

PART C 3.1

Service Information by the *Employer*

INSPECTION OF RAILWAY TRACK WITH ON-TRACK ULTRASONIC RAIL FLAW DETECTION MACHINES COUNTRYWIDE

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1. DEFINITIONS AND ABBREVIATIONS

- 1.1. AQL- Acceptable Quality Level
- 1.2. GPS- Global Positioning System
- 1.3. DGPS- Differential Global Positioning System
- 1.4. IAMM- Infrastructure Asset Maintenance Management (IAMM). It is a computer-based viewer that displays infrastructure condition in relation to infrastructure assets.
- 1.5. The *Employer* is Transnet (SOC) Limited trading as Transnet Rai Infrastructure
- 1.6. On- or off tracking facility- a place where the machines could be put on the track or removed from the track.
- 1.7. Primary Vehicle means a leading vehicle locating potential rail Defects.
- 1.8. Satellite Vehicle means an independent vehicle (i.e., not coupled to the primary vehicle during measurement), following the primary vehicle on the same track to confirm and accurately size potential rail Defects. Sometimes also referred to as "the chase car".
- 1.9. Road-Rail Vehicle (RRV) means a vehicle capable of traveling by any road and on the railway track as required.
- 1.10. Ultrasonic Measuring Car (UMC) means the RRV that is used for the ultrasonic or other means of detection of rail defects.
- 1.11. Breakdown time (Tb) means any period during which the primary vehicle **or the satellite vehicle** is non-available.
- 1.12. Maximum Occupation Time (Tom) means the total occupation time granted by the *Employer* to the *Contractor* to execute the *services* as per the contract agreement.
- 1.13. Occupation Time (To) means the period or periods between the announced commencement time of an occupation and the time when the UMC is secured at its staging point for the last time.
- 1.14. Travelling Time (Tt) means the time for the UMC to travel on track between work site and the off-tracking point.
- 1.15. Working Time (Tw) means the periods on track during which the UMC is actually engaged on the operation or function for which it was provided.
- 1.16. Time Worked In (Twi) means any day the UMC is agreed to be available and works outside of and in lieu of a normal working day. Such Twi as well as production statistics and all relevant times must be reflected against the day for which the time was worked in.
- 1.17. Standing Time (Ts): means the loss of Working Time (Tw) incurred by the *Contractor* due to reasons attributed to the Employer.
- 1.18. Train Crossing Time (Tx): means the time for the UMC to wait for train crossings.
- 1.19. Annual Holidays means the annual holiday with duration of 15 consecutive working days excluding statutory public holidays, Saturdays and Sundays that may fall within this period, when no work will be performed by the *Contractor*. This period will be taken in such a manner to include the days from 25 December to 01 January, both days included.

- 1.20. Available means when required to do work, a UMC is able to produce work to the standards specified. All outputs specified will be determinants of availability.
- 1.21. Database, will for the purpose of this specification unless otherwise stated, mean an electronic listing or electronic table containing specific information.
- 1.22. Easter weekend is the period indicated on the official calendar of South Africa that will be from the Friday to the Monday, both days included. The Easter weekend will be an "off week-end" for the *Contractor*.
- 1.23. Gauge means the perpendicular distance between points 14mm below the top of the rail against the gauge side of the rail to a point 14mm below the top of the rail on the gauge side of the other rail in the same track.
- 1.24. Licensed means the formal authorisation of a competent employee, by Transnet Rail Infrastructure Manager, to perform certain duties.
- 1.25. Day shall mean a calendar day. Where a specific number of days are allowed in the contract for the performance of any act or is stipulated for the extinction of any right or the duration of any event or circumstance, the days between the commencement and last day of the Annual Holidays (both days included) and the day from which the period is stated or agreed to commence, shall be excluded from the calculation of the number of days concerned.
- 1.26. Joint Assemblies means all types of rail joints, inter alia, including flash-butt and exothermic welded, fishplate and block-joints.
- 1.27. Month means the continuous period from the first day to the last day of any calendar month, both days included.
- 1.28. Non-Available means when required to do work, the UMC or the operation thereof is unsafe, or the UMC is not able to produce work to the standards specified, due to any reason other than a stoppage of work caused by Transnet Rail Infrastructure Manager.
- 1.29. Normal Working Day means a total shift of 8 hours, which may be non-continuous, out of every 24 hours for 5 consecutive days out of every 7 days, or for 10 consecutive days out of every 14 days. The *Service Manager* will determine the daily starting time, which may vary to suit seasonal changes or train timetables.
- 1.30. Occupation means a closure of the line on which work is to be performed for a specified period.
- 1.31. OHTE means any of the equipment used by the *Employer* in the high voltage overhead electrification for the supply of power to electric locomotives.
- 1.32. Overtime means any time worked in excess of the hours of a normal working day and any time worked on Saturdays, Sundays and statutory public holidays in excess of 5 consecutive days out of 7 days or in excess of 10 consecutive days out of 14 days, all on the written instruction of, or as approved by the *Service Manager*.
- 1.33. Pilot means an *Employer* official authorised and licensed in the movement of trains on *Employer* railway lines.

- 1.34. Track means all track, including splice joints, joint assemblies, turnouts, and including all portions of track where locking bars, guard rails, level crossings, check rails are not removed prior to working. It includes wagon retarders and boosters fitted.
- 1.35. *Service Manager* means the person appointed by the *Employer* from time to time to administer the contract according to the powers and rights held by and obligations placed upon him in terms of the NEC3 Term Services Contract (TSC3) and in terms of this contract.
- 1.36. *Supervisor* means the person appointed by the *Employer* from time to time to supervise the contract and to administer the performance and quality of the works according to the NEC3 Term Services Contract (TSC3) and in terms of this contract.
- 1.37. Sets mean all types of turnouts, including crossings, single - and double slips.
- 1.38. Shift Allowance (normal) means an allowance paid for time worked on a Saturday, Sunday or statutory paid public holiday when working 5 consecutive days out of 7 days or 10 consecutive days out of 14 days. Payment for shift allowance ceases when overtime is paid.
- 1.39. Splice Joint means a prefabricated rail expansion device. The welds at either end demarcate the extremities of the splice joint.
- 1.40. Split Occupation means an occupation on any one-day, divided into 2 periods, the sum of which does not exceed 9 hours, with a 2 hour break in between and the total period not exceeding 11 hours. The 2-hour break may be changed to suit circumstances, provided the *Employer* and *Contractor* agree on the period.

2. DESCRIPTION OF WORKS

- 2.1 The contract covers the detection of internal rail defects by ultrasonic sound system installed or mounted on a Road Rail Vehicle (RRV). The *Contractor* shall supply, operate and maintain the machine that is subject to the terms of the succeeding clauses, Service Information and schedules embodied in the contract. The contract period is Twenty-four (24) months.
- 2.2 The offered technique shall be able to detect, verify and size rail defects.
- 2.3 The measurements shall cover the following:
 - 2.3.1. In situ ultrasonic rail defect detection of plain track, and turnouts, both rails simultaneously.
 - 2.3.2. Data processing.
 - 2.3.3. Analysis and reporting of measurements for rail maintenance purposes.
 - 2.3.4. Upload of data to IAMM.
 - 2.3.5. An audited results by an independent person; artificial intelligence or body other than the *Contractor's* operators.

