ELECTRICAL SAFETY INSTRUCTIONS



2024

This document contains personal information as defined in the Protection of Personal Information Act, 2013 (the “Act”). The information contained herein shall be processed in accordance with the provisions of the POPIA.

THESE INSTRUCTIONS ARE ISSUED BY THE CHIEF EXECUTIVE OFFICERS OF THE RAILWAY OPERATORS AS BELOW.

THE INSTRUCTIONS CONTAINED IN THIS PUBLICATION COME INTO OPERATION ON 1st JUNE 2024 AND CANCELS ALL PREVIOUS INSTRUCTIONS WHICH ARE INCONSISTENT THEREWITH.

THIS INSTRUCTION SHALL BE REVIEWED EVERY 5 YEARS OR AS AND WHEN CIRCUMSTANCES DICTATE TO ENSURE THAT IT REMAINS CURRENT AND RELEVANT"

NEXT REVIEW DATE: MAY 2029

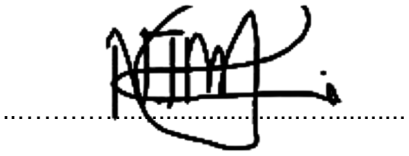


Mr. RUSSELL BAATJIES

CHIEF EXECUTIVE

TRANSNET FREIGHT RAIL

May 2024



CHIEF EXECUTIVE OFFICER

PRASA RAIL

May 2024

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ACKNOWLEDGEMENT FORM

I .....

hereby acknowledge having received a copy of the Electrical Safety Instructions, effective from 01 June 2024 and I hereby acknowledge that it is my duty as an employee, and a condition under which I am employed, to make myself fully acquainted with and abide by the instructions contained in the said Electrical Safety Instructions, and this I undertake to do. I agree to return this book to the proper official when called upon to do so, or upon leaving the service.

Station or depot ..... Signature .....

Date ..... Grade .....

NOTE: Each person receiving this Electrical Safety Instructions, effective from the 01 JUNE 2024 must return to the sender an acknowledgement form duly filled in by him/her.

Each official responsible for the distribution of the Electrical Safety Instructions, effective from 01 JUNE 2024 must see that an acknowledgement form is duly filled in and returned by each employee receiving a copy of the book. The completed acknowledgement forms received from each employee must be archived and copies must be submitted to the depot safety person/officer.

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LIST OF AMENDMENTS TO ELECTRICAL SAFETY INSTRUCTIONS

I hereby certify that I have received the following amendments and have amended my book accordingly:

Revision No.	Date Issued	Clause No.	Page No.	Remarks	Received	
					By	Date
3	April 2024	Section 1	1	Added to definition of Electrical Officer “Ensure that the contractor is adequately trained and”		
				Changes to definition of Electrician “or who holds a trade test certificate “was added and “is, or” was removed.		
				Changes to definition of Electrical fitter “or who holds a trade test certificate “was added and “is, or” was removed.		
			2	Added to definition of examining officer “who has been trained in and “		
				Added new definition “Localised control”		
				Changes to definition of “Responsible representative”		
				Added new definition “person in charge of tests”		
				Changes to the definition of Senior responsible electrical engineer “The person with the highest authority, who is the custodian of these instructions and also responsible for electrical maintenance standards, operating and safe working procedures and /or technology/design standards “		
			3	Added new definition of “Additional earth connections” .		
				Added new definition “*Boundary”*- is the approach limit to exposed high voltage electrical equipment that should not be encroached		
			4	Added “ work” to the definition of general supervision by authorised persons – requires “ continual presence of the authorised person		

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				in the work area		
			5	Added new definition “Primary earth- The first earth connection at each possible source of supply”		
				Added new definition “Work area – the immediate area where either work or testing is being undertaken		
			7	Additions to 103.3 Operations of switches “ In the case of fires of high voltage equipment where there is a possibility of the earthing system becoming compromised or the conductive parts e.g., fences ,structures becoming “Live” no manual operation of any switching devices shall be undertaken.”		
			8	Additions to 103.9.2 “via email”		
				Additions to 103.9.3.1 “services, Rail Safety regulator and department of labour”		
				Additions to 103.10 Note “*Classes of instruction on first aid to the injured, must be approved by the senior responsible electrical engineer and are organised by Transnet academy,* *Contractors (private or Transnet employees) working in terms of these instructions must ensure that their employees receive training by an accredited body. Public persons from surrounding areas recruited as casual labour for general work need not be trained as first aiders provided there is 1 first aider for a gang of not more than 15 casual labourers*		
				Addition of “103.11 **First Aid kit** – At every work site where work or testing is undertaken there must be at least one adequately stocked First Aid kit”		
			9	Removed “even a dry broom”		
3	April 2024	Section 2	14	Changed colour of the warning notices		
			18	Added to 209.1 ….” encroach the minimum safe clearance or “….		
			19	Changed colour of warning notices		

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3	April 2024	Section 3	23	302.1 changed “A Red to AR”		
				302.1.1 Removed …” electricians” and added “who are employees of Transnet and Prasa”		
				Added “302.1.2.4 supervise unauthorised persons in restricted aces ways’		
				Added “302.1.3.3 successfully completed the relevant first aid training and holds a valid certificate”		
				302.2 changed “A Brown to AB”		
				302.2.1 included…” who are employees of Transnet or Prasa”		
				Added “302.2.3 supervise unauthorised persons in restricted access ways (clause 607..0) and /or ..		
				Added “3020.2.2.4 perform the functions of “Localised Control” under “test permit” conditions “		
3	April 2024	Section 3	24	302.2..3.1 added …” and safely”..		
				Added “302.2.3.3 successfully completed the relevant first aid training and holds a valid certificate”		
				302.3 Removed “Grey”		
				Added ”302.3.3.2 successfully completed the relevant first aid training and holds a valid certificate.”		
				302.4 removed “Green”		
				Added “302.4.2.5 perform the functions of “Localised Control” under “test permit” conditions”		
				Added “302.4.3.3 successfully completed the relevant first aid training and holds a valid certificate.”		
				302.5 removed “Blue”		
3	April 2024	Section 3	25	Added “302.5.3.3.3 successfully completed the relevant first aid training and holds a valid certificate.”		
				302.6 removed “Yellow”		
				302.6.3.1 Added “successfully completed the relevant first aid training and holds a valid certificate”		

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				302.7 Changed "**Examining officers** - Only duly authorised persons, with a valid category A license, appointed by the senior responsible electrical engineer or a national examining officer in the office of the senior responsible electrical engineer or a depute national examining officer, may act as examining officers and issue licenses to work. This person: • must have successfully completed the examining officer training course as laid down by the senior responsible electrical engineer, • shall be appointed by means of a letter of authority (clause 303.1.5.2) and • shall ensure that each person to be licensed demonstrates practically that he/she has sufficient knowledge of safe working and of the equipment to be covered by the license.		
3	April 2024	Section 3	26	302.9 added "higher ranking"		
				303.11 added "such as Emergency Control, National Examining Officer"		
				Changed "303.1.2 The senior responsible electrical engineer or his depute may issue a letter of authority to 303.1.2.1 a competent and technically qualified member of the personnel under his control or any other person to perform high-voltage testing, commissioning, and tests on high voltage equipment (clause 609.0). 303.1.2.2 a contractor to perform high voltage testing and undertake the duties of the "person in charge of tests" only and shall not assume the duties of "Localised Control".		
			27	303.1.5 moved to 303.1.2.1 under the Senior responsible Electrical Engineer.		
				303.1.5.2 moved to 303.1.6.1		
				303.1.5.3 moved to 303.1.2.2		

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				under Senior responsible engineer		
				Added 303.1.6 “A national Examining officer” ….		
				303.2 added changes		
				Added 303.3 “Letter of authority” does not expire however the validity of the “Letter of Authority” is subject to the holder having a valid category “C” (previously C Green) certificate or a relevant license.”		
3	April 2024	Section 4	30	401.1 removed “electrical officer in charged” and added “Production Manager”		
3	April 2024	Section 5	31	Added “501.4.3.1 the status and condition of all high voltage equipment at all times;”		
				Added “501.4.3.6 all letters of authority issued for high voltage testing”		
			32	502.0 note changed “*''Emergency Control'', the person authorised by the senior responsible electrical engineer (clause 303. 1..1.1) to undertake the duties of ''Control'' for a specified section when all normal means of communication to and from ''Control'' have failed.*		
				Added “503.0 Localised Control”		
			33	Added “504.1.2 “Control” must give switching instructions **directly** to the authorised person who will be responsible for the operation of the switching device.”		
			34	Added “508.2 Instructions by “Control” must be given directly to the authorised person who would perform the switching operation.”		
3	April 2024	Section 6	35	602.1.1 removed “de-energised”		
			36	Changed 602.1.7.1 “**Authorised persons, category A, C and D**, are trained to work independently but periodic checks on their working methods are necessary, by their superiors or by their superiors with the assistance of an adequately qualified person,”		
			37	Changes to “Live” working 603.2.		
				603.4 Changed “insulation” to “section insulator”		

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				603.4.4 this now “Void”		
			38	Added to 607.1.3 Unauthorised persons “to whom the boundaries have been explained and pointed out to and” who		
				Added “607.2 The use of restricted access ways shall only be undertaken by an authorised person who is accompanied by one or more person/s, authorised or unauthorised, who is clearly aware of the dangers and who is trained in, and is capable to render First Aid in case of emergency. “		
				609.2 Added “duly issued “ and “endorsed for testing”		
			39	Changed “609.3”		
				609.5 added …”and a verbal warning” … Added ...” not more than 3 ‘…		
				609.6.1 added “ ...the equipment on test has been discharged and/or earthed”…		
				609.7 added…” discharged and“…		
			40	610.1 …changed “removed” to “worked on”		
				Removed 611.1.2, 611.1.3, 611.1.4 , 611.1.5 , 611.1.6		
3	April 2024	Section 7	44	Added “704.2 Portable earthing cables must be completely unrolled without loops or crossing and thoroughly inspected before use.”		
			45	705.1.1.1 added ... “primary” ...		
				Changed “705.1.1.2 “		
				705.1.3 Note added “In the case where the earthing system appears or is suspected to be in an unsatisfactory condition e.g., bonds vandalised/missing, the portable earth must be connected to an earth spike driven into the ground before it is connected to all phase wires of the power line.”		
				705.1.3 “Warning added “in the case where rail bonds /earthing are not up to standard a temporary earth spike must be used as an earthing point.”		
3	April 2024	Section 8	48	Changed 801.4.1.4		
			50	801.10.1.4 removed... “general or” ...		

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				801.10.2 added “all interlocking shall be inspected and “..		
				Added “801.10.2 Any displaced key of the interlocking system or master keys must be secured at all times in the possession of the person responsible for unlocking.”		
			51	802.4.1.2 “limits changed to boundary”		
				802.4.1.2 added ..” B1 and/or B2”		
				Added “802.4.1.4 ensure that “localised control completes portion B2 of the test permit”		
				Changed 802.5.1.3		
				Changed 802.7		
				Added “802.8 “		
			55	Changed Test permit form		
3	April 2024	Section 9	58	901.6 Added ...” Electrical interlocking must be provided, on all enclosure doors, covers, etc which isolates the high voltage source, prevent contact with “LIVE” High voltage equipment.”		
				901.7 …changed “disconnected” to “worked on” and added “adequate continuity jumper conductors are first installed.”		
				Added “901.10 Emergency stop…”		
			60	904.2 Added …” senior” …		
			61	905.6 Removed…” future” …		
				905.8.2.1 Changed warning notice colour		

Note: Revisions to this edition of the Electrical Safety Instructions will be published as Electrical Engineering Instructions. Such revisions will be incorporated in the next version of the Electrical Safety Instructions.

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INTRODUCTION

1.0 The instructions in this book supersede those contained in the Electrical Safety Instructions of September 2019 and any other instructions which may be inconsistent herewith. (Text underlined refers changes).

1.1 Electrical Safety Instructions dealing specifically with rolling stock matters have been moved to a separate publication, “Rolling Stock Electrical Safety Instructions”.

2.0 The book comprises of nine sections.

2.1 Sections 1 and 2 affects all employees who are employed on electrified sections and whose duties require them to work in the vicinity of exposed "live" high-voltage electrical equipment and particularly applies to unauthorised personnel.

- When working in the vicinity of exposed "live" high-voltage electrical equipment, care must always be taken to avoid coming “near” to the equipment.
- These instructions must, therefore, be strictly observed and all such persons must be trained and understand the instructions relevant to the duties they perform.

2.2 Sections 3 to 8 deal with:

- authorisation of personnel,
- "Control" and switching operations, and
- the conditions under which work may be carried out on, or to clearance from high-voltage equipment.
- These instructions particularly affect authorised electrical personnel and such other employees who are required to work and perform switching operations on electrified sections.

It is, therefore, incumbent on such personnel to ensure that in addition to being familiar with the instructions in sections 1 and 2; they are thoroughly acquainted with the relevant instructions in sections 3 to 8, as they affect them.

2.3 Section 9 covers the design of equipment and particularly affects electrical engineering and technical personnel, who must be fully acquainted with all the instructions in this book.

** NOTE: The terms "near", "to clearance from" and "work on" are defined in the definitions section of these instructions*. *“Near” and “to clearance from” are graphically illustrated in annexure 6.1.*

3.0 STUDY AND OBSERVE THESE INSTRUCTIONS and discuss them with your colleagues. If you do not understand or do not know how to apply the instructions, consult your controlling officer.

4.0 Notes are only included for the guidance of personnel and are not regarded as instructions.

5.0 Should you have any idea or proposal, which you consider will promote safety, submit your proposal through the normal channels.

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SECTION 1

DEFINITIONS AND GENERAL

100.0 DEFINITIONS

In these instructions, unless inconsistent with the context, the following definitions and meanings will apply:

100.1 Personnel definitions

Definition of personnel designations used in these instructions. (Other designations used in these instructions and not included hereunder shall have the meaning assigned to them in the railway operator's, Industrial Council Agreement).

"authorised person" - a person, whether an employee of the railway operator or not,

- who has been specially authorised to undertake specific duties in terms of these instructions and
- who holds a license or letter of authority to that effect.

"Capable person"- a person who in emergency can isolate the electrical supply to save a life or prevent damage to property without endangering himself or others.

"Control" - the person appointed and responsible for co-ordinating the operation of all electrical equipment placed under his jurisdiction.

"electrical engineer" - any officer who is professionally registered as either

- an electrical engineer, or
- a certificated electrical engineer, or
- a technologist

in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000).

"electrical engineering officer" - any officer who is professionally registered as,

- an "electrical engineer" or
- an engineering technician (electrical)

in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000).

"electrical officer (contracts)" - the person appointed in writing in terms of the E7/1 or E7/2 specification by the responsible electrical engineer or responsible electrical engineering officer, as the person who shall;

- ensure that the contractor is adequately trained and
- be consulted by the contractor in all electrical matters to ensure that adequate safety precautions are taken by the contractor.

"electrical officer in charge" - the electrical supervisor authorised in terms of these instructions and responsible for the equipment and the personnel concerned.

"electrician" - an employee who was graded as an electrician or who holds a trade test certificate and who has had sufficient training in electric light and power work, but not necessarily on high-voltage equipment, to appreciate the dangers of working to clearance from "live" high-voltage equipment.

"electrical fitter (electric motive power)" - an employee who was graded as an electrical fitter (electric motive power) or who holds a trade test certificate and who has had sufficient training in electrical work, but not necessarily on high-voltage equipment, to appreciate the dangers of working to clearance from "live" high-voltage equipment.

"Emergency Control" - the person authorised by the senior responsible electrical engineer to undertake the duties of "Control" for a specified section when all normal means of communications to and from "Control" have failed.

"employee" - any person exclusively employed by the rail operator and who is remunerated by salary or wages.

"examining officer" - the person who has been trained and appointed for the purpose of conducting such examination as is required in terms of these instructions.

"localised control" – an authorised person, who is familiar with the functions of control, to undertake the duties of control, under test permit conditions, for the purposes of testing high voltage equipment.

"operator" - a railway operations controller who has been authorised to perform switching.

"person in charge of tests" – a person who is responsible for high voltage testing and/or co-ordinating all switching operations, under test permit condition, and who holds a relevant "Letter of Authority" and a valid "C" (previously "C Green") certificate or an AB (previously "A" brown) license.

"responsible person" - a person whose duties fall within the scope of these instructions and who has been trained in and understands the instructions relevant to these duties.

"responsible person in charge" - any responsible person (authorised or unauthorised) directly in charge of work and constantly present during operations.

"responsible electrical engineer" - an "electrical engineer" with the responsibility for either maintenance, or maintenance standards, or technology/design standards for electrical equipment.

"responsible electrical engineering officer" - an "*electrical engineering officer"* with the responsibility for maintenance of electrical equipment.

"responsible representative" - the responsible person in charge, appointed by a contractor or the contractor himself, who has undergone specific training (and holds a license) to perform work and/or to supervise staff under his control to work on, over, under or adjacent to railway lines and in the vicinity of high-voltage electrical equipment.

"senior responsible electrical engineer" – The person with the highest authority, who is the custodian of these instructions and also responsible for electrical maintenance standards, operating and safe working procedures and /or technology/design standards.

"technical employee" - a person who is trained to perform technical work and is familiar with the scope of his authority.

** NOTE: In this document, unless the context clearly indicates otherwise:*

- *words implying any one gender shall include the other gender;*
- *the singular shall include the plural and vice versa;*

100.2 **General definitions**

"access way" - that portion of:

- the ground,
- a floor,
- a passage,
- a stairway,
- or other recognised fixed foothold,

affording approach to high-voltage electrical equipment, and on which it is intended that a person shall walk or stand while such electrical equipment is "live".

"Additional earth connection" - is any other earth connection applied by any authorised person after the primary earth connection has been applied.

"air break switch/isolator" - a switch or isolator, the contacts of which make and break in air, and for the purpose of these instructions includes the pantographs of electric locomotives and motor coaches.

"authorised entry" - entry to buildings and enclosures housing electrical equipment as permitted by these instructions or as specially authorised by the senior responsible electrical engineer.

"barrier" - any device designed to restrict access to and prevent inadvertent contact with exposed "live" high-voltage electrical equipment.

"bond" - a short conductor installed to provide electrical continuity.

"Boundary"- is the approach limit to exposed high voltage electrical equipment that should not be encroached.

"cable" - a length of single insulated conductor (solid or stranded), or two or more such conductors, each provided with its own insulation, which are laid up together. The insulated conductor or conductors may or may not be provided with an overall mechanical and/or insulating protective covering.

"catenary wire" - the wire from which the contact wire is suspended by means of droppers.

"chamber" - a walled enclosure with or without a roof, in which electrical equipment is installed.

"clearance" - the shortest distance in air between any two points as defined in the instructions.

"closed" - the state of a switching device to allow the conduction of electric current.

"conductor" - anybody or substance specifically provided for the purpose of conducting an electric current.

"contact wire" - the wire with which the pantograph or current collector is designed to make contact.

"contact wire height" - the height of the underside of the contact wire above rail level.

"dead" - isolated and earthed.

"direct supervision" - demands the continual presence of and supervision by an authorised person at the workplace.

** NOTE: Where an authorised person is working on dead equipment, personnel under his "direct supervision" may only work on the same equipment.*

"earth" - the general mass of the earth and any conductor in direct electrical connection with it. (To be read in conjunction with *NOTE* hereunder.)

"earthed" - connected to earth in such a manner as will ensure at all times an immediate discharge of electrical energy without danger. (To be read in conjunction with *NOTE* hereunder).

"earthing system" - a complete installation comprising one or more earth electrodes, earth conductors and earth bars as required. (To be read in conjunction with *NOTE* hereunder.)

** NOTE: For all electrical traction systems the terms "EARTH", "EARTHED" and "EARTHING SYSTEM" shall apply either to the traction return rail circuit or to the general mass of the earth*.

"earth connection" - a conductor installed or applied to ensure that electrical apparatus is earthed.

"earthing" - the act or operation of applying an earth connection.

"earthing device" - a device used to apply an earth connection by mechanical means.

"electric rolling stock" - refers to electric locomotive(s), motor coach(es) and plain trailer(s).

"earth wire" - the conductor installed for the purpose of providing electrical continuity between the supporting structures of the overhead track equipment or power lines and the earthing system.

"electrified section" - all sections of railway lines provided with overhead track equipment for electric traction purposes, including non-electrified tracks and sidings on such sections.

"emergency switching" - the opening of a switch when necessary to avoid imminent danger to life or damage to property.

"exposed" - neither protected by a barrier, nor insulated.

"feeders" - conductors which supply power or augment the power-carrying capacity of the conductors in a supply system.

"general supervision by authorised persons" - requires:

- giving clear instructions about the dangers involved,
- giving clear instructions about the safe boundary of work,
- continual presence of the authorised person in the “work area”,
- frequent checks on the unauthorised personnel.

"high-voltage" - for the purpose of these electrical safety instructions, high-voltage will be taken to be any voltage normally exceeding 1 000 volts, notwithstanding the voltage definitions depicted in SABS 1019: Standard Voltages, Currents and Insulation Levels for Electricity Supply.

"insulated" - adequately covered by insulation to ensure that the equipment is safe to touch.

"insulation" - a material which offers extremely high resistance to the passage of electricity.

"insulator" - a component constructed of insulation, used to separate the live parts of a circuit from each other or from earth.

"isolate" - to disconnect from all sources of supply.

"isolated" - electrical equipment that has been electrically disconnected from all sources of supply.

"isolating and earthing switch" - a switch with visible air-break provided for isolating and earthing (or making "dead") electrical equipment.

“isolating device’ – a lockable electrical device that creates a visible air break between circuits when opened.

"jumper" - a short conductor installed to provide electrical continuity.

"link stick" - a portable device provided for the manual operation of certain electrical equipment, and insulated for safe operation under the full working voltage of the equipment on which it is to be used.

"live" - a conductor is said to be "live" when it is at a potential different from that of the earth or any other conductor of the system of which it forms a part.

"low voltage" - a voltage normally not exceeding 1 000 volts.

"near" - to be in such a position that a person's body or the tools he is using or any equipment he is handling may come within 3 metres of exposed "live" high-voltage electrical equipment.

"normal outdoor earth clearances" - the respective clearances laid down in annexures 9.3 and 9.4.

"open" - the state of a switching device providing a break in an electrical circuit.

"overhead track equipment" - all high-voltage electrical equipment installed above the tracks on electrified sections. (See also traction return rail circuit).

"overlap span" - that portion of the overhead track equipment between structures, where:

- the conductors of two adjoining sections overlap and terminate, and
- an electrical break between those two sections can be effected by means of switching operations.

"pantograph pole or hookstick" - an insulated pole designed to push up a pantograph to make contact with the overhead track equipment (3kV DC electrification only).

"passing clearance" - the clearance between "live" overhead track equipment or the pantograph and any earthed material for a brief period under the worst conditions.

"phase break" - an arrangement of wires and insulators introduced into the overhead track equipment and designed to ensure that two sections, which must not be connected electrically, are kept separated, even during the passage of the pantographs of electric trains.

"portable earth connection" - a temporary earth connection that can be easily handled and that can be readily used as required.

"power line" - an overhead line erected to convey electrical energy for any purpose other than communications, but excluding the overhead conductors of an electric traction system.

"Primary earth connection" – the first earth connection at each possible source of supply

"railway operator" – is a station, train or network operator as defined in the National Railway Safety Regulator Act, 2002 as amended: Act 16 of 2002

"restricted access way" - an access way to which entry is prevented by a "barrier" which may only be opened or removed by an authorised person.

"return conductor (with booster transformer)" - a conductor, carried on insulators attached to the overhead track equipment supporting structures, generally at the side of the track, and which carries the traction return current.

"return conductor (without booster transformer)" - an uninsulated conductor attached to the overhead track equipment supporting structures and which carries a portion of the traction return current.

