RFQ / TENDER

Tender No: ERACNL3525

Vendor No: 11001386

BOARD LIST
BOARD LIST
TRANSNET FREIGHT RAIL
PROCUREMENT DEPARTMENT
2000

Purchaser : Nozipo Luzipo
Telephone : 012 315 4123
Fax Number: [redacted]

Please quote reference:
H10/6000618827

Deliver to:
Company
TFR Pretoria
Supply Chain Services
34 Carlton Centre
0001 Johannesburg

Closing Date [redacted] **:25.01.2016**
Validity Date :30.04.2016
RFQ No :6000618827

1. RETURN OF QUOTATION/S:

1.1 QUOTATION/S MUST BE SUBMITTED PUNCTUALLY AT 10:00 ON THE CLOSING DATE AND LATE QUOTATIONS WILL NOT BE CONSIDERED.

1.2 IF DELIVERED BY HAND:

THE CHAIRMAN
TRANSNET FREIGHT RAIL ACQUISITION COUNCIL
GROUND FLOOR, INYANDA HOUSE
21 WELLINGTON ROAD
PARKTOWN
JOHANNESBURG
2001

1.4 IF FAXED:

[redacted] **011 774 9129**
011 774 9186

CONTACT NO'S: THULI MATHEBULA - 011 544 9497
LOLO SOKHELA - 011 544 9494
PRUDENCE NKABINDE - 011 544 9486

2. CONDITIONS:

2.2 ANY PURCHASE ORDER PLACED AS A RESULT OF YOUR QUOTATION WILL BE SUBJECT TO THE STANDARD TERMS AND CONDITIONS OF CONTRACT, FORM US7, (LATEST) AND THE GENERAL TENDER CONDITIONS, FORM CSS5 (LATEST) AND CONDITIONS MENTIONED HEREIN.

2.3 TENDERERS MAY OFFER AN EARLIER VALIDITY DATE, BUT THEIR QUOTATION MAY, IN THAT EVENT, BE DISREGARDED FOR THIS REASON.

2.4 TENDERERS ARE REQUIRED TO OFFER ONLY FIRM PRICES. PRICES SUBJECT TO REVIEW IN TERMS OF CLAUSE 32 OF FORM US7 WILL ONLY BE CONSIDERED SHOULD THE DELIVERY PERIOD REQUIRED EXCEED 6 MONTHS.

2.5 BEST DELIVERY TIME MUST BE OFFERED.

DATE: ..... SIGNATURE OF TENDERER(S): ....

CONTACT PERSON: ..... TEL No: .....

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2.6 DISCOUNT (TRADE DISCOUNT)/CASH DISCOUNT (CONDITONAL DISCOUNT)/ VALUE ADDED TAX (VAT) MUST BE SHOWN SEPARATELY.

2.7 TRANSNET RESERVES THE RIGHT TO NEGOTIATE PRICES AND COMMERCIAL ASPECTS AFTER THE CLOSING DATE

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2.8 DIRECT DELIVERY INTIMATES DELIVERY BEING EFFECTED INTO THE WAREHOUSE OR THE ACTUAL POINT OF SUPPLY AND SHOULD THEREFORE INCLUDE ANY TRANSPORTATION MODE DEEMED NECESSARY IN EXECUTING THIS METHOD OF DELIVERY BASIS IN ORDER TO MEET THE REQUIRED DELIVERY DATE.

TAX CLEARANCE CERTIFICATES:
The Regulations in terms of the Public Finance Management Act, 1999: Framework for Supply Chain Management as published in Government Gazette No. 25767 dated 5 December 2003, Clause 9 (1) (d), stipulates that the accounting officer or accounting authority of an institution to which these regulations apply must reject any bid from a supplier who fails to provide written proof from the South African Revenue that the supplier either has no outstanding tax obligations or has made arrangements to meet outstanding tax obligations.
Tenderers will be disqualified if a valid tax clearance certificate or written proof from the South African Revenue Service that supplier has made arrangements to meet outstanding tax obligations is not submitted with the tender.

BROAD BASED BLACK ECONOMIC EMPOWERMENT (BBBEE)
Transnet fully endorses and supports the Government's Broad-based Black Economic Empowerment Programme and it is strongly of the opinion that all South African Business Enterprises have an equal obligation to redress the imbalances of the past.
Transnet will therefore prefer to do business with local business enterprises who share these same values. Transnet will endeavour to do business with local business enterprises that possess a BBBEE "recognition level" of at least a level 5. Transnet urges Tenderers (large enterprises and QSE's - see below) to have themselves accredited by any one of the various Accreditation Agencies available, who do their BBBEE ratings in accordance with the latest Codes (i.e. those promulgated on 9 February 2007) and whose names appear on the present ABVA (Association of BEE Verification Agencies) - "List of Full Members" as displayed on the ABVA website (www.abva.co.za).
Although no agencies have, as yet, been accredited by SANAS (SA National Accreditation System), Transnet will, in the interim, accept rating certificates of tenderers who have been verified by any of the listed agencies.

Enterprises will be rated by such agency based on the following:
1. Large Enterprises (i.e. annual turnover >R35million:
" Rating level based on all seven elements of the BBBEE scorecard.

2. Qualifying Small Enterprises - (QSE) (i.e. annual turnover >R5million but <R35million:
" Rating based on any four elements of the BBBEE scorecard.

NB:
3. Emerging Micro Enterprises - (EME) (i.e. annual turnover <R5m) are exempted from being rated/verified:
" Automatic rating of Level 4 BBBEE irrespective of race of ownership, i.e. 100% BBBEE recognition
" Black ownership >50% or Black Women ownership >30% automatically qualifies as Level 3 BBBEE, i.e. 110% BBBEE recognition
" EME's should provide certified documentary proof of annual turnover (i.e. audited financials) plus proof of Black ownership if Black ownership >50% or Black Women ownership >30% from the EME's Auditor/Accounting Officer.

4. In addition to the above, Tenderers who wish to enter into a Joint Venture or subcontract portions of the contract to BBBEE companies, must state in their tenders the percentage of the total contract value that will be allocated to such BBBEE companies, should they be successful in being awarded any business. A rating certificate in respect of such BBBEE JV-partners and / or sub-contractor/s, as well as a breakdown of the distribution of the aforementioned percentage must also be furnished

In view of the high emphasis which Transnet places on Broad-based Black Economic Empowerment, Transnet will allow certain preference points for BBBEE in the evaluation of all responses. Depending upon the value of the ensuing business award (i.e. below or in excess of R2m), the 80/20 or 90/10 point preference systems will be utilized where BBBEE will count out of 20 or 10 respectively in the evaluation process.

EACH RESPONDENT IS REQUIRED TO FURNISH PROOF OF THE ABOVE TO TRANSNET. FAILURE TO DO SO WILL RESULT IN A

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SCORE OF ZERO BEING ALLOCATED FOR BBBEE.

Turnover: Kindly indicate your company's annual turnover for the past year R_____

" If annual turnover <R5m, please attach certified confirmation from your Auditor/Accounting Officer
" If annual turnover >R5m please attach original or certified copy of accreditation certificate and detailed scorecard by an ABVA accreditation agency (registered as a "Full Member")

PAYMENT TERMS

The following payment terms will apply as from 1 October 2008.
" All suppliers will be paid 30 days from receipt of month end statement, i.e. payment term F055.
" All CIDB suppliers will be paid 21 days from date of invoice, i.e. payment term F057.