3. CONTRACT AREA, COMMENCEMENT AND DURATION

- 3.1 The contract will cover track owned and/or maintained by Transnet Rail Infrastructure Manager (referred to as *Employer* in the specification).
- 3.2 Seventy percent (70%) of the quantities indicated in the Price List are guaranteed to the *Contractor*.
- 3.3 Measurement will potentially be on all Transnet lines.

- 3.4 The *Service Manager*, however, reserves the right to deploy the machine wherever it is needed outside Transnet's borders or outside the borders of Republic of South Africa.
- 3.5 The contractor shall be allowed to a maximum of two months for lead time to start rendering service after the award of business.
- 3.6 The commencement date will only be finalised after acceptance of tenders. The Contract will therefore commence on the date stipulated in the acceptance letter.
- 3.7 Bidders shall also qualify their offers stating how soon after the award of the contract they will be able to start with the work. This shall include the provision and operation of any other on-track machines or support equipment.
- 3.8 The Contract can be terminated by mutual agreement should technical or safety problems become evident during the execution of the works.

4. PLACE OF WORK

- 4.1 All movements between work Sites shall be by road. Where this might not be practical, the *Service Manager* or *Supervisor* will authorize movement by rail. Movements by road will be the responsibility of the *Contractor*. The *Contractor* shall give the *Service Manager* written notice of the date and time of arrival at a new work site.
- 4.2 Any delay to the date and time of arrival after movement by road will render the machine non-available (Tb) for the period of such delay, excluding overnight stops.
- 4.3 Access to the railway track will be at an on or off tracking facility.
- 4.4 An on- or off-tracking facility could be any of the following:
- 4.4.1 A level crossing with the following surface:
- a) concrete.
 - b) bitumen.
 - c) wood.
 - d) sleepers.
 - e) concrete blocks or
 - f) gravel.
- 4.4.2 When a level crossing is used as an on or off tracking facility, there shall be no interference with road traffic.
- 4.4.3 In a yard.
- 4.4.4 In a yard where the ground surface is level or almost level with the crown of the rail.
- 4.4.5 Wooden blocks placed temporally between and adjacent to the rails under supervision of an *Employer* official.
- 4.5 It is the *Contractor's* responsibility to ensure that a facility used for on- or off tracking conforms to his requirements and that is safe at all times for the machine as well as trains. This must be confirmed by an *Employer* official in the workbook. Any temporary facility shall be removed before and after the machine has on or off tracked.
- 4.6 Any delay due to an on or off tracking facility not conforming to the *Contractor's* requirements shall be reported as soon as possible. The *Contractor* shall point out to the *Service Manager* any part of the

track or off-tracking facility where conditions may constitute a danger to the machinery and its ancillary equipment, and record this in the workbook.

- 4.7 The machines may only be placed on the track when authorized by a TRIM Track Inspector/ Track Master.

5. SUFFICIENCY OF CONTRACT

- 5.1 The *Contractor* will ensure that he has fully taken into account the condition of rails to be inspected and track conditions. No claims for the non-execution of the work will be accepted where any rail - or other condition related to the rails are given as a reason for non-execution. Some of these rail or rail related conditions are inter alia:

- 5.1.1 Rail lubrication.
- 5.1.2 Rolling Contact Fatigue (RCF)
- 5.1.3 Pitting, cracking, spalling, shelling or corrosion of the rail crown.
- 5.1.4 Skid marks.
- 5.1.5 Other rail surface defects.
- 5.1.6 Rails with side and or crown wear on the gauge and or field side or any combination thereof.
- 5.1.7 Rail welds.
- 5.1.8 Rail joints.

- 5.2 The *Contractor* must consider that the detection equipment, probes and/or rubber wheel probes will be subject to possible damage due to rail condition, and this will be entirely the *Contractors'* risk.

- 5.3 The *Contractor* shall make adequate allowance in the contract for wear and tear to his equipment due to any abnormal conditions being encountered. Exceptions to the above will be where the *Contractor* can prove that measuring could not be done due to limitations in ultrasonic sound generation and reception.

- 5.4 Any exceptions where the *Contractor's* equipment cannot test rails shall be submitted in detail with the contract, clearly explaining such limitations (head, web and foot).

- 5.5 Instances occur where the ballast may be higher than the rail top surface. This may cause the RRV to, inter alia:

- 5.5.1 Lose traction.
- 5.5.2 Lift causing the guide wheels to lose its guiding function with a resultant safety risk.
- 5.5.3 Incur damage to wheels and ultrasonic probes.

- 5.6 The *Contractor* to record sections of high ballast where measurement was problematic or where the machine couldn't measure at all to the *Service Manager* daily.

- 5.7 The *Contractor* shall allow for any such event and all costs and damage repair, or loss of income will be to the account of the *Contractor*. Any such occurrence shall be recorded in the workbook stating the exact location and distance of such occurrence.

6. MANAGEMENT AND START UP

6.1 Management Meetings

Monthly project meetings will be conducted to monitor progress and discuss contractual issues. These meetings shall be attended by all Depot Representatives and the contract's manager. A register will be kept of attendance and a minute of the proceedings will be recorded and distributed afterwards.

6.2 Tolerances and Quality Control

6.2.1 Tolerances

6.2.1.1 Rail Defect Sizing

The size and position of all Defects shall be reported with an accuracy of 2 mm in the longitudinal direction, 2 mm in depth and 2 mm in width.

6.2.1.2 The system shall be capable of correct distance location measurement accurate to one percent, e.g., 10 m over 1000 m. If this is not achieved, the machine will be rendered Tb for the day until it is proved by the *Contractor* that the required accuracy can be achieved.

6.2.1.3 If the km location data of the same Defect between any measuring campaigns is compared and a difference of more than 10 m is found, such a Defect will be taken as a rejected Defect.

6.2.1.4 The measuring car shall have a paint marking system capable of spraying Defects within 100 mm of the actual defect. The length of the mark may vary between 0.25 m and 0.4 m. The paint mark shall last at least 30 days.

6.2.1.5 Marking the exact location of the defect. Any defect detected shall be marked with yellow oil-based paint as per Annexure 17, Sheet 5 of the Manual for Track Maintenance (attached to this specification) or applicable revisions of this document. The paint mark shall be of a permanent nature and not easily eroded by weather. The *Contractor* shall ensure that the rail is clean so that the paint will adhere to the rail. The marking will be on the inside of the rail between the two rails and not on the field side of the rail.

6.2.2 Quality Control

6.2.2.1 Calibration shall ensure that no ambiguity of signals can occur. Any time taken to do calibration of the machine during occupation time (To) will render the machine non available on Tb.

6.2.2.2 On-line measuring of all recording functions by simulated impulse signals similar to those generated by the probes shall be possible.

6.2.2.3 Routine calibration with jigs and test pieces shall be carried out at least daily by the *Contractor*. All calibrating jigs, test pieces etc. shall be provided with and carried in the vehicle. Additionally, should problems be experienced with the measuring equipment at any time during measuring, calibration should be considered.

6.2.2.4 When the *Contractor* is instructed, acceptance tests shall be made by recording over sections of track with known rail defects. The equipment will be required to record all of these to within the stated degree of accuracy.

6.2.2.5 The measuring system will be audited twice a year by the *Supervisor* in conjunction with representatives of TRIM Technology Management. The audit will be conducted on site.

