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Part I: Project Overview

# Introduction

In 2012, Tompkins Consolidated Area Transit (TCAT) developed a roadmap to upgrade existing technology and implement new technology to support improvement in operations and provide better service to customers. As part of this roadmap, TCAT identified various needs and technology gaps within the existing maintenance systems. This project defines the technical specifications for a Maintenance Management System that meets TCATs needs and provides solutions to fill the technology gaps. This document is structured as follows:

* Section 2 describes background information regarding TCAT’s fleet, services, and existing technology systems.
* Section 3 describes the project and the overall technology system functionality desired by TCAT for managing maintenance.
* Section 4 describes the project scope, including the Contractor’s responsibilities and TCAT roles and responsibilities.
* Section 5 defines technical requirements for the Base System to be implemented under this project.
* Section 6 defines project implementation requirements for the Base System to be implemented under this project.
* Section 7 defines warranty and technical support requirements for the Base System to be implemented under this project.
* Section 8 defines requirements for optional system functionality that may be implemented under this project.

## Project Objectives

TCAT envisions that through this project, they will be able to implement a Maintenance Management System (MMS) and any associated central, garage, vehicle-based, and field equipment and software (collectively referred to as the “System” or “MMS”), that enables better management of maintenance related information, tasks, documentation, data, and reporting. These include:

* vehicle and asset information;
* maintenance task scheduling, assignment, update, and monitoring;
* parts inventory, warranty, and vendor information;
* human resources information;
* maintenance documentation;
* maintenance data;
* maintenance related reporting; and
* interfaces for maintenance system with other departments.

# Existing System

### Maintenance Staff and Responsibilities

TCAT’s Maintenance department is currently headed by the Maintenance Manager, who oversees the following staff members:

* One maintenance service supervisor
* One parts coordinator
* One facility maintenance mechanic
* Eight mechanics spread over three shifts
	+ One mechanic who is primarily dedicated to maintenance for the separate Gadabout paratransit services fleet (this service is not operated by TCAT)
	+ One mechanic who deals primarily with electronic signs and radios

In addition to maintenance activities that are performed in-house, external vendors are brought in as needed for specialized maintenance activities including:

* Air conditioning;
* Tire changes;
* Engine and transmission (vendors, including Allison and Cummins);
* Painting panels (local body shop);
* Window repairs and changes (nearby glass company); and
* Towing services.

### Maintenance Activities

At TCAT’s maintenance facility, each vehicle has an associated logbook that provides historical vehicle maintenance information. Vehicle faults and performed services are manually logged into its logbook. Regular preventative maintenance inspections are performed every 6000 miles. Bus repairs (i.e., beyond preventative maintenance) occur after the operator reports a fault/issue with the vehicle. The operator fills out and submits a defect card to Maintenance (typically at the end of their run). Work Orders are created manually on paper forms.

Maintenance is responsible for the daily Parking Sheet given to Operations and Dispatch, detailing which buses are available for pullouts. This sheet is created daily at 3 AM.

As part of the daily maintenance activities performed by TCAT, buses are fueled, washed and mopped every night, and oil levels are also checked. Mileage is entered by the fuelers and recorded into FuelMaster using the bus keys as a vehicle is fueled. Diesel Exhaust Fluid (DEF) is refilled twice a week.

### Inventory Management Activities

Inventory (parts) tracking is mostly done manually. TCAT maintenance staff manually type inventory information into paper work orders when they remove inventory for use on that work order. The information on the paper work orders is then entered into EasyInventory by a TCAT staff member (typically someone outside the maintenance department). This process can often result in a lag time of a few weeks between removal of inventory and this entry into EasyInventory. In the absence of real-time inventory information, inventory reordering is done based on visual detection of low inventory levels. Inventory purchasing is also done by staff across two different departments – purchasing and accounting.

Some parts are restocked directly by vendors when they visit the TCAT facility to determine the parts quantities required to maintain requisite stock levels, while other parts are purchased by TCAT staff from vendors.

### Maintenance Technology

The Maintenance Department uses the following software:

* An Excel spreadsheet is used to schedule preventative maintenance based on the current mileage information.
* EasyBus (software) is used to track labor hours of mechanics.
* Purchase Orders (PO) are generated using EasyInventory and FleetMax (software). EasyInventory is used for individual purchase orders, while FleetMax is used for blanket purchase orders. These separate PO systems are also used for non-maintenance TCAT purchases. Maintenance prints the issued PO details daily and sends these to Accounts Payable for reconciliation. Most TCAT maintenance parts purchase don’t undergo any formal approval process. Expensive components are approved and purchased as needed.
* Fuel usage is tracked using FuelMaster (software). A monthly report is printed and sent for entry into EasyBus and reconciliation with accounts for fuel purchases.

### Other Transit Technology Systems and Equipment

TCAT utilizes a custom developed Ridelogic farebox system to collect fares and validate fare cards. The Ridelogic system provides vehicle locations and fare information through a cellular communications system.

TCAT is currently implementing a suite of transit technologies to improvement scheduling, real-time operations, and provide real-time information to customers. The technologies being implemented include:

* The Masters Scheduler (TMS) software by Schedule Master Inc. to electronically develop service schedules and manage daily staff assignments to runs.
* Avail Technologies Computer Aided Dispatching and Automatic Vehicle Location system, including:
	+ DDS (Digital Dispatch System) mSlate Mobile Data Terminal (MDT) operator interface with cellular communications modem
	+ In-Vehicle Unit (IVU) central interface box and WLAN modem for processing to manage onboard announcements, vehicle health monitoring interface, and onboard interfaces
	+ InfoDev Automatic Passenger Counters (APC)
	+ MyAvail and associated central software suite
* Roadside LED and LCD information signs

The vehicle health monitoring component provides diagnostics and monitoring of onboard vehicle components through the J1708/1939 communications bus, and the MyAvail software maintains diagnostic information on the integrated components including MDT, IVU, and APC.

TCAT has 4G communications enabled Windows 10 tablets to enable road supervisors to access the MyAvail software remotely. The tablets may be used for other Windows 10 compatible applications.

The project is anticipated to be completed in the first half of 2017.

### IT Infrastructure

The current IT infrastructure at TCAT consists of:

* Two (2) ethernet switches
* One (1) Microsoft Exchange server
* One onboard camera system servers
* CAD/AVL communications infrastructure including WLAN access points and associated networking equipment.
* Three (3) Wireless LAN Access Points. The internet connection uplink was recently upgraded to a 50 Mbps fibre direct connection into the TCAT facility.
* Four (4) Servers to run client applications and store network data. Three are linked to RAID (Redundant Array of Independent Disks) storage.

TCAT currently has numerous ongoing programs to improve the network security infrastructure.

Full backups are done every Monday, with incremental backups from Tuesday to Saturday and a tape backup on Thursdays. TCAT staff use workstations/clients to access applications/data on-site via the LAN. The TCAT firewall software has a Virtual Private Network (VPN) module that allows staff to access applications and data over the internet when not directly connected to the TCAT LAN. Software licenses are managed (i.e., ensuring that the number of users complies with license constraints) through Active Directory groups that establish the individual staff access rights. Location data (generated by the Ridelogic farebox system) is stored on a separate offsite server not administered by TCAT, which they can access when needed. Additional sources of location and other operational data will are also available to TCAT through the Avail CAD/AVL system being currently deployed.

# Project Description

TCAT envisions the MMS as an integrated component of the overall transit technology architecture illustrated in Figure 1. The diagram shows anticipated components of the MMS, the CAD/AVL onboard equipment components that will need to be monitored by the MMS, and other existing systems at TCAT that the MMS would integrate with.



Figure 1: Project Components

## MMS Future Functionality

The MMS shall enable TCAT to improve its various maintenance activities by providing the following capabilities:

### Vehicle and Asset Management

* Vehicle Information Management: The MMS shall enable users to electronically add, edit, store, view, query, and run reports on vehicle information and associated maintenance history for all vehicles in the TCAT fleet.
* Asset Management: The MMS shall enable users to electronically add, edit, store, view, query, and run reports on asset information and associated maintenance history for TCAT assets including facility equipment, stop signs, electronic assets, bus shelters, etc.

### Tasks Management

* Work Order Management: The MMS shall enable users to automatically or manually generate, view, edit, track progress of, and develop queries and reports on work orders for all TCAT maintenance tasks, including daily activities, preventive maintenance (PM) activities, road calls, repairs and Department of Transportation (DOT) inspections.
* Project Management: This is to allow for special project requirements based on assets changes due to updates, configuration changes, etc. i.e. implementation of new bus fare systems, camera upgrades, etc.
* Work Order Input, Editing, and Review: The MMS shall enable users to logon, logoff, input, edit, review, finalize, query, and run reports on work order information based on system authorizations.
* PM Scheduling: The MMS shall enable users to automatically or manually schedule regular preventative maintenance on vehicles based on TCAT-configurable parameters and data input from other sources.
* Daily Activities scheduling: The MMS shall enable users to automatically generate a prioritized list of daily activities and associated work orders (including PMs, non-PM activities and repairs) at the beginning of each day/shift.
* Road Call Management: The MMS shall enable users to manage road call information, including road call categorization and vehicle status information (vehicle location, mileage, etc.).
* DOT Inspection Management: The MMS shall enable users to input, edit, store, review, query, and run reports on DOT inspection work orders and inspection results (e.g. pass, fail, issues, etc).

### Parts Inventory, Warranty and Vendor Information Management

* Parts Inventory Management: The system shall enable users to manage parts inventory, including providing capabilities to check-in and check-out parts, automatically associate parts with work orders and tasks, and provide low inventory alerts.
* Handheld Inventory Scanners and Printers: the system shall provide the capability for the potential use of handheld inventory scanners and printers for parts inventory management.
* Parts Warranty Management: The system shall enable users to add, edit, store, view, query, and run reports on parts warranty information.
* Vendor Information Management: The system shall enable users to add, edit, store, view, query, and run reports on vendor information.
* Purchase Order Management and Tracking: The system shall provide the capability to manually and automatically generate purchase orders when the quantity of maintenance parts drop below a defined threshold, as well as add, edit, store, view, query, and run reports on purchase orders.

###  Human Resources Management

* Labor Management: The system shall enable users to import human resource information from a payroll management system, track staff’s individual skill levels, specialties and labor rates, and enable users to add, edit, store, view, query, and run reports on staff. The system shall also allow for automated and easy entry of start (logon) and end (logoff) times on work orders for staff, and enable benchmarking and performance reporting for labor based on work orders.

### Document Management

* Document Management: The system shall allow the attachment and viewing of relevant documents to at least the following components of MMS: parts inventory (e.g., schematics, manufacturer sheets), work orders (e.g., defect card, incident report), asset inventory (e.g., vehicle insurance, registration, equipment sheets), vendor management (e.g., warranty policies, product details/brochures), warranty management (e.g., warranty policy) and purchase order management. The system shall allow users to view stored documents as necessary.

### Data Management

* Data Conversion and Import: The system shall have the capability to import existing maintenance-related data (e.g. maintenance history), that is identified by TCAT as necessary to make the system operational. The Contractor shall be responsible for cleaning and importing data as part of the initial configuration.
* Data Access: The system shall enable users to access, query, and export all data stored by the system.

### Reporting

* Reporting: The system shall have built-in report writing capability and shall provide TCAT with the capability to generate and schedule generation of pre-built maintenance reports. In addition, the system shall enable creation and customization of ad-hoc reports to meet specific needs, using a user friendly UI that does not require database and query knowledge. The system shall enable automatic dissemination of generated reports to specific people through email.

