TRANSNET FREIGHT RAIL,

a division of **TRANSNET SOC LTD**

Registration Number 1990/000900/30

[hereinafter referred to as **Transnet]**

ADDENDUM 1

REQUEST FOR PROPOSAL [RFP] SIC21031CIDB (HOAC-HO-37601)

FOR THE PROVISION OF MAINTENANCE SERVICES FOR RAILWAY TRACK WITH ON-TRACK OVERHEAD TRACK EQUIPMENT MEDIUM MACHINES COUNTRYWIDE ON AN "AS AND WHEN REQUIRED" BASIS FOR A PERIOD OF EIGHTY FOUR (84) MONTHS

RFP NUMBER	**: SIC21031CIDB (HOAC-HO-37601)**
ISSUE DATE	**: 25 APRIL 2022**
NON-COMPULSORY BRIEFING	**: 06 MAY 2022**
CLOSING DATE	**: 31 MAY 2022**
CLOSING TIME	**: 10:00AM**
TENDER VALIDITY PERIOD	**: 23 AUGUST 2022**

PURPOSE OF ADDENDUM:

1. To inform bidders of the additional documents made to:
    - RFP Reference: SIC21031CIDB (HOAC-HO-37601)
    - There has been an omission of part C3 – service information.

BACKGROUND:

2. The tender is for the provision of maintenance services for railway track with on-track overhead track equipment medium machines countrywide on an "as and when required" basis for a period of eighty four (84) months.

3. The purpose for the "As and When" contract for the maintenance of railway track with on-track Overhead Track Equipment medium machines is to have a proactive strategy that enables Rail Network to maintain and sustain the rail infrastructure for the safe and reliable passage of trains.

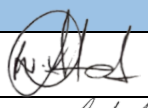
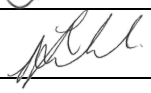
C3: Scope of Work

PROVISION OF AN ON-TRACK HEAVY CLASS VEHICLE FOR THE MAINTENANCE AND INSPECTION OF 25 kV AC AND 3 kV DC OVERHEAD TRACK EQUIPMENT, COUNTRY WIDE:

Part C 3.1

Service Information by the Employer

Maintenance of Railway Track with Overhead Track Vehicle: Countrywide for a Period of 84 Months

	POSITION	NAME & SURNAME	DATE	SIGNATURE
Compiled by:	*Contract Manager*	Nozipho Hadebe	06/04/2022	
Reviewed by:	*Acting Senior Contract Manager*	Tenny Madiba	06/04/2022	

CONTENTS

3.1.0 SCOPE OF CONTRACT

3.1.1 This document covers the conditions governing the hiring of an on-track OHTE maintenance vehicle from the Contractor which he shall provide and maintain during the contract period and within the areas of operation specified, subject to the terms of the succeeding clauses, specifications and conditions pertaining to this contract.

3.2.0 DEFINITIONS AND INTERPRETATIONS

3.2.1 Executive Officer: The person appointed by Transnet from time to time as the Executive Officer to act according to the rights and powers held by and obligations placed upon him in terms of the contract.

3.2.2 *Service manager*: The person appointed by Transnet from time to time as the *Service manager* to administer the contract according to the powers and rights held by and obligations placed upon him in terms of the contract.

3.2.3 *Service manager*'s Deputy: The person appointed by Transnet from time to time as the *Service manager*'s Deputy to administer the Contractor's performance and execution of the work according to the powers and rights held by and obligations placed upon him in terms of the contract.

3.2.4 Paid public holidays: Paid public holidays shall be those applicable to Transnet.

3.2.5 Normal working days: Mondays to Fridays, but excluding paid public holidays.

3.2.6 Normal working hours: The hours of duty from Monday to Friday between 08:00 and 16:00 during normal working days.

3.2.7 Emergency call-out hours: All hours which fall outside normal working hours (clause 3.2.6) on normal working days (clause 3.2.5.)

3.2.8 Sunday time: The period between 00:00 and 23:59 on Sundays as well as paid public holidays.

3.2.9 Overtime: The period not covered by clauses 3.2.5, 3.2.6 and 3.2.8.

3.2.10 Pre-arranged work outside normal working hours: Planned work which has to be performed outside normal working hours due to particular conditions.

3.2.11 Month: The continuous period between the first day of a calendar month and the last day of the same calendar month, both days included.

3.2.12 Hourly rate: The monthly charge inclusive of the Fitter, but excluding fuel costs and overtime, divided by the total number of working hours in an average month. (See clause 3.2.6.)

3.2.13 Non-available: When required to work, the vehicle and associated equipment is not able to produce work to the standards specified, due to breakdown.

3.2.14 Vehicle: The on-track self-propelled machine provided complete with all equipment complying with the requirements of the specifications annexed hereto.

3.2.15 Words importing the singular, also include the plural and vice versa where the context requires.

3.2.16 Movement Time (Tm): The period required to move the machinery from work site to work site as a train, as part of or on a train. Moving time will commence at the announced time of departure and will end when the staging point at the new work site is reached. Periods of overnight stops when the machinery is traveling as a train, as part of or on a train will be excluded from moving time. Moving time will be included in occupation time for payment purposes

3.3.0 TERM OF CONTRACT

3.3.1 The commencement date will only be finalised after acceptance of tenders. The Contract will therefore commence on the date stipulated in the acceptance letter. The *Contractor* shall be able to commence with the service within 12 months of contract award.

3.3.2 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. Where equipment offered may only be available at a later date, the date at which this will be available shall be indicated clearly upon submission of tender.

3.3.3 The duration of this contract is eight-four (84) months. The expiry date will therefore depend on the starting date of each part. The work output required shall depend on Site conditions and is expected to be carried out over the full duration of the contract period of eight-four (84) months. The Contractor shall Supply, Operate and Maintain the machine.

3.3.4 The Contract can be terminated by mutual agreement should technical or safety problems become evident during the execution of the works.

3.3.5 The vehicle will be in use for 84 months period and shall be used during normal working hours as well as for emergency call-outs and pre-arranged work outside normal hours. (Refer to clauses 3.2.6, 3.2.7 and 3.2.10.).

3.3.6 The quantities indicated in the Price List are estimated and not guaranteed to the contractor.

3.4 WORKING AREA

3.4.1 The working area shall be the overhead track equipment on all lines owned and / or maintained by Transnet within the borders of the Republic of South Africa and neighboring countries.

3.4.2 The staging depots of the vehicle will normally be at the following Depots or their recognised Sub-Depots.

3.4.2.1 Bellville, Kimberley (North and South), Bloemfontein, Port Elizabeth & East London

3.4.2.2 Empangeni, Durban, Ladysmith & Heidelberg

3.4.2.3 Isando, Vereeniging & Krugersdorp

3.4.2.4 Koedoespoort, Nelspruit, Witbank & Polokwane

3.4.2.5 Ermelo, Vryheid & Empangeni (Coal Line)

3.4.2.6 Saldanha (Ore Line) & Upington

3.5.0 DELIVERY OF VEHICLE

3.5.1 The *Service manager* shall determine where the vehicle will be delivered at the commencement of the Contract Period. The Contractor shall carry all costs for delivery of the vehicle from his workshops to the point of delivery and shall be responsible for all associated arrangements.

3.5.2 Similarly the Contractor shall carry all costs and do all arrangements for the return of the vehicle to his workshops after expiry of the contract.

3.5.3 The *Service manager*'s Deputy will determine where, when and how a vehicle shall be utilised on a day-to-day basis for the maintenance of Transnet assets. Only the *Service manager*'s Deputy may decide to stop work due to inclement weather, etc.

3.6.0 TRANSNET SPECIFICATIONS APPLICABLE AND DEEMED TO FORM PART OF THE CONTRACT

3.6.1 The latest edition of E.4E: Safety Arrangements and Procedural Compliance with the Occupational Health and Safety Act.

3.6.2 The latest edition of E.7/1: Specification for works on, over, under or adjacent to Railway lines and near high voltage equipment.

3.7.0 OPERATION

3.7.1 The Tender shall include for the provision of a full-time Fitter with the vehicle. The Fitter shall be responsible for travelling movements (not crawling in work mode), off-tracking / on-tracking, as well as regular vehicle inspections, maintenance and repairs, so that maximum availability may be achieved.

3.7.1.1 The Fitter will be expected to be available during normal working hours during normal working days (see clauses 3.2.6 and 3.2.5), as well as for emergency work during emergency call-out hours (see clause 3.2.7.) He shall also be available for pre-arranged work outside normal working hours as described in clauses 3.2.10 and 3.10.2.

3.7.2 Although a Fitter must be provided with the vehicle, the Contractor shall provide and present to Transnet personnel a training course or courses for the operation of the vehicle with relation to:

3.7.2.1 The safe handling and driving of the vehicle, in "travel" as well as in "work" modes.

3.7.2.2 The safe operating of the elevating platform/s or aerial work platform/s (whichever are provided), as well as all other equipment to be used by Transnet personnel during the performance of their tasks.

3.7.2.3 The necessary daily inspections to be carried out on the vehicle and their equipment before trips and work are undertaken.

3.7.2.4 Transnet reserves the right to use the course literature and reproductions thereof for internal training purposes.

