SANRAL
SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LTD

Reg.No.1998/009584/30

BUILDING SOUTH AFRICA
THROUGH BETTER ROADS

THE SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

CONTRACT SANRAL X.002-184-2023/1

PROCUREMENT OF THE OPERATIONS AND MAINTENANCE OF AN OPEN ROAD TOLLING SYSTEM IN THE GAUTENG PROVINCE, SOUTH AFRICA, AND A NATIONAL TRANSACTION CLEARING HOUSE

VOLUME 3

PART C3   EMPLOYER'S REQUIREMENTS

PART C3.4.2   GENERAL SYSTEM SPECIFICATIONS

CHIEF EXECUTIVE OFFICER

SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

48 TAMBOTIE AVENUE

VAL DE GRACE

PRETORIA, 0184

NAME OF TENDERER:

Set sequential number

CONTRACT SANRAL X.002-184-2023/1

FOR

THE PROCUREMENT OF THE OPERATIONS AND MAINTENANCE OF AN OPEN ROAD TOLLING SYSTEM IN THE GAUTENG PROVINCE, SOUTH AFRICA AND A NATIONAL TRANSACTION CLEARING HOUSE

VOLUME 3

PART C3   **EMPLOYER'S REQUIREMENTS**

PART C3.4.2   **GENERAL SYSTEM SPECIFICATIONS**

COMPILED UNDER THE DIRECTION OF THE REGIONAL MANAGER: NORTHERN REGION

SOUTH AFRICAN NATIONAL ROADS AGENCY SOC LIMITED

38 IDA STREET

MENLO PARK

PRETORIA

SOUTH AFRICA

0081

sanralbid@dbsa.org

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LIST OF CONTRACT DOCUMENTS

The following documents form part of this Contract:

Volume 1: The FIDIC Conditions of Contract for Design, Build and Operate Projects (September 2008), issued by the International Federation of Consulting Engineers, which the Tenderer shall purchase himself.

Volume 2: Not applicable.

Volume 3: The Project Document, containing the tender notice, Conditions of Tender, Tender Data, Returnable Schedules, general and particular conditions of contract, project specifications, Pricing Schedule, Form of offer and Site Information is issued by the Employer. The Employer's Form of Acceptance and any correspondence from the selected tenderer, performance security-demand guarantee and all addenda issued during the period of tender will also form part of this volume once a successful tenderer has been appointed.

The conditions of tender are the standard conditions of tender as contained in the South African Bureau of Standards, SANS 10845-3:2015, Construction procurement – Part 3: Standard conditions of tender, document, which the tenderer shall purchase himself.

Volume 4: Not applicable.

Volume 5: Not applicable.

Volume 6: Not applicable.

Volume 7: Not applicable.

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The following documents form part of this Contract:

Volume 1	**The FIDIC Conditions of Contract for Design, Build and Operate Projects, First Edition 2008**
Volume 2	**Not Applicable**
Volume 3	**Project Document (Parts T1, T2, C1, C2, C3 and C4)**
Part T1	**Tender Procedures**
T1.1	Tender Notice and Invitation to Tender
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PROCUREMENT OF THE OPERATIONS AND MAINTENANCE OF AN OPEN ROAD TOLLING SYSTEM IN THE GAUTENG PROVINCE, SOUTH AFRICA AND THE NATIONAL TRANSACTION CLEARING HOUSE

SECTION 1.   SYSTEM OVERVIEW

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1.1 SCOPE

1.1.1 Purpose of Document

1.1.1.1 This General System Specification for the Toll System covers system requirements common between the four Systems, i.e. the Road Side System (RSS), the ORT Back Office (BO) System, the Transaction Clearing House (TCH) System and the Violation Processing Centre (VPC) System. These specifications include general software and documentation requirements, system acceptance and other general software requirements, legal and auditability requirements, reporting and hardware.

1.1.1.2 All aspects relating to a specific system are dealt with in the following Specifications:

(a) Part C3.4.3: Road Side System Specifications;

(b) Part C3.4.4: Open Road Tolling Back Office System Specifications;

(c) Part C3.4.5: Transaction Clearing House System Specifications; and

(d) Part C3.4.6: Violation Processing Centre System Specifications.

1.1.1.3 The following terminology is applicable within the different set of specifications.

Entity (vertical) / Contract (horizontal)	ORT Operations Contract	Transitional Subcontract	SI [New Toll Back Office System] Contract, if / when triggered by SANRAL
SANRAL	Employer	Principal Employer	Employer
ORT Contractor	Contractor	Employer	"Other contractor" * of Employer under FIDIC Sub-Clause 4.6(b)
Transitional Subcontractor	Nominated Subcontractor	Contractor	"Nominated subcontractor" * of ORT Contractor under FIDIC Sub-Clause 4.5

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SI [New Toll Back Office System] Contractor	"Other contractor" * of Employer under FIDIC, Sub-Clause 4.6(b)	"Other contractor" * of Principal Employer under FIDIC, Sub-Clause 4.6(b)	Contractor

1.1.2   Overview

1.1.2.1   The improved road network of the GFIP will be tolled utilizing Open Road Tolling ("ORT") with electronic and automated methods of levying and collecting toll charges.

1.1.2.2   Together with the tolling of the GFIP, the Employer intends implementing a national Electronic Toll Collection ("ETC") interoperability solution, which will allow a Road User to register a Customer Account that shall be valid for use across all ETC Toll Roads nationally. To this end, a Transaction Clearing House ("TCH") shall be established, which shall undertake central ETC account management and transaction processing services in respect of all ETC Transaction Records, including those ETC Transaction Records implemented (and to be implemented in the future) by the Employer on other Toll Roads (which are operated by other Parties on behalf of the Employer) and those ETC Transaction Records as implemented by the current Concessionaires. Future Concessionaires that also implement ETC, shall therefore also be required to use the TCH System for account management and transaction processing.

1.1.2.3   Further, a Violation Processing Centre (VPC) is to be established for the processing and collection of unpaid toll fees and unpaid Customer Accounts, the handling of evidence related to exceptions and the possible administration of prosecuting procedures as required by the AARTO process.

1.1.3   Value Added Service (VAS) and Toll System

1.1.3.1   The Employer requires the procurement, operation and maintenance of a complete VAS and Toll System, which shall include the Road Side System (Hardware, software and integration), an ORT Back Office System for automated Transaction Record administration and processing, a TCH System to be used for central account management and Transaction Record processing, and a VPC System for the processing of unpaid toll fees and to recover costs related thereto. These systems are specified in detail in the Technical Specifications.

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1.1.3.2   The interaction of these systems, together with the current conventional Toll Plaza systems (including any ETC systems) of the Concessionaires and other Toll Roads operated on behalf of the Employer, is indicated in Figure 1-1: New Toll System Configuration including Conventional Toll Plaza Systems.

1.1.3.3   The generation of the Transaction Records shall be with sufficient accuracy and integrity for the TCH to charge an account, or for the VPC to prosecute an exception, according to the accepted Business Rules and within prevailing regulations.

1.1.3.4   All interfaces and communications between the system components shall be of a non-proprietary, open, documented nature to allow for flexibility in future system modifications.

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Figure 1-1: New Toll System Configuration including Conventional Toll Plaza Systems

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1.1.4   Employer's Equipment / Facilities

1.1.4.1   The Employer will provide certain infrastructure that shall be maintained and utilized by the Contractor. The detail of the items that shall be provided by the Employer is included in Part C4.1.1: Site & Location Information & Annexures. These items shall include:

(a)   Gantry structure at each Tolling Point;

(b)   Technical Shelter at each Tolling Point;

(c)   Tariff Boards;

(d)   Generator within each Technical Shelter and at each Customer Service Kiosk;

(e)   Uninterruptible Power Supply (UPS) within each Tolling Point and at each Customer Service Kiosk;

(f)   Communications backbone;

(g)   Access control, fire detection and security system; and

(h)   Electrical and mechanical equipment, including distribution boards, cable ducts, cabling, circuit breakers, air conditioning, security gates and fences, lights, etc. at each Technical Shelter.

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1.2   ROAD SIDE SYSTEM (RSS)

1.2.1   Overview

1.2.1.1   The RSS Tolling Points (gantries) for the first phase of the Project shall be strategically positioned along the road network of the GFIP. The RSS Tolling Points shall span across varying Lane configurations (2 to 6 trafficked Lanes, plus shoulders and emergency Lanes, as applicable). A Tolling Point shall be applicable to one direction only.

1.2.1.2   The main purpose of the RSS shall be to accurately measure, generate and frame all Transaction Records for every vehicle passage under a RSS Tolling Point. The RSS shall therefore be required to perform the following minimum functions:

(a)   Vehicle identification by means of Tags or Vehicle Licence Numbers;

(b)   Vehicle Image capturing (Front, rear and scene);

(c)   Vehicle Classification (Volumetric Vehicle Classification);

(d)   Transaction Record validation (Data correctness and completeness);

(e)   Transaction Record and images storing;

(f)   Transaction Record framing;

(g)   Operations and Maintenance interface; and

(h)   Transaction Record transmission to the ORT Back Office System.

1.2.1.3   In addition to the requirements within this specification, the RSS shall also comply with the requirements in Part C3.4.3: Road Side System Specifications.

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1.3 ORT BACK OFFICE SYSTEM

1.3.1 Overview

1.3.1.1 The main purpose of the ORT Back Office (BO) System is to collect and process all Transaction Records received from the various Tolling Points and transfer them to the Transaction Clearing House (TCH) System.

1.3.1.2 The ORT Back Office System shall therefore be required to perform the following minimum functions:

    (a) Collect data from the RSS;

    (b) Identify the vehicle through prescribed Identifiers such as Tags, the ANPR or MNPR process if it is not done at the RSS;

    (c) Resolve Class Discrepancies and other exceptions;

    (d) V-Tolling;

    (e) Apply route specific and other Discounts;

    (f) Determine the transaction Tariff;

    (g) Generate Tariff Tables;

    (h) Transfer the processed Transaction Records to the TCH System;

    (i) Monitor the RSS and ORT Back Office System; and

    (j) Receive Validation List(s) from the TCH and transfer them to the RSS.

1.3.1.3 In addition to the requirements within this specification, the ORT Back Office System shall also comply with the requirements in Part C3.4.4: Open Road Tolling Back Office System Specifications.

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1.4 TRANSACTION CLEARING HOUSE SYSTEM

1.4.1 Overview

1.4.1.1 The primary function of the TCH System is to host accounts and to manage transactions posted to these accounts. The TCH System functionality falls into two overall areas of operation:

(a) Account hosting and toll Transaction Record processing; and

(b) Payment Transaction Processing.

1.4.1.2 Apart from the two primary functions stated above, the TCH System shall need to interface with Entities such as:

(a) ORT Back Office System;

(b) VPC System;

(c) Concessionaires and other Toll Road Operators for account management and Transaction Record processing;

(d) NaTIS (e.g. for verifying licence and registration details); and

(e) Selected commercial outlets and Appointed Agents.

1.4.1.3 Reporting

1.4.1.4 In addition to the requirements within this specification, the TCH System shall also comply with the requirements in Part C3.4.5: Transaction Clearing House System Specifications.

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1.5   VPC SYSTEM

1.5.1   Overview

1.5.1.1   The Toll System consists of the Road Side System, ORT Back Office System, Transaction Clearing House System and Violation Processing Centre System. A Transaction Record migrates through the Toll System depending on the type of Transaction Record and information available. The VPC System forms the last resort to recover toll for passages that was not paid or where no payment mechanism is in place to pay for the passage after the event.

1.5.1.2   A Violation Processing System is required to process and recover unpaid toll Transaction Records. In order for the VPC System to process un-paid toll Transaction Records, it must perform the following main functions:

(a)   Account Management;

(b)   Violation processing;

(c)   Customer Service; and

(d)   Law enforcement.

1.5.1.3   In addition to the requirements within this specification, the VPC System shall also comply with the requirements in Part C3.4.6: Violation Processing Centre System Specifications.

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SECTION 2. GENERAL REQUIREMENTS

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2.1   DESIGN AND DEVELOPMENT REQUIREMENTS

2.1.1   Software Development Management

2.1.1.1   This Project will require custom Software development. A formalized development strategy with measurable milestones, clear deliverables during the execution i.e. Functional Specifications, a Quality Assurance Plan and risk assessment shall be submitted with the Tender or at the start of any software development.

2.1.1.2   A well-defined software methodology shall be utilized and the software System shall be subjected to formal reviews and audits based on acceptance tests as developed by the Contractor and accepted by the Employer.

2.1.1.3   Irrespective of the software development methodology utilised, whether it is an iterative / agile or waterfall methodology, the software shall be tested in accordance with the test phases prescribed within this specification.

2.1.2   Software Design

2.1.2.1   The software for this Project shall provide for the following:

(a)   User friendly graphical System User interface;

(b)   Enterprise operating system and relational database;

(c)   Modular design with scalability;

(d)   High availability clusters; and

(e)   Access controls, which ensure that access to systems, data and programs is restricted to authorized users to safeguard information against unauthorized use, disclosure or modification, damage or loss.

2.1.3   Minimum Software Requirements

2.1.3.1   Database

(a)   The Toll System shall be supported by a field-proven relational database management system (DBMS) capable of operating in a 24/7 Transaction-intensive environment.

(b)   The database software shall be compatible with the operating system and application software, and shall support the redundant Toll System architecture. The DBMS shall have an upgrade path and support upgrades to the Operating System, application, memory, processes etc.

2.1.3.2   Operating System and DBMS

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(a)   The latest version of the operating system and DBMS shall be used on commencement of the system. The operating system and DBMS vendor shall provide a life cycle road map of the operating system and DBMS, indicating the planned future upgrades and expected life cycle of the products for the next 10 years.

2.1.3.3   Application software

(a)   The Toll System shall use specialized software to automate the functionality. A road map of the development life cycle shall be supplied by the Contractor.

(b)   The software shall utilize configurable parameters to support basic Business Rule changes without requiring code changes. The parameters shall be updated by the System User with System Administrator privileges via the front end.

(c)   The software shall allow system operating rules and configurable parameters to be changed while the system is operating, without having to shut down the application. Any configurable operating rules or parameters that could result in any disruption of service while being changed shall require explicit approval from the Employer.

(d)   The System Specifications are described in detail in Parts C3.4.1 to C3.4.9.

