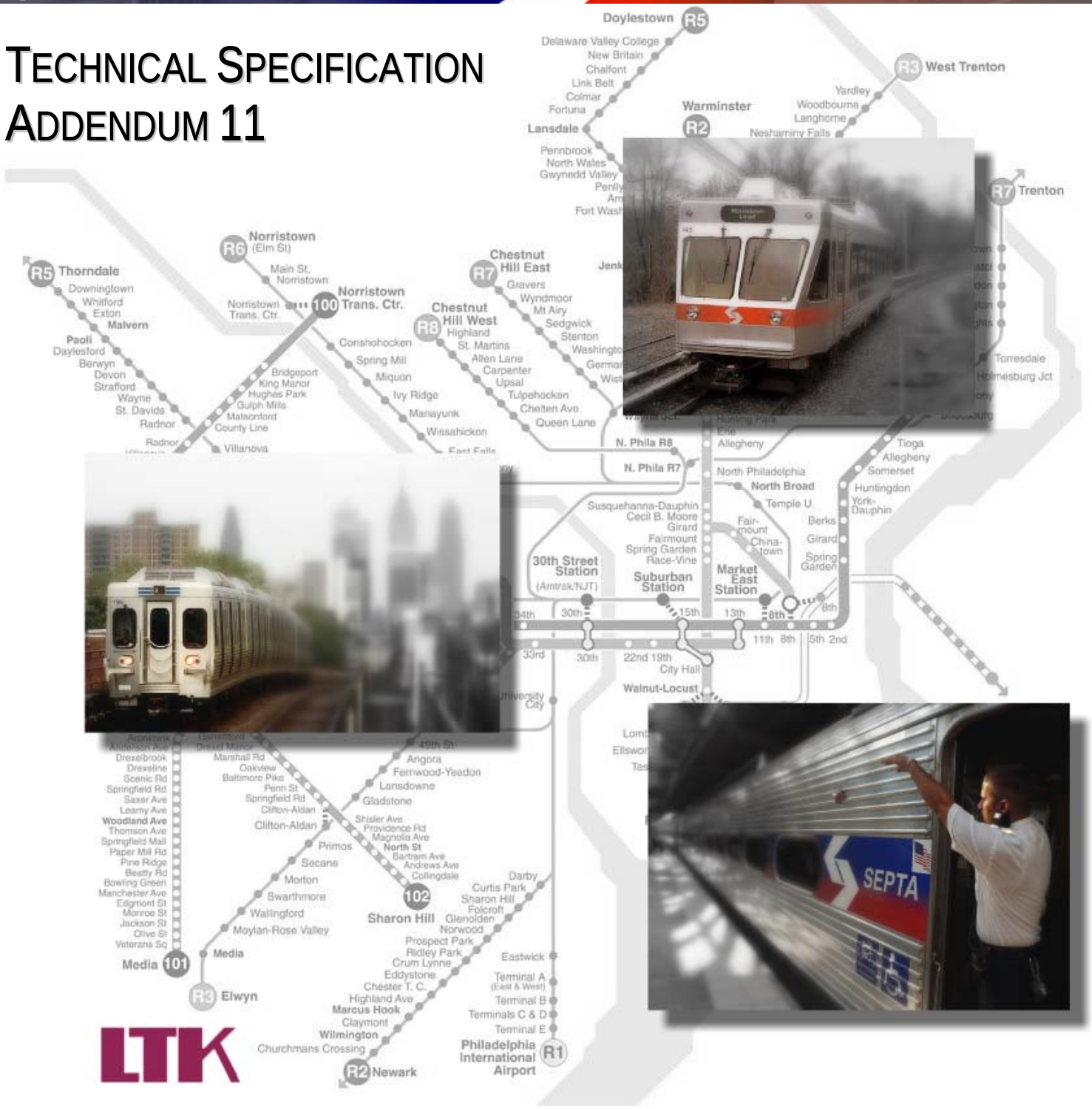
SOUTHEASTERN PENNSYLVANIA TRANSPORTATION AUTHORITY

TECHNICAL SPECIFICATION ADDENDUM 11



NEW PAYMENT TECHNOLOGIES

LTK Engineering Services
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New Payment Technologies System Technical Specification

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1 SYSTEM DESCRIPTION

1.1 Introduction

The Southeastern Pennsylvania Transportation Authority (SEPTA or the Authority), is a body corporate and politic which exercises the public powers of the Commonwealth of Pennsylvania as an agency and instrumentality thereof with its principal office at 1234 Market Street, 10th Floor, Philadelphia, PA 19107-3780. SEPTA operates a multi-modal transportation system consisting of buses, trolleys, paratransit, light rail, subway, and regional rail service. The service area includes the City of Philadelphia, four surrounding counties, and extends into New Jersey and Delaware.

SEPTA performed a study in 2006, which describes the existing fare collection system[1]. The report concludes that SEPTA's existing fare collection system has reached the end of its useful life. Farebox and turnstile system maintainability is limited due to parts on hand. Reliability and functionality cannot be improved from its current state due to the age of the electronics and the limitations of the computer operating system. Regional Rail, Customized Community Transportation, and Parking rely upon manual procedures that risk revenue security and limit efficient ridership and revenue data transfer and reporting. The ability to modify the pricing policies, manage service based on customer behavior, and manage the fare mix is limited by the system capabilities.

In light of the deficiencies of SEPTA's existing fare payment and collection system, it is SEPTA's intent to replace it with a state-of-the-art, integrated, electronic fare payment, distribution, collection and processing system which incorporates a centralized backend control system and data warehouse. This backend control system shall incorporate numerous control and reporting applications to support SEPTA's system management and business needs.

[1] This document, entitled "Task 2 – Baseline of SEPTA System, Section 3.0, published May 2006", is appended to the Technical Specifications as ~~Exhibit 1~~Appendix A.1. Note: There may have been changes to the SEPTA System since publication of the Task 2 report, and identification of any changes are the responsibility of the Contractor.

SEPTA requires that this system utilize available best practices of modern technologies in the consumer and fare payment arenas, and be capable of interfacing with both bank and non-bank financial clearing systems for transaction settlement. This new system has been entitled "New Payment Technologies" ("NPT") System.

1.1.1 Scope of New Payment Technologies System

SEPTA will deploy the ~~New Payment Technologies S~~NPT System across all modes of transportation operated as part of the SEPTA system, including buses, light rail vehicles (trolleys), rapid transit, commuter rail, and paratransit services. The NPT System shall process account-based Contactless Smart Media and Magnetic Fare Media for fare payment and fare verification purposes. The integrated, electronic system will feature Smart Media Processors (SMPs) and Magnetic Media Swipe Readers (MMSRs) incorporated into equipment such as Fare Vending Devices, Handheld Sales Devices, ~~Retail Sales Devices,~~ Administrative Sales Devices, ~~Smart Media Processors on~~ Subway/Elevated Turnstiles, ~~Faregates~~Railroad Turnstiles, On-Board Processors and Media Information Displays. ~~A and a~~ll NPT Equipment shall be interfaced with a Central Data Collection and Reporting System.

Fare Vending Devices will be installed at all Subway/Elevated stations, ~~and at~~ five (5) Center City stations and selected other locations to provide an automated means for the customer to purchase ~~Long-Term use SEPTA SEPTA Issued~~SEPTA Smart Media, ~~reloadr~~Replenish ~~Long-Term use SEPTA Smart~~~~SEPTA Issued~~SEPTA Smart Media accounts~~,~~ and sell Magnetic Fare Media ~~purchase Limited Use Media, and depending on volume and location, some Fare Vending Devices will sell/dispense permanent Smart Media and/or Limited Use Media~~. Smart Media Processors will electronically process and record fare payment from Smart Media ~~and Limited Use Media~~ at all required locations. On-Board Processors will be deployed on Surface Vehicles to process and account for Smart Media transactions. The Central Data Collection and Reporting System will monitor and control the functionality of the NPT E~~field e~~quipment, and will collect, store, and report data collected by NPT Equipment.

Automation and improved system applications will allow SEPTA to enhance customer service, expanding convenience and benefits. A remote, centralized NPT Customer Support Center will utilize the automated systems to handle all customer inquiries associated with Smart Media, provide management support for customer accounts, as well as fulfill all ~~SEPTA Smart~~~~SEPTA Issued~~SEPTA Smart Media requests. Automated channels such as Fare Vending Devices, Web Services, and Automatic ~~Reload~~Replenishments will also be available to not only give customers more convenient ways to obtain ~~SEPTA SEPTA Issued~~SEPTA Smart Media and ~~reload~~replenish ~~SEPTA Smart~~~~SEPTA Issued~~SEPTA Smart Media accounts, but they will also enable SEPTA to redefine certain employee responsibilities to improve customer service. In addition, system applications will allow SEPTA to offer customers new and attractive services associated with the Smart Media such as the security of Balance Protection and the convenience of Automatic ~~Reload~~Replenishments.

SEPTA wishes to leverage new market opportunities by teaming with the financial and wireless communications industries to accept a variety of Open Payment ~~contactless~~ Smart Media fare payment options on the vehicles and at rail stations, including credit/debit, third-party, or related transportation media forms, mobile phone fare payments and microchip equipped key fobs. By moving to a modern payment technology system, it is SEPTA's intent to provide customers with new, more efficient, convenient, and secure fare payment options. As well as improving customer service, the new system will also enable SEPTA to make possible operating efficiencies, provide enhanced revenue security and accountability, and achieve more available and accurate ridership and revenue data.

SEPTA has provided additional information to support the Vendor's understanding of the scope of the New Payment Technology System. These documents are contained in Appendix A and are identified in the footnote referenced here.[2]

[2] A.2 "SEPTA New Payment Technologies Video," A.7 "County Maps," A.8 "System Maps," A.13 "FY 2009 Ridership and Revenue Totals by Fleet," A.17 "SEPTA Credit-Debit Transaction Volumes CY 2008," A.18 "SEPTA Fiscal Year 2009 Operating Facts," A.19 "SEPTA FY 2010 Capital Budget," A.20 "SEPTA FY 2010 Operating Budget," A.24 "SEPTA Revenue Table FY 2009" and H.1 "SEPTA Bus and Trackless Trolley Models in Revenue Service."

1.2 New Payment Technologies System

1.2.1 Goals of the New Payment Technologies System

It is SEPTA's intent to implement a new flexible fare payment and collection system utilizing New Payment Technologies and Smart Media. In order to achieve this in an expeditious and cost-conscious manner, SEPTA will pursue refurbishment of some existing fare payment system components in conjunction with the replacement of the remaining fare payment system components with new devices.

SEPTA's strategic business interests for replacing its existing fare collection system with one based on Open Standard C~~c~~ontactless Smart Media technology are described in the following sections.

1.2.1.1 Goals to Support SEPTA Needs

SEPTA's internal major system goals associated with the implementation of an electronic fare payment and collection system are described in the following:

A. Improves customer service and convenience;

B. Provides for a more efficient transit operation;

C. Can be implemented in a timely manner with certainty of success;

D. Provides secure revenue management and accountability controls;

E. Provides accurate and timely ridership and revenue data;

F. Reduces cash handling by SEPTA staff;

G. ~~Replaces~~ Supplements existing Fare Media with Smart Media that can be verified electronically;

H. Permits Smart Media to be widely available throughout the SEPTA service area without requiring SEPTA to distribute Fare Media to the sales outlets;

I. Fosters fare policy innovation and flexibility;

J. Provides an open system that can accommodate new technologies for fare payment to meet the needs of customers, partners, and third parties;

K. Decreases SEPTA's role as transit-specific Fare Media issuer, transaction acquirer, and processor;

L. Provides information systems to permit tracking of Fare Media usage by customers;

M. Offers fare plans tailored to changing customer needs and travel patterns.

1.2.1.2 Goals to Support Customer Needs

SEPTA's major system goals for its customers for implementation of an electronic fare payment and collection system are described in the following:

A. Is easy to understand;

B. Enables customer self-service;

C. Is convenient and usable by all customers;

D. Provides customers with modern, flexible, and convenient fare payment options across all transit modes;

E. Facilitates seamless customer transfer between all SEPTA services;

F. Offers fare plans tailored to changing customer needs and travel patterns;

G. Facilitates seamless customer transfer among adjoining transit agencies at intermodal connection points.

1.2.1.3 Goals to Support Partner/Third Party Needs

SEPTA's major system goals for partners for implementation of an electronic fare payment and collection system are described in the following:

A. Provides strict revenue and data security;

B. Provides a more efficient and effective Fare Media distribution methodology;

C. Operates reliably and easily;

D. Provides flexibility to accommodate differences in operating procedures;

E. Provides timely revenue reconciliation automatically;

F. Is inexpensive to operate;

G. Is minimally intrusive on third party operations in terms of space requirements, time commitments, administrative overhead, and infrastructure demands; and

H. Can easily adapt to changes.

1.2.2 Acceptable Forms of Fare Media

Acceptable forms of payment for provision of SEPTA transportation services will be:

- ~~Long-term use~~SEPTA Smart Media;
- Partner Smart Media;
- ~~Short-term use Smart Media;~~
- SEPTA's existing Mmagnetic Fare Mmedia;
- Credit/Ddebit Mmedia ~~payments~~;
- Open Standard General Purpose Reloadable (GPR) Media;
- Mobile payments and other emerging technologies;
- Cash, and
- All other forms of payment as defined in Section 4.

SEPTA ~~-issued~~ Fare Media will be available for purchase by Customers at Fare Vending Devices, ~~Retail~~ Administrative Sales Devices, SEPTA's Website, through SEPTA's remote NPT Customer Support Center, ~~or~~and through a variety of external sales outlets. ~~SEPTA~~ SEPTA ~~Issued~~ Smart Media shall be open standard, closed-loop account-based media (see Section 4) which shall not store validity information on the ~~Smart~~ Media itself, but in an account stored in the Central Data Collection and Reporting System (CDCRS) ~~which is~~ linked to the ~~Smart~~ Media by its unique account number.

1.2.3 NPT Operating Scenarios

The following section describes the operating scenarios by mode of transportation as envisioned by SEPTA when the NPT System is initially implemented. SEPTA notes that the NPT operating scenarios described herein include changes to SEPTA's Tariff that require formal consideration by the public and adoption by SEPTA's Board of Directors. Some modification to the envisioned operating scenarios may occur prior to implementation of the NPT System as a consequence of this process.

~~However~~In order to address this issue, the subsequent sections of the Technical Specification (TS) for the NPT hardware described herein require the provision of additional functionality that is not portrayed in these scenarios. SEPTA requires the provision of the additional functionality as well as functionality described in these scenarios ~~the ability to control and enable specific attributes of device functionality~~in order to allow the NPT System to evolve with SEPTA's fare payment and processing needs as well as SEPTA's Fare Tariff modification process.

1.2.3.1 Subway ~~/~~ /Elevated System

Subway ~~/~~ /Elevated Operating Scenario

- In the Subway/Elevated environment, new or overhauled self-service, automated Subway/Elevated Turnstiles will continue to provide the barrier to subway platform entry until fare payment is completed.
- The Subway/Elevated Turnstiles will continue to accept SEPTA's existing M~~m~~agnetic Fare M~~m~~edia as well as all forms of acceptable Smart Media. However, no tokens, coins, or currency will be accepted at the Subway/Elevated Turnstiles.
- New ADA gates will be deployed at each station.
- Fare Vending Devices (FVDs) will be utilized within all stations to issue and add value/passes to ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media accounts.
- FVDs will be used to dispense Magnetic Fare Media that will allow customers without Magnetic Fare Media or~~,~~ Smart Media, ~~or Smart credit/debit media~~ to pass through the Subway/Elevated Turnstile barriers.

Appendices F.3.4 “BSL Schedule,” F.4.4 “MFSE Schedule,” F.3.6 “BSL High-Speed 2009 Turnstile Counts,” and F.4.6 “MFSE High-Speed 2009 Turnstile Counts” provide schedules and the most updated turnstile counts in support of the Subway/Elevated System existing operating scenario.

Required NPT Equipment for Subway~~/~~/Elevated System

- **New or Overhauled Subway/Elevated Turnstiles** will be conveniently located as customers approach platforms at all stations. The Subway/Elevated Turnstiles~~will:~~ shall:
    - Operate to restrict Customer access to station platforms until valid Smart Media is tagged at the SMP or valid Magnetic Fare Media swiped ~~o~~in the magnetic reader.
- **New ADA gates** will be installed at all stations. The ADA-gates ~~w~~shall:
    - Operate to restrict Customer access to station platforms until valid Smart Media is tagged at the SMP or valid Magnetic Media is swiped ~~o~~in the magnetic reader.
- Self-service **Fare Vending Devices (FVDs)** will be located at all stations. The FVDs ~~wi~~shall:
    - Vend Magnetic Media with a time-limited single ride;
    - Issue, l~~L~~oad value or pass products ~~o~~into ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media accounts stored in the CDCRS;
    - Accept payment by cash, SEPTA adult~~–~~ token, or credit/debit card.
- **Handheld Sales Devices (HSDs)** will be issued to SEPTA Customer Service Personnel that will be stationed in the Subway~~/~~/Elevated stations. The HSDs ~~will~~shall:
    - Enable Customer Service Staff to provide Customers with information regarding ~~remaining Stored Value or expiration date of Period Passes associated with~~validity information for ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media based on the information stored in the CDCRS;

    ~~oVerify validity of Smart Media and LUM for the selected trip;~~

- o Process unpaid fares for~~on~~ Smart Media with stored value in their CDCRS ~~linked~~ account;

- ~~oProcess sales of LUM and accept/account for payments by cash and credit media;~~

- o Support additional customer service activities such as remote release of the Subway/Elevated Turnstiles, ~~etc~~and other SEPTA-defined functions.

1.2.3.2 Surface Fleet

Surface Fleet Operating Scenario

- An On-Board Processor (OBP) will be deployed and installed adjacent to the existing farebox;
- The OBP will have the capability of processing all forms of acceptable Smart Media;
- Validity verification of a Smart Media account will be performed via direct communication to the NPT Central Data Collection and Reporting System by a wireless connection;
- Transactional information will be transmitted directly to the NPT Central Data Collection and Reporting System by a wireless connection;
- FVDs will be deployed at bus-loops and other ~~high volume~~selected locations to support customer demand for ~~Smart Media~~SEPTA ~~Smart~~SEPTA ~~Issued~~ Smart Media;
- At four (4) specific Trolley/Route 100 stations (19th Street, 22nd Street, 69th Street and Norristown Transportation Center), new or overhauled self-service, automated Subway/Elevated Turnstiles will provide the barrier to platform entry until fare payment is completed.

Appendices C.2 “Route 101 Schedule,” C.3 “Route 102 Schedule” and C.4 “Route 101& 102 Maps” have been included in support of the Media-Sharon Hill Trolley Surface System existing operating scenario. Appendices D.2 “Route 100 Schedule” and D.3 “Route 100 Map” have been included in support of the Norristown High Speed Line existing operating scenario.

Required NPT Equipment for Surface Fleet

- **On-Board Processor** will be provided to support payment of fares via ~~Smart Media~~SEPTA ~~Smart~~SEPTA ~~Issued Smart~~ Media account;

- Self-service **Fare Vending Devices (FVDs)** will be located at bus-loops and other ~~high volume bus-boarding~~selected locations. The FVDs ~~will~~shall perform the same functions those located in the Subway/Elevated environment.~~:~~

  - ~~Sell Long-Term use Smart Media~~SEPTA ~~Issued Smart and LUM encoded with stored value or time-limited single ride;~~

  - ~~Sell/load value or pass products o~~into ~~a Smart Media~~SEPTA ~~Issued Smart account;~~

  - ~~Accept payment by cash, token or credit/debit card.~~

- **New or Overhauled Subway/Elevated Turnstiles and ADA Faregates** will be conveniently located as customers approach platforms at selected surface stations. The Subway/Elevated Turnstiles shall perform the same functions as those located in the Subway/Elevated environment.

1.2.3.3 Regional Rail

As noted previously, this NPT operating scenario includes changes to SEPTA's Tariff that require formal consideration by the public and adoption by SEPTA's Board of Directors prior to adoption by SEPTA.

Regional Rail Operating Scenario~~ – Working Concept~~

- The number of fare zones will be reduced to ~~three~~five (5~~3~~):

  - Center City;

  - Zone 1;

  - Zone 2;

  - Zone 3;

  - New Jersey.

- No collection of fares will occur from customers traveling in the inbound direction towards Center City Philadelphia.

- SEPTA will collect a round-trip (double) fare ~~Collection of fares will occur~~ from all customers ~~in~~when travelling in the ~~the o~~outbound direction from Center City Philadelphia. ~~The~~Customers will tag their Smart Media at a Regional Rail Turnstile or ADA Faregate at one of the five Downtown RRD stations. The CDCRS will verify that the account associated with the ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media contains adequate fare for a Zone 1 trip, and if so, will initiate an "Open Trip" transaction. If Open Payment Smart Media is utilized, the CDCRS will verify that the Smart Media is not on the Invalid Media List. ~~fares collected outbound will be Zone 2 fares. Fares will be verified by one of the Passenger Encounter Targets at one of the five Center City Stations (30th Street, Suburban, Market East, Temple, University of Pennsylvania)~~ If boarding at a non-Center City Station in an outward bound direction, the Conductors will interact with Customer Smart Media for sales purposes using the Handheld Sales Device. ~~or if boarding at a non-Center City Station, by the conductor.~~

- Customers alighting in Zone 1 will tag their Smart Media at a ~~n~~ Media Information Display (Platform Validator) to ~~end~~"Close their Trip" ~~their trip~~. ~~When this occurs, the difference~~CDCRS records the transaction, and the associated Smart Media account will be charged a Zone 1 fare. ~~in fare (Zone 1 versus Zone 2) will be refunded to the customer in their account.~~

- Customers alighting in Zone 2 require no additional interaction with the NPT System or its equipment. The CDCRS will automatically "Close the Trip" at a default Zone 2 fare after a predetermined period of time after the trip is first initiated, or if the Customer continues their trip on an alternate form of SEPTA transportation in Zone 2.

