontally.
 - (iii) The top of the wall or platform is more than 300 mm below the plane containing the deck soffit but not less than 900 mm above adjacent rail level.
2. If one or more of these 3 conditions do not apply, the top of the wall or platform must be clear of the clearance line in diagram 2. This requirement applies also to walls and platforms not in the vicinity of bridges.



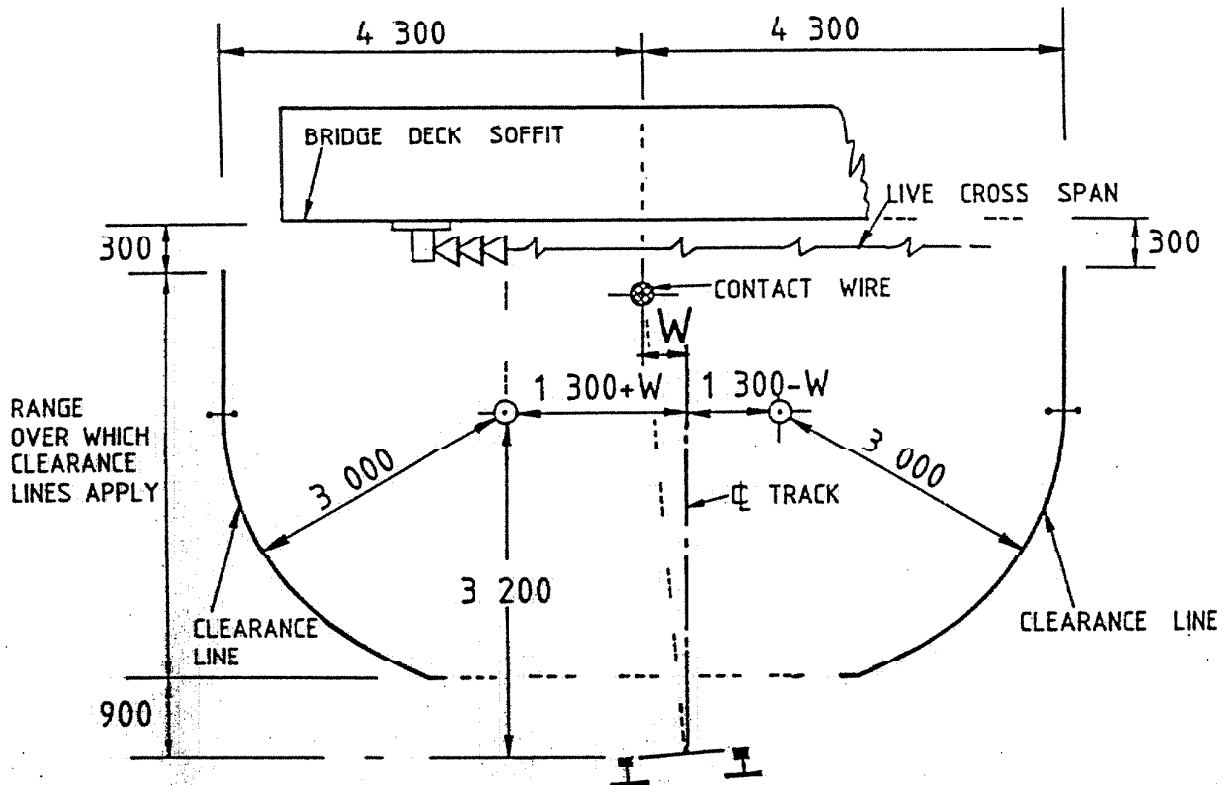


DIAGRAM 1

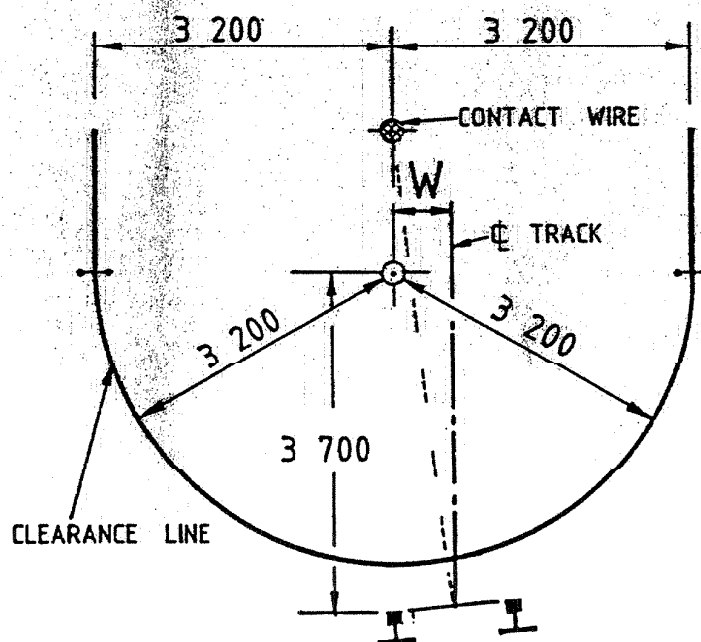
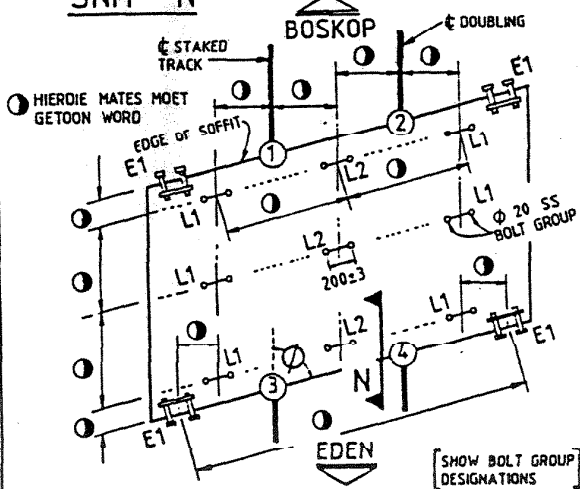
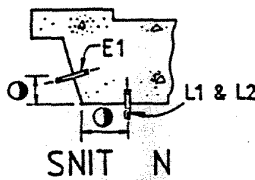
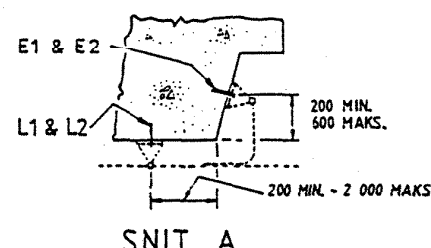


DIAGRAM 2

TRACK RAD m	W mm
140	460
200	420
300	370
400	340
600	280
800	240
1 200	160
2 000	110
3 000	60
> 5 000	NIL