2.1.3.4   Antivirus software

(a)   All computers and workstations shall be issued with Antivirus software and automated daily virus updates shall be downloaded to all the computers. Firewalls shall be installed where applicable. In cases where Antivirus software or Security updates may interfere with business-critical functionality and this can be substantiated by the Contractor, an alternate solution may be considered by the Employer granted that a sufficient level of protection is offered and that such a solution would not compromise the integrity of the system.

(b)   As a security measure, the RSS shall not be able to connect to the internet and shall not be able to receive any e-mail.

2.1.3.5   Language Requirements

(a)   The user interface of the Toll System shall be in English.

(b)   Static Web Information shall be made available from commencement of operations in English.

(c)   Customer related information, or other information that changes regularly (e.g. weekly), only has to appear English.

2.1.3.6   Deployment of patches and software updates

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(a)   The latest version of the database, operating system or third-party software shall typically be utilised and deployed to circumvent potential security breaches and to ensure efficient support from vendors. The Contractor shall seek approval from the Employer if the latest official version of the software cannot be used.

(b)   The Contractor shall provide a monthly report of all the software versions deployed versus the software versions that have been officially released.

2.1.4   System Documentation

2.1.4.1   The Contractor shall provide electronic and hard copies of all the required System User and Maintenance manuals at least 30 (thirty) days before it is required for training /acceptance testing.

2.1.4.2   All documentation supplied shall be project specific rather than generic and should only contain standard documentation where this is completely relevant to the aspect of the system being described. The documentation suite shall also be self contained and where there are references to external documents such as standards and the like, copies shall be included in the suite.

2.1.4.3   The level of detail and the method of presentation of each document shall be wholly appropriate for the intended user and shall assume a level of understanding of toll and computer based systems in general that a reader with appropriate qualifications and experience to undertake roles relevant to the manual may be expected to have. Overall, the level of the documentation shall be such that it could be handed to a contractor or staff unfamiliar with the particular system but with appropriate general experience and qualifications and within a reasonable length of time that contractor or staff could gain sufficient understanding to be able to effectively carry out tasks appropriate to the manual including system and facility operation and maintenance.

2.1.4.4   The Contractor shall supply, as part of the System Functional Specification defined in Clause 2.3.2.3, a list of documents to be provided.

2.1.5   Software Recovery Procedure

2.1.5.1   The Contractor shall include as a system deliverable a system recovery procedure, including every component required in the process, should the system operation be compromised because of a software failure.

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2.1.6   Change Control Procedures

2.1.6.1   The Contractor shall define change control procedures to ensure that changes and system updates are introduced in a controlled and coordinated manner. The change control procedures shall be based on the ISO 12207 guidelines or similar.

2.1.7   Escrow

2.1.7.1   The appointment of an internationally recognized Escrow agent shall be agreed between the Contractor and Employer. The Employer may also consider using a South African agent.

2.1.7.2   Within 90 days after the Contract award, an Escrow software agreement shall be in place.

2.1.7.3   All costs related to the Escrow shall be paid by the Contractor (excluding the costs of the Employer).

2.1.7.4   Within 30 days after the Operation Service Period has started, the Contractor shall supply the Escrow agent with the software source code and associated design, installation, System User and support documentation and the appropriate disaster recovery pack ("the Escrow Package").

2.1.7.5   The Escrow agent shall verify that the Application software (including third party software) can be successfully installed with the aid of the supporting documentation.

2.1.7.6   The Escrow agent shall verify that the disaster recovery pack can be successfully installed with the aid of the supporting documentation.

2.1.7.7   On successful verification of the Escrow Package, the Escrow agent shall deposit the Escrow Package in a safe and secure storage facility. For every sub-system comprising the Toll System, including complete module versions of the Road Side, ORT BO, TCH and/or VPC System software, the Contractor shall keep the source code, licences and associated design, installation, configuration, System User and support documentation ("the Escrow Package") in Escrow.

2.1.7.8   The verification of the Escrow Package shall be repeated at least annually and after every major upgrade, as agreed between the Contractor and Employer.

2.1.7.9   The Escrow agent shall release the Escrow Package to the Employer in the event of any of the following release conditions occurring:

2.1.7.9.1   The launching of an application for the dissolution and/or liquidation of the Contractor (except for the purpose of amalgamation or reconstruction of terms approved in advance by the Employer in writing) which is not dismissed within 60 (sixty) days of its commencement; or

2.1.7.9.2   The Contractor being placed into final or provisional liquidation; or

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2.1.7.9.3   Abandonment by the Contractor of any of the Works to be performed; or

2.1.7.9.4   The termination by the Employer of the Contract, provided that:

2.1.7.9.4.1   termination of said contract is due to a breach committed by the Contractor, which breach entitles the Employer to lawfully terminate; and

2.1.7.9.4.2   proper notice of termination has been given by the Employer as prescribed by the Contract.

2.1.8   Software Licences and Rights

2.1.8.1   Software licences shall be in terms of the Conditions of Contract as set out in Part C1.2: Special Provisions.

2.1.9   System Standards

2.1.9.1   The system shall be based on the applicable technical standards and legislation of South Africa.

2.1.9.2   The following system standards shall apply:

(a)   The Quality Management System (QMS) shall be based on the ISO 9001, Capability Mature Model (CMM) Standards or similar for a quality system as published by the International Standards Organization.

(b)   This Project will require the use of an industry standard project management methodology, for example, PMBOK, PRINCE2, etc.

(c)   System lifecycle software shall be based on ISO 12207 guidelines or similar and System documentation shall be based on the IEEE, ISO/IEC 15289:2006 guidelines or similar.

(d)   Database security shall comply with the ECT Act of 2002.

(e)   The environmental management system shall be based on the ISO 14001 Guidelines or similar for environmental management. Refer to Part C3.2.1: Scope of Works.

(f)   Surge protection: Equipment shall comply with the IEC 60664-1 and SANS 10142-1:2017 standards with regard to the minimum impulse withstand over voltage.

(g)   Validation of payment instruments and products issued by the banking industry shall be based on the applicable standards such as the standards set and endorsed by the Payments Association of South Africa (PASA).

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(h)   Any aspect of the system that relates to bank issued payment products or has access to the system's bank card related functionality has to be certified to be compliant to PCI DSS and relevant Banking industry standards.

(i)   Validation of ETC Readers and Tags shall be according to the CEN278 standards. Refer to Part C3.4.7: Standard Specification for Operations and Maintenance: Electronic Toll Collection (ETC).

(j)   The DSRC equipment installed shall adhere to all national and regional Laws and regulations concerning such equipment and the Contractor shall ensure that emitted energy levels do not constitute a safety hazard of any kind.

(k)   Cables and cable accessories shall comply with the standards as set out in Part C3.4.1: Standard Specs for Operations and Maintenance: E&M Specifications.

(l)   The image capture- and image management systems shall conform to the standards as set out in the:

    i.   South African Standard Specification: Road Traffic Law enforcement systems, Part 0: General Requirements (SANS 1795-0); and the

    ii.   South African Standard Specification: Road Traffic Law enforcement systems, Part 5: Data capturing and recording devices for Road Traffic Law enforcement (SANS 1795-5).

(m)   Protection of Personal Information Act No. 4 of 2013, also known as POPI Act.

(n)   Promotion of Access to Information Act no. 2 of 2000.

(o)   IT governance frameworks like COBIT 4.1 / 5.

(p)   IT service frameworks like the Information Technology Infrastructure Library (ITIL).

(q)   Leading practices for Information Security configuration standards, which typically include the ISO27000 family of Information security management systems and ISO 17799 Information Security Management, or similar standards.

(r)   ISO 22301 for the Business Continuity Plan

2.1.9.3   Prosecution shall be according to the Technical Committee for Standards and Procedures (TCSP) for Traffic Control and Traffic Control Equipment Guidelines as set out in Part C3.4.6: Violation Processing Centre System Specifications.

2.1.10   Redundancy

2.1.10.1   Sufficient data and system redundancy shall be provided to ensure continuous operation.

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2.1.10.2   The technical proposal shall include a detailed description of redundancy implemented on the Toll System and how high availability and good reliability are to be achieved.

2.1.10.3   Data and System Redundancy

(a)   The System shall have on-line data replication to ensure business continuity, which replicated system is to the same standard and specification as the primary system.

(b)   The data storage shall have adequate redundancy to ensure data reliability. The servers of the Toll System shall provide full redundancy wherein the hot standby server is a remote fail-over system at a different location that can be brought into service with no disruption to operations in real time.

(c)   The system shall provide sufficient redundancy to continue operating, with at least the minimum amount of required functionality. Any loss of data or revenue in contravention with this requirement shall be the Contractor's liability.

(d)   The data storage shall employ multiple levels of RAID technology.

2.1.11   System Disaster Recovery

2.1.11.1   System Disaster Recovery is essential to protect a 24/7 operation, such as the Gauteng Open Road Toll System.

2.1.11.2   The System Disaster Recovery centre and communications operations for the ORT Back Office System, TCH System and VPC System shall be replicated at a secure location physically remote from the current data centre. Network connectivity shall be in place to ensure automatic fail-over. The Rivonia Satellite Centre (Satellite Centre #3 (SC03)) shall serve as the Site for system Disaster Recovery equipment. Refer to Part C4.1.1: Site & Location Information & Annexures for a description and layout of the centre.

2.1.11.3   The Disaster Recovery centre shall work in synchronization with the Central Operations Centre. Data shall be sent to both locations. The data of each Entity shall be separately protected.

2.1.11.4   Refer to Part C3.3.1: General Operations Specifications for detail on the requirements for an Operational Disaster Recovery Site.

2.1.11.5   Primary Areas of Control

2.1.11.5.1   The following are the primary components that must be available at a safe location to form the bases for Recovery of operations:

(a)   Application Servers

iii.   Process Servers

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        iv.   Database Servers

        v.   Firewalls and other security support hardware and software

(b)   Network Communications (Toll Systems Communications Connectivity)

        i.   Fibre optic (Private network) (Hardware and software)

        ii.   Virtual private networks (VPN) (Hardware and software)

(c)   Interfaces with other networks and computers, e.g.

        i.   NaTIS

        ii.   Banks and Credit Card Companies

        iii.   Internet (Public at large)

        iv.   Wireless Telephones

        v.   Operator workstations

2.1.11.6   Business Continuity Plan:

(a)   The Disaster Recovery centre shall complete and maintain a comprehensive Business Continuity plan for each Entity. The plan shall be based on the SANS 17799:2005 guidelines and shall be designed to assess risks, identify and implement appropriate security measures responsive to those risks, verify that they are effectively implemented and ensure that they are continually updated in response to new developments.

(b)   A disastrous event shall be simulated and evaluated on an annual basis.

(c)   The plan shall, as a minimum, provide for:

        i.   A Business Impact Analysis with a sample impact matrix;

        ii.   A vulnerability assessment of risks;

        iii.   DRP Organization Responsibilities pre and post disaster (a DRP Checklist);

        iv.   A back-up and archive strategy for the Data Recovery Centre, file servers, network servers, firewalls, desktop nodes, and any authorized laptops;

        v.   Recovery strategy including approach, escalation plan process and decision points;

        vi.   Data Recovery procedures in a check list format;

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vii.   An update plan for administration processes;

viii.   A work-plan to modify and maintain the plan in an up-to-date condition;

ix.   Appendix of job descriptions for the Disaster Recovery manager and team;

x.   Technical appendix, including a definition of phone numbers and contact points for key persons; and

xi.   Disaster Recovery Plan, which shall include:

- Restart capabilities for all system application processes to be operational on the servers within the specified time;

- Restore connectivity for toll operations communications to and from nodes on the current networks;

- Time synchronization to a common primary time synchronization source approved by the Employer;

- Firewalls and other security measures in place and functioning before processing is resumed;

- Up to date approved commercial virus protection internal security software; and

- Restoration of the full system, after the interim measure with scaled down capacity.

2.1.11.7   Back-up, archive and restore activities shall be performed via a well-defined System User interface.

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2.2 GENERAL REQUIREMENTS

2.2.1 Environmental requirements

2.2.1.1 The Contractor shall ensure that the Toll System supplied for this Contract operates under all environmental conditions as is required for this Project. The Contractor shall therefore determine himself what measures need to be taken to ensure compliance.

2.2.1.2 As a minimum requirement, all equipment exposed to the elements (including but not limited to the RSS cameras, Tag Readers, Automatic Vehicle Classification devices, etc.) shall successfully operate within the following ambient temperatures:

   (a) Minimum: -10 deg C

   (b) Maximum: 50 deg C external at a relative humidity of 95%

2.2.1.3 The equipment shall successfully accommodate the high and low temperatures, the glare of the sun, excessive rain and spray on the roads.

2.2.1.4 All outside equipment exposed to the elements (including but not limited to the RSS cameras, Tag Readers, Automatic Vehicle Classification devices, etc.) shall be housed in weatherproof enclosures that are fit for the purpose and fabricated from corrosion resistant metal. It shall be robust and suitable for long and trouble-free service in areas subject to lightning storms, occasional wind storms, periods of high condensation, high sun temperatures, vehicle induced vibration and vehicle emissions. Suitable corrosion proofing shall be employed.   The Contractor shall state the available colour options.

2.2.1.5 The server equipment shall be accommodated in a dedicated server room that shall conform to the standards and requirements for server rooms or Technical Shelters, such as sufficiently large, well-lit and properly ventilated area. The Contractor shall ensure that the required power outlets, server racks and other environmental/technical prerequisites as specified by the supplier have been met. The Contractor shall state the permissible environmental limits for temperature, humidity and dust for the equipment to be supplied.

2.2.1.6 The personal computer and peripheral equipment shall be accommodated in a standard computer environment. The Contractor shall state the permissible environmental limits for temperature, humidity and dust for the equipment to be supplied.

2.2.1.7 The relevant standard specifications included within Part C3.4.1: Standard Specs for Operations and Maintenance: E&M Specifications shall be applicable to the supply, installation and maintenance of any Plant or Employer's Equipment as required of the Contractor.

2.2.2 Earthing, Lightning Protection and Surge Protection

2.2.2.1 Gauteng has a high incidence of lightning strikes, which can lead to frequent equipment failures if not catered and designed for. The Contractor shall therefore take all reasonable measures to protect the equipment against lightning and voltage surges.

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2.2.2.2   The Contractor shall review the design provided by the Road Contractor / Facility Contractor and, if necessary, add additional requirements in order to be able to take full responsibility for Lightning strikes.

2.2.2.3   The provision of an adequate earth system is imperative, as the effectiveness of surge suppression depends directly on its adequacy.