- Customers alighting in Zone 3 or New Jersey will ~~be~~have their Smart Media ~~–~~checked by the C~~c~~onductors using Handheld Sales Devices prior to reaching Zone 3, when the number of customers on board is expected to be significantly ~~less~~fewer. After determining the end location of the Customer trip, the Conductor will "Close the Trip" at the destination Zone, and the appropriate fare will be charged to the associated Smart Media account.~~Any additional fare owed shall be collected.~~

- Customers traveling between two of the five Center City Stations

- will tag their Smart Media at the ~~Passenger Encounter Target~~ Regional Rail Turnstile ~~before~~to gain access to the ~~reaching the~~ boarding platform.

- will tag their Smart Media at the Regional Rail Turnstile~~Passenger Encounter Target~~ at the exiting station to have the ~~difference~~appropriate ~~in~~ fare ~~(Zone 2 versus Center City fare) refunded.~~ charged to their associated Smart Media account.

- Inter-Line customers will not be checked on the inbound leg of their trip. However, ~~but~~ after the train leaves the last gated Center City Station in the outbound direction, conductors will walk the train and verify that all passengers have valid fare media. ~~The base inter-line fare may be different that the Zone 2 fare.~~

- Outbound passengers boarding at non-Center City stations will have their Fare Media verified ~~as valid~~ by the Ceonductors upon boarding.

~~. SEPTA seeks Proposer input concerning the design and implementation of a more automated, self-service fare vending and revenue collection system for Regional Rail. SEPTA's Regional Rail Division (RRD) currently receives the highest degree of Customer satisfaction grades of all of SEPTA's modes of transportation. The primary NPT/RRD goal for SEPTA is to maintain this high degree of Customer satisfaction while strengthening the current fare vending and revenue collection processes. SEPTA's "Working Concept" Operating Scenario represents only one solution to this issue, and SEPTA welcomes Proposer participation in this particular design effort as part of the RFP process.~~

~~In the event that Passenger Encounter Targets are deployed at the RRD stations, a pedestrian flow analysis shall be provided by the Contractor to determine the correct quantity and placement of the Passenger Encounter Targets~~

~~C~~Center City Stations

- Fare Vending Devices (FVDs) will be deployed at the five (5) Center City stations (30th Street, Suburban, Market East, Temple, University ~~City~~City ~~of Pennsylvania~~).

- Regional Rail TurnstilesPassenger EncounterPassenger Encounter Targets (PETs) will be installed at the five (5) Center City stations (30th Street, Suburban, Market East, Temple, University of Pennsylvania City).

    - o in the stations at the approach to the station platforms.

    - o Outbound Direction (travelling away from Center City) – Customer will tag Smart Media or swipe Magnetic Media at a PETRegional Rail Turnstile. The Regional Rail Turnstile PET will verify Media validity and process verify that the associated Smart Media account contains adequate value/product to support a Zone 1 fares prior to Customer being granted access to the station platform.

    - o Inbound Direction (travelling towards Center City) - Regional Rail Turnstiles PETs will not require tagging/swiping of Media to permit Customers to egress from the platform.

- On-board sweeps by Conductors using Handheld Sales Devices (HSD) will occur between within all Zones 2 and 32/3 on all inoutbound trains. and outside of the Center City stations on all outbound trains. The HSD will verify Smart Media validity, deduct trip cost from Stored Value media, and sell Limited Use Media (LUM).

Outlying Stations

- Fare Vending Devices (FVDs) will be deployed on platforms at stations. Media Information Displays (MIDs) will be deployed at selected Zone 1 stations.

    - o Inbound or Outbound Direction – After alighting the boarding the train, the Customer will tags their Smart Media at the MID to Close the Trip at a Zone 1 fare.and the fare difference is refunded.displays Fare Media. On-board sweeps by Conductors using Handheld Sales Devices (HSD) will occur within all Zones on inbound trains and outside of the Center City stations on outbound trains. The HSD will verify Smart Media validity, deduct trip cost from Stored Value media, and sell Limited Use Media (LUM).

Appendices E.1 "Station Boardings Summary (wkd-sat-sun)," E.2 "Ridership and Ticket Information" and E.11 "2009 RRD Ridership Census Data" provide the most updated Regional Rail Division ridership data in support of the Regional Rail existing operating scenario.

Required NPT Equipment for Regional Rail

- **Bidirectional Regional Rail Turnstiles~~Passenger Encounter~~Passenger Encounter ~~Targets (PETs)~~** will be conveniently located as Customers approach platforms at the five Center City ~~Regional Rail~~ stations. The Regional Rail Turnstiles ~~PETs~~ will:
    - Operate as faregates to restrict Customer access to station platforms until valid Smart Media is tagged at the SMP or valid Magnetic Media is swiped on the magnetic reader.
- **New ADA gates** will be installed at the five Center City stations. The ADA ~~-~~gates shall:
    - Operate to restrict Customer access to station platforms until valid Smart Media is tagged at the SMP or valid Magnetic Media is swiped on the magnetic reader.
- Self-service **Fare Vending Devices (FVDs)** will be located at the five Center City stations and selected other stations. The FVDs shall:
    - Vend Magnetic Media with a time-limited ~~single~~round-trip ride;
    - Dispense and l~~L~~oad value or pass products into ~~Smart Media~~SEPTA ~~Smart~~SEPTA ~~Issued~~ Smart Media accounts stored in the CDCRS;
    - Accept payment by cash, SEPTA adult~~–~~ token, or credit/debit card.
- ~~Self-service **Fare Vending Devices (FVDs)** will be located at stations. The FVDs will:~~
    - ~~Sell Smart Media and LUM encoded with stored value or time-limited single ride;~~
    - ~~Sell/load value or pass products onto Smart Media;~~

~~o Accept payment by cash, token or credit/debit card.~~

- Self-service **Media Information Displays (MIDs)** will be located on Zone 1 ~~selected~~ station platforms. The MID will

  - allow Customers to obtain information regarding Smart Media validity; and

  - ~~refund~~notify the CDCRS that the Smart Media ended the trip at a Zone 1 station so that the appropriate fare can be charged to the Smart Media account. ~~the fare difference to the outbound customer's Smart Media account remaining Stored Value or expiration date of Period Passes on Smart Media in a self-service manner.~~

- SEPTA/Contractor operated **Administrative Sales Devices (ASDs)** will be located at selected stations. The ASDs will:

  - Sell ~~LUM or Smart~~ Magnetic Media encoded with ~~stored value or~~ time-limited single ride for cash, credit cards and ~~/~~debit card~~s~~;

  - ~~Sell and I~~Issue and ~~l~~Load value or pass products ~~on~~to ~~a Smart Media~~SEPTA SmartSEPTA ~~Issued~~ Smart Media account.

- **Handheld Sales Devices (HSDs)** will be issued to all SEPTA Conductors. The HSDs will:

  - Verify validity of Smart Media ~~and LUM~~ for the selected trip;

  - Process unpaid fares for ~~on Smart Media~~SEPTA SmartSEPTA ~~Issued~~ Smart Media with stored value accounts;

  - Process on-board sales ~~of LUM~~ and accept/account for payments by cash and credit cards~~media~~;

  - Enable Conductors to provide Customers with information regarding ~~remaining Stored Value~~Smart Media ~~or expiration date of Calendar Passes on Smart Media~~validity.

1.2.3.4 Customized Community Transportation Fleet

Customized Community Transportation (CCT) Operating Scenario

- Eligible CCT Customers shall be issued a customized ~~SEPTA Smart~~~~SEPTA Issued~~SEPTA Smart Media, which encompasses both an NPT-compliant smart chip as well as a legacy SEPTA-compliant magnetic stripe.

- CCT Customers shall swipe the magnetic stripe of their ~~Smart Media~~~~SEPTA Smart~~~~SEPTA Issued~~SEPTA Smart Media when boarding a CCT vehicle, and the swipe information shall be connected through SEPTA's back-end systems to an NPT account for payment and reconciliation purposes.

Required NPT Equipment for CCT Fleet

- NPT equipment will not be installed on the CCT fleet.

A more thorough description of the CCT Operating Scenario is provided in the New Payment Technologies: CCT Concept of Operations Reports (see Appendix A.16~~ces~~).

1.2.3.5 Parking Payment System

For designated SEPTA-owned parking facilities, new parking payment and enforcement systems shall be provided for non-gated Pay-by-Space and gated Pay-on-Foot systems as part of the NPT System.

Pay-by-Space Parking Payment System Operating Scenario

- In the non-gated Pay-by-Space environment, customers will have the option of obtaining Parking Permits that are connected to a NPT customer account. The Parking Permits will be displayed by customers in their parked vehicles.

- Customers shall have the ability to purchase and renew Parking Permits through the remote NPT Customer Support Center and through the NPT E-Commerce Website. The Parking Permits shall be machine-readable by the Handheld Sales Device (HSD).

- FVDs and Parking Payment Stations (PPS) will be deployed in or adjacent to Pay-by-Space station parking lots. The customer shall pay the parking fee by entering the space number into the FVD or PPS and paying by cash, SEPTA-~~issued~~ Smart Media or credit-debit media.

- Customers shall also have the ability to pay the parking fee through the remote NPT Customer Support Center and through the NPT E-Commerce Website by use of phone, e-mail or text. Customers shall have the ability of electronically providing their parking lot number and space number to SEPTA and using their NPT customer account to pay for the parking fee.

- Parking enforcement staff will utilize the HSD to verify validity of the Parking Permit or verify that the parking fee has been paid for the specific numbered parking space. The HSD and its associated printing peripheral shall also enable the parking enforcement staff to issue a citation where necessary.

Required NPT Equipment for Pay-by-Space Parking Payment System

- Self-service **Parking Payment Stations (PPSs)** will be located at selected parking lots. The PPSs will:
    - Permit Customer to enter number of space in which they have parked;
    - Accept payment by cash, credit and debit media as well as SEPTA stored value media-;
    - Issue a receipt upon request.
- Self-service **Fare Vending Devices (FVDs)** will be located at selected stations. The FVDs will:
    - Permit Customer to enter number of space in which they have parked;
    - Accept payment by cash, credit and debit media, as well as SEPTA stored value media;
    - Issue a receipt upon request.

- **Handheld Sales Devices (HSDs)** will be issued to all SEPTA Parking Enforcement Staff. The HSDs will:
    - Verify validity of the Parking Permit;
    - Verify that the parking fee has been paid for the specific numbered parking space;
    - Enable the parking enforcement staff to issue a citation by use of a wirelessly connected printing peripheral.
- SEPTA/Contractor operated **Administrative~~utomatic~~ Sales Devices (ASDs)** will be located at selected stations. The ASDs will:
    - Permit Customer to provide payment for parking in a specific space number at a specific parking lot.

Pay-on-Foot Parking Payment System Operating Scenario

- The existing ~~A parking payment~~ Pay–on-Foot System employed at Frankford Transportation Center will be replaced with a new Pay-on-Foot ~~s~~System ~~has already been installed in SEPTA's gated Pay-on-Foot garages~~;
- SEPTA's customers shall be able to use the ~~new NPT Smart Media~~SEPTA Smart~~SEPTA Issued~~SEPTA Smart Media to pay for parking transactions ~~at the existing Pay-on-Foot system at the barrier gates~~and to use their ~~Smart Media~~SEPTA Smart~~SEPTA Issued~~SEPTA Smart Media, as permitted by SEPTA, as a monthly parking permit.

Required NPT Equipment for Pay-on-Foot Parking Payment System

- New **Ticket –Issuing Machines, Exit Readers, Parking Gates, Detector Systems** and **Pay-on-Foot Machines** ~~A Smart Media processor~~ shall be installed ~~adjacent to the~~ in SEPTA-designated locations to accommodate all parking Customers' needs.~~existing payment system to permit SEPTA Customers to utilize the new NPT Smart Media to pay for parking privileges.~~

1.2.3.6 Access Control and Reporting System

- SEPTA employees shall be issued customized ~~SEPTA Smart~~~~SEPTA Issued~~SEPTA Smart Media which incorporates both an NPT-compliant smart chip as well as a legacy SEPTA-compliant magnetic stripe;

- To support this new media, new access control hardware shall be deployed at all secure entrances to SEPTA's offices at the downtown Philadelphia, 1234 Market Street location.

Required NPT Equipment for Access Control and Reporting System

- All existing building access control hardware at 1234 Market Street shall be upgraded and/or replaced with a new system, which incorporates a Smart Media Processor.

1.2.3.7 Central Data Collection and Reporting System

To support the NPT System, the entire system will be controlled and monitored from a Central Data Collection and Reporting System (CDCRS). This CDCRS shall be the single data repository and control location for all NPT equipment provided as part of this system. The CDCRS shall be designed to interface with the segments of the NPT data network, to provide a single integrated set of controls and applications for the entire NPT System. This system shall serve as the central system through which SEPTA personnel will monitor and control all aspects of the NPT System. The CDCRS will interface with the SEPTA legacy systems, including those for finance.

1.2.3.8 Media Issuance

The NPT ~~Project~~ System shall provide Customers with numerous options for the purchase of ~~Smart Media~~SEPTA ~~Smart~~SEPTA ~~Issued~~SEPTA Smart Media. Furthermore, customers shall have the option of accessing a Customer Support Center via the telephone or utilizing a NPT E-Commerce website. The E-Commerce website shall permit SEPTA customers and SEPTA Transit Benefit Employers to establish accounts, acquire and register ~~Smart Media~~SEPTA ~~Smart~~SEPTA ~~Issued~~SEPTA Smart Media, add value and period passes to employee accounts, review media usage and status, as well as perform Autoload and other replenishment transactions.

The NPT System shall also permit establishment of SEPTA-preferred Vendor accounts. SEPTA-preferred vendors shall have the ability to issue SEPTA Smart Media and to reload value and/or pass products to SEPTA Smart Media accounts by use of an Internet utility, and also by use the Vendor's existing point-of-sale register.

1.2.3.9 Support Services

SEPTA is interested in exploring innovative ways to reduce SEPTA's current cost of collecting Customer fares. As such, SEPTA is seeking creative solutions for efficiencies and operational streamlining throughout the Customer payment model, and other means whereby SEPTA can reduce its operating costs, reduce in-house servicing and maintenance requirements, and offer "best value" both internally at SEPTA and to its Customers.

In order to accomplish this goal, SEPTA requires that the Contractor provide a premier support services program from start of revenue service through completion of the NPT System Warranty which includes the following elements:

- Customer Support Services;
- Maintenance Services;
- Revenue Services (Note – SEPTA requires that these services be provided after Warranty only);
- NPT Network Administration Services;
- Credit and Debit Media Processing Services;
- Commercial Wireless Services.

The requirements associated with the above services are defined in Section 24 and Section 25 of this Technical Specification.

1.3 Abbreviations

3DES	Triple DES
ABA	American Bankers Association
AC	Alternating Current
ACH	Automated Clearing House
ADA	Americans with Disabilities Act
AES	Advanced Encryption Standard
ANSI	American National Standards Institute
API	Application Programming Interface
ASD	Administrative Sales Device
ASTM	American Society for Testing and Materials
ASV	Approved Scanning Vendor
BCPS	Bank Card Processing Server
CAR	Contactless Access Reader
CCT	Customized Community Transportation
CCTV	Closed-Circuit Television
CDCRS	Central Data Collection and Reporting System
CPU	Central Processing Unit
CSR	Customer Support Representative
CQC	Contractor's QA/QC Manager for the NPT System Project
DES	Data Encryption Standard
DTE	Diagnostic Test Equipment
DUKPT	Derived Unique Key Per Transaction

DVD	Digital Versatile Disc
ECP	Engineering Change Proposal
EEPROM	Electrical Erasable Programmable Read Only Memory
EFT	Electronic Transfer of Funds
EIA	Electronic Industries Alliance
EMI	Electromagnetic Interference
EMICS	Equipment Maintenance and Inventory Control System
EMV	Europay MasterCard Visa.
EPROM	Erasable Programmable Read Only Memory
EU	European Union
FCC	Federal Communications Commission
FOCS	Fiber Optic Communication System
FOP	Fiber Optics Platform
FVD	Fare Vending Device
GB	Gigabyte(s)
GCS	Garage Communications Server
GHz	Gigahertz (Frequency of One Billion Cycles per Second)
GPS	Global Positioning System
GPR	General Purpose Reloadable
GUI	Graphical User Interface
HIPAA	Health Insurance Portability and Accountability Act
Hz	Hertz (Frequency of One Cycle per Second)
HSD	Handheld Sales Device

IEEE	Institute of Electrical and Electronic Engineers
ISO, ISO/IEC	International Standards Organization
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LTE	Long Term Evolution
MCBF	Mean Cycles Between Failure
MDT	Mobile Data Terminal
MID	Media Information Display
MIL-STD	Military Standard
MMSR	Magnetic Media Swipe Reader
MSD	Maintenance Support Device
MTBF	Mean Time Between Failure
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NFC	Near Field Communications
NFPA	National Fire Protection Agency
NPT	New Payment Technologies
NPTDS	New Payment Technologies Database Server
NTP	Notice to Proceed
NVRAM	Non-Volatile Random Access Memory
OBP	On-Board Processor
OBSMP	On-Board Smart Media Processor
OCU	Operator Control Unit
ODBC	Open Data Base Connectivity
OCD	Operator Control and Display

OEM	Original Equipment Manufacturer
OSHA	Occupational Safety and Health Administration
PASD	Portable Administrative Sales Device
PAYG	Pay as You Go
PCB	Printed Circuit Boards
PCI DSS	Payment Card Industry Data Security Standard
PCMCIA	Personal Computer Memory Card International Association
PET	~~Passenger Encounter~~Passenger Encounter Target (Regional Rail Bi-directional Turnstile)
PIN	Personal Identification Number
POF	Pay-on-Foot
POFM	Pay-on-Foot Machine
PPS	Parking Payment System
PROFIT	Pass Reconciliation of Fare Instrument Transaction
PROM	Programmable Read Only Memory
PSTN	Public Switched Telephone Network
QA/QC	Quality Assurance/ Quality Control
QSA	Qualified Security Assessor
RAID	Redundant Array of Independent Disks
RDBM	Relational Database Manager
RF	Radio Frequency
RFI	Radio Frequency Interference
RFID	Radio Frequency Identification
RMS	Rail Manager Server
RRD	Railroad Division

~~RSD~~	~~Retail Sales Devices~~
RSMS	Retail Sales Management Server
RTCE	Revenue Transfer and Collection Equipment
SAE	Society of Automotive Engineers
SAN	Storage Area Network
SEPTA	Southeastern Pennsylvania Transportation Authority
SL	Simulator Lab
SME	Smart Media Encoder
SMP	Smart Media Processor
SMS	Subway Manager Server
SONET	Synchronous Optical Network
SQL	Structured Query Language
SSL	Secure Sockets Layer
T1	T1 Carrier System (1.544 Mbps)
T3	T3 Carrier System (44.736 Mbps)
TCP/IP	Transmission Control Protocol~~/~~/Internet Protocol
TIA	Telecommunications Industry Association
TIM	Ticket Issuing Machine
TKIP	Temporal Key Integrity Protocol
~~TSL~~	~~Training Simulator Lab~~
USB	Universal Serial Bus
UL	Underwriters Laboratories, Inc.
UPS	Uninterruptible Power Supply
VAC	Volts Alternating Current
VDC	Volts Direct Current

WAN	Wide Area Network
WLAN	Wireless Local Area Network
WPA	Wi-Fi Protected Access
XR	Exit Reader

1.4 Definitions

Wherever the following terms are used within these Technical Specifications, the intent and meaning shall be interpreted as follows:

- Whenever in the Specifications the words "acceptable", "accepted", "approval", "approved", "authorized", "condemned", "considered-necessary", "deemed necessary", "designated", "determined", "directed", "disapproved", "established", "given", "indicated", "insufficient", "ordered", "permitted", "rejected", "required", "reserved", "satisfactory", "unacceptable", "unsatisfactory", or words of like import are used, it shall be understood as if such words were followed by the words " in writing to or by SEPTA or its designated representative", unless otherwise specifically stated.

- Wherever the word "indicated" is used, it shall be understood to mean "as described in the Technical Specifications", "as shown on the Contract Plans", or "as required by the other Contract Documents."

- Wherever the words "provided" or "supplied" are used in reference to work to be performed by the Contractor, it shall be understood to mean "furnished and delivered completed".

ACCEPTANCE. Reviewed for conformity to Contract requirements and accepted, in writing, by SEPTA.

ADA FAREGATE. A Regional Rail or Subway/Elevated fare gate that that is designed to allow the passage of an ADA customer and when installed satisfies all ADA requirements and regulations.