"section" - the electrical circuit beyond one or between two or more isolating points.

"sectioning" - the dividing of an electrical distribution system or network into electrical sections.

"section insulator" - a device for dividing a contact wire and catenary wire into electrical sections while maintaining mechanical continuity and a continuous path for the pantographs.

"signal access way" - an access way provided specifically to afford approach to signals.

"signal rail" - the rail used as the conductor for the track circuits controlling signalling appliances, and not used for traction return current.

"test permit" - a written application for carrying out certain testing operations.

"to clearance from" - to be so close to exposed "live" high-voltage electrical equipment that the specified working clearances of an authorised person can be observed.

"traction return rail circuit" - the return circuit from electric rolling stock wheels to the substation via the traction rail or rails.

"Transnet" - Transnet SOC Ltd. No. 1990/00900/30 a company registered in accordance with the companies act of the Republic of South Africa, registered address 6th floor 138 Eloff Street, Braamfontein, Johannesburg or P. O. Box 72501, Parkview, Postal code 2122 and includes the property and equipment of other railway lines with which Transnet Ltd. has an interface agreement.

"voltage" - the highest effective difference of potential between any two conductors in a circuit or between a conductor and earth.

"voltage-free" – isolated from a power source and verified with a test device.

" work area" – the immediate area where either work or testing is being undertaken.

"water column" - a watering point at which steam engines or water tank wagons take water.

"work on" - work undertaken on or so close to the equipment that the specified working clearances to the exposed "live" equipment cannot be maintained.

"work permit" - a combined written application and authority to proceed with work on dead electrical equipment.

**NOTE: Technical terms not included in the foregoing definitions must be taken as having the meanings applied thereto in the standard definitions of electrical terms*.

GENERAL

101.0 PURPOSE OF INSTRUCTIONS

101.1 These instructions have been issued to provide protection for all persons against the dangers arising from the use of electricity and from the existence of exposed "live" high-voltage electrical equipment maintained and/or operated by a railway operator.

These instructions cover the minimum safety precautions which must be taken to ensure safe working on or near high-voltage electrical equipment and must be observed at all times.

Should additional safety measures be considered necessary because of peculiar local conditions these may be provided at the discretion of the electrical officer in charge.

** NOTE: If there is any doubt whether electrical equipment is high-voltage or not, these instructions must be observed. Any exposed electrical equipment or bare conductor must be considered to be "live".*

101.2 **Exception** - These instructions do not apply to:

- radio equipment,
- electronic and communications equipment,
- Electric fences (non-lethal) see Electrical Machinery Regulations clauses 12 to 16, SANS 10222-3 and SANS 60335-2-76,
- luminous discharge tubes,
- high-frequency apparatus and
- other similar equipment.

102.0 EMPLOYEES TO WHOM INSTRUCTIONS APPLY

** NOTE: The term "near", which is defined in the definitions section of these instructions, and "in the vicinity of", is graphically illustrated in annexure 6.1.*

102.1 These instructions apply to all persons:

- employed on electrified sections and
- whose duties require them to work in the vicinity of or near exposed "live" high-voltage electrical equipment.

Every employee must comply with all the instructions affecting him in the discharge of his duties.

102.2 Whenever work is done near exposed "live" high-voltage electrical equipment every responsible person in charge of work must ensure that all reasonable precautions are taken for the safety of personnel under his control.

102.3 **Other persons and other organisations** - These instructions apply also to all other persons engaged in work in the vicinity of exposed "live" high-voltage electrical equipment maintained and/or operated by a railway operator.

103.0 GENERAL INSTRUCTIONS

103.1 **Employees to whom instructions must be supplied** - Every employee, whose duties require it, must:

- be supplied with a copy of these relevant instructions and all amendments issued from time to time.
- acknowledge receipt thereof and retain it in the employee's personnel file.
- bring his copy up to date when any instruction is added, altered or cancelled.

103.2 **Literacy requirements** - Each responsible person must be able to:

- read sufficiently or be assisted to understand all the relevant notices and instructions pertaining to the work performed.
- He must also be able to identify himself in writing and make entries where his duties require it.

103.3 **Acquaintance requirements** - Whenever a person in the course of his duty functions as a responsible person or a responsible person in charge, his supervisor must ensure that:

- the person understands the applicable safety instructions,
- the person enforces the instructions in practice.

at least annually, if the work is of a routine nature, the person is well acquainted with the instructions related to the duties he performs.

103.4 **Issue of notices before high-voltage electrical equipment is commissioned.**

103.4.1 High-voltage electrical equipment must not be energised unless -

103.4.1.1 the personnel directly involved in the installation of the equipment have been warned beforehand in writing by the “electrical officer in charge”, and

103.4.1.2 all other personnel who are affected, have been advised beforehand by means of an energising notice.

103.4.2 The energising notice must include particulars of the equipment concerned and the time and date the equipment is to be energised. Thereafter the equipment must be treated as "live".

103.5 **Failures to be reported** - Every instance of high-voltage electrical equipment failing to operate satisfactorily or any other incident affecting the safety of personnel or the continuity of supply, must be reported immediately to "Control". If there is no "Control" office, the electrical officer in charge must be advised.

103.6 **Accidents or breakdowns near electric wires** - In case of an accident or breakdown, all concerned must be warned against the danger of coming into contact with electrical equipment or loose or broken electric wires even when lying on the ground, as these may be "**LIVE AND DANGEROUS".**

Responsible persons on site must take all possible steps to prevent people approaching or coming in contact with broken electric wires.

Work on or near such wires may not be started until the equipment has been made "dead" and an authorised person, category A or D, has confirmed that it is safe to commence work.

103.7 **Outbreak of fire**

103.7.1 **Type of appliances to be used for extinguishing fires** - The conditions applicable to the use of a fire hose as a fire-fighting appliance, and the type of appliances permitted for use where electrical equipment is concerned, are as laid down by the Chief Fire Officer in consultation with the necessary qualified technical experts.

103.7.2 **"Control" to be advised** - In the event of an outbreak of fire in the vicinity of electrical equipment, "Control" must be advised as soon as possible. If there is no "Control" office, the electrical officer in charge must be advised.

103.8 **Operation of switches** -

No person may operate a switch unless he is permitted to do so in terms of these instructions.

In emergency cases, to avoid imminent danger to life or property and to promote safety, a switch may be opened by a capable person and "Control" must be advised as soon as possible thereafter.

In the case of fires of high voltage equipment where there is a possibility of the earthing system becoming compromised or the conductive parts e.g., fences, structures becoming “Live” no manual operation of any switching devices shall be undertaken.

103.9 **Procedure to be followed in case of electric shock.**

103.9.1 All cases of electric shock, burns or other injuries attributable to high-voltage or low-voltage electrical equipment, irrespective of the immediate result, must be regarded as serious.

It is essential that first aid be rendered without delay and that medical assistance be obtained in the quickest possible manner through:

- "Control",
- "Operating",

- the nearest station official or
- other available means.

** NOTE: Details of the emergency treatment to be given to persons suffering from electric shock form annexure 1.1.*

Notices of this treatment are also affixed in all premises where high-voltage electrical energy is generated, transformed or used.

It is far more important to render first aid than to advise "Control" of the accident. "Control" can be contacted after the injured person has been made comfortable.

103.9.2 Every case where a member of the public or an employee is electrocuted, electrically shocked or injured by burns, due to coming into contact with any "live" electrical equipment maintained and/or operated by railway operators, must be reported in writing via email as expeditiously as possible to the under mentioned:

103.9.2.1 Void

103.9.2.2 Senior responsible electrical engineer

103.9.2.3 and verbally to "Control".

103.9.3 Unless this is clearly the responsibility of another organisation, all cases of electrocution or electric shock or near miss involving employees or members of the public:

- must be investigated without delay by an electrical officer,
- who must submit a report to the senior responsible electrical engineer,
- who must decide if further investigation is required.

103.9.3.1 All cases of fatal electric shock must also be reported to the South African Police Service, Rail Safety Regulator and Department of Labour

103.9.3.2 All cases must be investigated, and reports submitted with the least possible delay.

** NOTE: These instructions must be observed in conjunction with, and not in lieu of:*

- *the instructions embodied in the relevant portion of Section X of the General Appendix (Part I) and*
- *the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) as well as the act's regulations and instructions*

103.10 **Personnel to be qualified in first aid** - Every employee who in the normal course of his duties is directly in charge of, or is required to work on, near or in the vicinity of high-voltage electrical equipment, must be competent to render first aid to a person suffering from electric shock.

** NOTE: Classes of instruction on first aid to the injured, must be approved by the senior responsible electrical engineer and are organised by Transnet academy/PRASA.*

Contractors (private or Transnet employees) working in terms of these instructions must ensure that their employees receive training by an accredited body. Public persons from surrounding areas recruited as casual labour for general work need not be trained as first aiders provided there is 1 first aider for a gang of not more than 15 casual labourers.

103.11 **First Aid kit** – At every work site where work or testing is undertaken there must be at least one adequately stocked First Aid kit.

Annexure 1.1

TREATMENT OF PERSONS SUFFERING FROM ELECTRIC SHOCK

It is not practicable to issue a firm instruction dealing with the action to be taken to release a person in contact with exposed "live" electrical equipment. The circumstances of each accident or incident must be taken into account, especially in regard to:

- the voltage involved,
- the location of the accident,
- the knowledge and experience of the rescuer, and
- the degree to which the rescuer is aware of the dangers presented by exposed "live" electrical equipment.

A rescuer must make sure that he does not himself come into contact with exposed "live" equipment during his rescue efforts, either directly or through the body of the person he is trying to rescue.

If the rescuer has technical knowledge of electrical circuits, he should assess the dangers of the situation and act accordingly.

In all cases, however, the first thing to do is to disconnect the source of electricity from the affected equipment. If this is at all possible and it is known that the voltage concerned is not likely to exceed 3 000 volts, make use of insulating material, such as:

- a pantograph pole,
- link stick

to dislodge the victim from the "live" equipment with which he is in contact.

IF THE ACCIDENT OCCURS ON A HIGH-VOLTAGE SYSTEM AN UNTRAINED RESCUER WILL EXPOSE HIMSELF TO SERIOUS DANGER IF HE ATTEMPTS A RESCUE.

After a rescue has been effected it is very important that the correct treatment is applied to the victim without delay. Prompt action is essential.

It must be borne in mind that victims of electric shock have been revived after long periods of unconsciousness.

As soon as a person rendered unconscious as a result of electric shock has been released from contact with the "live" equipment, the revival techniques described herein must be commenced immediately and continued for:

- at least 30 minutes or
- until the victim's breathing is again normal, or
- a doctor pronounces the patient to be dead.

IT IS BETTER TO TREAT A DEAD BODY THAN TO ALLOW A LIVING PERSON TO DIE FOR LACK OF FIRST AID.

Electrical accidents to a person working at a height, for example, on a ladder, a mast or a pole can result in the victim falling to the ground, thus sustaining physical injury to his head and body. Artificial respiration and cardiac massage (if necessary) must be applied in spite of any physical injuries.

Injuries caused by electrical burns may also occur. While these may not in themselves be serious at the time of occurrence, the danger of blood-poisoning through inadequate or wrong treatment must be guarded against.

The following suggestions are given for the guidance of the personnel in the treatment of sufferers from shock by electric current:

* PRESS THE EMERGENCY STOP IF AVAILABLE
* SWITCH OFF CURRENT, IF POSSIBLE, IN CASES WHERE THERE IS NO EMERGENCY STOP.
* IF PATIENT IS STILL IN CONTACT WITH CURRENT DO NOT TOUCH THE BODY WITH BARE HANDS.
* MOVE THE PATIENT IN THE SAFEST POSSIBLE WAY.
* IF SOMEONE ELSE IS PRESENT, SEND FOR MEDICAL ASSISTANCE IMMEDIATELY.

RESUSCITATION PROCEDURE:

* LOOSEN CLOTHING, ESPECIALLY ABOUT THE NECK.
* ASSESS CONSCIOUSNESS.
* BREATHING.
* CIRCULATION (PULSE).
* CPR.

A) Assess Alertness/Responsiveness

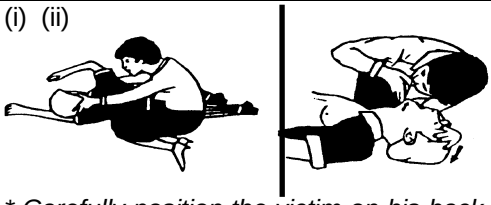


** Hazards?*
Ensure the safety of scene and rescuer
Beware of electrocution, noxious gasses, oncoming traffic, etc
** Hello*
Try to arouse victim by gently tapping the shoulder.
Shout: "Are you okay?"
** Help?*
Call for assistance

Not Responsive ↓

B) Assess Breathing

(i) (ii)



** Carefully position the victim on his back by turning the body as a whole to ensure no movement of the head and neck occurs*
** Kneel down next to the victim, in line with the ears*
** With the fingers of one hand, lift the bony part of the victim's chin forward while tilting the head back with the other hand*
** Remove obvious obstructions from the victim's mouth such as vomit, loose teeth, loose fitting dentures or food that could be seen or felt*
Cautiously turn the victim's head to the side and remove the objects by moving the index and middle finger from side to side in the victim's mouth.
** Place your ear next to the victim's mouth and nose*
- Look for movement of the chest
- Listen for breathing sounds
- Feel for breath against your cheek
** Take five seconds to determine if the victim is breathing*

↓If Responsive

Check for injuries

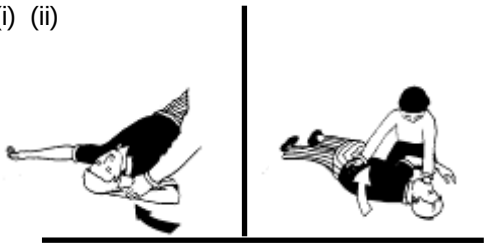


** Look for injuries and treat as necessary*
** Get help if needed.*
** Reassess victim.*
** Keep the victim comfortable until help arrives.*

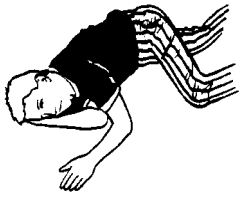
↓Adequate Breathing

Place in Recovery Position

(i) (ii)



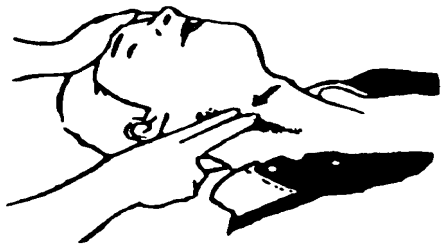
(iii)



** Place the victim's right hand next to his head*
** Support the head with one hand, and turn the victim as a unit onto the right side, laying his head onto his hand. Ensure that no twisting of the head or neck occurs.*
The same procedure can be followed for placing the victim on his left side.
** Get help*
** Keep checking for breathing and pulse.*
** Stay with the victim until help arrives*

No Breathing ⬇

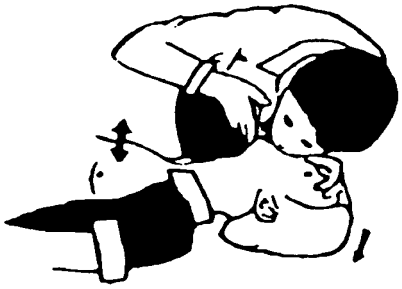
C) Assess Circulation (Pulse)



** Keep the victim's head tilted back*
** Slide two fingers into the groove between the Adam's Apple and the muscles of the neck*
** Press gently*
** Feel for a pulse for five seconds*

⬇Pulse Present

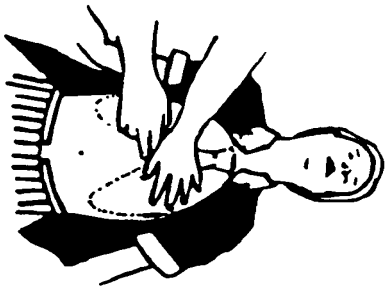
Start Rescue Breathing



** Pinch nose closed with thumb and index finger of hand on victim's forehead.*
** Place mouth over victim's mouth and form a tight seal while lifting the bony part of the chin up with other hand*
** Give 1 blow every 5 seconds, ensuring that the chest rises and falls with each breath*
** Get help, then reassess and continue rescue breathing if pulse is present*
** Reassess pulse after every 10 -12 rescue breaths*

No Pulse ⬇

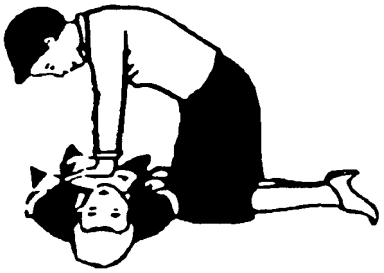
D) Don't Delay-Get Help and Start CPR



** Get someone to call the emergency services immediately*
** Commence CPR on a firm, flat surface*
A - Airway: Lift chin up and tilt head back
B - Breathing: Give two slow breaths
C - Circulation: Kneel next to the victim in line with the heart. Place the heel of one hand on lower half of breastbone, two finger-breadths above lower end of ribcage in the midline

⬇Do CPR

Start Chest Compressions



** Place the palms of both hands over each other in the position as described on the left.*
** Keep the arms straight with the shoulders above the victim's sternum (breastbone) and compress vertically downwards.*
** Compress the breastbone to a depth of 4-5cm at a rate of 80 compressions per minute.*
** Count: 1 -and -2 -and -3 etc. up to 15 compressions.*
** Lift chin and give 2 full, slow breaths after every 15 compressions*
** Continue until pulse and breathing returns, or until professional help arrives.*
** Feel for pulse ± every 1 minute for 5 seconds.*

ALTERNATIVE METHODS, SIGNS AND WARNINGS

1.0 **BREATHING**

1.1 The breathing should be less strong (shallow) for a child and still less (shallower) for a baby. In the case of a child or a baby, cover both the mouth and the nose with your mouth.

1.2 Watch carefully for signs of vomiting when respiration is applied. If vomiting occurs, turn the patient on his side, this will allow the head to drop, bring it forward and remove vomited matter as previously described.

1.3 If for some reason or other the mouth-to-mouth method cannot be applied or it is noticed that the chest does not expand when air is blown into the mouth,

- place your own mouth over the patient's nose, whilst the patient's head is extended backwards, sealing your lips around the patient's nose and closing the mouth by means of your hand, and
- blow into the nostrils and proceed as for mouth-to-mouth method.

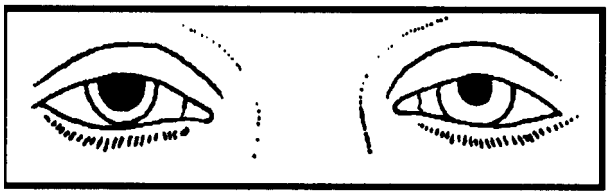
1.4 If so desired, the mouthpiece supplied in the first aid box or a piece of clean gauze or clean, thin handkerchief may be placed over the patient's mouth or nose. As soon as breathing is restored, regulate your own breathing to correspond with that of the patient and stop when considered advisable.

2.0 **CARDIAC COMPRESSION**

2.1 DIAGNOSIS

2.1.1 If a patient's neck (carotid) pulse cannot be felt, it must be assumed that he is suffering from cardiac arrest.

2.1.2 The diagnosis is confirmed if at the same time the pupils begin to dilate.



Dilated Normal

2.2 TREATMENT

2.2.1 One first aider

The rate of compression to ventilation is 15 to 2 i.e. compress: 1 and 2 and 3...15, with two ventilations.

Allow time for exhalation between ventilations. By counting 1, and 2 and 3 etc., the correct compression rate is maintained: namely ± 80 times per minute.

The chest must be depressed about 5cm. It will not be possible to monitor the pulse.

2.2.2 Two first aiders

2.2.2.1 If two first aiders are working together, one does the compression while the other does the ventilation. The ratio is 5 compressions to 1 ventilation. The first aiders kneel one on each side of the patient.

2.2.2.2 The person doing cardiac compression acts as leader, and counts: 1 and 2 and 3 and 4 and 5, ventilate, ...etc.

2.2.2.3 The person doing ventilation monitors the pulse.

3.0 **THE EFFECTIVENESS OF THE TREATMENT CAN BE CHECKED BY THE FOLLOWING:**

3.1 The pupils, which will become smaller.

3.2 The colour of the skin, which will improve from cyanotic (blue-grey) to normal.

3.3 The pulse is now palpable.

3.4 The patient may begin to make spontaneous movements.

4.0 **WARNING**

- Pressure must be on lower half of sternum.
- If the pressure is applied too high up, the sternum may fracture.
- Pressure on the lower tip of the sternum (Xiphoid process) may cause a laceration of the liver.
- If the pressure is applied at an angle and not vertically it may cause the ribs to fracture.

ON RETURN OF CONSCIOUSNESS

- Monitor pulse and breathing.
- Cover the patient with blankets or clothing, but not that he gets too warm (climate temperature to be considered).

STIMULANTS

- Do not give any stimulants.
- Sponge the face with hot and cold water alternately and wet lips if necessary.

BURNS

All burns should be soaked with cold water and covered well with bandage or soft material.

MEDICAL ATTENTION

In all cases where a person has received an electric shock, such person must be examined by a doctor, as early as feasible after the occurrence.

GENERAL

Notices

A Chart dealing with the treatment of sufferers from shock by electric currents must be displayed in a prominent position readily available to the personnel.

Instruction classes

The only way to carry out the instructions mentioned effectively is to know them thoroughly. Instruction classes on first aid are organised by the railway operator's emergency care services. The personnel required to be qualified in First Aid (at least level 1) is prescribed in clause 103.10 It is recommended that persons of all other grades employed in areas where high-voltage electrical equipment is installed, take the first opportunity of qualifying in first aid .

Warning regarding "HIV /AIDS" , other blood related diseases and any pandemic

- Rescuers are warned to take note of the possible presence of "HIV/AIDS" associated with a victim.
- In particular, avoid direct contact with body fluids and/or blood on exposed cuts and/or abrasions.
- Due cognisance should be taken regarding relevant information concerning this subject, available from recognised first aid organisations from time to time. Precautions should be applied accordingly.
- Notwithstanding the foregoing, the "HIV/AIDS" factor should not be allowed to hinder the process of assistance, with all due precautions, under the circumstances surrounding emergency treatment.

SECTION 2

ALL PERSONS WHO HAVE NOT BEEN SPECIALLY AUTHORISED

NOTE: This section deals with the safety precautions to be taken by any person not in possession of a license or letter of authority, who in the course of his duties is required to work in areas where exposed "live" high-voltage electrical equipment is present. Whenever it is necessary to work near exposed "live" high-voltage electrical equipment, these safety instructions must be strictly observed.

BELOW IS AN ILLUSTRATION OF THE WARNING NOTICES WHICH ARE USED TO INDICATE THE EXISTENCE OF DANGERS OF ELECTRICAL SHOCK.



WW 7



WW 23

A. WORK NOT PERMITTED WHILE ELECTRICAL EQUIPMENT IS "LIVE"

201.0 RESTRICTIONS

201.1 All electrical equipment and all electric wires may be "live" and dangerous and must not be touched. Even loose or broken wires lying on the ground may still be "live" and must be avoided.

201.2 No person may climb any pole or structure which supports exposed "live" overhead wires or electrical equipment.

201.3 No person may climb, ride or work on the roof of, or on the top of any load or equipment carried on any rail or road vehicle or any machine under exposed "live" overhead wires.