SCHEDULE OF REQUIREMENTS

TENDERERS SHOULD INSERT THEIR PRICE/S UNDER THE APPROPRIATE HEADINGS HEREUNDER.

IN THIS REGARD THE TENDERER'S ATTENTION IS DIRECTED TO PARAGRAPH 16 OF FORM CSS5 (LATEST).

NB. TENDERERS OFFERING GOODS FROM IMPORTED SUPPLIES MUST SUBMIT THEIR PRICES ON THE DELIVERY BASIS APPEARING UNDER COLUMN (C) OF THIS SCHEDULE OF REQUIREMENTS.

We urge our clients & suppliers to report fraud/corruption at Transnet to TIP-OFFS ANONYMOUS: 0800 003 056.

"Transnet insists on honesty and integrity beyond reproach at all times and will not tolerate any form of improper influencing, bribery, corruption, fraud, or any other unethical conduct on the part of bidders/ Transnet employees. If, in the opinion of Transnet's Chief Operating Officer, a Tenderer / Contractor / Supplier has or has caused to be promised, offered or given to any Transnet Employee, any bribe, commission, gift, loan, advantage or other consideration, Transnet shall be entitled to revoke the tender / contract by following its internal policies that govern the Exclusion process. In such an event Transnet will be entitled to place any Tenderer / Contractor / Supplier who has contravened the provisions of Transnet's business ethics on its List of Excluded Tenderers. This List will also be distributed to all other State Owned Enterprises and Goverment Departments.

Transnet invites its valued suppliers to report any allegations of fraud Corruption or other unethical activities to Transnet Tip-offs Anonymous, at any of the following addresses / contact numbers:-
* Toll-free anonymous hotline- 0800 003 056
* Email - Transnet@tip-offs.com
* Fax number - 0800 007 788
* Freepost DN 298, Umhlanga Rocks, 4320

DISCLAIMERS

TRANSNET IS NOT COMMITTED TO ANY COURSE OF ACTION AS A RESULT OF ITS ISSUANCE OF THIS RFQ AND/OR ITS RECEIPT OF A QUOTATION IN RESPONSE TO IT
PLEASE NOTE THAT TRANSNET RESERVES THE RIGHT TO:

DATE: ..... SIGNATURE OF TENDERER(S): ....

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* MODIFY THE RFQ'S GOODS/SERVICES AND REQUEST RESPONDENTS TO RE-BID ON ANY CHANGES;
*REJECT ANY QUOTATION WHICH DOES NOT CONFORM TO INSTRUCTIONS AND SPECIFICATIONS WHICH ARE DETAILED HEREIN;
*DISQUALIFY QUOTATIONS SUBMITTED AFTER THE STATED SUBMISSION DEADLINE;
*NOT NECESSARILY ACCEPT THE LOWEST PRICED QUOTATION;
*REJECT ALL QUOTATIONS, IF IT SO DECIDES;
*PLACE AN ORDER IN CONNECTION WITH THIS QUOTATION AT ANY TIME AFTER THE RFQ'S CLOSING DATE;
*AWARD ONLY A PORTION OF THE PROPOSED GOODS/SERVICE WHICH ARE REFLECTED IN THE SCOPE OF THIS RFQ;
*SPLIT THE AWARD OF THE ORDER/S BETWEEN MORE THAN ONE SUPPLIER/SERVICE PROVIDER; OR
*MAKE NO AWARD AT ALL

TRANSNET RESERVES THE RIGHT TO AWARD BUSINESS TO THE HIGHEST SCORING BIDDER/S UNLESS OBJECTIVE CRITERIA JUSTIFY THE AWARD TO ANOTHER BIDDER

EVALUATION METHODOLOGY

IN THIS RFQ THE 80/20 POINT PREFERENCE SYSTEM WILL BE UTILIZED WHERE BBBEE WILL COUNT OUT OF 20 AND PRICE WILL COUNT OUT OF 80 RESPECTIVELY IN THE EVALUATION PROCESS.

TOTAL TENDER VALUE: _____

Item	Qty	Material	Description
00010	2		Non-Spring controlled Pantograph

R.....
Each

Delivery Date: 15.03.2016

FULL DETAILS OF DESCRIPTION
PLEASE NOTE

QUOTES ARE REQUIRED FOR THE DIRECT AIR CONTROLLED TYPE TRIAL PANTOGRAPHS TECHNICAL REQUIRE,ENTS FOR UTILISATION ON 3KV DC, 25KV AC AND DUAL VOLTAGE LOCOMOTIVES.

PLEASE NOTE YOU ARE REQUIRED TO COMPLY WITH THE ATTACHED SPECIFICATION - BBG1857 VERSION 1.

ATTACHED TO THIS RFQ ARE MANDATORY RETURNABLE DOCUMENTS, FAILURE TO SUBMIT THESE DOCUMENTS WILL RESULT IN BEING DISQUALIFIED FUTHER FOR PRICE AND BBBEE :
1) CLAUSE BY CLAUSE COMPLIANCE TO PROJECT SPECIFICATION.
2) ANNEXURE A ON SPECIFICATION BBG1857 VERSION 1.

ENQUIRIES : ASHEEN SINGH 012 315 2357

DATE: ..... SIGNATURE OF TENDERER(S): ....

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3. ADDITIONAL INFORMATION REQUIRED: (WHERE APPLICABLE)

3.1 THE FOLLOWING ADDITIONAL INFORMATION IS REQUIRED:

(A) DISCOUNT: .....

(B) SETTLEMENT DISCOUNT:.....

(C) PRICE/S FIRM: .....

(D) PRICE/S FIRM UNTIL ..... THEREAFTER SUBJECT TO REVIEW.

(E) PRICE/S NOT FIRM: .....

(F) SABS MARK: .....

(G) SABS PERMIT NO: .....

(H) BRAND/MAKE/TYPE: .....

(I) FULL NAME AND ADDRESS OF MANUFACTURER.:

.....

.....

.....

(J) FULL NAME AND ADDRESS OF INSPECTION POINT:

.....

.....

.....

(K) COUNTRY OF ORIGIN: .....

(L) YEAR 2000 CONTRACT COMPLIANT :

Vendors/Proposers shall indicate their year 2000 compliance with :

A. Technology Products,
B. Equipment, Products, Components or Parts
C. "Products" and Services

Non-Compliance with either (A) or (B) shall result in your bid/proposal being deemed non-responsive. Non-compliance with (C) may cause you bid/proposal to be deemed non-responsive. If you indicate that none of the following apply, please provide a written justification for your determination. Transnet will review this justification and will make a final determination.

"Year 2000 Compliant" means that (A) the Information Technology (B) Equipment/Products/Components/Parts (Collectively "Products")supplied (C)"Products" and Services contracted, will accurately process date and time data from into and between the 20th and 21st centuries. The year 1999 and 2000 and for all leap years. "Process date and time data" includes, but is not limited to, data calculation, logistical functions, program branching, format conversion, edits and validations, and the use of dates in comparisons, sorting, sequencing, merging, retrieving,searching and indexing. Furthermore, year 2000 compliant, when (A) used in combination with other information technology, (B) used in combination with other products, (C) used in combination with their (Vendor) other date required interfaces, shall accurately process date and time data (A) if the other technology, (B) if the other "Products", (C) either passed to or received from their other customers/suppliers,properly exchange date and time data with it/them.

Comply :_____ Does not Comply :_____Not applicable :_____

Justification : .....

(M) SURPLUS MATERIAL:

DATE: ..... SIGNATURE OF TENDERER(S): ....