3.7.2.5 A course group of Transnet personnel will consist of between two and fifteen people.

3.7.2.6 The *Service manager* may, at any time during the duration of the contract, request the Contractor to present a training course at any depot or sub-depot in the working area.

3.7.2.6.1 The Trainer/Assessor must be accredited by a registered organisation whose qualifications are recognised by the South African Qualifications Authority (SAQA).

3.7.2.6.2 The training and certification of Trainees must be done according to the Driven Machinery Regulations. (Regulation 18) of the Occupational Health and Safety Act (Act 85 of 1993.)

3.7.3 It is anticipated that the vehicle will be operational daily (Mondays to Fridays) during normal working hours, for approximately 10 hours. There could also be need for emergency call-outs and pre-arranged work outside normal working hours, as per clauses 3.2.7, 3.2.10 and 3.10.2.

3.8.0 BREAKDOWN AND MAINTENANCE SERVICING

3.8.1 The Contractor shall be responsible for vehicle breakdown services as and when required. Own transport to the site shall be supplied in this event.

3.8.2 The *Service manager*'s Deputy shall inform the Contractor in writing when the vehicle will be transferred to a new staging depot. Such notice shall be given at least 7 (seven) days prior to transfer.

3.8.3 The Contractor shall provide maintenance services on the vehicle as determined by him. These services shall be conducted at predetermined intervals and times agreed upon by both parties. The vehicle shall be serviced at one of the staging depots or their sub-depots (see clause 3.4.2).

3.9.0 RECORDS AND INSTRUCTION BOOKS

3.9.1 The Contractor shall provide and keep on the vehicle two triplicate carbon copy books, one, in which instructions and events regarding the performance of the vehicle can be recorded and the other, a logbook where odometer readings and times that the vehicle was operational may be recorded, as well as the hours that the elevating platform or aerial work platform was operational. Statutory inspections of elevating devices must also be recorded as per requirements of the relevant laws and codes. Valid copies of relevant certificates for elevating devices must also be kept on the machine at all times.

3.10.0 AVAILABILITY

3.10.1 Availability of the vehicle in its entirety shall be 100% i.e. 8 (eight) hours daily during normal working hours during normal working days, (see clauses 3.2.6 and 3.2.5), as well as for call-outs during emergency call-out hours and during pre-arranged work outside normal working hours as described in clauses 3.2.7, 3.2.10 and 3.10.2.

3.10.2 Where practical needs dictate that Transnet staff will have to perform planned work at night or during weekends, the Contractor will be notified at least seven days in advance to allow the Fitter concerned to make the necessary arrangements for resting, service materials, etc.

3.11.0 NON-AVAILABILITY

3.11.1 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 to effect repairs, after inspection thereof.

3.11.2 The vehicle will be regarded as available after breakdown when it is declared available for the purpose of testing, unless after the period of testing 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.

3.11.3 Should a joint inspection of the vehicle by Transnet and the Contractor reveal that the vehicle is not in a safe working condition, the *Service manager* may order the temporary withdrawal of the vehicle from service. The vehicle will then be regarded as non-available until it has been repaired and is available for work.

3.11.4 In the event of breakdown during normal working hours (clause 3.2.6), penalty fees for non-availability will be calculated in minutes from the instant of breakdown, until the vehicle is declared available (clause 3.11.2). For the purposes of this calculation, non-availability outside normal working hours will be ignored, except if the vehicle is required for pre-arranged work outside normal working hours (clause 3.2.10) or emergency work (clause 3.2.7).

3.11.5 If the vehicle is required for work as per clauses 3.2.10 and 3.2.7, non-availability will be measured in minutes from the instant the vehicle is required or the instant of breakdown, whichever occurs later, until the end of the particular work period. Should the vehicle become available while this work is in progress and the vehicle is present at the worksite, and is utilised for the rest of the work period by Transnet, non-availability will end at the instant the vehicle is taken back into service.

3.11 .6 The Contractor shall state time of non-availability during which normal maintenance services will be carried out on the vehicle. For payment purposes the vehicle will be regarded as available during this time (see clauses 3.7.4 and 3.8.3).

3.12.0 TO BE SUPPLIED BY THE CONTRACTOR

3.12.1 The Contractor shall at his own cost provide labour, transport, consumable items, machinery equipment, tools and materials including spare parts required for maintaining the vehicle and carry out breakdown services to an acceptable standard.

3.12.2 A maintenance service schedule based on the usage stated in clause 3.7.4.

3.12.3 The Fitter with the vehicle, will be considered the contact person for the Contractor. An all-hours contact number must however still be provided where the Contractor may be reached in case of an emergency if the Fitter is not accessible.

3.12.4 A cellular telephone (with "car kit") for use by the Fitter.

3.12.5 Diesel fuel for the vehicle. (Both provision and filling.)

3.12.6 Security outside normal working hours. The vehicle would normally be parked in a Depot yard or in a station yard (manned or un-manned). Working conditions may, however, require that the vehicle be parked in a section at an off-tracking platform. The vehicle will not be parked in an area considered by Transnet Risk Management to be a high-risk location.

3.12.7 A training module regarding Electrical Safety for the Fitter.

3.12.8 The Fitter must pass the training course before the vehicle is delivered.

TABLE OF CONTENTS

30. DOCUMENTATION

- SCHEDULE OF REQUIREMENTS FOR OHTE VEHICLES
- APPENDICES A TO F

GENERAL NOTES:

1 All vertical measurements of equipment performance in this specification, are from track level, unless otherwise specified.
2 All flooring must be non-slip and weatherproof.

1.0 GENERAL REQUIREMENTS

1.0 An on-track, self-propelled Heavy Class vehicle for maintenance and measurement of high voltage Overhead Track Equipment (OHTE); suitable for 1 065 mm rail gauge.

1.2 Facilities, tools & equipment will consist of a cab and a selection of other facilities as discussed in Sections: 7 - Elevating Platform, 8 - Hydraulic Crane, 9 - Dual Purpose Hydraulic Crane Convertible to Aerial Basket, 10 - "Cherry Picker", 11 - Catenary Support Mast, 12 - Off-Tracking Equipment, 13 – Air Supply for Pneumatic Tools and 14 – High Pressure Washing Equipment.

Tenderers are requested to refer to the attached Schedule Of Requirements (S.O.R.) to determine which of the facilities are required. (Clause numbers in this Specification and those indicated on the S.O.R. are identical.)

1.3 The general vehicle lay-out is shown in Appendix A.

2.0 OPERATING CONDITIONS

2.1 The vehicle will be used to transport seated staff including a driver and equipment / tools for maintenance, over long distances.

2.2 Hydraulically operated lifting equipment will be used during maintenance of the OHTE.

2.3 The vehicle will be used at altitudes from sea level to 1 850 m above sea level, at ambient temperatures ranging from -5ºC to +45ºC, in all weather conditions and at night.

3.0 TENDERING PROCEDURE

3.1 No changes may be made to the text of this specification as issued, including it's Appendices and (possible) Addendum/s.

3.2 Tenderers shall indicate compliance with the specification on a clause-by-clause basis. This shall take the form of a separate typewritten document listing all the specification clause numbers, against which the individual statements of compliance or non-compliance must be indicated. This document may be used by Tenderers to elaborate on their response to a particular clause.

4.0 DIMENSIONS

4.1 Rail wheel track must be 1 065mm gauge.

4.2 Total vehicle length (measured over headstocks) may not exceed 15 300mm if two solid axles are used or if one solid axle and one bogie is used.

4.3 For two bogies, distance between inner axle centres on the two bogies must not exceed 13 350mm.

4.4 For two bogies, the maximum permissible overhang is 2 400mm, measured from the centre of the bogie to the end of the vehicle (headstock).

4.5 For two bogies, the total vehicle length (measured over headstocks) may not exceed 19 900mm

4.6 Wheelbase must not exceed 7 000mm if two solid axles or one solid axle and one bogie are used.

4.7 The maximum permissible overhang for two solid axles or one solid axle and one bogie is 4 150mm. In the case of a bogie being used, the overhang will be measured from the centre of the bogie to the end of the vehicle.

4.8 Nominal radius of the sharpest curve is 91m and such curves are check railed. The vehicle must be capable of safely negotiating a curve of 85m.

4.9 The profile of the vehicle must comply with Transnet's vehicle gauge (1 065 mm track gauge) depicted on drawing No. BE-82-15 sheet 1 attached to this specification. (See Appendix B.)

4.10 All components (including cow catchers) must clear the rail by a minimum of 75mm, except for wheels and flexible rail sweepers. The clearance between the rail and flexible railsweepers must stay between 13mm and 20mm, regardless of loading on the vehicle.

5.0 PERFORMANCE

5.1 The vehicle (fully laden) must be capable of a top speed of at least 80 km/h in both directions on level track.

5.2 The vehicle must be able to travel at top speed for distances in excess of 200 km at a time. A minimum operating range as specified, is required.

5.3 The fully laden vehicle must be able to maintain the specified speed on the specified gradient.

5.4 A crawling speed, continuously variable between 1 km/h and 10 km/h in both directions, must be possible on gradients up to 1:40.

