

Annexure 1.7:

Main Technical References

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1 GENERAL

1.1 Purpose of the Document

- 1.1.1 The purpose of this document is to provide the Main Technical Requirements (“MTR”) which form part of the minimum Requirements of the Passenger Rail Agency of South Africa (“PRASA”) for the planning, design, supply, construction, installation, testing, commissioning and maintenance of a new fully integrated, functional, complete and future-proofed PRASA Train Control System (“PTCS”) in PRASA’s KwaZulu-Natal (“KZN”) service region (“the Project”) that the Bidder shall meet and deliver at the Bidder’s cost therefore within the Bid Price.

1.2 Executive Overview

- 1.2.1 Notwithstanding any other PRASA Requirements stated throughout the RFP, the Bidder shall uncompromisingly deliver the whole of the Works required to achieve successful delivery of the Project.
- 1.2.2 The specifications, standards, regulations and procedures listed form part of the Technical Requirements.
- 1.2.3 The contents of the General Technical Requirements (“GTRs”) shall prevail in the event of a conflict between the referenced document and the GTRs.
- 1.2.4 All standards in this Bid specification (CENELEC, DIN, etc.) are given to describe the level of characteristic required. Any other standard equivalent or higher are acceptable. The standards adopted by the Bidder shall be approved by international, independent and qualified railway authorities.
- 1.2.5 The latest version of all standards, specifications, regulations and procedures shall be applicable, except where explicitly stated otherwise.
- 1.2.6 The Bidder shall provide any other Works, activities and resources required to achieve a fully integrated, functional, complete and future-proofed PTCS and meet any other requirements and specifications as required by all applicable legislation, regulations and by-laws and as requested throughout the RFP or as otherwise instructed in writing by PRASA.

2 MINIMUM APPLICABLE REGULATIONS, STANDARDS, SPECIFICATIONS AND REGULATIONS

2.1 General

DOCUMENT NO.	DOCUMENT DESCRIPTION
South African Regulations	
	The Engineering Profession Act, 46 of 2000
	Occupational Health and Safety Act, 1993 (Act 85 of 1993)
	Compensation for Occupational Injuries and Diseases Act (Act 130 of 1993)
	Explosives Act No 26 of 1956 (as amended)
	SATS Legal Succession Act (Act No.9 of 1989)
SANS	
SANS3000:1	Railway Safety Management - General
SANS3000:2-1	Technical requirements for Engineering and operational standards - General
SANS3000:2-2	Technical requirements for Engineering and operational standards – Track, civil and electrical infrastructure
SANS3000:2-2-1	Technical requirements for Engineering and operational standards – Track, civil and electrical infrastructure – Level Crossings
SANS3000:2-4	Technical requirements for Engineering and operational standards – Train authorization and control Systems and Equipment
SANS3000:2-5	Technical requirements for Engineering and operational standards – Train operations management
SANS3000:2-6	Technical requirements for Engineering and operational standards – Interoperability, intermodal and utilities management
SANS3000:3	Railway occurrence management
SANS3000:4	Human factors management
SANS3000:5	Railway stations
PRASA/TFR	
	Asset Disposal Form
	Train Working Rules
	Rolling Stock specification
E7/1	Work on, over, under and or adjacent for railway lines and near high voltage Equipment.
CENELEC	
EN50121-1	Railway applications - Electromagnetic compatibility - Part 1: General
EN50121-2	Railway applications - Electromagnetic compatibility - Part 2: Emission of the whole railway System to the outside world

DOCUMENT NO.	DOCUMENT DESCRIPTION
EN 50126	Railway applications – Specification and demonstration of Reliability, Availability, Maintainability and Safety (“RAMS”)
EN50125-3	Railway applications – Environmental conditions for Equipment
EN61000-6-2	EMC: Immunity for industrial environments
IEC	
IEC 62128-1	Railway applications - Fixed installations - Electrical safety, earthing and the return circuit - Part 1: Protective provisions against electric shock
IEC 61000-4	Electromagnetic compatibility (“EMC”) – Part 4-1 to 4-11: Testing and measurement techniques
ISO	
ISO 9001	Quality Systems – model for quality assurance in design, development, production, installation and serving