6.2.2.6 The accuracy of longitudinal paint marking of rail Defects shall be verified during the audit process.

6.2.3 Training

6.2.3.1 Provision shall be made for the training of *Employer* personnel in the operation, calibration and interpretation of results prior as required for the duration of the contract. Training shall be completed prior to the commencement of the works. Additionally, the *Contractor* shall train additional staff during the contract period as the need arises. No additional payment will be made for training.

6.2.4 Lead time on new machine(s)

6.2.4.1 A maximum of 2 months will be given to the successful bidder for the manufacturing, delivery, test and commissioning from the date of award of business.

6.3 Unsatisfactory Performance of the Machinery or Equipment

- 6.3.1 Should a single stoppage of work due to a breakdown of a machine exceed or is likely to exceed 30 minutes, the *Supervisor* may require the machine to off track as soon as possible. Such travelling, whether from or returning to the point of breakdown, will render the machine non-available.
- 6.3.2 When a Defect is rejected, the *Service Manager* may instruct the *Contractor* to re-measure a km before and after the rejected Defect. This re-measurement will not be included in the payment.
- 6.3.3 When measuring could not take place due to a breakdown of any of the vehicle(s) in the measuring consist, the *Contractor* shall re-measure the section scheduled for measuring that was not measured at his own cost and in a time convenient to the *Employer* train operation. *Employer* will determine the right measuring slots and inform the *Contractor* as such. This shall not be at the *Contractor's* discretion but that of *Employer*. Machine availability shall also be impacted by such machine breakdown even if the *Contractor* had re-measured the missed section.

6.4 Health and Safety

- 6.4.1 The *Contractor* shall comply with all applicable legislation as well as Transnet Safety requirements. The cost for such compliance shall be borne by the *Contractor* and shall be deemed to have been allowed for in the rates and prices of the Contract. Specifically, important in this regard is compliance with:
 - 6.4.1.1 The Compensation for Occupational Injuries and Diseases Act (Act 130 of 1993).
 - 6.4.1.2 The Occupational Health and Safety Act (Act 85 of 1993).
 - 6.4.1.3 *Employer* Specification E.4E, Safety Arrangements and Procedural Compliance with Occupational Health and Safety Act, Act 85 of 1993 and Regulations as applicable.
 - 6.4.1.4 Basic Conditions of Employment Act as well as all other relevant labour legislation.
 - 6.4.1.5 *Employer* Specification for Work on, under or adjacent to Railway Lines and near high Voltage Equipment – E7/1.
 - 6.4.1.6 The *Contractor* shall also comply with all other safety requirements, regulations and guidelines of Transnet applicable to the nature of work carried out under the Contract and shall obtain the particulars thereof from the *Service Manager*.
- 6.4.2 A formal risk assessment on the Transnet's risk management process has been conducted by *Employer* and the under mentioned safety critical risks have been identified. The *Contractor* shall conduct his own formal risk assessment on the risk management process offered by him and add any additional risks identified by him, to this list.
- 6.4.3 The *Contractor* is required to prepare and submit with his tender a comprehensive safety case in accordance with the requirements of Act 85 and the Construction Regulations.
- 6.4.4 The *Contractor* shall specify in his safety case the list of all risks identified by *Employer* together with any additional risks identified by his own risk assessment and indicated specific rules, processes, methods and designs of how he intends to mitigate these risks should he be awarded the contract.
- 6.4.5 The *Contractor* shall prepare and implement a comprehensive safety case covering all relevant legal safety aspects for their work teams. It shall include details of the site management structures, all safety legal appointments as well as the written safe working procedures for all equipment used on site.
- 6.4.6 The *Contractor* shall be responsible to ensure the use of only technically competent trained staff on all types of work.
- 6.4.7 The Safety Case together with all supporting documentation shall at all times be available for compliance audit.
- 6.4.8 The *Contractor* shall ensure that all site staff are trained and inducted in the written safe working procedures for all equipment used on site.

6.4.9 The *Contractor* shall ensure that all workers are appropriately equipped and wearing Personal Protective Equipment (PPE) and that Safety Talks are conducted and noted in the Site Diary before the start of every shift.

6.4.10 The *Contractor* shall be responsible to ensure that site staff is always trained competently with regards to Electrical Awareness Training.

6.5 Payment for Movement by Road

6.5.1. Movement by road will be paid for per km travelled along the shortest route between work sites. The shortest route could be a combination of tar and gravel roads. It will exclude travel outside the borders of South Africa. If the *Employer* and the *Contractor* cannot agree on the shortest route followed, the shortest distance (in km) to be used will be calculated using google maps. The distance will be rounded off to two decimals.

6.5.2. Movement by road will be paid when the distance between two worksites is greater than 200km. The distance used in the payment calculation will be the total distance excluding the first 200 km.

6.5.3. The movement to the first work site and from the last work site at the start and end of the contract period respectively is excluded from this payment.

6.5.4. The payment by road will be a separate item and will not form part of the rate per km measured on track. Any late arrival at a work site will render the machinery non-available.

6.5.5. Payment by road = Km travelled along the shortest route between two work sites.

6.6 To be Provided by the *Contractor*

6.6.1 The *Contractor* shall provide and deliver to the place of Work all fuels and water required for the UMC operations.

6.6.2 The *Contractor* shall maintain and operate the UMC, direct his own personnel and perform all work required.

6.6.3 The *Contractor* shall ensure that sufficient technicians, mechanics, operators and labour are present during track occupations to ensure efficient operation of the UMC.

6.6.4 At least one qualified and experienced mechanic shall be in attendance at all times during track occupations and when the UMC travels as a train.

6.6.5 The *Contractor* shall appoint one suitably qualified person as his representative at each occupation.

6.6.6 The *Contractor* and *Service Manager* shall notify each other in writing of the names of their representatives who will be present during track occupations. These, as well as any changes in the personnel shall be recorded in the workbook.

6.6.7 The *Contractor* will be responsible for the protection, security and safeguarding of the UMC and all equipment during measuring, parked overnight and when staged at any location under any conditions. Any cost of hiring external security for this purpose will be to the account of the *Contractor*. Protection with regard to train operations will be provided by the *Employer* official, but the *Contractor* shall assist when requested by the *Employer* official.

6.7 Records and Instruction Books

6.7.1 The *Contractor* shall submit such returns as may be required by the *Service Manager*. He shall also provide and keep on the UMC a page numbered, duplicate carbon copy book, A4 size, called the Workbook, in which instructions and events concerning the contract work shall be recorded, signed and dated by the *Service Manager* or *Supervisor*, and the *Contractor*. The *Service Manager* will remove the original pages in the book for his record purposes. The book will always be available on the UMC.

6.7.2 The following will be recorded in the Workbook:

6.7.2.1 The start of the day's occupation.

6.7.2.2 Events regarding the contract work.

6.7.2.3 The results of daily brake tests.

6.7.2.4 Measurement verification results.

6.7.2.5 Authorisation to pass signals on danger, etc.

7. ENGINEERING AND CONTRACTOR'S DESIGN

7.1 Ultrasonic Measuring Car System Requirement

7.1.1. Vehicles

7.1.1.1. The vehicle provided shall be able to locate potential rail defects.

7.1.1.2. Any type of RRV vehicle arrangement (one vehicle or two vehicle) will be considered as long as the system can be able to locate potential, confirm and accurately size rail defect(s).