### Integrations and Interfaces (Option)

* CAD/AVL System integration: The system shall integrate with the CAD/AVL system to receive Daily Vehicle Inspection Report (DVIR) data, Vehicle Health Monitoring component alerts, diagnostics information, and odometer information.
* Fuel Management System interface: The system shall interface with the Fuel Management System to receive vehicle fuel usage information.
* Accounting System interface: The system shall interface with the Accounting System to send purchase order information.
* Payroll System interface: The system shall interface with the Payroll System to exchange maintenance related HR information.

# Project Scope

## Scope of Base System

The following technologies comprise the Base System for MMS:

* Central Systems
	+ Maintenance Management Software
	+ Interface with Fuel Management System,
* Garage Systems
	+ Maintenance Management Workstation, Two

TCAT’s preference is to have a vendor hosted system solution that can be remotely accessed in real-time and the base solution envisions this approach.

### Contractor Responsibilities

The Contractor shall be responsible for providing a complete system that incorporates all specification requirements, including but not limited to:

* Provision of MMS components that meet the functional requirements (see Section 5)
* Provision of all Project Management services (see Section 6.1)
* Provision of all Testing services, up to and including the System Acceptance Test (see Section 6.2)
* Provision of all Installation and Configuration services for the MMS (see Section 6.3)
* Provision of all Documentation for the MMS (see Section 6.4)
* Provision of all Training and associated Documentation for TCAT personnel (see Section 0)
* Provision of Warranty for all equipment and software, up to and following System Acceptance, and provision of a System Warranty following System Acceptance (see Section 7.1)
* Provision of all Spare Parts for the MMS (see Section 7.2)
* Provision of Technical Support services following System Acceptance (see Section 7.3)

## Scope of Options

The following technologies comprise the Optional System Components for the MMS:

* Central Systems
	+ Interface with CAD/AVL System
	+ Interface with Accounting System, and
	+ Interface with Payroll System
* Garage Systems
	+ Handheld Inventory Scanners(2) and Printer
* Field Systems
	+ Portable Maintenance Application

TCAT would like to consider a TCAT local site installation system solution where the systems are hosted at TCAT facilities, and this is included as an option that would replace the vendor hosted solution envisioned under the base system.

### Contractor Responsibilities

For the options, the Contractor shall be responsible for providing the additional functionality and services envisioned to enable a complete system that incorporates all specification requirements under the selected options, including but not limited to:

* Provision of Project Management, Testing, Installation and Configuration, Documentation, Training, Warranty, and Support (see Section 8.1)
* Provision of optional interface functionality through the MMS components that meet the functional requirements (see Section 8.2)
* Provision of additional equipment and software upgrade or integration services to enable the use of garage equipment with the MMS as optional functionality through the MMS components that meet the functional requirements (see Section 8.3)
* Provision of additional equipment and software upgrade or integration services to enable the use of field equipment and applications with the MMS as optional functionality through the MMS components that meet the functional requirements (see Section 8.4)
* Provision of site installation approach network equipment and services

## TCAT Roles and Responsibilities

Through its authorized agents and representatives TCAT will:

* Assign a Project Manager with the authority to make decisions (and/or designate representatives with such authority) on behalf of TCAT;
* Participate in all scheduled project activities, attend scheduled meetings and promptly respond to new meeting requests, requests for information, technical support or other necessary communication activities;
* Provide basic infrastructure (power, space, access) required at each facility for installation of System equipment and for Training;
* Provide necessary information and access to EasyBus and EasyInventory to allow for the interface development between those systems and the MMS
* Provide staff, vehicles, and facilities for all Training held in accordance with the Training Plan; and
* Participate and approve the results of all tests, in accordance with the Test Plan.

TCAT will assist the Contractor in:

* Obtaining necessary permits or permissions for any activities requiring outside authorization;
* Coordinating logistical arrangements to receive project related equipment at project facilities;
* Providing access to TCAT locations as required;
* Scheduling and coordination of the actual equipment installation;
* Timely acquisition of required technical data from TCAT or other parties;
* Obtaining any new, changed, or updated operational information necessary to the Contractor to configure and initialize the system; and
* Scheduling and coordination for staff participating in training sessions as per the agreed training schedule.

Part II: Project Base System Requirements

# Maintenance Management System Requirements

## Functional Requirements

|  |  |  |  |
| --- | --- | --- | --- |
|  | Central Components | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | *General* |  |  |
|  | The Central components shall include all the necessary software and hardware required to provide MMS functionality as outlined in the project requirements. |  |  |
|  | At the Contractors expense, the Contractor shall either provide its proposed system’s source code to TCAT, establish an escrow account with the exact version of the source code being implemented at TCAT, or provide an alternative solution to ensure that TCAT has unrestricted access to and use of the source code if the Contractor ceases to exist, ceases to support the application, or otherwise terminates its relationship and/or ownership to the product. The details shall be finalized under an agreement acceptable to both parties prior to System Acceptance.  |  |  |
|  | TCAT shall own and have unlimited, perpetual, and royalty-free rights to access all data within the proposed system. The Contractor shall not be permitted to share or otherwise use data for purposes outside those outlined in the project requirements without the express written consent of TCAT. |  |  |
|  | The Final Design of the Central components shall be subject to agreement during the Design Review process. |  |  |
|  | The Contractor shall provide a data dictionary and Entity Relationship Diagram (ERD) for all databases and system data detailing all database entities, and documentation for all data exchange interfaces, logs and data fields, and data feeds. |  |  |
|  | All database transactions within the production software shall be completed within five (5) seconds of user entry. |  |  |
|  | It shall be possible to recover and transfer data files from a backup archive after a primary data storage failure. |  |  |
|  | All databases shall be Open Database Connectivity (ODBC) compliant. |  |  |
|  | All software shall integrate with standard printer drivers at TCAT to allow reports to be printed directly from within the software. |  |  |
|  | All user interfaces shall comply with the Americans with Disabilities Act (ADA) and ADA Accessibility Guidelines. |  |  |
|  | The system shall provide transaction audit trails within the Central software to maintain audit trails and produce audit reports identifying when system maintenance was performed (user, date, action, for all work orders, purchase orders and other human interactions with the MMS). The audit trail practices should meet NY State financial audit requirements. |  |  |
|  | The Central software shall provide a customizable on-line help system that supports site-specific procedures and instructions. |  |  |
|  | *User Account Control and Administration* |  |  |
|  | The Central software shall enable role-based access control to allow the system administrator to delegate management of certain user access permissions to other authorized users. |  |  |
|  | The Central software shall enable the roles identified in Appendix C to perform their jobs as described. |  |  |
|  | The Central software shall allow the system administrator to manage user access permissions for specific user groups based on but not limited to:* Vehicle type
* Garage (TCAT and Gadabout)
 |  |  |
|  | The Central software shall enable users to access data and information stored for only authorized vehicle types or garages. As an example, Gadabout service authorized users should only be able to access information about Gadabout related vehicles and maintenance activities.  |  |  |
|  | The Central software shall provide a single-point interface for the management of user accounts, groups, and associated privileges. |  |  |
|  | All Central software shall be accessible only to authorized users as per their assigned access permissions.  |  |  |
|  | All Central software components shall authenticate users via a secure logon and password. |  |  |
|  | All Central software components shall record all logons and logon attempts in the Central software database. |  |  |
|  | All Central software components shall lock out the user after a number of successive failed logon attempts within a set time frame. The number of permissible failed logon attempts and the time frame shall be configurable by TCAT. |  |  |
|  | The system shall allow concurrent users from TCAT full access to the system at any given time to input, retrieve, access, modify, and print data based on their account privileges. |  |  |
|  | All Central software components shall continuously monitor for unauthorized access to managed functions. |  |  |
|  | *Data Import* |  |  |
|  | The Contractor shall provide tools to import data from external data files (stored in electronic formats such as csv, .xls, .txt and databases such as Microsoft Access) into the MMS database.  |  |  |
|  | The Contractor shall import the following information into the MMS as part of the initial configuration setup:* Vehicle fleet information
* Staff information
* Inventory information
* Work order categories
* Road call categories
* Existing historical information from EasyBus, EasyInventory, and FleetMax software
* The Road Calls database and the Project Management Plan database developed by TCAT
 |  |  |
|  | The data imported shall include up to 15 years of vehicle fleet historical data. This includes high level summary and does not include detailed log book information. |  |  |
|  | The imported data shall be utilized by the MMS and shall allow for contextual selection by users (e.g. selection of work order categories within the work order creation and update interface). |  |  |
|  | Vehicles and Assets Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | *Vehicle Management* |  |  |
|  | The MMS shall enable users to electronically add, edit, store, view, query, and run reports on vehicle information and associated maintenance history for all vehicles, including:* TCAT buses
* Gadabout vehicles
* TCAT administrator and supervisor cars
* TCAT trucks (towing and other purposes)
* Any other vehicles to be added to TCAT fleet
 |  |  |
|  | The system shall provide the ability to add, edit, store, view, query, and run reports on at least the following static data about vehicle assets:* Make and Model;
* Model year;
* Vehicle identification number (VIN)
* Date when vehicle was purchased;
* Vehicle size;
* Number of seats, and wheelchair capacity;
* Fuel type;
* Owner (agency or contractor);
* Garage
* Registration status and tag number;
* Vehicle insurance information.
 |  |  |
|  | The system shall provide the ability to add, edit, store, view, query, and run reports on at least the following real-time and historical data about vehicle assets:* Mileage
* Fault and damage history
* Preventative maintenance history
* Ad-hoc maintenance history
* Work order history
* Road call information

The system shall allow users to access further historical details about each of the data fields. |  |  |
|  | In addition to the above fields, the system shall be capable of tracking up to 10 custom fields per vehicle asset. Custom fields shall be modifiable by TCAT.  |  |  |
|  | The system shall have the ability to schedule user alerts regarding vehicle data fields based on configurable data thresholds. Examples of alerts based on vehicle fields and thresholds include:* Expiry date of insurance or registration
* Preventative maintenance due date based on mileage
 |  |  |
|  | The system shall allow users to view open and closed vehicle component issues and repair history. |  |  |
|  | The system shall provide the ability to schedule multiple time-based alerts for each data field. The alerts may be in the form of pop-up alerts when personnel log-on, email alerts, audible indications, or other means. The design of the alerts shall be developed during design review as per TCAT needs. |  |  |
|  | The system shall provide email notifications to identified users for vehicles that are due for:* DOT inspection,
* Brakes inspection, and
* Preventative maintenance based on mileage.