2.2.2.4   Refer to Part C3.4.1: Standard Specs for Operations and Maintenance: E&M Specifications for earthing, lightning protection and surge protection requirements.

2.2.3   Radio Frequency Interference

2.2.3.1   The equipment shall be protected against radio interference. Its operation shall not be affected by the operation of a VHF or UHF radio transmitter radiating 25 Watt 6m or farther away from such equipment or by a cellular phone operated 4m or farther away from such equipment.

2.2.4   Uninterrupted Power Supply (UPS) and Generator

2.2.4.1   The Employer will provide a UPS and a diesel generator at each Technical Shelter, Central Operations Centre and Customer Service Centres. Refer to Part C4.1.1: Site & Location Information & Annexures for requirements in this regard.

2.2.5   Equipment

2.2.5.1   To the extent possible, currently supported "off-the-shelf" components and software (including the Operating System and the Database Management System) shall be used.

2.2.5.2   Processors, internal memory and disk drive(s), along with planned upgrades, shall support the estimated volume of Transaction Record data anticipated over the next ten (10) years, without degradation in performance.

2.2.5.3   Refer to the 'Baseline Information' in Part C3.2.1: Scope of Works for the estimated data volumes.

2.2.6   Capacity

2.2.6.1   The Toll System provided shall have adequate redundancy and storage capacity to appropriately and successfully manage any Transaction Record data transmission, processing or system availability risks. To this end, the Contractor should note that the expected number of Transaction Records on the network in April 2011 were estimated at around 2,4 million Tolling Point Transaction Records per day. However, the Toll System shall be able to catch up with 3 days data processing within one day, i.e. the Toll System shall be able to handle approximately 10 million Transaction Records per day and the processing thereof (in April 2011). In addition, the Toll System shall have an appropriate design life that caters not only for the growth in traffic of 3% to 5% per annum, but also for additional Tolling Points that shall be added on to the system through the life of the general Contract.

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2.2.6.2   The Toll System shall be able to process Transaction Record volume loads at projected maximum loads for the next ten years. The system shall be scalable such that it can be expanded beyond the ten-year expectation. The Contractor shall commit to maintaining the Toll Systems as technically viable throughout the life of the Contract.

2.2.7   Security, Surveillance, Auditing and General Purpose Camera System

2.2.7.1   The Contractor shall supply a video based camera audit system at the Tolling Points. Refer to Part C3.4.3: Road Side System Specifications for more detail.

2.2.7.2   The Employer shall supply a camera security system for general surveillance and security. Refer to Part C3.2.1: Scope of Works for detail in this regard.

2.2.8   Reliability

2.2.8.1   Equipment should be provided by a reputable vendor. MTBF on all components shall be supplied by the Tenderer as part of the Technical Proposal.

2.2.9   "As-built" Drawings and Documents

2.2.9.1   The Employer shall supply the "as-built" drawings for the facilities provided by the Employer, e.g. buildings and Technical Shelters.

2.2.9.2   The Contractor shall prepare, and keep up-to-date, a complete set of "as-built" records, showing the exact "as-built" locations, sizes and details of the work as executed. These records shall be kept on the Site. Refer to Part C2.1.1: Payment Methodology for delivery requirements of the "as-built" records.

2.2.9.3   "As-built" drawings shall include wiring diagrams with cable numbering.

2.2.9.4   In addition, the Contractor shall supply to the Employer's Representative "as-built" drawings of the work for review purposes. The Contractor shall obtain the consent of the Employer's Representative as to their size, the referencing system and other relevant details.

2.2.10   Design Life

2.2.10.1   The Contractor shall replace equipment at his own cost. The design life of the system shall be in accordance with the Operations Period and Hand-back requirements. Refer to section 2.7: Hand-back Requirements and Part C3.3.1: General Operations Specifications.

2.2.11   Spares

2.2.11.1   The Contractor shall provide all required spares, or an equivalent service level agreement, to effectively operate and maintain the entire Toll System as well as meet the response and repair time requirements; the quantities and/or details of which shall be agreed with the Employer.

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2.2.11.2   The Contractor shall seek approval from the Employer for replacing a spares methodology with an equivalent service level agreement. In order to operate and maintain the entire Toll System after Hand Back, the Contractor shall ensure that the service level agreements approved by the Employer is paid up for at least another year after expiry or termination of the Contract. All agreed service level agreements shall be transferred to the Employer and next Contractor.

2.2.11.3   The Contractor shall be responsible to provide sufficient spares and/or service level agreements for the duration of the Contract at his own cost, notwithstanding any approvals of spares or service levels.

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2.3 TESTS ON COMPLETION OF DESIGN-BUILD

2.3.1 General

2.3.1.1 The minimum requirements of the Toll System acceptance process, known as the Tests on Completion of Design-Build, are listed below. Testing includes pre-commissioning testing, commissioning testing and Trial Operation. Some of the phases listed below are not related to a physical test but rather to the Employer's acceptance of such a phase.

2.3.1.2 The acceptance of the Toll System shall be a multiple entity, complex integration testing process. Testing and commissioning shall be done per Section. (Refer to Part C3.2.1: Scope of Works). The test phases and their subsequent milestones are illustrated in Figure 2-1: Tests on Completion of Design.

2.3.1.3 Tests shall be conducted as on the programme submitted by the Contractor and approved by the Employer.

2.3.1.4 The Contractor shall prepare detailed test procedures that demonstrate a logical sequence of testing and define the aims and objectives of each Section of testing. The test procedures shall be properly integrated to test all functionality of the system. The expected test results shall be supplied. Refer to Appendix A for an illustrative solution of a Test Plan.

2.3.1.5 The Contractor shall provide all the required test equipment and Materials necessary to carry out the functional and operational tests of the total Works during factory tests and during testing and commissioning of the Works on Site.

2.3.1.6 Testing shall be done in all environmental conditions to verify that the equipment shall successfully accommodate the high and low temperatures, the glare of the sun, excessive rain and spray on the roads.

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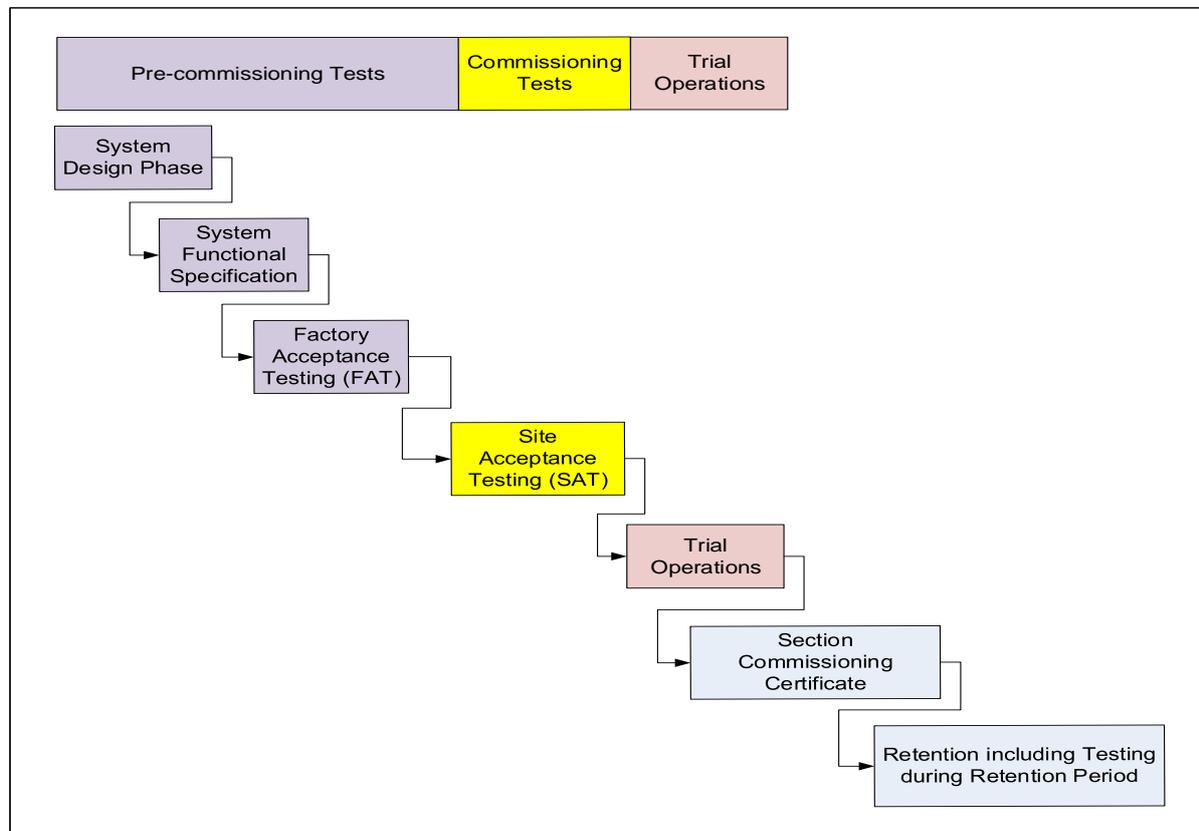
Figure 2-1: Tests on Completion of Design

2.3.2   Pre-Commissioning Testing

2.3.2.1   Pre-commissioning testing includes the System Design phase and System Functional Specification phase before system development is done, followed by the Factory Acceptance Testing. Pre-Commissioning testing shall be done per Section.

2.3.2.2   System Design Phase

(a)   The System Design phase is a critical phase where the Employer's Representative and the Contractor shall discuss and agree on all the aspects of the Toll System which have not been clarified or which must be clarified before the Functional Specifications can be completed. Unclear areas, uncertainties, Business Rules, etc. must be clarified, and areas that may be interpreted differently by different Parties must be identified and clarified. Alternatives can be offered for consideration by the Employer.

(b)   This effort must result in the agreements required and documented before it can be declared complete and the Project can move on.

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(c)   The Contractor shall use the information as agreed above to complete the Functional Specifications.

(d)   The Contractor shall compile Software and Hardware Architecture documents for every major subsystem and submit it to the Employer during the Functional Specifications phase.

2.3.2.3   System Functional Specifications Phase

(a)   The Contractor shall compile System Functional Specifications for every sub-system describing how all the requirements for the Toll System shall be implemented and submit it to the Employer within 120 (hundred and twenty) days of the Commencement Date.

(b)   The Employer, or Employer's Representative, will review the System Functional Specifications and indicate areas where the specifications deviate from the requirements of the Contract, or are unacceptable for the proper functioning of the systems. Disputes shall be resolved before proceeding with the System development and implementation.   However, approval by the Employer does not relieve the Contractor from any of his obligations or responsibilities in terms of the system requirements as specified in the Employer's Requirements.

(c)   The Contractor shall use the System Functional Specifications to develop the software during the software development phase. The software development phase shall include internal functional and quality control testing (Refer to Part C3.3.1: General Operations Specifications).

2.3.2.4   System Factory Acceptance Tests (SFAT)

(a)   The purpose of the SFAT is to test the functionality of the sub-systems in a factory environment to ensure that the system requirements are met.

(b)   The SFAT shall be performed after the internal functional and quality control tests have been done.

(c)   SFAT testing shall be a phased process as illustrated in and shall be performed per Section. However, the SFAT for the Sections can be combined.

(d)   System factory acceptance Tests shall test the functionality of the Toll System in the factory with hardware similar to the hardware that shall be installed at the ORT Sites. The SFAT testing for the Road Side System shall include testing at a test Site with actual vehicles and applicable equipment located on a gantry, simulating real-world traffic patterns driving through the test gantry. Refer to the test site specification in clause B.6.18 of Part C3.2.1: Scope of Works and clause 2.3.2.7 of this specification.

(e)   The Contractor shall compile individual system factory acceptance test procedures for every sub-system. The Contractor shall submit the test plans and procedures to the

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Employer's Representative for comments not less than 60 (sixty) days before the Employer's Representative is required to attend the SFAT for the specific System.

(f) The system factory acceptance test procedures shall accommodate and refer to the clause numbers in the Contract applicable to the Toll System in order to ensure that the System is complete and compliant. The software Compliance Test Plan shall include both the conditions to be tested and the expected results.

(g) The Contractor shall submit a grading for the defects, e.g. Critical, Major, Minor, depending on the severity of the defect. The pass or fail criteria related to the defects should be agreed on before entering the SFAT.

(h) The SFAT test shall include integrated tests between the systems to verify the data flow of a Transaction Record from the RSS, to the ORT Back Office (BO) System, Transaction Clearing House (TCH) System and Violation Processing Centre (VPC) System.

(i) The SFAT test shall include test procedures for stress testing in order to verify that the system shall be able to handle the estimated traffic, Transaction Record and account volumes. Stress testing should be done on hardware similar to the hardware to be used for this Project. In general the Toll System shall be able to catch up with three days' data processing within one day.

(j) Both normal and abnormal scenarios should be demonstrated during the SFAT. Alternatively, the Contractor shall provide documentation to indicate which functional tests were done to verify exception conditions and demonstrate some of the tests.

(k) The Contractor shall perform the SFAT and submit the test results to the Employer, including the severity levels of any defects found, before inviting the Employer to witness the formal SFAT testing.

(l) The test results shall be submitted to the Employer at least 14 (fourteen) days before the factory acceptance Tests with the Employer shall take place.

(m) The SFAT tests with the Employer shall be conducted at least 60 (sixty) days before the scheduled start of the Operational Service Period of the Section of the system.

(n) No software changes shall be allowed during testing with the Employer or the Employer's Representative, unless mutually agreed between the Parties.

(o) The Employer may perform any additional tests, not included in the test procedures, which he deems necessary.

(p) If the Employer deems the number or impact of the items that were unsuccessful too large or too severe, the Contractor may be instructed to solve the unsuccessful items, perform the applicable portion of the SFAT and re-submit the test results before the factory acceptance testing with the Employer takes place.

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(q)   The Contractor shall submit the completed sets of test results after the tests with the Employer, with any proposals for repair and retest as found to be necessary.

(r)   The Toll System shall only be deemed to have successfully completed the software factory acceptance Tests when the respective systems are functionally compliant to the requirements of the Contract as far as:

   i.   The functional requirements have been demonstrated to work as specified;

   ii.   The functionality is deemed to be fit-for-purpose by the Employer;

   iii.   No financial risk to the Employer and Road User remains due to the loss of Revenue as a result of non-conformance of the system to the contractual requirements;

   iv.   The legislative or statutory requirements such as VAT requirements have been met;

   v.   The required interfaces and services to the System User are provided and the tools to monitor this service are in place (Appropriate simulations shall be implemented if required); and

   vi.   The Toll System is auditable.