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TENDERERS MUST INDICATE IF THEY WILL BE PREPARED TO PURCHASE BACK FROM TRANSNET ANY SURPLUS MATERIAL WHICH MAY BECOME AVAILABLE FROM ANY RESULTING PURCHASE ORDER/CONTRACT ORIGINATED FROM THE QUOTATION SUBMITTED:

.....

(N) PAYMENT OVERSEAS:

ONLY IF TRANSNET LIMITED IS REQUESTED BY THE TENDERER TO EFFECT PAYMENT OVERSEAS DIRECT TO THE TENDERER'S PRINCIPAL/SUPPLIER THE FOLLOWING INFORMATION IS REQUIRED:

* EXCHANGE RATE ON WHICH THE QUOTATION PRICE IS BASED: R1,00 (S.A. CURRENCY) BEING EQUAL TO ..... (FOREIGN CURRENCY)
* PERCENTAGE IN RELATION TO THE QUOTATION PRICE TO BE REMITTED OVERSEAS: .....
* NAME OF COUNTRY TO WHICH PAYMENT IS TO BE MADE: .....
* APPLICABLE DATE OF EXCHANGE RATE: .....
* BENEFICIARY'S NAME AND FULL ADDRESS: .....
* BENEFICIARY'S BANKERS AND FULL ADDRESS: .....
* APPLICABLE ACCOUNT NUMBER: .....

(O) DELIVERY DATE:

TENDERERS MUST FURNISH THEIR ACTUAL DELIVERY AND MANUFACTURNG PERIOD HEREUNDER NOTWITHSTANDING THE DELIVERY DATES SPECIFIED BY TRANSNET.

THE FOLLOWING MUST ALSO BE FURNISHED IN REGARD TO THE ABOVE:

1. PERIOD REQUIRED TO OBTAIN RAW MATERIAL. ....**(DAYS)**
2. MANUFACTURING PERIOD. ....**(DAYS)**
3. PERIOD TO TRANSPORT MATERIAL TO DESTINATION. ....**(DAYS)**

MATERIAL NO.	1.(PERIOD)	2.(PERIOD)	3.(PERIOD)

TRANSNET
freight rail

A Division of Transnet SOC Limited

TECHNOLOGY MANAGEMENT

TENDER SPECIFICATION

TRIAL PANTOGRAPH TECHNICAL REQUIREMENTS FOR UTILISATION ON 25KV AC LOCOMOTIVES WITH REDUCED AIR CLEARANCE BETWEEN PANTOGRAPH KNUCKLE END AND LOCOMOTIVE ROOF

Compiling Officer:	Engineering Technician Technology Management	F. Matoro	
Compiling and Editing Officer:	Acting CET Technology Management	A. Singh	
Edited and Approved By:	Principal Engineer Technology Management	S.E. Sibande	

Date: 25 April 2014

Circulation Restricted To: Transnet Freight Rail
Transnet and Relevant Third Parties

Table of Contents

1.0 DEFINITIONS AND ABBREVIATIONS

Pantograph	An apparatus mounted on the roof of an electric locomotive that collects power from the overhead system through contact with the contact wire
Collector head	Sub-assembly of the pantograph supported by the frame sub-assembly. Includes contact strips, horns and may include a secondary suspension
Contact strip	Replaceable component of the collector head sub-assembly which interfaces with the overhead track equipment
Length of contact strips	Total effective length of consumable material intended for normal interaction measured transversely in relation to the vehicle
Rated current, vehicle at standstill	Average value of that current withstood for 30 min by the pantograph at standstill
Static contact force	Vertical force exerted upward by the collector head on the overhead contact line system at standstill
ADD	Automatic Dropping Device
DC	Direct Current
AC	Alternating Current
TCMS	Train Control Management System
OHTE	Overhead Track Equipment

2.0 SCOPE OF SPECIFICATION

2.0.1 This specification covers the supply of pantographs, for use on 25kV AC electric locomotives with reduced air clearance between pantograph knuckle and and locomotive roof. The profile of the collector head that all suppliers shall comply to is specified.

2.0.2 LEGAL REQUIREMENTS

In addition to the requirements of the referenced specifications and standards, the mandatory requirements of The Occupational Health and Safety Act and Regulations (Act No 85 of 1993) referred to as OHSA shall be adhered to.

2.0.3 PRECEDENCE

In the event of any conflict between the various submitted relevant documents, the order of precedence shall be, and in consultation with Transnet Freight Rail, Technology Management:

- Legal and safety requirements.
- This specification.

2.0.4 TECHNICAL DEVIATIONS

No technical deviations from this specification or any other document forming part of the purchase submission shall be permitted unless approved in writing by Transnet Freight Rail, Technology Management.

3.0 CONDITIONS OF CONTRACT

3.1 This specification must be read in conjunction with the general conditions of the contract referred to in the main locomotive specification where the pantograph is supplied as part of a locomotive, as well as other Transnet, SANS and international specifications referenced in this document. Requirements on the referenced specifications are also binding in support of this specification to the benefit and with approval of Transnet.

3.2 Any deviations from the pantograph specification must be discussed, documented and approved by Transnet Freight Rail, Technology Management prior to supplier approval.

4.0 REFERENCES

4.1 The following publications/drawings are referred to herein:

4.1.1 **International Electrotechnical Commission.**

4.1.1.1 IEC61133 – 2006 : Electric traction – Rolling Stock – Test methods for electric and thermal/electric rolling stock on completion of construction and before entry into service.

4.1.3 **International Union of Railways.**

4.1.3.1 UIC Code 606 OR – 4th Edition 1-1-86: Installation of 25 kilovolts and 50 or 60 hertz overhead contact lines (1).

4.1.3.2 UIC Code 608 OR – 3rd Edition, 2003: Conditions to be complied with for the pantographs of tractive units used in international services.

4.1.4 **Transnet Freight Rail Specifications.**

4.1.4.1 CEE-0041: 25 kV AC Electrification Overhead Track Equipment.
4.1.4.2 RT/TE/SPC/0241: Specification for supply of drawings on Specinet Projects
4.1.4.3 RSE/TE/SPC/0029 Performance Specification for Pantographs for Utilisation on 3kV DC, 25/50kV AC Locomotives

4.1.5 **South African Bureau of Standards.**

4.1.5.1 1574 – 2012: Flexible cables.

4.1.6 **European Standard.**

4.1.2 **British Standard.**

4.1.2.1 BS EN 50149 – 2001: Contact wire for electric traction.

4.1.6.1 BS EN 50206-1: 2010: Railway Applications – Rolling Stock Pantographs: Characteristics and Tests Part 1: Pantographs for main line vehicles.

4.1.6.2 BS EN 50119: Railway Application – Fixed Installations – Electric traction overhead contact lines.

4.1.6.3 BS EN 50367: 2012: Railway Application - Current collection systems - Technical criteria for the interaction between pantograph and overhead line (to achieve free access)

4.1.6.4 BS EN 50388: Railway Applications - Power supply and rolling stock - Technical criteria for the coordination between power supply (substation) and rolling stock to achieve interoperability.

4.1.6.5 BS EN 50163: Railway Applications – Supply voltages of traction systems

5.0 COMPLIANCE

5.1 Tenderers must submit their main offers in terms of this specification.

5.2 Tenderers may submit alternative offers for equipment considered by them to be equal to or better than that called for in this specification.

5.2.1 Such alternative offers must be accompanied by a full explanation supporting the tendered claims regarding the suitability of the equipment.