B. WORK UNDER "DEAD" CONDITIONS

202.0 LOADING OR UNLOADING OF WAGONS AT SIDINGS AND LOADING BANKS

** NOTE: On electrified sections special areas are provided which are usually on goods shed roads and sidings where loading or unloading of wagons may take place in safety. These special loading areas are either not wired or are provided with isolating and earthing switches. Warning notices (as illustrated hereunder) are provided to indicate where loading or unloading may take place.*

DANGER

LOADING OR UNLOADING MUST NOT BE DONE BEYOND THIS BOARD

GEVAAR

MOENIE ANDER-KANT HIERDIE BORD LAAI OF AFLAAI NIE

DANGER

PLACING THIS SWITCH IN THE "POWER ON" POSITION MAKES THE WIRES "LIVE" BETWEEN THE WARNING NOTICE BOARDS

BEFORE PLACING SWITCH IN THE "POWER ON" POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE CLEAR OF EQUIPMENT

ON COMPLETION OF SHUNTING MOVEMENTS, THIS SWITCH MUST BE LEFT IN "POWER OFF" POSITION AND LOCKED

GEVAAR

AS HIERDIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD, MAAK DIT DIE DRADE TUSSEN DIE WAARSKUKENNISGEWINGBORDE "LEWENDIG"

MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD

NADAT RANGEERBEWEGINGS VOLTOOI IS, MOET HIERDIE SKAKEI IN DIE "KRAG AF" -STAND GESTOOT EN GESLUIT WORD

202.1 Wagons must always be placed completely within the loading boundary marked by the warning notices. No loading or unloading may take place beyond these boundaries.

202.2 **Isolating and earthing switches**

202.2.1 The normal position of an isolating and earthing switch is in the "power off" position, that is, overhead track equipment "dead".

202.2.2 Loading or unloading may only be done when the switch is in the "power off" position.

202.2.3 When it is necessary to perform a shunting movement with an electric locomotive at a loading area controlled by an isolating and earthing switch, the responsible person in charge of the shunting operations must:

- first warn all persons.
- He must then ensure that all persons have removed themselves from open wagons and from vehicle roofs, that loading or unloading in the siding, or any other work, involving the handling of long lengths of material with which it is possible to make contact with the overhead wires is stopped and
- that all is in order for making the siding "live".

202.2.4 He may then place the switch in the "power on" position or instruct that it be placed in the "power on" position by another responsible person and allow the shunting movement.

202.2.5 During the shunting movement while the power is "ON" the responsible person in charge of the shunting movement must take positive steps to ensure that loading or unloading is not resumed.

202.2.6 Immediately after the completion of the shunting operation the responsible person in charge of the shunting movement must ensure that the switch is placed in the "power off" position.

202.2.7 The person who operates the switch must visually check that the switch blade operates correctly.

202.2.8 Only then may loading or unloading be carried out.

202.2.9 The issue, control and retention of keys for the operation of the isolating and earthing switches at the various loading areas equipped with such switches, must be covered by separate instructions issued for the operation of the sections of line concerned.

** NOTE: Where no isolating and earthing switches are provided and it is essential to load or unload wagons under "live" overhead track equipment, this work must be done under the conditions laid down in clause 211.0.*

203.0 WORK PERFORMED UNDER "DEAD" CONDITIONS UNDER COVER OF A WORK PERMIT

203.1 Whenever work cannot be done near exposed "live" electrical equipment in safety in terms of these instructions, the responsible person in charge must apply to the electrical officer in charge for a work permit which must be issued by an authorised person.

** NOTE: Responsible person in charge means any responsible person (authorised or unauthorised) directly in charge of work and constantly present during operations.*

203.2 The responsible person in charge must -

203.2.1 ensure that the boundary within which work may be carried out have been explained to him by the authorised person who issued the work permit to him, before commencement of work and that he fully understands these boundaries. See notes at beginning of clause 801.0. (See annexure 8.1 for a specimen of the work permit);

203.2.2 sign portion C of the work permit before commencement of work;

203.2.3 explain to all persons under his control the boundary within which work may be carried out, and ensure that they fully understand these boundaries;

** NOTE: Responsible persons in charge of gangs may keep a separate record of personnel working under their jurisdiction were considered necessary for control purposes.*

203.2.4 care for the safety of all persons under his control whilst work is in progress; and

203.2.5 withdraw all personnel under his control from the equipment on completion of the work before he signs portion D of the work permit.

C. WORK WHICH MAY BE DONE WHILE ELECTRICAL EQUIPMENT IS "LIVE" AND THE PRECAUTIONS TO BE TAKEN

204.0 WORK FROM ACCESS WAYS

204.1 Work may be done:

- on the permanent way and formation,
- on all normal roadways,
- pathways,
- walkways,
- station platforms,
- within the parapets of bridges and
- other situations at which protective screening of a permanent nature is provided,

without reference to the electrical officer in charge, provided it is undertaken in accordance with these instructions.

These locations are defined as access ways.

Protective screening or barriers must not be removed unless the electrical officer in charge is consulted.

** NOTE: Electrical equipment is designed so that all normal places of access are safe for normal working.*

The use of ladders, poles and long metallic objects, cranes, special machines and vehicles, measuring devices, the felling of trees, etc. is not normal work near exposed "live" equipment and is covered elsewhere in these instructions.

Special maintenance activities such as repairs to fixed structures, painting of roofs, etc. require special care as in such cases there is nothing to prevent accidental approach to exposed "live" wires and electrical equipment.

Also work on new constructions including buildings, structures and earth works of any kind near exposed "live" overhead wires requires special care for the same reason.

There are also power lines of extra high voltage which are easily recognised by their considerable height above ground and the long length of their insulators. No unusual work whatsoever may be done near these lines since even a 3-metre distance may not be safe. The electrical officer in charge must be consulted and must stipulate conditions under which work may be done.

205.0 WORK ON BUILDINGS OR FIXED STRUCTURES

205.1 In the case of buildings and fixed structures which have

- exposed "live" electric wires or
- electrical equipment supported from or attached to them,

and where direct access to this equipment

- exists, or
- can be provided by special means, for example ladders, etc.;

work may be done only under the following conditions:

205.1.1 The work must be supervised by a responsible person who must first consult with the electrical officer in charge.

205.1.2 Provided the responsible person can,

- constantly supervise his personnel and

- ensure that no one approaches closer than 3 metres from any exposed "live" equipment,

the work may be allowed to proceed.

If these conditions cannot be observed one of the following alternatives as instructed by the electrical officer in charge must be applied:

205.1.2.1 Suitable warning indicators (usually conspicuously coloured tapes) must be fixed at all means of approach at a distance not less than 2 metres from the exposed "live" equipment.

The responsible person must supervise all work and ensure that neither he nor any of his personnel approaches closer than the warning indicators,

OR

205.1.2.2 if work must be done within 2 metres of exposed "live" equipment suitable temporary barriers must be provided as instructed by the electrical officer in charge.

205.2 In the case of buildings and fixed structures which do not have exposed "live" electric wires attached but where exposed "live" wires or electrical equipment are nearby, work may be done under the following conditions:

** NOTE: This also applies to new buildings or structures under construction including earth works of any kind above ground level.*

205.2.1 A responsible person may allow work to be done provided a clear gap of 3 metres in air exists between any person in his normal working position and any exposed "live" electrical equipment.

If the clearance is less than 3 metres the responsible person must consult the electrical officer in charge, who must decide that one of the following alternatives be applied:

205.2.1.1 The electrical officer in charge may allow work to proceed, provided:

- the responsible person can ensure that no person in his working position can approach closer than 2 metres to the electrical equipment, and
- only tools and material agreed to by the electrical officer in charge may be handled,

OR

205.2.1.2 Temporary barriers must be provided as instructed by the electrical officer in charge.

206.0 CARRYING AND HANDLING RIGID MATERIAL AND WIRES

206.1 Pipes, scaffolding, iron sheets and other material which exceeds 2 metres in length, must be carried completely below head height near exposed "live" overhead wires. For maximum safety such material should be carried by two or more persons to maintain it as close as possible, to the horizontal position.

** NOTE: The utmost care must be taken to ensure that no part of the material comes within 3 metres of any exposed "live" wires or electrical equipment.*

206.2 Long lengths of wire or cable must never be run out in conditions where a part of a wire or cable can come within 3 metres of any exposed "live" electrical equipment unless:

- the electrical officer in charge is advised and has approved suitable safety precautions.

** NOTE: The presence of overhead power lines must always be considered especially when communications lines or cables or aerial cables, stay wires, etc. are being erected above ground level.*

207.0 USE OF PORTABLE LADDERS

207.1 Any type of portable ladder longer than 2 metres may only be used near exposed "live" wires under the direct supervision of a responsible person.

- The responsible person must ensure that the ladder is always used in such a manner that the distance from the base of the ladder to any exposed "live" equipment is greater than the fully extended length of the ladder, plus 3 metres.

207.2 Where these conditions cannot be observed the electrical officer in charge must be advised and he will arrange for suitable safety measures to be taken.

** NOTE: Ladders may be secured, suitable barriers, etc. may be provided.*

208.0 PRECAUTIONS TO BE TAKEN WHEN ERECTING POLES

** NOTE: The term "poles" also means other structures, that is, VHF microwave antennae, fire hydrant markers, etc. and also applies in principle to the felling of trees.*

208.1 A pole may be handled for the purpose of erection or removal near overhead wires under the following conditions:

208.1.1 If the distance between the point at which the pole is to be:

- erected or removed and
- the nearest exposed "live" equipment is **more than** the length of the pole plus 3 metres then,

the work must be supervised by a responsible person.

208.1.2 If the distance is **less than** the length of the pole plus 3 metres, then:

- the electrical officer in charge must be consulted.
- an authorised person must supervise the work, and
  - must ensure that the pole is earthed where possible.
  - the pole must be kept in contact with the point of erection and
  - adequate precautions must be taken to prevent contact with exposed "live" equipment.

209.0 USE OF CRANES, OTHER MACHINERY AND EXCAVATIONS

** NOTE: Other machinery includes pile-drivers, boring machines, excavators, dewatering equipment and road vehicles fitted with lifting equipment, etc.*

209.1 When work is being undertaken in such a position that it is possible for the crane, machine, or its load to encroach the minimum safe clearance or make contact with exposed "live" overhead wires or other electrical equipment,

- the electrical officer in charge must be consulted, and
- he must arrange for an authorised person with a license to directly supervise the work, and
- he must ensure that the crane or machine is adequately earthed.

209.1.1 The electrical officer in charge must also decide whether further safety measures are necessary.

** NOTE: When loads are being handled by crane, non-metallic rope hand lines must be employed, affixed to such loads to prevent their swinging and making contact with the exposed "live" equipment.*

209.2 For digging, boring and trenching, the electrical officers in charge must familiarise themselves with the location of buried high-voltage cables in their areas of jurisdiction.

209.2.1 Before digging, boring or trenching is performed,

- consideration must always be given to the possible presence of buried high-voltage cables and the dangers involved in damaging them.
- The electrical officer in charge must be consulted to indicate the location of cables and to specify the precautions to be taken to prevent incidents.

210.0 USE OF MEASURING TAPES AND DEVICES

210.1 Measuring tapes may not be used near exposed "live" high-voltage electrical equipment.

210.2 Special measuring devices longer than 2 metres such as survey staves and rods may be used if

- these are of non-conducting material and
- approved by the responsible electrical engineer.

** NOTE: These devices must not be used in rainy or wet conditions and they must never be allowed to come in contact with exposed "live" equipment.*

210.3 Special measuring devices of conductive material longer than 2 metres must be specifically approved by the responsible electrical engineer, who will lay down the conditions for their use.

211.0 WORK ON THE OUTSIDE OF ROLLING STOCK AND ON-TRACK MAINTENANCE MACHINES (INCLUDING LOADING OR UNLOADING)

211.1 No person may stand, climb or work, whilst on any platform, surface or foothold:

211.1.1 higher than the normal unrestricted access way, namely -

211.1.1.1 external walkways on diesel, steam and electric locomotives, steam heat vans, etc. and

211.1.1.2 walkways between coaches and locomotives.

211.1.2 of restricted access ways (clause 903.0), (requiring authorised supervision clause 607.0) namely -

211.1.2.1 the floor level of wagons (see clause 211.4)

211.1.2.2 external walkways or decks of road-rail vehicles, on-track maintenance machines and material trains.

211.2 When in the above positions -

211.2.1 no person may raise his hands or any equipment he is handling above his head except as provided in sub-clause 211.2.6 hereof,

211.2.2 the handling of long lengths of material such as metal pipes, etc. should be avoided. If essential the material must be handled as close as possible to the horizontal position below head height,

211.2.3 responsible persons must always warn all persons under their control against the dangers involved with exposed "live" wires,

211.2.4 no person may whilst on electric rolling stock approach or work on any part of the pantograph, hooter or other roof equipment, except the headlight, and

211.2.5 train personnel may give the recognised hand signals from the floor and steps of wagons and recognised positions on locomotives not higher than footplate level.

211.2.6 **Exceptions -** Only a responsible person who is fully aware of the dangers involved may:

- on closed rolling stock reach normally upwards and use small hand equipment, but
- he must never allow his hands or equipment to be higher than the portion of the roof nearest to his working position, or
- the top of the headlight, if above roof height, when he cleans the headlight or replaces the lamps.

This applies to all closed wagons, special vehicles, passenger coaches and electric motor coach stock as well as diesel, steam and electric locomotives.

211.3 **Warning notices -** To warn persons of the dangers of electric shock, warning notices (as illustrated) are fitted –



WW7



WW23

211.3.1 on all rolling stock equipped with exterior ladders or other easy means of access to the top of a vehicle.

The warning notice is placed in an easily visible position adjacent to the ladder or other means of access.

211.3.2 in the cabs of steam locomotives, on the rear of coal tenders as well as on any other rolling stock as may be decided by the responsible electrical engineer.

211.4 No person is permitted on the upper deck of special wagons, for example, car wagons unless special authority is given by the electrical officer in charge.

211.5 **Connection and disconnection of heater jumper cables** - Heater jumper cables may be connected or disconnected only,

- after all pantographs have been lowered, provided,
- the person at no time raises his hands, tools or material he is handling above the barrier provided.

211.6 **Pantograph poles/hook-sticks** must under NO circumstances be used under "live" 25kV or 50kV AC overhead track equipment.

This also applies to 3kV DC - 25/50kV AC change-over yards.

211.7 **Handling of tarpaulins**

211.7.1 Tarpaulins must not be placed over or be removed from vehicles under "live" overhead track equipment, unless special instructions are issued by the electrical officer in charge.

211.7.1.1 **Exception** - A responsible person who is fully aware of the dangers may unlash, lift or adjust tarpaulins to inspect loads.

Great care must be taken to avoid contact with the overhead track equipment.

211.8 **Washing of rolling stock**

211.8.1 Rolling stock may be washed by hand under "live" overhead track equipment, if supervised by a responsible person who must be present throughout the operation.

- A person must not raise any portion of his body, equipment or tools he is handling higher than the portion of the roof nearest to his working position, and
- in the case of electric rolling stock, pantographs must be in the lowered position.

211.8.2 Water hoses must not be employed for the purpose of washing the outside of rolling stock under "live" overhead track equipment.

211.8.3 The handles of brooms, mops, etc. used under exposed "live" overhead wires, must be constructed of non-conducting material.

211.9 **Operation of steam locomotives**

211.9.1 The handling of fire-irons on steam locomotives under "live" overhead track equipment is prohibited.

211.9.2 Filling of steam locomotive tender tanks or water tank wagons and trimming and spraying of coal under "live" overhead track equipment is prohibited.

211.9.3 At water columns where isolating and earthing switches are installed, only a responsible person may operate an isolating and earthing switch.

Responsible persons and personnel under their direct supervision may fill locomotive tender tanks or water tank wagons with water, and may trim coal on tenders provided that:

- the switch controlling the section of the overhead track equipment over the line concerned is in the "power off" position,
- the water column trunk is moved into a position so that the switch cannot be closed, and
- the tender or tank wagon is within the boundary of the warning notices (as illustrated).

DANGER
WATERING, TRIMMING OF
COAL AND EMERGENCY
WORK MUST NOT BE
DONE BEYOND THIS BOARD

GEVAAR
MOENIE ANDERKANT
HIERDIE BORD WATER
INNEEM, STEENKOOL TREM
EN NOODWERK DOEN NIE

211.9.4 After ensuring that all persons are safe, the person who operated the switch is responsible for:

- returning the water column trunk to the normal position;
- closing and locking the switch in the "power on" position.

212.0 ENTRY TO HIGH-VOLTAGE COMPARTMENTS OF ELECTRIC ROLLING STOCK

212.1 Personnel permitted to drive or move electric rolling stock under power may enter a high-voltage or auxiliary high-voltage compartment under "live" overhead track equipment, and then only provided the employee concerned ensures that -

212.1.1 he retains the reverser key, or one of the interlock keys, in his possession for the full period the high-voltage compartment door is open, and

212.1.2 before entering any high-voltage or auxiliary high-voltage compartment:

- the pantographs of the vehicle concerned are visibly checked to be in the housed position;
- the auxiliary machines have stopped running;
- the vehicle is stationary.

212.2 **Contractor's employees** may, in the course of meeting contractual commitments, enter high-voltage or auxiliary high-voltage compartments of electric rolling stock under "live" overhead track equipment provided that -

212.2.1 a responsible representative of the contractor, authorised in terms of clause 303.0 of these instructions, operates the automatic isolating and earthing equipment on the electric rolling stock.

212.2.2 the authorised representative locks the automatic isolating and earthing equipment in the "earthed" position with his personal lock and retains the key for the full period that work is performed by the contractor's personnel under “live” overhead track equipment.

212.2.3 the authorised representative removes the lock and restores the isolating and earthing equipment to the normal operational condition only after he has satisfied himself that:

- all personnel have been withdrawn and
- it is safe for the electric rolling stock to be energised.

213.0 SIGNAL ACCESS WAYS

** NOTE: A signal access way is an access way provided specifically for affording approach to signals. The use of a signal access way is permitted to responsible persons for:*

- *the purpose of maintaining signals,*
- *maintaining other associated equipment or*
- *other authorised purposes.*

213.1 The employee must not exceed the signal access way and he must handle only equipment or material approved by the responsible person in charge who, when giving such approval must take into account:

- the length and nature of the equipment or material to be handled and

- the possibility of contact with exposed "live" high-voltage electrical equipment.

213.1.1 **Exception** - However, the employee may also take up a safe working position on the signal itself where he may clean signals, replace lamps and perform other duties, provided:

he does not extend his arms, tools or equipment away from or above the signal.

** NOTE: Extra care must be taken in the use of test equipment with long leads.*

213.2 When working within signal cages the employee must:

- not project any portion of his body, tools or equipment he is handling beyond the restrictive barriers provided;
- On the ends where no barriers are provided the employee must take up a safe position where he may clean signals, replace lamps and perform other duties on condition that:

  he does not extend his arms, tools or equipment away from the cage or above the signal.

213.3 In all other circumstances the electrical officer in charge must be consulted and he must make suitable arrangements for the work to be done in safety.

D. CONTINUITY OF TRACTION RETURN RAIL CIRCUIT IN ELECTRIFIED AREAS MUST NOT BE BROKEN

214.0 INTERFERENCE WITH TRACTION RETURN RAIL CIRCUIT. PERMANENT WAY AND SIGNALLING PERSONNEL IN PARTICULAR TO NOTE

WARNING - UNAUTHORISED ALTERATIONS TO THE TRACTION BONDING CAN RESULT IN HIGH VOLTAGES WHICH WILL BE DANGEROUS. IMPEDANCE BONDS ARE PART OF THE TRACTION RETURN RAIL CIRCUIT.

214.1 No work on the track which involves

- interference with the traction return rail circuit either by cutting or removing the rails, or
- removal of bonds

may be done unless the electrical officer in charge is consulted and he must take such precautions as may be necessary to ensure continuity of the return circuit before permitting the work to be commenced.

214.1.1 **Exception** - Permanent way personnel who have been suitably instructed may apply approved temporary jumpers as permitted in the Permanent Way Instructions.

E. WORK BY CONTRACTORS

215.0 SAFETY ARRANGEMENTS AND PROCEDURES FOR WORK BY CONTRACTORS ON, OVER, UNDER OR ADJACENT TO RAILWAY LINES AND NEAR HIGH-VOLTAGE EQUIPMENT

215.1 The provisions of the E.4E, E7/1 and E7/2 specifications must be strictly applied to all contracts where applicable.

215.2 Every person appointed to administer a contract must ensure that an electrical officer (contracts) is appointed in writing for every contract.

SECTION 3

AUTHORISATION OF PERSONNEL

301.0 AUTHORISATION

301.1 Authorisation is necessary where the duties to be performed on high-voltage electrical equipment are such that the incorrect performance of those duties would endanger the safety of the person or any other person or equipment. Such authorisation is for a limited period and is covered by -

301.1.1 licenses to work and

301.1.2 letters of authority.

301.2 The authorisation must specify the duties of the recipient, the equipment upon which work, switching, inspection and/or tests may be performed, the geographic area and period of validity.

301.3 Only persons adjudged to be temperamentally suitable may be authorised.

302.0 LICENSE TO WORK

** NOTE: The various categories of licenses are dealt with and the following aspects are covered individually:*

Persons to whom a license may be issued.

Work that may be performed by the holder.

Qualifications required before a license may be issued.

302.1 **Category AR (previously A Red) (license)**

302.1.1 This license may be issued to Traction Linesmen who are employees of TRANSNET or PRASA.

302.1.2 The holder is authorised to -

302.1.2.1 work to clearance from exposed "live" high-voltage electrical equipment (clause 602.0); and

302.1.2.2 work on exposed "live" 3kV DC overhead track equipment (clause 603.0); and

302.1.2.3 perform switching and earthing (section 7) and/or

302.1.2.4 supervise unauthorised persons in restricted access ways (clause 607.0).

302.1.3 The license may only be issued to employees who have -

302.1.3.1 successfully completed the training programme as laid down by the Senior Responsible Electrical Engineer;

302.1.3.2 satisfied an examining officer that they are fully conversant with the equipment and the duties covered by the license and competent to work independently (clause 602.1.7).and

302.1.3.3 successfully completed the relevant first aid training and holds a valid certificate.

302.2 **Category AB (Previously A Brown) (license)**

302.2.1 This license may only be issued to Traction Linesman and Electricians who are employees of TRANSNET or PRASA.

302.2.2 The holder is authorised to -

302.2.2.1 work to clearance from exposed "live" high-voltage equipment (clause 602.0); and/or

302.2.2.2 perform switching and earthing (section 7) and/or

302.2.2.3 supervise unauthorised persons in restricted access ways (clause 607.0) and/or

302.2.2.4 perform the functions of “Localised Control” under “test permit” conditions.

302.2.3 The license may only be issued to persons who have -

302.2.3.1 successfully completed the training programme as laid down by the Senior Responsible Electrical Engineer; and

302.2.3.2 satisfied an examining officer that they are fully conversant with the equipment and the duties covered by the license and competent to work independently (clause 602.1.7) and

302.2.3.3 successfully completed the relevant first aid training and holds a valid certificate

302.3 **Category B (Previously B Grey) (License)**

302.3.1 This license may only be issued to a person in training.

302.3.2 The holder is authorised to -

302.3.2.1 work to clearance from exposed "live" high-voltage equipment (clause 602.0); and/or

302.3.2.2 work on exposed "live" 3kV DC overhead track equipment (clause 603.0); and/or

302.3.2.3 perform switching and earthing (section 7), all under the direct supervision of a person in possession of the appropriate category A license.

302.3.3 The license may only be issued to persons who have-

302.3.3.1 successfully completed the training course as laid down by the Senior Responsible Electrical Engineer where it is necessary for them to gain further practical experience to become fully authorised and

302.3.3.2 successfully completed the relevant first aid training and holds a valid certificate.