SECTIONS IN DIAGRAMS 1 & 2
ARE AT RIGHT ANGLES TO TRACK



SLEUTELPLAN WAT BOUTGROEPE VIR ELEKTRIFIKASIESTEUNE TOON
 TIPIESE VEREISTES VIR
 ALGEMENE RANGSKIKKINGSPLANNE

[APARTE KLEIN
 SKAAL TEKEN]

DRAWN <i>[Signature]</i>	CHECKED <i>[Signature]</i>
--------------------------	----------------------------

NOTES

- 1 THE FOLLOWING CASES MUST BE REFERRED TO THE CHIEF CIVIL ENGINEER:-
 - (a) VERTICAL CLEARANCE EXCEEDING 5.6 m AT ANY POINT BELOW DECK.
 - (b) POINTS AND CROSSINGS OR CROSS-OVERS LOCATED UNDER OR ADJACENT TO BRIDGE.
- 2 IN THE CASE OF MULTIPLE SPAN BRIDGES, THE EARTH CROSS SPAN MAY BE CONTINUOUS OVER THE FULL LENGTH OF THE BRIDGE
E.E. ONLY 2 END-BRACKETS E1 ARE REQUIRED WITH INTERMEDIATE F2 BRACKETS AT DISTANCES NOT EXCEEDING 13 m.

