

Contract Data

The Employer is

Name Transnet Limited Trading as Transnet Freight Rail
Address Transnet Tender Advice Centre, Inyanda House 1, Ground Floor, 21 Wellington Road, Parktown, Johannesburg.
Telephone (012) 315-2137 Fax No. (012) 315-2138/ 086 560 3332
E-mail anneline.scholtz@transnet.net

The works is **DISMANTLE AND RE-DO THE OUTDOOR EARTHING FOR 3KV DC TRACTION SUBSTAT UNDER THE CONTROL OF THE DEPOT ENGINEER, NELSPRUIT.**

The site is **PHALABORWA, MKHUHLU AND MBUMBA.**

The starting date is

The completion date is

The reply period is weeks

The defects date is **1(one)**..... weeks after completion

The defect correction period is **2(two)**..... weeks

The delay damages are **R1, 000.00**..... per day

The assessment day is the **13th (thirteen)**..... of each month

The retention is **10 (ten) %**

Does the United Kingdom Housing Grants, Construction and Regeneration Act (1996) apply? **No**

The Adjudicator is

Name To be advised if disputes arises.....

Address

Telephone **Fax No.**

E-mail

Contract Data

The interest rate on late payment is % per complete week of delay.

The *Contractor* is not liable to the *Employer* for loss of or damage to the *Employer's* property in excess of..... for any one event.

The *Employer* provides this

Insurance Transnet Principal Control Insurance

The minimum amount of cover for the third insurance stated in the

Insurance Table is **> R25, 000.00 (Limited to R10, 000,000.00. for any one event)**

The minimum amount of cover for the fourth insurance stated in the

Insurance Table is **Not applicable**.....

The adjudicator nominating

body is **The Chairman of the Association of Arbitrators (Southern Africa)**

The tribunal is **Arbitration**.....

If the tribunal is arbitration,
the arbitration procedure is **The rules for the Conduct of Arbitrators of the Association of Arbitrators (Southern Africa)**.....

The *conditions of contract* are the NEC3 Engineering and Construction Short Contract (June 2005) and the following additional conditions:

As mentioned in paragraph 1.0 (Contractual obligations)

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1.0 CONTRACTUAL OBLIGATIONS

A:

- 1.1 The Contractor shall not make use of any sub-Contractor to perform the works or parts thereof without prior permission from the Project Manager.
- 1.2 The Contractor shall ensure that a safety representative is at site at all times.
- 1.3 The Contractor shall comply with all applicable legislation and Transnet safety requirements adopted from time to time and instructed by the Project Manager / Supervisor. Such compliance shall be entirely at his own cost, and shall be deemed to have been allowed for in the rates and prices in the contract.
- 1.4 The Contractor shall, in particular, comply with the following Acts and Transnet Specifications:-
 - 1.4.1 The Compensation for Occupational Injuries and Diseases Act, No. 130 of 1993. The Contractor shall produce proof of his registration and good standing with the Compensation Commissioner in terms of the Act.
 - 1.4.2 The Occupational Health and Safety Act (Act 85 of 1993).
 - 1.4.3 The explosive Act No. 26 of 1956 (as amended). The Contractor shall, when applicable, furnish the Project Manager / Supervisor with copies of the permits authorising him or his employees, to establish an explosives magazine on or near the site and to undertake blasting operations in compliance with the Act.
 - 1.4.4 The Contractor shall comply with the current Transnet Specification E.4E, Safety Arrangements and Procedural Compliance with the Occupational Health and Safety Act, Act 85 of 1993 and Regulations and shall before commencement with the execution of the contract, which shall include site establishment and delivery of plant, equipment or materials, submit to the Project Manager / Supervisor.
 - 1.4.5 The Contractor shall comply with the current Specification for Works On, Over, Under or Adjacent to Railway Lines and near High Voltage Equipment – E7/1, if applicable, and shall take particular care of the safety of his employees on or in close proximity to a railway line during track occupations as well as under normal operational conditions.
 - 1.4.6 The Contractor's Health and Safety Programme shall be subject to agreement by the Project Manager / Supervisor, who may, in consultation with the Contractor, order supplementary and/or additional safety arrangements and/or different safe working methods to ensure full compliance by the Contractor with his obligations as an employer in terms of the Act.
- 1.5 In addition to compliance with clause 1.4 hereof, the Contractor shall report all incidents in writing to the Project Manager / Supervisor. Any incident resulting in the death of or injury to any person on the works shall be reported within 24 hours of its occurrence and any other incident shall be reported within 48 hours of its occurrence.
- 1.6 The Contractor shall make necessary arrangements for sanitation, water and electricity at these relevant sites during the installation of the equipments.
- 1.7 The Contractor shall supply a **site diary** (with triplicate pages). This book shall be used to record any unusual events during the period of the work. Any delays to the work shall also be recorded such as delays caused by poor weather conditions, delays caused by permits being cancelled etc. The appointed Project Manager or Technical Officer must countersign such delays. Other delays such as non-availability of

equipment from 3rd party suppliers must be communicated to the Project Manager or Technical Officer in writing.