FACILITIES, TOOLS AND EQUIPMENT

6.0 ELEVATING PLATFORM

6.1 The elevating platform must be capable of carrying a total load of not less than 600 kg with a minimum of 300 kg at any point; also while the vehicle is crawling at 10km/h.

6.2 The floor area of the platform must be 3 000mm long and 2 300mm wide and fitted with protective hand rails, 1 100mm high. Solid toe boards, 150mm high, must be fitted.

6.3 The platform must be adjustable in such a way that it is possible to stand on all points as described in Appendix C. Sideways movement, extra elevation, etcetera may be used to accomplish this.

6.4 The support frame must have sufficient rigidity for the fully laden platform to remain stable at all times, whilst stationary, during acceleration or braking of the vehicle, even on a track with a cant of 100mm, with the platform in any position.

6.5 Raising and lowering of the platform must be effected by a power driven system.

6.6 Suitable lockable access must be provided to the platform from the deck of the vehicle.

6.7 Certain sections of the handrails must be partly removable / collapsible to make it possible for the platform floor to rise to the height of the contact wire.

6.8 A facility must be provided to enable the sideways movement of the platform to be temporarily restricted to either side, such that the respective edges of the platform maintain a predefined clearance from an adjacent energised track. (This clearance will normally be 3 650mm from the centre line of the adjacent track, but may vary). The facility must operate by means of a key which can be removed in the locked position.

7.0 DUAL PURPOSE HYDRAULIC CRANE CONVERTIBLE TO AERIAL BASKET

7.1 A dual purpose hydraulic crane which is convertible to aerial basket, must be supplied and fitted to the vehicle at the end opposite to the cab.

7.2 The crane must be able to operate as a crane or a “cherry picker”. For this reason it must be possible to fit a hook (for crane operation) or an aerial basket (for “cherry picker” operation) to the hydraulic arm. This interchange must comply with the following requirements: (See also Appendix D.)

7.2.1 The cradle or crane hook must be connected to the hydraulic arm by means of an approved coupling allowing quick connecting / disconnecting.

7.2.2 Connecting and disconnecting of the cradle or hook must not require any modification or adjustment to the hydraulic system.

7.3 In “crane-mode” the crane must be as discussed in the applicable clauses of section 8.0.

7.4 In “cherry picker” mode it is required that the aerial basket floor reaches a maximum height of 10 500mm at 4 000mm from track centre and 4 900mm high at 7 000mm from track centre.

7.5 A removable aerial basket of approximately 1 800mm x 800mm and a minimum capacity of 270 kg must be provided for the purpose of elevating 2 persons and tools. Hand rails, 1 100mm high, with solid toe boards, 150mm high, must be fitted. Lockable access must be provided.

8.0 CHERRY PICKER”

8.1 A hydraulically operated “cherry picker” must be supplied and fitted.

8.2 A cradle of approximately 1 800mm x 800mm and a minimum capacity of 270 kg must be provided for the purpose of elevating 2 persons and tools. Hand rails, 1 100mm high, with solid toe boards, 150mm high, must be fitted. Lockable access must be provided.

8.3 The vertical lifting reach of the cradle floor, must be 10 500mm at 4 000mm from track centre and 4 900mm at 7 000mm from track centre. The cradle must be mechanically lockable in the stored position.

9.0 CATENARY SUPPORT MAST

9.1 A telescopic mast for support and shifting of overhead lines must be provided, which has a head that can swivel through 90º (in the horizontal plane) and reach a height of 8 000mm.

9.2 The telescopic mast must be able to lift 300 kg minimum at any point and extend at a rate of approximately 100mm per second.

9.3 The mast and head must withstand a horizontal force, transverse to the track, of 3 200N up to a height of 8 000mm.

9.4 The head of the telescopic mast must be 220mm wide (with three notches, as shown in Appendix E) capable of moving 450mm to either side of track centre (measured from centre of block), by means of a hand- or power-driven drive.

9.5 The mast must be situated on the vehicle centre line where it can be easily reached from the elevating platform.

10.0 OFF-TRACKING EQUIPMENT

10.1 The vehicle must have off-tracking equipment suitable for use on either of the off--tracking stand types employed by Transnet.

10.2 It must be possible to off-track and on-track the vehicle in five minutes for each operation.

11.0 AIR SUPPLY FOR PNEUMATIC TOOLS

11.1 Two pneumatic quick-couplers with manually-operated cut-off valves must be provided on each elevating platform, cradle and aerial basket.

11.2 A hose reel with a 5m length of pneumatic hose with a quick-coupler must be provided at the crane end of the vehicle with the hose permanently connected to the supply via a manually-operated cut-off valve.

11.3 Compressed air with a flow rate and pressure suitable for driving commercial air tools, must be available at the supply points.

11.4 An effective low-maintenance automatic air drier, with a capacity of at least that of the compressor, must be provided.

11.5 Pneumatic couplers must match the couplers of the air tools as required by the user.

12.0 HIGH PRESSURE WASHING EQUIPMENT

12.1 Portable high pressure washing equipment for use with water-based alkaline solvent detergent must be supplied on the vehicle.

12.2 The equipment must be electrically driven by 220V, with the power cable at least 10m long, to allow the device to be used some distance away from the vehicle.

12.3 A pressure of at least 130 bar on the high pressure side is required.

12.4 The detergent has a pH of ± 11,2.

12.5 Equipment to be supplied with flexible high pressure hose of the specified length or 10m (whichever is least), as well as handles and spraying nozzles as recommended by the suppliers.

12.6 Washing water storage of at least 500 litres capacity for supplying the portable washer,

must be supplied on the vehicle.

12.6.1 A low pressure water feedline of suitable length is required to connect the washing equipment to the water supply tank.

13.0 CAB

13.1 A fully enclosed, weatherproof cab must be provided. The cabin must be suitably protected against the weather and must provide seating accommodation for the specified total number of staff, including a driver. A specified number of these staff members must be seated in an elevated seat with a clear view of the OHTE and the measuring pantograph.

13.2 Good ventilation, heating and demisting are required.

13.3 A tank for potable water, with a capacity of not less than 40ℓ, fitted with suitable dispensing facilities, must be provided in the cab.

13.4 A lockable access door must be provided at one side of the cab. It must be fitted with suitable sidewall handrails and steps for easy access to the vehicle from ground level.

13.5 A lockable access door must be provided between the cab and the deck.

13.6 Windscreens must be at the approved standard and provided at both ends of the cab and fitted with suitable electric windscreen wipers.

13.7 At least one window on each side-wall must be provided with a sliding panel and all window glazing must be tinted.

13.8 All seating must be upholstered with heavy duty vinyl material (washable) and padded, whilst the driver's seat must be adjustable in height and distance from the control panel. Where possible, each seat must be provided with a 3-point safety belt. The remaining seats should have 2-point safety belts.

13.9 Storage for documentation must be provided in the cab.

13.10 Additional storage for flags and detonators is also required in the cab.

13.11 Passenger seats must be of the bench type of which the space below must be fully enclosed to provide for additional storage. Seats must be hinged to provide access to storage space.

13.12 Individually lockable storage for the personal belongings of the number of people specified in clause 13.1, is required. This storage space may be incorporated in the space specified in clause 13.11.

13.13 The driver and his assistant must be seated in such a way that allows them a clear view of the track when travelling in either direction. They must be seated in a comfortable manner to travel for long distances. These two seats may be in an elevated area of the cab.

14.0 DECK

14.1 The open accessible deck must be protected on all exposed sides with suitable handrails, 1100mm high and fitted with 150mm high solid toe boards.

14.2 The deck must be large enough to accommodate the elevating platform and all other equipment specified or required for the proper operation of the vehicle.

14.3 Suitable steps must be provided at the crane end of the vehicle to allow access from ground level, without impairing the crane's performance.

15.0 CONTROLS AND DISPLAYS

(Controls of equipment not selected, must be ignored.)

15.1 Controls for the elevating platform: (Refer to section 6.0)

15.1 .1 All movements of the elevating platform must be controlled from a control panel situated on the elevating platform.

15.1.2 Where additional smaller platforms are mounted on the elevating platform, their individual controls will be situated on themselves.

15.1.3 It must be possible to control vehicle crawling (0 - 10km/h) and braking from the elevating platform.

15.2 Controls for crane: (Refer to section 6.0.)

15.2.1 Controls for crane operation to be mounted in a suitable position at the crane end of the vehicle.

15.2.2 A remote control is also required to operate the crane from anywhere on the elevating platform.

15.3 Controls for crane with removable aerial basket fitted: (Refer to section 6.0.)

16.3.1 All the movements of the crane in "Cherry Picker" mode must be controlled from a control panel situated on the aerial basket.

15.3.2 The remote control for crane operation, may be plugged into the aerial basket for operating the crane in "Cherry Picker" mode from within the aerial basket.