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FIXED & SPRING TENSION 3 kV VASTE & VEERSPANNING

ATTACHMENT OF OVERHEAD TRACK EQUIPMENT TO BRIDGES

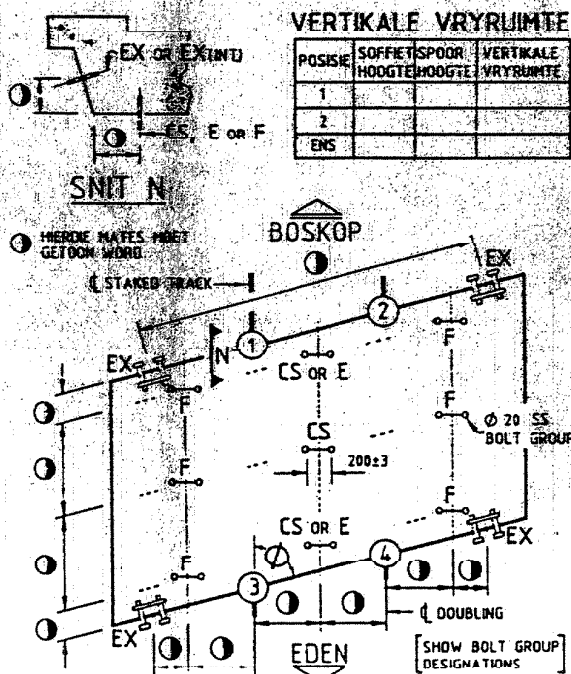
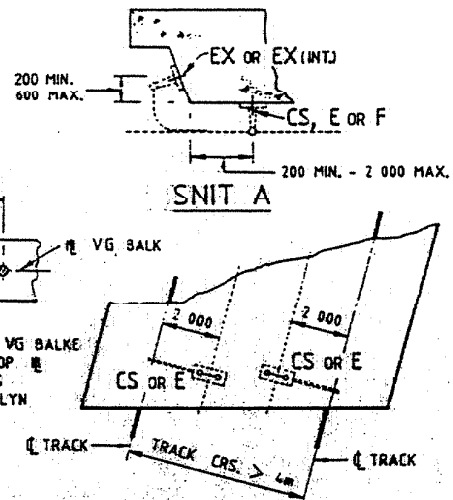
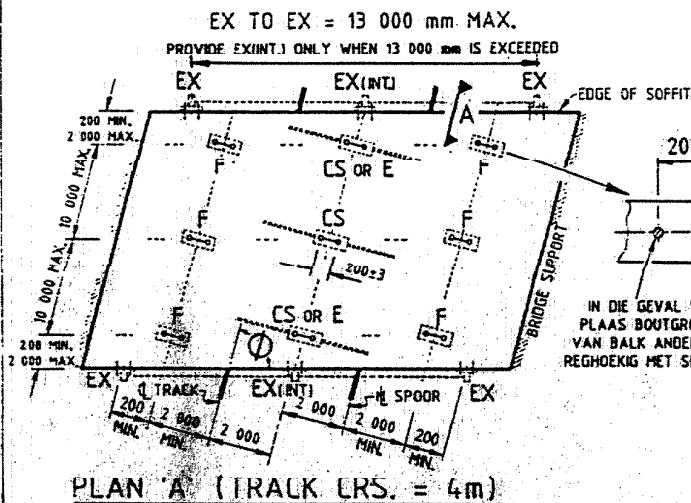
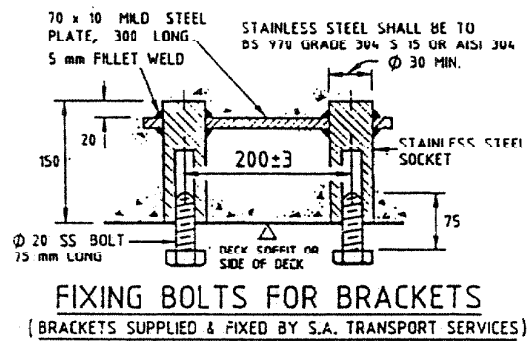
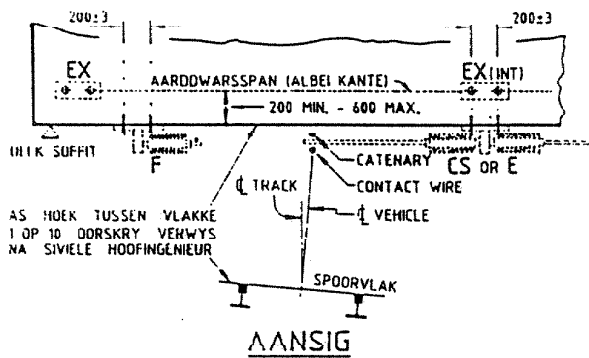
VASMAAK VAN
BOBAANTOERUSTING
AAN BRÛE