7.1.1.3 All vehicles shall have service brakes and independent emergency brakes capable of providing minimum retardation of 12,5% and gravitational acceleration of 6%.

7.1.1.4. All Vehicles shall comply with the following requirements:

- a) A self-propelled road rail vehicle (RRV).
- b) The RRV machine(s) shall be new or not older than five (5) years old.
- c) Capable of on/off tracking at an on or off tracking facility. The size and dimensions of the area required to on/off track shall be supplied when the contract is submitted.
- d) Fuel range of not less than 500 km.
- e) The water tank capacity for coupling should allow for not less than 150 km of measuring.
- f) Rail Guide Wheel Sets.
- g) Axle loading shall not exceed 20 tonne / axle.
- h) Solid axle designs with taper fitted wheels are preferred.
- i) The wheel size shall not be less than 385 mm in diameter and shall be profiled to drawing number MTV 173 given in Figure 1 below.

ENQUIRY:

DESCRIPTION OF THE SERVICES: INSPECTION OF RAILWAY TRACK WITH ON-TRACK ULTRASONIC RAIL FLAW DETECTION MACHINES COUNTRYWIDE FOR A PERIOD OF TWENTY-FOUR (24) MONTHS.

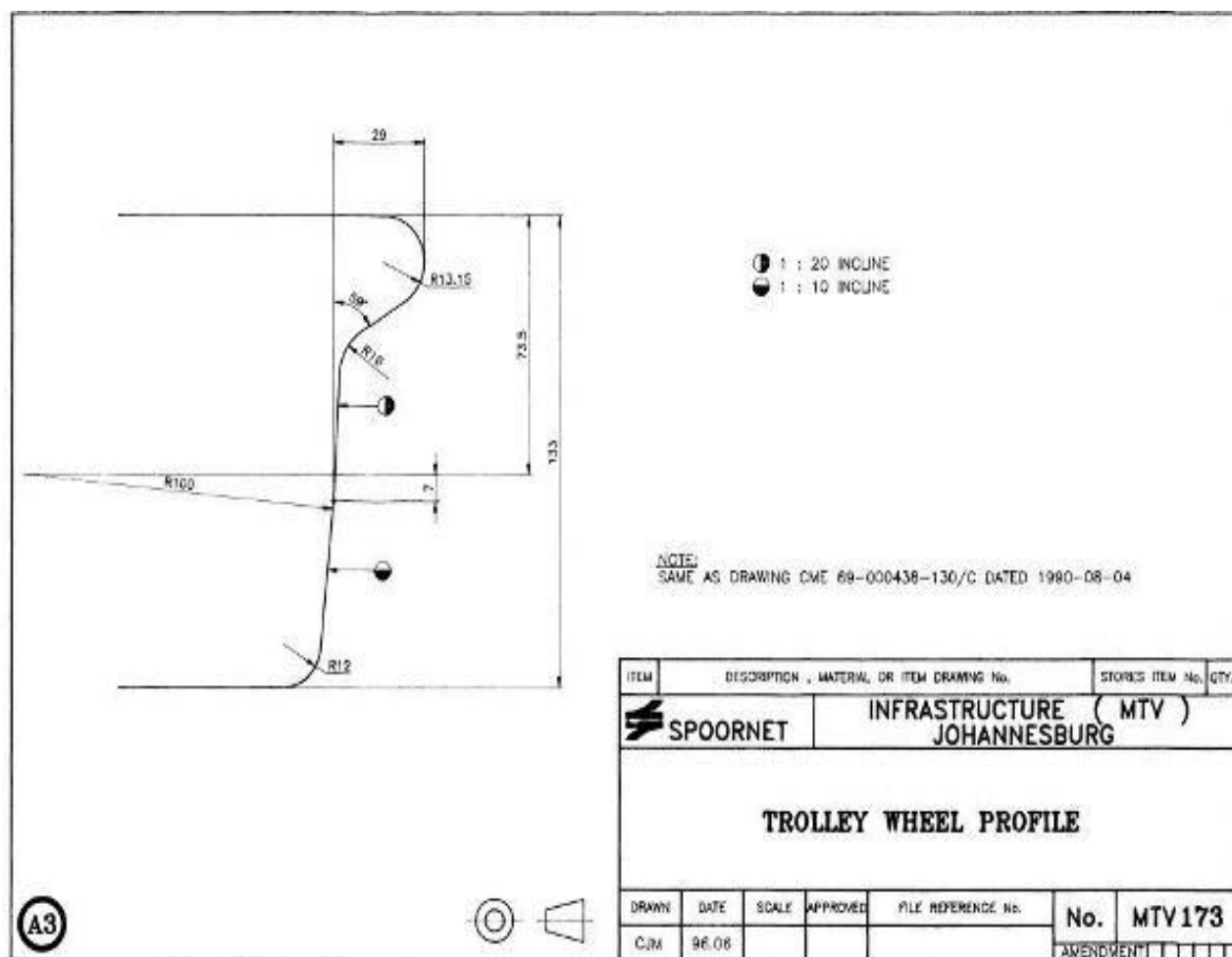


Figure 1: Wheel Profile

- j) The track gauge shall be 1065 mm.
- k) The inside distance between the wheel flanges must be 988 minus 1 plus 3 mm.
- l) The axles must be ultrasonically measured before assembly and test certificates must be submitted by the manufacturer.
- m) The wheel shall be as light as possible and able to be re-profiled at least 5 times before losing its metallurgical properties.
- n) The vehicle must remain stable under all conditions, especially under braking and through a turnout.
- o) Capable of travelling and measuring to a maximum track gradient of 1:30.
- p) The vehicle shall be capable of measuring through a minimum curve radius of 90m.
- q) No part of the vehicle may encroach the area below the rail head except the wheel flanges as given in Figure 2 below.
- r) The vehicle shall fit within the structure gauge given in Annexure 1 of the Manual for Track Maintenance.

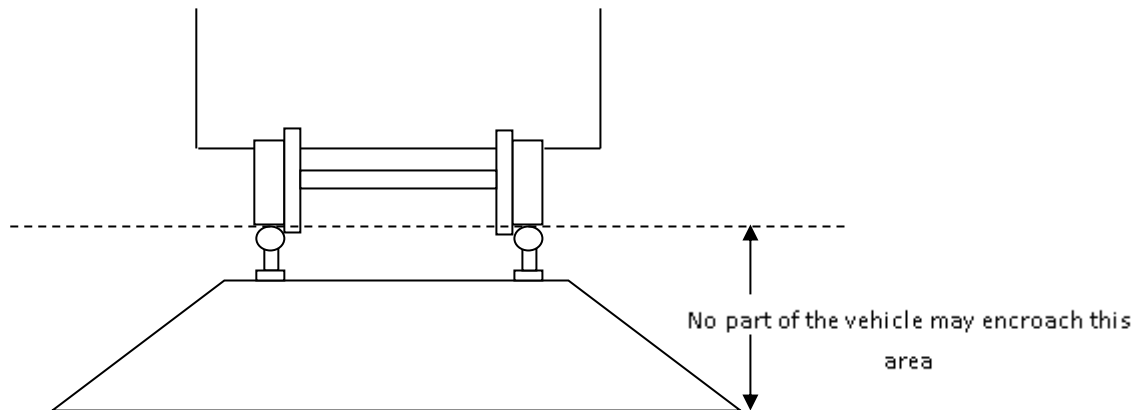


Figure 2: Vehicle Encroachment

7.1.1.4. Maximum Speed.

- a) Running free on track – up to 90 km/h.
- b) Measuring capability: minimum of 38 km/h.
- c) Transnet reserves the right to limit measuring speed to:
 - No more than 25 km/h; and/ or
 - No more than 15 km/h in the case of measurement through crossovers, and through stock & switch, stock & guard, and crossing areas of turnouts.