5.3 Tenderers must indicate by clause, either that their offers comply in every respect with the specification, or, if not, precisely how they differ.

5.4 A broad statement to the effect that the equipment is in accordance with this specification is not acceptable.

5.5 Failure to comply with the above requirements may preclude a tender from consideration.

6.0 TECHNICAL DATA SHEET

6.1 Tenderers must complete the Technical Data Sheet that forms Annexure A to this specification.

6.2 Failure to complete the Technical Data Sheet may preclude a tender from consideration.

7.0 ENVIRONMENTAL CONDITIONS

7.1 The equipment is required to operate under the following conditions:

Altitude:	0 to 1980m above sea level
Ambient temperatures:	Minus (-) 10°C to plus (+) 45°C
Relative humidity:	As high as 85%
Lightning conditions:	High incidence of severe lightning
Air pollution:	Heavy saline laden atmosphere with up to 85% relative humidity – Industrial fumes – severe dust, coal and iron particle laden wind

7.2 Snow and ice conditions as well as wind velocities of up to 150 km/h are experienced in the areas in which the pantographs will operate.

8.0 SERVICE CONDITIONS

8.1 **Particulars of overhead contact wire system under which the pantograph must operate in service:**

8.1.2 Alternating Current System: (25kV)

8.1.2.1 System voltage: Nominal 25kV, Minimum 17kV, Maximum 31kV rms single phase, 50Hz.

8.1.2.2 Rated and maximum current while vehicle at standstill: 350 and 850A.

8.1.2.3 Required pantograph and collector head rated current while vehicle running: 2000A.

8.1.2.4 The normal outdoor 25kV (rms) earth clearance for electric Rolling Stock is: 320mm.

8.1.2.5 Nominal contact wire auto tensioned: 11000 Newton.

8.1.2.6 Nominal span length: 70 metres.

8.1.2.7 Overhead tensioning: Auto tensioning.

8.1.2.8 Contact wire stagger from centre line of track, Nominal: 200mm.

8.1.2.9 Contact wire stagger from centre line of track, Maximum: 260mm.

8.1.2.10 The lateral midspan displacement from the centre line of the track if all parameters are within specification: 450mm.

8.1.2.11 Maximum rate of change of contact wire height with reference to rail level at loops: 1:125.

8.1.2.12 Maximum contact wire height with reference to rail level is: 6000mm.

8.1.2.13 Normal contact wire height with reference to rail level is: 5000mm.

8.1.2.14 Minimum contact wire height with reference to rail level is: 4500mm.

8.1.2.15 Minimum contact wire height with reference to rail level in certain Direct Current sections where an Alternating Current locomotive may be hauled "dead", is: 4220mm.

8.1.2.16 The overall length of the collector head (tip to tip), must be: 1950 $^{0}_{-10}$mm.

8.1.2.17 Maximum locomotive speed: 140km/h.

8.2 Moving structure gauge

8.2.1 Running vehicle clearances and overhead clearances must be in accordance with drawing D350M.

8.3 Locomotive details

8.3.1 The mounting height, compressed air pressure, continuous current, one hour rated current and maximum safe current drawn by the locomotive must be advised by the main locomotive contractor. (Transnet will supply these details if the pantograph is for use on an existing locomotive).

9.0 GENERAL REQUIREMENTS

9.1 The pantograph must be of the single arm open type.

9.1.1 It must be braced to ensure against lateral or longitudinal deflection under the most severe operating conditions.

9.2 Provision must be made to equalise the contact pressures of the leading and trailing contact strips on the contact wire to ensure that they wear evenly.

9.3 Unless otherwise stated in this specification the pantograph must comply with the relevant sections of UIC Code 606 OR.

9.4 The pantograph must operate by means of air bellow and controlled by means of a compressed air device.

9.4.1 The air cylinder must be mounted on the pantograph itself with adequate isolation between pantograph and locomotive roof.

9.5 The contact force must remain constant as the pantograph collector head rises or lowers as the contact wire height changes over the full specified range.

9.5.1 The static uplift force must not exceed 95N under all operating heights of contact wire.

9.5.2 The contact force must not change as the direction of travel of the locomotive changes, for all speeds.

9.5.3 The contact force of the pantograph must be adjustable between 70N and 95N. The upward and downward Force Difference over the specified working range must not exceed 14N.

9.5.4 The pantograph working height range above the pantograph mounting plane must be from 500mm (minimum) to 2000mm (maximum). The pantograph manufacturer will guarantee satisfactory current collection for the working height range.

9.6 The pantograph must be designed to minimise the effects of wind on the upward/downward pressure.

9.6.1 The normal steady pantograph uplift force including changes due to aerodynamic effects (speed from zero to 140km/h in direction of travel) must not add more than 13N to the static pressure.

9.6.2 The maximum steady pantograph upward force must not exceed 118N under worst-case conditions (maximum locomotive speed and maximum wind velocity).

9.7 When in the housed position, the pantograph collector head must not lift, from the fully lowered position due to the dynamic wind effects when the locomotive is travelling at maximum speed.

9.8 The initial break from the contact wire, when lowering the pantograph must be rapid.

9.8.1 The speed of lowering must be checked as the pantograph approaches the housed position.

9.9 Provision must be made to ensure against interruptions, to the power supply to the locomotive, for small but rapid variations/irregularities in the contact wire.

9.10 The current collector head sub-assembly must remain level when the contact wire is at the extremities thereof.

9.11 The current collector head sub-assembly must be robust and must not deform or fracture due to impact with the contact wire when raising or lowering the pantograph.

9.12 The main bearings must be of the ball or roller type. All other hinge points must be provided with anti-friction easily replaceable bushes.

9.13 Grease nipples must be provided at all points requiring grease lubrication in service.

9.14 All hinged joints must be protected against the passage of current by means of tinned flexible shunt straps.

9.15 The current collector head sub-assembly must comply with the following:

9.15.1 At least two – (2) contact strips must be provided, each set having the current carrying capacity required by the respective locomotives. The minimum contact strip length shall be 950mm and as per UIC 608 and as per Transnet approval.

9.15.2 The collector head profile must be in accordance with UIC Code 608 OR, Appendix D (D.1, Envelope type 1) with the following exception:

9.15.2.1 The horns of the collector head may be straight angle defected according to UIC Code 608 OR, Appendix D (D.1, Envelope type 1) or it may be radiused according to UIC Code 608 OR, Appendix D (D.2, Envelope type 2), see Figures 1 and 2 in annexure B. Transnet prefers envelope type 1, the tenderer/supplier shall discuss the final profile with the relevant personnel in Transnet Freight Rail, Technology Management.

9.15.3 The vertical distance from the tip of the horn to the top of a new carbon contact strip, measured at the centre of the contact strip, must be a minimum of 360mm.

9.15.4 In the case of the head profile being in accordance with UIC Code 608 OR, Appendix D (D.2, Envelope type 2), the centre point of the contact strip must remain in accordance with UIC Code 608 OR, Appendix D (D.1, Envelope type 1).

9.15.5 The horn tips must be of insulating material. The insulating material must be replaceable if damaged, without having to replace the whole horn. The design length of the insulating material must be at least 200mm as shown in the UIC Code 608 OR, Appendix D (D.1, D.2, Envelope types 1 and 2).

9.15.6 The maximum total length of the housed pantograph, this is, knuckle end to collector head end (excluding the base frame insulator points) should not exceed 2100mm.

9.16 Contact strips must comprise of a single length of 32mm wide metalised carbon or of sufficient size to carry continuous rated current of 2000A or as per approval by Transnet Freight Rail, Technology Management.