(s)   Following the acceptance tests, some minor defects remaining on the software at this stage, may be allowed by the Employer. The defects shall be tracked and a retest, including some regression testing, shall be planned.

(t)   If the SFAT fails, the problems shall be resolved before proceeding to any other test phase. More than one SFAT may thus be required to ensure that any significant issues identified in the initial SFAT are resolved.

2.3.2.5   Hardware Factory Acceptance Tests (HFAT)

(a)   The purpose of the HFAT is to verify that the hardware requirements of the sub-systems are met.

(b)   The Contractor shall invite the Employer's Representative to inspect samples of the major components of the hardware and to point out any non-compliant aspects or aspects that are not fit for purpose, before proceeding to order the remainder of the hardware sets required. These tests shall be conducted at least 60 (sixty) days before the Employer's Representative is required to attend the Factory Acceptance Testing.

(c)   Datasheets of these hardware items shall be submitted for comment to the Employer 14 (Fourteen) days before these inspections, together with reports indicating how the hardware complies with the requirements of the Contract.

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(d) As equipment is received, before it is installed, the Contractor shall invite the Employer to inspect and count the equipment in order to ensure that it is available on time in accordance with the programme submitted by the Contractor. The HFAT tests shall be deemed successful only once this has been achieved, with only minor snags, which can be fixed on Site, remaining on the hardware.

(e) The HFAT's may be done in a limited number of phases.

(f) National and International hardware FAT's might be conducted, should the Contractor want to test the South African procured systems separately.

(g) The Contractor shall execute performance tests to demonstrate that the hardware is capable to meet the capacity requirements of the Toll System, this during normal operations whilst the application software is running.

2.3.2.6   Accuracy Verification

(a) The system shall be subjected to extensive testing throughout the course of the Project. The Contractor shall conduct his own component-level, integrated and functional testing before the formal testing phases. The Contractor shall demonstrate as part of the factory acceptance testing that the system is capable of achieving the specified accuracies for the applicable equipment such as AVC, ETC, cameras and ANPR.

(b) The burden of the proof shall be on the Contractor to adduce and establish conclusively that the equipment meets the accuracy requirements as specified. As part of the process, the Contractor shall compile and submit for approval a comprehensive testing procedure at least sixty (60) days before the start of testing.

2.3.2.7   Test Site

(a) The test site that will be provided by the Employer, as described in Part C3.2.1: Scope of Works, shall be used for validation testing following the Factory Acceptance Tests (FAT) and before the commencement of the RSS System Acceptance Test (SAT) at the first or subsequent Tolling Point/s. The validation test shall demonstrate the required functionality of the RSS, the applicability of the equipment and the integration to the ORT Back Office as well as to the TCH and VPC Systems under local conditions.

(b) The SAT testing at the first Tolling Point (and subsequent Tolling Points) shall only be allowed to commence if the results of the validation testing has been approved by the Employer's Representative.

(c) The Contractor shall provide a validation test procedure, for approval to Employer's Representative, 30 days before the agreed date for validation testing. Validation testing is required as an integral part of the initial System testing, as well as for any future System upgrade, change or modification of software and/or hardware.

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(d)   Validation testing shall be performed under controlled conditions (i.e. with a lane closure) as well under live traffic conditions. The Employer's Representative shall be entitled, at any stage during the SAT testing, if such SAT testing fails or if continuous failures are experienced, to temporary suspend the SAT testing. In such case, the Contractor shall revert to the test site for further testing.

(e)   The Contractor shall include integration testing between the Road Side System and the ORT Back Office as well as the TCH and VPC Systems as part of the validation testing. The Contractor may use either the Dalpark Satellite Centre or the Technical Shelter (if provided by the Contractor) for the integration testing.

2.3.3   Commissioning Testing

2.3.3.1   Commissioning testing consists of Site acceptance testing, including integration, Functional Compliance and stress testing, and shall be performed once system installation has been done. Refer to section 2.5 for the System installation requirements.

2.3.3.2   Site Acceptance Testing
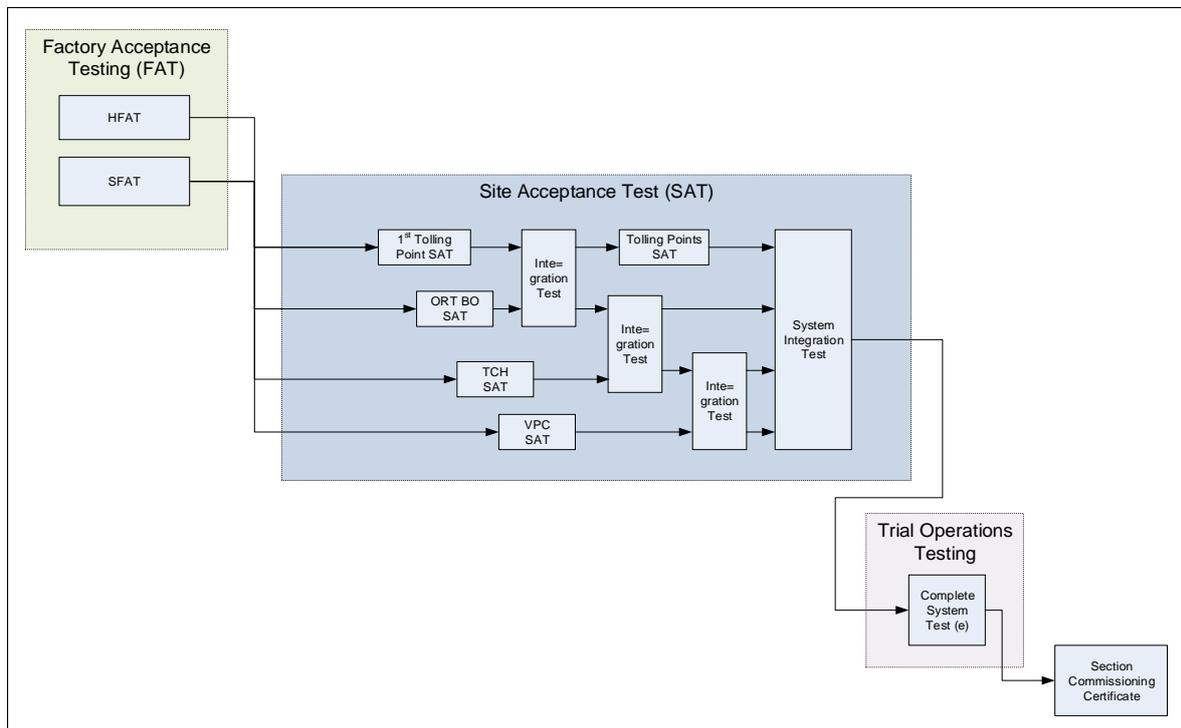
Figure 2-2: Typical FAT, SAT and Trial Operation Testing

(a)   The purpose of the Site acceptance testing is to verify that the installation is done properly, and that the system is properly configured.

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(b)   The Contractor shall compile Site acceptance test procedures and submit them to the Employer's Representative for comment not less than 60 (sixty) days before the Employer's Representative is required to attend the Site acceptance testing.

(c)   Site acceptance testing shall be a phased process as illustrated in Figure 2-2: Typical FAT, SAT and Trial Operation Testing.

(d)   Site acceptance testing shall be performed for every Section. Site acceptance testing at the first Tolling Point and/or test Sites shall include Functional Compliance testing. The Functional Compliance test procedures shall refer to the clause numbers in the Contract that are applicable to the Toll System and supply the applicable test procedure and expected results.

(e)   The Contractor may complete the installation at the other Tolling Points only once the SAT for the RSS at the first Tolling Point has been approved, or on mutual agreement between the Contractor and Employer.

(f)   Once the sub-systems have been individually tested, the sub-systems shall be integrated and tested to verify the data flow of a Transaction Record from the road, to the Back Office (BO) System, Transaction Clearing House (TCH) System and Violation Processing Centre (VPC) System and further to NaTIS, the Mobile Police Unit and courts.

(g)   The Site acceptance tests shall include test procedures for stress testing in order to verify that the system shall be able to handle the estimated traffic, Transaction Record and account volumes. The Site acceptance test plans shall propose the minimum performance and capacity to be used for stress testing, but shall at least be sufficient to demonstrate that the Toll System is able to catch up with three days' data processing within one day.

(h)   The Contractor shall demonstrate as part of the Site acceptance testing that the system is capable of achieving the specified accuracies for the applicable equipment such as AVC, ETC, cameras and ANPR.

(i)   Site acceptance testing shall take place at every location including the Tolling Points and at the Central Operations Centre for the ORT Back Office System, TCH System and VPC System to ensure that all Site-specific requirements have been met and that the system configuration is correct.

(j)   The Contractor shall pre-run the Site acceptance tests and submit the test results to the Employer or the Employer's Representative, including the severity levels of any defects found before inviting the Employer to the tests. The tests shall be performed per component e.g. per Tolling Point and set of equipment.

(k)   The test results shall be submitted to the Employer 14 (fourteen) days before the Site acceptance tests with the Employer takes place.

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(l) The Employer may perform any additional tests, not included in the test procedures that it deems necessary.

(m) No software changes shall be allowed during testing with the Employer or the Employer's Representative, unless mutually agreed between the Parties.

(n) A Disaster Recovery pack shall be tested and supplied by the Contractor to the Employer. A copy shall be available on Site after the successful completion of the SAT.

(o) The Toll System shall be deemed to have successfully completed the Site acceptance tests only when the respective systems are functionally compliant with the requirements of the Contract as far as:

    i. No financial risk to the Employer and Road User remains due to the loss of Revenue as a result of non-conformance of the system to the contractual requirements;

    ii. The safety of the Road Users and public shall not be compromised;

    iii. The legislative or statutory requirements such as VAT requirements have been met;

    iv. The required interfaces and services to the System User are provided and the tools to monitor this service are in place;

    v. The requested interfaces to other Entities such as the Toll Agencies, SAPO, mobile policing and the courts are provided and tested;

    vi. The required interfaces to other systems such as AARTO and NaTIS are tested and certified;

    vii. The Toll System is auditable, and

    viii. The Toll System is substantially complete and deemed to be fit-for-purpose by the Employer.

(p) If the Employer deems the number or impact of the items that were unsuccessful during the Contractor's test too large or too severe, the Contractor may be instructed to solve the unsuccessful items, re-do the testing and re-submit the test results before the Site acceptance testing with the Employer takes place.

(q) The Contractor shall execute performance tests to demonstrate that the hardware is capable to meet the capacity requirements of the Toll System, this during normal operations whilst the application software is running.

2.3.4 Trial Operation Testing

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2.3.4.1 Trial Operation testing is testing of the Toll System under live conditions without collecting fees from the Road Users. Trial Operation testing shall be done in phases, per system before integrated testing is done on the complete Toll System.

2.3.4.2 The Contractor shall propose a Trial Operation regime strategy and submit it to the Employer's Representative for approval not less than 60 (sixty) days before the Employer's Representative is required to attend the Trial Operation testing.

2.3.4.3 Trial Operation testing shall contain individual test procedures for each sub-system and interface. Each test procedure shall contain a list of prerequisites as well as numbered test steps and expected results.

2.3.4.4 Trial Operation testing shall be conducted for each sub-system of the Toll System. Once the sub-systems have been individually tested, the integrated test shall be conducted. Integrated tests shall be done to verify the data flow of a Transaction Record from the RSS to the Back Office (BO) System, Transaction Clearing House (TCH) System and Violation Processing Centre (VPC) System and further to NaTIS, the Mobile Policing Unit and courts.

2.3.4.5 Trial Operation testing shall include test procedures for the migration of existing ETC toll operations into the Toll System as well as the migration of their accounts to the TCH. These tests shall be performed separately from the overall Trial Operation testing, at a different time.

2.3.4.6 The integrated Trial Operation testing shall be sufficient to cover a month end, and shall include testing of reports as part of the month end process.

2.3.4.7 Test results shall be recorded, and any defects shall be categorized according to severity levels.

2.3.4.8 The Contractor shall perform the Trial Operation test procedures and submit test results to the Employer, including the severity levels of any defects found. The Employer shall be invited to witness the formal Trial Operation testing only after the following are completed:

(a) All severity 1 (i.e. Critical) and severity 2 (i.e. Major) defects shall be resolved or a mutually acceptable workaround shall be identified, implemented and tested.

(b) A regression test shall be conducted to verify that fixes did not introduce new defects.

2.3.4.9 The test results shall be submitted to the Employer 14 (fourteen) days before the Trial Operation tests with the Employer take place.

2.3.4.10 During the Trial Operation testing with the Employer, the Employer or the Employer's Representative shall be invited to observe the full system running in pre-fee-collection mode.

2.3.4.11 No software changes shall be allowed during testing with the Employer or the Employer's Representative, unless mutually agreed between the Parties.

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2.3.4.12   The Trial Operation testing shall continue for a period as proposed by the Contractor and approved by the Employer, e.g. one month, or until there are no severity 1 (i.e. Critical) defects remaining. All severity 2 (i.e. Major) defects shall be resolved or a mutually acceptable work around and a plan for resolution shall be identified. In addition, a plan for resolution of all severity 3 (i.e. Minor) defects shall be submitted for approval.

2.3.4.13   Once the conditions for completion of the Trial Operation testing have been met, the system can become fully operational. Any remaining defects must be resolved within a mutually agreed schedule. Prior to introducing any fixes into the production system, the Contractor must perform a regression test using a test system configuration, and a Change Control Board must approve the software build.

2.3.4.14   If the Trial Operation testing cannot be executed, this as a result of the system already being utilised in the production environment, or if there is no environment to perform the Trial Operation testing, then the Contractor can request relaxation from the Employer.

2.3.5   Commissioning Certificate

2.3.5.1   On successful completion of the Site acceptance tests and/or Trial Operations for a Section, the Employer will certify the Section as compliant by issuing a Section Commissioning Certificate. A Commissioning Certificate shall be issued when all Sections are compliant.

2.3.6   Responsibility to Comply with all Requirements

2.3.6.1   The approval of documents, inspections, testing and issuing of certificates by the Employer shall not release the Contractor of any obligation in the Contract.

2.3.7   Payment Terms

2.3.7.1   Refer to Part C2.1.1: Payment Methodology for the payment terms and conditions for the Toll System.

2.3.8   Continuous Testing

2.3.8.1   Tests during Retention Period

(a)   Tests that could not be completed or executed during the previous test phases shall be done during the Retention Period, but only if the Employer approved the postponement at the time of the previous test phases. This shall include the verification of outstanding defects and performance tests.