ADA GATE. See ADA Faregate.~~A Subway/Elevated gate that that is designed to allow the passage of an ADA customer and when installed satisfies all ADA requirements and regulations.~~

ACCOUNT -BASED MEDIA. All forms of Contactless Smart Media, including (SEPTA IssuedSEPTA IssuedSEPTA Smart Media, Limited Use Media, and Partner-Issued Smart Media,) that are linked to a customer account established within the CDCRS via the media's unique identification number, and contain account specific information, such as value or period calendar pass information, usage information or account holder information. Account-based media does not entail writing information to the Media as all processing of transactions occurs only at the CDCRS and is linked to the Smart Media via its unique identification number.

ADMINISTRATIVE SALES DEVICE. A PC-based device with a cash-drawer located in a SEPTA sales location, which sells and processes all SEPTA approved Smart Media.

ADVANCED ENCRYPTION STANDARD. A block cipher adopted as an encryption standard by the U.S. government.ANSI/TIA/EIA-526-7. Standard for the measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant.

ANSI/TIA/EIA-526-14-A. Standard for Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

ANSI/TIA/EIA-568-B. A set of telecommunications standards from the Telecommunications Industry Association. The standards address commercial building cabling for telecom products and services.

APPLICATION PROGRAMMING INTERFACE. A source code interface that a computer system or program library provides in order to support requests for services to be made of it by other computer programs, and/or to allow data to be exchanged.

APPROVAL OR APPROVED. SEPTA's written acknowledgement of acceptance.

AUTHENTICATE. To verify (guarantee) the identity of a person or entity or the validity of an item of Smart Media or credit/debit media. To ensure that the individual or organization is really who it says it is.

AUTHENTICATION. The process of verifying the identity of a person or other entity or the validity of an item of Smart Media or credit/debit media.

AUTHORIZATION. The assignment of a privilege or privileges (e.g., access to a building or network) verifying that a known person or entity has the authority to perform a specific operation. Authorization is provided after authentication. This term also refers to the approval of credit/debit media by a central authority (CDCRS or banking/industry clearinghouse).

AUTOLOAD. Automatic replenishment of ~~SEPTA-issued~~SEPTA ~~Issued~~SEPTA and Partner-issued Media. This will occur by registering the ~~SEPTA-issued~~SEPTA ~~Issued~~SEPTA or Partner-issued Media to a specific customer account within the CDCRS and linking a means of external electronic payment (credit/debit media) with the card for automatic replenishment of the Smart Media with a calendar period pass or stored value amount upon the account reaching a certain threshold for date or low value, or upon completion of a fixed calendar duration.

AUTO-REPLENISHMENT. See Autoload.

BAD NUMBER LIST. This list shall store all known Smart Media ~~card~~identification numbers which cannot be used in the NPT System. These shall include those defined by SEPTA and its P~~p~~artners as well as C~~c~~redit/D~~ and d~~ebit ~~card~~Media identification numbers.

BANK ISSUED CREDIT MEDIA. Media that is connected to an existing credit account through a financial establishment. This media type is issued by a certified U.S. financial institution to customers for electronic payment of goods and services. This type of fare media is comprised of both Contactless Credit Media and Magnetic Credit Media.

BANK ISSUED DEBIT MEDIA. Media that is connected to an existing checking/savings account through a financial establishment. Utilization of this type of media is associated with the need to enter a PIN for identification and verification purposes. This type of fare media is comprised of both Contactless Debit Media and Magnetic Debit Media.

BILL ACCEPTOR. A module that authenticates U.S. currency notes inserted.

BILL ESCROW. A secure module that is a component of the "Bill System" which serves as a temporary storage area for U.S. currency notes that have been authenticated until the transaction is completed. Escrowed bills are returned when a transaction is canceled.

BILL STACKER. A module within the Bill System that facilitates the stacking of U.S. currency notes in the secure vault.

BILL VAULT. A uniquely serialized locked box that holds U.S. currency notes that have been accepted on completion of a transaction and stacked by the bill stacker.

CALENDAR PASS. ~~Encoded~~ Fare Media or Fare Media Account on CDCRS that provides access to designated portions of the SEPTA transportation system for a specified calendar period.

CALIBRATION. Comparison of two instruments or measuring devices, one of which is of known accuracy traceable to national standards, to detect, correlate, report, or eliminate by adjustment any discrepancy in the accuracy of the instrument or measuring device being compared with the standard.

CARD ASSOCIATION. Card association refers to VISA, MasterCard. American Express, and/or Discover.

CASH TRANSACTION TIME. The time from completion of Fare Media selection to when all Fare Media are deposited in the ticket/coin return bin, the receipt is issued (if selected) and all change is returned (if applicable)

CENTER CITY REGIONAL RAIL STATIONS. See Downtown Regional Rail Stations.~~The five stations that comprise the Center City Regional Rail Stations are Temple University Station, Market East Station, Suburban Station, 30th Street Station and University Station.~~

CENTRAL DATA COLLECTION AND REPORTING SYSTEM (CDCRS). The computer system that controls all processes, transactions and events related to fare vending and collection device operation, as well as communications to the devices and external/ internal system. The CDCRS also serves as the repository and processor for all data transferred from NPT equipment. It monitors and controls the NPT equipment and ensures proper performance of the system as identified herein. It also stores fare tables and other system and equipment parameters for data exchange and provides interfaces to other systems.

CERTIFICATION. The action of determining, verifying, and attesting, in writing, to the qualifications of personnel, materials, and/or equipment.

CHIP. Electronic component that performs logic, processing, and/or memory functions.

CLEARINGHOUSE. A financial services company that provides clearing and settlement services for financial transactions.

CLOSED-LOOP MANNER. Uses routing alternatives to branded payment networks, but relies on open standards technology and processes for acceptance of the Media and electronic transfers of funds.

CLOSED-LOOP, OPEN STANDARD RELOADABLE PREPAID MEDIA. Media that uses open standard technology and processes the execution of payment transactions in an account-based manner. Replenishment of the account is permitted. Acceptance of the Media is restricted to a single merchant, a limited number of merchants or to select merchant categories. Processing of payment occurs in a closed-loop manner. This type of Media is often referred to as a private-label card. The Media itself can be equipped with a dual-interface of magnetic stripe and a contactless chip to in order to permit a broader range of acceptance and reload opportunities.

COIN ACCEPTOR. The module is part of the "Coin System". The device verifies the validity of U.S. issued coins inserted.

COIN ESCROW. A Coin System module that serves as a temporary storage area for U.S. coins that have been accepted until the transaction is complete. Escrowed coins are returned to the customer when a transaction is canceled.

COIN VAULT. A locked box that, as part of the Coin System, securely stores collected coins.

COMPONENT. Any device having distinct electrical or mechanical characteristics and having connection points to be connected to other components to form a sub-assembly.

COMPONENT TESTING. The rigorous testing regimen that all components of the NPT system are subject to.

CONSUMABLES. These are parts of the NPT system, excluding Fare Media, computer system toner, NPT equipment receipt stock, which either:

- may be expected to require replacement under normal maintenance schedules:
- have an expected life of less than five (5) years; or
- require replacement after performing their function one time (such as fuses).

CONTACTLESS CREDIT MEDIA. Credit M~~m~~edia employing an ISO/IEC 14443 compliant microchip and an internal RF antenna for communicating with a reader that is located on a fare vending or collection device (such as the MasterCard PayPass® and the Visa PayWave®).

CONTACTLESS DEBIT MEDIA. Debit M~~m~~edia employing an ISO/IEC 14443 compliant microchip and an internal RF antenna for communicating with a reader that is located on a fare vending or collection device.

CONTACTLESS SMART MEDIA. Fare Media that is compliant with ISO/IEC 7816 and ISO/IEC14443, employs an embedded integrated circuit and an internal RF antenna for communication. The integrated circuit can be either a secure microcontroller or equivalent intelligence with internal memory or a memory chip alone. The media communicates to a reader~~s~~, without physical contact, via radio frequency interface. With an embedded microcontroller, Smart Media ~~can~~ may store large amounts of data, carry out their own on-card functions (e.g., encryption and mutual authentication) and interact intelligently with a Smart Media Processor. Contactless Smart Media is available in a variety of form factors, including cards, subscriber identification modules used in GSM mobile phones, and USB-based tokens. Contactless Smart Media is comprised of ~~SEPTA Issue~~SEPTA Smart Media, ~~and~~ Partner ~~Issued~~ Smart Media, Contactless Credit Media and Contactless Debit Media.

CONTRACT DRAWINGS. Drawings provided as part of the Contract Documents.

CONTRACTOR. The Prime Contractor for this ~~SEPTA issued~~SEPTA contract who shall be solely responsible for the development of all hardware and software, its installation, quality, proper functioning, and reliability of the system; the person or persons, proposer, partnership, corporation, or combination thereof, which has entered into this contract with SEPTA to supply the system.

CONTRACTOR'S DRAWINGS. Items such as detail drawings, graphs, diagrams, and sketches that are prepared by the Contractor to detail its work.

CORRECTIVE MAINTENANCE (CM). Performing unscheduled repairs necessary to correct a machine malfunction. CM includes diagnostic testing, finger-tip repairs, component change out, and verification testing.

CREDIT/DEBIT MEDIA. See Bank Issued Credit Media and Bank Issued Debit Media.

CREDIT AND DEBIT MEDIA TRANSACTION TIME. The time from completion ~~of Fare~~ transaction selection to the time when the Customer gains access to the NPT System or ~~Media selection through~~ the time fare media is dispensed.~~,~~

CUSTOMIZED COMMUNITY TRANSPORTATION. SEPTA's Customized Community Transportation (CCT Connect) provides ADA paratransit service to individuals with disabilities who are functionally unable to use regular accessible fixed-route bus service for some or all of their transportation needs, as well as a Shared-Ride paratransit program for senior citizens.

~~CUSTOMER SUPPORT CENTER. Centralized customer support center providing walkup, Internet, and telephone support to SEPTA's NPT customers. Responsible for handling all customer enquiries associated with smart media account activity as well as issuance and fulfillment of all smart media requests and management of customer accounts.~~

DATA ENCRYPTION STANDARD. A method for encrypting information. (See related term Triple (3) DES.)

DEPLOYMENT PLAN. The methodology by which the Contractor will deploy the NPT System as defined in Section 21 of this Technical Specification.

DIN RAIL. A top-hat rail that is a standardized 35 mm wide metal rail with a hat-shaped cross section. It is used for mounting circuit breakers and industrial control equipment inside equipment racks.

DOLLAR COIN. This includes the U.S. dollar coins issued beginning 1979 - Susan B. Anthony, Sacagawea, and Presidential U.S. dollar coins.

DORMANT CARD. ~~SEPTA issued~~SEPTA Smart Media that has had no transaction activity for a SEPTA-defined period of time and shall be suspended until reactivated by a SEPTA agent. Attempts to use this M~~m~~edia shall be denied by the NPT equipment.

DOWNLOADING. The process of transferring data from the Central Data Collection and Reporting System to the Station LANs and NPT E~~e~~quipment.

DOWNTOWN REGIONAL RAIL STATIONS. The five stations that comprise the Center City Regional Rail Stations are Temple, Market East Station, Suburban Station, 30th Street Station and University City Station.

ELEMENTS. NPT System Devices and Software.

ENCRYPTION. The process of translating information into a code that can only be read if the reader has access to the key that was used to encrypt it. There are two main types of encryption, asymmetric (or public key), and symmetric (or secret key).

EQUAL. The make or quality of material or equipment in this Contract, SEPTA's decision as to whether any material or equipment proposed is equal to that specified shall be binding on both the Contractor and SEPTA.

ESCROW DEPOSIT. Placement of source code, development tools, documentation, and all other software required to replicate the executable CDCRS and device software for Contractor-Developed Core Software with an agreed with third party who will insure the safe keeping of these items and shall also release the items to SEPTA under specific defined conditions.

EUROPAY MASTERCARD VISA (EMV). Specifications developed by Europay, MasterCard, and Visa that define a set of requirements to ensure interoperability between payment chip cards and terminals.

EXACT FARE ONLY MODE. A degraded mode of operations where the FVD accepts coins and/or bills for payment but may have insufficient coins to make change.

FACIAL DIMENSION. Nominal tile size as defined in ANSI A137.1.

FAIL SAFE. A characteristic of a system, which insures that any malfunction affecting safety, shall cause the system to revert to a state that is known to be safe. To be considered "fail safe", the systems shall also automatically furnish an acceptable indication in accordance with the specification that a failure has occurred.

FAILURE. The inability of a system, subsystem, assembly, or component to perform its required function. An improper condition requiring the equipment/software to be withheld from or removed from service for corrective action. Refer to specification for further details.

FAREGATE. An item of NPT equipment installed at a station which provides a barrier and bars passage until it determines, by reading an item of Fare Media, that the user has paid a valid fare. One customer is allowed passage for each valid fare that is presented.

FARE MEDIA. Acceptable media that may be used as payment for transportation services on SEPTA. Includes both Contactless Smart Media and Magnetic Fare Media.

FARE VENDING DEVICE. Self-service customer operated device, which has the ability to sell and/or encode all types of Fare Media offered by SEPTA. There are multiple types of FVDs.

FRONTIER DIVISION. Suburban bus transportation services provided by SEPTA.

FULL GLOSS. Refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

GENERAL PURPOSE RELOADABLE (GPR) SMART MEDIA. Media that uses open standard technology and processes for executing payment transactions in an account-based manner. Replenishment of the account is permitted. The Media is accepted for payment purposes at multiple merchants by both the Media's "branding" and compliance with processing rules of any one of the major card associations or brands (i.e., VISA, MasterCard, American Express, etc.) and the merchant's acceptance of those brands. The Media itself can be equipped with a dual-interface of magnetic stripe and a contactless chip to in order to permit a broader range of acceptance and reload opportunities.

HANDHELD SALES DEVICE. Device that communicates with the CDCRS to ~~visually~~ displays the validity of the ~~data~~ Smart Media presented for transportation payment purposes. ~~encoded on Contactless Smart Media.~~ The primary intent of this device is for use by SEPTA staff to verify validity of and sell Fare Media, provide customer assistance, and communicate with selected station and parking equipment.

HYBRID MEDIA. Fare Media that contains a smart card chip and a magnetic stripe.

IDENTIFICATION CARD. Card identifying its holder and issuer, which may carry data required as input for the intended use of the card and for transactions based thereon.

IEEE 802.11. Set of standards for Wireless Local Area Network computer communication, in the 5 GHz and 2.4 GHz public spectrum bands.

IEEE 802.11N. An amendment to the IEEE 802.11 wireless networking standard. Increases the maximum raw (PHY) data rate from 54 Mbit/s to a maximum of 600 Mbit/s.

IEEE 802.16. Working Group on Broadband Wireless Access Standards, to prepare formal specifications for the global deployment of broadband Wireless Metropolitan Area Networks.

IEEE 802.16E. Standard for a mobile Broadband Wireless Access Standards.

IMPLEMENTATION PERIOD. Time period from SEPTA approval of NPT Final Design Review submittal through SEPTA approval of NPT System after Contractor implementation of complete NPT System functionality.

INTELLECTUAL PROPERTY. Information, systems, software, programs, processes, technology, services, methodologies, products, and any other materials or rights, tangible or intangible, all relating to the SEPTA project.

INTERFACE. The points where two or more systems, subsystems, or structures meet, transfer energy, or transfer data or information.

INSPECTION. A phase of Quality Control, which by means of examination, observation, or measurement, determines the conformance of materials, components, parts, appurtenances, systems, processes, installations, or structures to predetermined quality requirements.

ISO/IEC 14443. The international standard, "Identification Cards - Contactless Integrated Circuit(s) Cards - Proximity Cards," for contactless smart chips and cards that operate (i.e., can be read from or written to) at a distance of less than 10 centimeters (4 inches). This standard operates at 13.56 MHz.

ISO/IEC 18092. The internal standard for short-range wireless standard that uses magnetic field induction to enable communication between devices when they are brought close together (within 10-20 centimeters or 4-8 inches). NFC technology is compatible with ISO/IEC 14443-based technology.

INVALID FARE MEDIA LIST. A list of unique Smart ~~card~~ Media serial numbers, representing fare media, bank issued credit media, and bank issued debit media that have been determined to be invalid or unacceptable.

LICENSEE. Entity to whom a license is granted.

LICENSOR. Entity who owns the property for which the license is conveyed.

~~LIMITED USE MEDIA (LUM). A type of Contactless Smart Media. When compared to a SEPTA-Issued Smart Media, the Limited Use Media incorporate less memory and is reusable only for a few number of trips.~~

LINKED TRIP. The total number of riders and measures the actual number of complete trips from origin to destination, including transfers.

LOCAL AREA NETWORK. A data communication network conforming to IEEE standards, that is used to connect multiple computer controlled devices in close proximity to one another, i.e., in one office or building.

MAGNETIC CREDIT MEDIA. Bank issued credit media that incorporates a magnetic stripe that is encoded per ABA standards.

MAGNETIC DEBIT MEDIA. Bank issued debit media that incorporates a magnetic stripe that is encoded per ABA standards.

MAGNETIC FARE MEDIA. Fare media that utilizes a magnetic stripe that is encoded with data utilizing ~~data~~ SEPTA's magnetic encoding format~~as necessary~~.

MAGNETIC MEDIA. See Magnetic Fare Media.

MAINTAINABILITY. The ability of the NPT System to be maintained by maintenance staff, including enhancement of access to equipment and components that require maintenance.

MAINTENANCE, CORRECTIVE. The action performed, as a result of a failure, to restore an item to revenue service.

MAINTENANCE, PREVENTIVE. The action that is systematically performed to ensure that all fare vending and collection devices are operating in a highly reliable state, as specified by the Contract.

MAINTENANCE SUPPORT DEVICE (MSD). A portable piece of equipment used by the SEPTA maintenance personnel that is linked to the CDCRS via the wireless data network and provides information to assist in maintenance of the NPT equipment. This assistance includes interfaces with the work order system, spare parts and module tracking as well as storage and display of information from the Contractor-provided manuals and system documentation.

MEDIA. Physical object used for payment of services rendered.

~~MERCHANT ACQUIRER. Merchant Acquirer is the refers to processors and the affiliated financial institutions that execute authorizations and settlement for credit and debit cards.~~MERCHANT ACQUIRER. The entity, usually a processor and an associated financial institution, that processes and settles a merchant's credit and debit transactions with card associations and issuers of credit and debit cards. In order to receive payment from those credit and debit accounts, merchants are required to establish and maintain a business relationship with a Merchant Acquirer as the intermediary between the various participants in the payment of funds from the customer's credit or debit account to the merchant.

MODULE. A standardized, interchangeable unit, designed to facilitate maintenance, and repair.

MODULE SIZE. Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

NEAR FIELD COMMUNICATION (NFC). See ISO/IEC 18092

NFPA 130. Nation Fire Protection Association standard for fire protection requirements for underground, surface, and elevated fixed guideway transit and ~~passenger~~customer rail systems, including trainways, vehicles, and vehicle maintenance and storage areas, and for life safety from fire in fixed guideway transit and ~~passenger~~customer rail system stations, trainways, vehicles, and outdoor vehicle maintenance and storage areas. This shall include stations accommodating ~~passenger~~customers and employees of the fixed guideway transit and ~~passenger~~customer rail systems and incidental occupancies in the stations.

NOISE. Interference presented on a system by undesirable voltages or currents.

NON-PROPRIETARY HARDWARE. Hardware utilized within the NPT System on which a Contractor does not purposely place compatibility restrictions, in order to maintain a Contractor lock to provide hardware.

NON-PROPRIETARY SOFTWARE. Software utilized within the NPT System which the developer/producer has not set or included restrictions on the software use, private modification, copying, or republishing. Developers/producers of non-proprietary software may not enforce restrictions by technical means, such as by restricting source code access, or by legal means, such as through copyright and/or patents.

NPT CUSTOMER SUPPORT CENTER. Centralized customer support center providing walkup, Internet, and telephone support to SEPTA's NPT customers. Responsible for handling all customer enquiries associated with smart media account activity as well as issuance and fulfillment of all smart media requests and management of customer accounts.

NPT DEVICES. See NPT System Devices.

NPT SYSTEM DEVICES. Hardware utilized within the NPT System. Shall include, but not be limited to, Handheld Sales Devices, Faregates, Turnstiles, On-Board Processors, ~~Passenger~~Customer Enforcement Targets, etc. See also NPT System Equipment.

NPT SYSTEM EQUIPMENT. Hardware utilized within the NPT System. Shall include, but not be limited to, Handheld Sales Devices, Faregates, Turnstiles, On-Board Processors~~,~~, ~~Passenger~~Customer Enforcement Targets, etc. See also NPT System Devices.

NPT TEST LAB. The NPT Test Lab (NPT-TL) shall mimic and represent the entire deployed NPT System. When a subsequent deployment Phase requires the implementation of a new function or set of functions into the accepted NPT System or any accepted NPT System element from a previous deployment phase, a comprehensive test of the feature and a regression test of its impact on the entire NPT System shall be conducted in the NPT Test Lab.

ON-BOARD PROCESSOR (OBP). The device installed on the Surface vehicles which is used to process the Smart Media presented by Customers. The OBP incorporates an integrated Operator Control and Display for control of the OBP and for displaying information associated with transactions that occur on SEPTA's existing Farebox.