9.17 To accommodate connection from the roof busbar, a suitable tinned copper terminal plate must be brazed onto the frame of the pantograph at a suitable position.

9.18 The pantograph must be capable of operating without harmful effect or sparking at any combination of current or speed attained by the locomotive.

9.19 The Main Contractor must advise the maximum height (above rail level) of the pantograph in the lowered position.

9.20 The contact point of the pantograph collector head and the overhead wire must be at the centre line of the pivot point between the locomotive body and bogie.

9.21 All nuts, bolts, washers and pins must be stainless steel with the exception of the pantograph securing bolts (if supplied), which need to be zinc electroplated.

9.22 All bushes and bearings are to be protected against the ingress of foreign matter – dust, locomotive washing solutions, saline and ore particles.

9.23 All shunt straps must be tinned.

9.24 The pantograph must remain in the housed position and prevented from being raised by external forces, when the locomotive is travelling at its design speed and no air supplied to the air cylinder.

9.25 Two methods will be considered:

9.25.1 A locking device. The locking device must be arranged to be released by the pantograph-raising device.

9.25.2 Pneumatically. Should the locomotive air supply fail, the air cylinder must lower the pantograph.

9.25.3 If the Tenderer wishes to use any other means of keeping the pantograph in the housed position, proposals must be submitted beforehand.

9.25.4 The value of the housed force must be measured by means of an instrument fixed to the collector head pivot on which an upward force is exerted.

9.26 The orientation of the pantograph must be knuckle leading on the trailing pantograph.

9.27 If a three – (3) point mounting is used, the two – (2) insulators must be mounted on the side of the base frame where the higher forces are.

9.28 The design life of the consumable parts of the pantograph structure shall be 2 x 10^6 kilometres or 4 years, whichever is sooner.

9.29 The total pantograph resistance must not exceed 1.6mΩ. This will be tested by passing 100 ampere direct current (rectified alternating current), through the pantograph and the volt drop (maximum 160mV), measured between the collector head and the power take-off connection.

9.30 All pantographs shall be equipped with ADD fitted to the collector head. The ADD design type shall be approved by Transnet. From the moment of ADD activation, the pantograph shall lower to the minimum dynamic electrical clearance in less than 3 seconds. The pantograph shall lower to the housed position in less than 10 seconds.

9.31 The ADD shall operate once the collector head experiences a force of 500N and the ADD activation and quick response shall be sensitive such that it prevents structural damage of the pantograph

regardless of the direction of locomotive travel or impact on the collector head. Type test certificates shall be presented by the contractor to Transnet Freight Rail, Technology Management for approval. Transnet shall be invited for such type tests or Transnet may provide technical assistance to assist with in service testing.

9.32 Provision must be made for an ADD activated signal to be fed back to TCMS for integration with the locomotive control system. This signal shall be exclusively for ADD activated and not confused with, for example, air leaks and other faults on the air supply system. The signal shall be in the form of 'low pressure' in a return air pipe of sufficient length to be mounted on the roof of the locomotive. The design of the pipe shall be simple such that it may be removed easily when it is not required without compromising ADD operation.

9.33 The ADD can be mounted on the pantograph strips or on the secondary suspension but must only be activated when the collector head experiences a minimum force of 500N.

9.34 The maintenance of the ADD shall be simple such that it may be performed by trained personnel at the depot.

9.35 The ADD shall initiate the immediate lowering of the pantograph in the event of collector head failure.

9.36 Impact or damage occurring to contact strips liable to cause subsequent damage to overhead contact line system shall be detected by ADD. Impacts or damages to other parts of the collector head like horns can be included in the ADD if specified by the customer.

9.37 When designing, the following characteristics shall be taken into account and approval shall be obtained from Transnet Freight Rail, Technology Management in writing:

- ADD reaction time
- ADD failure to safe condition
- ADD self-test in workshop
- ADD reliability
- ADD fatigue analysis
- ADD risk analysis
- Pantograph integrity after operation of ADD

9.38 The ADD system shall be designed to ensure that minor damage to the contact strips as may be experienced in daily service shall not cause operation of ADD system.

9.39 The ADD shall not cause additional damage to the pantograph.

10.0 INFORMATION TO BE SUBMITTED BY TENDERERS

10.1 Tenderers must state the rated and peak current carrying capacity of the pantographs offered.

10.1.1 "Rated Current" is defined as that current which can be carried for 30 minutes by a stationary pantograph without deformation or visible heating at the point of contact.

10.1.2 "Peak Current" is defined as that current, which can be carried for 30 seconds under the conditions, detailed in sub clause 10.1.1 above.

10.2 Tenderers must submit curves showing the contact force between the contact strips and the contact wire in Newton's against the working height in millimetres over the full working range of the pantograph.

10.3 The contact force must be measured by means of an approved and certified set of mass pieces attached as near as possible to the centre point of the current collector head and pulled vertically downwards, during raising and lowering movements.

10.4 The base of the pantograph-mounting frame must be considered as the zero reference point for the purposes of this specification.

10.5 The curves and design details called for in the following clauses must be submitted together with the tender documents.

10.5.1 Curves showing the lateral and the longitudinal deflections in millimetres, at the centre point of the contact strips when a force of 300 N is applied, first laterally and then longitudinally to the current collector head, horizontally in line with the contact surface, over the full working height of the pantograph.

10.5.2 Curves must be provided for the measured static upward force characteristic versus height, for nominal static force settings of 70N, 80N and 90N on the pantograph.

10.5.3 Design curves must be provided for the total mean uplift force at speeds of 80km/h, 90km/h, 120km/h and 140km/h for nominal static force settings of 70N, 80N and 90N on the pantograph. The uplift force

characteristic must be measured in **both** directions of travel. These values will be verified during acceptance tests conducted on the locomotive before entry into service.

10.5.4 Static forces measured during raising and lowering must lie within the boundaries defined in Annex A as defined in European Standard EN 50206-1, 2010 – however, for the entire operating height range.

10.5.5 Tenderers must state to what degree, these forces as specified in clause 10.5.4, may change for pantographs in-service and make recommendations when the pantograph must be removed for overhaul when these values are exceeded.

10.6 Details of the design features, which ensure that the pantograph complies with clause 9.2.

10.7 The total mass of the complete pantograph without roof mounting insulators must be stated.

10.8 Tenderers must submit full details regarding any monitoring devices the pantograph may have. These will include "Over Height" facilities, ADD and Break-Save devices.

10.9 The mounting point dimensions of the insulators must be negotiated at the time when the design of the roof equipment is finalised.

10.10 A Reliability Specification must be provided.

10.11 Maintainability must be in accordance with European Standard EN 50206-1, Clause 9.3.

10.12 Tenderers must state whether an inter-changeable collector head is available for the three voltage systems, without having to change the top frame assembly or the secondary suspension. The 3kV system presently operates with copper or carbon contact strips and the 25kV system operate with carbon contact strips only.

11.0 INFORMATION TO BE SUPPLIED BY THE MAIN CONTRACTOR

11.1 Operating air pressures for the raising and/or lowering of the pantograph.

11.2 Continuous current that can be drawn by the locomotive.

11.3 One hour rated current that can be drawn by the locomotive.

11.4 The maximum safe current that can be drawn by the locomotive and the duration time thereof.

11.5 The information referred to in Clause 11.0 must be obtained from:

11.5.1 Transnet Freight Rail, (Technology Management), in the event of an enquiry for pantographs to be fitted to existing, in-service vehicles;

11.5.2 The Main Tenderers, in the event of pantographs to be fitted to new vehicles.

11.6 The upward and downward Force Difference over the entire working range must not exceed 14N.

12.0 DRAWINGS AND MAINTENANCE INSTRUCTIONS

12.1 The successful tenderer must submit to Transnet Freight Rail (Technology Management) and Transnet Engineering, prints of drawings showing the constructional and assembly details, principal dimensions, materials, force-height characteristics of the pantographs to be supplied.