302.3.4 The license may only be issued by a person appointed by the Senior responsible Electrical Engineer.

302.4 **Category C (Previously C Green) (license)**

302.4.1 This license may be issued to any person.

302.4.2 The holder is authorised to -

302.4.2.1 work to clearance from exposed "live" high-voltage equipment (clause 602.0); and/or

302.4.2.2 perform work and supervise unauthorised persons in restricted access ways (clause 607.0); and/or

302.4.2.3 assist with switching under direct supervision of an authorised person, category A or D (section 7),

302.4.2.4 apply additional earth connections as directed by an authorised person, category A or D (section 7) and/or

302.4.2.5 perform the functions of “Localised Control” under “test permit” conditions

302.4.3 The license may only be issued to persons who have -

302.4.3.1 successfully completed the training course as laid down by the Senior Responsible Electrical Engineer; and

302.4.3.2 satisfied an examining officer that they are fully conversant with the equipment and the duties covered by the license and are competent to work independently (clause 602.1.7) and

302.4.3.3 successfully completed the relevant first aid training and holds a valid certificate.

302.5 **Category D (previously D Blue) (license)**

302.5.3.1 This license may only be issued to Traction Linesman and Electrician for maintenance of private sidings which have a direct supply from the main line of a network operator.

302.5.3.2 The holder is authorised to –

302.5.3.2.1 perform switching and earthing (section 7) at the network interface point of the private sidings for which he has been specifically authorised.

302.5.3.2.2 perform maintenance work on overhead track equipment of private sidings that are further than 3 meters from “live” high voltage electrical equipment.

302.5.3.2.3 perform work and supervise unauthorised persons on private sidings.

302.5.3.2.4 apply additional earth connections as directed by an authorised person, category A (section 7)

302.5.3.3 The license may only be issued to persons who have -

302.5.3.3.1 successfully completed the training programme as laid down by the senior responsible electrical engineer; and

302.5.3.3.2 satisfied an examining officer that they are fully conversant with the equipment and the duties covered by the license and competent to work independently (clause 602.1.7) and

302.5.3.3.3 successfully completed the relevant first aid training and holds a valid certificate.

302.6 **Category E (previously E Yellow) (license)**

302.6.1 This license may be issued to -

302.6.1.1 an operator.

302.6.1.2 a technical employee of a railway operator.

302.6.1.3 a technical employee of a contractor.

302.6.2 The holder is authorised to -

302.6.2.1 perform switching of high-voltage electrical equipment as directed by Control (for the purpose of telecontrol testing); and/or

302.6.2.2 perform high voltage switching of specified equipment not under the jurisdiction of Control; and/or

302.6.2.3 enter restricted access ways to perform switching of high-voltage electrical equipment; and/or

302.6.2.4 enter restricted access ways for telecommunication purposes only.

302.6.3 The license may only be issued to persons who have -

302.6.3.1 successfully completed the relevant first aid training and holds a valid certificate.

302.6.3.2 successfully completed the training course as laid down by the senior responsible electrical engineer; and

302.6.3.2 satisfied an examining officer that they are

- fully conversant with the equipment and the duties covered by the license and
- competent to function independently (clause 602.1.7).

** NOTE: This license does not permit entry to restricted access ways where high-voltage equipment is exposed unless endorsed otherwise.*

302.7 **Examining officers** - Only duly authorised persons, with a valid category A license, appointed by the Senior responsible Electrical Engineer or a National Examining Officer in the office of the Senior Responsible Electrical Engineer or a depute National Examining Officer, may act as examining officers and issue licenses to work.

This person:

- must have successfully completed the examining officer training course as laid down by the Senior Responsible Electrical Engineer,
- shall be appointed by means of a letter of authority (clause 303.1.5.2) and
- shall ensure that each person to be licensed demonstrates practically that he/she has sufficient knowledge of safe working and of the equipment to be covered by the license.

- *NOTE: A specimen license to work forms annexure 3.1 to this section.*

302.8 **Record of issue of licenses** - A record must be kept of all licenses issued by examining officers. A separate instruction is issued in this regard.

302.9 **Only one license** may be issued to any one person. When a higher-ranking license is issued to a person, the original license must be withdrawn. If a person with a license to work receives training on new/additional equipment, a category B (Previously B Grey) license may also be issued to the

person during the training period since the category B (Previously B Grey) license is only classified as a training license.

302.10 **Authorised persons to produce their licenses** - An authorised person, while on duty, must be able to produce his license when he is called upon to do so.

302.11 **Electrical officer in charge or examining officer may withdraw licenses to work.**

302.11.1 The Electrical Officer in Charge or an examining officer has the power to withdraw a license to work at any time.

302.11.2 The Electrical Officer in Charge must, if in his opinion an employee is no longer conversant with the equipment specified on his license, due either:

- to his not having performed the authorised duties for a period, or
- to alterations to the equipment,

withdraw the license of the employee.

302.11.3 The electrical officer who withdraws a license must in all cases advise "Control" immediately. Where an examining officer withdraws the license, he must also advise the electrical officer in charge concerned.

302.11.4 If the license has been withdrawn as a result of disregard of these instructions, the electrical officer in charge must report details of the withdrawal to the responsible electrical engineer, who must arrange for an investigation to be carried out as soon as possible.

302.11.5 Where a license has been withdrawn, the withdrawn portion must be completed, the record system updated, and the withdrawn license placed on the person's file.

302.12 **Right of appeal** - Any employee whose license to work has been withdrawn has the right to appeal.

302.13 **Responsible persons supervising authorised personnel** - Any authorised person directly in charge of personnel, who are required to work on or to clearance from exposed "live" high-voltage electrical equipment, must be in possession of a license to work at least equal in category to the personnel supervised, unless otherwise agreed to by the responsible electrical engineer.

303.0 LETTERS OF AUTHORITY

** NOTE: A specimen letter of authority forms annexure 3.2 to this section.*

303.1 The officers indicated below are empowered to issue letters of authority to adequately trained persons. The letter of authority must specify the clearances to be observed (see clause 602.1.4) based on the experience and competence of the person.

303.1.1 **The senior responsible electrical engineer** may issue a letter of authority to any person, as he may deem necessary to perform specified work in any other special circumstances in terms of these instructions such as "emergency Control", National examining officer, etc.

303.1.2 **The senior responsible electrical engineer or his depute** may issue a letter of authority to**:-**

303.1.2.1 a competent and technically qualified member of the personnel under his control or any other person to perform high-voltage testing, commissioning, and tests on high voltage equipment (clause 609.0).

303.1.2.2 a contractor to perform high voltage testing and undertake the duties of the "person in charge of tests" only and shall not assume the duties of "Localised Control".

303.1.3 Void

303.1.4 **A responsible electrical engineer** or a **responsible electrical engineering officer** may issue a letter of authority to -

303.1.4.1 a competent engineering or other responsible person under his control, to inspect exposed "live" overhead track equipment (clause 602.0).

303.1.4.2 a competent engineering or other responsible person under his control to enter specified restricted access ways and substations to inspect equipment (clauses 607.0 and 608.0).

303.1.4.3 Void

303.1.5 A **responsible electrical engineer** may issue a letter of authority to:

303.1.5.1 a competent engineering or other responsible person in the electrical engineering discipline to take measurements to exposed “live” overhead track equipment from "access ways" using measuring devices approved by the responsible electrical engineer (sub-clauses 604.2 and 606.1).

303.1.5.2 Void

303.1.5.3 Void

303.1.6 **A national examining officer** may issue:

303.1.6.1 A “letter of authority” to an authorised person who is in possession of a valid category “A” license and, who has successfully completed the examining officer training programme, to function as an examining officer (clause 302.7),

303.1.6.2 A “license to work” to a relevant maintenance personnel who has successfully completed the stipulated training programme.

303.2 Persons to be issued with a letter of authority must have successfully completed the appropriate training programme either a category “C” (previously C Green) certificate or higher and any other training that is deemed relevant for his duties as laid down by the senior responsible electrical engineer.

303.3 “Letter of authority” does not expire however the validity of the “Letter of Authority” is subject to the holder having a valid category “C” (previously C Green) certificate or a relevant license.

Company Logo

LICENSE TO WORK

This license is issued in terms of clause **302.0** of the Electrical Safety Instructions. I have examined

.....
Full names

ID No. .....
Grade……
and am personally satisfied that he/she is qualified to perform the following duties applicable to the equipment in the specified area: -

Duties: .....

.....

.....

.....

Equipment .....
.....

.....

.....

.....

Area......
Period of validity of authorisation from time of issue / renewal: -

……..

.....
Signature of holder

Place.....

.....
Signature of Examining Officer

.....
Name of Examining officer

Designation……

Date……

Company Logo

LETTER OF AUTHORITY

This letter of authority is issued in terms of clause **303.0** of the Electrical Safety Instructions. I have assessed

.....

Full names

ID No. .....

Grade.....

and am personally satisfied that he/she is qualified to perform the following duties applicable to the equipment in the specified area:-

Duties.....

.....

.....

.....

Equipment.....

.....

.....

.....

.....

Area…….

Clearances to be observed :-……..

……..

.....

In accordance with clause(s)……

.....

Period of validity of authorisation from time of issue / renewal:-

……..

.....

Signature of holder

Place......

.....

Signature of Issuing Officer

.....

Name of issuing officer

Designation/grade……
….

Date…….

SECTION 4

LOCKING OF HIGH-VOLTAGE ELECTRICAL EQUIPMENT: ISSUE AND CONTROL OF LOCKS AND KEYS

** NOTE: This section deals with locks and keys for high-voltage electrical equipment used for the following purposes:*

Access to equipment.

Securing switches in open and closed positions.

Safety interlocking equipment.

401.0 LOCKS AND KEYS

401.1 **Safe custody of keys** - The method to be used for the safe custody of keys must be decided by the Production Manager (Transnet) or Technical Manager (PRASA), who is responsible for ensuring that a strict check is kept on the issue of keys.

401.2 **Keys and locks lost or broken** - Loss or breakage of keys, locks and locking mechanisms must be reported immediately to the electrical officer in charge and to "Control" (if the equipment is under "Control's" jurisdiction). Steps must also be taken to prevent unauthorised access to, or operation of, the equipment concerned.

401.3 **Personal locks** - An authorised person, if his duties require it, must be issued with a personal lock. The issue of personal locks must be controlled by the electrical officer in charge.

401.4 Void

SECTION 5

SWITCHING OPERATIONS AND "CONTROL"

** NOTE: Electrical Control (referred to in these instructions as "Control") is the person appointed and responsible for coordinating the operation of all electrical equipment placed under his jurisdiction. Control Officers are appointed with a letter of authority which is issued by the senior responsible electrical engineer.*

501.0 "CONTROL"

501.1 "Control" must have jurisdiction over -

501.1.1 all high-voltage electrical traction equipment and high-voltage equipment mounted on overhead structures, **except** -

501.1.1.1 electric rolling stock;

501.1.1.2 isolating and earthing switches at loading areas, water columns and electric motive power maintenance and repair or fault depots;

501.1.1.3 the operation of AC/DC changeover switches by remote control;

501.1.1.4 such other equipment as decided by the responsible electrical engineer.

501.1.2 All high-voltage power distribution equipment where coordinated switching is necessary for safety and continuity of supply such as parallel, duplicate and ring main supply systems;

501.1.3 Such other equipment as decided by the senior responsible electrical engineer.

501.2 "Control" must be established on a permanent, temporary or emergency basis at such centres or in such areas as may be required.

501.3 "Control" will be responsible for

- coordinating the operation of all electrical equipment placed under his jurisdiction in order to maintain continuity of supply and
- securing the greatest overall efficiency and the safe working of the system.

501.4 "Control's" responsibility will include the following duties for equipment placed under his jurisdiction:

501.4.1 Issue instructions for switching operations

** NOTE: The routine operation of high-voltage switches such as starting up and shutting down of compressors and high-voltage motors by local operators may be undertaken without reference to "Control".*

Trip testing of switchgear by authorised personnel may also by agreement be undertaken without reference to "Control", provided supply is restored immediately.

501.4.2 Operate the power system diagram or telecontrol system in such a manner as to indicate the position of switches and the location of work and test permits.

501.4.3 Keep an accurate and complete record of :

501.4.3.1 the status and condition of all high voltage equipment at all times;

501.4.3.2 all switching operations;

501.4.3.3 all reports received, and instructions given in connection with failures, breakdowns, etc.;

501.4.3.4 all work and test permits including their serial numbers, and the name of the person responsible;

501.4.3.5 all licenses issued for switching.

501.4.3.6 all “letters of authority” issued for high voltage testing.

501.4.4 Keep in close touch with the officers on duty in the operating and CTC offices at the various centres affected, and the electrical officers in charge concerned.

501.4.5 Before a work permit is issued on electric traction sections -

501.4.5.1 "Control" must advise "Operating" or "CTC" of the section of overhead track equipment and other equipment covered by the work permit which will affect the running of trains.

501.4.5.2 "Operating" or "CTC" must advise any operators concerned at the relevant stations or signal cabins controlling the section to be isolated and advise "Control" when the section is clear of electric trains. Thereafter, no electric trains must be allowed to enter the section.

501.4.6 On restoration of power -

501.4.6.1 "Control" must advise "Operating" or "CTC" immediately that the power is restored to the section and

501.4.6.2 "Operating" or "CTC" must advise all operators concerned, that the power has been restored and that the section is available for electric traction.

501.4.7 Control must without delay activate medical assistance and/or security in the event of a

501.4.7.1 an emergency notification received telephonically and /or

501.4.7.2 an emergency indication received remotely via telecontrol

502.0 "EMERGENCY CONTROL"

** NOTE: "Emergency Control", the person authorised by the Senior responsible Electrical Engineer (clause 303.1..1.1) to undertake the duties of "Control" for a specified section when all normal means of communication to and from "Control" have failed.*

502.1 In the event of failure of all normal means of communication to and from "Control", the person who has been specially authorised in terms of clause 303.1.4.3, must take over "Emergency Control", provided he is able to establish communication with the authorised persons on the section under his jurisdiction.

502.2 Persons authorised to undertake the duties of "Emergency Control" must

- be furnished with a switching diagram for the section over which he is authorised to undertake such duties, and
- this diagram must be kept up to date.

The responsible electrical engineering officer must

- ensure that a person so authorised is informed regarding alterations which affect the diagram, and
- that receipt of this information is acknowledged.

502.3 the area of jurisdiction of "Emergency Control" during a failure of communications shall be defined in the Letter of Authority beforehand as completely as practicable.

502.4 "Emergency Control" will undertake all the duties and responsibilities of "Control" (clauses 501.3 and 501.4) and in addition will be responsible for -

502.4.1 advising the authorised persons on duty at all attended switching points on the section about to be controlled that he is assuming the duties of "Emergency Control";

502.4.2 ascertaining particulars of and assuming jurisdiction over any work and test permits in force on the section at the time;

502.4.3 continuing to function as "Emergency Control" after the restoration of communication facilities, until the section can be handed over under normal operating conditions to "Control" who must be advised by "Emergency Control" of the period "Emergency Control" was in operation, the position of all switches and details of all work and test permits.

503.0 “LOCALISED CONTROL”

** NOTE: "Localised Control"- the person authorised to undertake the duties of "Control" for the duration of high voltage testing covered by a test permit.*

503.1 Person authorised to undertake the duties of "Localised Control" must

- be furnished with a switching diagram for the section over which he/she is authorised to undertake such duties, and
- verify visually that the diagram reflects the true state of the equipment.

503.2 The area of jurisdiction of “Localised Control" shall cover the boundaries of the test permit.

503.3 “Localised Control" will undertake all the duties and responsibilities of "Control" (clauses 501.3 and 501.4) verbally from control -

503.3.1 advising the authorised persons on duty at all attended switching points on the section about to be controlled that he/she is assuming the duties of "Localised Control";

503.3.2 ascertaining particulars of and assuming jurisdiction over any work permits in force on the section at the time;

503.3.3 continuing to function as "Localised Control" for the full duration of the testing until the equipment is handed back to “Control” or the test permit is cancelled.

504.0 SWITCHING OPERATIONS

504.1 Where switching operations controlling the isolating of or supply to any particular section or equipment under the jurisdiction of "Control" are necessary, such switching operations must be co-ordinated by "Control".

504.1.1 "Control" must ensure that

- such switching operations would isolate a particular section or equipment, and that
- restoration of a supply to the particular section or equipment will not result in a fault condition.

** NOTE: This also applies to equipment where switching is done by "Control" himself by means of telecontrol.*

504.1.2 “Control” must give switching instructions **directly** to the authorised person who will be responsible for the operation of the switching devices.

504.2 The authorised person who receives the necessary instructions from "Control" will be responsible for the correct operation of local switching devices and provide confirmation of the visible air break. The authorised person requesting the work permit must confirm the voltage-free condition. (see clause 701.2)

504.3 "Control" must, after switching operations have been carried out by himself and/or the authorised person, confirm with the authorised person which switches are in the open position as well as the time of isolation.

505.0 INTERCONNECTED SYSTEMS: SPECIAL INSTRUCTIONS

505.1 In cases where Transnet takes high-voltage electricity from a supplier, or supplies high-voltage electricity to a consumer, the responsible electrical engineer must issue written instructions necessary for co-ordinating the operation of the switchgear at the point or points of supply specifically in collaboration with the supplier or consumer. These instructions must lay down the standing procedure which must be followed in each case to isolate and protect equipment at the point or points of supply before work can be done.

506.0 EMERGENCY SWITCHING

506.1 No switch under the jurisdiction of "Control" may be operated without the authority of "Control" except in emergencies.

506.2 In emergency to avoid imminent danger to life or damage to property, a switch may be opened by any capable person without reference to "Control", but the circumstances must be advised to "Control" as soon as possible thereafter.

507.0 FAILURE OF COMMUNICATIONS OR TELECONTROL

507.1 During the failure of communications with "Control" or "Emergency Control", an authorised person, category A, C, D or E, may in terms of his license to work:

- operate circuit breakers,
- perform switching operations and
- other duties in accordance with the practice normally adopted by "Control",

provided that he has established to the best of his ability that it is safe to do so.

All such switching operations must be:

- logged in the book provided for the purpose or in the train register, and
- immediately after communication is restored, "Control" must be informed of all switching operations performed during the emergency period.

508.0 MESSAGES FROM AND TO "CONTROL"

508.1 Instructions given by and messages to "Control" must be clear and concise, avoiding any possible misunderstanding regarding the instructions or information conveyed.

508.2 Instructions by “Control” must be given directly to the authorised person who would perform the switching operation.

508.3 Every instruction given by "Control" must be repeated word for word by the authorised person to whom the instruction is given.

- The authorised person must, when he is satisfied that he understands the instruction given by "Control", carry out the instruction and report back to "Control" exactly what he has done.
- "Control" must thereafter repeat, word for word, the report made by the authorised person.

508.4 "Control" must give priority to all reports of emergencies involving possible danger to life or damage to property or equipment.

508.5 Where a member of the personnel is being trained for authorisation (clause 302.3), he may perform switching under the direct supervision of an authorised person, category A, provided "Control" is fully advised.

All communications with "Control" must be conducted in terms of clauses 507.1 and 507.2 and the authorised person must confirm that the switching operations have been carried out correctly.

SECTION 6

WORK ON OR TO CLEARANCE FROM EXPOSED "LIVE" HIGH-VOLTAGE ELECTRICAL EQUIPMENT

** NOTE: The term "to clearance from" (graphically illustrated in annexure 6.1) means to be so close to exposed "live" high-voltage electrical equipment that the specified working clearances of an authorised person can be observed.*

The term "work on" means work undertaken on or so close to the equipment that the specified working clearances to the exposed "live" equipment cannot be maintained.

Clause 603.0 is applicable only to exposed "live" working on 3kV DC overhead equipment and clause 611.0 is applicable only to 25kV and 50kV AC overhead equipment.

The other clauses are applicable to all high-voltage electrical equipment.

601.0 WORK NOT TO BE PERFORMED "LIVE" ON EXPOSED HIGH-VOLTAGE ELECTRICAL EQUIPMENT

601.1 Work may not be performed "live" on exposed high-voltage electrical equipment except -

601.1.1 on 3kV DC overhead track equipment (clause 603.0);

601.1.2 under conditions which may be laid down by the senior responsible electrical engineer.

601.2 In certain areas, sections of overhead track equipment are arranged so that these can be switched to either AC or DC to permit the change-over of electric rolling stock. No work may be undertaken "live" on such sections of the overhead track equipment.

602.0 WORK TO CLEARANCE FROM

** NOTE: Work to clearances from includes inspection, taking measurements and performing tests.*

602.1 An authorised person, category A, B or C, or a person issued with a letter of authority (clauses 303.1.1, and 303.1.4.1) may undertake work to clearance from exposed "live" high-voltage electrical equipment under the following conditions:

602.1.1 The authorised person must select a safe working position on or close to the equipment or structures where he is required to work.

602.1.2 The person must choose a safe route to and from this working position.

602.1.3 While in the safe working position and moving to and from it, the person must ensure that with outstretched arms, no part of his body or the tools or equipment he is handling, come within the safe clearances to adjacent exposed "live" high-voltage electrical equipment laid down in the following table:

TRACTION SYSTEM	POWER LINE SYSTEM	SAFE CLEARANCE (Annexure 6.1)	
	kV	CATEGORY A	CATEGORY C
3kV DC	1 - 22	600mm	900mm
25kV AC	44	900mm	1,2m
	66	1,1m	1,4m
50kV AC	88	1,4m	1,7m
	132	2,1m	
	220	3,0m	

Where the system voltage is between the figures laid down, the clearance for the next higher voltage will apply.

** NOTE: The clearances given in this table are the minimum safe working distances. The greatest care must always be taken when working near exposed "live" equipment, and whenever possible greater clearances should be observed.*

Where working barriers can be used this should be done in preference to working at the clearances permitted.

The use of specially designed insulated tools on exposed "live" equipment (hot-stick working) with suitable safety precautions may be approved at the discretion of the senior responsible electrical engineer.

Erection of steel structures using mechanical appliances, for example, cranes, etc. may be undertaken near exposed "live" equipment under direct supervision of an authorised person, category A, provided steelwork and appliances are adequately earthed and the safety of personnel is ensured.

602.1.4 A person issued with a letter of authority to

- inspect (clause 303.1.4.1) or
- measure (clause 303.1.4.4) or
- do other specified work (clause 303.1.1) or
- test (clause 303.1.5.3),

may perform work to clearances specified by the officer issuing the letter of authority, provided that the minimum clearances specified for a category C license are maintained.

602.1.5 Staff in training with a category B Grey license must observe the category clearances for which the person is being trained and work under direct supervision of a competent person.

When the person is working without supervision he must observe the clearances according to the person's existing license

602.1.6 Where safe working clearances cannot be observed from the exposed "live" equipment,

- approved portable working barriers must be employed by all persons in all cases, or
- work must be done with the equipment "dead" under cover of a work permit.

602.1.7 Supervision of personnel

** NOTE: When work must be done to clearance from exposed "live" high-voltage electrical equipment, general or direct supervision must be provided which depends on the degree of competence of the personnel concerned.*

602.1.7.1 **Authorised persons, category A, C and D**, are trained to work independently but periodic checks on their working methods are necessary, by their superiors or by their superiors with the assistance of an adequately qualified person.

602.1.7.2 **Unauthorised employees assisting authorised personnel** must be made aware of the conditions under which work is to be done and of the safety precautions to be taken.

602.1.8 Only authorised persons, category A, B or C, may be permitted to work on other equipment which is located on high-voltage overhead track equipment or power line structures.

602.1.9 When work is required to be done:

- in an overlap span, a phase break or a section insulator and
- the prescribed clearances from exposed "live" high-voltage electrical equipment cannot be maintained, or
- an approved temporary working barrier cannot be used,

then the work may only be carried out under cover of a work permit covering both sides of the equipment. See clause 603.4 for "live" working.