OPEN ARCHITECTURE. A ~~type of computer or software~~system architecture that allows adding, upgrading and swapping functionally equivalent components from multiple suppliers, without extensive development efforts for their integration. Software interfaces are through well-defined APIs. Hardware interfaces use standard or third party connectors available through multiple suppliers and no proprietary hardware or software implemented that would restrict such addition, upgrade or swapout.

OPEN PAYMENT. Methods of electronic fare payment controlled by third parties and permitted as a fare payment method in the NPT System, such as with credit cards, debit cards, ~~PayPal accounts,~~ etc., with their associated support systems. These open payment methods are ~~–~~based on standards and defined practices of the banking, financial services and payments industry.

OPEN PAYMENT SMART MEDIA. Contactless Credit Media, Contactless Debit Media, GPR Smart Media, third-party, or related transportation media forms compliant with ISO/IEC-14443 such as mobile phone fare payments, microchip equipped key fobs, etc.

OPEN SYSTEMS. Computer systems that support and provide some combination of interoperability, portability using open software standards.

OPERATIONAL SPARES. Spare cash containers used during the revenue servicing process for fare vending and collection devices. These include bulk coin hoppers, coin magazines, coin vaults and bill vaults for the fare vending and collection.

OPERATOR CONTROL AND DISPLAY. An integral device of the OBP which is used by the vehicle operator to sign-on to the On-Board Processor to provide a single point of control for the on-board NPT equipment.

OVERPAYMENT. Surplus payment made for a selected fare when sufficient change may not be available, i.e. the fare vending device may be in Exact Fare Only mode.

PARTNER~~-~~ ISSUED SMART MEDIA. Contactless Smart Media issued by an authorized partner of SEPTA that is linked to an account established within the CDCRS.

PARTNER SMART MEDIA. See Partner Issued Smart Media.

~~PASSENGER ENCOUNTER~~PASSENGER ENCOUNTER TARGET (PET). A Bi-directional ~~Faregate~~ Turnstile utilized on SEPTA's Regional Rail Division.

PASSWORD. A form of secret authentication data that is used to control access to a resource. The password is kept secret from those not allowed access, and those wishing to gain access are tested on whether or not they know the password and are granted or denied access accordingly. Typically referred to as "something you know" for single factor authentication.

PAY ON FOOT. A parking system which requires machine readable media to be issued to the customer when entering the parking facility, and machine readable media for facility exit at a central location and use of the exit at the exit lane to leave the facility.

PAY BY SPACE. A parking system which requires the parking payment to be made for as specific space in which the vehicle is parked. The duration of time for which the customer wishes to park is either assumed by default or entered as part of the process.

PERIOD PASS. Encoded Fare Media that provides access to designated portions of the SEPTA system for a specified time period.

PERSONAL IDENTIFICATION NUMBER (PIN). An alphanumeric security code number that is associated with an ID card that adds a second factor of authentication to the identity verification process. Can be used in conjunction with an ATM card to access the cardholder's account for payment of Media purchase; an alphanumeric security code that is used by a SEPTA employee to gain access to fare vending and collection devices for operation, servicing and/or maintenance.

POSITIVE LIST. This list shall store selected known Smart Media ~~card~~identification numbers which can be used in the NPT System without further verification required. Such Smart Media ~~card~~ numbers shall include those of SEPTA Employees and Customers (for which auto-replenish services have been enabled and remain authorized) who continue to satisfy SEPTA's eligibility requirements. These shall include those defined by SEPTA and its partners.

PRECAST CONCRETE. Concrete that is cast at a precasting plant in the form of a structural element (as a slab, pile, panel, or beam) before being shipped to the job site and placed in final position.

PRECONSTRUCTED CONCRETE. Concrete that is cast on the job site in the form of a structural element and then moved to its final location and placed in its final position; work performed under this Section. Manufacturing procedures shall be in general compliance with PCI MNL-117.

PREEXISTING WORK. Intellectual property that is completed and/or owned by the Contractor, and that may be provided to SEPTA for the project.

PREVENTIVE MAINTENANCE (PM). Performing periodic, scheduled procedures that ensure the equipment meets equipment reliability and availability targets with a minimum of corrective maintenance.

PRODUCT DATA. Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, instructions, warnings, and other information furnished by the Contractor to illustrate or explain the fabrication, assembly, installation, maintenance, or operation of materials, equipment, or some portion of the work.

PROJECT MANAGER. Project Manager means SEPTA's authorized representative having the responsibility to oversee and manage the day to day activities of the NPT System contract.

QUALITY ASSURANCE (QA). A program of planned and systematic actions that provide adequate confidence that all activities affecting quality have been accomplished in accordance with governing codes, standards, and contract requirements. QA oversight of activities affecting quality is accomplished through field and manufacturing facility surveillance, audits, or other documented measures conducted to verify that requirements have been met.

QUALITY CONTROL (QC). The act of examining, witnessing, inspecting, checking, and/or testing of in-process or completed work to determine conformity with specified requirements and documenting the results.

QUALITY ASSURANCE (QA) AUDIT. A documented activity performed by written procedure or checklist to verify that selected elements of the Quality Assurance/Quality Control Program have been developed, documented, and implemented in accordance with specified requirements.

RADIO FREQUENCY. Any frequency within the electromagnetic spectrum associated with radio wave propagation. Many wireless communications technologies are based on RF, including radio, television, mobile phones, wireless networks, and contactless payment cards and devices.

RADIO FREQUENCY IDENTIFICATION. Technology that is used to transmit information about objects wirelessly, using radio waves. RFID technology is composed of 2 main pieces: the device that contains the data and the reader that captures such data. The device has a silicon chip and an antenna and the reader also has an antenna. The device is activated when put within range of the reader. The term RFID has been most commonly associated with tags used in supply chain applications in the manufacturing and retail industries.

RECEIPT TOKEN. A pre-encoded Magnetic Media issued by a Regional Rail Conductor to a Customer in lieu of issuing a receipt. The Regional Rail Conductor shall have the ability to manually write the amount of the transaction on the Receipt Token. SEPTA Customers will take this token to a SEPTA Sales Outlet (FVD, ASD, Website, etc.) in order to obtain a receipt for the paid fare.

REDUNDANCY. The existence in a system of more than one means to accomplish a given function, for the purpose of increasing security or reliability.

REFERENCE. Where reference is made in the Contract Documents to publications or standards issued by associations or societies, the intent shall be to specify the current edition of such publications or standards in effect on the date of Contract Award, notwithstanding any reference to a particular date.

REGIONAL RAIL SYSTEM. The commuter rail system operated by SEPTA.

RAILROAD TURNSTILE. A new bi-direction access control device located at SEPTA Subway/Elevated stations that maintains access to and egress from the station by processing user presented Fare Media. One customer is allowed passage into the station for each valid item of Fare Media that is processed.

RELIABILITY. The performance of a specified function without failure and within design parameters for the period of time or the number of cycles specified under actual service conditions.

REPLENISHMENT. See Autoload.

~~RETAIL SALES DEVICE. A computer controlled device located in a media third-party sales location, which sells and processes valid SEPTA Fare Media.~~

REVENUE SERVICE PROVEN (ALSO "SERVICE PROVEN" OR "PROVEN"). The historical success of equipment/software operating for a stated minimum successful performance of scheduled revenue service under similar conditions elsewhere and in accordance with the reliability requirements.

ROUGH CARPENTRY. Carpentry work not specified in other Sections and not exposed.

SAFETY. The condition in which persons are free from threat, danger, harm, or loss arising from improper design, manufacture, assembly, malfunction, or failure of the NPT system or any of its components or elements.

SATIN. Refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.

SECURE SOCKETS LAYER. A protocol used to transmit information on the Internet in encrypted form. SSL also ensures that the transmitted information is only accessible by the server that was intended to receive the information.

SEMIGLOSS. Refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.

SEPTA. Southeastern Pennsylvania Transportation Authority.

SEPTA- ISSUED SMART MEDIA. Open Standard, Contactless Smart Media issued by SEPTA that is –linked to an account established within the CDCRS. Acceptable forms of media would include items such as ISO/IEC-14443 Type A and B smart cards, limited use smart cards, key fobs, cell phones, etc.

SEPTA-LINKED SMART MEDIA. SEPTA-Registered Media where the account holder has chosen to link the account to a checking or credit account with a financial institution for the purposes of auto-replenishment of stored value or period passes.

SEPTA-REGISTERED SMART MEDIA. ~~SEPTA-Issued~~SEPTA ~~Issued~~SEPTA Smart Media linked to a customer account which has been established within the CDCRS, and where the account holder has chosen to register their personal identification information with the account.

SEPTA SERVICE AREA. The physical space occupied by a SEPTA operated vehicle at any point in time during current operations.

SEPTA SMART MEDIA. See SEPTA Issued Smart Media.

SERVICE, (AS IN SERVICE USE). The operation of the NPT System under normal conditions with customers.

SHOP DRAWINGS. Items, such as drawings, calculations, and catalog cuts, which are prepared by the Contractor to supplement or detail Contract Drawings or Specifications, or are prepared at Contractor's option to detail its work; or which the Contractor is required to submit to the Engineer for review, information, or record, including electrical schematics and wiring diagrams, fabrication, erection, layout, assembly, installation, tests, maintenance, and repair drawings.

SIGNATURE DEBIT. One of three principal payment card types, the others beng credit cards and PIN debit cards. Like PIN debit cards, Signature Debit Cards withdraw funds directly from the customers' depository or checking account in order to settle the transaction. Unlike PIN debit cards, Signature Debit Cards do not require entry of a Personal Identification Number (PIN) in order to execute a payment transaction, and they instead use the credit card network instead of the unique PIN-debit network to process the transaction.

SITE INSPECTION. Site Inspection consists of reviewing, monitoring, observing, and inspecting the work at the project site.

SMART MEDIA. See Contactless Smart Media

SMART MEDIA TRANSACTION. The time measured from the time the customer commences selection of the fare media information until all transaction information is shown on the customer display,

SMART MEDIA PROCESSOR. A component within the fare vending or collection device that is correctly and efficiently interacting with an ISO/IEC compliant Smart Media; the device that processes Smart Media when it is touched (“tagged”) to the surface of the unit.

SOFTWARE. The media and documents that regulate and control the operation of computer and microprocessor based systems including data transmission by specifying computer programs, procedures, and rules. It includes compilers, library routines, source codes, report generation, manuals, and flow charts.

SOURCE INSPECTION. Source inspection consists of the review, monitoring, observation, and/or inspection, random or consistent, or at selected stages of manufacture or construction, of manufacturer or sub-manufacturer's personnel, material, equipment, processes, or tests.

STANDARD. Something set up and established by a recognized authority as a rule for the measure of quantity, weight, extent, value, quality, or other performance measure. This includes specifications produced by accredited associations, such as ANSI, ISO, SIA, ETSI, or NIST. In the United States, the use of standards is typically optional and multiple standards can be developed on the same subject. In some countries, the use of existing standards may be required by law and the development of multiple standards on the same subject may be restricted.

STORED VALUE. SEPTA Fare Media with value on deposit with SEPTA. The funds data may be either encoded on the Fare Media (card-based approach) or may be maintained in an account affiliated with the Fare Media (account-based approach).

SUB-ASSEMBLY. Two or more components combined into a unit for convenience in assembling or servicing equipment.

SUBCONTRACTOR. An individual, partnership, corporation or joint venture to whom the Contractor sublets any part of the Contract.

SUBURBAN TRANSPORTATION SERVICES. Transportation services provided by SEPTA outside the City of Philadelphia.

SUBWAY/ELEVATED SERVICE. The gated system operated with terminuses at Fern Rock Transportation Center, Pattison, 8th and Market Street, Frankford Transportation Center, and 69th Street Terminal operated by SEPTA

SUBWAY/ELEVATED TURNSTILE. A rehabilitated or new one-direction access control device located at SEPTA Subway/Elevated stations that maintains access to and egress from the station by processing user presented Fare Media. One customer is allowed passage into the station for each valid item of Fare Media that is processed.

SURFACE SYSTEM. The buses and trolley services operated by SEPTA.

SURFACE VEHICLES. The buses and trolleys operated by SEPTA.

SURVEILLANCE. Term used to describe a review performed for the purpose of verifying that applicable quality requirements are properly accomplished

SWEEP. The process whereby SEPTA employees start at one end of a rail or bus vehicle and moves to the other end while verifyingy that all Customers on-board have Ffare Mmedia valid for their trip.

TEST CARDS. Fare Media issued by the NPT devices when they are in the maintenance or test mode, a mode settable from the CDCRS as well as locally at the NPT device, which are not valid for transportation on any SEPTA service and when used on a NPT device not in the maintenance mode will identify the Fare Media as test media. Separate transactional and summary information is maintained by the NPT System for these test cards.

TIMEOUT. When a prescribed amount of time has elapsed, during which a specified action has not occurred.

TRANSACTION. The data stored by any fare vending or collection device in the SEPTA NPT System due to processing a customer Fare Media sale or use, the advent an event and/or an alarm, the initiation of a function within the devices or the change in the status of a device, module, item of equipment or system.

TRIPLE DES (3DES). A block cipher formed from the Data Encryption Standard (DES) cipher by using it three times.

~~TURNSTILE. An existing, upgraded access control device located at SEPTA Subway/Elevated stations that maintains access and egress to the station by processing user presented Fare Media, determining if the user has paid a valid fare. One customer is allowed passage into or from the station for each valid item of Fare Media that is processed.~~

UNIVERSAL SERIAL BUS. A serial bus standard to interface devices

UNLINKED TRIPS. The boardings on an individual vehicle, totaled individually.

VALIDITY-BASED MEDIA. All forms of Contactless Smart Media (~~SEPTA-Issued~~SEPTA-IssuedSEPTA Smart Media, Limited Use Media, and Partner-Issued Smart Media) for which the validity information is stored on the Smart Media itself rather than in a separate account stored by the CDCRS.

VICTORY DIVISION. Suburban transportation services provided by SEPTA using buses, the Route 100 High-speed Third-rail Vehicles and the Route 101 and 102 Light Rail Vehicles.

WIDE AREA NETWORK (WAN). A public or private data communication network connecting multiple computer controlled devices, or local area networks (LANs) not located in close proximity to each other.

WIRELESS LAN. A local area network that transmits over the air typically in the 2.4GHz or 5GHz unlicensed frequency band, and comply to an industry standard. It does not require line of sight between sender and receiver. Wireless base stations (access points) are wired to an Ethernet network and transmit a radio frequency over an area of several hundred feet through walls and other non-metal barriers. Roaming users can be handed off from one access point to another like a cellular phone system.

Section 2 – System Design Requirements
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2 SYSTEM DESIGN REQUIREMENTS

These Technical Specifications define the requirements for the design, manufacture, fabrication, furnishing, assembly, testing, inspection, and installation of thea New Payment Technologies (NPT) System for Southeastern Pennsylvania Transportation Authority (SEPTA). The NPT System will fully outfit SEPTA with a complete fare vending and collection system for Customer payments for all SEPTA-provided transportation services as well as selected other functionalities as defined within these Technical Specifications. This section provides the general requirements for the entire NPT System.

2.1 General Requirements

The Contractor shall deliver the NPT System for SEPTA to deploy across all modes of transportation operated as part of the SEPTA system, including buses, light rail vehicles (trolleys), rapid transit, commuter rail, and paratransit services. This shall be an integrated, electronic fare payment and collection system utilizing new payment technologies capable of interfacing with both inter-bank and non-bank financial clearing systems for transaction settlement.

All data input into the NPT System and/or generated by the NPT System shall be the property of SEPTA. SEPTA retains all rights to this data and neither the Contractor, nor any agent or the Contractor shall have authority to use, distribute or in any other way utilize this data without the express written consent of SEPTA. Even when SEPTA does provide consent for use of the data, the ownership of the data shall remain with SEPTA.

The Contractor shall furnish an NPT System which includes, but is not limited to, On-Board Processors, Subway/Elevated Turnstiles, Fare GatesRailroad Turnstiles, Fare Vending Devices, Handheld Sales Devices, Retail Administrative Sales Devices, Media Information Displays, Parking Equipment, cash handling equipment, and computer and communications network for monitoring, control, data exchange and interfaces to third-party systems.

Fare Vending Devices shall be installed at stations to provide an automated means for ~~Customers to~~ Customers to purchase SEPTA Smart Media, ~~reload~~replenish ~~long term~~ SEPTA ~~Smart~~SEPTA ~~Issued~~ Smart Media accounts with calendar passes or stored value, and p~~,~~ purchase ~~Limited Use Media (LUM)~~Magnetic Media for single-use fares ~~and, depending on volume and location, some FVDs shall provide for the purchase of Long term Smart~~SEPTA Issued Smart ~~Media~~ (as per Section 5). ~~Smart~~ Media Information Displays~~Media Processors~~ shall process and record ~~fare payment from~~ Smart Media interactions ~~and LUM~~ at all deployed locations (as per Section 13).

The Contractor shall be responsible for the design, installation, and testing of the NPT Communications Networks. These networks shall be responsible for the secure transmission of all data related to the NPT System, between a centralized location and all of the NPT system components

The Contractor shall also be responsible for the design, installation, and testing of the Central Data Collection and Reporting System (CDCRS). The CDCRS shall be designed to interface with all of the segments of the NPT data network in order to provide a single integrated set of controls and applications for the entire NPT system. The CDCRS shall store all ~~SEPTA~~ SEPTA Issued Smart Media accounts and provide validity information to the NPT equipment when ~~SEPTA~~ SEPTA Issued Smart Media are presented to a Smart Media Processor.

The CDCRS shall also serve to monitor and control the functionality of all NPT equipment, as well as to collect, store, process and report data. The CDCRS shall be the data repository for all NPT equipment provided as part of this system. The CDCRS shall provide functions of detailed revenue data capture, revenue accounting, consolidated revenue reporting. This system shall also interface with SEPTA's existing legacy systems.

The Contractor shall provide automation and system applications to allow SEPTA to enhance Customer service, as well as expand convenience and benefits. The Contractor shall provide aA centralized NPT Customer Support Center will to handle all Customer enquiries associated with NPT Equipment and Smart Media, provide management support for Customer accounts, as well as fulfill all SEPTA SmartSEPTA Issued Smart Media requests. Automated methods will also be available through most deployed NPT equipment, as well as via Web Services and Automatic ReloadReplenishments to not only give Customers more convenient ways to obtain and reloadreplenish SEPTA Smart Media, but also enable SEPTA to redefine certain employee responsibilities to improve Customer service. In addition, system applications will allow SEPTA to offer Customers new and attractive services such as the security of Balance Protection and the convenience of Automatic ReloadReplenishments.

2.1.1 Business Requirements

The NPT System shall:

A. Provide for an integrated, state-of-the-art electronic fare vending, payment, distribution, collection and processing system utilizing new payment technologies capable of interfacing with both bank and non-bank financial clearing systems for transaction settlement;

B. Include elements system devices and software that are deployed or are in a final prototype status such that their complete functionality can be demonstrated to verified by SEPTA prior to NTP;

C. Be based on published, open standards, be unconstrained by proprietary technology, and facilitate the inclusion of devices, components and systems supplied by multiple manufacturers under separate procurements;

D. Be able to be deployed in a phased manner to meet the needs and goals of SEPTA and its partners. This will include continued acceptance of the existing SEPTA Fare Media (magnetic tickets)Magnetic Media as a part of the NPT System and acceptance of tokens at the FVDs for an undetermined period of time;

E. Be fully compliant with the requirements for the NPT System, as ~~able to operate and meet all of SEPTA's needs as~~ defined within this Technical Specification~~document~~ without the need for deployment of additional hardware or software;

F. Quickly and efficiently verify the validity of all Fare Media used at any NPT device;

G. Substantially reduce SEPTA's exposure~~Eliminate the exposure of SEPTA~~ to revenue losses, including losses due to the use of invalid Fare Media, fraudulent Fare Media, as well as valid Fare Media (or an associated account) that does not contain enough ~~stored~~ value or an adequate pass for the selected trip;

H. Maximize Customer throughput at all fare collection devices;

I. Be adaptable to innovations specific to the transit, banking and communications industries in particular, as well as other technological innovations;

J. Be able to securely accommodate and process Fare Media offered and/or distributed by third parties;

K. Interface with SEPTA's existing infrastructure, specifically the physical conditions at stations and their associated parking facilities;

L. Replace SEPTA's existing data and reporting systems for ridership, revenue and other operational needs, including for the production of historical reports;

M. ~~-~~Easily accommodate ongoing programs of improvement projects on the SEPTA rail, bus and other systems including the Smart Station upgrade project, construction of new parking facilities, communication system upgrades, information technology improvements, and changes to business processes;

N. Support all existing modes of transportation and the needs of all existing categories of Customers, including programs for specific types of Customers.

Additional specific functional requirements of the NPT System are identified further in this Section and the other Technical Specification Sections.

2.1.2 Fare Structure

The NPT System shall provide the flexibility to adapt quickly and easily to meet SEPTA's current and future needs for changes in fare tariff, fare policy, fare structure and overall business and processing rules and procedures as defined in Section 4. All functional elements of the NPT System, including those that collect cash or process Fare Media, shall communicate with the CDCRS. All fare system operations modifications, including but not limited to fare tariff, fare policy, fare structure, and business and processing rules, shall be made via the CDCRS.

The fare structure shall accommodate the sale of media for special events from the NPT System fare vending devices (e.g., ASD, ~~RSD,~~ FVD, and HSD) which include the fare for travel to the event as well as the media for the event itself. Special event elements of fare structures shall incorporate start and end sales dates and times so that these elements of the fare structure expire without the necessity of downloading a new fare structure.