15.3.3 It must be possible to control vehicle crawling (0 - 10km/h) and braking from the aerial basket.

15.3.4 Controls in "crane mode" will be as described in clauses 16.2.1 and 16.2.2.

15.4 Controls for the "cherry picker": (Refer to section 9.0.)

15.4.1 All the movements of the "Cherry Picker" must be controlled from a control panel situated on the cradle.

15.4.2 It must be possible to control vehicle crawling (0 - 10km/h) and braking from the cradle.

15.5 Controls for the catenary support mast: (Refer to section 10.0)

15.5.1 The catenary support mast must be operated from a suitable position on the elevating platform.

15.6 Interlocking of crawling controls:

15.6.1 The vehicle crawling controls must be so interlocked that no movement of the vehicle is possible if any crane outrigger (clause 7.5) or the catenary support mast (clause 9.0) are not within the vehicle gauge.

15.6.2 The crawling and braking controls must be so interlocked that when the elevating platform, aerial basket or “cherry picker” is in use, crawling operations can only be carried out by one of the controls at any one time - whichever control has the master interlocking key.

15.7 Emergency controls:

15.7.1 An emergency stop must be provided on the platform, in the aerial basket / cradle, in the cab, and on both sides of the vehicle, to be reached from ground level.

15.7.2 Independent emergency controls for lowering the platform must be situated on the deck.

15.7.3 Independent emergency controls for lowering the aerial basket on the crane must be situated on the deck.

15.7.4 Independent emergency controls for lowering the cradle of the “cherry picker” must be situated on the deck.

15.8 Automatic parking brake:

15.8.1 An automatic parking brake, working in conjunction with the crawling controls of the platform, must be provided.

15.9 Cab controls and displays:

15.9.1 The driver’s control panel(s) must be positioned such that all controls are ergonomically accessible when driving in either direction.

15.9.2 Warning lights for earthing pantograph positions, elevating platform positions, crane / ”cherry picker” and catenary support mast operation, must be provided. An alarm(s) which sounds if either pantograph is activated, but does not make contact with the contact wire, must also be provided. The alarm(s) must be audible in the working area.

15.9.3 Controls of both earthing pantographs are to be interlocked with the controls of all other lifting / elevating devices in such a manner that the latter can only be activated after contact has been made between the overhead conductor and the earthing pantographs.

15.9.4 The control panel must contain all the necessary controls, instruments and switches necessary to safely drive and operate the vehicle and must include the following:

15.9.4.1 Switches for all the lights, windscreen wipers and cooling fan(s).

15.9.4.2 Gauges for engine and gearbox coolant temperature.

15.9.4.3 Gauge for fuel level.

15.9.4.4 Speedometer with odometer (both calibrated to at least ±5% accuracy).

15.9.4.5 Voltmeter.

15.9.4.6 Engine tachometer with hour meter.

15.9.4.7 Gauge(s) for brake reservoir pressure and auxiliary reservoir pressure.

15.9.4.8 Warning lights for: Low engine oil pressure; battery charge, suspension locking device and fuel / water separator.

15.10 The driver's travelling controls must be locked out if any device is not in it's stored position (including pantographs).

16.0 TOWING EQUIPMENT

16.1 The vehicle must be capable of being hauled in either direction by a locomotive if required, to clear the section after breakdown.

16.2 The vehicle must be provided with a system for connection to a standard locomotive coupler.

16.3 Mounted next to the drawbar connection, must be instructions warning that the drawbar must only be used to tow the machine in case of breakdown.

17.0 HYDRAULIC SYSTEM(S)

17.1 All hydraulic equipment supplied, must be able to work at the same maximum supply pressure, on a specific system.

17.2 The hydraulic reservoir(s) must be large enough to allow simultaneous operation of all the hydraulic equipment in the system.

17.3 Hydraulic hoses must be manufactured to an approved SABS/SANS standard. Details must be furnished.

17.4 The following safety features (devices) must be incorporated into the system:

17.4.1 Device to prevent overloading (over-pressurising).

17.4.2 Device to prevent load from dropping in case of hose or other failure.

17.4.3 Replaceable return / suction filter, suction strainer and suitable oil level indicator fitted to the hydraulic tank.

17.4.4 Port relief valves required for every function.

18.0 ENGINE

18.1 A suitable, easily maintainable diesel engine must be provided to drive the vehicle(s) and auxiliary systems at the required speed. Refer to Section 5.

18.2 Approval (sign off) of engine installation must be done by representatives of the engine manufacturer.

19.0 TRANSMISSION

19.1 A suitable, easily maintainable transmission must be provided to drive the vehicle(s) at both high and crawling speeds, continuously in both directions.

19.2 Approval (sign off) of transmission installation must be done by representatives of the transmission manufacturer.

20.0 FUEL SYSTEM

21.1 A fuel tank must be provided, having sufficient capacity for the vehicle operating range specified in clause 6.2 and driving the auxiliary systems. No diesel fumes may enter the passenger compartment.

21.2 Fuel filters suitable for the engine capacity, must be fitted.

21.3 A fuel / water separator, with warning light in the cab to alert the driver when the system needs draining, must be fitted in the fuel system.

22.0 WHEEL SETS

22.1 The distance between wheel flanges must be 988 ±2mm.

22.2 The “tyre” profile of the wheels must be according to the latest drawing of wheeltread MTV.173, as shown in Appendix F.

22.3 The axles and wheels must be ultrasonically tested before assembly and test certificates must be submitted by the contractor. It shall be possible to positively associate individual certificates with particular wheelsets and axles.

22.4 The resistance between the wheels of an axle must not be greater than 0,05 ohms so as to operate the track circuits of the signalling system.

23.0 SUSPENSION

23.1 Suitable automatic suspension locking device(s) must be provided for stabilising the vehicle when the platform and / or crane or “cherry picker” are in use over their full operational range and capacity while the vehicle is standing / crawling on a track, even with a cant of 100mm. Locking of axles must be such that all wheels will stay in contact with the rails in the event of twist in the track.

24.0 BRAKES

24.1 The brake pneumatic system must be isolated from other pneumatic systems on the vehicle.

24.2 Service and emergency brake action must be provided on all wheels. Service brakes should be air-operated to give a brake efficiency of not less than 12,5%G. The emergency brake should be able to give a brake efficiency of not less than 6,5%G.

24.3 A system must be provided to charge the vehicle’s air-brake system from a towing vehicle. The connector must match the standard Transnet equipment.

24.4 The mechanical parking brake must operate on all wheels and must be capable of holding the vehicle at an incline of at least 1:25.

24.5 The emergency brake must be controlled from the driver’s panel, the control panel on the elevating platform and from the aerial basket / “cherry picker”.

25.0 EXHAUST SYSTEM

25.1 The exhaust system must prevent recirculation.

25.2 The exhaust system must prevent fumes from entering the cab.

25.3 It must be possible to discharge exhaust gases at either end of the vehicle, close to ground level.

25.4 A system to condition the exhaust fumes to ensure a healthy and safe environment for staff, when working under confined conditions (such as in tunnels), must be provided.

26.0 STORAGE AND TOOL BOXES

26.1 Two hatch type tool trays to be provided on elevating platform top, 500 x 300 x 200mm deep.

26.2 A lockable weatherproof cupboard manufactured from sheet metal, must be provided on the open deck of the vehicle. The cupboard will contain:

26.2.1 One box, 1 800mm long x 1 800mm wide x 300mm deep, to hold electrical conductors in roll diameters of between 1 600mm and 1 800mm (contact wire), 1 200mm and I 500mm (catenary wire) and between 800mm and 1 400mm for other conductors.

26.2.2 Eighteen boxes, each 300mm long x 300mm high x 750mm deep and four boxes, 900mm long x 300mm high x 750mm deep, of the pigeon hole type.

26.2.3 One box 1 800mm long x 300mm high x 750mm deep.

26.3 Secure storage space for the aerial basket (if supplied) must be provided on the deck of the vehicle for when the basket is not in use.

26.4 If required, storage space must be provided on one side to carry a 1000kg mast of dimensions 300mm x 500mm x 10 500mm long.

27.0 SAFETY COMPLIANCE

27.1 The vehicle must comply with the Machinery and Occupational Safety Act (Act 85 of 1993), as well as Transnet's safety instructions, where applicable.

27.2 Weatherproof safety notices indicating safe working loads, must be mounted on all the equipment where appropriate.

27.3 Safe operating instructions and daily inspections to be carried out by the driver of the vehicle before trips are undertaken, must be mounted on the inside of the cab.

27.4 Clear instructions regarding all precautions to be taken before the vehicle is towed, as well as maximum towing speed and distance, must be mounted in the cab.

27.5 All hydraulic equipment and movable sections must be fitted with mechanical locks, for use in travelling mode.

28.0 QUALITY ASSURANCE

28.1 All processes for the manufacture and assembly of the product components, must be subjected to a Quality Assurance System.

28.2 The tenderer will assume full responsibility for assuring that the products purchased, meet the requirements of Transnet for function and performance, including purchased products from sub-contractors.

28.3 The onus is on the manufacturer to prove the effectiveness of their system to Transnet.

28.4 SABS ISO 9000 to 9004 inclusive (SABS 0157 Parts 1 to 4) must be regarded as a guideline, where applicable.

28.5 The manufacturer must provide a description of the system employed to ensure that the above requirements will be met.