(b)   Reports shall be verified with live data that span the month range in order to verify that the data are correctly reported. Toll Agency accounting shall be verified, reconciliations shall be done and all other functions that could not be truly verified during the test phases shall be verified.

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(c)   The Contractor shall submit test plans to the Employer for approval. The test plans shall include measurable criteria that shall form the basis for final acceptance of the System.

(d)   All identified defects must be resolved unless the Employer grants exceptions based on a mutually acceptable plan for resolution.

(e)   The Employer reserves the right to request a regression test that shall include retesting of systems or sub-systems that may have been affected by software changes implemented to fix defects during the various testing phases up to and including the tests performed during the Retention Period.

2.3.8.2   Change Control Testing

(a)   Change control testing shall be done to ensure that software upgrades / changes are done in a controlled and coordinated manner. The testing requirements shall be agreed upon between the Contractor and the Employer, or the Employer's Representative.

(b)   All changes shall be assessed and approved by the Employer, or the Employer's Representative, before their implementation in order to ensure:

i.   Minimal disruption of services;

ii.   Prevent faults being introduced;

iii.   Reduction in back-out activities; and

iv.   Economic utilization of resources involved in implementing change.

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2.4 TRAINING

2.4.1 System Training

2.4.1.1 In addition to operational training, adequate training and knowledge of the System amongst the System Users are required on the Toll System. All training, relevant for introducing the equipment into service, shall have taken place before using the equipment or the Toll System.

2.4.1.2 The Contractor shall define, implement and update a formal training plan and programme for System Users.

2.4.1.3 System Users shall be trained in accordance with the defined training plan and associated Materials. Non-classroom training exercises shall be provided where applicable. Training Material shall allow for training without the presence of the training personnel, i.e. so that the Operator can use the training material to improve their knowledge of the system on their own.

2.4.1.4 The Contractor shall provide the training programme with supporting training manuals for all levels of System Users. System Users include personnel from the Employer, ORT-, TCH and VPC System Users and any third-party personnel that may be granted access to the System by the Employer, including Toll Authority System Users.

2.4.1.5 The Contractor shall notify all role-players of details of the training for each sub-system and arrange suitable venues. Training can occur before the system installation is done.

2.4.1.6 When the Contractor is satisfied with the knowledge and competence of the System Users, the Contractor shall sign off the training.

2.4.1.7 Re-training shall be done after major System upgrades or when deemed necessary.

2.4.2 Training Manuals

2.4.2.1 Training material shall be developed as part of every system development, implementation or modification. The material should be focused on the system's daily use.

2.4.2.2 The Contractor has to supply Toll System software training manuals for the RSS, ORT Back Office System, TCH System and VPC System with the relevant modules for each class of System User.

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2.5   INSTALLATION

2.5.1   System Installation

2.5.1.1   Refer to Part C3.2.1: Scope of Works for the Contractual requirements for installations.

2.5.1.2   The RSS System shall be installed under live traffic conditions. Road closures shall be minimized and must be accepted by the Employer and pre-approved and executed by the Routine Road Maintenance Contractor.

2.5.1.3   The installation of the RSS shall adhere to strict traffic safety requirements of the Contract.

2.5.1.4   Installation activities shall be planned and executed in such a manner as to minimise the potential impact, revenue loss, traffic disruption, Road User safety, etc.

2.5.1.5   The Contractor shall ensure that old assets shall be removed safely and disposed in accordance with the Employer's asset policy.

2.5.1.6   Any replacement of assets shall be executed in a phased manner so that the old system is not disabled all at once, but only as the new system is made available, e.g. the RSS gantries will be replaced one gantry at a time, which will ensure that the new and old system can operate simultaneously, this whilst the old RSS gantries are still being replaced.

2.5.1.7   Installations shall be phased. As soon as the hardware factory acceptances tests of a Section, or part thereof, are successfully completed, the hardware required for the installation shall be shipped to a secure and safe storage location, which shall be provided by the Contractor in close proximity of the Site.

2.5.1.8   Installations that impact the availability of the system shall be planned and executed to minimise the transaction loss and effect on Customers. Such installations that have an impact on system availability shall be clarified with and approved by the Employer.

2.5.1.9   On instruction from the Employer or the Employer's Representative, the Contractor may proceed with installations per Site.

2.5.1.10   The Contractor shall do the installations of the Toll System at the test Sites in accordance with the Method Statements and the agreed safety requirements.

2.5.1.11   The first completed and accepted Tolling Point shall be regarded as the reference Site for the RSS.

2.5.1.12   The Contractor shall ensure that the RSS installation of the other Tolling Points will be conducted be to the same standard as the first Employer accepted Tolling Point.

2.5.1.13   Provision shall be made for software installation on the workstations at the Employer's offices.

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2.5.2   Time Frames for System Installation

2.5.2.1   The Contractor shall install the system to ensure compliance with the requirements contained in this Contract within the time period/s agreed with the Employer. Refer to Part C3.2.1: Scope of Works.

2.5.3   Method Statements

2.5.3.1   The Contractor shall provide Method Statements for all the major Systems to be constructed or installed, which shall include procedures of how to construct or install the relevant item. Method Statements shall include configuration drawings.

2.5.3.2   The Contractor shall provide Method Statements (where applicable) before commencing with work on Site.

2.5.3.3   The Method Statements shall also be utilized by maintenance personnel when replacing a particular item.

2.5.3.4   A register of all Method Statements, including those from Subcontractors, utilized on the Project shall be maintained on file and stored electronically.

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2.6   SYSTEM UPGRADE REQUIREMENTS

2.6.1.1   The Contractor shall implement upgrades as part of his contractual obligations as set out in the sections below.

2.6.2   System obsolescence upgrades

2.6.2.1   The Contractor shall develop and maintain a strategic plan that addresses obsolescence in advance and makes plans to avoid obsolescence by being proactive in keeping the systems on currently supported platforms.

2.6.2.2   The Contractor shall replace any equipment during the Contract period that has become obsolete or that was identified by the Employer as obsolete in the Contract period.

2.6.2.3   The use of operating systems and Application software is limited to the vendor maintenance period available as supplied in the software road map, unless otherwise agreed to by the Employer.

2.6.2.4   The Contractor shall during the Contract period upgrade all operating systems, hardware and application software once the supplier of the operating system and/or application software has discontinued support for the current operating system and/or application software.

2.6.2.5   In cases where the new version of the operating system and/or application software is not compatible with the hardware and/or application software, the Contractor shall replace the hardware and/or application software with compatible hardware and/or application software.

2.6.2.6   When an operating system, database, application software or third party software has to be upgraded, a Software Executable Release Plan shall be submitted to the Employer for approval. The plan shall address any implication for Toll Agencies who utilize the TCH and VPC. The Contractor shall ensure that the operating system, database, application software or third party software keeps up to date with the latest proven and tested releases.

2.6.3   Performance related upgrades

2.6.3.1   The Contractor shall, during the Contract, replace or upgrade equipment when the equipment does not meet its performance criteria as specified by this Contract.

2.6.3.2   All units, components and Materials used during upgrades shall be submitted to the Employer for approval before the installation of any changes.

2.6.3.3   When an operating system, database, application software or third party software has to be upgraded, a Software Executable Release Plan shall be submitted to the Employer for approval. The plan shall address any implication for Toll Agencies who utilize the TCH and VPC.

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2.7   HAND-BACK REQUIREMENTS

2.7.1   General

2.7.1.1   At Contract completion none of the Systems or their Hardware or software components shall be obsolete or within their end-of-life phase. The Contractor shall assure that the Toll System can be operated for at least one year after Contract completion. The Contractor shall be willing to support and maintain the Toll System at a monthly fee during that period and sufficient spares shall be available for the period.

2.7.1.2   Refer to Part C3.3.1: General Operations Specifications and Parts C3.3.2 to C3.3.4 for the Contractor's Hand-back requirements.

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2.8   SYSTEM REQUIREMENTS

2.8.1   Vehicle Classes

2.8.1.1   The Vehicle Classification of the ORT System is based on the volumetric dimensions of the vehicle, i.e. the length, width and height of a vehicle. The classification scheme includes four types of classes as detailed in the classification scheme below:

Table 2-1: Classification scheme

Class	Description	Dimensions
A1	Motorcycles	Total vehicle Length < 3.0 m and Width < 1.3 m Height < 2.5 m
A2	Light Vehicles	Length (excluding trailer) < 6.0 m and Height (excluding trailer) < 2.5 m Trailers with tow bars are allowed and are excluded from the volumetric measure above
B	Heavy Vehicles (< specified volume)	Total vehicle Length < 12.5 m and Height > 2.5 m
C	Heavy Vehicles (> specified volume)	Total vehicle Length > 12.5 m and Height > 2.5 m

2.8.1.2   Although Class A1 Tariff is a discounted Tariff on the Class A2 Tariff, the AVC system shall be able to distinguish between Class A1 and Class A2.

2.8.1.3   Vehicle Class B (vehicle length shorter than 12.5 metres) shall thus typically allow for Heavy Vehicles without a trailer, while Vehicle Class C (vehicles longer than 12.5 metres) shall allow for Heavy Vehicles with a trailer.

2.8.1.4   In the event of a Heavy Vehicle that can pull a trailer, the Vehicle Class of the Heavy Vehicle must be registered, but it shall be indicated on the system that the Heavy Vehicle can pull a trailer and thus belong to multiple classes.

2.8.1.5   The TCH System shall support and incorporate both the Gauteng ORT classification scheme as well as the existing classification scheme on the current South African Toll Roads. The

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existing classification scheme on the current South African Toll Roads includes four classes as detailed in the Classification Scheme below:

(a) Class I – Light vehicles, with or without a trailer. Class I includes motorcars, minibuses and light delivery vehicles;

(b) Class II – Medium heavy vehicles, which are 2-axled vehicles designed to seat more than 16 passengers or that have an axle fitted with either tyres with a bead diameter larger than 406.4 mm (16") or more than 2 wheels;

(c) Class III – Large heavy vehicles which are heavy vehicles or combinations with 3 or 4 axles; and

(d) Class IV – Extra large heavy vehicles which are heavy vehicles or combinations with more than 4 axles.

2.8.1.6 Due to the difference in vehicle classification schemes between the various Toll Authorities, the Toll System must provide a generic classification system that will allow the System User or Customer to choose his vehicle from a defined Vehicle List instead of matching his vehicle to a specific Vehicle Class.

2.8.1.7 The Toll System must be able to automatically map the generic Vehicle Class to the vehicle classification of the Toll Agency.

2.8.1.8 The generic Vehicle Class shall appear in the Validation Lists.

2.8.1.9 The Employer may amend the Vehicle Class scheme in Table 2-1: Classification scheme from time to time to ensure an equitable and Customer friendly scheme.

2.8.2 Transaction Record Compliancy Status

2.8.2.1 Transaction Compliancy has an impact on the risk to manage and recover the transaction Tariff.

2.8.2.2 A Transaction Record can be 'Compliant and Complete', 'Compliant and Incomplete', Non-Compliant or 'Technical Loss Non-Compliant'. Payment to the Tolling Agency is Guaranteed for a Compliant Transaction Record (complete or incomplete), irrespective whether the toll fee could be recovered or not. The percentage Compliant Transactions is one of the Key Performance Indicators used to measure the performance of the Toll Agency.

2.8.2.3 However, the toll fee of both Compliant and Non-Compliant Transaction Records are recoverable or not recoverable. Technical Loss Transaction Records are not recoverable, as these Transaction Records are not valid autonomous transactions. This implies that VPC takes the risk for unrecoverable Compliant Transaction Records while the Toll Agency or TCH will take the risk for unrecoverable, Non-Compliant Transaction Records. Technical Loss Transaction Records in the System need to be minimised or phased out as they have no financial value.

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2.8.2.4   A Transaction Record has one of the following compliancy statuses:

(a)   A Compliant Transaction Record is a Transaction Record for which all the available information has been captured accurately and was successfully encrypted and framed as required by technical requirements. A Compliant Transaction Record may either be complete or incomplete.

(b)   A Compliant and Complete Transaction Record is a Transaction Record that:

  i.   Has been accurately captured & framed; and

  ii.   Contains the required minimum information and images (if relevant) as specified in section 2.8.2.5; and

  iii.   Is appropriately encrypted.

(c)   A Compliant and Incomplete Transaction Record is a Transaction Record where some required Transaction Record Information is not available, and is **not** due to any negligence by the Contractor, i.e. where:

  i.   The Identifier(s) could not be determined through Tag read, ANPR process or other means, although the Transaction Record has been accurately captured & framed; and

  ii.   The Transaction Record is accompanied by the required images (as specified in section 2.8.2.5);

  iii.   The Transaction Record contains the minimum data fields captured (as specified in section 2.8.2.5); and

  iv.   Is appropriately encrypted.

(d)   A Non-Compliant Transaction Record is a Transaction Record where Transaction Record information is not available due to the Contractor's negligence, i.e.:

  i.   The Identifier number(s) for the Transaction Record could not be determined; and/or

  ii.   The Transaction Record has not been accurately captured & framed; and/or

  iii.   The Transaction Record does not contain the required minimum information and/or relevant images (as specified in section 2.8.2.5); and/or

  iv.   The Transaction Record is not appropriately encrypted.

(e)   A Technical Loss Non-Compliant Transaction Record is either a Transaction Record where some Transaction Record information is available, although another chargeable

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Transaction Record already exists in the system, or it is a non-valid Transaction Record, which transaction was not triggered by a vehicle, i.e.:

i. The Transaction Record has not been accurately captured & framed; although one Compliant Transaction Record was created and the 2nd Transaction Record shall be considered as "Technical loss – Framing Error".

ii. Multiple Tag reads from the RSS for one vehicle passage have been received (e.g. due to the RSS having 2 Tags identified in one vehicle or a wrong 2nd Tag transaction has been assigned to the passage). The additional Transaction Records shall be considered as "Technical loss – Duplicate".

iii. Two independent Transaction Records for the same vehicle/Tag combination at the same time at the same Tolling Point. The second transaction shall be considered as a Technical Loss - Framing Error.

iv. The recorded image for the Transaction Record does not reflect an actual vehicle passage, e.g. due to the fact that that the triggering of the passage happened due to some environmental impact like rain or hail, a shadow from another vehicle or a person walking. Such a Transaction Record shall be considered as "Technical loss – Framing Error"

2.8.2.5   Requirements for a Compliant Transaction Record:

(a)   Images shall be captured of all vehicle passages. However, only the Transaction Records with potential financial and operation risk, as defined in Part C3.4.3: Road Side System Specifications, shall be accompanied with the required images.