Email notifications shall include an automatic generated report that consists of the list of vehicles and their corresponding information. |  |  |
|  | The system shall provide a notification to the user on upcoming vehicle inspection due dates and reason when a vehicle work order is open.  |  |  |
|  | The system shall provide the ability to define vehicle availability by a service level for daily rundown (e.g., Weekday/Saturday service or night service). |  |  |
|  | *Assets Management* |  |  |
|  | The system shall allow TCAT to define details about other assets that include at least the following:* TCAT facilities;
* Stop signs;
* Electronic assets which include at least the following:
	+ Existing and future electronic vehicle components; and
	+ Electronic stop signs
 |  |  |
|  | The system shall provide the ability to add, edit, store, view, query, and run reports on the following data regarding any asset acquisition and disposal:* Acquisition date;
* Acquisition cost;
* Seller;
* Purchase order number;
* Title
* In service date;
* Out of service date
* Disposal date
* Disposal reason
* Disposal cost; and
* Disposer
 |  |  |
|  | Tasks Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | *Work Order Generation and Management* |  |  |
|  | A work order module shall be used to generate, view, edit, track progress of, and develop queries and reports on work orders for all TCAT maintenance tasks, including daily activities, preventive maintenance (PM) activities, road calls, repairs and Department of Transportation (DOT) inspections.  |  |  |
|  | In addition to single-job work orders, the MMS shall also allow for the mass-generation of work orders to efficiently initiate and track projects and campaigns across a user-defined group of equipment. |  |  |
|  | The system shall provide the flexibility to manually and automatically generate work orders.  |  |  |
|  | The work order shall include at least the following data:* Repair location (in-house or external);
* Billing code,
* Problem type,
* Personnel assigned,
* Personnel jobbed-on,
* Priority codes,
* Specialty codes,
* Budgets for material and labor,
* Start and completion date and times,
* Total work order charges
* Internal work order charges (ex. Labor and material charges)
* External work order charges (ex. Towing charges)
* Vehicle, and
* Vehicle Number
 |  |  |
|  | The MMS shall provide the capability to create, schedule, update, print, review, close and reopen closed work orders for preventative, corrective (repairs), and emergency maintenance (road calls), as well as projects/campaigns and DOT inspections. |  |  |
|  | Information to be incorporated in a work order shall include the vehicle(s) or equipment to be worked on, the procedure and tasks, the parts required, any special tools required, and the amount of labor hours allocated. |  |  |
|  | Project/Campaign work orders shall allow for tracking of, at a minimum, project progress, percentage of project work performed at any time, vehicles with completed maintenance, vehicles yet to be worked on, as well as labor hours and parts used. |  |  |
|  | The MMS shall support various types of work orders and shall use data from various subsystems to provide additional information and take action on tasks required to support the work order. |  |  |
|  | Each work order shall track multiple reasons for repair, multiple job types, job estimates, and unlimited technicians, labor charges, and parts. Work order estimates shall be able to track labor rates at standard and overtime hours. |  |  |
|  | The work orders module shall provide reporting to monitor the work order process by task and exception. The system shall allow multiple personnel to be simultaneously logged in to one work order, but shall not allow any personnel to be logged in to multiple work orders simultaneously. |  |  |
|  | The system shall provide the functionality to project labor demands for any future time period based upon open work orders.  |  |  |
|  | The system shall enable staff of a designated authority level (typically maintenance managers) to review, edit, and finalize work orders prior to closing them. |  |  |
|  | As work orders are closed, accomplished tasks shall be written to a historical database identified by vehicle number or assembly serial number.  |  |  |
|  | Deferred tasks shall be maintained as open items. |  |  |
|  | The system shall provide the capability to view all planned work orders within a configurable future time duration (e.g., day, week, month or a date range).  |  |  |
|  | The system shall provide the ability to search work orders by the following: part number, vehicle, work order number, maintenance technician, repair date, and repair site. |  |  |
|  | The system shall allow maintenance staff to define its fiscal calendar and billing cycle(s).  |  |  |
|  | Work orders shall span fiscal years, enabling the current billing year to be closed, even if open work orders exist.  |  |  |
|  | The system shall allow TCAT staff to allocate funds and charge against these allocations for fuel, capital equipment expenditures, maintenance services, commercial repairs, accident repairs, overhead, and daily rental fees. |  |  |
|  | The system shall schedule employees by ability and qualification to perform work (skill level) and labor hours available.  |  |  |
|  | Scheduling of work shall also accommodate local, state and federal labor standards requirements. |  |  |
|  | The system shall provide prefilled contextual work order task menus associated with vehicle types and shall utilize dropdown menus and prefilled information wherever possible. |  |  |
|  | The system shall allow for descriptive tags to standardize notation and tracking of tasks. |  |  |
|  | The system shall minimize the amount of data entry by utilizing visuals of vehicles and vehicle components, and predefined vehicle failure codes for vehicle and vehicle components. |  |  |
|  | *Daily Activities and Preventative Maintenance Scheduling* |  |  |
|  | The MMS shall schedule daily and weekly regular preventative maintenance on vehicles, stop signs, and other asset information. |  |  |
|  | The MMS shall automatically calculate the preventative maintenance due date. The frequency of preventative maintenance and vehicle inspections shall be configurable by TCAT.  |  |  |
|  | The MMS shall be able to accommodate automatically scheduling maintenance and inspections relative to a vehicle’s most recent inspection or preventative maintenance. This will allow TCAT to specify that, for example, maintenance is required after 6,000 miles following the vehicle’s most recent inspection. |  |  |
|  | The MMS shall schedule preventative maintenance work orders based on frequency of days, hours, mileage information, fuel consumption, brakes status and other major components status. |  |  |
|  | The MMS shall schedule preventative maintenance based on established hierarchies. |  |  |
|  | The MMS shall provide the ability to generate an automatic prioritized list of daily activities at the beginning of each day/shift. |  |  |
|  | The MMS shall generate automatic alerts when regular preventative maintenance activities are coming up, are due, or are late. |  |  |
|  | The MMS shall be capable of automatically generating and printing work orders for scheduled preventative maintenance and daily activities. |  |  |
|  | The MMS shall expediently generate proof of maintenance. |  |  |
|  | The MMS shall accommodate assigning maintenance to a particular vehicle, performed as a one-time event (non-routine). |  |  |
|  | The MMS system shall provide instructions for scheduled maintenance to be performed. |  |  |
|  | The MMS shall identify parts required for scheduled maintenance. |  |  |
|  | The MMS shall accumulate the labor and parts cost for scheduled maintenance. |  |  |
|  | The MMS shall keep track of outside contractor work. |  |  |
|  | *Road Calls* |  |  |
|  | The MMS shall allow users to schedule work orders for road calls, and store associated vehicle status (mileage, block/route/operator, time of day), fault and damage information. |  |  |
|  | The Contractor shall import road call categorization and coding information into the MMS, and shall enable users to categorize road call work orders according to the imported information using a contextual user interface (such as the Road Calls database and the Vehicle Health Monitoring system within the CAD/AVL system). |  |  |
|  | The MMS shall enable users to manually input information related to road calls, including location of vehicle, block/route/operator, time of day, road call type, and fault/damage information. |  |  |
|  | *Repairs Management* |  |  |
|  | The MMS shall allow work orders to be generated for all vehicle fault and damage repair activities and shall associate the information with the corresponding vehicles. |  |  |
|  | The system shall allow users to view open and closed vehicle component issues and repair history. |  |  |
|  | *DOT Inspections Management* |  |  |
|  | The MMS shall allow designation of vehicles for DOT inspections and scheduling of corresponding work orders. |  |  |
|  | The MMS shall allow users to input, edit, store, review, query, and run reports on DOT inspection work orders for each vehicle, historical DOT inspection information and inspection results (e.g. pass, fail, reported issues). |  |  |
|  | Parts Inventory, Warranty and Vendor Information Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | *Parts Inventory Management* |  |  |
|  | The system shall enable users to manage parts inventory, including providing capabilities to check-in and check-out parts, automatically associate parts with work orders and tasks, and provide low inventory alerts.  |  |  |
|  | The system shall allow TCAT to quickly search for the location, in stock quantity and details of a part by manually entering invoice number, order number, part category, part number, or part vendor into the system or by scanning the part barcode using a handheld inventory scanner. |  |  |
|  | The system shall allow real-time inventory tracking during all stages of parts ordering, shipment, arrival, storage, sign-out and installation. |  |  |
|  | The system shall have the ability to keep track of stock level for all maintenance parts and shall provide a stock summary when requested.  |  |  |
|  | The system shall allow automated association of parts with work orders, maintenance staff and vehicle/equipment. |  |  |
|  | The system shall track the stock level and alert TCAT through email notifications when the level drops below a predefined-threshold. |  |  |
|  | The system shall analyze usage rates of parts such that future stock levels can be estimated and reported based on current usage levels. |  |  |
|  | Transactions affecting inventory levels shall be tracked according to financial reporting periods (i.e. fiscal years). TCAT shall be able to designate reporting periods at “Open” or “Closed.” No retro-active transactions or inventory adjustments shall be allowed within “Closed” reporting periods. |  |  |
|  | Parts manuals and maintenance related information shall be stored electronically and easily accessible. |  |  |
|  | *Parts Warranty Management* |  |  |
|  | The system shall enable users to add, edit, store, view, query, and run reports on parts warranty information on all different parts of vehicle including but not limited to: air conditioning, engines and transmissions.  |  |  |
|  | The system shall provide the ability to add, edit, store and view at a minimum the following data for standard and extended warranty:* Start date of warranty
* End day of warranty
* Warranty type
* Part Brand
* Vendor information
 |  |  |
|  | The system shall display a notification to TCAT when accessing parts information that are about to expire. The notification shall only be displayed at a predefined interval from the date when the warranty for parts is about to expire. |  |  |
|  | *Vendor Information Management* |  |  |
|  | The system shall enable users to add, edit, store, view, query, and run reports on vendor contact information. |  |  |
|  | The system shall be capable of tracking a vendor’s status as a Disadvantaged Business Enterprise (DBE) organization. |  |  |
|  | The system shall provide the ability to record and review vendor equipment purchase details, sale and shipment record. |  |  |
|  | The system shall provide the ability to store warranty and return policies by vendor and vendor equipment. |  |  |
|  | *Purchase Order Management*  |  |  |
|  | The system shall provide the capability to manually and automatically generate purchase orders when the quantity of maintenance parts drop below a defined threshold, as well as add, edit, store, view, query, and run reports on purchase orders.  |  |  |
|  | The automatically generated purchase orders shall be reviewed by authorized TCAT staff before finalization. |  |  |
|  | The system shall be able to track and run reports on total procurement time on a part-by-part basis.  |  |  |
|  | The system shall provide the ability to track the entire procurement workflow, which shall include at least the following steps:* Purchase order/Invoicing status
* Order status
* Shipment/delivery status
* Post-delivery inspection status
 |  |  |
|  | Real-time inventory purchasing information shall be visible to users based on their access level.  |  |  |
|  | The system shall interface with the accounting system for sending purchase order information. |  |  |
|  | Human Resources Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The system shall enable users to import human resource information from a payroll management system, track staff’s individual skill levels, specialties and labor rates, and enable users to add, edit, store, view, query, and run reports on staff.  |  |  |
|  | The system shall be capable of input and storage of staff skill levels and specialties. It should allow maintenance staff to assign specific tasks based on their individual specialties and skill levels. |  |  |
|  | The system shall also allow for automated and easy entry of start (logon) and end (logoff) times on work orders for staff, and enable benchmarking and performance reporting for labor based on work orders. |  |  |
|  | The system shall provide accurate calculation of labor hours and the corresponding labor costs through work order logon and logoff timings. |  |  |
|  | The system shall allow for the tracking and reporting of staff performance and benchmarking by tasks. |  |  |
|  | The system shall allow multiple staff to work on a single work order. |  |  |
|  | Document Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The system shall allow attachment of relevant documents to at least the following components of MMS:* Parts inventory (e.g., schematics, manufacturer sheets)
* Work order (e.g., defect card, incident report)
* Asset inventory (e.g., vehicle insurance, registration, equipment sheets, vendor)
* Vendor management (e.g., warranty policies, product details/brochures)
* Warranty management (e.g., warranty policy)
* Purchase order management
 |  |  |
|  | The system shall allow users to view stored documents as necessary. |  |  |
|  | Data Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The system shall have the capability to import existing maintenance-related data (e.g. maintenance history), that is identified by TCAT as necessary to make the system operational. The Contractor shall provide information on the necessary data required to make the system operational and then identify with TCAT’s staff, what data will be available from current systems, and what data may have to be developed. Once the data conversion specifications are completed, the Contractor shall be responsible for importing the existing data into the new MMS. Further, the Contractor shall be responsible for cleaning data before and after importing the data, as necessary. |  |  |
|  | The system shall track data modification by user and provide an audit-trail report. |  |  |
|  | The system shall provide the ability to close data modifications for a configurable time-period and prohibit any retroactive adjustments once modification is closed. |  |  |
|  | The system shall provide the capability to summarize data for departmental reporting requirements. |  |  |
|  | Reporting | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Proposers shall provide a list of standard reports available in their solution. |  |  |
|  | The MMS Central Software shall provide a web-based reporting tool to allow for access from any workstation. |  |  |
|  | The system shall allow users to create graphical reports that include color-coded charts and graphs.  |  |  |
|  | The MMS Central Software shall allow users to generate reports from within the software. |  |  |
|  | The system shall have built-in report writing capability and shall provide the TCAT with the capability to create ad-hoc reports to meet specific needs. |  |  |
|  | The system shall have the capability to schedule and generate batch report runs without disrupting user sessions. |  |  |
|  | The system shall have the capability to schedule automatic generation of off-line reports or lengthy reports for off-peak hours. |  |  |
|  | All reports shall use standard reporting tools (e.g., Crystal Reports or MS Access) and shall have the ability to export data into file formats that can be viewed with a web browser or viewed and edited with standard office software (e.g., Microsoft Internet Explorer, Word and Excel versions used by TCAT). |  |  |
|  | Reports shall be easy to print, export for use in a standard spreadsheet or word processing applications, or convert to other formats for emailing. End users of reports shall have a variety of export formats available to choose from including .csv, .doc, .pdf, .txt and .xls. |  |  |
|  | The MMS Central Software shall be capable of establishing automatic hourly, daily, weekly, monthly, quarterly routines to automatically produce and email standard reports to defined user groups. |  |  |
|  | The MMS Central Software shall provide at least the following reports, to be developed in coordination with TCAT:* Maintenance reports including reports by vehicle, task, open road calls, and maintenance staff. E.g. vehicles with upcoming PMs, DOT inspections,
* Reports on buses available/unavailable, buses under maintenance, buses in service and waiting on parts (“Tripper List”), garage (in-house) work and off-property (external vendor) work,
* Reports on individual vehicle components PM status, such as brakes life, DEF status, etc.,
* Reports on labor performed on vehicles by day, week, month and individual(s) that performed the labor,
* Reports on individual staffs’ labor performed by day, week, month and labor performed by vehicle,
* Reports on staff performance, productivity, task benchmarking, etc.
* Reports on common maintenance issues,
* Management reports including high-level status of PMs, DOT inspections, budgetary reports, maintenance performance, bus performance, inventory utilization etc.
* Reports required by other departments including accounting, human resources (staff time and performance), etc.
* Reports on inventory purchase orders for each different type of TCAT vehicles as well as for Gadabout vehicles.
* Reports on inventory purchase orders finalized or outstanding within a user defined time span
 |  |  |
|  | The MMS shall provide the ability to generate reports on DOT inspection results and details of the potential issues identified and addressed. |  |  |
|  | The system shall be able to generate reports on a monthly basis, listing vehicles which are due for a renewed registration.  |  |  |
|  | The system shall be able to generate reports on a monthly basis, listing vehicles which are due for maintenance. |  |  |
|  | The MMS Central Software shall provide an easy to use utility to create ad hoc custom reports using any data stored within the system database. |  |  |
|  | The MMS Central Software shall generate reports combining live database and historical (e.g. archived database) data. |  |  |
|  | The reporting system shall be able to integrate with the MMS system and query data from multiple sources. |  |  |
|  | The MMS Central Software operation shall not be impacted by the generation of reports using live MMS data. |  |  |
|  | Interfaces | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The contractor shall list all systems the MMS can be integrated to in the future. |  |  |
|  | *Interface with the Fuel Management System* |  |  |
|  | The system shall be capable of receiving information from the Fuel Management System for the purposes of sharing and synchronization of information.  |  |  |
|  | Synchronization and sharing of data shall be in real-time and shall include: fuel information, mileage information and vehicle information. |  |  |