28.6 The following must accompany the description:

28.6.1 An organisational structure diagram highlighting the quality assurance function.

28.6.2 All inspection sheets and checklists in use.

28.7 The manufacturer must give detailed clarification regarding the quality assurance system when required.

28.8 The manufacturer must allow Transnet officials to carry out random audits of the system, without any prior warning.

28.9 The tenderer must ensure accessibility to all sub-contractors for audit purposes.

29.0 PAINTING

29.1 The vehicle and all its equipment must be thoroughly treated against rust and painted to provide a pleasant working environment. Paint colours must be negotiated between the Contractor and the Client.

29.2 Mechanical locks on hydraulic equipment must be painted red.

29.3 Chevron boards must be mounted on both ends of vehicle.

30.0 FURTHER REQUIREMENTS

30.1 Flexible rail sweepers must be fitted at both ends of the vehicle. (See clause 5.10.)

30.2 A cow catcher must be fitted at both ends of the vehicle.

30.3 A marker bracket (for train tokens) must be fitted at each end of the vehicle.

30.4 An emergency back-up system must be supplied for use in the event of a total failure of the main power source.

30.4.1 The back-up system must make it possible to retract all systems to allow towing.

30.5 A suitable Engineer’s vice must be supplied and fitted somewhere in a suitable position on the vehicle.

30.6 Noise levels in the working area must be less than 85dB (A).

31.0 DOCUMENTATION

31.1 A complete maintenance manual and spare parts list must be available on the vehicle.

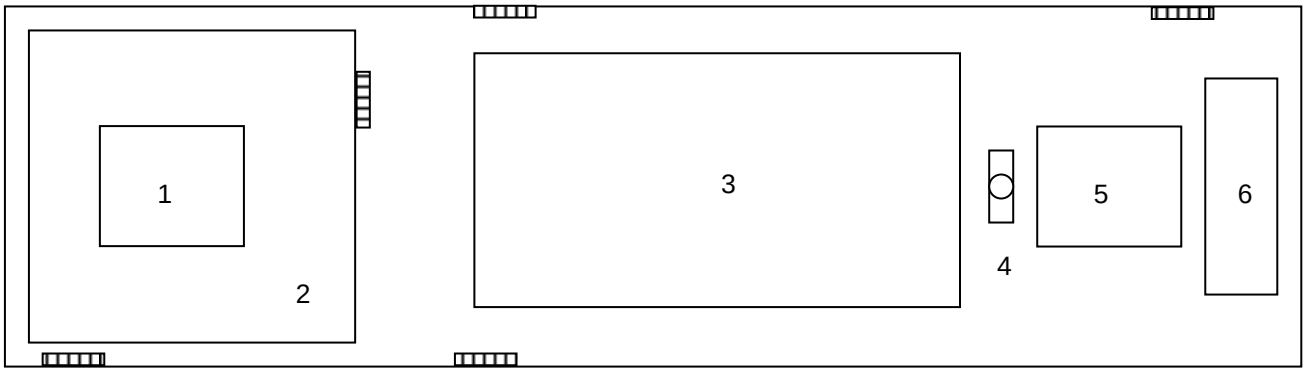
31.2 A complete operator’s instruction manual must be available on the vehicle.

SCHEDULE OF REQUIREMENTS FOR MEDIUM O.H.T.E. MAINTENANCE VEHICLES

NOTE: The clause numbers in this schedule correspond with those of the preceding specification (i.e. Annexure 3).

Clause number	Description	Required
6.2	The operating range required:	**600 km**
6.3	The governing incline encountered:	**1 : 40**
6.3	The speed the vehicle must be able to maintain up the incline above:	**50 km/h**
7.0	Elevating Platform:	**Yes**
8.0	Hydraulic Crane:	No
8.3	The lifting capacity required (t.m):	N/A
9.0	Dual Purpose Crane:	**Yes**
9.3	The lifting capacity required of dual purpose crane (t.m):	**7,5 t.m.**
10.0	“Cherry Picker”:	No
11.0	Catenary Support Mast:	**Yes**
12.0	Off-Tracking Equipment:	**Yes**
13.0	Air Supply for Pneumatic Tools:	**Yes**
14.0	High Pressure Washing Equipment:	**Yes**
14.5	High Pressure Hose length:	**10 m**
15.1	Number of persons seating accommodation is required for (6 minimum and driver included):	**6**
15.1	Number of the people specified above to be seated in the elevated inspection position:	**2**
27.4	Storage space for one mast:	No