SEN. DESIGN ENG
(BRIDGES)

CHIEF CIVIL ENG
DATE 1993-04-21

SECTION 507
FILE 19/11/3/5

PLAN NO.
BE 82-02
AMENDMENT



BOLT GROUP DESIGNATIONS

CS	=	CATENARY SYSTEM BOLT GROUP
E	=	EARTH BRACKET BOLT GROUP
F	=	FEEDER CONDUCTOR BOLT GROUP
EX & EX(INT)	=	EARTH CROSS SPAN BOLT GROUP

NOTES

- THE FOLLOWING CASES MUST BE REFERRED TO THE CHIEF CIVIL ENGINEER:
 - VERTICAL CLEARANCE EXCEEDING 5.6 m AT ANY POINT BELOW DECK.
 - POINTS AND CROSSINGS OR CROSS-OVERS LOCATED UNDER OR ADJACENT TO BRIDGE.
 - SINGLE TRACK UNDERPASSES.
- IN THE CASE OF MULTIPLE SPAN BRIDGES, THE EARTH CROSS SPAN MAY BE CONTINUOUS OVER THE FULL LENGTH OF THE BRIDGE I.E. ONLY 2 END-BRACKETS EX ARE REQUIRED WITH EX(INT) BRACKETS AT DISTANCES NOT EXCEEDING 13 m.

SLEUTELPLAN WAT BOUTGROEPE VIR ELEKTRIFIKASIESTEUNE TOON

TIPIESE VEREISTES VIR ALGEMENE RANGSKIKKINGSPLANNE

[APARTE KLEIN SKAAL TEKENING]

DRAWN *delator* CHECKED *delator*

S.A. TRANSPORT SERVICES JOHANNESBURG S.A. VERVOERDIENSTE

AUTO TENSION 3kV AUTO SPANNING

ATTACHMENT OF OVERHEAD TRACK EQUIPMENT TO BRIDGES

VASMAAK VAN BOBAANTOERUSTING AAN BRGE

SEN. DESIGN ENG. (BRIDGES)