## IT and Communication Requirements

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The system shall be developed, tested, implemented, and hosted utilizing a remote hosting approach, whereby the Contractor provides remote hosting of the system and enables TCAT users to access all system capabilities through their communications network. |  |  |
|  | The system shall include all necessary hardware and software to ensure the functionality of all Base System Components as per the System Availability, Performance, and Security requirements outlined below. |  |  |
|  | The system shall consist of two independent environments, a production environment and a development environment. The production environment shall be utilized for all live system components. |  |  |
|  | The development environment shall be utilized for software update verification and testing. Changes made to the development environment shall not impact the “production” (live) system.All future updates or upgrades shall be tested in the test environment and certified before being implemented on the production environment |  |  |
|  | The system shall include all necessary data connectivity between systems’ fixed and mobile elements. |  |  |
|  | All system components and communication infrastructure shall not interfere with the existing and separate voice radio and WLAN access point systems.  |  |  |
|  | All system components and communication infrastructure shall not subject the existing and separate voice radio and WLAN access point systems to harmful interference, or be impacted by their radiations. |  |  |
|  | All communications infrastructure provisions shall be: * Non-proprietary;
* Widely-recognized standards-based;
* Interoperable (as required);
* Readily scalable; and
* Readily upgradeable.
 |  |  |
|  | All data transfer shall be completed over local WLAN infrastructure, where available, to minimize cellular data charges. |  |  |
|  | Any cellular data communication shall employ a secure connection. |  |  |
|  | The Contractor shall establish and maintain all necessary cellular data contracts, including activation and monthly charges, until System Acceptance. |  |  |
|  | Hosted System Requirements | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The system shall be fully hosted by the Contractor until the system implementation and subsequently hosted as per the Service Agreement referenced under Section 5.2.7. |  |  |
|  | The Proposers shall clearly define the approach for software hosting and access in their proposal (e.g., Citrix’s independent computing architecture [ICA] protocol, Microsoft’s remote desktop protocol [RDP] over secure VPN connection, completely web-based application accessible via hypertext transport protocol secure [HTTPS]) on latest standard web browsers (e.g., Microsoft Internet Explorer, Mozilla Firefox, Google Chrome and Apple Safari). |  |  |
|  | For a hosted solution, Proposers shall describe the minimum computer hardware and browser requirements (e.g., java run-time environment [JRE] for java-based web applications). |  |  |
|  | The Contractor shall develop and propose a plan to ensure high availability and redundancy of the system in case of any impact to the hosting site that causes the solution to be unavailable. |  |  |
|  | The Contractor shall only implement the hosting upgrades upon TCAT approval. Following installation of the upgrade, the Contractor shall provide supporting material and shall be responsible for ensuring system availability. |  |  |
|  | Software Requirements | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The MMS shall operate on MS Windows 7 or Windows 10 operating system environment, as designated by TCAT. |  |  |
|  | Application server software shall support 32bit and 64bit computing.  |  |  |
|  | All software shall be the current version in production at the time of installation.  |  |  |
|  | All software shall contain version control numbers and features shall be provided to identify and verify the version control numbers on all software. |  |  |
|  | Application software and associated licenses shall be portable (i.e. the source code and license shall be transferable to other computers using the same hardware and operating system without the need for a new license). |  |  |
|  | The Contractor shall have existing scheduled routine maintenance and emergency situation management plans. Proposers shall submit maintenance schedules and emergency plans with their proposal for TCAT review. |  |  |
|  | The Contractor shall provide a reliable method for telephone problem notification. Maintenance issues should be resolved in a timely manner, as agreed to per the TCAT-approved maintenance plans. |  |  |
|  | The Contractor shall designate a specific Technical Support contact person (e.g., an account manager) to handle all TCAT reported issues. This contact person should be the first point of contact for the TCAT to report all new issues and to follow up on previously reported issues and shall be available during normal TCAT service operating hours. |  |  |
|  | The Contractor shall notify the TCAT of the availability of enhancements, releases, and newer versions of the software (including third party software), including all bug fixes, patches, and modifications, or any modifications to the hosting system. |  |  |
|  | The Contractor shall conduct all testing to ensure the enhancements or upgrades do not impact the system.  |  |  |
|  | The Contractor shall only implement the enhancements upon TCAT approval. Following installation of the enhancement, new release, or new version, the Contractor shall provide supporting material and shall be responsible for ensuring system availability. |  |  |
|  | The Contractor shall provide, license, install, and integrate all released software patches and updates for the proposed solution |  |  |
|  | System Availability | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The proposed system shall provide 24-hour per day, 365 days per year operation. |  |  |
|  | The Central components shall have a minimum System Availability of 99.9%.System Availability shall be defined as the percentage of time that a system is performing all required functions in accordance to the requirements in Section 5.2.4 System Performance. System Availability calculations shall not include planned maintenance time if it falls out of TCAT business hours. |  |  |
|  | System Performance | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Any communications infrastructure shall comply with all applicable local, state, and federal standards and regulations. |  |  |
|  | The end-user software modules shall perform with little-to-no discernible latency (response time of roughly 150ms or less, excluding delays in internet service not controlled by the Contractor) when performing basic functions such as navigating between modules. |  |  |
|  | The Contractor shall be able to measure data input/output latency on their servers, and provide these statistics accurately for the purpose of assessing performance against requirement 5.2.4.2. |  |  |
|  | Central components shall be designed to allow for at least 10 simultaneous users without a noticeable reduction in system response times, to facilitate future expansion |  |  |
|  | The Contractor shall electronically monitor all servers, routers, switches, data center security, and facility power 24 hours a day, 365 days a year. If there are any out of tolerance conditions with any server components, the Contractor shall automatically notify its technical support. The Contractor’s technical support must respond to these issues within one hour of notification. |  |  |
|  | The system shall include tools necessary to track and report on the following metrics, at a minimum:* System availability (based on requirements outlined above);
* System usage (data usage, server usage, etc);
* System security breaches and attempted breaches;
* System errors (server hardware/software malfunctions);
* Average response time;
* Central Software user IP addresses; and
* Virtual Private Network (VPN) connections.
 |  |  |
|  | Planned Maintenance | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Planned maintenance shall be limited in in frequency and duration during out of business hours, defined by TCAT, to minimize the impact on system users.  |  |  |
|  | Planned maintenance activities shall be scheduled at a mutually agreed time, with confirmation issued to TCAT by email notification, at least 72 hours in advance of the start of any impact on system functionality. |  |  |
|  | All planned maintenance schedules shall define start and end times and dates. |  |  |
|  | The Contractor shall manage the implementation of critical software patches on a regular and timely basis during the planned and scheduled regular maintenance periods. |  |  |
|  | Proposers shall describe their maintenance update and upgrade approach in their proposal along with the costs for updates and upgrades. |  |  |
|  | Service Agreement | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide 3 years of initial hosting service to TCAT. The hosting service shall start from System Acceptance as part of the initial service agreement, with pricing for an option to renew for 4 additional 2 year terms.  |  |  |
|  | Hosting shall be conducted as per the contractually agreed service agreement. At TCAT’s option, the Contractor shall provide a one-time option to transition from a hosted approach to a TCAT local site hosted approach. |  |  |
|  | Service levels shall be regularly monitored and quantified by the Contractor in terms of system availability on a monthly basis for as long as TCAT is contracting the hosted service to the Contractor. |  |  |
|  | If measured system availability falls below thresholds defined in section 5.2.3 System Availability, or the system is unavailable for 1 or more hours during TCAT’s normal operating hours then the Contractor shall provide written information on the underlying causes.  |  |  |
|  | In the case of repeated system availability failures, the TCAT Project Manager shall issue a written warning to the Contractor and request that the Contractor provide a remediation plan to bring the software availability to the levels specified in the Contract. The Contractor shall provide TCAT with a written remediation plan within 15 days of receipt of the letter from TCAT. TCAT shall review and must approve the remediation plan prior to implementation.  If TCAT provides comments to the plan, then the Contractor must respond to those comments within 7 days.  The Contractor shall implement the plan immediately upon receipt of plan approval by TCAT.  |  |  |
|  | In the case where there are 10 or more unresolved service tickets with the Contractor and each of those tickets have been unresolved for 30 days or more, the TCAT Project Manager shall issue a written warning to the Contractor and request that the Contractor provide a remediation plan within 15 days, to remediate all of the issues related to these service tickets. Contractor shall submit a written remediation plan to TCAT within 15 days of receipt of the letter from TCAT. TCAT shall review and must approve the remediation plan prior to implementation.  If TCAT provides comments to the plan, then the Contractor must respond to those comments within 7 days.  The Contractor shall implement the plan immediately upon receipt of plan approval by TCAT.  |  |  |
|  | The Contractor shall provide the following support levels: * Urgent Care
* Routine Care
* General Provisions
 |  |  |
|  | The Contractor shall provide support, including technical support for all proposed hardware and software. |  |  |
|  | Support services shall be initiated by a user through a 24/7 support line. |  |  |
|  | TCAT shall be able to view the status of their support request(s) at any time through an online tracking system which the Contractor shall provide. |  |  |
|  | System Operations Support | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide user and technical support 24 hours per day and 7 days per week, until the contract is completed and all executed support options are complete. |  |  |
|  | TCAT users shall be able to directly reach Contractor support through a toll-free telephone number and an on-line system at all times. |  |  |
|  | The Contractor shall be able to remotely access the user’s screen during support, if needed. The Contractor shall work with TCAT to ensure that all connections are secure. |  |  |
|  | All calls and on-line support provided shall be logged by the Contractor. Issues and Action items shall be tracked and logged. The log shall be accessible 24/7 for TCAT Users to query. |  |  |
|  | In the event of maintenance, modification, or replacement of the issue tracking system, all issues and action items shall be preserved and migrated; all open items shall remain open. |  |  |
|  | No item on the issue tracking system shall be closed without the specific approval of TCAT. |  |  |
|  | The criticality of system errors shall be determined and assigned by TCAT, based on operational need, assessed in terms of how fundamental the process or function is to the performance of the system, and the degree to which TCAT operations are impacted by the error |  |  |
|  | In no instance shall any service ticket remain unresolved for 180 days or more. If a valid service ticket remains open for 180 days or more, then the TCAT Project Manager shall issue a written warning to the Contractor and request that the Contractor provide a remediation plan within 15 days, to remediate the issue related to this service ticket. Contractor shall submit a written remediation plan to TCAT within 15 days of receipt of the letter from TCAT. TCAT shall review and must approve the remediation plan prior to implementation.  If TCAT provides comments to the plan, then the Contractor must respond to those comments within 7 days.  The Contractor shall implement the plan immediately upon receipt of plan approval by TCAT.  |  |  |
|  | For Urgent Care Support (Severity 1), TCAT shall contact support line. Support line shall offer immediate resolution. If immediate resolution is not possible, within 1 hour a qualified engineer shall log into the system and diagnose the problem. A resolution strategy, that shall detail the scope and duration of the solution, shall be presented to TCAT within 8 hours of notification, with the solution time not exceeding 24 hours.An Urgent Care Support is defined as support required for error that renders the system or a core function unusable. The set of functions designated as core shall be as agreed upon during the system design. |  |  |
|  | For Routine Care Support (Severity 2), TCAT shall contact support line. Support line shall offer resolution within 4 hours. If resolution is not possible, within 1 day a qualified engineer shall log into the system and diagnose the problem. A resolution strategy, that shall detail the scope and duration of the solution, shall be presented to TCAT within 1 day of notification, with the solution time not exceeding 3 days.A Routine Care Support is defined as support required for error that severely impacts the core functions by slowing them down to perform outside of the performance requirements of this contract. A workaround might be available for the impacted core functions. The set of functions designated as core shall be as agreed upon during the system design. |  |  |
|  | For General Provisions Support (Severity 3), TCAT shall contact support line. Support line shall offer resolution within 1 day. If resolution is not possible, within 5 days a qualified engineer shall log into the system and diagnose the problem. A resolution strategy, that shall detail the scope and duration of the solution, shall be presented to TCAT within 10 days of notification, with the solution time not exceeding 30 days, without written authorization of TCAT.A General Provision Error is defined as support required for error that affects system operation or functionality in any way but is not a Routine Care or Urgent Care Error. |  |  |
|  | Data Ownership, Retention and Access | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | All system data shall be owned by TCAT, with the rights and ability to access all data, export it to other applications, and allow access to third parties for integration purposes on a perpetual royalty-free basis. |  |  |
|  | The Contractor shall provide a comprehensive data archive, backup, and recovery plan and the equipment and systems necessary to implement that plan. |  |  |
|  | The system shall contain an Active-Passive Disaster Recovery (DR) function. A copy of the most current version of the MMS software shall exist on a Contractor hosted remote disaster recovery site. In the event of a disaster, the system shall have a Recovery Time Objective of 24 hours, with a Recovery Point Objective of at most one day of data loss. |  |  |
|  | TCAT shall be able to upload/download as much data as desired in transactions with the system. The Contractor shall not apply any usage restriction or fee. |  |  |
|  | The Contractor shall not modify the data structure without the consent of TCAT. For any TCAT-approved modification to the data structure, TCAT shall be given notice 60 days in advance, in order to make corresponding accommodations/ modifications. |  |  |
|  | Data uploading and downloading transactions shall meet or exceed minimum service levels, defined as:* Minimum 100 megabits-per-second data transfer speed
 |  |  |