APPENDIX A



1 Earthing pantograph

2 Cab

3 Elevating platform

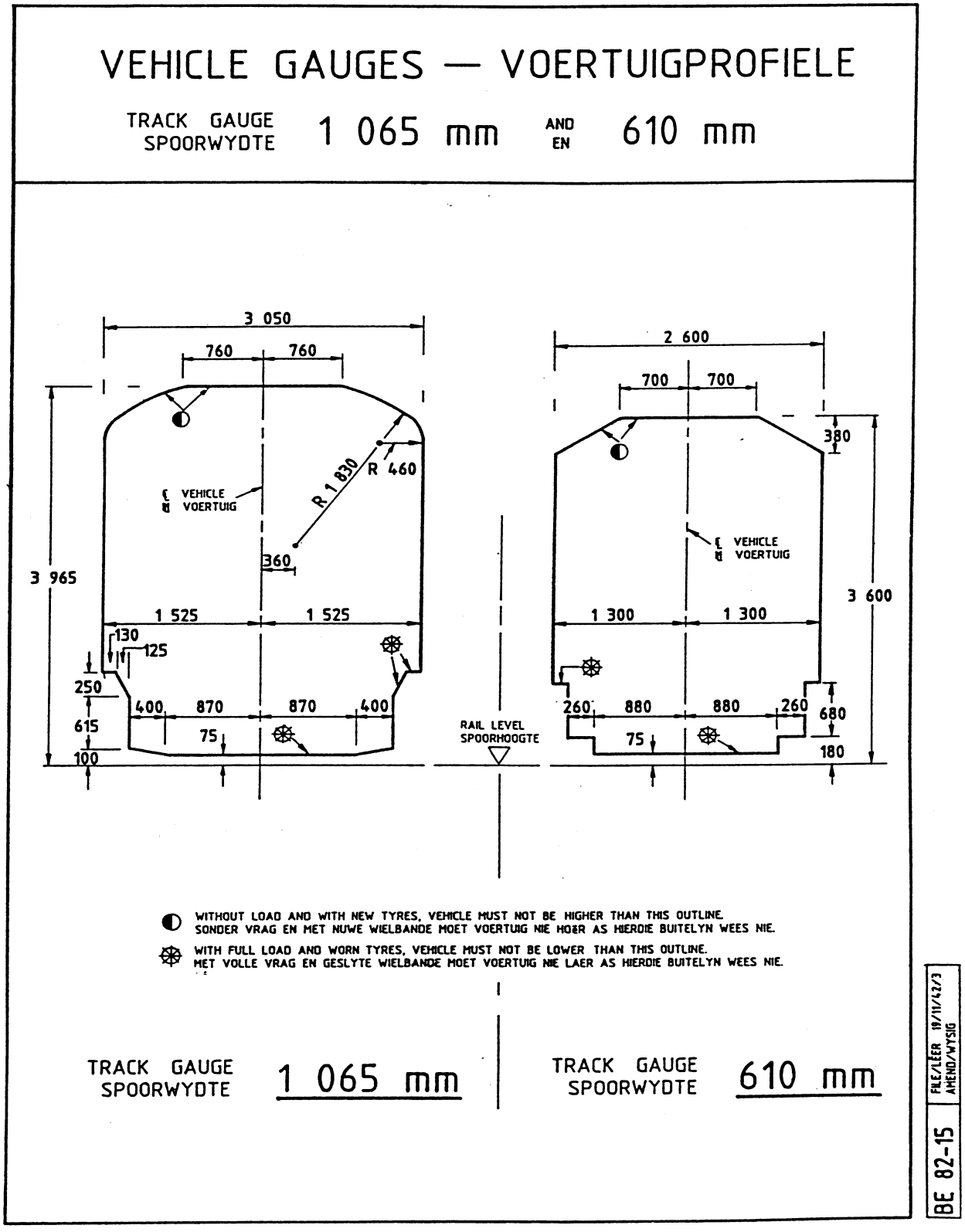
4 Catenary support mast

5 Measuring pantograph

6 Crane

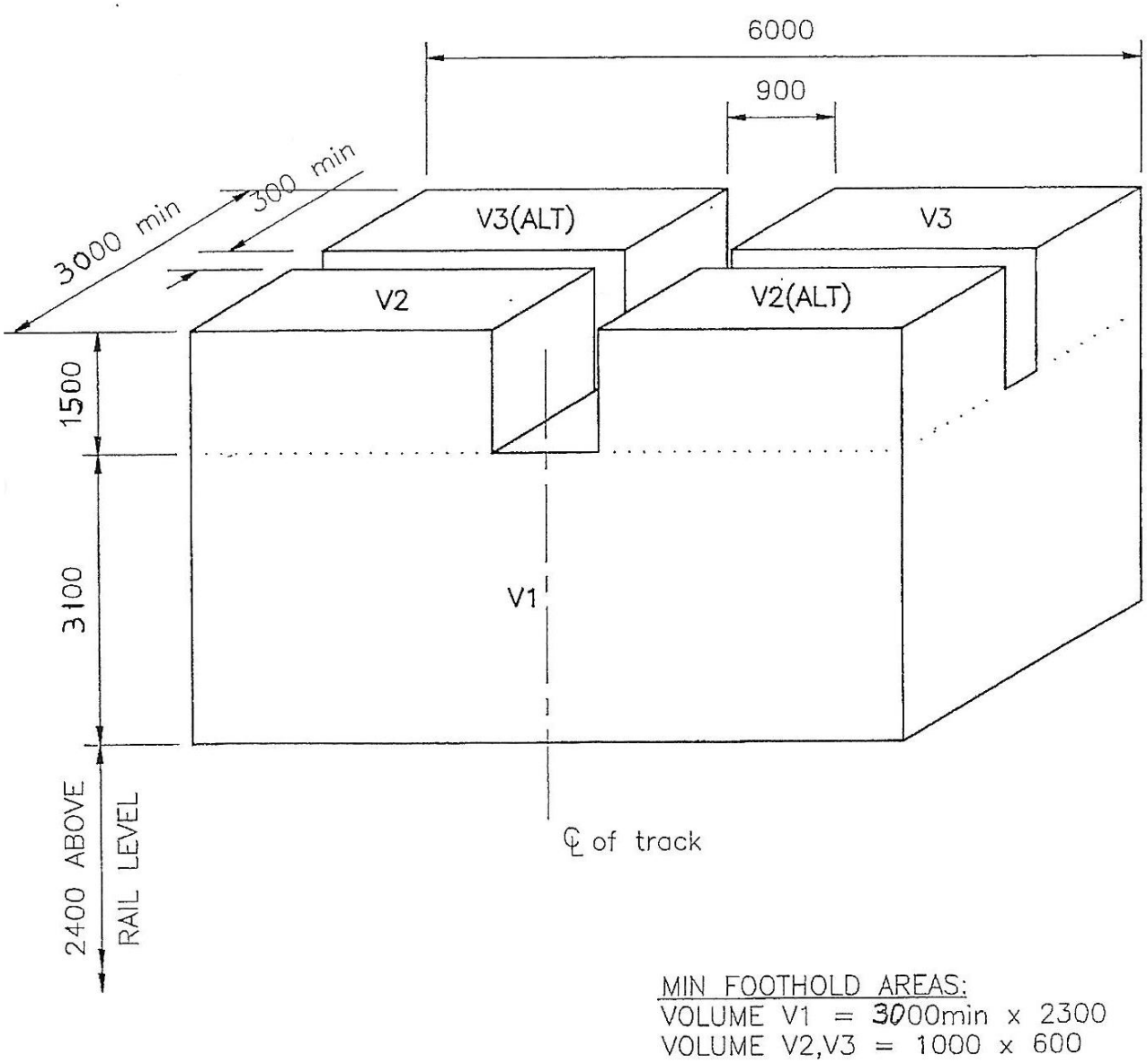
Door / gate

APPENDIX B


VEHICLE GAUGES — VOERTUIGPROFIELE
TRACK GAUGE SPOORWYDTE 1 065 mm AND EN 610 mm
3 050
760
760
3 965
℄ VEHICLE VOERTUIG
R 1 830
R 460
360
1 525
1 525
130
125
250
615
100
400
870
870
400
75
2 600
700
700
380
℄ VEHICLE VOERTUIG
3 600
1 300
1 300
260
880
880
260
680
180
75
RAIL LEVEL SPOORHOOGTE
WITHOUT LOAD AND WITH NEW TYRES, VEHICLE MUST NOT BE HIGHER THAN THIS OUTLINE.
SONDER VRAG EN MET NUWE WIELBANDE MOET VOERTUIG NIE HOËR AS HIERDIE BUITELYN WEES NIE.
WITH FULL LOAD AND WORN TYRES, VEHICLE MUST NOT BE LOWER THAN THIS OUTLINE.
MET VOLLE VRAG EN GESLYTE WIELBANDE MOET VOERTUIG NIE LAER AS HIERDIE BUITELYN WEES NIE.
TRACK GAUGE SPOORWYDTE 1 065 mm
TRACK GAUGE SPOORWYDTE 610 mm
BE 82-15
FILE/LÊER 19/11/42/3
AMEND/WYSIG

APPENDIX C

NOTE:
HEIGHTS SHOWN REFER
TO FOOTHOLD SURFACES



MIN FOOTHOLD AREAS:
VOLUME V1 = 3000min x 2300
VOLUME V2,V3 = 1000 x 600

APPENDIX D/1

from: MTV HEAD OFFICE

date: 15 August 1995

to: ELECTRIC'S HEAD OFFICE
Att.: Dawie Kruger & Jan Swiegers

Dear Sirs.

Interchangeability of crane and cherry picker

During previous discussions between MTV and ELECTRICS, MTV advised that both a crane and a "cherry picker" should be situated on the vehicle and that it should not be interchangeable. This recommendation was based on the MACHINERY AND OCCUPATIONAL SAFETY ACT OF 1985, regulation 18, paragraph 5 which reads as follows:

"The user shall cause the whole installation and all working parts of every lifting machine to be thoroughly examined and subjected to a performance test, as prescribed by the standard to which the lifting machine was manufactured, by a person who has knowledge and experience of the erection and maintenance of the type of lifting machine involved or similar machinery and who shall determine the serviceability of the structures, ropes, machinery and safety devices, before they are put into use following every time they are dismantled and re-erected, and thereafter at intervals not exceeding 12 months: Provided that in the absence of such prescribed performance test the whole installation of the lifting machine shall be tested with 110% of the rated mass load, applied over the complete lifting range of such machine and in such manner that every part of the installation is stressed accordingly."

According to the above, a performance test (overload test), executed by a competent person, is required every time the cradle is interchanged with the hook. After discussing this issue with Larry Kloppenborg (Occupational Safety, Department of Labour), the following allowance was made:

The performance test may be omitted after the hook has been interchanged with the cradle or *vice versa* subject to:

- The cradle and hook are connected to the rest of the hydraulic arm through a quick disconnect coupling.
- Connecting and disconnecting of the cradle or hook does not require any adjustment and/or alteration to the rest of the hydraulic system.
- The interchange is done by a competent person as described in regulation 18, paragraph 5 of the MACHINERY AND OCCUPATIONAL SAFETY ACT.

The above has not yet been confirmed in writing, but as soon as such a document is received, it will be forwarded to your office.

We regret such an amendment at this late stage, but sincerely hope that this aspect can still be renegotiated with the relevant tenderers for the Bloemfontein vehicle.

Due to the discussion with Mr Kloppenborg, the request for an interchangeable crane and cherry picker on the Empangeni vehicle, will be incorporated in the MTV specification.

Thank you

Stedrick Saayman
Engineer
MTV

APPENDIX D/2

Senioringenieur, Infrastruktuur (M.T.V)
Privaatsak / Private bag X47, Johannesburg

SPOORNET

Telefoon / Telephone	(011) 773-2983	Faksnommer / Fax number	(011) 773-3002	Datum / Date	17 August, 1995

Aan faksnommer / To fax number: **(011) 326-2549**

Gerig aan / Addressed to: Department of Labour - Occupational Safety

Vir aandag / For attention: **Larry Kloppenborg**

Van / From: Spoornet MTV

Getal bladsye insluitend hierdie bladsy / Number of pages including this page: 2

Verwysing / Reference: Phone call 15/08/95

Boodskap / Message

HEADING: Interchanangeable lifting equipment

Body Text

Attached please find a letter addressed to Electric's Head Office. This letter was drafted after a discussion between yourself and Mr A. Haasbroek. Would you please confirm,in writing, the omittance of a performance test under the conditions stressed in the attached letter.

Thanking you in advance

Stedrick Saayman
Engineer

APPENDIX D/3

LABOUR
Chief Directorate: Occupational Safety
Private Bag X117
0001 Pretoria

TRANSNET LIMITED
SPOORNET: SENIOR ENGINEER
INFRASTRUCTURE (MTV)
PRIVATE BAG X47
JOHANNESBURG
2000

Navrae • Enquiries: L. Kloppenborg
Bylyn • Extension:
Verwysing • Reference: 344

34/2/6/2/18

25 August 1995

Attention: Mr S. Saayman

Fax: (011) 773 3002

OCCUPATIONAL HEALTH AND SAFETY ACT, 1995
LIFTING MACHINE INSPECTION AND TESTING

Concerning your facsimile dated 17 August 1995 regarding confirmation of a discussion with your Mr A. Haasbroek, into the requirements for load testing of lifting machines.

The references made in your letter dated 15 August 1995 addressed to "ELECTRIC'S HEAD OFFICE" are in principle correct.

For clarity purposes, the OCCUPATIONAL HEALTH AND SAFETY ACT, 1993 has a number of regulation groups attached to the Act. Of which, regulation 18 of the DRIVEN MACHINERY REGULATIONS addresses the use of Lifting Machines (cranes, cherry pickers et cetra). Sub-regulation 5 addresses the inspection and testing frequency of lifting machines and special inspection and testing occasions. The "dismantling and re-erection" referred too in the sub-regulation is applicable when the whole lifting machine is dismantled and re-erected.