2.2 RSS, Telecommunication and ETCS

DOCUMENT NO.	DOCUMENT DESCRIPTION
CENELEC	
EN 50121-4:	Railway applications- Electromagnetic compatibility (EMC)- Signalling and Telecommunication
EN50128:	Railway applications – Software for railway control and protection Systems
EN50129:	Railway applications - Safety related electronic Systems for signalling
EN50159-1:	Railway applications – Signalling and communications – Safety-related communication in closed transmission Systems
EN50159-2:	Railway applications – Signalling and communications – Safety-related communication in open transmission Systems
ETSI	
EN 302 608	Electromagnetic Compatibility and Radio Spectrum Matters (“ERM”); Short Range Devices (“SRD”); Radio Equipment for Eurobalise railway Systems
IEC	
IEC 60068-2-64	Environmental testing - Part 2-64: Tests - Test Fh: Vibration, broadband random and guidance
IEC 60068-2-29	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock
IEC/TS 62443	Industrial communication Network – Network and System security
ISO/IEC 27000	Information Technology — Security techniques — Information security management Systems
PRASA/TFR	
BBB0321	Numbering of heads and sections for multi-section axle counters

DOCUMENT NO.	DOCUMENT DESCRIPTION
BBB1454	Specification for non-illuminated train control diagrams
BBB2582	Points rodding: Manufacturing specification
BBB2673	Points rodding: Welding specification
BBB3609	
BBB4628	
BBC0281	
BBC1040:	Installation of earthing and lightning protection of signal relay rooms and signal Equipment enclosures
BBC4030	Competent person for testing and commissioning of signalling installations
BBC5665	Single Phase Static Uninterruptible Power Supply 3 To 10 kVA
BBC5666	3 Phase Static Uninterruptible Power Supply. 10 To 125 kVA
BBD5786	Signal number plates
CSE1155-515 Cat N48:	Specification for installation of earthing
CSE Z148-1F	Standard Signalling Symbols
SAD-S&T-1	ROC for Interlocking Systems
SAD-S&T-10	Identification and Traceability requirements for RSS, Telecoms and ETCS
SAD-S&T-3	URS for Level Crossings
SAD-S&T-3	URS for ETCS
SAD-S&T-4	SATCOS Symbol catalogue
SAD-S&T-5	SATCOS command catalogue
SAD-S&T-6	RAMS requirements for RSS, Telecoms and ETCS
SAD-S&T-7	EMC, lightning and earthing requirements for RSS, Telecoms and ETCS
SAD-S&T-8	Environmental requirements for RSS, Telecoms and ETCS
SAD-S&T-9	Transportation and storage requirements for RSS, Telecoms and ETCS
STZ148-41F:	South African Railways – Multi Aspect Signalling

2.3 Electrical

DOCUMENT NO.	DOCUMENT DESCRIPTION
DIN	
DIN 43138	Flexible cables for overhead Equipment and return current
DIN 48201-2	Bronze stranded conductors
DIN EN 12464-1	Light and lighting - Lighting of workplaces - Part 1: Indoor workplaces
DIN EN 12464-2	Light and lighting - Lighting of workplaces - Part 2: Outdoor workplaces

DOCUMENT NO.	DOCUMENT DESCRIPTION
DIN EN 1838	Lighting applications - Emergency lighting
DIN EN 50172	Emergency escape lighting Systems
DIN EN 50182	Conductor for overhead lines
DIN VDE 0210	Planning and design of overhead power lines with rated voltages above 1 kV
CENELEC	
EN 50 081-1-3	Electromagnetic compatibility (EMC): General emission standard / Part 2 / Industrial environment
EN 50119	Railway applications – Fixed installations: Electric traction overhead contact lines for railways
EN 50121-1	Railway applications - Electromagnetic compatibility - Part 1: General
EN 50121-2	Railway Applications Electromagnetic Compatibility – Part 2: Emission of the whole railway System to the outside world
EN 50121-4	Railway applications - Electromagnetic compatibility - Part 4: Emission and immunity of the signalling and telecommunications apparatus
EN 50121-5	Railway applications - Electromagnetic compatibility - Part 5: Emission and immunity of fixed power supply installations and apparatus
EN 50122-1	Railway applications - Fixed installations, Electrical safety, earthing and bonding - Part 1: Protective provisions relating to electrical safety and earthing
EN 50124-1	Railway applications – Insulation coordination – Part 1: Basic requirements – Clearances and creepage distances for all electrical and electronic Equipment
EN 50124-2	Railway applications – Insulation coordination – Part 2: Over voltages and related protection
EN 50126	Railway Applications – The specification and demonstration of Reliability, Availability, Maintainability and Safety (RAMS)
EN 50149	Railways application – Fixed installations; Electric traction – Copper and copper-alloy grooved contact wires
EN 50152-1	Railways application – Fixed installations – Particular requirement for a.c. switchgear – Part 1: Single-phase circuit-breakers with Um above 1 kV
EN 50152-2	Railways application – Fixed installations – Particular requirement for a.c. switchgear – Part 2: Single-phase disconnectors, earthing switches and switches with Um above 1 kV
EN 50152-3-1	Railway applications - Fixed installations; Particular requirements for a.c. switchgear - Part 3-1: Measurement, control and protection devices for specific use in a.c. traction Systems; Application guide
EN 50152-3-2	Railway applications - Fixed installations; Particular requirements for a.c. switchgear - Part 3-2: Measurement, control and protection devices for specific use in a.c. traction Systems; Single-phase current transformers
EN 50163	Railway applications – Supply voltages of traction Systems