- 1.8 The Contractor shall supply a **site instruction book** (with triplicate pages). This book shall be used to record any instructions to the Contractor regarding problems encountered on site – for example the quality of work or the placement of equipment. This book shall be filled in by the Project Manager or Technical Officer and must be countersigned by the Contractor.
- 1.9 Both books mentioned in 1.10 and 1.11 shall be the property of Transnet Freight Rail and shall be handed over to the Project Manager or Technical Officer on the day of energising or handing over.
- 1.10 All processes or the manufacture and assembly of the product components must be subjected to a quality assurance system.
- 1.11 The Contractor will assume full responsibility for assuring that the products purchased meet the requirements of Transnet Freight Rail for function, performance, and reliability, including purchased products from 3rd part suppliers/Manufacturers.
- 1.12 The Contractor shall prove to Transnet Freight Rail that his equipment or those supplied from 3rd party suppliers/manufacturers confirms to Transnet freight rail specifications.
- 1.13 The Contractor will remain liable for contractual delivery dates irrespective of deficiencies discovered during workshop inspections.

Contract Data

The Contractor's Offer

The Contractor is

Name

Address

Telephone **Fax No.**

E-mail

The percentage for overheads and profit added to the Defined Cost for people is.....%.

The percentage for overheads and profit added to other Defined Cost is..... %.

The *Contractor* offers to Provide the Works in accordance with the *conditions of contract* for an amount to be determined in accordance with the *conditions of contract*.

The offered total of the
Prices is

Signed on behalf of the Contractor

Name

Position

Signature Date

The *Employer's* Acceptance

The *Employer* accepts the *Contractor's* Offer to Provide the Works

Signed on behalf of the *Employer*

Name

Position

Signature Date

Contract Data Price List

Item	Description	Unit	Qty	Rate	Price
A	Phalaborwa 3 kV DC Substation				
1	Redo Earthing of outdoor high voltage yard	Sum	1		
2	Installation, Testing and Commissioning	Sum	1		
3	Transportation of all dismantled material to Nelspruit Depot	Sum	1		
4	P's and G's	Sum	1		
A	Total Price for Phalaborwa =		R		
B	VAT (14%) =		R		
C	Gross Total (A+B) =		R		

Contract Data Price List

Item	Description	Unit	Qty	Rate	Price
B	Mkhuhlu 3 kV DC Substation				
1	Redo Earthing of outdoor high voltage yard	Sum	1		
2	Installation, Testing and Commissioning	Sum	1		
3	Transportation of all dismantled material to Nelspruit Depot	Sum	1		
4	P's and G's	Sum	1		
A	Total Price for Mkhuhlu =			R	
B	VAT (14%) =			R	
C	Gross Total (A+B) =			R	

Contract Data Price List

Item	Description	Unit	Qty	Rate	Price
C	Mbumba 3 kV DC Substation				
1	Redo Earthing of outdoor high voltage yard	Sum	1		
2	Installation, Testing and Commissioning	Sum	1		
3	Transportation of all dismantled material to Nelspruit Depot	Sum	1		
4	P's and G's	Sum	1		
A	Total Price for Mbumba =			R	
B	VAT (14%) =			R	
C	Gross Total (A+B) =			R	

Contract Data

Works Information

1. Description of work

- 1.1 Dismantle and re-do the outdoor earthing at **PHALABORWA, MKHUHLU and MBUMBA** for 3kV DC traction substation under the control of Depot Engineer, Nelspruit.