603.0 WORK ON "LIVE" 3 KILOVOLT DC OVERHEAD TRACK EQUIPMENT

603.1 Work on "live" overhead track equipment may only be undertaken by

- an authorised person category AR (previously A Red) (license) or category B (Previously B Grey)(license) under direct supervision of a category AR, or
- a person issued with a letter of authority (clauses 303.1.1) provided this person observes the same conditions for safe working as in clause 602.1, except that at least the following clearances must be observed between the authorised person and -

603.1.1 earth or equipment which is "dead" – 600mm.

603.1.2 any “live” equipment which is not part of the circuit on which he is working - 600mm;

603.1.3 any authorised person other than one working on the same circuit - 1m.

** NOTE: ALTERNATIVE WORKING METHODS SUCH AS:*

- *THE DISCONNECTION OF EQUIPMENT (STEADY ARMS, ETC.) AND*
- *THE USE OF WORKING BARRIERS ON THE “LIVE” SIDE OF INSULATION*

SHOULD ALWAYS BE CONSIDERED IN PREFERENCE TO WORKING TO THESE MINIMUM CLEARANCES.

603.2 An authorised person may not be called upon to perform “Live” working:

- on overhead track equipment during the hours of darkness, unless adequate lighting is available, and
- where the work to be performed is on dropper no.1 or on the structure side of dropper no.1 and
- without first applying an approved portable barrier or under the direct supervision of another authorised category AR licensed person and,
- without authority from Control and
- without due process being followed and on a section on which he is not normally employed, and
- where he is not familiar with conditions

603.3 A authorised person providing direct supervision must be available-

- for each authorised person performing “Live” working or
- for more than one authorised person performing “Live” working provided the activity is on the same equipment, in the same location and direct supervision can be given to each person at the same time or
- for each span

603.4 Work on or across section insulator or on more than 1(one) span

603.4.1 Work on or across section insulator

603.4.1.1 Work may only be undertaken on or across section insulator if both sides of the section insulator are maintained at the same potential by the application of a copper jumper having a cross section of not less than that of the conductor to which it is applied.

603.4.1.2 This jumper may only be applied while equipment is "live" if

- the section insulator is first bridged out by means of a switch or
- by a safe method approved by the senior responsible electrical engineer.

In all cases permission must first be obtained from "Control".

603.4.1.3 The jumper may only be removed while equipment is "live" provided the switch is closed or by a safe method approved by the senior responsible electrical engineer.

603.4.1.4 Void

WARNING: A DIFFERENCE OF POTENTIAL MUST BE REGARDED AS EXISTING BETWEEN ANY TWO SEPARATE CIRCUITS, AND BETWEEN ANY TWO CONDUCTORS WHICH ARE NOT CONNECTED TOGETHER BY MEANS OF A JUMPER.

603.4.2 Work on more than 1(one) span

603.4.2.1 work may only be undertaken under “direct supervision” as per 603.3 or

603.4.2.2 between portable barriers on each span on the span side of dropper no.1

603.5 Portable ladders for use on “live” 3kV DC overhead track equipment must be of a type approved by the senior responsible electrical engineer and must be suitably marked.

604.0 PANTOGRAPH GAUGES, INSULATED MEASURING RODS AND TESTING EQUIPMENT FOR USE ON OR UNDER EXPOSED "LIVE" HIGH-VOLTAGE ELECTRICAL EQUIPMENT

604.1 **Equipment to be approved by the senior responsible electrical engineer** - Pantograph gauges, insulated measuring rods and testing equipment for use on or under the overhead track equipment must be of a type approved by the senior responsible electrical engineer for the voltage concerned.

604.2 **Use of pantograph gauges** - Pantograph gauges or insulated measuring rods approved for the voltage concerned may be used under "live" overhead track equipment from rail level by a person;

- category A (license), Category B (B Grey license), Category C (C Green license), category D (D Blue license) or
- holding a letter of authority (clause 303.1.4.4) or
- under direct supervision of an authorised person, categories A, C or D.

605.0 WORK FROM INSULATED VEHICLES AND TRESTLE TROLLEYS

605.1 Where specially constructed insulated vehicles or trestle trolleys are provided for the maintenance of the 3kV DC overhead track equipment, authorised persons, category A (A Red license), may be permitted to work from the top of such vehicles under "live" overhead track equipment.

605.2 Unless specifically authorised by the senior responsible electrical engineer, work may not be undertaken from insulated platforms on or under "live" overhead track equipment in 25kV and 50kV AC sections and in AC - DC change-over yards for electric rolling stock.

606.0 USE OF MEASURING TAPES

606.1 Measurements on or to clearance from exposed "live" high-voltage equipment may be undertaken only by

- authorised persons, category A, and
- persons holding a letter of authority (clause 303.1.5.1),

using non-conducting measuring devices approved by the senior responsible electrical engineer.

607.0 RESTRICTED ACCESS WAYS

607.1 The following persons are permitted to use restricted access ways:

607.1.1 Authorised persons, category A, B, C, D or E in terms of their licenses to work (see clause 302.0).

607.1.2 A person holding a letter of authority (clauses 303.1.1, and303.1.4.2).

607.1.3 Unauthorised persons to whom the boundaries have been explained and pointed out to and who have been clearly instructed about the dangers pertaining to the restricted access way and are under the direct supervision of an authorised person, category A, C or D, whilst on the access way.

607.1.4 Unauthorised persons who have been clearly instructed about the dangers involved and work on "dead" equipment, may work provided that:

607.1.4.1 a safe boundary has been marked out by means of barriers, and they are under the general supervision of an authorised person, category A, C or D, or;

607.1.4.2 a safe boundary has been marked out by using a conspicuous physical means of demarcation and they are under the direct supervision of an authorised person, category A, C or D.

607.2 The use of restricted access ways shall only be undertaken by an authorised person who is accompanied by one or more person/s, authorised or unauthorised, who is clearly aware of the dangers and who is trained in, and is capable to render First Aid in case of emergency.

608.0 ENTRY TO RESTRICTED ACCESS WAYS BY VISITORS

608.1 **Visitors to substations** - A responsible electrical engineering officer may, at his discretion, and subject to the provisions of these instructions, permit a person to visit a substation or other electrical installation provided the visitor.

- completes and signs a "Release from Liability" form and
- is under the direct supervision of an authorised person, category A, whilst on the access way.

** NOTE: Contractors, their subcontractors and/or employees are not required to complete "Release from Liability" forms as the Conditions of Contract must define the liabilities and conditions under which they will be allowed to enter property/premises for the purpose of performing their duties in terms of any contract.*

609.0 CONDITIONS GOVERNING HIGH-VOLTAGE POWER TESTING

609.1 The following instructions apply to all high-voltage testing on equipment where the voltage can or is likely to be raised to above 1 000 volts, irrespective of the normal operating voltage of the equipment.

609.1.1 **Exceptions** - These instructions do not apply to special testing instruments, e.g. insulation testers, which are designed so that the current that they can generate is not normally dangerous to life.

Also excluded are special testing equipment such as oil test sets which are designed to prevent lethal contact while in use. However, suitable safety precautions in the use of such instruments must always be taken.

609.2 **Appointment of "person in charge of tests"** - An authorised person, duly issued with a letter of authority endorsed for testing (clause 303.1.1.2 and 303.1.1.3):

- must take charge of and
- be responsible for the tests to be undertaken.

This person will be responsible for:

- the implementation of all the relevant instructions and
- precautions as well as the safety of all persons.

For the responsibilities of the "person in charge of the tests", see relevant clause 802.5. Where test permits are involved see clause 802.2.

609.3 **Responsible persons to be present during test undercover of a test permit** - At least two authorised persons, one of whom must be a licensed category 'A" person and the other person must be the "person in charge of the tests", both of whom must be present throughout the period that the tests are being conducted.

609.4 **Protection of approaches to equipment under test** - No high-voltage tests may be commenced unless the following precautions have been taken to warn all persons and to prevent unauthorised access to equipment under test.

609.4.1 **By means of tape** - A conspicuously coloured tape approximately 1m above floor level must be strung across all approaches to the area containing the equipment to be tested.

Approved warning notices must be exhibited at appropriate points, and the position of the tape must be such as to prevent persons approaching to within 2m of any exposed "live" portion of the equipment under test.

609.4.2 **By means of persons** - A responsible person may be posted at each possible access to the equipment under test to ensure that persons do not approach within 2m.

609.4.3 **By means of barriers** - A suitable temporary barrier may be interposed preventing access to the equipment under test.

609.5 **Audible warnings to be given at commencement and end of test** - An audible warning consisting of:

- three short blasts on a siren, hooter or whistle and a verbal warning must be given prior to the closing of the switch energising the equipment under test at high- voltage, and
- one short blast at the end of the test.
- However, if the number of persons affected by the test is not more than 3, the authorised person performing the testing may give direct verbal warnings to each person affected.

609.6 **Entry to test area**

609.6.1 Persons may only enter the test area with permission after the person in charge of the tests has disconnected the high-voltage supply and the equipment on test has been discharged and/or earthed.

609.6.2 Where it is required to visually observe the equipment to be tested in order to ascertain where flash-over takes place, e.g. an insulator, rectifier or high speed circuit breaker tested in position, an authorised person, category A, or a person holding a relevant letter of authority (clause 303.1.5.3) may be permitted by the authorised person in charge of the test to enter the test area, provided he rigidly observes the clearance requirements of clause 602.0.

The testing equipment must be so positioned that the authorised person conducting the test can be at the controls and at the same time check the working clearances of the authorised person who has entered the test area.

Should he at any time consider that the situation is unsafe, he must immediately switch off the testing equipment.

609.7 **Discharge of equipment after testing** - Equipment under test must be discharged and earthed immediately after the test has been concluded in order to ensure the discharge of any voltage which may have been built up.

609.8 **High-voltage and earth connections** - All the connections between the source of high-voltage supply and the equipment under test must be as short as possible and securely made.

609.9 **Tests for long periods** - Where high-voltage tests are required to be carried out over long periods and it is not practical to comply with clause 609.3, the equipment must be tested under cover of an energising notice.

610.0 NEGATIVE CONNECTIONS TO HIGH-VOLTAGE DC POTENTIAL DIVIDERS IN TRACTION SUB AND TIE STATIONS

610.1 The negative connections of high-voltage DC potential dividers in traction sub and tie stations must never be worked on unless it has first been established that the high-voltage supply has been isolated and earthed (clause 901.6) and remains dead until the negative connection has been replaced.

** NOTE: Examples of this potentially dangerous condition are the negative connections of the 3kV DC potential dividers feeding undervoltage relays, voltmeters and wattmeters in traction sub and tie stations.*

611.0 WORK ON 25 KILOVOLT AND 50 KILOVOLT AC OVERHEAD TRACK EQUIPMENT

611.1 Work on earth wires, return conductors and booster transformers and their connections may only be undertaken under the following conditions:

611.1.1 **Earth wires and return-conductors WITHOUT booster transformers**

611.1.1.1 Where the required working clearances cannot be observed or temporary working barriers cannot be provided,

- the "live" overhead track equipment which is too close to a return conductor or earth wire must be isolated and earthed and
- a work permit issued.

611.1.1.2 When a return conductor or earth wire has to be interrupted, a continuity jumper must first be applied and must not be removed until that return conductor or earth wire is again electrically continuous.

611.1.2 **void**

612.0 WORK PERFORMED ON, OR TO CLEARANCE FROM "LIVE" HIGH-VOLTAGE ELECTRICAL EQUIPMENT, UNDER PROTECTION OF ISOLATING AND EARTHING SWITCHES AT SIDINGS AND LOADING BANKS

612.1 Work may be performed by an authorised person, category A, on a section of overhead track equipment at a siding or loading bank controlled by an isolating and earthing switch, without the issue of a work permit, provided,

- the person secures the switch in the open position by a personal lock, and
- checks visually that the switch is open and the equipment is earthed.

Note: Such work may not affect the tension of the wiring in the tension length beyond the limits of the switched siding or loading bank.

612.2 If more than one person is to perform work under protection of an isolating and earthing switch, an authorised person, category A, must,

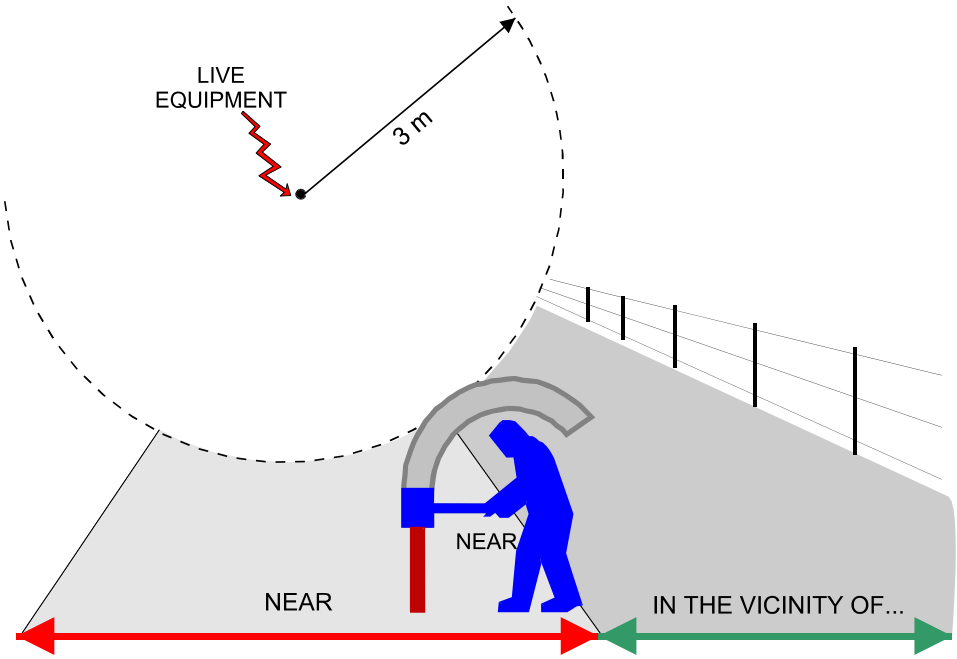
- secure the switch in the open position by means of a personal lock and
- issue a work permit without reference to "Control".

612.3 Where the siding is at an attended station, the station official in charge must be advised that work is in progress.

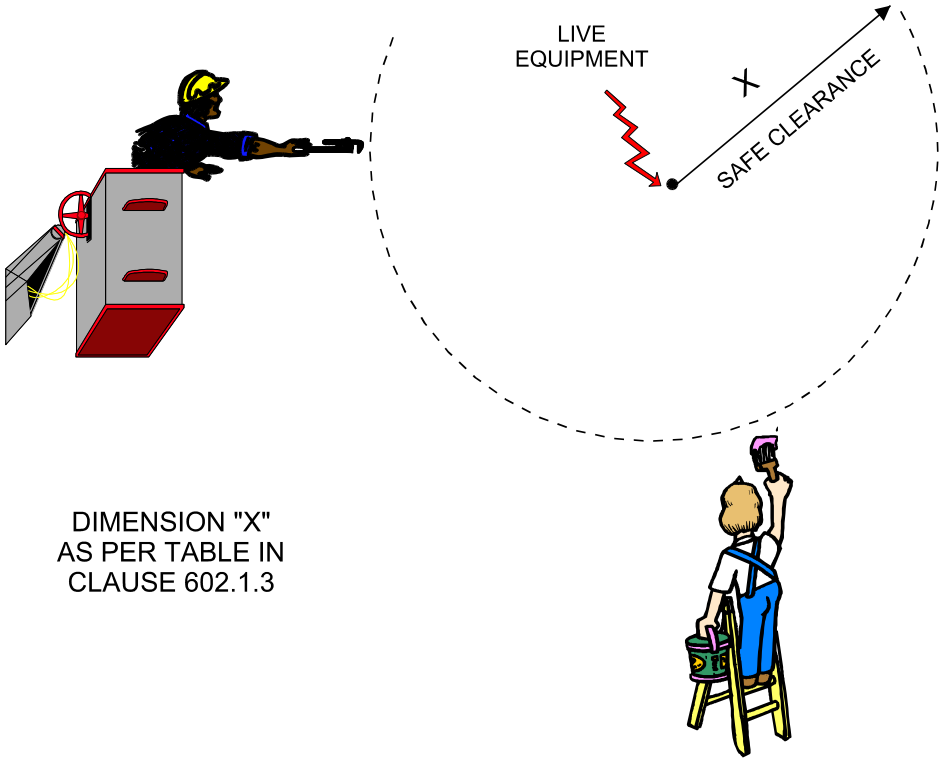
613.0 Void (Work performed under protection of isolating and earthing switches at electric motive power maintenance and repair or fault depots).

614.0 Void (Work on high-voltage electrical equipment of electric rolling stock under "live" overhead track equipment).

GRAPHIC ILLUSTRATION OF WORKING NEAR EXPOSED "LIVE"
HIGH-VOLTAGE EQUIPMENT



GRAPHIC ILLUSTRATION OF WORKING TO CLEARANCE FROM
EXPOSED "LIVE" HIGH-VOLTAGE EQUIPMENT



DIMENSION "X"
AS PER TABLE IN
CLAUSE 602.1.3

SECTION 7

ISOLATION AND EARTHING OF HIGH-VOLTAGE ELECTRICAL EQUIPMENT

** NOTE: This section covers the isolation and earthing of high-voltage electrical equipment whenever work cannot be done in safety with the equipment "live".*

701.0 PROCEDURE FOR ISOLATING AND EARTHING OF EQUIPMENT

701.1 The equipment must first be isolated, which means disconnected from all sources of supply.

701.2 A visible air break must exist between such equipment and every possible source of supply, and

- a test device must be applied to ascertain whether the isolated equipment is voltage-free before the first earth connection may be applied.

OR

701.3 void

701.4 Where:

- specially designed automatic earthing devices are provided and
- where circuit breakers are equipped with approved earthing devices,

these must be checked to ensure correct operation and must be locked or interlocked in the earthed position.

The trip mechanism of a circuit breaker used for earthing must be made inoperative.

701.5 An earth connection or connections **must** be applied to the equipment at all possible sources of supply, or between such sources and the personnel working on the equipment. See also clauses 704.0 and 705.0.

OR

701.6 The equipment must be completely withdrawn from its normal "live" position, e.g. in the case of withdrawal type circuit breakers.

701.7 Where the design of equipment precludes the strict compliance with all details of these procedures the work shall be carried out in accordance with specific instructions of the electrical officer in charge.

** NOTE: It is not sufficient only to isolate high-voltage equipment because in spite of all efforts to achieve complete isolation there are still several ways in which it may become "LIVE". Some of these are:*

- *Electrostatic induction (including lightning).*
- *Electromagnetic induction.*
- *Accidental operation of switches either manually or by motor or other electrical operation.*
- *Pantographs bridging section insulators.*
- *Breakdown of insulation between circuits.*
- *Falling high-voltage wires or metallic bridging of equipment.*

701.8 The only way to ensure that high-voltage equipment is "DEAD" in terms of these instructions is by "EARTHING". This rule is not applicable in the case of high-voltage equipment which is completely withdrawable.

702.0 PRECAUTIONS TO BE TAKEN WHEN ISOLATING EQUIPMENT

702.1 By means of high-voltage isolating devices.

702.1.1 All high-voltage **isolating devices** which are opened locally to isolate the electrical equipment must be locked to prevent operation. If it is possible to operate such **isolating devices** electrically, the electrical control circuit must be made inoperative.

702.1.2 Shutters to protect “live” contacts must be locked shut.

702.1.3 When isolation of the equipment is affected by telecontrol or remote control, suitable precautions must be taken to prevent as far as possible inadvertent operation of the **isolating devices.**

702.1.4 An authorised person performing the manual isolation is solely responsible for the locking of **isolating devices** and other isolating equipment. He must, where practicable, always ensure by visual inspection that the switch and arcing horns have responded to the switching operation.

702.1.5 The operation of equipment which is designed to be operated with a link stick must be performed only by means of a link stick suitable for the particular equipment.

702.1.6 Where the isolation is done manually, the authorised person must post a warning notice at switchgear, warning against reclosing such isolating devices, clearly indicating "Personnel working on equipment" to the isolating device or to the housing from which the isolating equipment has been removed. Wherever provision is made he must also lock isolating devices in the open position.

Note: Electronically disabling the remote control of devices at Electrical Control (blocking) only prevents the Electrical Control officer from reclosing these devices remotely.

This method of working may only be applied in emergency situations.

A non-withdrawable circuit breaker is not considered to be an isolating device.

702.2 By means of low-voltage switches

702.2.1 In all cases where a low-voltage source of supply exists which can produce a high-voltage in equipment to be isolated, every such supply must be isolated.

** NOTE: Examples of such sources of supply are:*

- *Permanent step-up supplies from a low-voltage source.*
- *Diesel-driven generators permanently or temporarily connected to the low-voltage system.*
- *Municipal or railway operator stand-by supplies.*
- *Transformers normally connected in parallel on the low-voltage side.*
- *Motor generator sets where a separate supply exists to the generator.*
- *Inverters operating from a battery supply.*

702.2.2 All such supplies may be isolated by one of the following means:

702.2.2.1 A low-voltage switch, miniature circuit breaker or a two-position change-over switch.

702.2.2.2 Removal of fuses or withdrawable circuit breaker.

702.2.2.3 Contactors which must be electrically or mechanically interlocked to prevent feedback.

702.2.3 Where the isolation is done manually the authorised person must post a warning notice, warning against reclosing such switchgear or control gear, clearly indicating "Personnel working on equipment" to the switch or to the housing from which the isolating equipment has been removed. Wherever provision is made he must also lock switches in the open position.

703.0 SAFETY TESTING OF EQUIPMENT AFTER ISOLATION

703.1 Only an authorised person, category A, may perform the safety testing of equipment. The testing device must be of a type approved by the senior responsible electrical engineer and must be proved to be in working order, immediately prior to the application of the earth connection.

704.0 APPLICATION AND REMOVAL OF PORTABLE EARTH CONNECTIONS

704.1 Only an approved type earthing device may be used for the purpose of applying a portable earth connection.

704.2 Portable earthing cables must be completely unrolled without loops or crossing and thoroughly inspected before use.

704.3 Portable earth connections must in all cases be connected to earth or the traction rail before being attached to the equipment which is to be earthed. Good contact must be made to earthed metal work and to bare conductors.

704.4 Earth connections must be attached to all phases of polyphase systems.

704.5 When applying an earth connection by means of an approved earthing device the authorised person making use of the device must ensure that he applies it from a safe position as far away as possible and in such a manner that no portion of his person will come within the safe working clearances (clause 602.1.3). He must bear in mind that the equipment may possibly be "live".

704.6 All portable earthing devices must be maintained in a state of good repair, and a person must, before using such equipment, satisfy himself that it is in a satisfactory condition.

704.7 An earth connection must never be removed from the earthing system before it has been disconnected from the high-voltage equipment.

705.0 SPECIAL EARTHING CONDITIONS

705.1 **Earthing of overhead track equipment and power lines with portable earthing devices**

705.1.1 When the section of overhead track equipment or power line has been isolated the authorised person who requested the work permit must -

705.1.1.1 apply at least one "primary earth" connection;

and

705.1.1.2 thereafter apply, or arrange for other authorised person/s, category A, C or D, to apply other primary earth connections to all other possible sources of supply as required so as to ensure that there is always an earth connection on all sides of any person or persons working on or close to the equipment.

705.1.2 Any authorised person category A, B, C or D working on or close to the equipment under work permit conditions must ensure that there is an earth connection between himself and any source of supply.

705.1.3 Earth connections must be applied as close as possible to the personnel working on the equipment, and must be not more than 800m apart (See clause 701.5).

** NOTE: In view of the practical difficulty in some cases of applying these instructions where long lengths of equipment are involved, any person authorised to do so may apply additional working earth connections and is solely responsible for removing them. Such earth connections need not be recorded.*

Provided these instructions are applied, it is not necessary to apply earth connections at the extreme end of a section of overhead track equipment and power lines.