DOCUMENT NO.	DOCUMENT DESCRIPTION
EN 50327	Railway applications – Fixed installations – Harmonisation of the rated values for converter groups and tests on converter groups
EN 50328	Railway applications – Fixed installations – Electronic power converters for substations
EN 50329	Railway applications – Fixed installations – Traction transformers
EN 50351	Basic standard for the calculation and measurement methods relating to the influence of electric power supply Systems on telecommunications Systems
EN 50388	Railway applications – power supply and rolling stock – technical criteria between power supply and rolling stock to achieve interoperability
EN 60529	Specification for degrees of protection provided by enclosures (Ingress Protection Code) (IP Code)
EN 60694	Common specifications for high-voltage switchgear and control gear standards
EN 60909	Short-circuit currents in three phase ac Systems
EN 61000 4-2	Electromagnetic compatibility (EMC) – testing and measurement techniques – electrostatic discharge immunity test and basic EMC
EN 61000 4-3	Electromagnetic compatibility – testing and measurement techniques – radiated, radiofrequency, electromagnetic field immunity test
EN 61000 4-3	Electromagnetic compatibility – testing and measurement techniques – radiated, radiofrequency, electromagnetic field immunity test
EN 61000 4-4	Electromagnetic compatibility – testing and measurement techniques – electrical fast transient/burst immunity test and basic EMC publication
EN 61000 4-5	Electromagnetic compatibility – testing and measurement techniques – surge and immunity test
EN 61000 4-8	Electromagnetic Compatibility (EMC): Testing and Measurement Techniques – Power Frequency Magnetic Field Immunity Test
EN 61140	Protection against electric shock – Common aspects for installation and Equipment
EN 62305	Protection against lightning
HD 637 S1	Power installations exceeding 1 kV a.c.
IEC	
IEC 1034-2	Smoke density test of cables for tunnel cables
IEC 60038	Standard voltages
IEC 60076-8	Power transformers – Application guide
IEC 60287	Electric cables – Calculation of the current rating, General
IEC 60296	Fluids for electro-technical Applications - Unused Mineral Insulating Oils for Transformers and Switchgear
IEC 60309	Plugs, socket-outlets and couplers for industrial purposes

DOCUMENT NO.	DOCUMENT DESCRIPTION
IEC 60331-1, 2, 3	Fire resisting characteristics of electric cables
IEC 60332-1, 2, 3	Tests on electric cables under fire conditions
IEC 60364	Electrical Installations for Buildings on electrical installations of buildings
IEC 60383-2	Insulators for overhead lines with a nominal voltage above 1000V – Part 2: insulator sets for a.c. Systems; definitions, test methods and acceptance criteria
IEC 60529	International protection classes Degrees of protection provided by enclosures (IP Code)
IEC 60664	Insulation coordination for Equipment within low-voltage Systems – Part 1: Principles, requirements and tests
IEC 60850	Railway applications - Supply voltages of traction Systems
IEC 60865-1	Short-circuit currents – Calculation of effects – Part 1: Definitions and calculation methods
IEC 60913	Electric Traction Overhead Lines
IEC 61000	Electromagnetic compatibility
IEC 61034	Measurement of smoke density of cables burning under defined conditions
IEC 61140	Protection against electric shocks – common aspects for installation and Equipment
IEC 61557	Electrical safety in low-voltage distribution Systems up to 1,000V AC and DC 1,500V
IEC 61850	Generic Cabling for Customer Premises Cabling
IEC 62271-1	High-voltage switchgear and control gear – Part 1: Common specifications
IEC 62271-100	High-voltage switchgear and control gear – Part 100: High-voltage alternating-current circuit-breakers
IEC 62271-102	High-voltage switchgear and control gear – Part 102: Alternating current disconnectors and earthing switches
IEC 62271-200	High-voltage switchgear and control gear – Part 200: AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52kV
IEC 62305	Protection against lightning
IEC 754-1/2	Test of Halogen free cables for tunnel cables
IEC-801-2	Electromagnetic compatibility for industrial-process measurement and control Equipment – Part 2: Electrostatic discharge requirements for tunnel cables
NFC	
NFC 15-100	Low voltage installations
NFC 20-010	Common rules for electrical Equipment/ Degrees of protection for enclosures
NFC 32-070	Classifications of fire resistance for electrical cables