2. DRAWINGS, INSTRUCTION MANUALS AND SPARE PART CATALOGUES

- 2.1 All as built drawings shall be supplied in electronic format (Microstation/Acad).
- 2.2 The successful Contractor shall be required to submit all drawings (paper prints), within four weeks of award of tender, to the Project Manager or Supervisor for approval. No construction or manufacturing activity will be allowed prior to the associated drawings having been approved.
- 2.3 During the duration of the contract period, the successful Contractor will be required to inform the Project Manager or Supervisor of any changes to these drawings and will have to resubmit the affected drawings for approval prior to it being used on this contract.
- 2.4 All drawings, catalogues, instruction book and spares lists shall be in accordance with Transnet Freight Rail's specification CEE.0224.2002.
- 2.5 All final as built drawings shall be provided to Transnet Freight Rail within four weeks after commissioning.

- 2.6 Supply three sets of A3 schematic wiring diagrams in hard copy format and electronic format for approval.

3. SITE TESTS

- 3.1 The work shall be inspected/tested and approved by Transnet Freight Rail Quality Assurance on site.
- 3.2 The Contractor shall be responsible for carrying out of on-site tests and commissioning of all the work done on site.
- 3.3 The Contractor shall submit a detailed list of on-site tests for the approval of the Project Manager or supervisor.
- 3.4 The Contractor shall arrange for the Supervisor or his representative to be present to witness the on-site tests.
- 3.5 The on-site tests and subsequent commissioning **will not commence until ALL WORK** has been completed. Material shall be removed from site prior to the commencement of testing.
- 3.6 At the completion of the on-site tests, the Project Manager or Supervisor or his representative shall either sign the tests sheets (supplied by the Contractor) as having witnessed the satisfactory completion thereof, or hand to the Contractor a list of defects requiring rectification.
- 3.7 Acceptance by the Project Manager or Supervisor of satisfactory completion of on-site tests in no way relieves the Contractor of his obligation to rectify defects which may have been overlooked or become evident at a later stage.

4. COMMISSIONING OF EQUIPMENT

- 4.1 Commissioning will only take place after all work has been done to the satisfaction of the Project Manager or Supervisor.
- 4.2 On completion of commissioning, the Contractor will hand the site over to the Project Manager or Supervisor in terms of the relevant instruction.

5. The Contractor shall be present during the testing.

6. GUARANTEE AND DEFECTS

- 6.1 The Contractor shall guarantee the satisfactory operation of the complete electrical installation supplied and erected by him and accept liability for maker's defects that may appear in design, materials and workmanship.
- 6.2 The Contractor shall be issued with a completion certificate with the list of all defects to be repaired within 14 working days after commissioning.

- 6.3 The guarantee period for these standby plants shall expire after: A period of 12 months commencing on the date of completion of the contract or the date the standby plant was handed over to Transnet Freight Rail.
- 6.4 Any defects that may become apparent during the guarantee period shall be rectified to the satisfaction of Transnet Freight Rail, and to the account of the Contractor.
- 6.5 The Contractor shall undertake work on the rectification of any defects that may arise during the guarantee period within 7-days of him being notified by Transnet Freight Rail of such defects.
- 6.6 Should the Contractor fail to comply with the requirements stipulated above, Transnet Freight Rail shall be entitled to undertake the necessary repair work or effect replacement of defective apparatus or materials, and the Contractor shall reimburse Transnet Freight Rail the total cost of such repair or replacements, including the labour costs incurred in replacing defective material.
- 6.7 Any specific type of fault occurring three times within the guarantee period and which cannot be proven to be due to other faulty equipment not forming part of this contract e.g., faulty locomotive or overhead track equipment, etc., shall automatically be deemed an inherent defect. Such inherent defect shall be fully rectified to the satisfaction of the Project Manager or Technical Officer and at the cost of the Contractor.
- 6.8 If urgent repairs have to be carried out by Transnet Freight Rail staff to maintain supply during the guarantee period, the Contractor shall inspect such repairs to ensure that the guarantee period is not affected and should they be covered by the guarantee, reimburse Transnet Freight Rail the cost of material and labour

7. QUALITY AND INSPECTION

- 7.1 Transnet Freight Rail shall inspect the work on site under contract.
- 7.2 The Contractor shall notify Transnet Freight Rail 14 days in advance of such an inspection date.

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Contract Data

Works Information

8. Specifications

8.1 South African National Standards:

8.2 SANS 1091 National colour standard.

8.3 SANS 763 Hot dip galvanised zinc coating.

8.4 SANS 121 Article. Hot Dip Galvanised Coating for Fabricated Iron or Steel

8.5 SANS 8528 Reciprocating internal combustion engine driven alternating current generating set.

8.6 SANS 10142 Wiring Code.

8.7 Transnet Freight Rail:

8.8 BBB 3620 version 4 3kV DC earthing arrangement–Traction Substation.

- 8.9 CEE-TBD-0007 Earthing arrangement for traction substations.
- 8.10 CEE.0183.2002 Hot dip galvanising and painting of electrical equipment.
- 8.11 CEE.0224.2002 Drawings, catalogues, instruction manuals and spares list for electrical equipment supplied under contract.