12.1.1 The above drawings must be supplied prior to the delivery of the pantographs.

12.2 The contractor must supply to Transnet Freight Rail (Technology Management) and Transnet Engineering, a full set of "as built" datapack, covering all main aspects of the pantographs, in soft copy, in approved software, in accordance with Transnet specification RT/TE/SPC/0241. These would include the base frame, lower frame, upper frame, collector head, primary and secondary suspensions, air cylinders, dampers, valves and any protection devices.

12.3 Tenderers must submit, together with their tender documents, drawings of the complete pantograph assembly in accordance with Transnet specification RT/TE/SPC/0241.

12.4 The following Technical Manuals/Catalogues are also required: Maintenance Manual, Component Overhaul Manual and Spare Parts Catalogue for the pantograph as well as the ADD.

12.5 Tenderers must also submit details in the information mentioned in clauses 12.2, 12.3 and 12.4 as used by the Manufacturer can be supplied in the Original Electronic Format.

12.5.1 Details of supplying the same information in the JPEG File Interchange Format (.JPG) must also be submitted.

12.6 Tenderers must supply details of how modifications or changes to the equipment will be communicated to Transnet Freight Rail (Technology Management) and Transnet Engineering and also how updates to documentation delivered, will be communicated.

12.7 Tenderers must submit training details and after sales support details.

13.0 TEST REQUIREMENTS

13.1 Type tests as detailed below must be conducted on the first pantograph only.

13.2 Routine tests as detailed below must be conducted on every pantograph produced, including the pantograph subjected to type tests.

13.3 Every pantograph must be subjected to tests as laid down in IEC Recommendation, Publication 165, and clause 13 thereof.

14.0 TYPE TESTS

14.1 Lateral and Longitudinal rigidity

14.1.1 The deflection of the collector head over the working range of the pantograph in both the lateral and longitudinal directions must not exceed 30mm when a horizontal force of 300 N is applied to the part of the frame that supports the collector head.

14.2 Mechanical endurance

14.2.1 The pantograph must not fail nor must settings change, when subjected to 10 000 successive raise and lowering operations from the fully lowered to the upper operating position with normal service air pressure. The first and last 500 operations must be conducted with the minimum air pressure for which satisfactory operation is guaranteed, between the fully lowered to the maximum extension.

14.3 Heating

14.3.1 The pantograph must be subjected to the following currents without deformation or visible heating of the pantograph, the pantograph contact strips, annealing of the contact wire or damage to bearings, pivots and shunts.

14.3.1.1 Rated current at standstill for 30 minutes and immediately thereafter,

14.3.1.2 Maximum current for 30 seconds.

14.3.2 The pantograph must be able to handle a Prospective Fault Current of 35kA Direct Current for 50 µ seconds without sustaining any damage.

14.3.3 The contact wire used must be in accordance with the specification for the invitation to tender.

14.4 Transverse vibration tests

14.4.1 This test must be carried out in accordance with European Standard EN 50206-1, 2010, Clause 6.4.3.1.

14.5 Functional check of ADD

14.5.1 The test shall be performed for two extensions of the pantograph:

- Upper operating position;
- 20 % of the working range above housed position.

14.5.2 After the pantograph is raised to the considered extension, the ADD shall be activated by simulating damage. The simulation shall be carried out with the same physical signal as in real operation. The reaction time shall be measured from generating the signal to 200mm below the considered extension.

14.5.3 Test acceptance criteria:
The reaction time shall be less or equal to 3 seconds. There shall be no damage on the pantograph structure.

15.0 ROUTINE TESTS

15.1 Operating tests

15.1.1 These tests must be carried out at ambient temperature and with normal service air pressure, to check that the control mechanism and its supply fulfil the following conditions:

15.1.2 A smooth steady rise to the maximum working height in 6 to 10 seconds measured from the moment the pantograph starts to move.

15.1.3 A lowering from the maximum extended height of the pantograph without shock liable to cause damage to the base insulators of the pantograph. The lowering time must be stated.

15.2 Contact force

15.2.1 The contact force must be measured over the working range of the pantograph for both raising and lowering, as stated in clause 9.5.

15.2.2 The deviation of the contact force measured over the working range of the pantograph from the values to be stated by the Tenderer as required by clause 10.2 must not exceed the maximum deviation stated by the Tenderer.

16.0 SURFACE PREPARATION AND PAINTING

16.1 As a result of the severe saline conditions, adequate corrosion protection of the pantograph structure must be provided.

16.2 Surface preparation must be in accordance with Transnet specification RS/ME/SP/026 Rev.2.

16.3 The Tenderer may submit alternatives regarding application and type of corrosion protection, for approval.

17.0 QUALITY ASSURANCE

17.1 The successful Tenderer/Manufacturer must comply with the conditions as stipulated in the Transnet Freight Rail quality assurance specification no.RS/W435/MARCH/1 amendment 4.

17.2 In addition to the conditions stipulated in the Specification as stated in clause 3.1, the following clauses stated hereafter must also have reference:

17.2.1 Transnet reserves the right, with prior arrangement with the Manufacturer, to inspect, audit or monitor any individual component, or process relating to the manufacture of the pantographs.

17.2.2 The Manufacturer must be equipped with all gauges, measuring instruments, meters, jigs and test facilities necessary to establish the correctness of the pantographs according to the relevant drawings.

17.2.3 The Manufacturer must keep record of all documentation, in the form of reports, charts, printouts, diagrams and calculations for the results of any tests, process capability, inspections and audits. The Manufacturer must retain these records for a period of 3 years.

17.2.4 The measuring instruments and gauges must have verifiable calibration traceability and must form part of the manufacturing process.

17.2.5 A copy of the original test certificate signed by the Manufacturer must be supplied with each pantograph, stating all the relevant test parameters and the results pertaining to such tests, that is dimensional, deflection and time.

17.2.6 The format of this test certificate must be made available prior to commencement of testing of the first pantograph produced, for scrutiny by Transnet Freight Rail Inspection personnel and finalisation of format between Manufacturer and Transnet Freight Rail.

17.2.7 Copies of all test certificates quoting the contract number and giving details and results of all tests, including those, which were witnessed by Transnet Freight Rail Inspectors, must be handed to or made available to the Inspectors after each test.

17.2.8 Quality and inspection plans must be provided.

18.0 MARKING

18.1 The pantographs must be clearly stamped on the mounting base with the following:

- Contract No.
- Manufacturers name or symbol.
- Manufacturers serial number.
- Date of manufacture.
- Transnet Freight Rail.

19.0 PACKAGING, RELIABILITY AND MAINTENANCE

19.1 If pantographs are supplied as individual units (applicable to pantographs imported into South Africa), the pantograph must be packed in suitable crates to prevent damage, facilitate easy transfer and stencilled with the following information:

- Transnet Freight Rail.
- Transnet Freight Rail Store Item no.
- Contract no.
- Manufacturers name or symbol.
- Pantographs for 3kV DC or 25kV AC or dual 3kV DC and 25kV AC locomotives.