7.1.1.5. Vehicle must be capable of measuring in both directions, i.e., including measuring in a reverse orientation measuring

7.1.1.6. Be of sufficient size and capacity to carry all necessary staff, equipment, spares and consumables to work in remote areas.

7.1.1.7. Over and above the Contractors staff complement the vehicle shall be capable of carrying minimum of three Transnet persons: a licensed Transnet employee (usually referred to as the Pilot) inside the measuring vehicle with an unobstructed view of the track, wayside instructions and signalling in front of the vehicle and another employee inside the vehicle. If these requirements are not met, the contract will be rejected, and if a contract is awarded, the machine will be non-available. Access in and from the machine will be with a minimum of effort.

7.1.1.8. Where two car system is offered, the distance between the primary and satellite vehicles shall not exceed 2 km at any time while on track.

7.1.1.9. Both vehicles shall at all times be within the same area of control for train operations and signalling purposes.

7.1.1.10. All machinery and equipment shall be track worthy when moving on the track.

7.1.1.11. A plan of the floor layout of the measuring vehicle must be submitted with the contract. This plan must show all dimensions of compartments and will form part of the contract document.

7.1.1.12. Both vehicles shall be fitted with a hooter for use during travelling and operations audible within 300m.

- 7.1.1.13. A rotating amber flashing light shall be fitted to the top of both vehicles for use when traveling on the track.
- 7.1.1.14. The Contractor shall provide and maintain his own communication system such as walkie-talkie radio transceivers or cell phone communication. These radios shall comply with any South African legislation as well as the Employer rules for walkie-talkie radio communication. Any system offered shall be approved by the Employer.
- 7.1.1.15. When the primary vehicle locates a Defect and the satellite vehicle does not agree with the result, the primary vehicle shall retest the section and the most dangerous scenario shall be reported with a comment on the report describing the situation.
- 7.1.1.16. All vehicles shall comply with South African road traffic legislation.

Ultrasonic Testing Equipment

The detection equipment shall comply with the following requirements:

- a. Real time measurement shall be carried out on both rails simultaneously.
- b. The area of the rail to be covered must be indicated by the *Contractor*.
- c. The defect types to be detected are indicated in Annexure 17, Manual for Track Maintenance latest version (extract attached to this Service Information) or applicable revisions of this document.
- d. Track through crossovers, and through stock & switch, stock & guard, and crossing areas of turnouts shall be measured, as far as possible with the equipment installed on the machine, during measuring campaigns for all tracks. The Contractor shall allow for this in the pricing and no additional payment will be made for this.
- e. Any proposed probe configuration and/or system by the *Contractor* that can detect the rail break is essential to the *Employer*.
- f. The probe configuration shall cover at least 80% of the head, 95% of the web and 10% of the foot of the rail in all longitudinal directions.
- g. A minimum of at least fifteen (15) test channel per rail is required for effective internal rail defects detection. The following probes are critical and mandatory on any configuration to be offered to the *Employer*; probes skewed/angled to find transverse defects in the gauge corner & side looker probes aimed toward the field and gauge to find vertical split heads.
- h. Probe range shall be from 0 to 70 degrees (inclusive), in both longitudinal directions. The bidders shall therefore submit with the tender their probe configurations, probe type, probe position, probe coverage, and explain how this would be measured.
- i. Additionally, the *Contractor* shall indicate the adjustments to probe configurations, if any, for measurement through crossovers, and through stock & switch, stock & guard, and crossing areas of turnouts.
- j. All equipment shall be capable of measuring all rail profiles in the range from 30 kg/m to 60 kg/m.
- k. A complete test shall be performed on each probe at any given intervals during vehicle travel independent of measuring speed.
- l. "A scan" presentation for calibration & operational checking of ultrasonic channels. At least one for each rail is required, although multiple presentations are preferred.
- m. The system and equipment shall have the flexibility to quickly and easily change probes without additional payment.
- n. High-resolution graphic video monitors shall indicate all probe parameters, status information and events. This system shall permit review of off-line playback by the Employer, should this be required.
- o. The system shall allow the operator to enter messages and comments to record events and positions.

- p. The system shall have multiple levels of detection logic and must be able to recognize Defect signatures.
- q. Amplification and detection levels of each probe shall be easily controllable.
- r. The system's results shall provide audited measurement results by an independent person or tool for assurance purposes.
- s. All equipment shall be modular for ease of maintenance and replacement.
- t. The system shall be capable of working in inclement weather conditions.
- u. Special care shall be taken when measuring rails in level crossings. If any material covers the top of the rail crown in a level crossing, the *Contractor* shall remove and clean the rails to ensure that effective ultrasonic measurement can proceed. No payment will be made for such removal, or cleaning of rails in level crossings.

7.3 Operational Environment

- 7.3.1 All ultrasonic probes shall remain fully functional on any rail and rail surface condition, inter alia: side worn, skidded, corrugated or corroded rail.
- 7.3.2 Measurement shall be done between rail temperatures of – 10°C to 50°C.
- 7.3.3 Both AC & DC traction is used on the *Employer* system with running rails used as the return conductors. Effective measurement shall be possible under these conditions.
- 7.3.4 The signaling system also uses the rail for current at various frequencies. Effective measurement shall be possible under these conditions.
- 7.3.5 The rails of some lines are lubricated. The contract shall make provision for the effect that lubrication may have on the measurements and the equipment. No allowances will be made when problems with the lubrication are experienced. Ample provision shall be made in cost and time estimates for the cleaning of equipment. No additional payment will be made for this. If any cleaning is carried out during occupation time, the machine will be taken as broken down (Tb) for payment purposes.

7.4 System Outputs

- 7.4.1 Marking of the rail defect location by means of paint, on both plain track and turnouts.
 - 7.4.2 The measuring system shall be capable of sending all defects classified as exceedances or urgent to TRIM management as per circulation list to be agreed to between the two parties real time as the machine measures.
 - 7.4.3 The results of the measurement campaign shall be provided as follows:
 - 7.4.3.1 All data shall be logged in a database. This database shall be kept for the full period of the contract. A backup of the database shall be kept by the *Contractor* and updated on an interval not exceeding one week.
 - 7.4.3.2 The database shall be supplied to *Employer* as and when required in report format using the data in the database.
 - 7.4.3.3 A hard copy report at the end of every day referred to as the daily report. This report shall be handed over to the *Supervisor* and a signature obtained. The report shall be provided to the *Supervisor* by the close of the shift on the day of the measuring campaign. The *Contractor* must ensure that the signature, initials and surname in block letters, the date and time of receipt by the *Employer* Infra representative appear on a copy of the report to be kept by the *Contractor*. If these are absent, it will be taken that the report was not received by the *Employer* Infra representative.
 - 7.4.3.4 An electronic report at the end of the day referred to as the daily database report. This will be provided to the *Supervisor* and to the *Service Manager* not later than 07h30am on the day following the measurement.
- If these reports are not received on time a penalty will be levied as stated in clause 7.7.
- The *Employer* may change the formats and requirements of the reports during the contract period. If it requires a substantial change, the work should be done against the item for development in the Price List.
- 7.4.4 The system shall log the following measured parameters in the database, and it shall be reported in the Daily Report and the Daily Database Report.