## Physical Requirements

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | All hardware equipment and components provided shall be new. |  |  |
|  | System components shall be built in accordance with best commercial practice. |  |  |
|  | All external screws, nuts, and locking washers shall be stainless steel or an approved alternate non-corrosive material; no self-tapping screws shall be used unless specifically approved. |  |  |
|  | All materials used shall be either inherently corrosion resistant or either treated or coated to resist corrosion. |  |  |
|  | All functionally identical devices, modules, assemblies and components shall be fully interchangeable between all equipment provided under this contract. |  |  |
|  | All modules and assemblies shall be connected using standardized durable, positive-locking, indexed quick disconnect connectors. Weatherproof connectors shall be supplied for all connections exposed to the exterior environment. |  |  |
|  | All equipment shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, or to reconfigure I/O options. |  |  |

## Environmental Requirements

|  |  |  |  |
| --- | --- | --- | --- |
|  | Central System Equipment  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | All hardware equipment installed in TCAT shall be designed to operate normally and shall maintain specified performance under the following environmental conditions:* Operating Temperatures: Between +32°F to +110°F
* Humidity: 0-90% relative humidity, non-condensing
* Solid Object and Moisture Protection: IEC IP54 or NEMA 3S
 |  |  |
|  | Where equipment does not comply with environmental conditions, equipment shall be protected with environmentally-protected enclosures or cabinets. The enclosures or cabinets shall internally maintain the operating environment required by equipment within, under the above required environmental conditions. |  |  |

## Electrical Requirements

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | For any hardware equipment installation, the Contractor shall be responsible for securing all relevant electrical certifications and for any costs associated with the certification process and/or inspections. |  |  |
|  | Central Equipment  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Equipment installed in TCAT offices or facilities shall operate from a nominal line voltage of 120 Voltage Alternating Current (VAC), within voltage tolerances of +10% to -10%, and a frequency range of 57 to 64 Hz. |  |  |

# Maintenance Management System Project Implementation Requirements

## Project Management

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall appoint a Project Manager who will be the primary point of contact with TCAT. |  |  |
|  | The Project Manager or his deputy shall participate in all scheduled project activities, attend scheduled meetings and promptly respond to new meeting requests, requests for information, technical support or other necessary communication activities. |  |  |
|  | The Contractor shall convene regular progress review meetings, such as:* Weekly design/contract review meetings with TCAT;
* Technical and contractual interface meetings with Sub-contractors, if any.
 |  |  |
|  | Implementation Schedule and Master Schedule of Work | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall prepare a Master Schedule of Work to be submitted following Notice to Proceed. |  |  |
|  | The Contractor shall describe the implementation schedule in the Master Schedule of Work, which must be approved and accepted by TCAT before it can become effective. |  |  |
|  | The Master Schedule of Work shall be updated by the Contractor on a monthly basis to reflect the progress attained in the previous month and the anticipated changes in the future. The updated Master Schedule of Work shall be submitted to TCAT at the beginning of each month. |  |  |
|  | The Master Schedule of Work shall identify all project implementation activities including delivery and installation of equipment and software, training programs, and test procedures.  |  |  |
|  | The Master Schedule of Work shall identify planned delivery of documentation. |  |  |
|  | The Contractor shall include in the Master Schedule of Work the necessary time and resources to modify documentation to incorporate comments from TCAT.  |  |  |
|  | The Contractor shall include in the Master Schedule of Work the time for TCAT to review the revised documentation. |  |  |
|  | The Contractor shall include in the Master Schedule of Work the necessary time and resources to modify documentation to incorporate comments from TCAT. |  |  |
|  | The Master Schedule of Work shall be implemented in PERT, GANTT or equivalent form to show TCAT and any third party responsibilities and activities, and their associated dependencies.  |  |  |
|  | Action Items List | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall maintain an Action Items List (AIL), indicating for each item the following: * Item number;
* Date generated;
* Brief item descriptive title;
* Assigned person with lead resolution responsibility;
* Date resolved; and
* Ongoing dated notes on resolution status.
 |  |  |
|  | The AIL shall be sorted, primarily by unresolved vs. resolved items and secondarily by the date the item was generated. |  |  |
|  | Project Coordination Meetings | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall participate in person in a kick-off meeting between the TCAT project team and the Contractor team at the start of the project. |  |  |
|  | The Contractor shall participate in weekly coordination meetings in person or via conference call with the TCAT Project Manager, other TCAT staff and outside consultants as determined by the TCAT Project Manager. |  |  |
|  | The agenda for these meetings will be to discuss the most current status of and plans related to all issues identified in the recent releases of the Master Schedule of Work and Action Items List (AIL). |  |  |
|  | TCAT reserves the right to identify for discussion any additional issues beyond those in the Master Schedule of Work and AIL. |  |  |
|  | A status report shall be issued to TCAT at least 2 days prior to each coordination meeting, including: 1) an agenda for the upcoming coordination meeting highlighting key discussion items; and 2) an updated AIL with the updates incorporating the discussions of the previous coordination meeting as well as other subsequent developments since the previous AIL release. |  |  |
|  | The Contractor shall be available to meet the TCAT Project Manager in person upon request for resolution of major obstacles or significant schedule delays. |  |  |
|  | The Contractor shall be represented in these coordination meetings by at a minimum their Project Manager, as well as any additional Contractor staff necessary to properly address the current issues and project status. |  |  |
|  | TCAT will be represented by their designated Project Manager and/or designated representatives. |  |  |
|  | Coordination meeting conference call facilities will be arranged and paid for by the Contractor. |  |  |
|  | The Contractor shall submit minutes within 5 days of each coordination meeting. |  |  |
|  | System Design Review | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall participate in a System Design Review (SDR), focusing on the overall technical system design and its compliance with all contract requirements. |  |  |
|  | The SDR shall encompass the following three stages:* Preliminary Design;
* Draft Final Design; and
* Final Design.
 |  |  |
|  | For each stage of the SDR, the Contractor shall provide updates to the following documents:* System Design Document (Section 6.4.2);
* Installation Design Documentation (Section 6.4.3);
* Training Plan (Section 6.4.4);
* Test Plan (Section 6.4.7); and
* Interface Control Documentation (Section 6.4.10).