DOCUMENT NO.	DOCUMENT DESCRIPTION
NFPA	
NFPA 101	Life Safety Code
NFPA 130	Standard for Fixed Guideway Transit and Passenger Rail Systems
UIC	
UIC 600	Electric traction with aerial contact line
UIC 606-1	Application of kinematic gauges to contact lines
UIC 606-2	Installation of 25 kV 50/60 Hz contact lines
PRASA/TFR	
	Specification for uninterruptible power supplies – Uninterruptible Power Supplies
	Specification for DC power supplies - Modular Direct Current Linear Power Supplies
	Specification for distribution panels - Power Distribution Cubicles
	Specification for Batteries – Valve Regulated Lead Acid Standby Batteries
	Specification for works on, over, under or adjacent to railway lines and near high voltage Equipment
	Safety arrangements and procedural compliance with the occupational health and safety act
	Rolling Stock Specification

2.4 Civil and Track

DOCUMENT NO.	DOCUMENT DESCRIPTION
E10	General
E10/1	Laying of rails
E10/2	Laying of sleepers
E10/4	Ballasting and tamping
E10/5	De-stressing of rails
E10/6	Building and replacement of sets
E10/7	Field welding and rail joints
E10/9	Slewing and alignment
E10/11	Survey and setting out of track alignment and referencing
E10/12	Installation of insulated rail joints
E10/13	Miscellaneous
E10/14	Building of new lines

DOCUMENT NO.	DOCUMENT DESCRIPTION
Annexure A	Tolerance of track geometry standards
Annexure B	Typical Turnouts
Annexure C	Classification of lines and ballast standard
Annexure D	Ruling temperatures of sections
Annexure E	Sleeper spacing
Annexure G	Super elevation
Annexure H	Distressing ranges
Annexure I	Cutting of released rails
Annexure J	Layout of insulated rail joints
	TFR Manual for Track maintenance
	TFR Track Welding Specification
ENV 13803-1:2002	Railway Applications - Track Alignment Design Parameters - Track Gauges 1435 Mm and Wider - Part 1: Plain Line
	Bridge code 1983
S410	Specification for Railway Earthworks
S406	Specification for the Supply of Stone – Concrete Stone
S402	Specification for Concrete work
S413	Specification for stabilisation
SSS-8	TFR Track Welding Specification
PRASA: 2010-08-05	Perway & Structures Standards for the Design and Construction of New Infrastructure
	Norms Guidelines and Standards (NDS) for Facilities and Platforms (Prasa)
	SABS standards: Railway Stations- Passenger Platforms Part 1: Clearances on Ballastless track (1065mm Gauge); 2009

3 REQUIREMENT OF OPERATIONAL CAPABILITIES (“ROC”)

3.1.1 The Bidder is referred to the attached documents:

- a) KZN PTCS D&C-RFP Annexure1.7 GTR MTR Annex1.7.1 ROC being the:
 - Required Operational Capability for Interlocking Systems
- b) KZN PTCS D&C-RFP Annexure1.7 GTR MTR Annex1.7.2 ROC being the:
 - User Requirement Specification for Electronic Interlocking Interface to a Siemens Key Release Instrument
- c) KZN PTCS D&C-RFP Annexure1.7 GTR MTR Annex1.7.3 ROC being the:
 - User Requirement Specification for Electronic Interlocking Interface to Spoorplan Interlocking Systems: Mk1, Mk1a, M1b, Mk1c, MkII, MkM, and HR97
- d) KZN PTCS D&C-RFP Annexure1.7 GTR MTR Annex1.7.4 ROC being the:
 - User Requirement Specification for Electronic Interlocking Interface to Level Crossing Protection Controller
- e) KZN PTCS D&C-RFP Annexure1.7 GTR MTR Annex1.7.5 ROC being the:
 - Required Operational Capability for Axle Counter Systems
- f) KZN PTCS D&C-RFP Annexure1.7 GTR MTR Annex1.7.6 ROC being the:
 - Required Operational Capability for Interlocking Indications