Any fare type shall be able to be associated with any Customer category as necessary to meet SEPTA's needs. Fare types to be accommodated must include the following as a minimum:

- Fixed period pass (Calendar Pass);
- Floating period pass;
- Stored-ride (multi-trip);
- Round-trip Fares;
- Distance based fares (based on tag-on and tag-off, as well as tag-on and assumed/default tag-off);
- Distance based fares (based on selection of destination);
- Stored-value;
- Best Value; and
- Transfers among SEPTA-operated services.

Processing rules and types of acceptable Fare Media that may be utilized for all fare tariff elements within the NPT System shall be defined at the CDCRS, within the Fare Tables. These shall be subsequently forwarded to the required devices, locations, partners, and entities.

2.1.3 Smart Media Distribution

SEPTA envisions that the NPT System will be implemented in multiple phases, and that an evolving level of fare payment and collection functionality shall be available for Customer use as each phase of the system implementation is successfully completed.

Upon conclusion of the phased implementation process, SEPTA envisions that Smart Media will be distributed by SEPTA, its partners, and third-party vendors. Retail outlets that distribute SEPTA-compliant Smart Media will be spread throughout the SEPTA service area and provide enhanced Customer convenience and support. Customers will also be able to order ~~SEPTA-issued Smart~~SEPTA Issued Smart Media through an NPT Customer Support Center providing walk-up, internet and telephone support services.

SEPTA Customers will be able to link pre-existing acceptable forms of Smart Media, as outlined in Section 4, to a SEPTA account at SEPTA-authorized locations and through other customer services, such as internet and telephone support.~~.~~

The ~~reloading~~ replenishment of ~~SEPTA-issued Smart~~SEPTA Issued Smart Media shall occur at a variety of locations to enhance Customer convenience. Customers shall be able to ~~reload~~replenish Smart Media Accounts through Fare Vending Devices located in SEPTA stations, ~~or~~ at Administrative Sales Devices located at SEPTA ~~ticket~~ sales locations, and at SEPTA-preferred partner locations through a web interface or through an existing SEPTA-preferred partner point-of-sale system~~offices~~. ~~Reload~~Replenishing shall also be possible via the NPT Customer Support Center and E-Commerce Website. Customers shall be able to activate Autoload and Balance Protection services through the NPT Customer Support Center and E-Commerce Website.

2.1.4 Other Transit Agencies

In addition to SEPTA, other transit agencies shall be able to obtain NPT equipment and computer systems defined within these specifications. Th~~is~~e NPT equipment and computer systems shall enable these other transit agencies to select and implement any of the following operational scenarios:

- Interface with no element of the SEPTA-installed system but be a stand-alone system for that agency only;
- Interface with certain elements of the SEPTA-installed system, such as the Web-based sales; ~~and~~
- Interface completely with the SEPTA-installed system and operate with all of the rules and processes used by the SEPTA-installed system.

Each of the above system types shall permit the agency to access and utilize all of the functions as defined for the SEPTA-installed system.

~~Other transit agencies shall be able to obtain elements for their system through the NPT procurement for a period of not less than one (1) year after the completion of Phase 3 for the SEPTA NPT procurement.~~

~~Costs for each of these elements shall be based on the unit prices defined in the procurement, plus escalations to the costs, based on the change in the Producer Price Index for Finished Goods for January of the year purchased when compared with January of the year SEPTA purchased the initial NPT elements.~~

~~All costs other than for the equipment and software shall be separately prepared and provided by the Contractor.~~

2.1.5 Use of SEPTA Facilities and/or Structures

As identified in Section 3.1.5, SEPTA's Facilities and/or Structures shall not be utilized by the Contractor for temporary scaffolding and/or support for the construction effort. However, a Contractor may request SEPTA's consideration for such action and provide a plan.

Any such plan shall include appropriate drawings and supporting calculations to validate such a plan. These drawings and supporting calculations shall be sealed by a Professional Engineer registered in the Commonwealth of Pennsylvania and shall be included with the plan.

2.1.6 Non-SEPTA Facilities

The NPT System shall be deployed throughout the SEPTA service area. Deployment locations may include some which ~~which includes locations which~~ are not owned by SEPTA. ~~These~~Non-SEPTA owned ~~locations~~stations are as follows:

Table 2-1 – Non-SEPTA Owned Stations

R2 Line	R5 Line	R7 Line
Darby	Overbrook	North Philadelphia
Curtis Park	Merion	Bridesburg
Sharon Hill	Narberth	Tacony
Folcroft	Wynnewood	Holmesburg
Glenolden	Ardmore	Torresdale
Norwood	Haverford	Cornwell Heights
Prospect Park	Bryn Mawr	Eddington
Ridley Park	Rosemont	Croydon
Crum Lynne	Villanova	Bristol
Eddystone	Radnor	Levittown
Chester TC	St Davids	Trenton
Highland Ave	Wayne	
Marcus Hook	Strafford	
Claymont	Devon	
Wilmington	Berwyn	
Churchman's Crossing	Daylesford	
Newark	Paoli	
	Malvern	
	Exton	
	Whitford	
	Downingtown	
	Thorndale	

In the event it is determined that NPT Equipment shall be deployed at any of the above locations, the Contractor shall not directly contact the owner of these non-SEPTA facilities or ~~with~~ associated State/municipal government agencies. All contact will be from the Contractor to SEPTA and from SEPTA to these entities.

2.2 Standards

The following standards and codes in effect at Preliminary Design Review shall be followed as applicable during the design, development, construction and installation of the system, including all components and devices. The Contractor shall also comply with all applicable Federal, state and local codes.

American Association of State Highway and Transportation Officials (AASHTO) M182, Standard for Burlap Cloth made from Jute or Kenaf

ACI (American Concrete Institute) 211.1, Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete

ACI 226.3R, Use of Fly-~~-~~Ash in Concrete

ACI 301, Specifications for Structural Concrete

ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete

ACI 305R, Hot Weather Concreting

ACI 306R, Cold Weather Concreting

ACI 308, Standard Practice for Curing Concrete

ACI 318M, Building Code Requirements for Structural Concrete

ACI 530.1, Specifications for Masonry Structures

American Bankers Association (ABA)

American Express℠

American Society for Quality Control (ASQC)

American Welding Society (AWS)

Americans with Disabilities Act (ADA)

Americans with Disabilities Act Accessibility Guidelines (ADAAG)

ANSI Standard – General Purpose Paper Cards

ANSI Standard – General Purpose Plastic Cards

ANSI C80.1, Standard for Rigid Steel Conduit, Zinc Coated

ANSI/IEEE Standard 828 Standard for Software Configuration Management Plans

ANSI/IEEE Standard 1012 Standard for Software Verification and Validation Plans

ANSI/IEEE 730, Standard for Software Quality Assurance Plans

ANSI/NEMA FB 1, Standard for Fittings and Supports for Conduit and Cable Assemblies

ANSI/NEMA FB 1, Standard for Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies

ANSI/NEMA OS 1, Standard for Sheet - steel Outlet Boxes, Device Boxes, Covers, and Box Supports

ANSI/NFPA 70, National Electrical Code

ANSI X9.2 and 8 Pin pad unique key and encryption

ASTM (American Society for Testing and Materials) C31, Practice for Making and Curing Concrete Test Specimens in the Field

ASTM C33, Specification for Concrete Aggregates

ASTM C39, Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C42, Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C94, Specification for Ready - Mixed Concrete

ASTM C109/C109M, Test Method for Compressive Strength of Hydraulic Cement Mortars

ASTM C143, Test Method for Slump of Hydraulic Cement Concrete.

ASTM C150, Specification for Portland Cement

ASTM C156, Test Method for Water Retention by Concrete Curing Materials

ASTM C171, Specification for Sheet Materials for Curing Concrete

ASTM C172, Practice for Sampling Freshly Mixed Concrete

ASTM C173, Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method

ASTM C191, Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

ASTM C192, Practice for Making and Curing Concrete Test Specimens in the Laboratory

ASTM C207, Specification for Hydrated Lime for Masonry Purposes

ASTM C231, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C260, Specification for Air-Entraining Admixtures for Concrete

ASTM C309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C404, Specification for Aggregates for Masonry Grout

ASTM C476, Specification for Grout for Masonry

ASTM C494, Specification for Chemical Admixtures for Concrete

ASTM C596, Test Method for Drying Shrinkage of Mortar Containing Portland Cement

ASTM C618, Specification for Coal Fly-Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete

ASTM C827, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures

ASTM C920, Specification for Elastomeric Joint Sealants

ASTM C1019, Test Method for Sampling and Testing Grout

ASTM D695, Test Method for Compressive Properties of Rigid Plastics

ASTM D1190, Specification for Concrete Joint Sealer, Hot-Poured Elastic Type

ASTM D1751, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

ASTM D1752, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete paving and Structural Construction

ASTM D3405, Specification for Joint Sealant, Hot-Applied, for Concrete and Asphalt Pavements

British Standard of Information Security 7799:2002

Commonwealth of Pennsylvania, Department of Transportation (PennDOT) Specifications, Pub. 408/2000

CRD-C 572, Specification for Waterstop

Data Encryption Standard

Discover Zip

European Norm EN55022, Emissions standards for CE marking

European Norm EN55024, Immunity standards for CE marking

FCC Part 15 Class B – Radio Frequency Devices

Federal Transit Administration ITS Architecture provisions of 5602(e) of the Transportation Equity Act for the 21st Century (TEA 21) (Pub. L. 105-178.)

IAW EEIG 97s0665, ERTMS/ETCS Environmental Requirements

International Standards Organization (ISO)

IEC-801-2 pertaining to electrostatic discharge

IEC 60332-3-24, Tests on electric cables under fire conditions – Part 3-24: Test for vertical flame spread of vertically-mounted bunched wires or cables - Category C

IEC 60695-11-10 1999 (Amd 1 2003), Fire hazard testing : part 11-10: test flames : 50 W horizontal and vertical flame test methods

IEC 60754-2, Test on Gases Evolved During Combustion of Electric Cables – Part 2: Determination of Degree of Acidity of Gases Evolved During the Combustion of Materials Taken from Electric Cables by Measuring pH and Conductivity

IEC 61000-4-2, Electromagnetic Compatibility (EMC) - Part 4: Testing and measurement techniques - Electrostatic discharge immunity test

IEC 61034-2, Measurement of Smoke Density of Cables Burning under Defined Conditions - Part 2: Test Procedure and Requirements CORRIGENDUM 1

IEEE Standard 1058, Software Project Management Plans

IEEE P1588 Standard for Software Documentation for Rail Equipment and Systems

International Code Council, International Building Code (IBC)

International Code Council, International Fire Code (IFC)

IEC529, Definition of Protection Grades

ISO/IEC 7810, Identification Cards – Physical Characteristics

ISO/IEC 7810, Identification Cards - Financial Transaction Cards

ISO/IEC 7811, Identification Cards - Recording Techniques

ISO/IEC 7813

ISO/IEC 7816, Identification Cards – Integrated Circuit Cards with contacts

ISO/IEC 8584

ISO 9001, International Standards for Quality Management

ISO/IEC 10373, Identification Cards – Test Methods

ISO/IEC 14443 Parts 1 through 4 – Contactless Smart Card Standard

ISO/IEC 15693-1

ISO/IEC 18092 / ECMA-340 – Near Field Communication Interface and Protocol-1 (NFCIP-1)

ISO 27001, Information Technology - Security Techniques - Information Security Management Systems - Requirements

MasterCard EMV MChip

MasterCard PayPass

MasterCard PayPass MStripe

MIL-STD 105, Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-461E

MIL-STD-810F

National Electrical Code (NFPA 70)

National Electrical Code (NEC) 250, Ground Electrode Systems

National Electrical Safety Code (ANSI C2)

National Fire Protection Association (NFPA) 101

National Fire Protection Association (NFPA) 130

NCITS 322-2002, American National Standard for Information Technology – Card Durability Test Methods

NECA (National Electrical Contractors Association) Standard of Installation

NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

NEMA AB 1 - Molded Case Circuit Breakers

NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies

NEMA ICS 4 - Terminal Blocks for Industrial Control Equipment and Systems

NEMA PB 1 - Panelboards

NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less

NEMA WD 1 - General Purpose Wiring Devices

NEMA WD 6 - Wiring Device Configurations

NFC ECMA-352

Occupational Safety and Health Administration (OSHA)

Payment Card Institute Data Security Standards (PCI-DSS)

PCI Manual 117 - Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products

PCI Manual “Architectural Precast Concrete”

SAE J-1113-13 Electrostatic Discharge

Society of Automotive Engineers; J1708, J1587, J1939

Steel Structures Painting Council (SSPC) Painting Manual

UL1053 Standard for Safety Ground-Fault Sensing and Relaying Equipment

UL 50 3R Water Ingress Test

UL 50 Integrity Against Deflection

UL 1685, UL Standard for Safety Vertical-Tray Fire-Propagation and Smoke-Release Test for Electrical and Optical-Fiber Cables

UL 60950, UL Standard for Safety of Information Technology Equipment

UL 969 Standard for Safety Marking and Labeling Systems

VISA PayWave

VISA PayWave MSD

VISA EMV PayWave (qVSDC)

State, county and city building and construction codes, as applicable

In the case of conflict between provisions of codes, laws, and ordinances, the more stringent requirement shall apply.

2.3 Design Requirements

All equipment shall be ergonomically designed and constructed in a manner that will be easy to use, functional, safe, and ADA compliant. Additionally, the design of the equipment shall be such as to facilitate easy access by authorized service and maintenance personnel yet prevent any unauthorized access to equipment components. Equipment intended for use by or for SEPTA Customers shall be aesthetically pleasing.

NPT System architecture shall be designed to conform with the applicable portions of the FTA National ITS Architecture Policy in effect at NTP.

All equipment shall be robustly designed for non-stop continuous operation for its intended purpose in a public transportation environment and to meet the system life requirements as defined in Section 2.6.

2.3.1 System Security

The NPT System shall provide SEPTA with a complete, high-security system for control of revenues. The Contractor shall conduct an analysis of security features of the system at each design review, at each phase of implementation as well as prior to presentation of the system for final acceptance, and notify SEPTA of any potential exposure in system design. In the event security is compromised at any time during the design, development, installation, and testing stages of the system, the Contractor shall immediately inform SEPTA as soon as the condition is detected. The Contractor shall ensure that all system passwords shall be safeguarded and resettable under SEPTA control, and that no "back doors" or means of unauthorized entry are designed into the system.

The ability to remove or add users shall be restricted to designated users with the highest level of security clearance. Additional password authorization shall be required to perform this function. At no time shall any password be displayed on any screen in the revenue system.

A system security plan shall be developed and presented to SEPTA for review and approval. **CDRL 2-1** This system security plan shall include password systems and administration, communications security measures, operating systems and program security, and data encryption methods, and shall be submitted in conjunction with the system architecture submission.

2.3.2 Product Supply and Availability

The NPT System, its equipment, and all associated components and software shall, unless more stringently specified, conform to industry standards as specified within the Sections of these Technical Specifications. Components supplied shall be based on standard products by established fare collection and financial payment industry suppliers with documented experience producing and supplying such components. Wherever possible, components, spare parts and supplies shall be available from two or more U. S. based suppliers, neither of whom shall be the equipment supplier or Contractor. Non-standard, prototype, obsolete or discontinued products, or components shall not be utilized. For each deployment phase, components shall be of current manufacture.

2.3.3 Prior Service Performance

Design of all equipment of the NPT System shall be identical to or derived from existing designs or prototypes slated for an operating environment equal to or more severe than that which will be experienced in SEPTA's service area. Performance in a laboratory environment is insufficient for meeting this requirement.

2.3.4 Fault Tolerance and Recovery

The NPT System is the central point of fare payment interaction between SEPTA and its Customers, and system failure will have an immediate and adverse impact on SEPTA's operations and revenues. The Contractor shall design the system and equipment to quickly recover from power, communications and/or system software failures, automatically returning to the operating state it was in prior to the experienced fault without loss of data. The Contractor shall provide documentation explaining how this fault tolerance and recovery capability will be achieved at the Preliminary Design Review **PDR 2-1**, and will identify the files and software that will be required to recreate an operational NPT System in the event of a disaster. **CDR 2-1**

2.3.5 Modular Design

Each of the basic functions within the NPT field equipment shall be performed by modular components, which shall permit easy field replacement of inoperative modules to quickly return the equipment to service. Repair and adjustment of modules shall be performed in shop facilities.

NPT equipment design shall support the “fingertip maintenance concept”. This shall provide individual modules that are fixed in unitized frames, rails, or slides with fast latching devices, captive fasteners, or other means that do not require the use of tools to remove and replace modules. Where specified, modules shall also be secured by keys or electronic locks to prevent unauthorized removal.

Modules shall be connected together with uniform control and power supply lines. Internal control and power connections shall be made via clearly identified plug-in connections. Plugs and receptacles shall be keyed to prevent a module from being inserted into the wrong receptacle. Each module shall be designed so that it can only be installed in one correct position, and that orientation shall be readily apparent to trained maintenance and servicing personnel. All sources of electrical interference shall be suppressed within the respective module to eliminate all potential EMI-generated deficiencies.

Contractor shall provide a list of all replaceable modules at the Preliminary Design Review for SEPTA review and approval. **PDR 2-2**

2.3.6 Code Requirements

The NPT System shall be designed to comply with all applicable local, state, and national codes, ordinances, statutes, standards, and federal rules and regulations existing. The Contractor shall be responsible for identifying all local, state, or national codes, ordinances, statutes, standards, and federal rules and regulations applicable to NPT System at the time of Notice to Proceed and shall provide this information and an explanation of how their equipment meets these requirements at the Preliminary Design Review. **PDR 2-3**

Until Final Acceptance of the entire project, the Contractor shall be responsible for identifying all changes to all applicable codes and laws, and notifying SEPTA.

The Contractor list shall include, but not be limited to, the items below.

2.3.6.1 NFPA 130

All equipment shall conform to the requirements of the version of NFPA 130 in effect at the time of Notice to Proceed.

Facilities-based equipment shall conform to the applicable requirements of the local Uniform Fire Prevention and Building Codes.

Should the addition or modification of equipment alter the passenger egress the Contractor shall perform the appropriate NFPA 130 egress calculations and affect the required remedies, including structural work, to accommodate code requirements.

2.3.6.2 ADA Requirements

All NPT equipment, systems and sub-systems, as well as any station related modifications and improvements, shall fully comply with the Americans with Disabilities Act (ADA) and associated regulations that have been approved and instituted at the time of Notice to Proceed. These additional regulations include, but are not necessarily limited to, Code of Federal Regulations, 49 CFR 237, and the ADA Accessibility Guidelines of 2004, amended August 5, 2005.

The requirement that aAll NPT equipment, systems and sub-systems, as well as any NPT Contractor-performed station related modifications and improvements, comply with the Americans with Disabilities Act (ADA) and associated regulations shall be met at everyone location, including stations, regardless of the stations status regarding ADA accessibility.

2.3.6.3 PCI-DSS Requirements

The NPT System will accept credit and debit media as a form of payment. Because of the sensitive nature of credit/debit card transaction data, The entire NPT System, all NPT devices that process credit or debit cards, and all communications and computer systems comprising the entire NPT System and all interfaces with the existing SEPTA system components, shall be in full compliance with the latest versions of the Payment Card Industry (PCI) Data Security Standards (DSS) standards, version 1.2, for Level 1 in effect at NPTP, . The PCI DSS 1.2 includes 12 major requirements.as outlined in Section 5. the Contractor shall furnish documentation at the Conceptual Design Review, Preliminary Design Review and Final Design Review to provide full details for the NPT System's compliance with all aspects of PCI. **CDR 2-2, PDR 2-4, FDR 2-1**

2.3.7 Contractor shall identify any existing SEPTA systems which are impacted by the NPT System that are not PCI compliant and shall notify SEPTA of these deficiencies not more than thirty (30) days after NTP. **CDRL 2-2**

~~The PCI DSS 1.2 requires that the Contractor build and utilize secure data networks for the NPT System, which protect cardholder data including the implementation of strong access control measures. Per PCI DSS regulations, a single violation of any of the requirements will warrant an overall non-compliant status.~~

~~From time of initial NPT implementation through the completion of the full system implementation, changes to the PCI DSS requirements shall be incorporated to the NPT System to ensure continuing PCI DSS compliance. As a part of each implementation phase and through the conclusion of the NPT System Warranty period as defined by the Contract, a PCI DSS certification expert shall be utilized by the Contactor to certify the compliance with the standards in force at the time of acceptance of each phase of implementation, as well as for final NPT System acceptance.~~

~~The Contractor shall also perform the following activities through the conclusion of the NPT System warranty period:~~

- ~~Performing quarterly scheduled scanning for network security as well as internal and external vulnerabilities and correction of such vulnerabilities based on the published Security Scanning Procedures;~~
- ~~Perform the annually required penetration testing;~~
- ~~Track and monitor all access to network resources and cardholder data;~~
- ~~Routinely perform Data Security Assessments.~~

~~2.3.8~~2.3.7 Maintenance/Test Mode

Each type of NPT equipment installed which interfaces with the Customer shall incorporate a test mode. In this mode, the equipment shall only process test media (either Smart Media or Mmagnetic Fare Media). Non-test media shall be unaffected but shall be reported as "invalid" both at the field device and by the CDCRS.