(b)   At least the following Transaction Record information shall be captured by the RSS, of which more detail is specified in Part C:

Table 2-2: Transaction Record Information created by the RSS

Information Required:
a)   Unique Transaction Record number.
b)   Transaction Record date and time when Transaction Record is detected.
c)   Unique identifier number of the Toll Agency, as assigned by the Employer.
d)   Unique identifier number of the Tolling Point, as assigned by the Employer.
e)   Lane identification, Tag Reader and equipment identification (SessionLocation). In the case of conventional Toll Plazas, the identifier number of the Lane as assigned by the Employer.

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Information Required:	
f)	Tag identification (for ETC Transaction Records only, and as is defined in Part C3.4.7: Standard Specification for Operations and Maintenance: Electronic Toll Collection (ETC)), which shall include. i. Manufacturer identifier ii. Equipment class iii. EFC- *ContextMark* iv. PAN (*PersonalAccountNumber*) v. Tag validity
g)	Classification of the vehicle associated with Identifier, as available from the Validation Lists.
h)	AVC equipment used for classification.
i)	Class of vehicle as determined by the AVC. The classification should be in accordance with the Employer classification scheme.
j)	Equipment in Certification Status indicator, as required by the VPC System i.e. the certification status of each applicable RSS unit used during the transaction in accordance with the SANS 1795 Standard
k)	VLN Image status indicator, e.g.: i. Front image captured ii. Rear image captured iii. Side view captured (Scene) iv. Different front and rear image v. No image captured
l)	Vehicle Licence Number from ANPR, if ANPR is done by the Road Side System. The RSS shall be able to accommodate foreign Vehicle Licence Number plates. Indicate if no number plate is available, e.g. 'No ID'.
m)	ANPR confidence level, if ANPR is done by the Road Side System.
n)	3rd Identifier ID number, for 3rd Identifier Transaction Record Records only.
o)	Validation List(s) used to process the Transaction Record.
p)	Active Tag status on the Validation List(s) used.
q)	VOSI and abnormal high vehicle indicators.
r)	Relevant image files.
s)	Transaction Record identifier type, e.g. PAN, VLN, 3rd Identifier, ContractSerialNumber, none
t)	ETC Session type (*SessionType* as detailed in Part C3.4.7)

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Information Required:
u)   Tag transaction counter

v)   Authentication information (as detailed in Part C3.4.7) that will consist of
   i. Operator Authenticator
   ii. Issuer Authenticator

w)   Low Tag battery indicator
x)   Reserved for future use

(c)   The ORT Back Office shall not forward Transaction Records of vehicles that did not exceed 30 transactions in a financial year to the TCH. For more detail, refer to Part C3.4.4: Open Road Tolling Back Office System Specifications.

(d)   Requirements for additional information linked to the Transaction Record at ORT Back Office System level:

Table 2-3: Transaction Record Information appended by ORT BO System

Information Required:
a)   Actual Class of the vehicle as determined by the system or System User. The Actual Class shall either default to the AVC class, or the Registered Vehicle Class, as specified in the Business Rules.
b)   Vehicle Class Discrepancy detected indicator.
c)   Identifier of the System User who determined the Vehicle Class in case of discrepancy.
d)   Tariff Table Identifier number.
e)   Nominal Tariff of the Transaction Record.
f)   Discount types applied by the Toll Agency, if any.
g)   Discount amounts applied by the Toll Agency, if any.
h)   Exempt / free passage Transaction Record indicator.
i)   Net Transaction Record Value charged for the Transaction Record.
j)   Vehicle Licence Number(s) from ANPR, if ANPR is done by the Back Office System. The ORT Back Office System shall be able to accommodate foreign Vehicle Licence Number plates. Indicate if no number plate is available, e.g. 'No ID'.
k)   ANPR Confidence level, if ANPR is done by the Back Office System.
l)   MNPR Vehicle Licence Number, if MNPR was performed.

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Information Required:	
m)	Identifier of the System User who performed the MNPR, if MNPR was performed.
n)	Vehicle Licence Number from Validation List(s).
o)	Vehicle Licence Number discrepancy detected indicator.
p)	Transaction Record Identifier Type, e.g. ETC, VLN, None.
q)	Initial Transaction Record compliancy indicator (Compliant and Complete, Compliant and Incomplete, Non-Compliant).
r)	Potential unrecoverable Transaction Record / Potential Violation indicator.
s)	Manually Imported Transaction Record indicator.

(e) The TCH shall forward all Transaction Records of Opt-In Toll Agencies not linked to a Valid account, or paid within the Grace Period to the VPC, irrespective if the Transaction Record is 'Compliant' or 'Non-Compliant'. Non-Compliant Transaction Records are immediately forwarded to VPC ignoring the Grace Period. 'Technical-Loss Non-Compliant' will only be sent to TCH but rejected immediately as there is no value to be recovered.

(f) The requirements for additional information linked to the Transaction Record at TCH System level are as follows:

Table 2-4: Transaction Record Information appended by the TCH System

Information Required:	
a)	Account Number of Account Holder.
b)	Account Holder, if available.
c)	Account Holder's address, if available.
d)	Telephone Number. Indicate if not available.
e)	Cellular Number. Indicate if not available.
f)	Fax Number. Indicate if not available.
g)	E-mail address. Indicate if not available.
h)	Preferred means of communications. Indicate if not available.
i)	Transaction Record Payment Status (Paid, Grace Period, Violation etc.).

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Information Required:
j)   Reason for transfer to VPC (Customer Accounts).

2.8.2.6   Image Requirements for an Evidential Record:

(a)   At least three image files are required for a compliant Evidential Record forwarded to VPC:

    i.   The rear Image of the vehicle in order to identify the Vehicle Licence Number;

    ii.   Image of the front of the vehicle in order to identify the Vehicle Licence Number; and

    iii.   A Scene Image, with a view sufficient to ensure that the vehicle and the location where the image was taken can be identified.

(b)   At least one image (front or rear) is required to identify the Vehicle Licence Number for a Compliant Transaction Record forwarded to TCH for assignment (if no Tag could be identified).

(c)   No image is required for a Transaction Record forwarded to TCH for if a Tag could be identified to assign the transaction to the corresponding account.

(d)   The following minimum information shall be stored with an image:

    i.   Transaction Record number;

    ii.   Transaction Record date and time;

    iii.   Tolling Point where the Transaction Record occurred; and

    iv.   Camera ID number of the camera that captured the image.

(e)   The image files shall comply with the SANS 1795-0 and 1795-5 specifications and TSCP guidelines.

2.8.2.7   Requirements for a Technical Loss Transaction Record:

2.8.2.7.1   Technical Loss Transaction Records shall be considered to be "Non-Compliant" Transaction Records which allow no further revenue collection since it is not recognized as an actual passage.

2.8.2.7.2   Technical Loss Transaction Records shall be grouped into:

(a)   Technical Loss – Framing Error

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(b)   Technical Loss – Duplicate Transaction

2.8.2.7.3   Technical Loss Transaction Records shall be identified by the ORT BO and not be accepted by the TCH for further processing. The TCH shall reject any Transaction Records flagged as Technical Loss by a Toll Agency without further processing (and without charging of any processing fees).

2.8.2.7.4   The Technical Loss Transaction Records shall be part of the transaction-based ORT Reports (There shall be an option to draw the reports with or without Technical Loss Transaction Records).

2.8.2.7.5   The Technical Loss Transaction Records shall be excluded from the Employer's financial (ERP) system.

2.8.2.7.6   The Contractor shall provide monthly reports on the number of Technical Loss Transaction Records, sub-divided into records with framing errors, records that are duplicated or records that are non-valid Transaction Records (transaction was not triggered by a vehicle).

2.8.3   Tariff Structure

2.8.3.1   The Tariffs shall be structured as a Nominal Tariff with discounts based on certain preconditions. The Nominal Tariff is the Tariff that is applicable to a Tolling Point before any discount is applied.

2.8.3.2   The Tariff structure is applied to the system at ORT Back Office System level. Refer to Part C3.4.4: Open Road Tolling Back Office System Specifications.

2.8.4   Discount Structure

2.8.4.1   Road Users can qualify for more than one Discount by adhering to specific preconditions.

2.8.4.2   Route specific Discounts, shall be assigned by each Toll Agency before Transaction Records are sent to the TCH System. The Transaction Record shall contain the Nominal Tariff, the details of applicable Discounts as well as the final discounted Tariff. Refer to Part C3.4.4: Open Road Tolling Back Office System Specifications.

2.8.4.3   Reward Programs can be centralized and shall be an after-the-event re-imbursement depending on the usage for the measured period. Reward programs shall be allocated by the TCH System. Refer to Part C3.4.5: Transaction Clearing House System Specifications for more information on Reward Programs.

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2.9 TAX AND VAT REQUIREMENTS

2.9.1 Overview

2.9.1.1 This section covers the requirements to meet the Tax and VAT obligations of the Toll System in such a way that a user-friendly service is maintained.

2.9.1.2 This section shall be read in conjunction with the requirements in clause 2.3 of Part C3.5.3 Financial Management.

2.9.1.3 The Toll System shall comply with all applicable Laws including the current and future Tax and VAT legislation (currently VAT Act 89 of 1991 as amended) and Tax directives as they are granted to the Employer by the South African Revenue Services (SARS).

2.9.1.4 The content of this section shall not be construed in any way as limiting, amending or changing in any way the requirements of any applicable Legislation and is set out merely for the purpose of convenience of the Contractor. It shall be the responsibility of the Contractor however, to comply fully with the requirements of the Employer as set out below.

2.9.1.5 The Employer will submit the VAT Return and pay the VAT.

2.9.1.6 Without detracting from the generality of any of the provisions relating to the Contractor's responsibility in respect of compliance with applicable Laws, the payment of taxes and duties, the Contractor shall indemnify the Employer against all loss or claims arising out of the default of or failure by the Contractor to comply fully with its obligations under this clause 2.9, its compliance with all Laws in respect of taxation and all applicable Laws generally.

2.9.2 VAT Requirements

2.9.2.1 The Toll System shall comply with all VAT requirements as may be stipulated by applicable Law and the requirements of the South African Revenue Services (SARS) from time to time. The Employer may also, from time to time, obtain tax directives from SARS in relation to VAT. The Toll System shall be configurable to comply with these tax directives. In addition, the system shall automate the issuing and retention of all Tax Invoices for audit purposes. The system shall provide the Road User with the necessary Tax Invoices in a format that shall make the claiming of VAT on Toll Transaction Records and associated fees possible. This shall include the functionality to issue a consolidated Tax Invoice reflecting the summarized Toll Transaction Records per Tolling Point per Identifier for a period.

2.9.2.2 The implementation of the VAT requirements listed in this section shall be subject to the approval of the Employer.

2.9.3 VAT Act Requirements

2.9.3.1 This section applies to invoices, credit and debit notes as per section 20 and 21 of the VAT Act. In order for a system to comply with the SARS VAT requirements it needs to comply with the following basic concepts (amongst other requirements):

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(a)   A uniquely numbered Tax Invoice shall be issued for all VAT-able Transaction Records on request. All VAT-able Transaction Records performed by a VAT registered company must be reflected in its VAT return.

(b)   The Tax Invoice shall contain the information of the purchaser when the Tax Invoice value exceeds the limit as specified in the VAT legislation.

(c)   All Tax Invoices shall be retained electronically for a period as defined by applicable Law for VAT inspection purposes. Applicable Law regarding the storage of VAT information shall dictate whether summary information would be acceptable. The system shall be able to reproduce any Tax Invoice on request from VAT Inspectors.

(d)   TAX Invoice numbers shall be sequential to ensure auditability.

(e)   Tax Invoices generated may not be changed. Any changes to Tax Invoice values shall be performed according to the prescribed VAT procedure. This involves retracting the original Tax Invoice by issuing a credit note and then issuing the correct Tax Invoice. Each credit note shall be linked to the specific invoice for the supply delivered and shall reference the original invoice number and invoice issue date.

(f)   An original Tax Invoice shall not be duplicated. It shall be possible to print a copy of a Tax Invoice. A copy of any Tax Invoice shall clearly state "Copy Tax Invoice" that comply with VAT legislation.

(g)   The words "Computer generated" shall appear on the original Tax Invoice.

(h)   Any Tax Invoice printed before month-end closure shall clearly indicate "Pro-forma Tax Invoice".

(i)   In terms of supplies rendered/received between entities with the same VAT number, that VAT must be not applied. The Contractor shall in the interim design a process to not charge VAT for these transactions.

(j)   For each debit and credit note, the Contractor shall provide, in terms of VAT requirements, adequate detailed reasons for the debit or credit note.

2.9.4   The Employer's Implementation of the VAT Act Requirements

2.9.4.1   The Toll Agency Systems shall automatically transfer the taxable Transaction Records to the TCH System. The TCH shall act as agent for the Toll Agency and the TCH System shall generate Consolidated Tax Invoices for Toll Transaction Records on behalf of the Toll Agency.

2.9.4.2   For Tax & VAT Records issued on behalf of 3rd parties, for instance Toll Agencies and other TCH Clients the Toll System shall comply with Section 54 of the VAT Act. Refer to the requirements in clause 2.3 of Part C3.5.3 Financial Management.

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2.9.4.3   The TCH System shall be configurable to generate Consolidated Tax Invoices for Customer Accounts once or twice a month on behalf of the Toll Agency.

2.9.4.4   The consolidated Tax Invoices for Transaction Records shall be summarized per Tolling Point. However, the Customer shall be able to obtain a detailed list of Transaction Records on request.

2.9.4.5   The TCH System shall either link the Transaction Records received from the Toll Agency to a Customer Account or will not be able to link the Transaction Record to a Customer Account.

2.9.4.6   Transaction Records not linked to a Customer Account shall be linked to a "Potential Violator" account.

2.9.4.7   VAT rules for Transaction Records linked to an account:

(a)   Transaction Record

i.   The TCH System shall allocate the Transaction Records received from the Toll Agency Systems to the Customer Accounts.

ii.   The TCH System shall generate a consolidated Toll Agency (TA) Tax Invoice for Toll Transaction Records on behalf of the Toll Agent.

iii.   The Consolidated TA Tax Invoices shall be generated for a Customer, per account, per Toll Agent, once or twice a month, according to the invoice generation rules for the account.