In the case of a power line erected on wooden poles, where no continuous earth is provided, the portable earth connection must be connected to the traction rail, a permanent metallic earth or an earth spike driven into the ground before it is connected to all the phase wires of the power line.

In the case where the earthing system appears or is suspected to be in an unsatisfactory condition e.g., bonds vandalised/missing, the portable earth must be connected to an earth spike driven into the ground before it is connected to all phase wires of the power line.

WARNING:

- IN THE CASE OF THE OVERHEAD TRACK EQUIPMENT THE EARTH IS THE TRACTION RAIL.
- GREAT CARE MUST BE EXERCISED TO ENSURE THAT THE EARTH CONNECTION IS MADE TO THE TRACTION RETURN RAIL AND NOT TO THE SIGNAL RAIL (WHERE ONLY ONE RAIL IS USED FOR TRACTION RETURN CURRENT).
- ON SECTIONS WHERE TRAIN DETECTION SYSTEMS DO NOT MAKE USE OF A SIGNAL RAIL, THE EARTH CONNECTION MAY BE MADE TO EITHER RAIL.
- ELECTRIFICATION MASTS WITHOUT SPECIAL EARTHING POINTS MUST NOT BE USED AS EARTH EVEN IF IT HAS BEEN BONDED.
- IN THE CASE WHERE RAIL BONDS ARE NOT UP TO STANDARD A TEMPORARY EARTH SPIKE MUST BE USED AS AN EARTHING POINT

705.2 **Earthing of overhead track equipment by means of earthing pantographs when working from maintenance vehicles.**

705.2.1 Earthing pantographs, including the control system, which are provided on rail vehicles, must be approved by the senior responsible electrical engineer.

705.2.2 The following conditions must be complied with when the overhead track equipment is earthed by means of earthing pantographs:

705.2.2.1 At least two earthing pantographs must make contact with the contact wire at all times during execution of the work.

705.2.2.2 Only the authorised person, who requested the work permit, may raise or lower the earthing pantographs.

705.2.2.3 More than one vehicle may be coupled together in a train configuration, provided that at least one earthing pantograph at each end of the train makes contact with the contact wire and the distance between the two earthing pantographs does not exceed 85m.

** NOTE: Tests and calculations of voltage drop during circulation of **fault current**, show that work can be performed safely up to a distance of 85m from a single earthing pantograph. The second earthing pantograph which must be applied within 85m from the first one, serves as safety back-up.*

705.2.2.4 If personnel work from ladders together with the vehicle/s, additional earth connections must be applied as prescribed in clauses 705.1.1.2 and 705.1.3. (The earthing pantographs on the vehicle/s may be used as a first earth connection.)

705.2.2.5 Section insulators, phase breaks and overlap spans must be bridged out by means of a jumper, in accordance with clause 901.4, when being worked on with only one earthing pantograph on each side.

705.2.2.6 Should one or both earthing pantographs on a vehicle need to be lowered (e.g. when working on phase breaks, overlaps and above turnouts), portable earth connections must first be applied to ensure that there will always be at least two earth connections at the work place.

705.3 **Earthing of busbars** - A busbar or any section of busbar which has been isolated, shall be earthed at least at one point.

705.4 **Earthing and identification of isolated cables**

705.4.1 If a cable is to be cut or the conductor exposed the cable must be isolated and an earth connection must be applied at every source of supply to the cable.

705.4.2 If the cable cannot be positively identified, the cable must be pierced with an approved earthed metal spike.

705.5 **Earthing in substations** - When equipment in a substation is electrically separated by means of circuit breakers, rectifiers, etc. and earth connections have been applied at all sources of supply, it is not essential to apply additional earth connections to intermediate sections of equipment which are completely isolated provided provision is made for the discharge of capacitors.

705.6 **Equipment which can retain charge or become statically charged to be earthed** - With equipment such as capacitors, etc. which can retain a charge or become statically charged, an earth connection must be applied to all exposed connections.

705.7 **Equipment to be earthed during construction**

705.7.1 Work must not proceed on overhead track equipment, a feeder or a power line after it has been insulated, unless all such equipment has been earthed.

** NOTE: An energised line can induce dangerous voltages in adjacent insulated conductors and for this reason effective earthing of lines under construction is essential.*

705.7.2 When installation and/or erection of any high-voltage electrical equipment has reached the stage where it is possible for such equipment to become energised by the operation of a switch or due to the breakdown of the insulation between such equipment and any other exposed “live” high-voltage electrical equipment, or by any other means, then the supervisor in charge of the personnel will be responsible for ensuring that -

705.7.2.1 the equipment under construction is earthed with duplicate earth connections at all possible sources of supply;

705.7.2.2 all switches are locked in the open position and the keys are retained in safe custody;

and

705.7.2.3 the earth connections are recorded and inspected before each application and before the start of work on each shift or day and at regular intervals.

SECTION 8

WORK AND TEST PERMITS

WORK ON HIGH-VOLTAGE ELECTRICAL EQUIPMENT

801.0 WORK PERMITS

** NOTE: A work permit is a written application and an authority to proceed with work on high-voltage electrical equipment after it has been isolated and earthed (Section 7). It is an assurance that the equipment has been made "dead" and that it will not again be made "live" until the permit has been cancelled. A work permit form is serial numbered and a specimen permit forms annexure 8.1 to this section.*

801.1 Work on high-voltage electrical equipment which has been isolated and earthed may only be undertaken under cover of a work permit, unless otherwise provided in these instructions. (See also clause 801.10).

801.2 Boundaries within which work may be carried out must be pointed out to personnel in the most suitable manner. The method used must take into account the competence of the personnel concerned.

** NOTE: A work permit will provide safety to personnel only if the boundaries within which work may be carried out are completely clear to all persons concerned and are constantly observed by them.*

The boundary can be pointed out by using a physical means of identification, e.g. the earth connections where they can be placed in conspicuous positions, warning notices, flags or conspicuously coloured tapes suitably attached to the overhead equipment. In cases of particular danger, the boundary concerned must be effectively marked at suitable intervals, e.g. in a yard where a "live" line may overlap a work permit area.

801.3 **Authority for and persons responsible for the isolation of equipment and issue of work permits**

801.3.1 Where the equipment is under the jurisdiction of "Control" only "Control" may -

801.3.1.1 authorise the issue of a work permit by an authorised person, category A or D, and

801.3.1.2 arrange for isolation of the equipment.

801.3.2 Where the equipment is not under jurisdiction of "Control" authority is granted to the under-mentioned persons to isolate equipment and issue work permits:

801.3.2.1 An authorised person, category A.

801.3.2.2 A person issued with a letter of authority to operate the isolating and earthing switches installed at electric motive power maintenance and repair or fault depots.

801.3.2.3 A private siding owner’s electrician and/or linesman, issued with category D (previously D Blue) License

801.4 **Responsibility of authorised person who issues a work permit**

801.4.1 This person must -

801.4.1.1 fully complete portion A(i) to ensure that it is safe to work and indicate which equipment is to be isolated, work to be performed and how the boundary within which work may be carried out are indicated;

801.4.1.2 apply to "Control" (where the equipment is under the jurisdiction of "Control") for permission to issue a work permit and furnish him with the work permit number;

801.4.1.3 confirm with Control that his drawing number and amendment number corresponds with the drawing used by Control;

801.4.1.4 insert details of the isolating devices which have been opened, and the actual time of operation and the time as advised by "Control", in portion A(ii);

801.4.1.5 confirm verbally to Control that the opening of the isolating device has been verified and that a voltage-free condition exists, earth the equipment in terms of clause 701.0, complete portion B(i) and record all the earth connections applied in terms of clause 701.5;

801.4.1.6 issue the work permit by completing portion B(ii);

801.4.1.7 furnish to the signatories of portion C of the work permit (clause 801.5) particulars of the equipment which has been made "dead" and indicate to them the boundaries within which work may be carried out (see notes at the end of clause 801.2);

801.4.1.8 ensure after all work has been completed that portion D of the work permit has been signed by all the signatories of portion C and that the earth connections recorded on the work permit have been removed before cancelling the work permit;

801.4.1.9 cancel the work permit, complete portion E and hand back the equipment to "Control" (if applicable).

801.5 **Completion of portions C and D of the work permit**

801.5.1 In cases where the work is to be carried out independently by persons not under direct control of a responsible person each of these persons must sign portion C and D of the work permit.

801.5.2 In cases where work is to be carried out by persons in a gang under general or direct supervision of a responsible person in charge of the gang, only this person must sign portions C and D of the work permit.

** NOTE: When an authorised person who issues a work permit is working with unauthorised persons under his control he/she does not have to sign portion C of the work permit clause 607.0 must be adhered to.*

801.6 **Responsibility of responsible persons in charge**

801.6.1 Responsible persons in charge must -

801.6.1.1 ensure that the boundary within which work may be carried out have been explained to them by the authorised person who issued the permit before commencement of the work and that they fully understand the boundary;

801.6.1.2 ensure that the boundary within which work may be carried out have been explained to all persons under their control and ensure that they fully understand the boundary before commencement of the work. The responsible person/s must then sign portion C of the work permit. See notes at the end of clause 801.2.

** NOTE: Responsible persons in charge of gangs may keep a separate record of personnel working under their jurisdiction where considered necessary for control purposes.*

801.6.1.3 supervise personnel under their control for the duration of the work permit and ensure that safe working procedures are followed;

801.6.1.4 withdraw all personnel under their control from the equipment on completion of work and before signing portion D of the work permit.

801.7 **Responsibility of senior supervisory personnel i.e. personnel not directly in charge of personnel working under a permit**

801.7.1 Senior supervisory personnel must ensure that instructions are given through the responsible person in charge who has signed portion C of the work permit.

801.7.2 Before any senior supervisor undertakes work on equipment or takes direct control of personnel he must also sign the work permit.

801.8 **Responsibility of persons working independently** - Each person must ensure that the boundary within which work may be carried out have been explained to him by the authorised person who issued the permit and must sign portion C before commencement of work and portion D on completion of work.

WARNING: IF YOU ARE NOT SURE OF THE BOUNDARY OF A WORK PERMIT, CONSULT YOUR SUPERVISOR.

801.9 **The issue of separate work permits**

801.9.1 Separate work permits must be issued where work necessitates the isolation and earthing of the overhead track equipment, a power line, a substation or other high-voltage equipment **except**

801.9.1.1 when work is to be performed on high-voltage equipment electrically connecting any of that mentioned, e.g. a track switch or cable, then such work may be covered by one work permit only.

801.9.2 "Control" may authorise the issue of more than one work permit on the same isolated equipment.

801.10 **Conditions under which work permits are not required**

801.10.1 A work permit is not required -

801.10.1.1 Void.

801.10.1.2 when work is performed by an authorised person, category A or D, on a section of overhead track equipment controlled by an isolating and earthing switch at sidings and loading banks (clause 612.1);

801.10.1.3 to work on high-voltage equipment which has been completely withdrawn from its normal "live" position (clause 701.6);

801.10.1.4 for a single authorised person, category A, and personnel working under his direct supervision, and

for a “person in charge of tests”, to work in high-voltage enclosures where interlocking is provided to ensure that all high-voltage equipment is isolated and earthed before the enclosure can be entered.

** NOTE: In these cases testing, earthing and recording of earth connections are not required in terms of these instructions.*

801.10.2 All interlocking shall be inspected and should the interlocking fail, a “work permit” authorised by “Control” must be issued.

801.10.2 Any displaced key of the interlocking system or master keys must be secured at all times in the possession of the person responsible for unlocking.

801.11 **Transfer of work permits -**

801.11.1 An authorised person, category A or D, who has issued a work permit, may transfer the work permit to another authorised person, category A or D, after both these persons have communicated with "Control".

801.11.2 In the event of an authorised person who has issued a work permit becoming incapacitated or if the necessity arises for relief, "Control" must authorise the transfer of the work permit to another authorised person, category A or D, who must thereafter undertake full responsibility. An endorsement must be made on the permit regarding its transfer.801.12 If a person who has signed part C of a work permit becomes incapacitated or departs without signing off part D of the work permit, the authorised person who issued the work permit must:

- make an endorsement on the permit regarding the circumstances,
- take appropriate action to ensure that the person concerned does not return to work on the equipment after the work permit has been cancelled.
- report to the person’s supervisor and to Electrical Control.

801.13 When all normal means of communication with both "Control" and "Emergency Control" have failed, all the conditions applicable to work permit working must be observed with the exception of those relative to "Control".

The work may only be undertaken after an authorised person, category A or D, has issued a work permit, and then only provided he has himself performed or has confirmed the necessary isolation and earthing.

801.14 In the case of electric motive power maintenance and repair or fault depots where isolating and earthing switches are provided for the overhead track equipment, supplementary instructions may be issued which shall not alter the principles incorporated in these clauses.

801.15 Separate instructions are issued regarding the administrative procedure for work permits.

802.0 TEST PERMITS

802.1 When high-voltage power tests have to be carried out on equipment and one or more of the following conditions apply, such tests must be carried out under cover of a test permit:

802.1.1 The extent and complexity of the tests are such that it will facilitate more efficient working if the normal functions of "Control" are localised on site of the tests.

802.1.2 When equipment which is not normally connected and energised as part of the system, has to be connected and energised to high-voltage during the course of the tests, e.g. special shunts and transformers for measuring purposes.

802.1.3 When earth connections on equipment have to be removed for the purpose of carrying out certain tests.

802.2 When tests have to be carried out under cover of a test permit, an authorised person, category A, whose authorisation covers the equipment to be tested must apply for a test permit from "Control". A test permit form, according to annexure 8.2 must be used for these purposes. This application may only be done if above mentioned person is assisted by a person who will be in charge of tests according to clause 609.2.

** NOTE: The person who will be in charge of the tests must be decided upon before commencement of the tests and need not necessarily be the senior person on site.*

802.3 The “person in charge of tests” may at his own discretion make prior arrangements for an authorised person either a duly authorised test officer, licensed person (category A) ,specifically authorised licensed person(category C)or "Emergency Control" to assist him on the site as “localised control”

802.4 **Responsibilities of the authorised person, category A, who applies for a test permit**

802.4.1 This person must -

802.4.1.1 apply to "Control" for a test permit to cover the equipment to be tested bearing in mind that a test permit will always include the isolating switches of the equipment concerned. In making this application to "Control" portion A of the test permit must be completed;

802.4.1.2 perform or arrange for any switching and earthing and issue any work permits requested by the “person in charge of tests” within the boundaries of the test permit;

802.4.1.3 ensure that the “person in charge of tests” completes and signs portions B1 and/or B2, and D of the test permit;

802.4.1.4 ensure that “localised control” completes portion B2 of the test permit

802.4.1.5 complete portion E of the test permit and hand the equipment back to "Control" on completion of the tests.

802.5 **Responsibilities of the “person in charge of tests”**

802.5.1 This person must -

802.5.1.1 advise "Control" of his presence at the site of the tests and that he is taking over the equipment specified in portion A of the test permit for test purposes.

802.5.1.2 complete portion B1 of the test permit thereby accepting the responsibilities for the tests

802.5.1.3 complete portion B2 of the test permit thereby accepting the responsibility for co-ordinating of all switching operations within the boundaries of the test permit for the duration of the test. He will from then onwards have full jurisdiction over all work to be carried out within the boundaries of the test permit or arrange for another person to act as “localised control“ to assist with the coordination of the switching operations.

802.5.1.3 before any tests are commenced advise all other persons involved with the tests of the limits of the test permit and explain details of tests to be undertaken;

802.5.1.4 record particulars of all work done, switching and earthing carried out and serial numbers of work permits issued in the substation logbook or a special test book. Details of work permits issued and cancelled must also be recorded in portion C of the test permit;

802.5.1.5 ensure that all connections and test equipment which may be energised at high-voltage have been properly screened and barriers and warning notices or indicators erected where necessary to ensure safe working during the tests;

802.5.1.6 ensure that the necessary precautions are taken to prevent anyone not involved with the tests from inadvertently energising equipment under test. Such precautions can amongst others include the application of personal locks or the physical removal of connections or busbars;

802.5.1.7 maintain close liaison with "Control" during the course of the tests to ensure that train operations and continuity of supplies are the least disrupted;

802.5.1.8 in cases where the nature of tests to be performed necessitates the use of master keys, take over and sign for these keys prior to commencement of the test. He is fully responsible for the use of these keys for the duration of the test permit and must hand them back personally after cancellation of the test permit;

802.5.1.9 complete portion D of the test permit after all tests have been finalised.

802.6 A test permit is no authority for any person to work on high-voltage electrical equipment. If, during the course of the tests, work has to be carried out on high-voltage electrical equipment a work permit must be issued as for equipment not under the jurisdiction of "Control" (clause 801.3.2).

802.7 Work, switching, earthing, etc. to be carried out within the boundaries of the test permit must be arranged in consultation between the “person in charge of tests” and the licensed person category “AB” and, “localised Control".

802.8 **Transfer of test permits**

802.8.1 “Person in charge of tests”, who is responsible for the test permit,may transfer a test permit to another duly authorised person ,after both these persons have communicated to electrical “control”.

802.8.2 if the necessity arises for relief, electrical “control" must authorise the transfer of the work permit to another duly authorised person, who must thereafter undertake full responsibility. An endorsement must be made on the test permit regarding its transfer.

802.8.3 In the event of an authorised person who has issued a Test permit becoming incapacitated electrical "Control" must authorise the transfer of the work permit to another authorised person (holder of a vailid letter of authority), who must thereafter undertake full responsibility. An endorsement must be made on the permit regarding its transfer.

803.0 ALTERATIONS ON WORK AND TEST PERMITS

803.1 The work and test permits as embodied in these instructions have been designed from the point of view of electrical safety and no alterations to the printed portions thereof may be made.

803.2 Alterations to the hand-written portions of the permit forms may be made by the authorised person who issues the permit, who must himself insert the date and time. He must initial the alteration and immediately thereafter have such alteration initialled by every person/person in charge, whose signature appears on the permit.

Work Permit page 1

APPLICATION, EARTHING AND ISSUE.

A	*Request (* To Control) for the isolation of electrical equipment*	**No.**	
(i)	(a) *Equipment to be isolated*:	*Drg. no.*	*Amend. no.*
	(b) *Work to be performed:*		
	(c) *How the work boundaries will be indicated*:		
	Time	*Date*	*Signature*	*Category*
A	*(* "Control" confirms that) the following isolating devices have been recorded as opened, the equipment specified in (i) hereof has been isolated and where applicable visually confirmed, the earthing devices may now be applied and a work permit issued.*		
(ii)			
	Time	*Date*	*Signature*
B	*tested voltage- free by:*		
	Earthing of equipment and issue of work permit	***All other equipment is live and dangerous and working clearances must be observed***	

(i)		*Locality*	*By whom*	*Time*
	Earthing devices applied:	1		
		2		
		3		
		4		
		5		
B	*Time work permit issued:*	6		
(ii)		7		
		8		
		9		
		10		

Time	*Date*	*Signature*	*Category*

This work permit must be completed according to the Electrical Safety Instructions, clauses 801.4 and 801.5.
Transnet Freight Rail, a division of Transnet SOC, Registration number: 1990/00900/30

Work Permit page 2

WORK AND CANCELLATION

C *Declaration before work is commenced* **No.**

I hereby certify that I have read and understand portions A and B of this permit.
The boundary within which work may be carried out have been explained in detail to me.
The boundary within which work may be carried out have been explained in detail (by myself as the responsible person in charge) to persons under my control.

Name and Surname in print	*Signature*	*Time*	*Date*	***Contact details for the:*** *Responsible Person / Responsible person in charge who has signed portion C.*	*Supervisor of these Responsible Person / Responsible Person in charge.*
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

D *Declaration before work permit is cancelled* ***I have withdrawn all persons from the equipment. The equipment must now be treated as "LIVE" and DANGEROUS.***



Signature	*Time*	*Date*
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

E ***Cancellation***

All persons have been withdrawn from the equipment.
The earthing devices specified in B(i) have been removed from the equipment.
The equipment may now be made "LIVE".

Time work permit cancelled	*Time*	*Date*	*Signature*

This work permit must be completed according to the Electrical Safety Instructions, clauses 801.4 and 801.5.
Transnet Freight Rail, a division of Transnet SOC, Registration number: 1990/00900/30

TEST PERMIT

PERFORM TESTS ON HIGH-VOLTAGE ELECTRICAL EQUIPMENT

TRANSNET freight rail

A	*Application to "Control" for equipment to be handed over to perform tests*	**No.**
	(I) *Equipment:*	
	(ii) *Details of tests to be carried out:*	
	(iii) *Details of person in charge of Tests- Name:*	

(iv) *Time*	*Date*	*Name*	*Signature*

B1	*Equipment in portion A handed over by "Control" to the person in charge of the test*			
	I hereby take over the equipment within the limits specified in portion A(i) from control and accept responsibility for all tests			
	Time:	*Date:*	*Name:*	*Signature:*
B2	*Equipment in portion A handed over by "Control"/ Person in charge of tests to the person responsible for co-ordinating of all the switching operations*			
	I hereby take over the equipment within the limits specified in portion A(i) and accept responsibility for co-ordinating of all switching operations for the duration of the tests			
	Time:	*Date:*	*Name:*	*Signature:*
C	*Details of work permit/s issued and cancelled*			

Reason for work permit	*Work permit number*	*Time issued*	*Time cancelled*

D	*Tests completed and the equipment restored to its original condition*		
	All tests have been completed and the equipment recorded in A(i) has been restored to its original condition, except for the following:		
	Time	*Date*	*Signature*
E	*Equipment handed back to "Control"*		
	The equipment recorded in portion A(i) is handed back to "Control" in its original condition, except for the following:		
	Time	*Date*	*Signature*

This test permit must be completed according to the Electrical Safety Instructions, clause 802.0
Transnet Freight Rail, a division of Transnet SOC, Registration number: 1990/00900/30

SECTION 9

DESIGN

** NOTE: For existing installations, where the instructions prescribed differ from previous instructions, it is not obligatory to change the existing installation before renewal becomes necessary unless the contrary is specifically stated, but such change is not precluded if the advantage justifies the cost.*

901.0 EARTHING

** NOTE: A distinction between "RAIL" AND "EARTH" is made for electrolysis purposes with DC traction. These instructions deal only with high-voltage safety and for this purpose the "RAIL" is required to be an effective "EARTH". No action to prevent electrolysis may be in conflict with these instructions.*

901.1 **Metalwork to be permanently earthed**

901.1.1 All metallic structures within a distance of 3m from "live" overhead track equipment must be earthed.

901.1.1.1 **Exception - Colour-light signals and signalling equipment** - The earthing of these shall be in accordance with the directives of the senior responsible signal engineer.

901.1.2 All metalwork such as operating handles, barriers, handrails, instrument cases and all metallic structures, steelwork and other apparatus provided for the support, operation and protection of a power system which may be touched in normal use or inadvertently, must be earthed. Recommended limits for contact and step voltages are given in annexure 9.5.

901.2 **Provision of automatic protective devices** - All high-voltage systems must incorporate automatic protective devices to ensure that when contact is made between a "live" conductor and another conductor of different phase or polarity, or between any such conductor and metal which is earthed, the protective devices will automatically isolate the affected circuit or equipment.

901.3 **Permanent earth connections**

901.3.1 All permanent earth connections must be protected wherever exposed to the possibility of mechanical damage and also, where necessary, against corrosion. Particular attention must be given to all joints and points of connection.

901.3.2 The minimum cross section of the continuity conductor shall be sufficient to carry the maximum possible earth current for a period long enough to allow the protective devices to operate. Also the minimum cross section shall not be less than half the cross sectional area of the incoming feeder and shall have a minimum copper equivalent of 13mm^2.