The Daily Report shall include the following:

- 7.4.4.1. Date measured.
- 7.4.4.2. Infrastructure depot name.

- 7.4.4.3. A daily report number. This shall be a unique number per report that will contain the date as the last six characters, e.g., *****ddmmyy.
- 7.4.4.4. The route km name. This will be provided before each measuring campaign or shall be taken from the table that will be provided to the *Contractor* electronically in a *Windows Excel* spread sheet. Route km names shall always be stated in the order shown in the table. This is in the increasing kilometre direction.
- 7.4.4.5. The track section number.
- 7.4.4.6. The line number, i.e., 1, 2, 3, up, down, avoiding, etc.
- 7.4.4.7. The names of the *Contractor's* operator, assistant and driver.
- 7.4.4.8. The name of the *EMPLOYER* representative.
- 7.4.4.9. The name of the measuring car.
- 7.4.4.10. The start km and meter point of the campaign.
- 7.4.4.11. The end km and meter point of the campaign.
- 7.4.4.12. The totals of the days contract activities, namely:
- Total occupation time in hours -To.
 - Total break down time in hours – Tb.
 - Total standing time due to *Employer* – Ts.
 - Total time worked – Tw.
 - The speed of measurement – V.
 - Number of Defects recorded during the campaign.
- 7.4.4.13. List of Activities for the day showing the following per Activity:
- Type of activity, e.g. To, Tb, Tw, Ts, etc.
 - The exact start time of the activity.
 - The exact end time of the activity.
 - The total time taken by the activity.
 - The line on which the activity took place.
 - The direction of measurement, e.g., up, down, increase in km, etc.
 - The start km plus meter of the activity where applicable.
 - The end km plus meter of the activity where applicable.
 - The total km for the activity where applicable. Ts does not have a km distance.
 - The track section number.
 - Any relevant comments.
- 7.4.4.14. A table of Defects located showing the following per Defect:
- Defect type according to the Employer classification. (See Annexure 17, Manual for Track Maintenance latest version - attached to this specification or applicable revisions of this document).
 - Size of the defect.
 - Position of the defect.
 - Amplification settings on detection levels.
 - Rail mass (kg/m)
 - The km plus meter location as shown in Figure 3 below (a "long-chain" example is shown).
 - GPS coordinates of the defect as measured with a GPS receiver with *sub meter accuracy*.
 - High/Low legs in curves.
 - Left/Right rail.
 - Vehicle speed
 - Areas not measured
 - Tracks not tested due to ultrasonic sound limitations
 - Events - Level crossing, sets, splice joint, bridges, stations.
 - The type of weld where a Defect was located in the weld, i.e., aluminothermic/ "thermit
 - " (TW) or flash-butt (FB). There shall be a clear distinction between defective and fault-free welds.

- There shall be a clear distinction between defective and fault free bolt holes in assemblies such as fishplate joints, insulated joints, sets, bonds and splice joints. Sound bolt holes shall not be recorded.
- Whether the Defect was located during a previous campaign or by any other means of detection, e.g., handheld probe or visual.

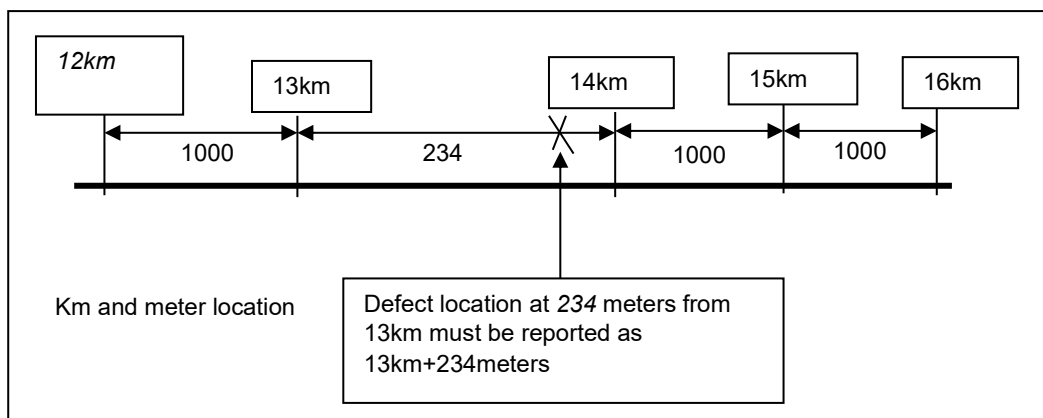


Figure 3: Example: Reporting of Defect Location

7.4.4.15. A summary showing the total number of Defects per type of defect located

7.4.4.16. The Daily Database Report.

- It shall contain all the outputs as described for the Daily Report.
- It shall be in electronic format in approved software.
- The report will be in the form of a database with records representing each defect located and the parameters as field names.

7.4.4.17. Measurements of Defect Size

For defects oriented in the transverse plane, the following to be measured and reported:

- The head size as given in Figure 4 below; and
- The web size

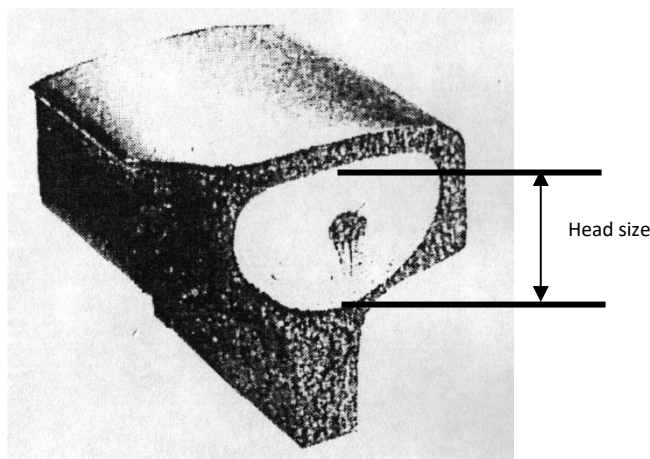


Figure 4: Head Size of Defect Oriented in the Transverse Plane

For defects oriented in the horizontal or vertical plane, the following to be measured and reported:

- (a) The length of the Defect as given in Figure 5 below; and
- (b) The depth of the top of the defect below the rail surface as given in Figure 5 below

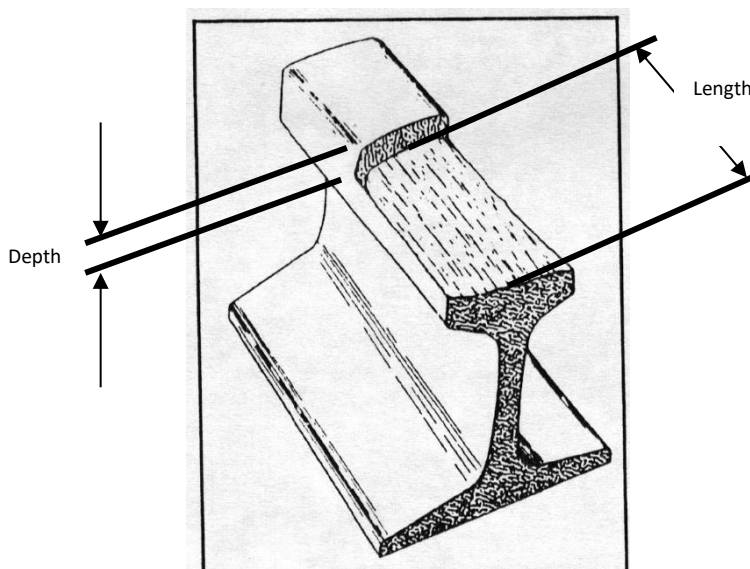


Figure 5: Depth and Length of Defect Oriented in the Horizontal or Vertical Plane

Threshold levels: See Annexure 17, sheet 5, Manual for Track Maintenance attached to this specification.