When test media is processed, all functions shall be performed for that fare type, except that the transaction data shall not be included in revenue summaries but shall be separately identified. This identification shall not permit the test data to be included in the normal revenue data reports but this shall be reported separately. Test Smart Media shall be invalid and not be processed when the equipment is in the normal operating mode.

If an item of equipment is in this mode and all access doors have been closed properly, the equipment shall automatically return to the normal operating mode. This shall be recorded as an event and reported to the CDCRS.

~~2.3.9~~2.3.8 Human Factors

Principles of human factors engineering shall be applied throughout the design to facilitate ease of use and safety for Customers, employees, and service personnel.

The equipment shall provide Customers with displays, graphics and signage, controls and mechanisms that are simple to use, easy to understand, and conveniently located. All Customer interfaces shall be user-friendly; that is, safe, predictable, simple to use, and in accordance with other applicable human engineering principles. By following instructions given on and by the equipment, an inexperienced Customer must be able to quickly understand all types of media purchase options and the pass initialization process. Facilitated focus groups of SEPTA Customers and non-customers shall be utilized by the Contractor to assist in designing the human elements of the NPT System.

All NPT equipment controls and operating mechanisms shall be operable with one hand, without requiring tight grasping, pinching, twisting, force, or pressure.

NPT equipment and other elements of the system to be used by SEPTA users shall accommodate a broad range of potential Customers. These shall include, but not be limited to, commuters, shoppers, accompanied children, occasional users traveling to and from special events, the elderly, Customers with motor and/or sensory impairments (e.g., Customers in wheelchairs, and/or who are hearing and/or sight impaired) and Customers with limited communication skills.

~~2.3.10~~2.3.9 Safety

NPT equipment shall be free from safety hazards. Exterior surfaces shall have no sharp edges or burrs. Cabinets, consoles and other equipment housings shall have no protrusions beyond the base that could impede the progress of a Customer. Customer control and display components shall not by design present a pinching hazard.

Unless specified otherwise in other equipment sections of this document, NPT equipment cabinets having surfaces that are exposed to the public, including all fixed equipment used by SEPTA located in stations, shall be stainless steel or other revenue service proven finish, as approved by SEPTA.

All interior surfaces and components with which Customers and/or maintenance and service personnel could come in contact shall also be free of sharp edges, burrs and other hazards. Throughout the interior of the machine, there shall be no pinching hazards when the modules are moved or removed, including contact with the trays and slides provided for the movement of modules.

All components shall be grounded and shall prevent electrical leakage or static charge, in accordance with all local and national codes and applicable published standards. Electrical components shall have highly visible warning graphics indicating the voltage present and other hazards. Samples of these graphics shall be provided at the Conceptual Design Review for review and at the Final Design Review for approval by SEPTA. **CDR 2-3, FDR 2-2**

~~2.3.11~~2.3.10 Security

All NPT equipment provided shall be constructed to provide maximum protection for equipment and revenue contained therein. All equipment shall be designed to be vandal resistant to the greatest extent possible, and shall not suffer damage as a result of reasonably foreseeable conditions.

The design and installation of all NPT equipment shall discourage and minimize the effects of vandalism and theft, prevent unauthorized access to the interior of the equipment, and prevent unauthorized removal of the equipment from its installed location. Several, separate levels of security access shall be provided for access to the interior of the equipment for maintenance personnel, revenue servicing personnel, and money processing personnel at the revenue-counting facility of SEPTA or its designated revenue collection and processing agent. Access to the equipment by authorized personnel equipped with proper keys and individual access code(s) shall be provided without undue delay.

All locks for access to the interior of the NPT equipment shall be electrical locks of type Cyberlock® or SEPTA-approved equivalent. The electronic locks shall not be affected when there is a main power failure to the equipment; i.e., opening and closing of the electronic lock shall not be contingent on main power being available. The electronic locks shall operate without being adversely affected by electromagnetic interference (EMI) and radio frequency interference (RFI) emissions; the electronic locks shall comply with the EMI and RFI requirements identified in Section 2.3.12.1. Locks and their components shall be manufactured of non-corrosive material, such as brass. Once placed in normal revenue service, there shall be no corrosive effects displayed by the locks.

Provided as part of the NPT system shall be all hardware and software to permit SEPTA to manage, administer, report on and modify as necessary, the operation of the NPT System security system utilizing the Cyberlock® system. All NPT equipment shall incorporate these locks and be managed by the electronic locking system software

Locks used for accessing/removing the revenue containers and for accessing/removing other interior modules shall be keyed differently from other device locks. To the greatest extent possible, locks for accessing/removing interior modules shall be keyed alike.

Locking systems for components and interior partitions or doors within the devices shall employ the use of high security locks. Upon the use of the high security key, an event message shall be stored within the equipment in order to provide traceability of access to the equipment. Commencing with initial implementation of NPT equipment, all locks, keyways, and key codes shall become the exclusive property of SEPTA thus giving SEPTA the ability to rekey as necessary.

Security access codes or passwords shall be required to access the interior of system equipment and for certain functions once valid access is gained using the high security key. Verification of access codes shall be performed before access to the interior of the machine is permitted. The access codes shall incorporate the SEPTA NPT employee account number as a part of the access security system. The security access codes and passwords shall provide for eight (8) characters as a minimum.

All doors, panels and covers, which provide internal access to the interior of the equipment, shall incorporate sensing to identify when a door, panel, or cover is opened and store an event message (if the user is properly signed in) or transmit an alarm (if the user is not properly signed in), regardless of whether or not the equipment contains revenue.

~~2.3.12~~2.3.11 Useful System Life

All NPT equipment and associated software furnished under this Contract shall be designed to provide a minimum usable life of fifteen (15) years subject to proper preventive maintenance being performed. Contractor shall also supply spare parts for the useful life, including upgraded components if a device or component is discontinued or declared obsolete during the system life. The NPT equipment shall also be capable of incorporating technology upgrades without undue redesign of components or modules, extensive software revisions or other similar excesses.

~~2.3.13~~2.3.12 Operating Environment

All NPT equipment shall be designed for continuous reliable operation in revenue service under anticipated environmental conditions found within the region to which they are exposed.

~~*2.3.13.1*~~*2.3.12.1 Station- and Facilities-Based Equipment*

~~Most~~ Parking equipment and most station equipment, including FVDs, turnstiles, faregates, and media information displays, will be installed in locations that may not be environmentally controlled locations. If the NPT equipment needs canopies or protection in order to operate in accordance with the specified requirements, the Contractor shall include these protections ~~in~~ as part of their deliverables for the ~~their~~ NPT System ~~design~~ and explicitly identify them.

The following climatic factors shall be used as design guidelines and shall be considered as operational requirements. Actual localized temperatures and conditions within any NPT device may be more severe than the ambient climatic conditions and the Contractor shall be responsible for evaluating these during its design effort. Additionally, the Contractor shall be responsible for advising SEPTA if there are any special environmental factors to which its equipment may be sensitive that are not listed below. The Contractor shall ensure that no equipment damage occurs during manufacture, storage, and shipment as a result of climatic conditions that differ from those below.

Sunlight

Measures shall be taken by the Contractor during the design and manufacturing of the equipment to minimize the effects of direct sunlight on the NPT equipment. The equipment shall be designed to operate with a solar radiation loading of not less than 275 BTU/hr/ft^2.

Some in-station equipment may be installed in glass-enclosed areas exposed to unfiltered sunlight.

In order to minimize problems caused by the heat or brightness of the sun, the Contractor shall consider the following factors in the design:

- selecting components with a temperature range at least 20° F above the maximum working temperature expected;
- turning on/off fans automatically using temperature control sensors;
- using tilt, surface orientation, texture, and covers to reduce reflections and glare; and
- using graphics and display types that are readable under all natural and artificial light conditions.

Components sensitive to ultraviolet radiation shall be protected at all times, and the equipment shall be resistive to damaging effects from this type of radiation, including when the front door is open for maintenance and servicing activities.

Environmental Contaminants

All equipment to be installed at SEPTA stations, Bus Depots and Trolley Barns, shall operate reliably when subjected to dust (including dust generated by brakes, wheels and rails), moisture, electromagnetic interference, power fluctuations, vibration, and other adverse conditions.

Suitable enclosures and filtering shall be provided inside the equipment for sensitive components such as printed circuit boards and memory storage devices to prevent malfunction resulting from dust particles that could be as small as 1 to 200 microns, with a maximum concentration of 0.248 mg/cubic centimeters. Where possible, positive air pressure and appropriate filtering shall be used to reduce the dust intake.

Local Climate

All station-based and facilities-based equipment shall be designed to operate reliably in the following environmental conditions, singularly and in any combination:

A.	Sunlight:	None to full, direct
B.	Storage Temperature	-22°F to 150°F
C.	Operating Temperature:	-22°F to 140°F
D.	Thermal Shock:	Up to 50°F in 2 hours
E.	Relative Humidity:	13% to 99% R.H., including condensation
F.	Rainfall/Snowfall:	Up to 6 inches rainfall/20 inches snowfall per hour (may occur simultaneously and in the worst case include wind)
G.	Airborne Dust:	Up to 180 micrograms per cubic meter, with iron and salt particles
H.	Wind Speed:	Up to 90 mph, any direction
I.	Freezing Precipitation	Up to 3 inches per hour
~~J.~~	~~Inclination~~	~~0º to 10º off vertical~~

~~K.~~J. Water/Solvents	Water spray on equipment from cleaning floors and walls, industrial cleaning solvents and standard cleaning chemicals used by SEPTA, rain, mud, snow and slush will come in contact with equipment

All equipment shall operate as specified in the atmosphere commonly found in rail station environments and the SEPTA service region.

During extreme low ambient temperatures, NPT equipment shall be brought to proper internal operating temperatures prior to initializing operations of the equipment. In the event of extended periods of no operation during extreme cold climate conditions, internal heaters shall be utilized to raise and stabilize internal temperatures of the equipment to operating levels. Once operational, heaters or other devices shall retain internal temperatures of the station equipment within the operable range during all expected climate conditions.

NPT equipment shall be designed to be resistant to liquid ingress caused by driving rain, blowing snow, and incidentally splashed water such as would occur during routine equipment and/or platform cleaning. Equipment enclosures shall comply with International Electrotechnical Commission Standard 529 (IEC529) to level IP34 or equivalent.

Shock

Components, which are sources of vibration, shall be sufficiently damped to eliminate externally-audible resonance or affect the integrity of other internal components.

The NPT equipment shall be designed to withstand the intermittent shocks common to the installation environment including proximity to both slow and fast moving Customer and freight trains, Customer abuse on the platform and attempts at intrusion and vandalism.

Requirements for shock testing shall conform to the following:

- IAW EEIG 97s0665-, ERTMS/ETCS Environmental Requirements; Operational requirements per para.2.8.2.2, Track (lineside) and track side equipment; Test requirements per para 2.8.4.2 IEC 68.2.27-Shock, test Ea, Test 1. The half sine shock pulse shall have a peak value (A) of 2g and a duration (D) of 11 milliseconds. This is executed with all the internal components;

- UL50 integrity against deflection test, 29.1. ~~For a drawn, embossed, flanged, or similarly strengthened door or cover made of metal having when a vertical force of 100 pounds (445 N) is applied at any point on the door or cover. The force is to be applied through a rod having a 1/2-inch (12.7 mm) square, flat steel face. For the test, the enclosure is to rest on its back on a smooth, solid, horizontal surface with the door closed and the cover secured as intended. If more than one test is necessary, separate samples are to be used for additional tests. This is to be tested on the top and all sides of the devices. There shall be no deflection inward of more than 1/4 inch (6.4 mm).~~

Vibration

All NPT equipment installed in Stations, Bus Depots, and Trolley Barns shall be designed to withstand structure-borne stresses and vibrations caused by the passing and idling of trains and vehicles within a one-foot distance.

The Contractor shall ensure that equipment proposed is both resilient and protected from vibration conditions expected in their intended environments. NPT equipment shall withstand the vibrations common to the installation environment, including proximity to both slow and fast moving Customer and freight trains. The testing for these various types of equipment shall include verification that the equipment operates properly at the completion of each of the testing cycles without modification or adjustment. Requirements for vibration testing shall conform to the IAW EEIG 97s0665, ERTMS/ETCS Environmental Requirements:

A. Operational requirements per para.2.8.2.2, Track (lineside) and track side equipment;

B. Test requirements per para 2.8.4.5 Vibration: 0.23g rms, frequency range 0 to 200Hz.

Electromagnetic Interference

Electrical and electronic components that are part of the NPT System shall operate without being adversely affected by or emitting electromagnetic interference (EMI) and radio frequency interference (RFI) emissions. Electrical and electronic components shall be immune to radiated electromagnetic and radio frequencies fields, conducted electromagnetic and radio frequency energy, electronic fast transients, and electrostatic discharge. Transmissions from equipment components, either radiated or conducted, shall not cause interference to other SEPTA systems.

Components shall not be adversely affected by any electromagnetic frequency and shall not interfere with the transmission and reception of the following established frequencies:

A. Audio frequencies for overlay track circuits, highway crossing approach and island circuits, and electrical lock circuits;

B. Audio frequency code overlay for ATC system;

C. Signal power;

D. Cab signals;

E. Radio frequencies (MHZ).

NPT equipment operations shall not be adversely affected by the electromagnetic fields generated by the 600 Volt DC overhead contact wire traction power system. The system shall conform to the following requirements:

- FCC Part 15, Subpart B Class A (Conducted emissions), pertaining to conducted susceptibility;
- FCC Part 15, Subpart B Class A (Radiated emissions), pertaining to radiated susceptibility;
- SAE J-1113-13 pertaining to electrostatic discharge.

Vandalism

~~All NPT equipment that is deployed in a non-office environment and can be accessed or used by the general public shall fulfill the requirements of UL50 integrity against deflection. A drawn, embossed, flanged, or similarly strengthened door or cover made of metal having the thickness specified when a vertical force of 100 pounds (445 N) is applied at any point on the door or cover. The force is to be applied through a rod having a 1/2-inch (12.7 mm) square, flat steel face. For the test, the enclosure is to rest on its back on a smooth, solid, horizontal surface with the door closed and the cover secured as intended. If more than one test is necessary, separate samples are to be used for additional tests. This is to be tested on the top and all sides of the devices. There shall be no deflection inward more than 1/4 inch (6.4 mm).~~

NPT devices shall also meet the requirements as identified in Section 2.3.14. Contractor shall provide documentation for the requirements of Section 2.3.14 at the Conceptual Design Review for SEPTA review and approval. **CDR 2-4**

If such documentation is not approved by SEPTA, these requirements shall be verified as part of the Environmental testing.

~~*2.3.13.2*~~*2.3.12.2 Handheld Equipment*

All handheld equipment shall operate under the environmental conditions specified herein without failure, degradation without limitation.

A.	Operating Temperature ~~Range~~	~~0~~14° F to 1~~10~~22° F
B.	Storage Temperature	-25° F to 150° F
C.	Thermal Shock	~~20~~60° F ~~per minute drop in temperature over 60° F range between 110° F and -20° F~~within 15 seconds
D.	Electromagnetic Interference	10 V/m, bands a, b, c; 300V arcs in nearby equipment
E.	Shock and Vibration	Up to 5g (instantaneous)

The HSD shall remain operational in the presence of the airborne particles and other contaminants common to a rail transit environment.

~~2.3.13.3~~2.3.12.3 *On-Board Equipment*

On-board NPT equipment will be installed in vehicles, which will be environmentally conditioned when in revenue service. ~~, but~~W~~ w~~hen not in active revenue service, this equipment will be without environmental conditioning or vehicle power, both overnight in the Bus Depots and Trolley Barns and during layovers between service runs.

On-board equipment shall remain operational to meet the specified technical requirements in the presence of contaminants, including but not be limited to any airborne particles (including dust generated by brakes, wheels, and rails), greases, oils, and other contaminants accumulated on Smart Media.

Local Climate

The equipment on the vehicle shall not suffer any degradation in performance while operating under the following environmental conditions:

A.	Sunlight	None to full, direct behind a glass windshield
B.	Storage Temperature:	-30º to + 140ºF
C.	Operating Temperature:	~~-20~~14º to + 12~~0~~2ºF
D.	Thermal Shock:	Up to 50°F in 2 hours
E.	Relative Humidity	13% to 99% R.H including condensation
F.	Vibration	as identified below
G.	Shock:	as identified below
H.	Airborne Dust:	Up to 180 micrograms per cubic meter, with iron and salt particles
I.	Inclination	0º to 10º off vertical

J.	Water/solvents	Water spray on equipment from cleaning floors and walls, industrial cleaning solvents and standard cleaning chemicals used by SEPTA, rain, mud, snow and slush will come in contact with equipment

Electromagnetic Interference

EMI and RFI radiating from equipment on the vehicle, including vehicle propulsion, radio, lights, electronic destination signs, air conditioners, and generators shall not affect the operation of the equipment.

The equipment shall not emit measurable EMI or RFI that produces harmful interference with any other on-board electronic device or system.

The same requirements as identified in Section 2.3.12.1 shall apply.

Rain, Moisture & Humidity

As a result of Customer boardings in rainy and humid conditions, the insert slots can be expected to become wet due to transfer from Customer clothing, etc. In addition, the equipment base can be expected to become wet and accumulate salt, mud, and moisture. The equipment shall function and not suffer any degradation of operation under these conditions.

Shock

Onboard NPT equipment shall comply with SAE J1455 for shock .~~The same requirements as identified in Section 2.3.12.1 shall apply.~~

Vibration

Onboard NPT equipment shall comply with SAE J1455 for vibration.

~~The same requirements as identified in Section 2.3.12.1 shall apply.~~

~~2.3.13.4~~2.3.12.4 *Interior Environment*

All NPT System equipment installed in office and other indoor locations, including ASDs, and the CDCRS, which are not subject to the rigors of the elements shall be able to properly function and not suffer any degradation of performance under the following conditions:

A. Air Temperature: 40 degrees F to 99 degrees F.

B. Relative Humidity: 20 percent to 95 percent, non-condensing.

C. EMI: meeting the requirements of Section 2.3.12.1 Airborne Dust: meeting the requirements of Section 2.3.12.1, item G

D. Inclination: meeting the requirements of Section 2.3.12.1, item J

E. Water/Solvents: meeting the requirements of Section 2.3.12.1, item K

If an item of equipment is planned to be installed and or operated in both the external and interior environments, the more stringent requirements shall apply.

~~2.3.14~~2.3.13 General Electrical Requirements

NPT System components shall conform to the requirements of the National Electrical Code (NEC) and Underwriters Laboratories, Inc. (UL) and all applicable electrical codes. All equipment provided shall be UL certified and copies of these certifications shall be provided to SEPTA at the completion of the First Article Test. **CDRL 2-3** All equipment, enclosures, and assemblies, shall be grounded, conforming to NEC requirements. All electrical infrastructure and components installed to support NPT System components shall facilitate electrical power distribution in accordance with these Technical Specifications. All electrical installation activities shall be performed by first class labor thoroughly skilled in the class of work anticipated under this contract.

Contractor shall ensure that final connections to all NPT equipment and components are provided. All installation activities shall proceed in stages, in accordance with the SEPTA approved Installation and Deployment Schedule (see Section 21).

All Contractor installation activity scheduling and proposed installation drawing submittals shall be submitted in accordance with provisions of Section 20 for SEPTA approval.

Termination of each end of a cable shall be by polarized, snap connect plug with positive retention devices, allowing ready exchange of equipment and components if required without unsoldering or otherwise disassembling the cable connection.

The electronics shall be solid state, assembled on reinforced printed circuit boards. These boards shall be modular (plug connected) and removable for inspection and/or maintenance. The components mounted on the board shall be securely soldered in place. For those items that must be easily and often removed, high quality sockets with retainers shall be used. Where electronic circuit boards are employed and where they are to be inserted and/or removed by means of board guides, they shall be provided with lifting tabs.

All major electrical/electronic subassemblies and devices shall be interconnected also by means of polarized, snap connect plug with positive retention devices. All contacts and connections shall be of non-corrosive materials. Wires and multi-conductor cables shall be color coded and/or permanently marked to permit positive identification. It shall not be possible to improperly insert a plug-in component into a connector.

Fuses, circuit breakers, or other protective devices shall be employed to protect the electronics, motors, and other components from overload and damage. Where used, they shall be accessible without disassembly of components. Location shall permit inspection and/or replacement through normal maintenance access doors or panels.

A master "disconnect" switch shall be provided within the equipment cabinet to disconnect the unit from the incoming power supply. This switch shall be identified and marked, and be of the two position type.

Each type of equipment shall be designed and manufactured to provide under-voltage and over-voltage protection as defined later in this Section.

The complete loss or fluctuation of power, as identified later in this Section, to the equipment shall not cause any information or data contained in electronic memory to be lost or altered. The electronic memory logic shall be capable of maintaining electronic memory without incoming power for a minimum of one (1) month.

The NPT equipment electronics and logic shall be protected against stray EMI radiations, vibrations, ultraviolet light, or other environmental conditions, which would cause the equipment to become inoperative and/or lose the data contained therein. Electronic circuit boards shall not be potted.

Adequate ventilation to disperse the heat created and to preclude degradation of components and performance.