19.2 Locally manufactured pantographs:

19.2.1 Pantographs must be supplied in approved transportation stands. If individually packed, the packing requirements must comply with Clause 19.1.

19.2.2 If supplied on transportation stands the Manufacturer must give full details of the type of transportation stand (if not approved by Transnet) to be used in the transport and storage of the pantographs. The information required in Clause 19.1 must also be provided.

19.2.3 The manufacturer must give details as to how pantographs will be covered during transport on open vehicles.

19.3 Methods of transport and storage of individual pantographs as well as stacked pantographs must be specified by the Tenderer for approval by Transnet Freight Rail, Technology Management.

19.4 The design life of the pantograph structure (frame, base frame) and operating conditions must be 30 years or 12 million cycles whichever comes sooner.

19.5 The minimum design life of consumable items (excluding the collector head structure) will be 5 years or 12 million cycles whichever comes sooner.

19.6 The minimum design life of the collector head structure will be 2.5 years or 6 million cycles whichever comes sooner.

19.7 All bushes must be easily replaceable and their surfaces must not form part of the main structure components. (No force fits). All bearings and bushes must be protected against the ingress of foreign matter such as dust, saline, coal and iron ore particles.

19.8 The collector head must be easily removable and replaceable onto the pantograph frame.

19.9 The contact strips must be easily replaceable onto the collector head.

19.10 The design life and maintainability must be demonstrated through calculations and operational validation of at least 5 years on the Transnet network or other suitable electrified railway network.

19.11 Type test certificates that shows pantograph compliance to all stated requirements in this specification and other referenced specifications/standards and international standards shall be submitted prior to delivery of pantograph or pantograph components and shall be produced at any other time as may be required by Transnet in in accordance with Transnet specification RT/TE/SPC/0241.

ANNEXURE A

TRANSNET FREIGHT RAIL

TECHNICAL DATA SHEET
(To be completed by Tenderers)

1.0 PANTOGRAPH

1.1 Material and construction of current collector head: _____

_____

_____

1.2 Dimensions of current collector head: _____mm

1.2.1 Horizontal contact surface length: _____mm

1.2.2 Horizontal component length of horns: 2 x _____mm

1.2.3 Total length of current collector head: _____mm

1.2.4 Total width of current collector head: _____mm

1.3 Current collector head contact strips: _____

1.3.1 Number of contact strips per collector head: _____

1.3.2 Material composition details, copper alloy (state alloy), metal impregnated carbon or sintered metal:

_____

_____

1.3.3 Details of mounting of contact strips: _____

_____

_____

1.3.4 If segmented strips are offered, Tenderers must detail:
(i) The angle of the scarfed joint: _____
(ii) The number of sections: _____
(iii) Carrier: Aluminium extrusion, soldered metal or other: _____

1.3.5 Dimensions of contact strip: _____

1.4 Specific resistance of contact strip: _____

1.5 Transverse bend strength of contact strip _____

1.6 Rated current of current collector: _____amperes/millimetre
(See clause 10.1.1)

1.7 Peak current of current collector: _____amperes/millimetre
(See clause 10.1.2)

1.8 Lubrication (if applicable) of current collector head contact strips, contact surface:

_____

1.9 Method of ensuring electrical continuity through the various mechanical joints. Details of flexible braid connections on the structure: _____

_____

_____

1.11 Type of horn provided on current collector, straight, radiused, curved or other:

_____

_____

1.12 Material recommended for the horn structure: _____

_____

_____

1.13 Is the horn solid or fitted with removable inserts (excluding the insulating material required for horn tips)? _____

_____

1.14 Type of secondary suspension, spring box, torsion rubber, other or none :

1.15 What mechanism is used to raise the upper arm assembly? :

1.16 What mechanism is used to raise the pantograph, air cylinder, pneumatics, hydraulics or other? :

1.17 Is any mechanism provided to limit the pitching axis of the collector head? :

1.17.1 If yes, describe the mechanism:

1.18 What mechanism is provided to maintain the adjusted upward pressure of the pantograph at varying speeds? :

2.0 Brief constructional details and state National Standards of compliance in regard to all materials used:

2.1 The following dimensions must be provided. The zero reference point must be the base of the pantograph mounting frame.

2.1.1 Height in fully housed position: _____mm
2.1.2 Minimum operating height: _____mm
2.1.3 Maximum operating height: _____mm
2.2 Attach details descriptive literature, illustrations, specifications, force height characteristics, principle dimensions, materials, strip contact lubrication, covering the pantograph offered.
3.0 Operating range of air pressure:
3.1 Minimum pressure: _____ kPa
3.2 Maximum pressure: _____kPa
4.0 Attach force-height curves to pantographs offered, covering the full range of net operating heights. Base of the pantograph must be used as reference as stated in clause 10.4
5.0 Attach force-height curves to pantographs offered, covering the full range of operating heights as required in clause 10.5.4.
6.0 The extent to which any lever mechanisms of the pantograph extend above or below the base of the pantograph when it is in the lowered or fully extended position.
_____mm below base.
_____mm above base.
7.0 The pantograph as a unit, are all the frames manufactured from the same material? :

7.1 If no, specify different materials. :

8.0 The maximum total length (pantograph knuckle end to pantograph collector head end) of the housed pantograph: _____ mm

TENDERER'S SIGNATURE_____ DATE _____

ANNEXURE B

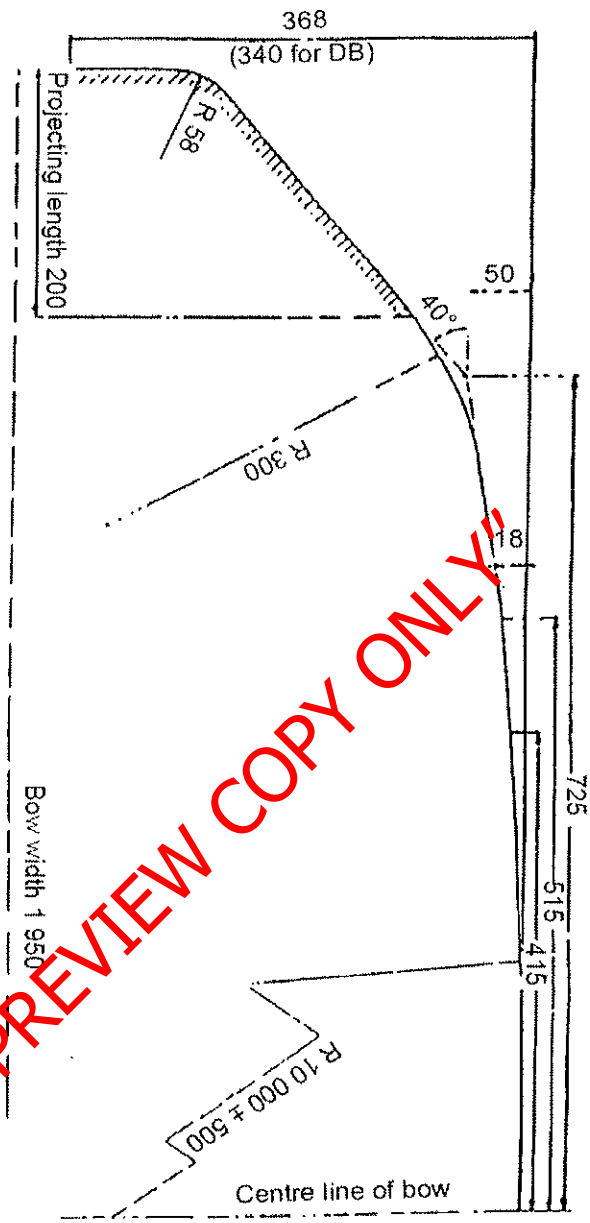

Figure A1: Profile of pantograph collector head with length of 1 950 mm
(Insulated horns of up to 200 mm)