NOTE: Any other specifications referenced in the above mentioned specification, will be for information purposes and may be provided on request.

8.12 Occupational Health and Safety Act No. 85 of 1993 (Available at depot for referral)

9. Constraints on how the *Contractor* Provides the Works

9.1 The constraints shall be as specified in the specifications of the particular equipment.

10. Requirements for the programme

- 10.1 Programme of work : To be submitted by successful Contractor
- 10.2 CIDB rating : 2 EPPE or 3EP and above
- 10.3 Format : Any
- 10.4 Information : How work is going to be executed and commissioned
- 10.5 Submission : 1 week after the award of contract
- 10.6 Site diary : Successful Contractor to supply in triplicates carbon copies
- 10.7 Site instruction book : Successful Contractor to supply in triplicates carbon copies

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

- 11.1 Transnet Freight Rail shall have responsible person available for isolation and the erection of barriers to live electrical equipment and issuing of work permits

Contract Data

Site Information

The works shall be performed at **PHALABORWA, MKHUHLU and MBUMBA** UNDER THE CONTROL OF THE DEPOT ENGINEER, NELSPRUIT.

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Transnet Freight Rail

ENGINEERING AND TECHNOLOGY TECHNOLOGY MANAGEMENT SPECIFICATION

3kV DC Traction substation earthing system for high voltage outdoor yards.

1. Scope

- 1.1 This specification specifies Freight Rail's Requirements for the design, supply, installation and testing of the earthing systems for new and existing 3kV DC traction substations.
- 1.2 This specification must be read in conjunction with Freight Rail's drawing BBB 3620.

2. Standards And Publications

- 2.1 Unless otherwise specified all materials and equipment supplied shall comply with the applicable and latest editions of SANS and Freight Rail publications.
- 2.2 The following publications are referred to in this specification:

2.2.1 South African Bureau Of Standards

SANS 926	Two pack zinc-rich epoxy primer.
SANS 1063	Earth rods and couplers.
SANS 1391-1	Zinc and Aluminium coatings for the protection of iron and steel against atmospheric corrosion.
SANS 1507- 1-3	Electric cables with extruded solid dielectric insulation for fixed installations. (300/500V to 1900/330V)
SANS 10199	The design and installation of an earth electrode.

2.2.2 Freight Rail

CEE 0177	Code of Practice Earth systems for electric light and power and traction installations.
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Freight Rail's Electrical Safety Instructions

Freight Rail Drawaing

BBB 3620	3kV DC Traction substation earthing system for high voltage outdoor yards.
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3. Method Of Tendering

- 3.1 Tenderers shall indicate clause by clause compliance with the specification. This shall take the form of a separate document listing all the specification's clause numbers indicating the individual statement of compliance or non-compliance.
- 3.2 A statement of non-compliance shall be motivated by the tenderer.
- 3.3 Tenderers shall submit descriptive literature consisting of detailed technical specifications, general constructional details and principal dimensions, together with clear illustrations of the equipment offered.
- 3.4 Failure to comply with clauses 3.1, 3.2, 3.3 could preclude a tender from consideration.

4. Definitions

Definitions are in accordance with SANS 10199.

4.1 Earth Electrode

One or more conductive parts embedded in the earth for the purpose of making effective electrical contact with the general mass of the earth, and to act as a path for the discharge of either lightning currents or fault currents.

4.2 Earthed

So connected to the general mass of earth as to ensure at all times an immediate discharge of electrical energy without danger.

4.3 Earthing system

A System intended to provide at all times, by means of one or more earth electrodes, a low impedance path for the immediate discharge of electrical energy without danger into the general mass of earth.

5. Earthing Systems Of Traction Substations

The earth leakage protection consists of an AC earth leakage and a DC earth leakage system as described below:

5.1 AC Earth Leakage System

The AC earth leakage system is used to detect flashovers on high voltage HV outdoor yard equipment. The equipment in the outdoor yard is insulated from the substation earth mat and connected in parallel through a current transformer to earth mat. (Minimum resistance to earth mat is 10 Ohms). The output of the current transformers feeds to an earth leakage relay, which will trip and lock out the primary circuit breaker when operated.