All components connectors shall be of positive type and self-locking, to assure proper connections and preclude intermittent performance due to poor contacts. All electrical connectors shall be non-corroding. Where required in order to ensure that there is no corrosion of electric terminals or connectors exposed to the environment, Weather Pack connectors, or other SEPTA-approved environmentally sealed connectors shall be used. No butt connectors shall be used in any type of NPT equipment or power supply source connected to the equipment. All plug-in components shall be retained with a positive force holding them in position to ensure they do not work loose with the vibration that can be expected in the vehicles.

All NPT equipment shall be installed to permit easy access to equipment for normal maintenance. Access to the electronics, power supplies, and other electrical components for maintenance, replacement, or repair shall not require the removal of the equipment or of any components.

~~Installation shall conform to the requirements of NFPA 70, and the requirements specified herein.~~ All cables shall be installed in such a manner that they do not exceed the manufacturer's bending radius. This includes the minimum-bending radius under pulling and permanent installation. Both values shall be furnished by the vendor.

2.3.13.1 Regulatory Requirements

All electrical installation shall conform to the requirements of the National Electrical Code (NEC) and Underwriters Laboratories, Inc. (UL) and all applicable electrical codes. These regulatory requirements shall include but not be limited to:

A. NFPA 70 - National Electrical Code;

B. Fire and Panic Code - Commonwealth of Pennsylvania;

C. Electrical Code City of Philadelphia;

D. Obtaining of permits and requesting inspections from Philadelphia License and Inspection;

E. Provision of products listed and classified by UL or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated;

F. All other standards indicated within these Technical Specifications.

2.3.13.2 Conduit Requirements

Installed conduit shall be classified by UL as suitable for the purpose specified. Conduit size shall be in accordance with ANSI/NFPA 70. Conduit no less than 13/16 inch in size shall be used unless specified.

Underground Locations

Conduit shall be installed no less than 5 feet from Foundation Wall. Thickwall non-metallic conduit shall be used for all underground installations. For "In or Under Slab on Grade" conduit installation, rigid steel conduit shall be used with a size no less than 1 inch.

Outdoors Locations Above Grade

Rigid metal conduit shall be used for all conduit installation in outdoor locations above grade.

In Slab Above Grade

Rigid metal conduit shall be used for all conduit installation in slab above grade. "In Slab" conduit shall be restricted to a maximum conduit size of 13/16 inch and 5/8 inch for conduits crossing each other.

Wet and Damp Locations

Rigid metal conduit shall be used for all conduit installation in wet and damp locations.

Dry Locations

Rigid steel conduit shall be used for all conduit installation in concealed and exposed locations.

Metal Conduit

Rigid Steel Conduit in accordance with ANSI C80.1 shall be used where rigid steel conduit is required. Fittings and conduit bodies in accordance with ANSI/NEMA FB 1 shall be used to match conduit material.

Flexible Metal Conduit

Flexible Metal Conduit shall utilize Interlocked Steel Construction. Fittings in accordance with ANSI/NEMA FB 1.

Liquidtight Flexible Metal Conduit

Liquidtight Flexible Metal Conduit shall utilize Interlocked Steel Construction with PVC jacket. Fittings in accordance with ANSI/NEMA FB 1 shall be used.

Fiberglass Reinforced Epoxy Conduit

Conduit for emergency power feeder shall be rigid non-metallic, high impact and compressive strength, with low coefficient of friction fiberglass reinforced epoxy. Conduit shall conform to the requirements of NEMA TC14 Part B and shall be UL listed in accordance with Article 347 of the NEC for underground or exposed use according to the use intended and SEPTA's "STANDARD SPECIFICATION FOR FIBERGLASS CONDUIT AND SYSTEM". Fiberglass reinforced epoxy (FRE) duct and fittings shall be manufactured from pure, high grade, filament wound fiberglass epoxy and shall have the following properties as a minimum:

1. Tensile strength (axial): 11,000 psi when tested per ASTM D2105.
2. Modulus of elasticity: 1,300,000 psi when tested per ASTM D2105.
3. Thermal conductivity: .166 Btu(th) ft/hour/ft^2/°F (288/w/m.k).
4. Coefficient of linear thermal expansion: 1.37 x 10^{-5}/^{0}F.
5. Specific gravity: ounces/$inches^3$.
6. Temperature range: 65 °F to 300 °F.
7. Dielectric strength: 500 Kv/inch when tested per ASTM D348.
8. Dissipation factor: 0.5% average at room temperature when tested per ASTM D348.

Where ducts are to be used in corrosive areas, isophthalic polyester resin shall be used in both the liner and the overlap. Fiberglass duct smaller than 4 inches in size shall have an average wall thickness of 1/16 inch. Sizes larger or equal to 4 inches shall be heavy wall type with an average wall thickness of 3/32 inch. The ducts shall be thoroughly cured and shall not contain any material in sufficient quantities to cause damages to cables. They shall be straight and shall have a circular bore with the inner surface smooth and free from dents, obstructions or any other defects which would cause damage to cables. The bores shall pass freely a mandrel 3 feet in length and ¼ inch less in diameter than the nominal diameter of the duct. Plastic couplings and straight adaptors shall be suitable in size and design for the conduit with which they are to be used. Bends (90 degrees, 5 feet radius) shall be provided at vertical or horizontal curves and as indicated or as directed by the Project Manager. Conduit Expansion Fittings shall be fabricated from material similar to the type of conduit with which they are to be used. Each fitting shall include a factory installed packaging ring, designed to prevent the entrance of moisture, a pressure ring, and a grounding ring or grounding conductor for metallic expansion couplings.

2.3.13.2.1 Conduit Installation

Conduit shall be installed in accordance with NECA Standard of Installation. Related conduits shall be grouped and supported using conduit rack. Conduit rack shall be constructed using steel channel and shall be constructed to provide space on each for 25 percent additional conduits. Conduit shall not be supported using wire or perforated pipe straps. Clearance of 3/16 inch between conduit and surfaces with temperatures exceeding 104°F shall be maintained. No more than the equivalent of three (3) 90-degree bends between boxes shall be installed.

Conduit bodies shall be used to make sharp changes in direction, such as around beams. A hydraulic bender shall be used to fabricate elbows and bends in exposed parallel conduit runs. Factory elbows shall be used for non-exposed non-parallel runs. Fittings that accommodate expansion and deflection where conduit crosses control and expansion joints, shall be used. Suitable caps shall be used to protect installed conduit against the entrance of dirt and moisture.

Conduit passing through a masonry or concrete wall, floor or partition shall be provided with a sleeve made from standard weight steel pipe with smooth edges, securely and neatly cemented in place. Conduit passing through a frame or metal partition shall be provided with sleeve made from 2¾ feet galvanized sheet metal, securely fastened in place.

Sleeves shall be two pipe sizes larger than any conduit. Sleeves imbedded in concrete floors or walls shall be placed in the forms before concrete is poured; sleeves shall have integral waterstop flanges, where said sleeves shall receive either watertight or hydrostatic seals. Sleeves for electrical raceways passing through ceiling air plenum walls or the floor above airtight and fire resistant ceilings shall be sealed in a manner similar to that specified for watertight sleeves. This shall also apply where conduits leave heated areas and enter unheated areas. Contractor shall be responsible for the proper location and alignment of all sleeves for installation activities before and during concrete placement.

2.3.13.2.2 Conduit Identification

Conduit markers shall be used for each conduit longer than 19½ feet. Spacing between conduit markers shall be no less than 20 feet. The following color code shall be used for the identification of conduit:

1. 480 Volt System: Green
2. 208 Volt System: Blue
3. Fire Alarm System: Red
4. Telephone System: Black
5. 15 KV System: Orange

2.3.13.3 Wire and Cable Requirements

Where the Contractor shall be required to install wiring and cabling to support the installation of NPT System equipment, the following requirements shall be applicable. Building and facilities wire and cable shall be single conductor insulated copper wire. Insulation shall be in accordance with ANSI/NFPA 70 and shall be Type THHN/THWN insulation for feeders and branch circuits. The following wiring connectors shall be permitted:

- Split Bolt Connectors;
- Solderless Pressure Connectors;
- Spring Wire Connectors;

- Compression Connectors.

The following wiring methods shall be permitted:

- Concealed Dry Interior Locations: Type TW, THW, THHN/ THWN, XHHW 75% insulation shall be used in raceway;
- Exposed Dry Interior Locations: Type THHN/THWN 75% insulation shall be used in raceway;
- Above Accessible Ceilings: Type THHN/THWN 75% insulation shall be used in raceway;
- Wet or Damp Interior Locations: Type THHN/THWN 75% insulation shall be used in raceway;
- Exterior Locations: Type THHN/THWN, XHHW 75% insulation shall be used in raceway;
- Underground Installations: Type THHN/THWN, XHHW 75% insulation shall be used in raceway.

~~***2.3.13.1Conductor Identification***~~

~~All wires and cables shall be identified by circuit numbers in all cabinets, boxes, manholes, wireways and other enclosures and access locations and at all terminal points.~~

~~All cables shall be labeled at least at each end of every cable section; using SEPTA approved cable tags or labels. Inside plant cables shall be labeled using SEPTA approved self-adhesive waterproof labels; outside plant cables shall be labeled using SEPTA approved waterproof plastic cable tags. Samples of conductor identifications shall be provided at the Conceptual Design Review for review and approval by SEPTA. **CDR 2-54**~~

~~***2.3.13.2***~~***2.3.13.3.1 Cable Installation in Conduit, Cable Trays, Ducts, and Raceways***

During the installation of cables in conduits, cable trays, ducts, and other raceways the cable manufacturer's recommended pulling tension shall not be exceeded. A suitable lubricating medium, harmless to the cable jacket, shall be used when pulling cables into a conduits pipes, cable trays, or duct banks. No oil or grease substances not specifically manufactured for cable installation will be permitted for such use.

Contractor shall use adequate lubrication when installing cables in conduits or raceways. Any pulling compounds shall be compatible with the finish of the wires and cables provided.

~~2.3.13.3~~2.3.13.3.2 Cable Attachment and Support

Lengths of cables which are not installed in conduits or other raceways and are run inside equipment rooms shall be secured to cable trays or cable ladders using nylon cable ties and attached to walls and backboards using nylon cable clamps or hangers or using a plastic wiring system such as manufactured by Panduit, or approved equal. Cables shall be attached or otherwise supported at intervals not to exceed eighteen inches (18"). Cables above accessible ceiling shall be supported using spring metal clips or nylon cable ties to support cables from structure. Cables shall not be allowed to rest on ceiling panels. Cable supports shall not be fastened or attached to pipes, ducts, mechanical equipment and/or conduit.

~~2.3.13.4~~2.3.13.3.3 Strain Relief

Provide sufficient strain relief (slack) in all cables, cable conductors, and wiring to avoid stress on all cables, wires, and wiring connections.

~~2.3.13.5~~2.3.13.3.4 Bends

Cables shall not be bent to a radius less than ten (10) times the diameter of the cable, or less than the manufacturer's recommended minimum bending radius, during installation or as final install.

~~2.3.13.6~~2.3.13.3.5 Cable Continuity and Integrity

All cables shall be continuous and without splices between the specified termination locations. The cable termination points shall be located within communication cabinets, equipment enclosures, splice cases, and equipment termination boxes.

~~2.3.13.7~~2.3.13.3.6 *Termination and Identification*

All cables shall be terminated in standard order, according to the EIA/TIA and ICEA color codes. All aluminum conductors shall be terminated with tin-plated aluminum- bodied compression connectors only. Suitable reducing connectors or mechanical connector adaptors shall be used for connecting aluminum conductors to copper conductors. Split bolt connectors shall be used for copper conductor splices and taps, 0.02 inches^2 and larger. Solderless pressure connectors shall be used with insulating covers for copper conductor splices and taps, 0.012 inches^2 and smaller. Insulated spring wire connectors shall be used with plastic caps for copper conductor splices and taps, 0.008 inches^2 and smaller. Individual cables shall be identified at each cable termination with self-adhesive labels. All spare pairs in each cable shall be terminated and identified.

All wiring and cabling shall be uniquely identified in terms of equipment to and from connections. This identification shall be shown on all wiring, electrical schematics, and location drawings. Those components that have been installed by the Contractor as a supplement to the original design shall be identified.

All wires and cables shall be identified by circuit numbers in all cabinets, boxes, manholes, wireways and other enclosures and access locations and at all terminal points.

All cables shall be labeled at least at each end of every cable section; using SEPTA approved cable tags or labels. Inside plant cables shall be labeled using SEPTA approved self-adhesive waterproof labels; outside plant cables shall be labeled using SEPTA approved waterproof plastic cable tags. Samples of conductor identifications shall be provided at the Conceptual Design Review for review and approval by SEPTA. **CDR 2-5**

All labeling shall:

A. Meet the legibility, defacement, exposure and adhesion requirements of UL 969;

B. Be preprinted or computer printed type. ⅛ inches letters shall be used for identifying individual equipment and loads. ¼ inches letters shall be used for identifying grouped equipment and loads. Hand written labels are not acceptable;

C. Use vinyl substrate with a white printing area and black print. For cable jackets that are white, provide cable label with printing area that is any color other than white, preferably orange or yellow, so that labels are easily distinguishable;

D. Be flexible vinyl or other substrates to apply easily and flex as cables are bent;

E. Use aggressive adhesives that stay attached even to the most difficult to adhere to jacketing.

The following shall be labeled:

A. Communications Cables:

1. Twisted Pair Cables (i.e. CAT 3, CAT 5, CAT 5E, and CAT 6);
2. Coaxial Cables (RG-59, RG-6, etc.);
3. Fiber optic cables and patch cords;
4. Data cables (RS-232, RS-422, RS-485, etc.).

B. Communications Rooms and General Cabling:

1. Patch panels;
2. Terminal blocks;
3. Type 66 blocks;
4. Telecommunications Outlets.

C. NPT Devices and Hardware.

All record documentation that is necessary to complete identification of equipment and components in terms of location, equipment type, and any other information required to make the ID unambiguous shall be submitted for SEPTA review and approval at the Conceptual Design Review. **CDR 2-6**

2.3.13.4 Boxes, Cabinets, Enclosures and Panel Boards

Where the Contractor shall be required to install wire and cabling infrastructure to support the installation of NPT System equipment, boxes, cabinets and enclosures, and panel boards shall be installed as necessary in accordance with the following requirements.

2.3.13.4.1 Boxes

Outlet Boxes

Outlet Boxes shall be sheet metal outlet boxes or cast boxes. Sheet metal outlet boxes shall be in accordance with ANSI/NEMA OS 1 and shall be made of galvanized steel. Boxes shall be rated for the weight of equipment which it shall support. Concrete ceiling boxes may be used. Cast boxes in accordance with NEMA FB 1 shall be Type FD, aluminum, or cast feralloy. Cast boxes shall utilize gasketed covers supplied by the box manufacturer.

Pull and Junction Boxes

Pull Junction Boxes shall be sheet metal boxes or surface-mounted cast metal boxes. Sheet metal outlet boxes shall be in accordance with ANSI/NEMA OS 1 and shall be made of galvanized steel. Surface-mounted cast metal boxes in accordance with NEMA 250 shall be Type 4, flat-flanged, surface-mounted junction boxes.

Cover legends on all Outlet and Pull and Junction Boxes shall read "ELECTRIC."

2.3.13.4.2 Cabinets and Enclosures

Cabinets

Cabinet boxes shall be made of galvanized steel. Boxes shall be 2 feet wide by "as required" inches high by 6 inches deep. Backboards for mounting terminal boards shall be made of plywood and shall be ¾ inch thick. Cabinet fronts shall be surface type with concealed trim clamps, concealed hinges, and flush lock keyed to match branch circuit panelboards. Cabinets shall be finished with gray baked enamel. Metal barriers shall be provided to separate compartments containing control wiring operating at less than 50 volts from power wiring.

Terminal Blocks

Terminal blocks shall be ANSI/NEMA ICS 4 compliant. Power Terminals shall be of unit construction type with closed back and tubular pressure screw connectors, rated 600 volts. Signal and Control Terminals shall be of modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts. A ground bus terminal block shall be provided with each connector bonded to enclosure.

2.3.13.4.3 Panel Boards

Distribution Panel Boards

Panelboards shall be NEMA PB 1 compliant and of the circuit breaker type. Panelboards shall be rated for reliable operation at a temperature of 115 °F. The panel board bus shall be made of copper with a ground bus provided in each panel board. Minimum integrated short circuit rating shall be as noted on the schedules. Molded case circuit breakers shall be in accordance with NEMA AB 1. Circuit breakers shall be provided with integral thermal and instantaneous magnetic trip in each pole. Circuit breakers shall be UL listed as Type HACR for air conditioning equipment branch circuits. Circuit breaker accessory trip units and auxiliary switches shall be provided as indicated.

Branch Circuit Panel Boards

Lighting and Appliance Branch Circuit Panel Boards shall be NEMA PB 1, circuit breaker type. The panel board bus shall be made of copper with a ground bus provided in each panel board; insulated ground bus shall be provided where scheduled. Minimum integrated short circuit rating shall be as noted on the schedules. Molded case circuit breakers shall be in accordance with NEMA AB 1. Bolt-on type thermal magnetic trip circuit breakers with common trip handle for all poles shall be used. Circuit breakers shall be UL listed as Type SWD for lighting circuits. UL Class A ground fault interrupter circuit breakers shall be used where applicable. Tandem circuit breakers shall not be used.

2.3.13.5 Wiring Devices

Where the Contractor shall be required to install wiring devices to support the installation of NPT System equipment, the following requirements shall be applicable.

2.3.13.5.1 Receptacles

General-duty duplex type receptacles shall be 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, 20-amperes, 125 volts, with metal plaster ears, side wiring, and NEMA configuration 5-20R unless otherwise indicated. Duplex receptacles connected on emergency power shall be of red color. General-duty grounding type duplex receptacles, with integral ground-fault circuit interrupters shall be grounding type UL-rated Class A, Group 1, 20-amperes rating, 125-volts, 60Hz, with solid-state ground-fault sensing and signaling circuitry with 5 milliamperes ground-fault trip level. The grounding type duplex receptacle shall be equipped with a 20-ampere plug configuration, NEMA 5-2OR, and shall include push-to-test capability.

2.3.13.5.2 Wall Plates

Duplex receptacle wall plates shall be provided with types, sizes, ganging and cutouts as required. All plates for multiple gang requirements shall be one piece combination. Wall plates shall utilize metal screws for securing plates to devices, screw heads colored to match finish of plates, and plates colored to match wiring devices to which attached. Receptacle circuit numbers shall be identified on plates with engraved or etched designations with 3/16 inch high block type letters filled with black enamel.

2.3.13.5.3 Grounding and Bonding

Receptacles shall utilize existing grounding electrode systems in compliance with NEC 250. Where no grounding electrode systems exist, Contractor shall supply a Grounding Electrode System in compliance with NEC 250. The Grounding System shall provide a system resistance of 5 ohms. The rod electrode shall be made of copper-clad steel and shall have a diameter of 5/8 inch and shall be no less than 10 feet in length. Mechanical connectors shall be made of bronze. Wiring for the grounding system shall utilize stranded copper. Wiring used for connecting Foundation Electrodes shall have a cross sectional area of 0.196 square inches. Wiring used for connecting Grounding Electrode Conductors shall be sized to meet NFPA 70 requirements. Separate insulated grounding conductors shall be provided within each feeder and branch circuit raceway.

2.3.13.6 Electrical Identification

Contractor shall install electrical identifiers, tags, and signs for all electrical work completed as required by governing regulations and authorities to ensure the safety of persons in the vicinity of electrical components. Approved forms of electrical identification are as follows:

Plasticized Tags

Manufacturer's standard pre-printed or partially pre-printed accident-prevention and operational tags, of plasticized card stock with matte finish, suitable for writing, shall be used where provided. Tags shall be installed with brass grommets and wire fasteners, and with appropriate pre-printed wording including large-size primary wording (as examples: DANGER, CAUTION, DO NOT OPERATE).

Baked Enamel Danger Signs

Manufacturer's standard "DANGER" signs of baked enamel finish on 1/32 inch steel with standard red, black and white graphics shall be used. Sizes shall be 14 inches by 10 inches except where 10 inches by 7 inches is the largest size which can be applied where needed, and except where larger sizes are needed for adequate visibility. Signs shall include recognized standard explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURLED CABLE, DO NOT TOUCH SWITCH). In addition to installation of danger signs required by governing regulations and authorities, appropriate danger signs shall be installed at locations indicated and subsequently identified by SEPTA or SEPTA authorized personnel as constituting similar dangers for persons in or about project.

Lettering and Graphics

Contractor shall utilize standard abbreviations, graphics and other designations used in electrical identification work to ensure proper identification and operation/maintenance of the electrical components and NPT equipment.

Samples of electrical identifications as described shall be provided at the Conceptual Design Review for review and approval by SEPTA.
CDR 2-7

~~**CDR -7**~~

2.3.13.7 Equipment Installation

All NPT equipment shall be installed in accordance with the manufacturer's recommendations. Contractor shall provide all necessary anchoring devices and supports including any equipment supports not detailed on architectural or mechanical drawings. Contractor shall use structural supports as indicated by the manufacturer. Otherwise, structural supports suitable for each item of NPT equipment shall be used. Anchoring devices and supports shall not be welded to building structural members. In the event that approved substitute equipment shall be installed, anchoring devices and supports shall be revised to support the requirements of the substituted equipment.