(b)   Service Charges

i.   The TCH System may allocate Service Charges to the Customer Account. Refer to Part C3.4.5: Transaction Clearing House System Specifications.

ii.   The TCH System shall generate a TCH Tax Invoice for Service Charges on behalf of the TCH.

iii.   The TCH Tax Invoice shall be issued to a Customer per account, once or twice a month, according to the invoice generation rules for the Customer Account.

(c)   Rewards Program

i.   The TCH System may implement Rewards Program (Refer to Part C3.4.5: Transaction Clearing House System Specifications) to the accounts.

ii.   Should the TCH apply a Rewards Program, the TCH System shall generate a TCH Credit Note for the discount on behalf of the TCH.

iii.   The TCH Credit Note shall be issued to the Customer per account once or twice a month, according to the invoice generation rules for the Customer Account.

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2.9.4.8   VAT rules for Compliant Transaction Records not linked to a Customer Account:

(a)   Compliant Transaction Records settled within the Grace Period

    i.   The TCH System shall allocate Transaction Records from the Toll Agencies to a "Potential Violator" account.

    ii.   The TCH System shall generate a consolidated TA Tax Invoice to the Road User for Toll Transactions on behalf of the Toll Agencies.

    iii.   Consolidated TA Tax Invoices are generated per Road User per Toll Agency when settled by the Road User.

(b)   Compliant Transaction Records not settled within Grace Period

    i.   If Compliant Transaction Records are not settled within the Grace Period, the Transaction Records are "Sold On" to the VPC.

    ii.   The TCH System shall generate a TA Tax Invoice on behalf of the Toll Agency and shall issue the TA Tax Invoice to the VPC on a daily basis when "Sold On" to the VPC.

    iii.   The TCH System shall generate a TA credit note on behalf of the Toll Agency to the Toll Agency for Transaction Records forwarded to VPC.

(c)   TCH Service Charges associated with un-paid Transaction Records specified in (b)

    i.   The TCH System shall generate a TCH Tax Invoice on behalf of the TCH and shall issue the TCH Tax Invoice to the VPC System.

    ii.   The TCH System shall generate a TCH Credit note on behalf of the TCH for the Service Charges forwarded to the VPC System.

(d)   A Violator account per Vehicle Licence Number shall be created on the VPC System and the Transaction Records and Service Charges "Sold On" to the VPC shall be allocated to the accounts.

(e)   Compliant Transaction Record and Service Charges recovered by the VPC:

    i.   The VPC System shall add admin fees to the Violator account.

    ii.   The VPC System shall generate a VPC Tax invoice on behalf of the VPC for outstanding Transactions, TCH Service Charges and VPC Admin Fees for the Road User.

(f)   Transaction Record, Service Charges and admin fees sent to AARTO:

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i.   The VPC System shall create a 'Copy Tax Invoice' of the Invoice as set out in (e) and send it to AARTO for Transaction Records, Service Charges and Admin fees sent to AARTO.

ii.   AARTO shall add a non-taxable fine.

iii. AARTO shall issue a Statement to the Road User on behalf of the VPC. The Statement shall reference the following:

1.   The VPC Tax Invoice for Transaction Records, Service Charge and Admin Fees on behalf of VPC; and

2.   A non-taxable AARTO fine.

(g)   Bad Debts:

i.   The VPC System shall generate a VPC Credit Note for the VPC for bad debts when written off.

2.9.4.9   VAT rules for Non-Compliant Transaction Records:

(a)   The TCH shall generate a TA Tax Invoice on behalf of the Toll Agency to the ORT Operator, when confirmation is received from the VPC (via the TCH) that a Transaction Record is Non-Compliant.

(b)   Payment is not Guaranteed for Non-Compliant Transaction Records from the Toll Agency.

(c)   The VPC shall generate a VPC Tax Invoice to the Road User. The Tax Invoice shall include the appropriate Service Charges and Admin fees.

(d)   The TCH shall generate a Sundry Payment TA Tax Invoice on behalf of the Toll Agency to the VPC.

2.9.4.10   VAT rules for Transaction Records of vehicles that did not exceed the 30 transaction threshold in ORT Back Office:

(a)   VAT shall not be applied to transactions that are kept in ORT and which did not exceed the 30-transaction threshold.

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2.10 AUDITABILITY

2.10.1 System Auditability

2.10.1.1 The Toll System shall at least comply with the generally accepted practices for auditing as specified herein.

2.10.1.2 Each and every Transaction Record shall be a uniquely identifiable and traceable unit, stored by the Toll System.

2.10.1.3 The Toll System shall ensure that each Entity shall store those data that are collected on and/or reside on its system. Audit trails shall be required of all updates to data in the system.

2.10.1.4 The Toll System shall incorporate automated verification procedures to verify that all the required data elements were successfully communicated from one system to the other. Data integrity verification and request of missing data shall be performed at pre-defined intervals.

2.10.1.5 All reports submitted to the Employer in electronic or any other format shall reflect the data integrity status, e.g. whether the day/month is closed, of the data or statistics reflected in any such report.

2.10.2 Protection of the Toll System

2.10.2.1 System security and data privacy policies shall need to be determined that shall minimize the potential for internal and external security breaches and concurrently provide for the protection of customer privacy in compliance with acceptable legislation.

2.10.2.2 Privileged or confidential information shall include all information that is:

(a) Determined by the Employer to be privileged or confidential (such as Bank Issued Card information and other Road User information);

(b) Of a personal nature about a third party;

(c) Deemed to violate a Person's right to privacy if disclosed; or

(d) Declared to be privileged, confidential or secret in terms of Law.

2.10.2.3 Any aspect of the system that relates to bank card transactions or has access to the system's bank card related functionality has to be PCI DSS compliant.

2.10.2.4 The Contractor shall implement all procedures, equipment and software, or a combination thereof necessary to ensure that the Toll System is adequately protected against any third party obtaining unauthorized access to any part of the Toll System. This shall include the safeguarding of all data communication lines and dial-up facilities. The Contractor shall ensure that all functions within the systems, including those functions of the LAN and functions within the application software, shall be protected from unauthorized disclosure.

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2.10.2.5   If an Entity is linked to the Internet or any other public network, sufficient procedures have to be defined and implemented to safeguard the Toll System against Internet threats throughout the duration of the Contract and ensure confidentiality and non-repudiation of sensitive messages.

2.10.2.6   Under no circumstances shall a third party be allowed to change data on the production system. All account holder access to the website or IVR phone system shall be handled in such a way that the integrity of the database cannot be compromised.

2.10.2.7   The logical access to and use of the website shall be restricted by the implementation of adequate identification, authentication and authorization mechanisms, linking Road Users and resources with access rules.

2.10.2.8   Such mechanisms shall prevent unauthorized personnel, dial-up connections and other system (network) entry ports from accessing computer resources and minimize the need for authorized users to use multiple sign-ons.

2.10.2.9   Procedures shall also be in place to keep authentication and access mechanisms effective (e.g. regular password changes).

2.10.3   Access Control

2.10.3.1   Access Control shall be based upon the ISO/IEC 17799 standards.

2.10.3.2   All access leading to road side and other equipment shall have lockable access doors. This shall include Road Side System, routers/network interface cabinets, etc. All access doors shall be security controlled and access or attempts to access shall be automatically logged and reported.

2.10.3.3   Logical access controls, which ensure that access to systems, data and programs is restricted to authorized users to safeguard information against unauthorized use, disclosure or modification, damage or loss shall be implemented.

2.10.3.4   Unauthorized System Users shall not be able to have access to the Toll System. This shall be accomplished through the use of access security, individually assigned by the Contractor and allocated on an "as-needed" basis to personnel, with access to specific areas of the system provided or denied, depending on job function.

2.10.3.5   Authorized System Users shall enter a username and password to sign into the system. The username and password shall identify the System User to the system and the level of access (System User privileges) permitted for the owner of the username and password submitted.

2.10.3.6   The Toll System shall prohibit the use of common System User identifiers and passwords that are not subject to change.

2.10.3.7   The password security system shall be fully configurable by the system security administrators. Basic security levels are:

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(a)   Read only access to non-confidential information;

(b)   Read only access to confidential information;

(c)   Read and write access to enter specific types of data only;

(d)   Read and write access to update data already in the system; and

(e)   Access to all data and programs for system administrator.

2.10.3.8   Passwords shall be changed at least every 30 (thirty) days.

2.10.3.9   The system shall be auditable in terms of System User access to the system.

2.10.4   Protection of data within the Toll System

2.10.4.1   The Contractor shall utilize techniques for protecting data files and their integrity for any database structure or operating system within the Toll System. This shall include techniques for providing data integrity, encryption, overwrite protection and data security.

2.10.4.2   All data communicated between components of the Toll System, shall be encrypted; no data or passwords shall be communicated in plain text format. Encryption shall provide protection against external and to some degree, unauthorized internal access attempts.

2.10.4.3   In case of a security breach to image capturing devices, the applicable Transaction Record shall be flagged in accordance with the certification rules.

2.10.4.4   The Contractor shall also keep in place adequate firewalls, virus protection software and spy ware protection software (regularly updated) on all relevant parts of the Toll System to protect the system against denial of services and any unauthorized access to the internal resources. The Contractor shall also ensure that operating systems and application software are updated with the latest security updates with automated daily updates.

2.10.4.5   The Contractor shall ensure the safekeeping of all privileged or confidential information including images. The Contractor shall refuse a request for access to privileged or confidential information, unless:

(a)   Written approval has been obtained for such disclosure, from the Employer; or

(b)   The individual whose rights might be affected has consented in writing to its disclosure to the requestor concerned; or

(c)   So ordered by Law or a South African court or by the South African Police Services (SAPS).

2.10.5   Protection of Transmitted Data

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2.10.5.1   Protected data shall comply with the contractual requirements of the Toll System.

2.10.5.2   Data transfers shall be secured from one sub-system to another to prevent eavesdropping, spoofing, replay and undetected tampering.

2.10.5.3   All security related Hardware and Software shall at all times be protected against tampering to maintain their integrity and against disclosure of secret keys. In addition, organizations should keep a low profile about their security design, but should not base their security on the design being secret.

2.10.6   Reporting

2.10.6.1   The Toll System shall ensure that Violation and security activities are logged, reported and appropriately escalated on a regular basis to identify and resolve incidents involving unauthorized activity.

2.10.7   Configuration Control

2.10.7.1   Controls shall be implemented that identify and record all system software, hardware and documentation and their physical location, and a regular verification programme which confirms their existence to account for all software, prevent unauthorized alterations, verify physical existence and provide a basis for sound change management.

2.10.7.2   The Toll System shall provide the functionality to enable the Contractor to implement configuration and software version control.

2.10.8   Asset Management System

2.10.8.1   The Contractor shall provide and maintain an Asset Management System which shall entail the capturing and tracking of assets in an electronic database as specified in Part C3.3.2: Open Road Tolling Operations Specifications. The Asset Management System shall include a fully integrated Equipment Record System.

2.10.8.2   During the course of the Contract, the equipment record system shall be used to track equipment movement and manage minimum spare levels. The output of this system shall be used at the end of the Contract, for the handover of the Equipment to the Next Contractor. The system shall:

(a)   Be computerized;

(b)   Be updated on at least a weekly basis;

(c)   Track the location of all major units and major sub-assemblies;

(d)   Keep record of the serial numbers of major units and major sub-assemblies;

(e)   Be able to provide reports of the above to aid in Asset management.

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2.10.8.3   The Contractor shall submit the proposed equipment record system to the Employer for approval, within three months from the Contract Commencement Date.

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2.11 NETWORK AND COMMUNICATION

2.11.1 Communication Backbone

2.11.1.1 The Employer will provide the fibre optic based communications backbone.

2.11.1.2 The backbone will provide the Contractor with a WAN connection point at each of the Employer's Facilities (excluding the permanent and temporary kiosks). The backbone will ensure suitable communication links between the Tolling Points and the Central Operations Centre, as well as 8 dark fibre connections between the disaster recovery site at Rivonia and the Central Operations Centre. Refer to clause B.6.13 of Part C3.2.1: Scope of Works for more detail.

2.11.2 Communication Infrastructure

2.11.2.1 The Contractor shall have to design and provide for a redundant enterprise network solution that complies with the performance requirements of the Toll System. The network solution shall include the following:

(a) Provision of strict network security that allows for System User access control, firewalls for Internet and external network connections, limited Internet connectivity for System Users, restriction on the number of System Users that can receive and send mail, the use of Antivirus software on all workstations, etc.;

(b) Utilising managed network switches and routers which shall allow for continuous data traffic monitoring on the network and hence shall allow the Contractor to change the network to alleviate congestion; and

(c) Segmenting the network implementation (either logically or physically) to limit network traffic to the areas where it is required, and reduce network congestion.

2.11.2.2 The Communications infrastructure could be a mixture of a public switched telephone network (PSTN), a dedicated fibre optic network and an ethernet or Wi-Fi network. This Network infrastructure shall tie together all parts of the Toll System and shall adhere to strict security and communications and data transfer protocols. All Tolling Points, the Toll Agencies, the TCH System and the VPC System shall be direct nodes of this network. The various financial institutions participating and other agencies such as the Law Enforcement Agencies shall communicate directly with each Entity involved and shall have no additional access to the private network of any of the Entities affected.

2.11.2.3 The communications backbone shall carry all data transmitted (between Tolling Points and the ORT Back Office System) and shall cater for communications to all the Customer Service Centres. Any communication link between different buildings shall utilize fibre optic cable or PSTN lines with surge protection. PSTN or public lines shall be configured as a VPN with a high level of data security. A typical network configuration is provided in the figure below.

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2.11.2.4   The Contractor shall submit the design of the local area network solution and WAN routing and switching equipment and redundancy strategy for approval to the Employer.