5.2 DC Earth Leakage System

The DC earth leakage system is used to detect 3kV DC and 380V AC insulation failures. The steelwork and panels inside the traction substation are bonded to a DC earth leakage busbar, which is insulated from earth mat. (Minimum resistance to earth mat is 25Ohms). The DC earth

leakge bushbar is connected to the substation negative busbar through a DC earth leakage relay.

Operation of this relay will isolate the complete substation from all sources of supply and lock out the primary circuit breaker and all the 3kV DC high speed circuit breakers.

6. Service Conditions

6.1 Atmospheric Conditions:

Altitude	:	0 to 1800m above sea level.
Ambient temperature	:	-5% to +45 °
Relative humidity	:	10% to 90%
Lightning Conditions	:	12 ground flashes per square kilometre
Pollution	:	Heavily salt laden or polluted with smoke from industrial sources.

6.2 Soil Condition

The soil resistivity can vary from 10 Ohmmeter to more than 5,000 Ohmmeter. Earth value enhancement methods will have to be used, where necessary to obtain the desired value of 5 Ohms or less.

6.3 Corrosion

Buried conductors will be exposed to both severe galvanic and chemical corrosion. There is a high level of stray current in the vicinity of 3kV DC traction substations which will reduce the life of the earthing system.

7. Technical Requirements

7.1 The design and installation of Freight Rail's earthing system for outdoor yards shall be in accordance with Freight Rail's drawing BBB 3620.

7.2 A 5-second fault current duration shall be used for the rating of the earthing system. The earth down conductors and earth tails shall be able to withstand 6,2 kA for 5 seconds when exothermically welded. The rated aC fault level for 3kV DC traction substations shall be taken to be 16kA.

7.3 Deviation of the design shall be submitted to the project manager for approval.

8. Earthing Layout

8.1 The following electrical equipment in the outdoor yard shall be bonded directly to earth mat

- The support steel structures for the surge arresters at the Eskom supply side
- All surge arresters
- The AC disconnects

- Voltage transformer steel structures where applicable
- Main current transformers on Eskom side of primary circuit breaker in high voltage (HV) yard
- The perimeter fence posts and gates
- Substations metal roof

8.2 The following electrical equipment forms a part of the AC earth leakage system and shall be connected via a current transformer to earth.

- Main traction transformer
- Primary circuit breaker
- Main current transformers between primary circuit breaker
- The auxiliary transformer's barrier screen

8.3 The following electrical equipment is connected directly to the DC earth leakage relay busbar.

- The auxiliary transformers tank
- All sparkgaps

8.4 The following outdoor electrical equipment is connected directly to the DC earth leakage relay busbar.

- The anode wall plate (wall bushings)
- The auxiliary transformer neutral point
- AC/DC motorised link framework and structure where fitted.
- The auxiliary transformer short circuiting switch fitted on substation wall in the outdoor yard.

9. Materials to be used

Earthing

9.1 The material to be utilised shall be 16mm diameter copper plated earth rods. The rods shall comply with SANS 1063 and shall be electro – plated to a minimum thickness of 250 microns.

The length of the rods will be dependant on the application.

- Earth electrodes (Earth spikes). Minimum length of 1.5 meters shall be used.
- Down conductors, earth tails and interconnecting conductors. Rods of varying lengths may be used.

9.2 Copper plated rods shall have the SANS mark of approval and the manufacturers name.

- 9.3 For the installation or replacement of the main earth mat / earth electrode, copper conductor of At least 16mm diameter shall be used and shall be buried at least 1.5 meters below the ground. The earth mat shall cover an area of at least 1.5 square meters.
- 9.4 The earth mat shall be provided with a test point connection for test purposes. This test point shall protrude a minimum of 100 mm above ground level and shall be protected by means of a metal pipe or metal housing.
- 9.5 The location of the earth mat / earth spike shall be as close as possible to the main surge arresters support structures.

AC Earth Leakage System

- 9.6 PVC insulated composite galvanised steel, tinned copper bonding wire shall be used where insulated earthing conductors are required for the interconnecting of the high voltage equipment on the AC earth leakage system. The conductivity of the interconnecting cables shall be the equivalent of 98mm² copper conductor.
- Two composite cables each with a conductivity equivalent to 50mm² copper conductor as per SANS 1507 shall be connected in parallel to obtain the equivalent conductivity of a 98 mm² copper conductor.
- 9.7 The resistance between the outdoor yard steelwork connected to AC earth leakage system and main earth electrode shall be a minimum of 10 Ohms.