The Contractor should expect multiple and ongoing revisions to each of these documents both within and beyond the SDR process. |  |  |
|  | The Contractor shall attend SDR meetings after each design stage to discuss review comments and proposed responses on provided documentation. |  |  |
|  | The SDR meetings shall occur shortly after the Contractor receives and has a chance to review agency comments on provided documentation. |  |  |
|  | The SDR meetings shall be used to reach agreement on any outstanding issues raised through the review process; the Contractor shall be expected to issue notes with agreed upon action items following the meetings. |  |  |
|  | The Contractor shall work with TCAT for tailoring of the Central Software Graphical User Interfaces (GUIs). |  |  |

## Testing

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall submit a Test Plan (refer to Section 6.4.7 detailing the test procedures. |  |  |
|  | All Testing shall be conducted according to the approved Test Plan. |  |  |
|  | The Contractor shall not conduct any testing until the Test Plan has been approved by the TCAT. |  |  |
|  | The results for all tests shall be submitted using approved Test Results documentation (refer to Section 6.4.8). |  |  |
|  | The Contractor shall conduct the following tests:* Factory Acceptance Test (FAT);
* Data Sufficiency Test (DST);
* System Acceptance Test (SAT);
* Operability Period Test (OPT).
 |  |  |
|  | A minimum of at least two (2) weeks prior to conducting any test, the Contractor shall notify the TCAT in writing and receive authorization to proceed from the TCAT. |  |  |
|  | The Contractor shall confirm the test forty-eight (48) hours in advance. |  |  |
|  | Prior to notifying the TCAT for witnessing of tests, the Contractor shall conduct “dry-run” testing for all test stages, in accordance with the approved Test Plan. The dry-run tests shall be conducted prior to the arrival of the TCAT’s representatives to ensure that successful completion of the formal witnessed tests can be reasonably anticipated. Where applicable, testing shall be conducted in accordance with equipment manufacturer’s standards and recommendations. |  |  |
|  | If test results, in the sole opinion of the TCAT, indicate that the System components fail to meet System requirements, the Contractor shall undertake all necessary corrective action, including replacement or upgrade of components at no additional cost to the TCAT, and shall retest until full compliance with all requirements is demonstrated. |  |  |
|  | Factory Acceptance Test | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Factory Acceptance Testing (FAT) shall be performed to ensure that the proposed hardware and developed software system components meet all system requirements. FAT for all software may be performed using a development environment, and for hardware may be performed using hardware samples identical to proposed hardware. The FAT shall demonstrate all functionality being provided by the MMS prior to production system implementation. At a minimum, the Contractor’s Project Manager and a technical engineer shall be present during the FAT. |  |  |
|  | The Contractor shall develop a comprehensive FAT program consisting, at a minimum, of the following individual test programs:* Human factors test for all devices/subsystems with a user interface.
* Scenario or use-case testing to demonstrate end-to-end connectivity and correct processing/handling of data.
* Functional tests to demonstrate that all functional and operational requirements and specifications applicable to the device/subsystem have been delivered; and
* Hardware test to verify the operating parameters of all equipment are per the requirements of this Contract, Original Equipment Manufacturer (OEM) specifications, and System Design Document.
 |  |  |
|  | Any device certifications required by regulatory agencies shall be the responsibility of the Contractor. |  |  |
|  | All required certifications shall be submitted with each shipment of devices or subsystems. |  |  |
|  | Any changes to the hardware or software versions or configurations shall require a FAT retest. |  |  |
|  | FAT shall be witnessed by TCAT representatives (TCAT staff and/or designated support consultants). |  |  |
|  | Data Sufficiency Test (DST) | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Data Sufficiency Test (DST) shall be conducted upon installation of the system and completion of data import to ensure the system is functional and contains all data needed to start utilizing the system. |  |  |
|  | The DST shall be conducted to review that the data imported from other systems into the MMSs or manually entered into the MMS is sufficient and satisfactory for TCAT to begin production use of the system. |  |  |
|  | The DST shall verify that data imported into the system is correct and accurate by comparing against original data prior to import and formatted according to TCAT’s identified needs. |  |  |
|  | System Acceptance Test | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | SAT can only be initiated once all of the system elements have been installed and configured and all pre-installation and installation Quality Assurance / Quality Control has been successfully completed. The SAT looks at the entire system, and tests are completed to ensure that the overall functional requirements are met.  |  |  |
|  | Each requirement listed in the specification shall be tested or, in case it may not be feasible to test certain functions in the operational environment, evidence for correct function is to be provided. Where software interfaces with other software, this interface shall be tested through the SAT for each piece of software. |  |  |
|  | SAT shall be witnessed by TCAT representatives (TCAT staff and/or designated support consultants). |  |  |
|  | Operability Period Test | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The OPT is a 30 day performance test initiated once the SAT has been accepted by TCAT. Through the OPT, the system is tested under full operations with full scale deployment to ensure that the performance requirements are met, and to measure the system reliability and availability.  |  |  |
|  | System failures will be rated as significant or moderate by TCAT, based on operational impact. Significant system failures will result in restart of the OPT. Moderate failures will result in suspension of the 30 day OPT clock until resolved |  |  |
|  | Any deficiencies shall be rectified, and all training and documentation completed before TCAT will provide System Acceptance. |  |  |

## Installation

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Unless otherwise specified, the Contractor shall provide a turn-key installation and implementation solution, including all equipment, data entry, and configuration.  |  |  |
|  | The Contractor shall arrange for access and approval to complete relevant installations and system implementation. Access and approval will be granted by TCAT. |  |  |
|  | The installation plan and installation procedures shall be submitted to TCAT for approval at least 30 days prior to installation for review and commenting. |  |  |
|  | The Contractor shall ensure that all hardware materials and components are delivered to the installation site(s).  |  |  |
|  | Notwithstanding the details presented in these specifications, it is the responsibility of the Contractor to verify the correctness of the material lists and suitability of devices and software proposed to meet the intent of the specifications. |  |  |
|  | The Contractor shall be responsible for providing or arranging to provide all parts and labor necessary for the equipment and its installation up to and including system acceptance. The Contractor shall be responsible for any hardware equipment until it has been installed or received by TCAT into inventory as a spare component. TCAT is not responsible for damage during shipping and prior to acceptance. |  |  |
|  | Any equipment or parts required to provide a complete and operational system, and not specifically mentioned herein, shall be provided by the Contractor without any claim for additional payment. It shall be understood that the contract and agreement contemplates and requires the “turnkey” construction and installation of a completely operational system that meets the standards set by TCAT. |  |  |
|  | The Contractor shall work with TCAT to identify an appropriate installation schedule for central hardware and software. |  |  |
|  | At TCAT’s option, a TCAT representative shall be present during any onsite installation to monitor quality control of the installation process. |  |  |
|  | Central Software | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall install required client software, including virtualized software where applicable. |  |  |
|  | The Contractor shall prepare, install, test, and commission all communications infrastructure required. |  |  |
|  | The Contractor shall notify TCAT 14 days prior to production implementation for TCAT. |  |  |
|  | Central Equipment  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall prepare, install, test, and commission all Central equipment. |  |  |
|  | Any hardware equipment shall be installed in a neat and workmanlike manner, in accordance with good practice, by competent technicians and mechanics. Resumes of key installation staff shall be provided to TCAT for approval no less than 30 days prior to installation. |  |  |
|  | All installers shall be properly trained by the Contractor. TCAT reserves the right to require the Contractor to immediately replace any unqualified installer. |  |  |
|  | All cables, connectors, and ports shall be uniformly color-coded, and descriptively labeled in accordance with TCAT standards, and an agreed labeling plan. |  |  |
|  | All rubbish and debris associated with site preparation, unpacking of shipping materials, and/or installation of new equipment related to this project shall be removed from the premises by the Contractor and properly disposed of. All dumpsters and related containers used for disposal, are the responsibility of the Contractor. Removal of rubbish and debris shall be performed daily. |  |  |
|  | The Contractor shall bear responsibility for the safety of their workmen and all others involved with the installation phase. |  |  |
|  | For any equipment that is installed onboard vehicles or at TCAT facilities, a site inspection shall take place prior to and post installation. The Contractor shall coordinate with TCAT to ensure TCAT personnel are available to witness and sign-off on these inspections. |  |  |
|  | If any equipment is installed onboard vehicles, any damage to the vehicle or its equipment due to the mistake or negligence of the Contractor during installation shall be corrected at Contractor expense. |  |  |
|  | The Contractor shall provide and input detailed electronic information into the MMS documenting the following for all hardware equipment provided under this Contract:* Manufacturer,
* Manufacturer Model Number,
* Manufacturer Part Number,
* Contractor Model Number (if different from Manufacturer Model Number),
* Contractor Part Number (if different from Manufacturer Part Number),
* Serial number,
* Make and Model,
* Description,
* Battery Type (if applicable),
* Firmware and programming versions,
* Date of Installation,
* Date of Installation Acceptance, and
* Warranty Provisions (e.g. type, expiration date).
 |  |  |

## Documentation

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | All documentation shall be in English and use US customary units.  |  |  |
|  | All documentation shall be submitted directly to TCAT electronically in one of the following formats:* MS Office formats (DOC, XLS, PPT, VSD)
* AutoCAD formats (DWG, DWX)
* Adobe PDF (searchable)
* Other electronic format as approved by TCAT.