901.3.3 For 25kV and 50kV traction systems it shall not be less than the following:

Copper	35mm^2
Aluminium	65mm^2
Steel	96mm^2

901.3.4 In the case of overhead track equipment, where certain earth wires and/or return conductors may carry a portion of the current, the size of these will be subject to the approval of the senior responsible electrical engineer.

901.4 **Portable earth connections**

901.4.1 Portable earth connections must be of a type and size approved by the senior responsible electrical engineer. It must be manufactured of copper or aluminium and must be protected where vulnerable to mechanical damage.

901.4.2 The minimum cross-sectional area must be not less than:

	TYPE OF EQUIPMENT TO BE USED ON	CROSS SECTIONAL AREA
901.4.2.1	For all 25kV and 50kV AC traction equipment	35mm^2 copper equivalent
901.4.2.2	For all DC electrical equipment	65mm^2 copper equivalent
901.4.2.3	For equipment at all other voltages	50mm^2 copper equivalent

901.5 **Device for mechanically applying an earth connection** - All high-voltage electrical equipment to which access is required by persons other than authorised persons, Category A, (e.g. grease trolleys), must be provided with a device for isolating and mechanically applying an earth connection to the high-voltage equipment, before access can be gained thereto, and means must be provided for locking the device in the earthed position.

901.6 **Connections to apparatus supplied from high-voltage equipment via potential dividers and series resistors in 3kV DC traction sub and tie stations -** Such connections must be made inside a bay, chamber or behind a locked, bolted or screwed panel, which may not be accessed, unless the high-voltage equipment energising the apparatus is isolated and earthed. The key to locked panels must be kept inside the 3kV DC busbar chamber in such a position that it can only be retrieved safely by hand after the high-voltage equipment in the busbar chamber has been isolated and earthed. Electrical interlocking must be provided, on all exposed high voltage enclosure doors, covers, etc, to de-energise the high voltage source, preventing access and/or contact with "LIVE" High voltage equipment. In addition, the following warning notice must be exhibited on or adjacent to the apparatus.

CAUTION - HIGH-VOLTAGE

DO NOT WORK ON THIS APPARATUS UNLESS THE
HIGH-VOLTAGE EQUIPMENT IS ISOLATED AND EARTHED

WAARSKUWING - HOË SPANNING

MOENIE AAN HIERDIE APPARAAT WERK
NIE TENSY DIE HOËSPANNINGSTOERUSTING
AFGESONDER EN GEAARD IS

901.7 **Connections to neutral busbar, negative busbar, DC earth leakage busbar and to rail at all traction sub and tie stations** Such connections must have a minimum cross-sectional area of 95mm² copper equivalent for DC and 35mm² copper equivalent for AC and be painted RED to indicate that they must not be worked on until the equipment concerned is isolated and earthed or adequate continuity jumper conductors are first installed.

901.8 Void.

901.9 **Warning notices on doors or panels of busbar chambers in substations and tie / track sectioning stations**- A warning notice (as illustrated) must be affixed to the outside of all doors and removable panels which afford entrance to busbar chambers of all traction substations and tie / track sectioning stations.

WARNING

AFTER ISOLATION, EARTH BUSBAR AND
ALL FEEDER CABLES ON ENTERING

WAARSKUWING

NA AFSONDERING, AARD GELEISTAM EN ALLE
TOEVOERKABELS WANNEER INGEGAAN WORD

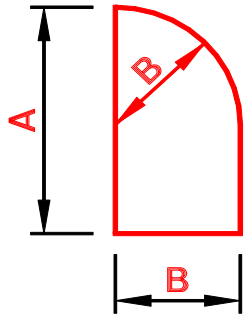
901.10 Emergency stops in substations and HV switching stations – Emergency stops must be installed at all building entrances and on or near all HV equipment, at appropriate positions and must be readily accessible to facilitate the speedy disruption of high voltage in the case of an emergency. The emergency stop shall be connected via telecontrol to provide an immediate indication to "Control' when operated.

The design of the emergency stop shall consist of a mechanical latching to inhibit automatic re energisation of the equipment.

Note : Independent of the emergency stop ,Control still needs to be informed telephonically in cases of emergency .

902.0 CLEARANCES

902.1 When clearances are stipulated for the vertical as well as the horizontal direction it must be assumed that the clearance area so formed is rounded off in the diagonal corner to a radius equal to that of the lesser clearance distance as indicated in the following diagram:



A- Clearance in vertical direction & B- horizontal direction

902.2 The clearances laid down in these instructions will apply under the worst conditions of sag and swing, and each case must be considered on its merits by the electrical engineering officer concerned who must increase the minimum distances laid down if local conditions, e.g. vehicular traffic, loading areas, etc. necessitate such increase.

903.0 CLEARANCES TO ALL TYPES OF ACCESS WAYS AND SIGNALS

903.1 All "LIVE" high-voltage electrical equipment, except roof equipment on electric rolling stock must be installed so that persons are protected against contact by observing clearances in air as detailed below.

903.1.1 **Access ways (as defined)** - The clearance between the nearest exposed "live" high-voltage electrical equipment and any portion of an access way must be -

903.1.1.1 for overhead track equipment and feeders mounted on overhead track structures: In accordance with annexure 9.1;

903.1.1.2 for power lines and independent feeders: In accordance with annexure 9.2.

903.1.2 **Signals and signal access ways** - The clearance between the nearest exposed "live" high-voltage electrical equipment and signals and signal access ways must be -

903.1.2.1 1,95m for 3kV DC in the horizontal direction to any part of the signal;

** NOTE: This clearance is to allow "live" working on the 3kV DC overhead track equipment.*

903.1.2.2 1,8m plus normal outdoor earth clearance in the horizontal direction for all other voltages from any signal access way or foothold on the signal;

903.1.2.3 3m plus normal outdoor earth clearance for all voltages in the vertical direction from the highest foothold.

903.1.2.4 In the case of a signal cage with open ends, the clearances in air must be at least the following measured in a straight line from any safe working position within the cage. See clause 213.2;

3kV - 25kV	1,5m
50kV	1,8m

If these clearances cannot be obtained, additional protection must be provided.

903.1.3 **Restricted access ways** - The clearance between the nearest exposed "live" high-voltage electrical equipment and a restricted access way must not be less than -

903.1.3.1 in the horizontal direction - 1,5m plus normal outdoor earth clearance;

903.1.3.2 in the vertical direction - 2,5m plus normal outdoor earth clearance.

903.1.3.3 Warning notices (as illustrated) must be displayed at all recognised entrances to restricted access ways forbidding unauthorised entry, and such places of entry must be kept locked. Alternatively, designed footholds must be omitted for a distance of not less than 1,8m from any point of entry.

GEEN TOEGANG

SONDER MAGTIGING.

UNAUTHORISED

ENTRY PROHIBITED.

903.1.4 **High-voltage equipment below an access way** - Where the exposed "live" high-voltage electrical equipment is below the level of any access way, the clearances laid down for the horizontal direction may be applied in the vertical direction.

904.0 BARRIERS

904.1 **Equipment protected by barriers** - The clearances laid down in these instructions for the protection of persons against contact with exposed "live" high-voltage electrical equipment may be reduced, if approach to exposed "live" equipment is protected by means of barriers.

904.2 **Barriers to be approved** - All permanent barriers must be approved by the senior responsible electrical engineer and all temporary or working barriers by the electrical officer in charge.

904.3 **Design of barriers whether metallic or non-metallic**

904.3.1 All barriers must be designed with sufficient mechanical strength for the purpose. The minimum clearance in air between any exposed "live" equipment and any point on a barrier must be not less than the normal earth clearance.

904.3.2 A barrier must afford protection against inadvertent contact with the exposed "live" high-voltage electrical equipment, due consideration being given to the nature of the equipment and material to be used in the course of the work.

904.3.3 In the case of a foot or road bridge or other similar structure to which there is access where the high-voltage equipment is located within 3m, the structure must be such that it is not possible to make contact with the equipment by passing a wire or any other conducting material through an aperture. The parapet height must be at least 1,5m unless otherwise approved by the senior responsible electrical engineer. The effective minimum horizontal width of the parapet at the top should be 150mm.

904.4 **Structures on which electric light fittings are installed** - Where it is necessary for a person, other than an authorised person, category A or C, to come near (within 3m of) exposed "live" high-voltage electrical equipment while moving to or from, or while working on an electric light fitting, an access way or barrier must be provided.

904.5 **Barriers to be earthed** - All metallic barriers within 3m of high-voltage electrical equipment must be earthed (clause 901.1).

904.6 **Air clearance to barriers may be reduced** - The senior responsible electrical engineer may at his discretion reduce the required air clearance between high-voltage equipment and barriers in the case of -

904.6.1 enclosed metal clad switch panels or switchgear, instrument cases and similar metallic enclosures;

904.6.2 insulated barriers where the basic insulation level of the barrier has been specifically designed for the purpose. This includes insulated cables and bushings of all types suitable for the voltage concerned.

905.0 CONDITIONS GOVERNING THE DESIGN OF OVERHEAD TRACK EQUIPMENT AND FEEDERS

905.1 **Design standards** - Design standards shall be in accordance with specification SANS 10280-1: Overhead Power Lines for Conditions Prevailing in South Africa Part 1: Safety, where these are applicable or as otherwise decided by the senior responsible electrical engineer.

905.2 **Maximum, minimum and normal heights** - The height of overhead track equipment and feeders for various conditions are as set out in annexure 9.1.

905.2.1 The normal contact wire height must be adopted throughout the system unless local conditions necessitate a departure from normal height, e.g. at bridges, tunnels, station roofs and similar structures.

905.3 **Level crossings**

905.3.1 Height gauges must be installed at all level crossings according to annexure 9.1.

905.3.2 The construction of height gauges and position of warning signs to be as per the South African Road Traffic Signs Manual, Volume 2 Chapter 7, Signing for Railway Crossings or the South African National Standard for Railway Safety Management Part 2-2-1: Technical requirements for engineering and operational standards – Track, civil and electrical infrastructure – Level crossings. SANS 3000-2-2-1:2012 or RSR 2-2-1:2012 (when promulgated).

905.4 **Minimum contact wire height locations** - At all such locations suitable marks must be provided to indicate the highest permissible rail height. Lifting of the track at such locations must not be carried out unless this is co-ordinated with the electrical officer in charge.

905.5 **Equipment located over station platforms**

905.5.1 All wires or fittings forming part of the overhead track equipment which pass over stations or other platforms, and which are less than 6m above the platform, must be insulated from the "live" overhead track equipment and permanently earthed.

905.5.1.1 **Exception** - Return conductors (with booster transformer) which are sheathed with insulation.

905.6 **Design of contact wire dropper clips -** The design of the contact wire dropper clip and dropper wire must be such that it is not possible for the dropper to hang below the contact wire if it breaks.

905.7 **Design clearances for "live" working on 3kV DC equipment**

905.7.1 For 3kV DC, adequate clearance must be provided for personnel to work on "live" overhead track equipment. No other equipment shall therefore be erected at a distance less than 1,8m plus normal outdoor earth clearance from any "live" equipment.

905.7.1.1 **Exception** - Where conditions are such that work on "live" 3kV DC track equipment is not permitted in terms of these instructions this clearance may be reduced, e.g. fixed structures, bridges, station roofs, etc.

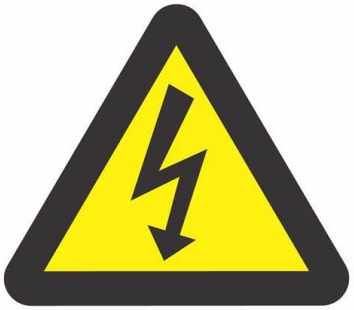
905.8 **Overhead track equipment on parallel tracks**

905.8.1 Where the overhead track equipment on parallel tracks is isolated from each other and does not form part of the same circuit, rigid steel vertical members must be used and the following design clearances must be maintained to permit safe working on any single track under cover of a work permit: (The clearance is based on the stretched out hand-to-hand length of a worker plus the normal earth clearance.)

		Design clearances			
Work on:		"Live"	Earthed		
Traction Systems:		3kV	3kV	25kV	50kV
Voltage of the adjacent "live" traction system:	3kV	1,950m	1,950m	1,950m	1,950m
	25kV	2,100m	2,100m	2,100m	2,100m
	50kV	2,385m	2,385m	2,385m	2,385m
To the adjacent "live" traction system's return conductors (with booster transformers)		1,950m	1,950m	1,950m	1,950m
To switched-off systems		1,950m	-	-	-
To earthed structures		1,950m	-	-	-

905.8.2 **The following exceptions** are valid for working methods and clearances where applicable:

905.8.2.1 Feeders which are switched independently of the adjacent overhead track equipment should preferably comply with this clause, but where this is not economic or practical the clearance may be reduced subject to the approval of the senior responsible electrical engineer. In all cases irrespective of the clearance a warning notice (as illustrated) must be provided at each point of support.



WW7



WW23

905.8.2.2 Where the overhead track equipment is isolated from each other by rigid steel vertical members and the clearance as indicated cannot be maintained, it must be possible to put up a shield or barrier.

The shield must ensure that the authorised person can maintain his safe working clearance according to clause 704.4.

905.8.2.3 Where it is not possible to put up rigid steel vertical members, warning notices must be provided at the point where the clearance cannot be maintained, on both separate circuits.

Work permits must be issued for work to be performed on assemblies which are under clearance.

905.8.2.4 Other conditions approved by the senior responsible electrical engineer.

905.9 **Metal covering of feeder cables on track structures to be permanently earthed-**The metal covering of all feeder cables erected on the overhead track equipment structures must be permanently earthed at least at one end.

905.10 **Sectioning switches and isolating and earthing switches to be provided with warning notices -** Such switches controlling supplies to the overhead track equipment must, where design permits, be equipped with warning notices (as illustrated) and the number of the switch must be shown in the space provided.

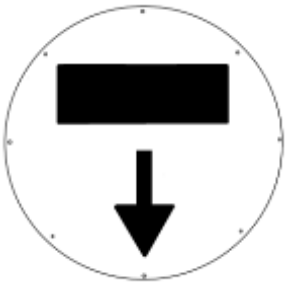
Sectioning switch



Isolating and earthing switch



905.11 **Warning notices at entry to non-electrified roads** - Warning notices (as illustrated) must be erected on the overhead track equipment in a most suitable position at least 3m ahead of the entrance to all non-electrified roads.



905.12 **Sidings and loading banks where loading or unloading takes place**

** NOTE: This clause does not apply to electric motive power maintenance and repair or fault depots.*

905.12.1 In view of the number of unattended stations and the need for ensuring maximum safety, special areas where loading or unloading of wagons is permitted must **not** be electrified unless, after full consideration of all factors, it has been established that this cannot be avoided.

905.12.2 Each siding which has to be electrified must be equipped with an isolating and earthing switch, which isolates and earths the section of overhead track equipment concerned.

The normal position of the isolating and earthing switch must be the "power off" position, i.e. the overhead track equipment "dead".

905.12.3 Only isolating and earthing switches and switch locks approved by the senior responsible electrical engineer may be installed.

905.12.4 The switch must be so designed that -

905.12.4.1 it cannot be locked in the "power on" position;

905.12.4.2 it cannot be placed in the "power on" position without the use of a switch key, which can only be withdrawn when the switch is locked in the "power off" position;

905.12.4.3 the switch operating mechanism is provided with facilities for attachment of personal locks.

905.12.5 An isolating and earthing switch must be installed as near as possible to the siding concerned and be so placed that the person operating the switch has a clear view of the siding.

905.12.6 Where there is more than one siding with independent switches each switch must be provided with a warning notice (as illustrated) approved by the electrical engineering officer concerned indicating the siding which it controls.

THIS SWITCH CONTROLS
HIERDIE SKAKELAAR BEHEER

905.12.7 Warning notices (as illustrated) must be erected so as to be conspicuously in the view of persons performing switching operations, warning them that they must ensure that all persons are clear of the overhead track equipment before placing the switch in the "power on" position.

DANGER

PLACING THIS SWITCH IN THE “POWER ON” POSITION MAKES THE WIRES “LIVE” BETWEEN THE WARNING NOTICE BOARDS

BEFORE PLACING SWITCH IN THE “POWER ON” POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE CLEAR OF EQUIPMENT

ON COMPLETION OF SHUNTING MOVEMENTS, THIS SWITCH MUST BE LEFT IN “POWER OFF” POSITION AND LOCKED

GEVAAR

AS HIERDIE SKAKELAAR IN DIE “KRAG AAN” -STAND GESTOOT WORD, MAAK DIT DIE DRADE TUSSEN DIE WAARSKUKENNISGEWINGBORDE “LEWENDIG”

MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG

VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD

NADAT RANGEERBEWEGINGS VOLTOOI IS, MOET HIERDIE SKAKELAAR IN DIE "KRAG AF" -STAND GESTOOT EN GESLUIT WORD

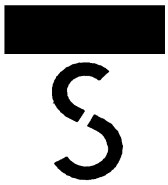
905.12.8 Warning notices (as illustrated) must be erected at a distance of not less than 3m from the nearest "live" equipment at each point of isolation on the siding concerned to indicate the area within which loading or unloading may take place. This applies also to sidings which are not wired. For maximum safety each point of isolation must be as near as possible to the clearance mark of the siding concerned. If the section insulator is not installed at the clearance mark, steps must be taken to prevent loading between the clearance mark and the warning board.

DANGER
LOADING OR UNLOADING MUST NOT BE DONE BEYOND THIS BOARD

GEVAAR
MOENIE ANDER-KANT HIERDIE BORD LAAI OF AFLAAI NIE

905.12.9 A section insulator should not be installed above a cross-over track between a siding and an adjacent track immediately opposite the loading or unloading area of the siding, unless the adjacent track is at least 5,5m. Where this cannot be avoided the matter must be referred to the senior responsible electrical engineer.

905.12.10 A warning notice (as illustrated) must also be erected on the overhead track equipment in a most suitable position at least 3m ahead of the entrance of all sidings equipped with isolating and earthing switches.



905.12.11 Isolating and earthing switches at sidings where flammable/explosive hazards prevail will be covered by special instructions. Warning notices (as illustrated) must be installed at these sidings.

For (DC):

DANGER

PLACING SWITCHES "A" AND "B" IN THE "POWER ON" POSITION MAKES THE WIRES "LIVE" BEYOND THIS BOARD

BEFORE PLACING THESE SWITCHES IN THE "POWER ON" POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE CLEAR OF EQUIPMENT

ON COMPLETION OF SHUNTING THESE SWITCHES MUST BE LEFT IN "POWER OFF" POSITION AND SWITCH "A" LOCKED

GEVAAR

AS SKAKELAARS "A" EN "B" IN DIE "KRAG AAN" -STAND GESTOOT WORD, MAAK DIT DIE DRADE ANDERKANT HIERDIE BORD "LEWENDIG"

MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAARS IN DIE "KRAG AAN" -STAND GESTOOT WORD

NADAT RANGEERBEWEGINGS VOLTOOI IS MOET HIERDIE SKAKELAARS IN DIE "KRAG AF" -STAND GESTOOT EN SKAKELAAR "A" GESLUIT WORD

TO MAKE WIRES "LIVE"

1 UNLOCK SWITCH A

2 PLACE SWITCH A IN THE "POWER ON" POSITION

3 PLACE SWITCH B IN THE "POWER ON" POSITION

TO MAKE WIRES "DEAD"

1 PLACE SWITCH B IN THE "POWER OFF" POSITION

2 PLACE SWITCH A IN THE "POWER OFF" POSITION

3 LOCK SWITCH A

OM DRADE "LEWENDIG" TE MAAK

1 SLUIT SKAKELAAR A OOP

2 STOOT SKAKELAAR A IN DIE "KRAG AAN" -STAND

3 STOOT SKAKELAAR B IN DIE "KRAG AAN" -STAND

OM DRADE "SPANNING-LOOS" TE MAAK

1 STOOT SKAKELAAR B IN DIE "KRAG AF" -STAND

2 STOOT SKAKELAAR A IN DIE "KRAG AF" -STAND

3 SLUIT SKAKELAAR A TOE

For (AC):

DANGER

PLACING THIS SWITCH IN THE "POWER ON" POSITION MAKES THE WIRES "LIVE" BEYOND THIS BOARD

BEFORE PLACING THE SWITCH IN THE "POWER ON" POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE CLEAR OF EQUIPMENT

ON COMPLETION OF SHUNTING, THIS SWITCH MUST BE LEFT IN THE "POWER OFF" POSITION AND LOCKED

GEVAAR

AS HIERDIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD, MAAK DIT DIE DRADE ANDERKANT HIERDIE BORD "LEWENDIG"

MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD

NADAT RANGEERBEWEGINGS VOLTOOI IS MOET HIERDIE SKAKELAAR IN DIE "KRAG AF" -STAND GESTOOT EN GESLUIT WORD

905.13 **Provision of isolating and earthing switches over shed inspection pit roads** - Where approved, isolating and earthing switches may be provided over shed inspection pit roads and certain other roads at electric motive power maintenance and repair or fault depots. In this case the switch is normally in the "power on" position.

905.14 **Water columns to be located on non-electrified tracks** - Water columns provided on electrified sections must be located on non-electrified tracks.

905.15 **Low-voltage lines and communication circuits erected on electrification track structures** - These are not permitted unless specially approved by the senior responsible electrical engineer.

905.16 **Communication circuits crossing electrified tracks** - Communication circuits crossing an electrified line above the overhead track equipment must conform to the following conditions:

905.16.1 **Open type crossings** - The entire portion of the circuit crossing the overhead track equipment must be protected by a cradle approved by the senior responsible electrical engineer, and so designed that in the event of a wire in the communication circuit breaking such wire cannot come into contact with any portion of the "live" overhead track equipment, and the minimum clearance from any portion of the communication circuit including its supports and cradle, must be at least the following:

905.16.1.1 To any portion of the overhead track equipment steelwork - 2,5m.

905.16.1.2 To the earth wire or return conductor (this clearance is a minimum and should be increased where possible) - 600mm.

905.16.1.3 To any "live" portion of the overhead track equipment:

25kV or 50kV AC	-	600mm
*3kV DC	-	1,95m

** NOTE: This clearance is to allow for "live" working on 3kV DC overhead track equipment in safety.*

905.17 **Insulated type crossings** - Insulated wires and/or overhead cables may cross the railway track provided they are suspended from a messenger wire. The clearances stipulated for open type crossings must be applied (905.16.1).

906.0 POWER LINES (INCLUDING CROSS-COUNTRY FEEDERS): DESIGN, CLEARANCES, ETC.

906.1 The design of all power lines, unless otherwise decided by the senior responsible electrical engineer, shall be in accordance with specification SANS 10280-1: Overhead Power Lines for Conditions Prevailing in South Africa Part 1: Safety.

906.2 The minimum clearances of power lines over property of Transnet are set out in annexure 9.2.

907.0 ANTI-CLIMBING DEVICES ON STRUCTURES

907.1 Supports carrying overhead conductors and the design of which is such that the supports are readily climbable and which are located in areas to which the public has legal access must be adequately protected to prevent unauthorised persons attempting to climb the supports. Such supports located in areas other than those stated must be similarly protected should this be deemed necessary by the responsible electrical engineering officer concerned.

907.2 Anti-climbing devices must be installed at a height of at least 3m from ground level.

908.0 EXITS FROM CHAMBERS HOUSING OIL-FILLED EQUIPMENT

All permanent chambers, housing high-voltage equipment which contain flammable oil and where access is required to the equipment while the equipment is "live", must be so designed as to avoid the spread of fire in the event of an explosion occurring in the equipment, and, wherever possible, must be provided with at least two means of exit.

It must be possible at all times to open each such means of exit from inside the chamber without the use of a key and such means of exit must be so arranged as to provide a reasonable possibility of escape in the event of any one piece of oil-filled equipment in the chamber exploding.

909.0 RUPTURING CAPACITY OF PROTECTIVE EQUIPMENT

909.1 In order to minimise the danger arising from destructive short circuits, special attention in regard to the breaking capacity of protective equipment is necessary.