- 7.4.5. Daily exception report as agreed with the *Service Manager*.
- 7.4.6. All data shall be provided in a format compatible to software used by the *Employer* at the time of contracting.
- 7.4.7. Any hard copies shall be verified, accepted and signed by the *Service Manager* or Supervisor before payment will be authorized.
- 7.4.8. Penalties for the late submission of reports or reports with errors will be as specified under clause 7.7 for penalties.
- 7.4.9. The Defect data listed in the daily report shall be cut and a new page started at the following points:
 - 7.4.10.1 Where a new km route is measured.
 - 7.4.10.2 Where there is a change in track section measured.
 - 7.4.10.3 At a zero km point.
- 7.4.10. Where a depot boundary is crossed, a separate report will be produced per depot. The Defect numbering will however continue sequentially across the depot border. Defect numbering will only be allowed to change where the km starts at zero.

7.5 Importing Data into IAMM

- 7.5.1. Reports shall be compatible with IAMM system and in a format that the data may be imported directly into the IAMM system.
- 7.5.2. Data shall be imported by the *Contractor* into IAMM within 7 days after each day's measurement campaign.
- 7.5.3. An import will be taken as correct if the data imported displays correctly if compared with the Daily Database Report provided.
- 7.5.4. The *Contractor* will develop a system for importing of the data in conjunction with the Employer's developers of IAMM or any other preferred database.
- 7.5.5. Payment for the successful import of the data will be made against the item allowed for in the Price List.

7.6 Summary of Information to be supplied by the *Contractor*

- 7.6.1. Specification and layout of the measuring vehicle.
- 7.6.2. Specification of the ultrasonic defect detection equipment.
- 7.6.3. Limitations and exceptions where the *Contractor's* equipment cannot test the *Employer* rails.
- 7.6.4. Specification of the hardware and software for recording and logging and analysing data.
- 7.6.5. References of rail measuring previously performed including dates.
- 7.6.6. Access requirements for on/off tracking. The dimensions of the area must be supplied.
- 7.6.7. A commissioning program.
- 7.6.8. Tolerance capabilities in respect of defect detection.
- 7.6.9. Example of output reports.
- 7.6.10. A complete technical specification of the measuring equipment shall be supplied with the contract, and these will form part of the contract document.

7.7. Penalties

- 7.7.1. Clause X17 in the contract data shall apply for the total non-availability of the measuring car/s. Penalties payable under this clause will be subtracted from any future payments until all penalty amounts have been paid.
- 7.7.2. If the supply of measurement reports, or partial reports, as described in the contract are not provided by 07h30 on the day following measurement, a penalty will be imposed for each report per calendar day of late delivery of the day's measurement data.
- 7.7.3. If the data for the day's measurements is not imported error free into IAMM within 7 days from the day following the measurements, a penalty for late importing of data into IAMM will be levied per report per calendar day.
- 7.7.4. Late delivery of any part or component of the specified reports will be taken as a late delivery.

- 7.7.5 Penalties for the late delivery of reports and the late importing of data into IAMM will be calculated separately and added together to determine penalties.
- 7.7.6 Any delay caused by any e-mail system, fax, or any other system will not be an acceptable reason to waiver a penalty and the *Contractor* remains responsible for the timely delivery of reports and importing of data into IAMM.
- 7.7.7 The late delivery of reports will apply for reports delivered to the *Employer* Infrastructure central office as well as any depot regardless of the depot's location in South Africa. Penalties for the Infra central office and depots will be calculated separately.
- 7.7.8 Any incorrect data imported into IAMM will constituted as a "late import" and will be penalized as in the table below until a correct re-import has been done.

The penalties will be levied for reports as in the table below:

Delivery of a report:	Penalty per calendar day
Later than 07h30 on the day following the day of measurement for a report	R2000
Days ≤ 2	R3000
$2 < \text{Days} \leq 4$	R4000
$4 < \text{Days} \leq 7$	R5000
Days > 7	R10000 with a maximum value of R50000

The penalties will be levied for IAMM upload as in the table below:

Import into IAMM completed:	Penalty per calendar day
Later than 7 days for a data import into IAMM from the day of measurement	R10000 with a maximum value of R50000

The accuracy, timely and correct delivery of reports supplied are a safety critical issue and vitally important during derailment investigations. Any deviation from the standard of error free reports will be strictly monitored. Penalties for deviation from the standards will be levied.

Typical errors that will constitute a deviation from standards are inter alia:

- Incorrect km locations supplied anywhere in a report.
- Incorrect dates anywhere in the report.
- Incorrect report numbers anywhere in the report.
- Incorrect filenames.
- Incorrect test car number.
- Any obvious errors, e.g., GPS coordinate.
- Using unacceptable formatting.
- Inaccurate statistics, e.g., Tw, Ts, To, etc.
- Incorrect section name.
- Incorrect reference to a line measured.

The penalties for reports with errors are:

Report with error	Penalty per report per day in Rand
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Report/s with error first day	R200
Report/s with error second consecutive day	R400
Report/s with error third consecutive day	R1000
Report/s with error fourth consecutive day	R2000
Report/s with error every consecutive day following the fourth day	R2000

When error free reports have been submitted for 10 or more consecutive days, the penalty for a report with an error after ten or more days will revert back to R200 and the penalties will follow the values in the table above.

- 7.7.9 If it is confirmed by a metallurgical laboratory report that a defect that was skipped should have been detected, a penalty of R50000 (fifty thousand rand) will be levied.
- 7.7.10 The monthly payment (MP) will be reduced by 50% when it is proved, in the opinion of the *Service Manager*, that a derailment was caused by a Defect not located during a measurement campaign due to negligence or incompetence by the *Contractor*.