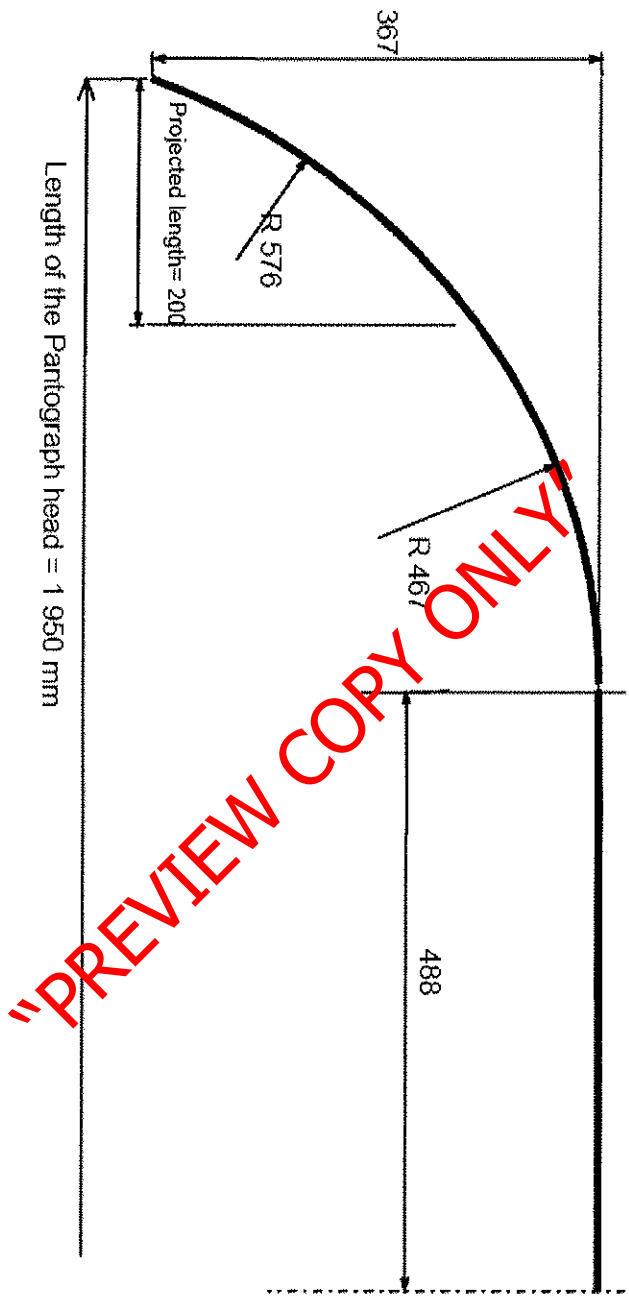

Figure A2: Pantograph head with length of 1 950 mm (Type 2)

SECTION 1: CLAUSE BY CLAUSE COMPLIANCE TO PROJECT SPECIFICATION

Clause No.	Comply	Does Not Comply	Comments
2.0 SCOPE OF WORK			
2.0.1			
2.0.2			
2.0.3			
2.0.4			
3.0 CONDITIONS OF CONTRACT			
3.1			
3.2			
5.0 COMPLIANCE			
5.1			
5.2			
5.2.1			
5.3			
5.4			
5.5			
6.0 TECHNICAL DATA SHEET			
6.1			
6.2			
7.0 ENVIRONMENTAL CONDITIONS			
7.1			
7.2			
8.0 SERVICE CONDITIONS			
8.1			
8.1.2 ALTERNATING CURRENT SYSTEM : 25KV			
8.1.2.1			
8.1.2.2			
8.1.2.3			
8.1.2.4			
8.1.2.5			

Clause No.	Comply	Does Not Comply	Comments
8.1.2.6			
8.1.2.7			
8.1.2.8			
8.1.2.9			
8.1.2.10			
8.1.2.11			
8.1.2.12			
8.1.2.13			
8.1.2.14			
8.1.2.15			
8.1.2.16			
8.1.2.17			
8.2 MOVING STRUCTURE GUAGE			
8.2.1			
8.3 LOCOMOTIVE DETAILS			
8.3.1			
9.0 GENERAL REQUIREMENTS			
9.1			
9.1.1			
9.2			
9.3			
9.4			
9.4.1			
9.5			
9.5.1			
9.5.2			
9.5.3			
9.5.4			
9.6			
9.6.1			
9.6.2			

Clause No.	Comply	Does Not Comply	Comments
9.9			
9.8			
9.8.1			
9.9			
9.10			
9.11			
9.12			
9.13			
9.14			
9.15			
9.15.1			
9.15.2			
9.15.2.1			
9.15.3			
9.15.4			
9.15.5			
9.15.6			
9.16			
9.17			
9.18			
9.19			
9.20			
9.21			
9.22			
9.23			
9.24			
9.25			
9.25.1			
9.25.2			
9.25.3			
9.25.4			

Clause No.	Comply	Does Not Comply	Comments
9.26			
9.27			
9.28			
9.29			
9.30			
9.31			
9.32			
9.33			
9.34			
9.35			
9.36			
9.37			
9.38			
9.39			
10.0 INFORMATION TO BE SUBMITTED BY TENDERERS			
10.1			
10.1.1			
10.1.2			
10.2			
10.3			
10.4			
10.5			
10.5.1			
10.5.2			
10.5.3			
10.5.4			
10.5.5			
10.6			
10.7			
10.8			
10.9			

Clause No.	Comply	Does Not Comply	Comments
10.10			
10.11			
10.12			
11.0 INFORMATION TO BE SUPPLIED BY THE MAIN CONTRACTOR			
11.1			
11.2			
11.3			
11.4			
11.5			
11.5.1			
11.5.2			
11.6			
12.0 DRAWINGS AND MAINTENANCE INSTRUCTIONS			
12.1			
12.1.1			
12.2			
12.3			
12.4			
12.5			
12.5.1			
12.7			
13.0 TEST REQUIREMENTS			
13.1			
13.2			
13.3			
14.0 TYPE TEST			
14.1			
14.1.1			
14.2			
14.2.1			
14.3			

Clause No.	Comply	Does Not Comply	Comments
14.3.1			
14.3.1.1			
14.3.1.2			
14.3.2			
14.3.3			
14.4			
14.4.1			
14.5			
14.5.1			
14.5.2			
14.5.3			
15.0 ROUTINE TESTS			
15.1			
15.1.1			
15.1.2			
15.1.3			
15.2			
15.2.1			
15.2.2			
16.0 SURFACE PREPARATION AND PAINTING			
16.1			
16.2			
16.3			
17.0 QUALITY ASSURANCE			
17.1			
17.2			
17.2.1			
17.2.2			
17.2.3			
17.2.4			
17.2.5			

Clause No.	Comply	Does Not Comply	Comments
17.2.6			
17.2.7			
17.2.8			
18.0 MARKING			
18.1			
19.0 PACKAGING, RELIABILITY AND MAINTENANCE			
19.1			
19.2			
19.2.1			
19.2.2			
19.2.3			
19.3			
19.4			
19.5			
19.6			
19.7			
19.8			
19.9			
19.10			
19.11			