7 CHIEF CIVIL ENG.

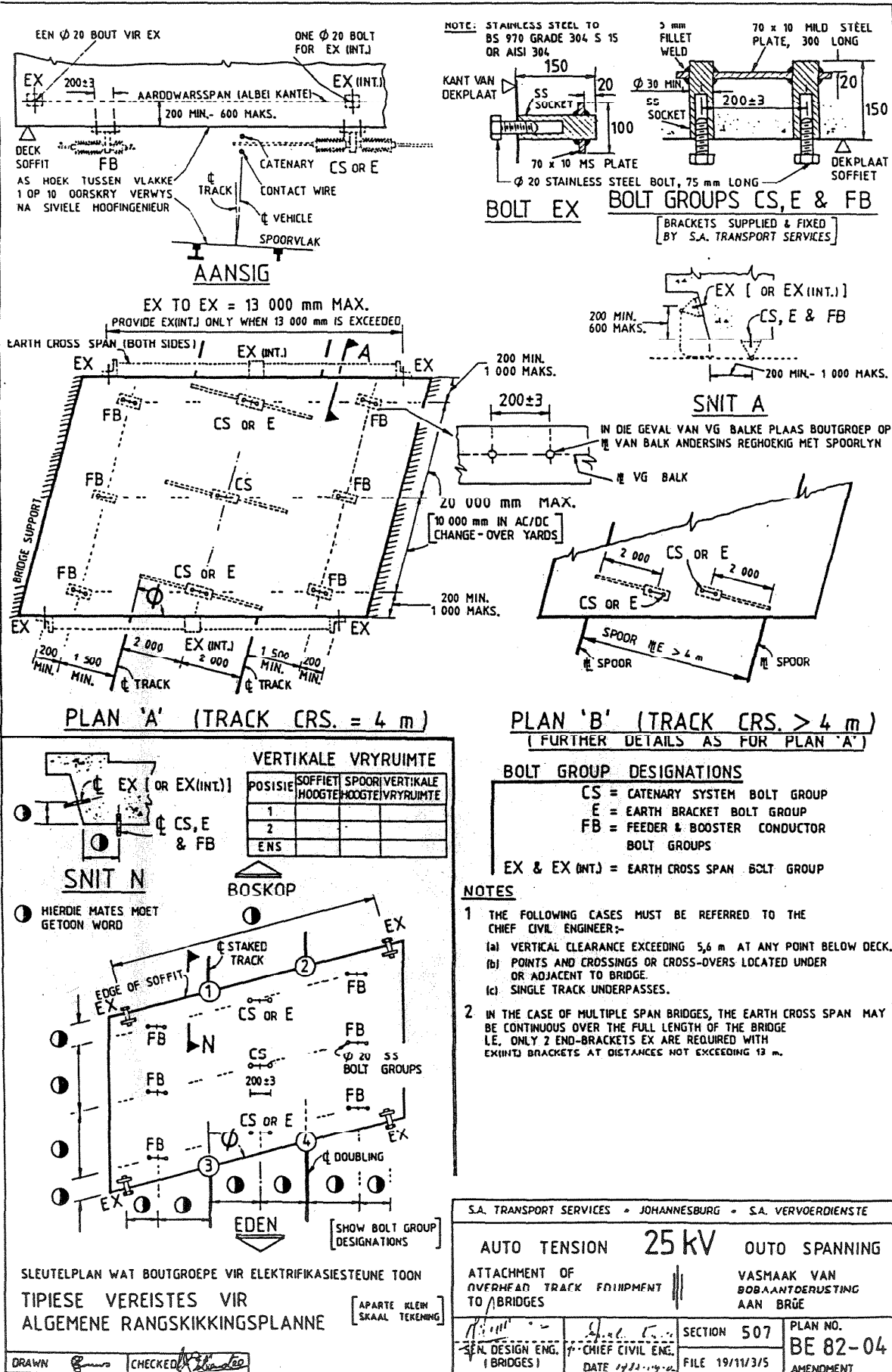
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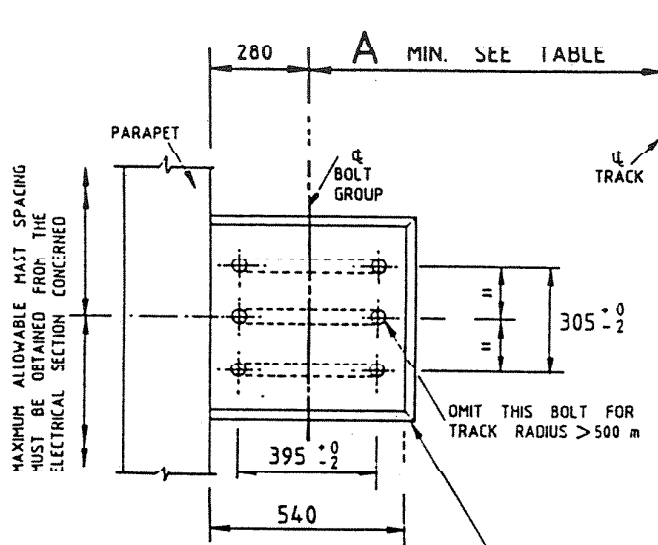
SECTION 507