10. Installation Of Earthing System

10.1 Earthing Survey

- For new installations the contractor shall carry out an earthing survey in accordance with the method as described in specification CEE0177 or SANS 10199 to determine the type of earthing system required. The contractor shall be required to submit a separate quotation for the survey.
- For existing substations the contractor shall carry out earth resistance tests to establish the condition of the existing earth mat/earth spike and shall replace such earth mat/earth spike where required.

10.2 Trenching

- Before any trenching commences the contractor shall consult with Freight Rail staff for approval with regard to the routing of the trenches in the outdoor yard.
- Trenching shall include all trenches required for the installation of the earthing system.
- The perimeter fence trenching shall be as possible to the perimeter fence on the inside of the HV yard.
- The depth of trenches shall be at least 700 millimetres. Care must be taken not to damage existing cables in the high voltage outdoor yard during trenching operations.
- Before the trenches are closed a representative from Freight Rail shall inspect the earthing system for damage to earth rods.

10.3 Installation

- Earth electrodes shall be driven into the ground at the corners of the outdoor yard and in between the corners.
- In the case of double unit substations the number of earth electrodes between the corner electrodes shall be determined in consulting with Freight Rail.
- The depth of the earth electrodes driven into the ground shall be such that the top of the earth electrode shall be a minimum of 700 mm below the surface of the ground.
- The earthing of the support steel structures for the surge arresters, AC disconnects, voltage transformers (Where installed) and current transformers shall be in accordance with Freight Rail's drawing BBB 3620.
- The surge arresters base shall be connected directly to earth mat/spike.
- Where surge arresters are fitted on the main transformer provision shall be made to install an earth electrode in close proximity to the transformer. The earth electrode shall be connected directly to the earth system as shown in drawing BBB 3620.
- All underground connections which include connections to the earth electrodes, the joints in the copper plated steel rods, connections to the perimeter fence posts, support steel structures and the connection to the new or existing earth mat shall be exothermic welded.
- Where exothermic welding cannot be carried out, galvanised studs, nuts, tinned cable lugs and any other approved means may be used for the termination of the earthing conductors to the fence posts, surge arresters down leads and other electrical equipment.
- Exothermic welded joints and steel components exposed to corrosion shall be sealed with a durable waterproofing compound i.e. Bitumen, Denso tape or Noxide.
- All crimped connections that are above ground level must be filled with an anti corrosive compound.
- Where the exothermic welding is carried out on galvanised surfaces of the support steel structures, the galvanising must be removed and the surface cleaned. After completion of the exothermic weld, the surface area on the support steel structure where the galvanising was removed shall be treated using zinc-rich paint which complies with the requirements of SANS 926 and SANS 1391.
- Exothermic joints shall be hemmer tested on recommendation of the manufacture of ensure that the mechanical strength of the joints are adequate. The exothermic weld is tapped by a hammer and by sound it is determined whether the joints are solid or that there are voids in the joint.
- Where two earthing conductors run parallel to each other, exothermic parallel joints shall be installed every 1.5 metres on all straight sections between these conductors.
- The contractor shall replace any copper plated steel rods, damaged during installation.

10.4 Certification Of Contractors (Exothermic Welding)

- Only contractors who are certified and accredited by the exothermic welding industry shall be used for the installation.

10.5 Crusher stone

New Substations

- After completion of construction, installation of equipment, the laying of all cables and earthing conductors, a suitable weed killer approved by the Project Manager shall be applied in the outdoor yard unless otherwise specified.
- The successful tenderer shall exercise the greatest care to avoid contaminating private property.
- After treatment with the weed killer, a 100 mm layer of 25mm to 37mm crusher stone shall be laid over the whole area of the Freight Rail high voltage outdoor yard (within the apron).

Existing substations

- The contractor shall remove the necessary crusher stone before any excavation commences.
- The contractor shall restore the crusher stone to its original condition once the installation work has been completed.
- The contractor shall supply any additional crusher stone required to restore the trenched areas to original condition.

11. Special Tools (Optional)

11.1 Tenders shall furnish quotations for the special bending equipment and exothermic welding moulds required for the installation of the earthing system.

11.2 The price shall form a separate part of the quotation.

12. Test and Acceptance

12.1 The contractor shall perform resistance measurements tests, which shall be witnessed by a representative of Freight Rail. The resistance measurements shall be entered into the substation station log book.

12.2 In the event of any dispute, Freight Rail reserves the right to make the final decision on the acceptance of the earthing system.