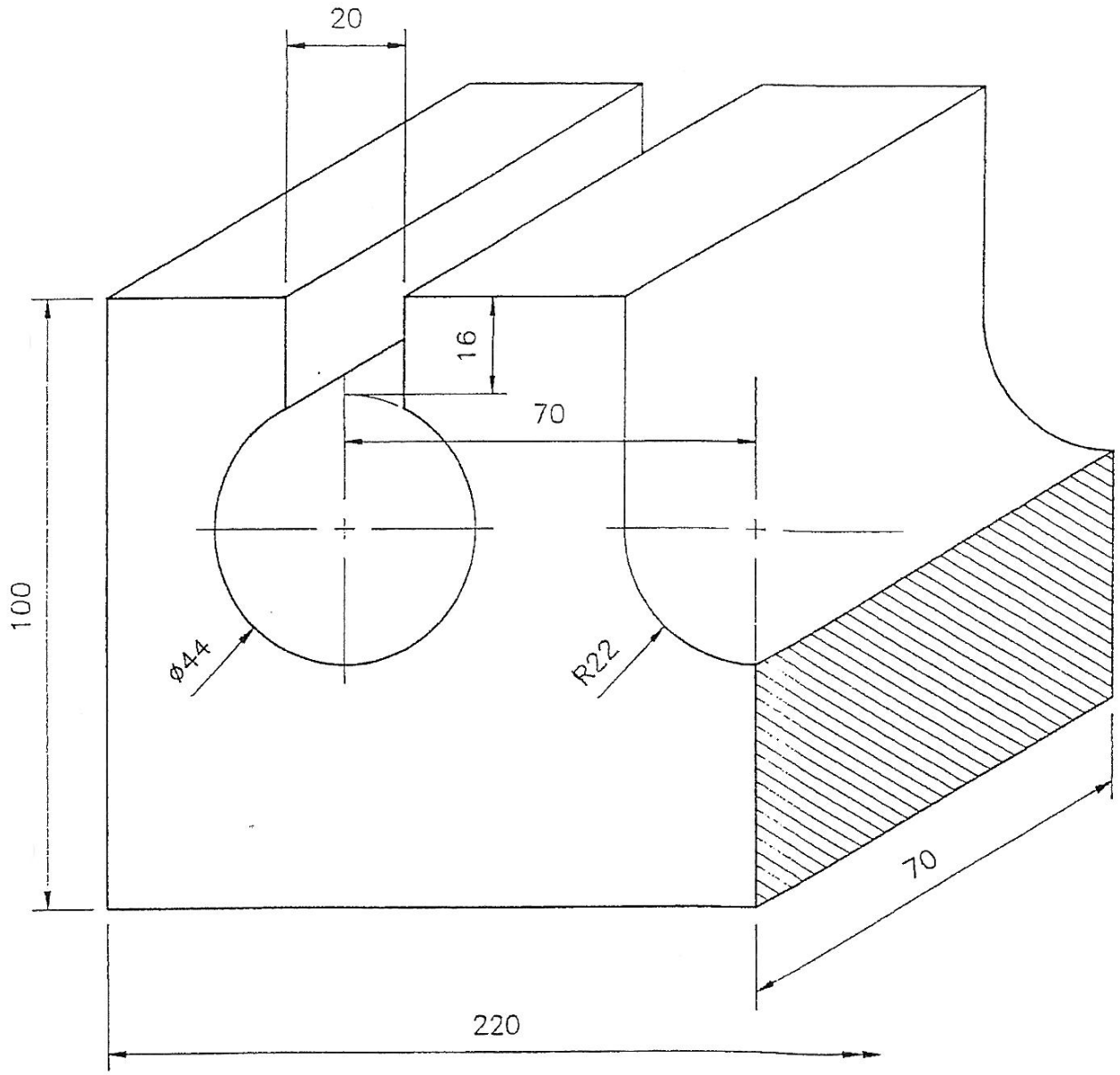
The connecting and disconnecting of lifting tackle (spreaders, cradles, attachment hocks et cetra) does not constitute the "dismantling and re-erection" of the lifting machine and therefore does not fall into the requirements of the Driven Machinery Regulation 18 (5).

Should you require any further assistance or information please contact the writer.

Your faithfully

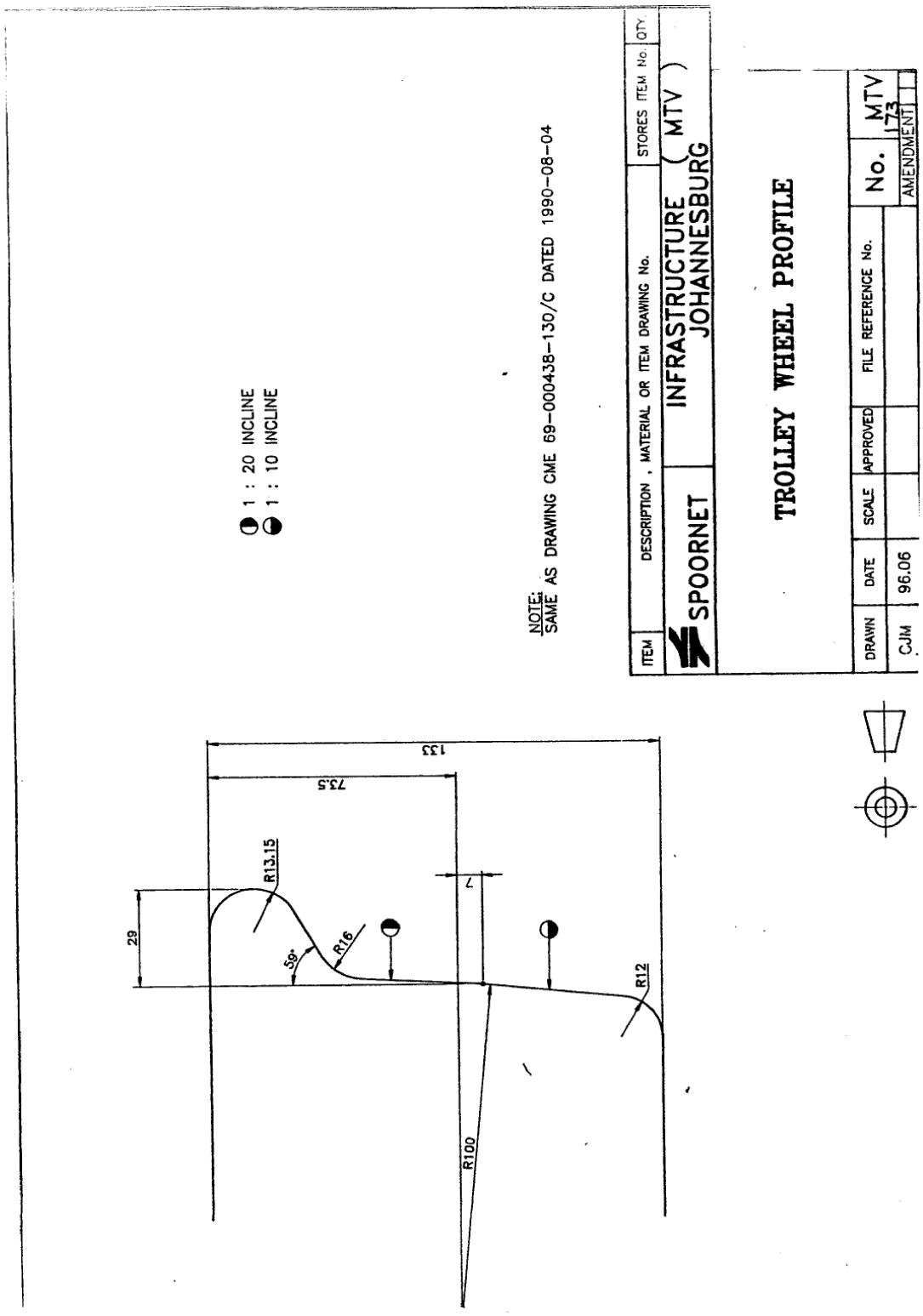
For Chief Inspector

APPENDIX E



DESIRED SHAPE OF NOTCHES

APPENDIX F


1 : 20 INCLINE
1 : 10 INCLINE
NOTE:
SAME AS DRAWING CME 69-000438-130/C DATED 1990-08-04
ITEM
DESCRIPTION , MATERIAL OR ITEM DRAWING No.
STORES ITEM No.
QTY.
SPOORNET
INFRASTRUCTURE (MTV)
JOHANNESBURG
TROLLEY WHEEL PROFILE
DRAWN
DATE
SCALE
APPROVED
FILE REFERENCE No.
No. MTV 173
AMENDMENT
CJM
96.06
133
73.5
R13.15
7
29
59°
R16
R12
R100

SECTION CONTENTS

1.0 SCOPE

1.1 This specification covers the Electrical requirements for a hired, heavy class self-propelled on-track inspection and maintenance vehicle, to be used on overhead electrical equipment of both 3kV DC and 25kV AC.

3.0 TENDERING PROCEDURE

3.1 No changes may be made to the text of this specification as issued, including its Appendice/s and (possible) Addendum/s.