FILE 19/11/3/5

PLAN NO. BE 82-03

AMENDMENT



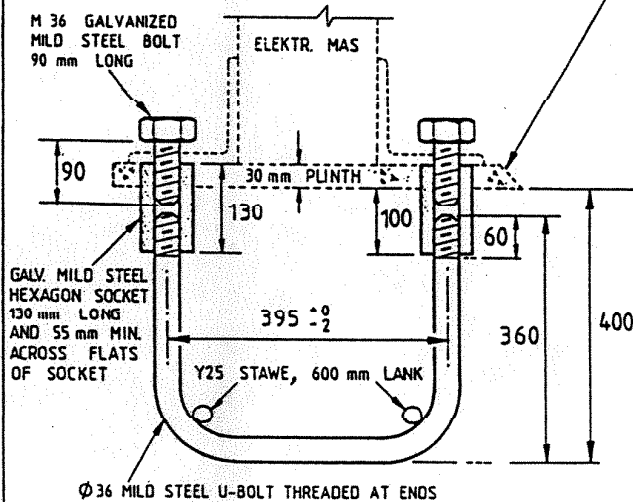


PLAN VIEW ON BOLT GROUP

TRACK RADIUS (m)	A (mm) MIN.	
	INSIDE OF CURVE	OUTSIDE OF CURVE
200	2 930	2 720
300	2 870	
400	2 840	
500	2 810	
600	2 780	
700	2 750	
800 AND OVER, INCLUDING STRAIGHTS	2 720	

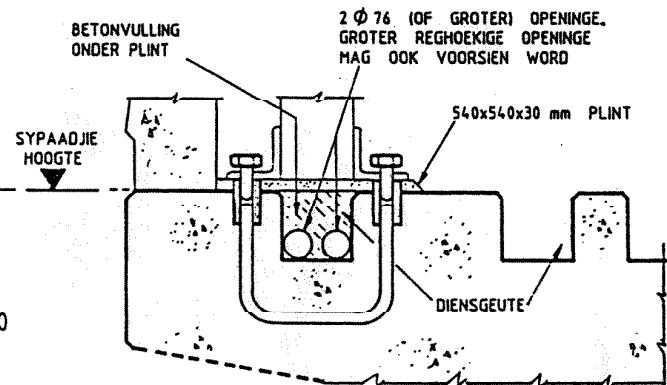
540 x 540 x 30 mm PLINTH

- (i) 1:2 CEMENT / SAND MIX
- (ii) TOPS OF SOCKETS MUST LIE IN A PERFECTLY HORIZONTAL PLANE AFTER DECK CONCRETING HAS BEEN COMPLETED
- (iii) PLINTH MUST BE CAST FLUSH WITH SOCKETS & SCREEDED LEVEL



BOUT DETAIL

NOTE: GALVANIZING OF BOLTS AND SOCKETS TO SABS 763



BOUTGROEP BY OOP DIENSGEUTE

S.A. TRANSPORT SERVICES • JOHANNESBURG • S.A. VERVOERDIENSTE

HOLDING DOWN BOLTS
FOR ELECTR. MASTS
ON BRIDGE DECKSANKERBOUTE
VIR ELEKTR. MASTE
OP BRUGDEKKEDRAWN *Bous* CHECKED *Qghat*SEN: DESIGN ENG.
(BRIDGES)CHIEF CIVIL ENG.
DATE 19/11/3/5SECTION 507
FILE 19/11/3/5PLAN NO.
BE 82-05
AMENDMENT

SURVEY DATA REQUIRED FOR PREPARATION OF SITE PLAN

Angle of intersection between road and rail centre lines.

Rail kilometrage of point of intersection.

Rail kilometrage of existing level crossings.

Rail levels (low leg on curves).

Radii of road and rail curves.

Rail kilometre and grade posts.

Kilometre distance along road and rail.

Turnouts (Give distance along track if unable to show positions).

Signals (" " " " " " " ").

Signal wire runs.

Electrification masts.

Telephone and telegraph routes.

Power routes.

Cables (signal, power and communication).

Water mains.

Other services such as sewer, stormwater and gas.

Manholes.

Spot levels.

Road levels.

Cuttings and banks (road and rail).

Fences and land beacons.

Servitudes.

Culverts.

Natural drainage and drainage improvements.

Structures affected by planning.

Access to adjoining properties.

Position of foundation test holes with reduced ground levels.

North point.

Any special features.