The protection of the circuit which supplies the equipment must be such as to ensure that the rated breaking capacity of the equipment will not be exceeded, having regard to the calculated fault current likely to occur under fault conditions.

910.0 MEANS TO BE PROVIDED FOR DISCHARGE OF STORED CHARGE IN CAPACITORS ON SUBSTATION EQUIPMENT AND ELECTRIC ROLLING STOCK

910.1 High-voltage capacitors must be provided with automatic means to effectively discharge themselves within five minutes of switching off the source of supply.

910.2 Permanently connected discharge resistors or permanent connection to associated equipment which is automatically earthed may be used for this purpose.

911.0 CONTROL EQUIPMENT AND HIGH-VOLTAGE CABLES TO BE CLEARLY MARKED FOR IDENTIFICATION PURPOSES

911.1 **Control equipment** - all control equipment associated with high-voltage apparatus must be clearly marked to indicate the circuit being controlled.

911.2 **Cable joint boxes** - All cable joint boxes must be clearly marked by means of a suitable tag attached to each joint box, to indicate the identity of the cable concerned.

912.0 WARNING BELLS, SIRENS, ETC.

912.1 Warning bells, sirens, hooters or any such appliances must be mounted not less than 3m from "live" equipment.

913.0 DESIGN OF CONVENTIONAL HIGH-VOLTAGE TESTING TRANSFORMERS (HI-POT)

913.1 The design of conventional high-voltage testing transformers must be such that the high-voltage winding is energised only while the energising switch is held in the "on" position and this switch must open automatically immediately the hand is removed or failure of insulation under test occurs.

913.2 The closing of the energising switch will operate a device which will ensure that a red light is exhibited.

914.0 INJURY FROM ELECTRICAL SHOCK: NOTICES

914.1 Notices regarding the treatment of persons suffering from electric shock must be affixed in a prominent position in all premises where high-voltage electrical energy is generated, transformed or used.

LIST OF ANNEXURES

ANNEXURE 9.1	Minimum clearances: Overhead track equipment and feeders erected on track-equipment structures.
ANNEXURE 9.2	Clearances for power lines over property of Transnet.
ANNEXURE 9.3	Outdoor earth clearances for electrification.
ANNEXURE 9.4	Outdoor earth clearances (excluding electrification).
ANNEXURE 9.5	Voltage occurring when current passes through an earthing system.
ANNEXURE 9.6	List of warning notices.

Annexure 9.1

MINIMUM CLEARANCES: OVERHEAD TRACK EQUIPMENT AND FEEDERS ERECTED ON TRACK EQUIPMENT STRUCTURES

EQUIPMENT		Clearance in metres except where otherwise indicated		
1.0 1.1	CONTACT WIRE (CLAUSE 905.2) **Height above rail level:**	**3kV**	**25kV**	**50kV**
1.1.1	Normal	5,0	5,0	5,0
1.1.2	Maximum	6,0	6,0	6,2
1.1.3	Minimum	4,5	4,5	4,5
1.1.3.1	Reduced heights for 3kV may only be approved by the senior responsible electrical engineer. (Refer 905.2.1)	as decided by the senior responsible elect. engineer	-	-
1.1.4	Contact wire height at marshalling and other yards, dead ends and sidings	as decided by the senior responsible electrical engineer		
1.1.5	Over electric motive power shed inspection pit roads (unless otherwise approved by the senior responsible electrical engineer)	6,0	6,0	6,2
1.1.6	Tolerance on normal contact wire height	+ 150mm - 0	+ 150mm - 0	+ 150mm – 0
1.1.7 **At level crossings:** (clause 905.3)				
1.1.7.1	Over proclaimed and public roads (required by Road Department for conveyance of abnormal loads up to 5,35m)	5,65	5,65	6,0
1.1.7.2	Over other roads	5,0	5,0	6,0
1.1.7.3	Over other roads where alterations to other structures are necessary the responsible electrical engineer may approve a lower height for 3kV DC but not less than	4,5	-	-
1.1.7.4	The height of the height gauge above road level shall be the height of the contact wire above rail level minus the clearance as indicated	300mm	300mm	500mm
2.0	OVERHEAD TRACK EQUIPMENT, HV FEEDERS AND RETURN CONDUCTORS* ON OVERHEAD TRACK STRUCTURES (CLAUSE 903.1.1.1 and 611.1.2) 2.1 **Minimum height above -**	**3kV and all bare AC return conductors***	**25kV**	**50kV**
2.1.1	access ways including passenger platforms	6,1	6,5	6,9
2.1.2	ground inside the fenced railway boundaries where the public and vehicles do not normally have access:			
2.1.2.1	Normal minimum	6,0	6,0	6,0
2.1.2.2	Reduced minimum (to be approved by the senior responsible electrical engineer) but never less than	4,5	4,5	4,5
2.1.3	walkways of footbridges	4,7	5,0	5,3
2.1.4	buildings where the crossing cannot economically be avoided	3,0	3,0	3,4
2.1.5	ballast machine off-track platform	6,1	6,5	6,9
2.2	**Minimum clearance for equipment not directly above access ways**			
2.2.1	Buildings, embankments, platforms and retaining walls	3,0	3,0	3,4
3.0	HORIZONTAL CLEARANCES For all overhead track equipment including feeders and return conductors from an access way	3,0	3,0	3,4

(* with booster transformer)

Annexure 9.2

MINIMUM CLEARANCES FOR POWER LINES OVER PROPERTY OF TRANSNET

	MAXIMUM VOLTAGE IN KV, RMS PHASE-TO-PHASE	Earth, up to 1,1 kV	1,1 to 7,2 kV	12 kV	24 kV	36 kV	48 kV	72 kV	100 kV	145 kV	245 kV	300 kV	362 kV	420 kV	800 kV	533kV DC
1.0	REQUIREMENTS FOR TRANSNET **Above non-electrified tracks**	CLEARANCES IN METERS														
1.1	Where electrification is unlikely.	7,6	7,7	7,8	7,9	8,1	10,0	10,2	10,4	10,9	11,4	11,8	12,4	12,7	15,0	13,2
1.2	Where electrification is likely:															
1.2.1	Single supply line crossing over open railway lines.	9,5	9,6	9,7	9,8	9,9	10,0	10,2	10,4	10,9	11,4	11,8	12,4	12,7	15,0	13,2
1.2.2	All multiple supply line crossings and single supply line crossings at stations, yards and at level crossings.	11,0	11,2	11,3	11,4	11,5	11,6	11,8	12,0	12,4	13,0	13,3	13,9	14,2	16,5	14,7
1.3	Above road surfaces, platforms and other access ways.	6,1	6,2	6,3	6,4	6,5	6,6	6,9	7,1	7,5	7,9	8,4	9,0	9,3	11,6	9,8
1.4	Above footbridges.	4,6	4,7	4,8	4,9	5,0	5,1	5,3	5,6	6,0	6,6	6,9	7,5	7,8	10,1	8,3
	Above electrified tracks															
1.5	To "live" conductors and return conductors (with booster transformers) on electrification structures.	1,8	2,0	2,1	2,2	2,3	2,4	2,6	2,8	3,3	3,7	4,2	4,7	5,0	7,3	5,5
2.0	STATUTORY REQUIREMENTS	Refer to Table E.1, Annex E of SANS 10280-1:2013 "Overhead power lines for conditions prevailing in South Africa, Part 1: Safety and all Transnet related requirement are indicated in brackets.														
2.1	Above ground outside townships. (Also Transnet power lines inside the fenced railway boundaries where the public and vehicles do not normally have access).	4,9	5,0	5,1	5,2	5,3	5,4	5,7	5,9	6,3	6,7	7,2	7,8	8,1	10,4	8,6
2.2	Above ground in townships.	5,5	5,5	5,5	5,5	5,5	5,5	5,7	5,9	6,3	6,7	7,2	7,8	8,1	10,4	8,6
2.3	To communication lines, other power lines, between power lines and cradles. (Also to earth wires and return conductors without booster transformer).	0,6	0,7	0,8	0,9	1,0	1,1	1,4	1,6	2,0	2,4	2,9	3,5	3,8	6,1	4,3
2.4	To buildings, poles and structures not part of the power line. (Also horizontal clearance to all access ways).	3,0	3,0	3,0	3,0	3,0	3,0	3,2	3,4	3,8	4,2	4,7	5,3	5,6	8,5	6,1
2.5	Above roads in townships and proclaimed roads outside townships. Railways and tramways. (See 1.0 for Transnet tracks).	6,1	6,2	6,3	6,4	6,5	6,6	6,9	7,1	7,5	7,9	8,4	9,0	9,3	11,6	9,8

NOTE:

Clauses 1.0 - 1.5 are the requirements for Transnet, which may be in excess of statutory regulations.

Clause 1.2.2 - clearances may be reduced as required due to special local circumstances to not less than those stated in clauses 1.1 and 1.2 respectively.

Clause 2.0 – Note that the statutory clearances are minimum values to be conformed to for a minimum power line conductor temperature of 50 °C and a swing angle associated with a wind pressure of 500 Pa. Should the power line conductor temperature exceed 50°C for normal conditions the statutory clearance must be conformed to at the higher temperature at which the conductors operate.

Annexure 9.3

OUTDOOR EARTH CLEARANCES FOR ELECTRIFICATION

	3kV DC	25kV AC	50kV AC
1.0 DESIGN EARTH CLEARANCES (STATIC)			
1.1 Normal outdoor earth clearance	150mm	300mm	585mm
1.2 Reduced or minimum (static) clearances at bridges, tunnels, etc.	* 75mm	200mm	535mm
1.3 Special reduced clearance at tunnels, bridges, etc. (Requires senior responsible electrical engineer's approval and special precautionary measures)	-	150mm	-
2.0 DESIGN EARTH CLEARANCES (PASSING)			
2.1 Passing clearances at tunnels and bridges	150mm	150mm	400mm
2.2 Special reduced passing clearances. (Requires senior responsible electrical engineer's approval. This clearance shall apply to isolated points only).	* 75mm	125mm	-
3.0 CLEARANCE TO LOAD (STATIC)			
3.1 Normal clearance between contact wire and load	150mm	300mm	535mm
3.2 Reduced (or minimum) clearance between contact wire and load	100mm	250mm	450mm
4.0 SUBSTATIONS	150mm	540mm	1000mm
5.0 ELECTRIC ROLLING STOCK			
5.1 Normal outdoor earth clearance	150mm	320mm	550mm
5.2 Special reduced earth clearance. (Requires senior responsible electrical engineer's (Traction) approval)	75mm	-	-
6.0 RETURN CONDUCTORS			
6.1 Return conductors (with booster transformer)	-	150mm	150mm

NOTES

(i) Reduced (or minimum) clearances must only be resorted to if undue difficulty or expense is involved in adopting the "Normal" clearances given.

(ii) For the terms "Normal" and "Passing" clearances see definition of terms.

(iii) Item 2.1 above: In areas where rolling stock often stands for more than a brief period, such as at terminal stations and stabling points, the normal outdoor earth clearances must be observed in regard to "live" equipment when uplifted by pantograph pressure.

**(iv) The reduced clearance for 3kV DC of 75mm may be applied below 1 000m altitude or as otherwise approved by the senior responsible electrical engineer.*

Annexure 9.4

OUTDOOR EARTH CLEARANCES (EXCLUDING ELECTRIFICATION)

NOTE: These clearances are adapted for the railway environment from the statutory clearances of the Table E.1, Annex E of SANS 10280-1:2013 "Overhead power lines for conditions prevailing in South Africa, Part 1: Safety and apply for the protection of persons in addition to basic clearances stipulated in the instructions where indicated. They do not apply to the designed insulation clearance of exposed "live" equipment to earth, which must be in accordance with standard specifications for the equipment concerned.

The following are the normal outdoor earth clearances irrespective of altitude for the voltages shown:

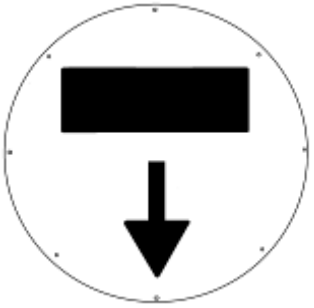
HIGHEST VOLTAGE FOR EQUIPMENT	NORMAL OUTDOOR EARTH CLEARANCE
kV	
1,1-7,2	150mm
12	200mm
24	320mm
36	430mm
48	540mm
72	770mm
100	1,0m
145	1,45m
245	1,85m
300	2,35m
362	2,9m
420	3,2m
800	5.5 m
533 DC	3,76m

body".

LIST OF WARNING NOTICES

Electrical Safety Instructions Clause No.	Drawing No. CEE- * Stores Item No.	Size of Warning Notice (Mm)	Particulars of Warning Notice	Warning Notice
211.3 905.8.2.1	TWN-0031 ITEM 1 (Single side) 54/017134 ITEM 2 (Double side) 54/017146	 190 x 190 190 X 190	***WARNING NOTICE:*** *HAZARD OF EXPOSED LIVE HIGH-VOLTAGE EQUIPMENT*	 **SABS 1186: WW23**
905.3.2	TWN-0002 ITEM 1 54/011845 ITEM 2 54/015932	190 x 190 290 x 290	***WARNING NOTICE:*** *ELECTRIC SHOCK HAZARD*	 **SABS 1186: WW7**
903.1.3.3	TWN-0010 54/003115	127 x 80	***WARNING NOTICE:*** *UNAUTHORISED ENTRY PROHIBITED*	**GEEN TOEGANG** **SONDER MAGTIGING** **UNAUTHORISED** **ENTRY PROHIBITED**
702.2.3 614.2	TWN-0012 54/003103	165 x 165	***WARNING NOTICE:*** *MEN WORKING ON EQUIPMENT*	**DANGER** **MEN WORKING** **ON EQUIPMENT** **GEVAAR** **MANNE WERK** **AAN TOERUSTING**
905.12.6	TWN-0015 * 54/005098	228 x 456	**WAARSKUKENNIS-GEWING:** HIERDIE SKAKE-LAAR BEHEER.... ***WARNING NOTICE:*** *THIS SWITCH CONTROLS...*	**THIS SWITCH CONTROLS** **HIERDIE SKAKELAAR BEHEER**

LIST OF WARNING NOTICES

Electrical Safety Instructions Clause No.	Drawing No. CEE- * Stores Item No.	Size of Warning Notice (Mm)	Particulars of Warning Notice	Warning Notice
905.12.11	TWN-0016 * 54/003329	457 x 457	**WAARSKUKENNIS-GEWING (GS):** SKAKELAARS BY VLAM-/PLOFBARE TERREINE ***WARNING NOTICE (DC):*** *SWITCHES AT FLAMMABLE/EXPLOSIVE SITES*	**DANGER** PLACING SWITCHES "A" AND "B" IN THE "POWER ON" POSITION MAKES THE WIRES "LIVE" BEYOND THIS BOARD BEFORE PLACING THESE SWITCHES IN THE "POWER ON" POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE CLEAR OF EQUIPMENT ON COMPLETION OF SHUNTING THESE SWITCHES MUST BE LEFT IN "POWER OFF" POSITION AND SWITCH "A" LOCKED **GEVAAR** AS SKAKELAARS "A" EN "B" IN DIE "KRAG AAN" -STAND GESTOOT WORD, MAAK DIT DIE DRADE ANDERKANT HIERDIE BORD "LEWENDIG" MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAARS IN DIE "KRAG AAN" -STAND GESTOOT WORD NADAT RANGEERBEWEGINGS VOLTOOI IS, MOET HIERDIE SKAKELAARS IN DIE "KRAG AF" -STAND GESTOOT EN SKAKELAAR "A" GESLUIT WORD
905.12.11	TWN-0014 * 54/003253	305 x 457	**WAARSKUKENNIS-GEWING (GS):** SKAKELVOLGORDE VLAM-/PLOFBARE TERREINE ***WARNING NOTICE (DC):*** *SWITCH SEQUENCE FLAMMABLE/EXPLOSIVE SITES*	**TO MAKE WIRES "LIVE"** 1 UNLOCK SWITCH **A** 2 PLACE SWITCH **A** IN THE "POWER ON" POSITION 3 PLACE SWITCH **B** IN THE "POWER ON" POSITION **TO MAKE WIRES "DEAD"** 1 PLACE SWITCH **B** IN THE "POWER OFF" POSITION 2 PLACE SWITCH **A** IN THE "POWER OFF" POSITION 3 LOCK SWITCH **A** **OM DRADE "LEWENDIG" TE MAAK** 1 SLUIT SKAKELAAR **A** OOP 2 STOOT SKAKELAAR **A** IN DIE "KRAG AAN" –STAND 3 STOOT SKAKELAAR **B** IN DIE "KRAG AAN" –STAND **OM DRADE "SPANNINGLOOS" TE MAAK** 1 STOOT SKAKELAAR **B** IN DIE "KRAG AF" –STAND 2 STOOT SKAKELAAR **A** IN DIE "KRAG AF" –STAND 3 SLUIT SKAKELAAR **A** TOE
905.12.11	TWN-0038 * 54/0031786	457 x 457	**WAARSKUKENNIS-GEWING (WS):** SKAKELAARS BY VLAM-/PLOFBARE TERREINE ***WARNING NOTICE (AC):*** *SWITCHES AT FLAMMABLE/EXPLOSIVE SITES*	**DANGER** PLACING THIS SWITCH IN THE "POWER ON" POSITION MAKES THE WIRES "LIVE" BEYOND THIS BOARD BEFORE PLACING THE SWITCH IN THE "POWER ON" POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE CLEAR OF EQUIPMENT ON COMPLETION OF SHUNTING, THIS SWITCH MUST BE LEFT IN THE "POWER OFF" POSITION AND LOCKED **GEVAAR** AS HIERDIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD, MAAK DIT DIE DRADE ANDERKANT HIERDIE BORD "LEWENDIG" MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD NADAT RANGEERBEWEGINGS VOLTOOI IS MOET HIERDIE SKAKELAAR IN DIE "KRAG AF" -STAND GESTOOT EN GESLUIT WORD
905.11	TWN-0009 * 54/003289	508 Diameter	**WAARSKUKENNIS-GEWING:** ELEKTRIESE TREINE MOET NIE NIE-GEËLEKTRIFI-SEERDE SPOORLYN BINNEGAAN NIE ***WARNING NOTICE:*** *ELECTRIC TRAINS NOT TO ENTER NON-ELECTRIFIED ROAD*	

LIST OF WARNING NOTICES

Electrical Safety Instructions Clause No.	Drawing No. CEE- * Stores Item No.	Size of Warning Notice (Mm)	Particulars of Warning Notice	Warning Notice
211.9.3	TWN-0008 * 54/003342	460 x 460	**WAARSKUKENNIS-GEWING:** PERKE VAN WATER INNEEM, TREM, ENS. ***WARNING NOTICE:*** *LIMITS OF WATERING, TRIMMING, ETC.*	**DANGER** **WATERING, TRIMMING OF COAL AND EMERGENCY WORK MUST NOT BE DONE BEYOND THIS BOARD** **GEVAAR** **MOENIE ANDERKANT HIERDIE BORD WATER INNEEM, STEENKOOL TREM EN NOODWERK DOEN NIE**
905.12.7	TWN-0017 * 54/005102	457 x 457	**WAARSKUKENNIS-GEWING:** SYLYNSKAKELAAR VOORSORGMAAT-REËLS ***WARNING NOTICE:*** *SIDING SWITCH PRECAUTIONS*	**DANGER** PLACING THIS SWITCH IN THE "POWER ON" POSITION MAKES THE WIRES "LIVE" BETWEEN THE WARNING NOTICE BOARDS BEFORE PLACING SWITCH IN THE "POWER ON" POSITION ENSURE THAT ALL PERSONS HAVE BEEN WARNED AND ARE ALL CLEAR OF EQUIPMENT ON COMPLETION OF SHUNTING MOVEMENTS, THIS SWITCH MUST BE LEFT IN THE "POWER OFF" POSITION AND LOCKED **GEVAAR** AS HIERDIE SKAKELAAR IN DIE "KRAG AAN" -STAND GESTOOT WORD, MAAK DIT DIE DRADE TUSSEN DIE WAARSKUKENNISGEWINGBORDE "LEWENDIG" MAAK SEKER DAT ALLE PERSONE GEWAARSKU IS EN WEG VAN DIE TOERUSTING STAAN VOORDAT DIE SKAKELAAR IN DIE "KRAG AAN -STAND GESTOOT WORD NADAT RANGEERBEWEGINGS VOLTOOI IS, MOET HIERDIE SKAKELAAR IN DIE "KRAG AF" -STAND GESTOOT EN GESLUIT WORD
202.0 905.12.8	TWN-0011 * 54/0033/17	914 x 534	**WAARSKUKENNIS-GEWING:** MOENIE ANDERKANT HIERDIE BORD LAAI OF AFLAAI NIE ***WARNING NOTICE:*** *LOADING OR UN-LOADING MUST NOT BE DONE BEYOND THIS BOARD*	**DANGER** **LOADING OR UNLOADING MUST NOT BE DONE BEYOND THIS BOARD** **GEVAAR** **MOENIE ANDER-KANT HIERDIE BORD LAAI OF AFLAAI NIE**
905.12.10	TWN-0007 * 54/003305	406 x 456	**WAARSKUKENNIS-GEWING:** GEEN TOEGANG TOTDAT SYLYN-SKAKELAAR IN DIE "KRAG AAN" -STAND IS NIE ***WARNING NOTICE:*** *NO ENTRY UNTIL SIDING SWITCH IS IN "POWER ON" POSITION*	
905.10	TWN-0006 * 54/003241	534 x 254	**WAARSKUKENNIS-GEWING:** (KRAG AAN - KRAG AF) NET AFSONDER-EN-AARDING-SKAKELAARS ***WARNING NOTICE:*** *(POWER ON-POWER OFF) ISOLATING AND EARTHING TYPE SWITCHES ONLY*	**POWER ON KRAG AAN**  **POWER OFF KRAG AF**

Annexure 9.6

LIST OF WARNING NOTICES

Electrical Safety Instructions Clause No.	**Drawing No. CEE- * Stores Item No.**	**Size of Warning Notice (Mm)**	**Particulars of Warning Notice**	**Warning Notice**
905.10	TWN-0005 * 54/003228	534 x 254	**WAARSKUKENNIS-GEWING:** ("TOE - OOP") NET SEKSIESKAKELAARS ***WARNING NOTICE:*** *("CLOSED - OPEN") SECTION SWITCHES ONLY*	**CLOSED** **TOE**  **OPEN** **OOP**
901.6	TWN-0035 * 54/031596	80 x 35	**WAARSKUKENNIS-GEWING:** VERBINDINGS ONDER HOË SPANNING ***WARNING NOTICE:*** *CONNECTIONS AT HIGH-VOLTAGE*	**CAUTION - HIGH-VOLTAGE** **DO NOT WORK ON THIS APPARATUS UNLESS THE HIGH-VOLTAGE EQUIPMENT IS ISOLATED AND EARTHED** **WAARSKUWING - HOË SPANNING** **MOENIE AAN HIERDIE APPARAAT WERK NIE TENSY DIE HOËSPANNINGSTOERUSTING AFGESONDER EN GEAARD IS**
901.9	TWN-0037 * 54/031584	150 x 320	**WAARSKUKENNIS-GEWING:** GELEISTAMKAMER-DEUR ***WARNING NOTICE:*** *BUSBAR CHAMBER DOOR*	**WARNING** **AFTER ISOLATION, EARTH BUSBAR AND** **ALL FEEDER CABLES ON ENTERING** **WAARSKUWING** **NA AFSONDERING, AARD GELEISTAM EN ALLE TOEVOERKABELS WANNEER INGEGAAN WORD**

ELECTRICAL SAFETY INSTRUCTIONS - INDEX

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