3.2 Tenderers shall indicate compliance with the specification on a clause-by-clause basis. This shall take the form of a separate typewritten document listing all the specification clause numbers, against which the individual statements of compliance or non-compliance must be indicated. This separate document may be used by Tenderers to elaborate on their response to a clause.

3.3 Any statement of non-compliance shall be motivated by the Tenderer.

3.4 Tenderers may offer alternatives which they deem as viable, to the equipment specified in this specification. Alternative offers must be clearly marked as such. The consideration and / or acceptance of any alternative offer will be at the discretion of Spoornet**.**

4.0 SERVICE CONDITIONS

The vehicle will be required to operate under the following environmental conditions:

4.1	Altitude:	0 - 1800m above sea level.
4.2	Ambient temperature:	Minus 5 degrees Celsius to plus 45 degrees Celsius.
4.3	Relative humidity:	10 percent to 90 percent.
4.4	Lightning conditions:	11 flashes per square km per annum.
4.5	Contact wire heights:	4,2m to 6,2m above rail level.

5.0 TECHNICAL REQUIREMENTS

5.1 VEHICLE ELECTRICAL SYSTEM:

5.1.1 The vehicle battery shall be mounted in a well-ventilated housing. (Not inside the cab.)

5.2 ELECTRICAL POWER REQUIREMENTS:

5.2.1 A 50Hz supply of 220V AC with a minimum capacity of 6,5kVA shall be provided.

5.2.2 Two 220V, 50Hz watertight welding socket outlets, each with a 30 Amp capacity, shall be provided, one on each side of the vehicle deck. (Only one in use at any one time.)

5.2.3 Two 220V, 50Hz socket outlets with a total capacity of 20Amp, shall be installed in a suitable position inside the cab.

5.2.4 For the purpose of operating small power tools, one 220V, 50Hz watertight socket outlet, with a capacity of 20 Amp, shall be installed on each working platform of the vehicle including the aerial basket / ”cherry picker”, as well as one at the crane end of the vehicle. (Only one in use at any one time.)

5.2.5 For the purpose of operating hand held leadlights, one 24V DC watertight socket outlet with a capacity of 5 Amp, shall be provided on each working platform and in the aerial basket / “cherry picker”.

5.3 LIGHTING:

5.3.1 For the purpose of general night and tunnel work, two separately switched, weatherproof high pressure sodium floodlights, each rated at 70 Watt, shall be mounted as high as possible in the side handrails of the main elevating platform and aimed upwards (adjustable) to illuminate the overhead track equipment. Lenses of luminaires to be manufactured from clear polycarbonate or similar tough and shatter-proof material. Mounting must be on opposite sides of the platform and shall not cause an obstruction to staff working on the platform. Glare shall be reduced to a minimum.

5.3.2 One separately switched, weatherproof high pressure sodium floodlight rated at 70 Watt, shall be mounted as high as possible in the handrails of each working platform of the vehicle other than the main elevating platform and aimed upwards (adjustable) to illuminate the area above the platform. Lenses of luminaires to be manufactured from clear polycarbonate or similar tough and shatter-proof material. Mounting shall not cause an obstruction to staff working on the platform/s. Glare shall be reduced to a minimum.

5.3.3 Four 24V headlights for night driving (minimum 75 Watt Halogen) shall be mounted on the vehicle, two at each end. Pairs of headlights (front and rear) shall be switched separately. Pairs of headlights shall have a dipping facility, e.g. the driver must be able to select “high” or “low” beam as required.

5.3.4 Four 24V red tail-lights shall be mounted on the vehicle, two at each end.

5.3.5 The head- and tail lights of the vehicle shall be switched in such a way that, whichever pair of headlights is selected by the driver, will automatically cause the pair of tail-lights on the opposite end of the vehicle to light up.

5.3.6 One 24V spotlight (55 Watt Halogen) shall be provided on the cab. It shall be in such a position that it can be aimed at the measuring pantograph from inside the cab. The spotlight shall be separately switched, shall be fully adjustable and shall be capable of swivelling through 360 degrees.

5.3.7 At least two fully-enclosed fluorescent luminaires (cab lights) with an adequate light output, shall be mounted on the inside of the cab roof of the vehicle. These lights shall be separately switched.

5.4 EARTHING PANTOGRAPHS

5.4.1 The vehicle shall be equipped with two earthing pantographs. The pan of the pantograph at the non-cab end shall be mounted directly above a set of rail wheels or the centre of a bogie, to double as basic measuring pantograph. The other pantograph shall be mounted at the opposite (cab) end of the vehicle, preferably also above a set of rail wheels**.** They will only be activated when the vehicle is in crawling mode, i.e. at speeds varying between 0 and 10km/h.

5.4.1.1 Single-arm pantographs similar to those used on locomotives, are preferred. They must be calibrated to exert an upward force of 80N ±10% on the contact wire. This force shall stay constant throughout the range of contact wire heights (see clause 4.5) and shall also not vary by more than 10% during sloping up or down of the contact wire when the vehicle is travelling at a speed of up to 15km/h.

5.4.2 Both pantographs on the vehicle must be provided with both curved carbon (AC) pans as well as straight copper (DC) pans. Suitable storage space or brackets must be provided to allow the 2 pans not in use at a particular moment, to be securely carried on the vehicle at all times. The respective mass of the 2 types of pans must be equalised by attaching extra weights to the pans with lower mass (normally the AC pans), thus avoiding the need to adjust the pantograph tension springs each time the pans are exchanged.

5.4.3 Both the AC and DC pans of the basic measuring / earthing pantograph must be provided with a suitable scale on one side, so that contact wire stagger up to 500mm to the left or right of vehicle centre line, can be read off directly. (Vehicle centre line must also be track centre line on tangent track). The scales must have clear graduations every 10mm with figures every 100mm, arranged around a centre zero, i.e. 5-4-3-2-1-0-1-2-3-4-5. They must be legible from the elevating platform or cherry picker cradle. Black lettering on a white background is preferred.

5.4.4 The basic measuring / earthing pantograph must also be provided with a mechanical pointer to indicate contact wire height above rail. It must have clear graduations every 10mm over the full range of contact wire heights stipulated in clause 3.0, with figures every 100mm (e.g. 42-43-44-…..60-61-62) and red marks at 4,22m, 4,5m and 6,0m. It must be legible from the elevating platform or cherry picker cradle. Alternatively a digital height display may be provided for alternate use on the elevating platform and crane cradle.

5.4.5 Both the earthing pantograph frames shall be mounted directly onto the vehicle chassis (without insulation) and the current collectors must be connected directly to vehicle chassis via flexible copper cables / braiding with a total cross-sectional area of at least 70mm².

5.4.6 In the event of engine or system failure, spring pressure shall cause the earthing pantographs to stay up against the contact wire if they were up at the instant of failure. A lock-down system to ensure safe travelling under live Overhead conductors, shall be provided if necessary.

5.4.7 The two earthing pantographs shall be separately controlled from the driver's position by means of spring-loaded key switches and pushbutton switches. The earthing pantographs must only be activated by using two hands simultaneously to operate these switches. Dropping the earthing pantographs, shall require a similar two-hand operation. It shall only be possible to remove the key from the key switch in the centre-OFF position.

5.4.8 A manual override facility which is lockable in the OFF position by means of a removable key, must be provided at the driver's position of the vehicle, so that the elevating platform, cherry picker and catenary support mast may be operated without the earthing pantographs being in contact with the contact wire, for special conditions or operations.

5.4.9 The maximum height of both the earthing pantographs shall not exceed 3,965m above rail level when fully lowered.

5.4.10 An air-pipeline connection from the vehicle auxiliary system shall be provided for raising and lowering the pantograph.

5.5 WARNING DEVICES

5.5.1 An amber revolving light shall be mounted on the cab roof or other suitable position on the vehicle and shall be visible from all sides.

5.5.2 A suitable warning horn which shall be clearly audible at 300 metres, shall be provided. The air-horn type used on Spoornet's electrical locomotives, is preferred.

5.5.3 A suitable siren must also be provided, to warn staff against approaching trains.

5.6 VEHICLE EARTHING

5.6.1 The vehicle chassis shall be earthed to the rail by means of flexible copper cables with a total cross-sectional area of at least 70 square mm, which shall be connected to sturdy earth brushes on two of the vehicle axles, but not on the same bogie. These brushes must have at least the same current carrying capacity as the copper cables.

5.6.2 Cab, elevating platform/s, catenary support mast and crane/”cherry picker”, shall have flexible copper cables with a total cross-sectional area of at least 70 square mm connected across all hinges and joints in the frames and down to vehicle chassis.

5.6.3 A connection point for portable earthing cables must be provided in a suitable position on the elevating platform or “cherry picker” cradle. This facility shall consist of a 200mm length of approximately 50mm X 10mm unpainted copper bar, provided with two Ø14mm holes for clamping or bolting of earth cables. This connection point must make solid electrical contact with the platform or cradle framework. A flexible copper cable of at least 70 square mm shall be connected between this point and vehicle chassis.

5.6.4 All earthing connections must be made between clean metal surfaces. Vibration-resistant fasteners must be used wherever possible. A suitable jointing compound to prevent oxidation and ingress of moisture, must be applied in all earthing joints.

END