Scanned documents consisting of signatures, etc. may be approved for submittal. |  |  |
|  | Any and all communications or submissions to the TCAT Project Manager shall be via email. The Contractor shall also submit a copy of the final as-built document deliverable via an electronic media on System Acceptance. |  |  |
|  | Any equipment installation drawings shall be prepared and submitted in AutoCAD and Adobe Acrobat formats and accompanied with calculations, material specifications, process specifications, and test data required to support review and approval of the drawings. |  |  |
|  | The contractor shall include the necessary time and resources to modify the documentation to incorporate comments from TCAT. The contractor shall also include the necessary time in the project schedule to allow TCAT to review the revised documentation. |  |  |
|  | Manuals shall be complete, accurate, up-to-date, and shall contain only information that pertains to the system installed.  |  |  |
|  | All pages of the documentation shall carry a title, version number and issue date, and the document shall contain a complete subject index. The Contractor shall be responsible for fully coordinating and cross referencing all interfaces and areas associated with interconnecting equipment and systems. |  |  |
|  | Documentation shall require re-issue if any change or modification is made to the equipment proposed to be supplied. The Contractor may re-issue individual sheets or portions of the documentation that are affected by the change or modification. Each re-issue or revision shall carry the same title as the original, with a change in version number and issue date. |  |  |
|  | All submissions shall be accompanied by a letter of transmittal listing drawing and document titles, numbers, and revisions. |  |  |
|  | Submission of revisions shall be accompanied with a comment-by-comment response to TCAT prior comments. |  |  |
|  | The System Documentation shall include the following:* Master Schedule of Work
* System Design Document
* System Implementation Document
* Test Plan
* Test Results
* As-Built Document
* Maintenance and Operations Support Plan
* System Administration Manual
* Operations and Maintenance Manual
 |  |  |
|  | System Design Documentation | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide detailed documentation that describes the system design and configuration.  |  |  |
|  | The Contractor shall provide preliminary (draft) and final design level System Design Documentation that includes, at a minimum, the following information:* Schedule compliance and discussion of variances or delays;
* System overview, architectural and configuration information;
* A traceability matrix cross-referencing all contract requirements with the corresponding sections of the System Design Documents such that TCAT can reasonably and independently confirm that the requirements are being met;
* Risks/benefits and implications for deviating from the system requirements;
* Functional and physical description of all proposed hardware;
* Flowcharts, diagrams and supporting text describing major system processes. Major software applications shall be described in detail, especially where custom processing algorithms are to be provided;
* Any equipment mounting arrangements, dimensions, installation requirements, and estimated installation time;
* Network configuration and interfaces, including all wireless system and network design;
* System backup and recovery plan;
* Interfaces to other systems;
* Description of the system security features;
* Data model describing entities, attributes, data dictionary and metadata;
* Communications system architecture described graphically and in text, including descriptions of the transmission mediums used, capacity utilization, speed, and expected reliability;
* List of all special tools and software requirements;
* Software design descriptions for microprocessor-based or programmable equipment;
* User interface information and drawings, flow charts, messages, menus and screens;
* Performance measures and overall testing and acceptance process; and
* Operation and maintenance (O&M) documentation.
 |  |  |
|  | System Implementation Documentation | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide a system implementation documentation that describes all the steps in a planned process to implement all system software and hardware.  |  |  |
|  | For any system software, the process shall document all processes from the software development, configuration, testing, and transition to production installation.  |  |  |
|  | For any facility hardware, wiring and installation diagrams for on-board equipment shall be provided by the Contractor for each make/model of vehicle coach or facility location. These diagrams shall be reviewed and approved by TCAT prior to the start of installations. |  |  |
|  | Wiring and installation diagrams shall be provided by the Contractor for all central hardware components. These documents shall be reviewed and approved by TCAT prior to the start of installation. |  |  |
|  | For any central hardware equipment, a prototype installation for each vehicle type or facility location shall be documented and conducted by the Contractor to enable finalizing the System Implementation Documentation. The prototype installations shall be approved by TCAT or its representative(s) before proceeding with installation. Contractor shall document the approved installation designs, including photos or AutoCAD drawings of the equipment locations and electrical wiring routing, and electrical schematics of wiring. The document shall be submitted to and approved by TCAT or its representative(s) prior to production installations. All installations shall be consistent and uniform with the prototype installations in quality, equipment location, and wire routing. |  |  |
|  | Test Plan | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Test Plan document shall include the detailed schedule for conducting each stage of testing and for each equipment Item. This schedule shall include notifications to TCAT to allow for their participation and witnessing of all testing. |  |  |
|  | For each test, the Test Plan shall include detailed test descriptions identifying how the System Requirements for each item will be demonstrated, and the Requirements Traceability Matrix listing linking each requirement proposed to be demonstrated to applicable test procedure(s). |  |  |
|  | The test descriptions shall identify all test procedures to be performed and shall include a description of the test objective, required test equipment, test environment, test setup and equipment configuration, success/failure criteria and expected results for each test step, and a detailed description of the step-by-step sequence of testing. |  |  |
|  | Test descriptions shall be detailed enough to allow TCAT to approve in advance which requirements will be addressed and to witness and verify test results. |  |  |
|  | Test descriptions shall be sufficiently detailed to allow anyone with technical capabilities similar to that of the Contractor to set up and perform the test and obtain the same results (the test results shall be repeatable). |  |  |
|  | For each test, the Test Plan shall also include:* Documentation on materials, submitted as part of the SDD.
* Detailed equipment information including type and model number of each system component.
* Product data for all test equipment to be employed.
* Any additional submittals required by the equipment Item specification.
* Detailed test configuration block diagrams, depicting the test setup and system configuration for all system equipment and test equipment.
* Wiring diagrams showing the interconnection of all equipment used in the test.
* Configuration details (e.g. configurable parameters) for each of the communications components.
* Detailed test report forms.
* Checklists clearly highlighting required submittals.
 |  |  |
|  | Test Results Documentation  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | As part of every test, the Contractor shall submit Test Results. The Test Results shall include for each equipment item:* Detailed equipment information including type, model number, and serial number of each component tested.
* Detailed description of test environment.
* Test results recorded on approved test report forms. For commercial off-the-shelf products, this includes stamped quality testing documents from before it leaves the factory environment.
* The Requirements Traceability Matrix listing linking each requirement proposed to be demonstrated in the test to applicable test results.
* Any additional submittals required by the equipment Item specification.
* Documentation of all system equipment and configuration changes required to meet System Requirements following test failures.
 |  |  |
|  | Training Plan  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Training Plan shall detail the scope, schedule, course content, training time requirements, and who should attend, including identification of specific training focused for different types of recipients. |  |  |
|  | The Training Plan shall cover, at a minimum, all training courses as referenced in Section **Error! Reference source not found.**. |  |  |
|  | Training Manuals | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Training Manuals shall provide information on all topics covered during each training session and include exercises and screen captures. Training manuals shall include illustrations to enhance content presentation, and common problems with comprehensive solutions given. |  |  |
|  | The Training Manuals shall include space for users to take notes during training sessions. |  |  |
|  | Other Training Documentation  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | All Contractor-supplied products, interfaces, systems, and subsystems shall have training documentation provided to TCAT as part of the contract. These training materials shall be comprehensive, with training explicitly provided on every function available to TCAT users. |  |  |
|  | As-Built Documentation (ABD) | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Following the conclusion of all installations and testing, and as a condition of System Acceptance, the Contractor shall update and provide copies of all engineering and design reports, “as-built” drawings, data, and other material produced for the equipment installed and/or procured as part of this contract, and submit them to TCAT. |  |  |
|  | The ABD shall also include: * an inventory of all components supplied including supplier, model number, serial number and installation location;
* an inventory of all spare parts supplied including supplier, model number, serial number and storage location;
* all warranties documentation, including that for components supplied by third parties;
* a diagram indicating the as-built interconnections between components;
* all reference and user manuals for components, including those components supplied by third parties;
* all software configuration information; and
* the version numbers of all software, including those supplied by third parties.
 |  |  |
|  | TCAT shall retain exclusive and perpetual license to reproduce and share As-Built Documentation with third parties for the purposes of integration and contracted work. |  |  |
|  | Interface Control Documentation | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide the necessary Interface Control Documents (ICDs) as part of the SDD. |  |  |
|  | An ICD shall be included for the following interfaces:* All data inputs;
* All configuration files;
* All APIs; and
* Other interfaces in the proposed solution.
 |  |  |
|  | The ICDs shall include:* Description of data formats into and out of the interface;
* Description of the data structure;
* Description of the data protocol;
* A data dictionary; and
* Description of the communications protocol.
 |  |  |
|  | TCAT shall retain exclusive and perpetual license to reproduce and share Interface Control Documentation with third parties for the purposes of integration and contracted work. |  |  |

## Training

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall be responsible for training TCAT-designated personnel according to the requirements specified herein. |  |  |
|  | The Contractor shall submit a Training Plan (refer to Section 6.4.4) detailing the training schedule and courses. |  |  |
|  | The Contractor shall not conduct any training until the Training Plan has been approved by TCAT. |  |  |
|  | All Training shall be conducted according to the approved Training Plan. |  |  |
|  | Training shall take place at TCAT-designated facilities. |  |  |
|  | The training presentations and material shall be in English. |  |  |
|  | Instruction shall cover equipment familiarization, installation, configuration, system operation and maintenance. The minimum training is that necessary to designated employees to the level of proficiency required for performing their respective duties. |  |  |
|  | The Contractor shall provide experienced and qualified instructors to conduct all training sessions. The Contractor is responsible for ensuring that the instructors teaching these courses are not only familiar with technical information but are able to utilize proper methods of instruction, training aids, audiovisuals and other materials to provide for effective training. |  |  |
|  | The Contractor is responsible for providing all training materials, training aids, audiovisual equipment and visual aids for the conduct of these courses. |  |  |
|  | Instructional materials consisting of applicable equipment operation and maintenance manuals, and supplemental notebooks consisting of additional drawings, procedures, and descriptive information shall be provided. |  |  |
|  | Student guides shall include full topic descriptions, illustrations as needed to enhance content presentation, and common problems with comprehensive solutions given. Student guides shall mirror the instructor guides. |  |  |
|  | The Contractor shall submit the training curricula, presentations, and materials for review and approval by TCAT. No training shall commence until these items have been approved by TCAT. |  |  |
|  | Training curricula shall meet all training requirements and indicate trainee prerequisite knowledge, course content, training time requirements, and who should attend. |  |  |
|  | Training curricula shall be provided to TCAT for review a minimum 30 days prior to commencement of equipment installation. |  |  |
|  | Training Manuals shall be provided for each training participant and in addition an electronic copy shall be provided for TCAT’s future use.  |  |  |
|  | The Training Manuals shall be provided at the initiation of each training session. |  |  |
|  | All training materials are to become the property of TCAT at the conclusion of training. |  |  |
|  | Once approved for use, the TCAT shall retain the unlimited right to reproduce copies of training documents and materials for its own purposes |  |  |
|  | As a minimum, training shall be provided on the following:* System Operation Training for maintenance technicians, maintenance supervisors, and maintenance manager. This training shall teach users to use the system to logon and logoff work orders, update work order information, check-in or check-out inventory, and conduct other operational features.
* System Management Training for maintenance supervisors and maintenance manager. This training shall teach users to use the system to schedule, manage, and review tasks and manage vehicles, assets, and staff.
* Inventory Management Training: This training shall teach users to use the system to manage inventory and vendors, and create purchase orders.
* Reporting and Accounting Training: This training shall teach users to use the system to view all system information, create and manage reports, and manage and use external interfaces.
* System Administration Training for system administrators. This training shall teach users to use the system to administer and configure the system.
 |  |  |
|  | At the request of TCAT, the Contractor shall provide additional training sessions at a contract price per session. |  |  |
|  | Follow-Up Training | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Follow-up training sessions shall be provided 6 months after the initial sessions and shall consist of the same modules as the initial training. Sessions shall be at least half the length of the initial training sessions. |  |  |