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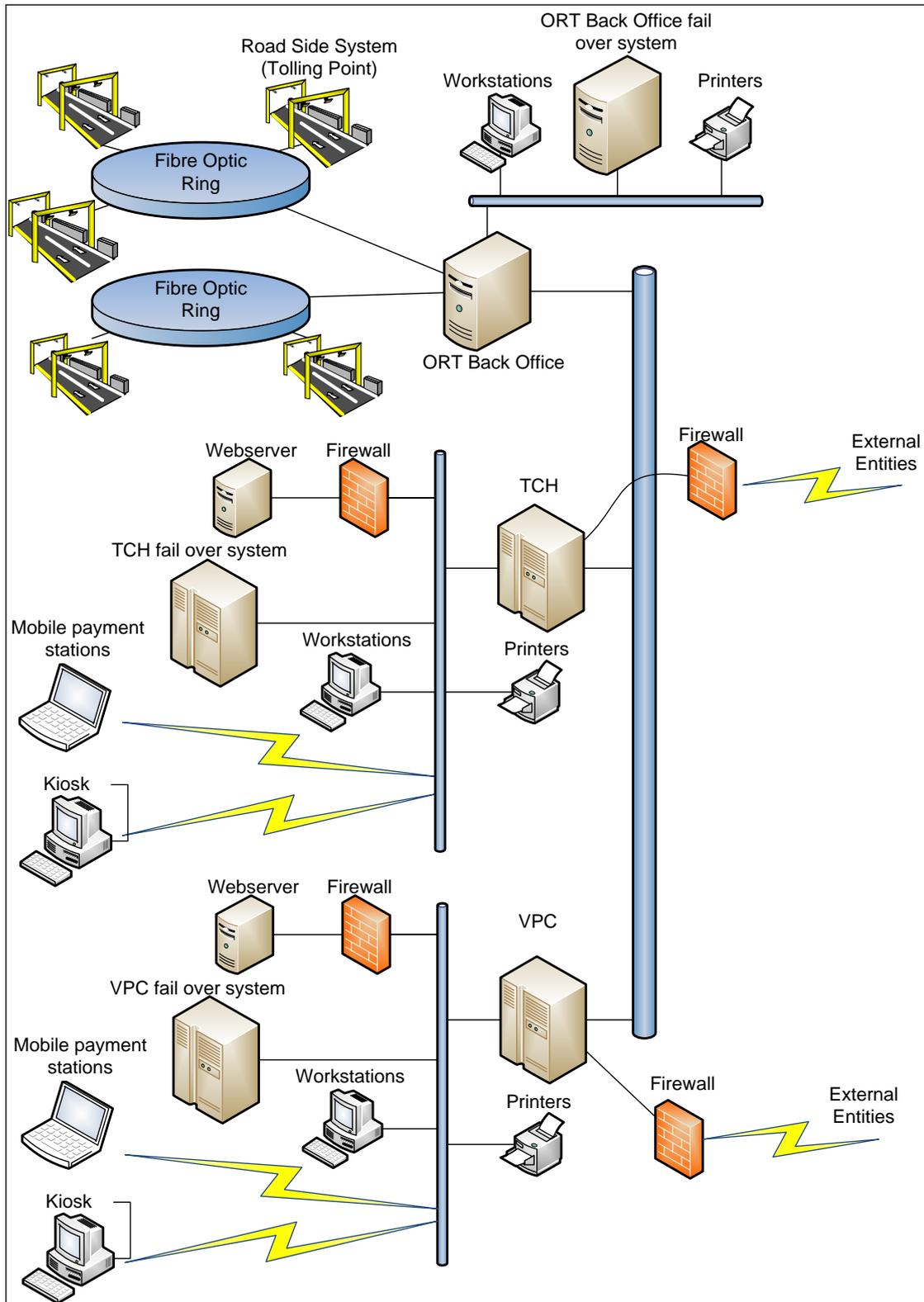
Figure 2-3: Typical Network Configuration (for illustrative purposes only)

2.11.3   General Network Requirements

2.11.3.1   An open, guaranteed messaging communication protocol shall be used to ensure proper data delivery. In the event of a communications failure, no loss of data shall occur.

2.11.3.2   The network must be operational on a 24/7 basis; therefore, it shall have fail over capabilities. The network server and the main routers shall be backed up with spare equipment ready in place and monitoring the ongoing communications processes and would pick-up operations in an automatic fail over.

2.11.3.3   A back-up strategy shall be arranged with the PSTN provider for events where a physical telephone line is cut or somehow disconnected.

2.11.3.4   The failure of any network link shall not result in the permanent loss of any data.

2.11.3.5   Contractor supplied routers, switches, Hubs, and Fibre Optic media converters shall be installed in lockable 19" racks to be located in the RSS Technical Shelter or in an access controlled computer room.

2.11.3.6   The system shall link to the different Toll Agencies (TAs) through fixed line, mobile or other wireless means, which is dependent on the available infrastructure at the TA.

2.11.4   Downtime

2.11.4.1   All Transaction Records have to be captured by the RSS in real time and transmitted to the ORT Back Office System in near real time. However, there can and shall be unscheduled downtimes due to line breaks and some unusual occurrences from equipment, such as copper theft of lines. The communication of the critical private network therefore has to be monitored continuously and an alarm system is required to notify the Contractor when a network segment becomes inoperable. Ref to Part C3.5.1: Contract Performance Measurement for availability requirements.

2.11.5   Time Synchronization

2.11.5.1   The Contractor shall provide and maintain a centralised time server solution that will provide time synchronisation to all relevant elements of the Toll System including, but not limited to, the RSS Tolling Points, ORT/TCH/VPC servers etc.

2.11.5.2   The solution shall include independent primary and backup NTP time synchronisation servers to ensure adequate redundancy and mitigation of the impact for single source outages at the Road Side System.

2.11.5.3   The technology and accuracy of the solution shall comply with all relevant legal requirements, such as the SANS 1795 Standard as well as the NRCS Average Speed Over Distance requirements detailed within Part 3.4.3: Road Side System Specifications, but in any case

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shall be within at least 5 seconds of accuracy from the national time standard. The Contractor shall submit a full technical proposal of the solution to the Employer for approval.

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2.12   DATA RETENTION

2.12.1   Data Storage

2.12.1.1   Transaction Records, including the relevant images shall be stored for a minimum of hundred and eighty (180) days to enable the ORT, TCH and VPC Operators to perform reconciliation, reporting and auditing functions.

2.12.1.2   The images shall be made available to the TCH and VPC Customers, this so that a Customer or owner of a vehicle will be able to view his / her transaction image.

2.12.1.3   Refer to Part C3.4.3: Road Side System Specifications for raw data storage requirements and Part C3.4.6: Violation Processing Centre System Specifications for VPC data storage requirements.
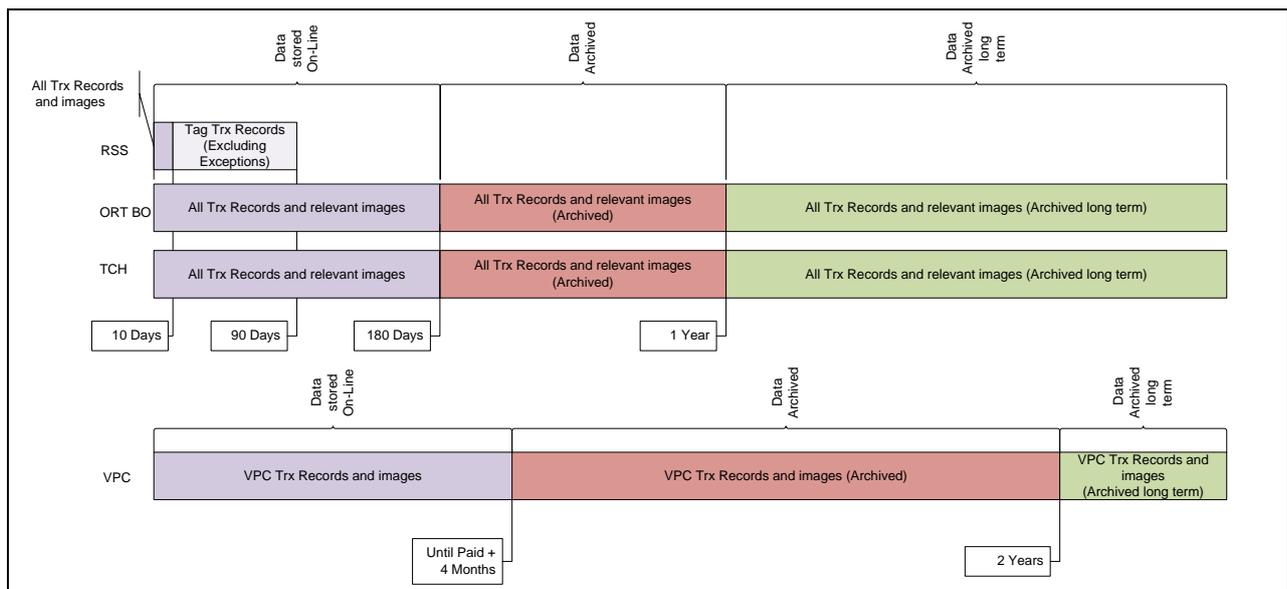
Figure 2.5: Data Retention Requirements

2.12.2   Back-up, Recovery and Data Deletion

2.12.2.1   The ORT Back Office System, TCH System and VPC System shall have a proper archive, back-up and restore strategy. The configuration of the systems shall include back-up equipment such as a high capacity tape or disk drive system. Back-up, archive, delete and restore activities shall be performed via a well-defined System User interface.

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2.12.2.2   The data shall be backed up on a daily, weekly and monthly basis. The back-up storage media must be stored both on-site and offsite in a secure (locked) fire and damp proof container.

2.12.2.3   The systems shall have additional capacity to cater for archiving without impacting on the normal processing speed and storage space.

2.12.2.4   The systems shall have a level of security adequate to protect the back-up resources from unauthorized access, theft or damage.

2.12.2.5   The last twelve months of back-up data must be available at all times, unless otherwise specified.

2.12.2.6   The archived data shall be stored in such format that it could be successfully restored for auditing purposes. Archived data shall be available within a predefined time after the request. Refer to the Part C3.5.2: Project Business Rules.

2.12.2.7   A platform shall be supplied on which the system can be restored for audit and query purposes.

2.12.2.8   Data shall be deleted from time to time. However, data shall be retained long term when required by legal statute. The system shall not allow data to be deleted before the data are summarized, archived and/or backed-up.

2.12.2.9   All data from the Commencement Date of this Contract shall be available for auditing purposes in accordance with contractual requirements. On expiration of this Contract, archived data shall be made available on request. This data shall be exportable to an ODBC compliant database or structured ASCII files. It remains the Contractor's responsibility to ensure that these data are accessible and readable.

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2.13   SUPPORT SYSTEM

2.13.1   Internal Support Requirements

2.13.1.1   The system supplier must provide a proposal for the inclusion of an electronic internal support Help Desk system. As a minimum requirement the support Help Desk must be able to:

(a)   Enable the Operator to log internal requests that needs to be attended to;

(b)   Link the request to a fault category, e.g. 'Operator Error', 'Latent Defect' etc;

(c)   Link the request to the sub-system in which error occurred, e.g. Accounts or Reporting module etc;

(d)   Apply a criticality rating that corresponds to a performance requirement, e.g. Severity 1 (Refer to the repair time as specified in Part C3.5.1 Part A - Contract: Contract Performance Measurement) or Severity 2 (Refer to the repair time as specified in Part C3.5.1 Part A - Contract: Contract Performance Measurement) etc;

(e)   Keep record if the Person who logged the request;

(f)   Keep record of the Person who attended to the request;

(g)   Log the date and time the request was received; and

(h)   Log the date and time the request was resolved.

(i)   Report on all open or unresolved requests.

2.13.1.2   The Help Desk system must also provide detailed reports that can be used for performance monitoring purposes.

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SECTION 3.   REPORTING

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3.1 REPORTING REQUIREMENTS

3.1.1 Overview

3.1.1.1 The reporting system shall adhere to the general rules as set out below. The specific reporting requirements are discussed in Parts C3.4.3, C3.4.4, C3.4.5 and C3.4.6.

3.1.1.2 The reporting system shall be efficient, flexible and configurable to the extent possible and consistent with the overall system's operating environment. It shall support a wide spectrum of System User configuration parameters to allow for managed reporting, ad-hoc queries and predefined exception condition reporting.

3.1.1.3 The reporting system shall utilize commercial off-the-shelf (COTS) generalized reporting software.

3.1.1.4 The system shall provide for scheduled and on demand reporting as well as automated exception condition reporting.

3.1.1.5 The system shall produce a warning if a report is requested using parameters that would affect system performance. The System User shall be able to schedule reports that require large amounts of data to be retrieved and processed during low system demand periods.

3.1.1.6 The system shall provide an option to archive scheduled reports. A System User interface shall be supplied to allow the System User to retrieve and reprint the reports.

3.1.1.7 The reporting scope shall be configurable by the System User e.g. to reflect different time periods or data element selections.

3.1.1.8 It shall be possible to make queries on a combination of data stored in multiple tables in the database.

3.1.1.9 Access to reports shall be restricted according to the System User category.

3.1.1.10 The systems shall provide for remote access to on-line reports.

3.1.1.11 It shall be possible to export the contents of the reports to multiple formats including, but not limited to, Excel, PDF and XML.

3.1.1.12 It shall be possible to save and print the report in a PDF format.

3.1.1.13 All the report formats and layouts are to be approved by the Employer.

3.1.1.14 The Contractor must ensure that that, as far as reasonably possible and unless otherwise stated, measurements shall be made by the Contractor to derive the Service Levels applicable to each of the Key Performance Indicators identified in Part C3.5.1. The Contractor shall report

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the measurements and Service Levels according to the reporting requirements specified in Part C3.5.1.

3.1.2 General information

3.1.2.1 The following information shall appear on a Report:

(a) The logo of the Employer;

(b) Selection criteria used to draw the report;

(c) The date and time when the report was printed;

(d) Workstation and server from where the report was printed;

(e) Page number and total number of pages for the report;

(f) Data completeness and consistency status (where applicable); and

(g) User identification of the System User that printed the report.

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SECTION 4. APPENDIX A TO GENERAL SYSTEM SPECIFICATIONS: ILLUSTRATIVE SOLUTION FOR A TEST PLAN

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4.1 ILLUSTRATIVE SOLUTION FOR A TEST PLAN

4.1.1 Table of Contents

4.1.1.1 The table of contents for an illustrative solution for a Test Plan is listed below:

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5.6. Trial Operation Testing

5.6.1. Tolling Point(s)

5.6.2. ORT Back Office (including integration)

5.6.3. TCH (including integration)

5.6.4. VPC (including integration)

5.6.5. Full System Integration

5.7. Continuous Testing (Post Commissioning)

5.7.1. Regression Testing

5.7.2. Testing related to Upgrades and Latent Defect Correction

5.7.3. Report Accuracy Testing

5.7.4. Other Ongoing Testing