This reduction of payment will be applied according to line classification as per the table below:

Line Classification/ Route	A derailment caused by a Defect not located during a measurement campaign occurred within the number of days in this column since the last measuring campaign.
S: ORELINE: Salkor – Erts	30 days
S: Broodsnyersplaas – RBCT Line 1	30 days
S: Broodsnyersplaas – RBCT Line 2	60 days
S: Blackhill – Saaiwater – Broodsnyersplaas	60 days
S: Geluksplaas – Pullenshope	90 days
S: Sishen – Beeshoek	90 days
S: Palingpan – Manganore	90 days
S: Thlaping – Kolomela	90 days
N1 Lines	90 days
N2 Lines	180 days
N3 Lines and Branchlines	365 days

8. TRAINING

8.1 Operator Requirements

- 8.1.1 The *Contractor* shall provide the necessary drivers and operators for the machine. Allowance shall be made for any additional drivers of the vehicles when travelling by road for long distances.
- 8.1.2 Drivers and/or operators of machines shall be alert and vigilant at all times, and anyone may not operate the machine for more than 10 hours continuously in a day when travelling by road and/or on track. The

total time for road and/or track travelling shall not exceed 14 hours. Any driver and/or operator shall have at least a 10-hour rest between shifts. Consideration should be given to having more than one driver per vehicle for long distances of travel by road.

8.1.3 The rail-measuring Operators must be in possession of the South Africa Ultrasonic Examination Certificate (i.e., UT Level 2) or equivalent.

8.1.4 Subcontracting

8.1.4.1 Subcontracting procedures

8.1.4.2 No part of the contract may be subcontracted without written approval from Transnet Rail Infrastructure Manager.

8.2 Compulsory Training

The following training shall be arranged with Transnet at the *Contractor's* costs.

Type of training	Staff required to undergo training	Estimated duration of training	Location of training	Trainer to conduct training at start of contract	Alternative trainer to conduct training at contract start	Future refreshment training
Induction	All contract staff including new entrants. Start of work at any new depot	+/- 2 hours	Depot where work starts	<i>Employer's Service Manager</i> or Track inspector	New recruits: <i>Contractors</i> accredited representative	<i>Contractors</i> accredited representative
Electrical awareness	All contract staff including new entrants	+/- 2 hours	Depot where work starts	<i>Employer's</i> depot electrical officer or accredited trainer	New recruits: <i>Contractors</i> accredited representative	<i>Contractors</i> accredited representative

Type of training	Staff required to undergo training	Estimated duration of training	Location of training	Trainer to conduct training at start of contract	Alternative trainer to conduct training at contract start	Future refreshment training
PWC (Electrical)	Service Managers, Operators, fitters, Technicians & Workers supporting fitters, working in risky OHTE areas	2 days	Depot where work starts	<i>Employer's</i> , Esselen Park or Depot accredited trainer, or <i>Employer's</i> hired accredited trainer: By appointment at depot	Replacement / new staff: <i>Contractors</i> accredited representative	<i>Contractors</i> accredited representative
Competency (Electrical)	Service Managers (Follow up training in PWC)	1 day	Depot where work starts	<i>Employer's</i> accredited trainer, or <i>Employer's</i> hired accredited trainer: By appointment at depot	Replacement / new staff: <i>Contractors</i> accredited representative	<i>Contractors</i> accredited representative
Flagman training	Flagmen and standby flagmen	5 days		<i>Employer's</i> accredited trainer, or <i>Employer's</i> hired accredited trainer: By appointment at depot	Replacement / new staff: <i>Contractors</i> accredited representative	<i>Contractors</i> accredited representative

Type of training	Staff required to undergo training	Estimated duration of training	Location of training	Trainer to conduct training at start of contract	Alternative trainer to conduct training at contract start	Future refreshment training
Bonder training	Bonder	5 days		<i>Employer's</i> accredited trainer, or <i>Employer's</i> hired accredited trainer: By appointment at depot	Replacement / new staff: <i>Contractors</i> accredited representative	<i>Contractors</i> accredited representative

8.3 Workmen

- 8.2.1 All persons employed by the *Contractor* to carry out the Contract shall be competent, responsible and of good character.
- 8.2.2 During the currency of the Contract, the *Contractor* shall not approach any employee of Transnet Rail Infrastructure Manager with a view to offering him employment in any capacity whatsoever.
- 8.2.3 The *Contractor* shall, upon request, provide the *Service Manager* with a weekly statement of the number of persons employed on the Work each day by the *Contractor* and any sub-*Contractor*, the capacity in which employed, the total number of hours worked in that week for each grade of staff separately and details of any incentive or bonus payment schemes introduced. The statement shall be supported by documentary evidence when so required by the *Service Manager*.
- 8.2.4 The *Contractor* shall ensure that all staff transported by on-track machines and/or the UMC, Transnet Rail Infrastructure Manager wagons or coaches, shall at all times be transported in a safe and responsible way. Only authorised staff shall be transported.
- 8.2.5 The attention of the *Contractor* is directed to the requirements of safety legislation and regulations with regard to storage and transport of dangerous substances, accommodation and transport of people.
- 8.2.6 Staff shall only be allowed to travel inside the UMC in approved manner.

9. THE WORKS

- 9.1 Availability of the vehicle in its entirety shall be 100% i.e. 8 (Eight) hours daily during normal working hours, normal working days, emergency call-out hours and during pre-arranged work outside normal working hours.

- 9.2 The *Contractor* shall include for the supply of a full-time Operator with the vehicle. The Operator shall be responsible for travelling movements, off-tracking / on-tracking, as well as regular vehicle inspections, maintenance and repairs, so that maximum availability may be achieved.
- 9.3 The Operator will be expected to be available during normal working hours during normal working days, as well as for emergency work during emergency call-out hours. He shall also be available for pre-arranged work outside normal working hours.
- 9.4 The *Employer* will be responsible for the safety of the vehicle in so far as train working rules is concerned and will provide qualified employees who will be in charge and supervise the operation of the vehicle.
- 9.5 A person in charge of the occupation (pilot) for an on-track machine shall be a competent employee, reporting to the Transnet Rail Infrastructure Manager depot Engineer. This person shall be responsible for the following on a work Site.
- 9.5.1 Taking Occupation.
- 9.5.2 Communicating with CTC with regard to occupation matters.
- 9.5.3 Piloting the machine on the track.
- 9.6 All tools/Equipment of every description necessary for the execution of the works shall be supplied by the *Contractor* with complete fuel, spares, maintenance, and competent operators and legally compliant with all applicable safety legislation.
- 9.7 The *Contractor* shall at his own cost provide labor, transport, consumable items, Equipment, tools and materials including spare parts required for maintaining the vehicle and carry out breakdown services to an acceptable standard.
- 9.8 The *Contractor* shall make sure that the daily inspections are carried out on the vehicle and its equipment before trips.
- 9.9 If the non-availability of the vehicle is due to a breakdown, the *Contractor* or his representative shall advise the *Service Manager* of the estimated time needed for repairs, after inspection thereof.
- 9.10 The vehicle will be regarded as available after breakdown when it is declared available for the purpose of measuring, unless after the period of measuring the vehicle is still non-available. In the latter case, non-availability time will continue from the time that the vehicle previously became non-available.
- 9.11 Should a joint inspection of the vehicle by *Employer* and the *Contractor* reveal that any vehicle is not in a safe working condition, the *Service Manager* may order the temporary withdrawal of the vehicle from Work Site. The vehicle will then be regarded as non-available until it has been repaired and is available for work.
- 9.12 If for any reason the satellite vehicle is not available due to Tb being booked on the satellite vehicle, Tb will be booked on both the primary vehicle and on the satellite vehicle.
- 9.13 A penalty of R5000 (Five Thousand Rand) per day due to non-availability in clause 9.12 will be levied against the *Contractor*. The penalty fee will be subtracted from the future payments.