# Maintenance Management System Warranty and Technical Support Services Requirements

## System Warranty

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide System Warranty and Technical Support services for the Base System as per the requirements of this section. |  |  |
|  | Warranty and Technical Support Period  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The System Warranty and Technical Support period shall commence upon System Acceptance (SA), and shall terminate 2 years following SA. Any extended warranties on specific system components that apply beyond this period shall be transferred to TCAT. |  |  |
|  | The Contractor shall offer an option to extend the system’s warranty and/or technical support periods for 4 additional consecutive 2 year periods. The Contractor shall document any differences in the warranty terms for these option years in their proposal. |  |  |
|  | Warranty Coverage  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall warrant that it has good title to the system and its components and the right to sell to TCAT, free of any proprietary rights of any manufacturer (if the Contractor is not the manufacturer) or other party, and free of any lien or encumbrance. |  |  |
|  | The Contractor shall warrant that it has good title to all system software or that it has the right to license the use of such software, or both, free of any proprietary rights of any other party and free of any other lien or encumbrance. |  |  |
|  | The Contractor shall warrant that all installation work and all system hardware furnished by the Contractor, including but not limited to all such work and system hardware provided by Contractors or other suppliers or manufacturers, shall be fit for their intended purpose, shall be new and shall be of good quality and free of any defects or faulty materials and workmanship for the warranty period. |  |  |
|  | The Contractor shall warrant that all installation work and system hardware and software shall perform according to the specifications for the warranty period. |  |  |
|  | For any hardware, it is recognized that the original manufacturer or supplier warranties may expire before the end of the warranty period. The Contractor must therefore provide extended warranties for all such products or equipment (software, hardware, spare parts) and must assume full responsibility for replacement or repair for the duration of the warranty period, the full cost of which must be included in the contract price. |  |  |
|  | All warranties and guarantees of Contractors, manufacturers and suppliers with respect to any such work and system hardware shall be obtained by the Contractor for the benefit of TCAT regardless of whether or not such warranties and guarantees have been assigned or transferred to TCAT by separate agreement. On TCAT’s behalf, the Contractor shall fully enforce such warranties and guarantees. |  |  |
|  | The Contractor shall warrant that the documentation provided shall completely and accurately reflect the equipment and software’s operation and maintenance and provide TCAT with all information necessary to maintain the system. |  |  |
|  | The contractor shall provide a number for TCAT to call 24 hours a day 7 days a week. The time from the placement of calls to this number to the time of problem resolution shall be deemed the contractor resolution time to the issues.  |  |  |
|  | Repair or Replacement of Faulty Components | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | For each system component or workmanship failure during the warranty period, TCAT shall determine whether to correct the failure by repair or replacement of part(s) within an assembly, or by replacement of the entire assembly. |  |  |
|  | The Contractor shall provide during the warranty period the latest compatible version of the failed part/hardware with the latest firmware. |  |  |
|  | The Contractor shall retain full responsibility for replaced or repaired parts or assemblies throughout the duration of the warranty coverage period for all parts and assemblies replaced by TCAT. |  |  |
|  | Systemic Failures  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Systemic failures shall be defined as the occurrence of component hardware failures in excess of 10% during the warranty period, or component software system availability falling below 99.9% during any month of the warranty period. |  |  |
|  | In the event of systemic failures during the warranty period, the Contractor shall at their expense, within 30 days of notification of such instance, commence a modification program to repair or replace all such hardware components, or develop and implement patches to all such software components, to correct the cause(s) of such failures. The design changes in such modification program shall be developed by the Contractor to remedy the nature and probable cause of the component failures and shall be approved by TCAT.  |  |  |
|  | In no case shall the correction of defects in design, material or workmanship result in any significant change in usage pattern of the system from that specified in the Contract Documents. If any usage change is necessitated, the Contractor shall provide prior notification to, and request approval to proceed from, TCAT.  |  |  |
|  | Replaced Parts  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | Any materials, parts or components used for replacement under the initial warranty period shall be warranted again, such that the new warranty period shall begin upon date of replacement as recorded in TCAT’s system maintenance records, and be of the same duration as the original warranty period (i.e. two years from replacement if the original warranty period was 2 years), regardless of the timeframe of the failure. In the case of components that are replaced pursuant to a modification program but have not yet failed, the new warranty period shall be computed from the date of TCAT notification to the Contractor of a requirement for the particular modification program. |  |  |
|  | Software Updates and Support  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | All software provided by the Contractor shall be covered by the Warranty from installation until the warranty and support period is valid. |  |  |
|  | The Contractor shall supply compatible software versions across the fleet over the term of this contract including the warranty. |  |  |
|  | As part of the proposal, the Contractor shall provide the migration path or schedule for compatibility with updates to third party software. |  |  |
|  | During the warranty period, the Contractor shall update all applicable software with the then-current software version at no additional cost to TCAT. |  |  |
|  | Any “patches” recommended by the hardware or software Contractors, (including operating systems), shall not void the system warranty. |  |  |

## Spare Parts

|  |  |  |  |
| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall propose for consideration a list of spare parts (Spare Parts List) to be provided. This list shall include replacement parts, components or sub-assemblies for all items of equipment provided, in sufficient quantities to meet the estimated need for warranty and maintenance purposes for a period of two years, this shall include a minimum of 10% of the installed quantity for each component. The Spare Parts List shall include complete sets of all necessary replacement parts |  |  |
|  | The Contractor shall provide spare parts in accordance with the agreed Spare Parts List, the full cost of which shall be included in the Contract Price. |  |  |
|  | The Spare Parts shall be placed into the spare parts inventory and become the property of TCAT upon handover. |  |  |
|  | TCAT shall receive replacement spares within 7 calendar days of notice of shipment of the defective part to the Contractor. |  |  |
|  | TCAT shall have the option to purchase additional spare components at the proposed price at any time within the warranty period. Additional purchased spares shall be received within 7 calendar days of order. |  |  |

## Technical Support

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| --- | --- | --- | --- |
|  | General  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | System support during the warranty period shall be provided as per the contractually agreed service agreement (refer to Sections 5.2.7 and 5.2.8). |  |  |

# Maintenance Management System Options

## General Requirements

|  |  |  |  |
| --- | --- | --- | --- |
|  | General Option Requirements | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | For each selected option, the contractor shall:* Provide all Project Management services for the selected options as per Section 6.1.
* Provide all Testing services, up to and including the System Acceptance Test, for the selected options as per Section 6.2.
* Provide all Installation and Configuration services for the selected options as per 6.3.
* Provide all Documentation for the selected options as per Section 6.4.
* Provide all Training and associated Documentation for TCAT personnel for the selected options as per Section 6.5.
* Provide Warranty for all equipment and software, up to and following System Acceptance, and provision of a System Warranty following System Acceptance for the selected options as per Section 7.1.
* Provide all Spare Parts for the selected options as per Section 7.2.
* Provide all Technical Support services following System Acceptance for the selected options as per Section 7.3.
 |  |  |

## Maintenance Management System Interfaces

|  |  |  |  |
| --- | --- | --- | --- |
|  | Option A: Interface with the CAD/AVL System | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The MMS shall be interfaced with the Vehicle Health Monitoring system within the CAD/AVL system enabling the MMS to receive, import, store and update vehicle information. |  |  |
|  | Data received from the CAD/AVL system may include the following:* Daily Vehicle Inspection Report (DVIR) data for all vehicles that provides vehicle fault and damage information,
* Vehicle Health Monitoring component performance alerts for individual vehicle system components (e.g. engine temperature) based on thresholds configured in the CAD/AVL system,
* Diagnostics information for individual vehicle system components based on components faults and failures, and
* Odometer information
 |  |  |
|  | The system shall associate the information received from the CAD/AVL system and update the information stored in the MMS for the corresponding vehicle.  |  |  |
|  | The system shall generate real-time alerts for major issues as configured by TCAT. |  |  |
|  | The system shall automatically generate draft work orders using predefined templates based on issues identified through vehicle status changes. |  |  |
|  | The Contractor shall provide an ICD as per Section 6.4 for importing standard CAD/AVL system information. |  |  |
|  | Option B: Interface with the Accounting System  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The MMS shall interface with TCAT’s existing accounting system for electronic transfer of purchase order information. |  |  |
|  | The MMS shall automatically import purchase order information exported by the accounting system and stored in a text file formatted in standard electronic formats such as .txt or .csv. The Contractor shall provide information on the standard text file to be imported, including data fields such as purchase order number, equipment information, quantity and pricing, and order status.  |  |  |
|  | The Contractor shall provide an ICD as per Section 6.4 for importing standard accounting system information. |  |  |
|  | Option C: Interface with the Payroll System  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
| ` | The MMS shall interface with TCAT’s existing Payroll System for electronic transfer of payroll information. |  |  |
|  | The MMS shall automatically export payroll information in text files formatted in standard electronic formats such as .txt or .csv. The Contractor shall provide information on the standard text file to be exported, including employee IDs, labor hours, and calculated labor costs.  |  |  |
|  | The Contractor shall provide an ICD as per Section 6.4 for exporting standard payroll information. |  |  |
|  | Option D: Interface with Human Resource Management | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The MMS shall allow for automatic import of the human resource information from the payroll management system. |  |  |
|  | The MMS shall automatically import payroll information in text files formatted in standard electronic formats such as .txt or .csv. The Contractor shall provide information on the standard text file to be imported, including data fields such as employee IDs, employee names, and employee labor rates.  |  |  |
|  | The Contractor shall provide an ICD as per Section 6.4 for importing standard human resource management system information. |  |  |

## Garage Systems

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| --- | --- | --- | --- |
|  | Option E: Handheld Inventory Scanner and Printer | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide Handheld Inventory Scanner and Printer devices that are interfaced with the MMS to enable identification of parts through scanning bar codes and printing of bar code tags for inventory management purposes.  |  |  |
|  | The Handheld Inventory Scanner and Printer devices shall enable the following functionality:* Scanning in of inventory parts into the MMS
* Scanning out of inventory parts from the MMS and association with work orders
* Printing of bar code tags for inventory parts stored in the MMS
 |  |  |
|  | The MMS shall be upgraded to enable the Handheld Inventory Scanner and Printer device functionality, including: * Real-time update of inventory part information numbers in MMS
* Real-time update of work orders and association with vehicles
* Handheld Inventory Scanner and Printer devices monitoring and troubleshooting
 |  |  |
|  | The Handheld Inventory Scanners shall wirelessly communicate with the MMS server in real-time. |  |  |
|  | The Handheld Inventory Scanners shall include common optical scanning techniques (e.g., laser scan) and shall have the capability to read both 1D and 2D barcodes (e.g., QR code, Data Matrix). |  |  |
|  | The Handheld Inventory Scanners shall have first read accuracy of 99% or higher. |  |  |
|  | The Handheld Inventory Scanners shall include a built-in Printer to be able to print 1D and/or 2D barcodes. Printed barcodes shall represent the following information:* Part number
* Short description
* Storeroom location
* Storage shelve/bin location
 |  |  |
|  | The Contractor shall provide all attachments and accessories necessary to use the Handheld Inventory Scanners and Printers on an ongoing basis, including any charging accessories, storage devices, and wireless receivers.  |  |  |

## Field Systems

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| --- | --- | --- | --- |
|  | Option F: Portable Maintenance Application | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | The Contractor shall provide a Portable Maintenance Application to access the MMS remotely and utilize a subset of its functionality through portable Windows 10 enable mobile devices.  |  |  |
|  | The Portable Maintenance Application shall offer at least the following functionality:* Work order log-in and log-off
* Access to work order history
* Access to vehicle maintenance history
* Access to, and ability to update inventory
 |  |  |
|  | The MMS shall be upgraded to enable wireless integration with the Portable Maintenance Application. |  |  |

## IT and Communications

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| --- | --- | --- | --- |
|  | Option G: Maintenance Management System Site Installation Option  | Compliance (N-CM-F) | Alternate Requirement (where applicable) |
|  | As an alternative to the hosted approach underlined in Section 5.2.2, proposers shall provide all costings necessary for the MMS to be hosted at TCAT. The requirements for this option shall replace all requirements under Section 5.2.2. |  |  |
|  | The system shall include all necessary hardware and software to ensure the functionality of all System Components as per the System Availability, Performance, and Security requirements outlined below. |  |  |
|  | All system central servers shall be virtualized, with all server software provided and installed. |  |  |
|  | The system shall include the necessary connection infrastructure for authorized remote access using a VPN connection approved by TCAT. An appropriate user authentication protocol shall be employed to ensure only authorized remote access to the Central Software. |  |  |
|  | The system shall include the necessary connection infrastructure for authorized remote access using a VPN connection approved by TCAT. An appropriate user authentication protocol shall be employed to ensure only authorized remote access to the Central Software. |  |  |