2.3.13.7.1 Quality Control

Contractor shall perform Quality Control activities in accordance with Section 20 to demonstrate workmanship, operation, and performance of all electrical installation activities completed. Tests shall be performed in the presence of inspectors of agencies having jurisdiction, if required. Contractor shall furnish all materials required for Quality Control activities. Equipment and systems found inoperative or defective shall be repaired, replaced and re-tested.

~~2.3.14.2~~2.3.13.8 *Station and Facilities Equipment*

NPT System components shall be capable of the following:

A. Operating on source power of 110 VAC (nominal) ~~(~~+/-10%~~)~~, single phase, 3 wire, 60 Hz (+/-1%);

B. Normal operation while ignoring micro cuts in the power supply of up to 15 milliseconds, with a recurrence of 100 milliseconds;

C. Withstanding the following voltage excursions:

1. Sag: - 15%
2. Surge: +15%
3. Transient Impulse: 75 volts
4. Common Mode Noise: 5 volts

D. Completing transactions in–process, retaining data and shutting down in an orderly manner in the event of loss of electrical power;

E. Returning to full operational status after a power failure without manual intervention, adversely affecting the current operational situation or the integrity of stored data.

NPT equipment shall include adequate filters and components in order to regulate the supplied voltage and render it devoid of power spikes and noise. Adequate protection against transient surges shall be incorporated to the extent necessary to prevent damage to electronic components.

Circuit Breaker

All NPT equipment shall be equipped with a Circuit Breaker with Ground Fault Circuit Interrupter. This shall include a "push to test" button, visible indication of tripped condition and ability to detect an earth leakage current of approximately 5 milliamperes in accordance with UL 1053 and NFPA 70.

Grounding

For all NPT equipment, all non-current carrying metallic parts of each device shall be grounded. In addition, the following equipment and components of the NPT System must be grounded:

- neutral conductors;
- cable shields;
- metallic cable sheaths and armor;
- metallic conduits;
- cable terminations;
- junction boxes;
- poles;
- surge arresters.

Equipment installation shall conform to the requirements of the National Electrical Code, local electrical codes, and to the requirements specified herein. Equipment supports shall not be fastened or attached to pipes, ducts, mechanical equipment and/or conduit. Spring steel clips and clamps shall not be used in the installation of supports. Supports shall be fabricated from structural steel or steel channel. Grounding methods shall be in accordance with manufacturer's requirements.

For safety protection, non-current carrying metallic parts of electrical equipment shall have a maximum resistance to solid "Earth" (ground) not exceeding 2 ohms.

The system shall use terminal lug(s) to connect grounding conductor to equipment enclosures, and use approved ground connector(s) to connect grounding conductors to piping, fencing, and conduit systems.

Splices in grounding conductors will not be permitted.

~~2.3.14.3~~2.3.13.9 *On-Board Equipment*

All on-board NPT equipment shall be designed to operate reliably without malfunction from the vehicle's direct current power source, which is between 11VDC through 15VDC, 12 volts nominal.

The equipment shall be protected against damage, loss, or modification of data caused by:

A. Lower or higher voltage in the range of zero (0) to fifty (50) volts;

B. Reverse polarity of the input voltage;

C. Temporary voltage drops associated with starting of vehicles;

D. Fluctuating voltages between the maximum and minimum voltages identified above.

On-board NPT equipment shall include adequate filters and components in order to regulate the supplied voltage and render it devoid of power spikes and noise. Adequate protection against transient surges shall be incorporated to the extent necessary to prevent damage to electronic components.

Sensing means shall be incorporated within the NPT equipment power supply to cause the on-board NPT equipment to be switched off automatically if the supply voltage increases or decreases to levels beyond the voltage tolerance supplied. This sensing means shall also facilitate automatic restart once voltage levels are within the required levels. Fuses and other similar consumable items shall not be permitted as the sensing means identified above. Neither loss nor reinstatement of power shall not result in any corruption of the data in memory.

2.3.15 2.3.14 General Structural and Material Requirements

The NPT equipment shall be constructed to meet the following structural and material requirements:

A. With the exception of FVD bases, POFM bases and all turnstile baseplates, all NPT equipment shall be shall be constructed of non-rusting stainless steel (Grade 304L) with a random orbital finish or other finish as approved by SEPTA. FVD bases, POFM bases and turnstile baseplates shall be constructed of Grade 316L stainless steel.

A.B. Fastenings shall be concealed wherever possible. Exposed corners shall be rounded or mitered, welded, and ground smooth. Stainless steel shall be formed around corners so that edges are folded and concealed from patrons' views when doors are closed.

B.C. All hinges shall be of the type, which run the length of the door.

C.D. NPT equipment cabinets shall be designed to form an integrated structure capable of resisting, without permanent deformation, fatigue, failure, or undue wear, and other stresses inherent in the type of service for which this equipment is intended, including remaining operational and undamaged after experiencing a kick, punch, or other impact resulting in a concentrated load of 400 pounds to one square inch to any part of the enclosure;

D.E. NPT equipment including all its installed components shall remain in operation and survive impacts resulting in loads of 1g peak with an approximate duration of 10 milliseconds along each of three mutually perpendicular axes;

~~E.~~F. NPT equipment including all its installed components shall remain in operation and survive vibration of 1 Hz to 6 Hz at acceleration of 0.1g along each of three mutually perpendicular axes;

~~F.~~G. NPT equipment cabinets shall be completely unitized. All sections (excluding the leveling pedestal and light fixture) shall be suitably welded together;

~~G.~~H. All NPT equipment shall be arranged to distribute the equipment weight over the mounting base evenly;

~~H.~~I. NPT equipment shall be capable of being anchored into locations other than station platforms, such as building floors, mezzanine floors, and on concrete slabs;

~~I.~~J. For all NPT equipment, where dissimilar metals come in contact, the joint both inside and out shall be painted with an approved coating to exclude moisture from the joint, and provide a suitable insulating barrier separating the metals. Dissimilar metals are defined as those metals, which are incompatible with one another in the presence of moisture, as determined from their relative positions in the Electrochemical Series, or from test data.

~~*2.3.15.1*~~*2.3.14.1 Vandalism Protection*

For protecting against vandalism and burglary for each NPT device type, the following requirements shall be met:

A. All latches shall be secure and robust.

B. All external screws shall be tamperproof.

C. All fasteners used to secure equipment shall be concealed and tamperproof.

D. All hinges for the front door and external access panels shall be concealed.

E. Security locks with profile catches shall be used. All security locks shall capture and hold the key whenever the lock is open.

F. Locks and keepers shall be drill-resistant stainless steel, and be mounted flush with the outside surface of the access door.

G. The cabinet designs shall hinder any use of burglary tools.

H. All gaps between doors/access panels and the cabinet shall be consistent along each edge and shall not exceed 0.05 inches when the door/access panel is latched.

I. Reinforcement shall be provided at the positions where there is the possibility of burglary.

~~2.3.16~~2.3.15 Software Requirements

Software for the NPT devices and CDCRS shall be provided by the Contractor fully debugged and documented, and shall include all revisions introduced up to the time of final acceptance. Where the software is a derivative based on a previous system, the Contractor shall ensure that all software patches and modifications have been applied prior to commencement of installation in any NPT device or sub-system. Versions of third party commercially available software shall be finalized at FDR. **FDR 2-3**

Equipment logic shall be designed to place the processing of Smart Media in precedence over any other function. The NPT equipment processors shall be active at all times, requiring no manual intervention to activate the processor after power-up.

~~*2.3.16.1*~~*2.3.15.1 General*

Software shall perform the following basic functions:

A. Implement the desired control scheme such that the specified performance is achieved;

B. Monitor all inputs for unsafe, erroneous, or unknown conditions or combinations of conditions and take appropriate actions to preserve proper functioning and capture appropriate information to facilitate root cause analysis and repair when necessary;

C. Sample all input conditions at rates sufficient to detect and remedy all unsafe or damaging conditions in the shortest possible time. Sampling rates and program execution times shall be such that the control system is not the limiting factor in response to unsafe or damaging conditions. All software shall be designed to ensure that the timing requirements for safety-related tasks are always met;

D. Limit all output commands to safe levels regardless of any combination of input conditions;

E. Perform self-diagnostic routines and respond promptly, safely, and predictably to detected faults. The self diagnostics shall include tests for program corruption and integrity in read/write memories;

F. Respond safely and predictably when powering up or recovering from power interruptions. All power interruptions likely to have corrupted temporary storage shall be detected and cause the system to re-initialize all affected routines and temporary data. Detection of power interruptions may be by hardware;

G. Permit thorough interrogation of all input, output, and internal conditions by external diagnostic equipment.

~~2.3.16.2~~2.3.15.2 *Operating Systems and Languages*

Software may be written in a high or low-level language although high-level languages are preferred. The language, and its implementation for the selected microprocessor system, shall be commercially available in English. No proprietary languages or code generating systems are allowed. All languages and operating systems must have an acceptable installed base and be approved by SEPTA.

All source code, including comments and development tools, shall be in English. Source code must be well structured, modular, and clearly documented to allow easy comprehension and straightforward traceability to the Software Design Description documents. Software comments shall also include explanations of all significant memory addresses such as interrupt vectors, I/O addresses, and memory locations for RAM, ROM and other memory devices.

~~2.3.16.3~~2.3.15.3 *Commercially Available Software*

Some software supplied under this procurement may be commercially available to a wide variety of users. Examples include operating systems supplied by chip manufacturers and database software for wayside fault analysis. The Contractor shall submit a list of software, which is commercially available to the general public for SEPTA's approval. **CDRL 2-4**

For commercially available software, software documentation requirements are limited to the original data storage/transfer media (DVD), functional and usage details, all provider manuals, and licenses required for SEPTA site use. The Contractor shall incorporate training on how the software is to be used in the specific situation for which it was provided, as part of the Training Program.

~~2.3.16.4~~2.3.15.4 *Capacity*

Software shall be capable of being configured to communicate with a minimum of 5,000 NPT devices (simultaneous, online), and process a minimum of 3,000 media transactions per minute. This information is provided in order assist the Contractor in estimating the size, communications throughput, and minimum memory requirements of the NPT System. The ability to accommodate two times the above amount of transactions shall be included in the base system implemented.

~~2.3.16.5~~2.3.15.5 *Redundant Data*

All data for all NPT equipment shall be stored in two physically separate locations with each device to provide for the best data security and data redundancy. Both sets of data shall be stored in the CDCRS after data transfer.

~~2.3.16.6~~2.3.15.6 *Communication*

Software shall be capable of supporting operations over multiple, disparate telecommunications/data networks. In situations of communications failure, manual data access, upload, download, and backup procedures with associated data security must be provided.

~~2.3.16.7~~2.3.15.7 *Version Control*

The Contractor shall implement a procedure for identifying the version number for each software module for SEPTA to review and approve as part of the QA submission. The version control procedure shall maintain a record of the current release and each previous release, with a detailed description of each modification. As a minimum, version control shall include:

A. the automatic identification of the version number of each item of hardware and software for each device;

B. the automatic reporting of this information when any version number changes;

C. unique, sequential version numbers for each software and hardware module.

At any time desired by SEPTA, a report shall be able to be generated from the CDCRS to provide version information for any, all or selected items of equipment and systems throughout the NPT System.

~~2.3.16.8~~2.3.15.8 *Configuration Management*

The Contractor shall devise and implement a procedure for management of the addition, alteration, or deletion of hardware, software, or telecommunications. This method shall be provided for SEPTA review and approval at Conceptual Design Review. **CDR 2-8**

~~**CDR 2-86**~~

It shall allow SEPTA to change and test configurations before being deployed throughout the system. This method shall also allow the ability to back out and return to original software configurations.

The Contractor shall develop and maintain a Software Configuration Control Plan for tracking software changes relative to all NPT equipment and devices. This plan shall be submitted for approval by SEPTA. The Contractor shall include in the plan a database system capable of maintaining the history of all software and status changes making it possible to determine which versions currently resides in which equipment, on which vehicles, and also which versions were used in the past. The database system shall be capable of generating various reports showing the configuration of a typical device in terms of software history and status, and also a system configuration report capable of determining the exact software configuration of a particular operating unit on a per device basis. The Contractor shall make these reports available to SEPTA.

The Contractor shall submit a final software configuration for each NPT device at the time of system acceptance, or conditional acceptance, in an electronic format as approved SEPTA. **CDRL 2-5**

All software shall be identified by a name and a version number. The name shall identify the equipment into which the software is installed. Every change to software shall be reflected in an update to the version number.

~~2.3.16.9~~2.3.15.9 Software Design

Design criteria identified in this section, unless otherwise indicated, apply to all software for all devices and all computer and communications systems in the NPT System. Additional software design criteria will be defined as necessary in the appropriate sections of this document.

The Contractor shall utilize a Software Quality Assurance Plan in accordance with ANSI/IEEE Standard 730. The plan shall describe a mechanism for orderly software development. The Contractor shall be responsible for the overall design, the partitioning of the requirements to the subsystems, and the integration of the subsystems into the complete system

The Contractor Software Verification and Validation Plan (SVVP) shall describe the integration of the subsystems to cover the requirements of the entire system.

Since software is part of a total system design, it will be reviewed as part of each design review.

Software versions shall be tested before being updated throughout the system. This design shall also allow the ability to back out and return to a previous software version.

All CDCRS and Customer-interface software shall be menu-driven and easy for Customers and/or non-technical employees to use on a daily basis. Software shall utilize a Graphical User Interfaces (GUI), with pull down menus, icon command prompts, on-line help features, capable of activation in combination with the keyboards or keypads. Software shall provide for a minimum of four access/security levels and their association with defined system functions.

Software shall be sufficiently robust, so that the system can recover from error conditions and power losses with a minimal impact on operations. Software shall include provisions for setting and verifying date and time, with automatic adjustments for leap year, and the programmable setting of automatic daylight savings time changeovers.

Software modules shall be designed with flexibility in mind, and be clearly and well documented in English.

The operating systems for all equipment and computer systems shall be versions of which are commercially available at the time of Notice to Proceed and supported through the planned final acceptance date. The operating system software shall be fully multi-tasking, and capable of executing multiple concurrent applications programs without delays detectable by the users.

Database software for all NPT devices and computer systems of the CDCRS shall be ODBC-compliant and shall not be proprietary nor utilize proprietary language, routines, or sub-routines. Microsoft SQL, or other SEPTA-approved database, shall be used as the database engine. Database software shall be commercially available at the time of proposal submission, fully SQL and OBDC compliant, and easy to install following industry standards for operating system selected.

The software shall be fully integrated with the operating system to support all required functions of the applications programs in both a networked and a stand-alone environment. The software shall allow for the distribution of software modifications to all NPT devices from a centralized location.

Microcomputers, or any other system components, shall not rely on, or employ, the use of EPROM's. All code updates at the device level shall be implemented without requiring mechanical intervention to accomplish the change.

~~2.3.16.10~~2.3.15.10 Coding

Software shall be coded in a non-proprietary language. Except as expressly permitted by SEPTA, hard-coding of values shall be prohibited. All programs and routines shall reference central tables of codes and values for each function. A process shall be provided to facilitate updating of tables prior to implementation of changes, with multiple future effective dates designating the actual implementation of each change. No less than seven (7) years of effective date code and values shall be maintained so that reports can be constructed from historical data spanning changes in fares and other parameters.

Software error codes shall be table driven, include the manner in which the error can be corrected, and contain easily understood explanatory text. Entries shall be available for editing at the CDCRS level with the ability to add additional error codes as required. The procedure for these modifications shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 2-5, FDR 2-4**

~~2.3.16.11~~2.3.15.11 *Software Maintenance and Related Tools*

SEPTA retains the right to modify the performance of its equipment, at its own risk after final system acceptance. Since this involves software modifications, all software for the NPT System shall be delivered to SEPTA on DVD.

The Contractor shall provide software development workstations, including all of the software and software development tools used by the suppliers. The complement of equipment shall include all compilers, assemblers, linkers, in-circuit emulators, and other such tools that are used for software development.

All associated manuals shall be provided. Development tools and software, which are provided to SEPTA, must be the same version as used by the suppliers. The system shall allow software modifications and tests of all transit related software on this procurement. The complete complement of software development/modification tools shall be delivered such that software modifications can, if desired, be made on-site during acceptance testing.

The workstations shall include automated tools for the configuration management of software and associated hardware. The Contractor shall use this system throughout the Contract term so that configuration is controlled and SEPTA's configuration documentation remains current with the actual equipment configuration.

~~2.3.16.12~~2.3.15.12 *Software Documentation*

The intention of this specification is to be generally consistent with the evolving IEEE P1588 Standard for Software Documentation for Rail Equipment and Systems. Draft or released versions of that standard may be consulted, as they become available, for understanding of the desired direction for documentation standardization.

For non-commercially available software, thorough and accurate software documentation submittals and SEPTA approval of these submittals are required. SEPTA shall be provided with sufficient documentation to fully comprehend and analyze the operation of the equipment in which the software is to be installed; and to enable SEPTA to maintain and modify the software to correct problems, adapt it to changing requirements, add features, and port it to a new hardware platform. The Contractor shall define a single software documentation methodology for the project and require all subcontractors to comply with same. The methodology shall be submitted for SEPTA's approval. **CDRL 2-6** The Contractor shall provide descriptions to enable SEPTA's design reviewers to understand the documentation methodology.

Software, Specifically for Custom Applications

All software documentation from all suppliers shall be in a common format. This format shall use a consistent set of graphic and texts (techniques, formatting) to fully describe the software functionality and implementation.

The Contractor shall develop and submit for approval a Software Quality Assurance Plan (SQAP) in accordance with ANSI/IEEE Standard 730. The scope of this document shall cover the entire software development for the project. It shall describe the responsibilities of the Contractor and the Suppliers. The SQAP shall describe the design activities and documentation required of the Contractor and Suppliers. It shall be submitted and approved soon after the NTP, before the submittal of other documents. The SQAP shall require of the Contractor, as a minimum, the following documents:

- A Software Project Management Plan (SPMP).
- A Software Configuration Management Plan (SCMP) in accordance with ANSI/IEEE Standard 828, including definition of the Software Configuration Items (SCI) within each subsystem.

- A Software Verification and Validation Plan (SVVP) in accordance with ANSI/IEEE Standard 1012. This document shall describe the verification and validation plans related to integration of the subsystems that produce the desired behavior of the complete system. Verification and validation is to be done as early in the development cycle as possible. Whenever possible it shall be done within the subsystem development.

- A Software Verification and Validation Report (SVVR) in accordance with ANSI/IEEE Standard 1012.

- User Documentation as described in ANSII/IEEE Standard 730 Section 3.4.2.5.

- System Functional Description (SFD) for each subsystem presenting the external interfaces, defining the processors in the subsystem, the Software Configuration Items, and the internal interfaces within the subsystem. It shall include a software summary table with a row for each software item in the system including proposed COTS items. Columns will give the software item name and ID, SRS name and ID, SDD name and ID, and section within the SFD where it is described. Each proposed COTS item must be described in the SFD.

- Software Requirements Traceability Matrix (SRTM)

- Document templates, instructions, and definitions for the suppliers to assure consistent documentation for the entire project.

The Contractor shall assure that the documentation produced provides for the straightforward traceability of requirements of the Technical Specification throughout the design documentation and including the final tests. All documents submitted shall utilize revision bars in the margin and/or underline/strike through to highlight changes from one revision to the next.

After original approval, changes to the software shall be formally submitted for approval by SEPTA, prior to implementation of the changes in the source code. The software documentation shall be revised concurrently with software changes. New versions of software must be accompanied by revised, reviewed, and released software documentation.

Software Project Management Plan (SPMP)

The SPMP for both the Contractor and the Suppliers shall conform to IEEE Standard 1058, Software Project Management Plans. It shall include a schedule showing the key tasks defined for the project.

Software Requirements Traceability Matrix (SRTM)

The SRTM shall provide cross-referencing between the requirements of the SRSs and the corresponding sections of the SFD, SDD, and the Software Verification Test Plans. It shall include one table for each SCI and within each table, there shall be a row for each SRS requirement. The first column shall be the unique identifier for the individual requirements defined in the SRS. Columns 2 to 6 shall be, in order, a short description of the requirement, the reference to the corresponding SFD section, the reference to the SRS section, the reference to the SDD section or sections, and last, the reference or references to the Software Validation test. Since the references are dependent on the version of the documents referenced, the specific versions of all referenced documents must be stated for each table.

All references to documents shall specify the location to a sufficiently specific section of text so the reader easily and unambiguously understands the intention.

Software Documentation Templates

A template must be defined by the Contractor for each deliverable document. A common general format must be defined for the title page and the revision history. The title page must include the Contractor or supplier name, project name, document name, document ID, sign-off names, signatures, and dates, the document version date, and the version ID. The change history must show in a table the changes made for each version along with the source of the change such as a review issue, a change, or a meeting action item. Sufficient information must be provided to allow the reader to understand the changes and the reasons for the changes.

~~2.3.16.13~~2.3.15.13 *Testability*

All features and functions of software systems shall be testable on a systems level. Specific approval by SEPTA is required for any feature, which is not testable on a systems level. For features, which are only testable with special equipment, all such equipment shall be supplied by the Contractor as test equipment, and become the property of SEPTA. This equipment shall provide the logic, sequencing, and emulation necessary to verify that the software functions as intended.

Type tests of all processor systems shall verify the proper operation of all software features, including diagnostics.

All Test Plans and Procedures shall be submitted for approval prior to conducting the tests. **CDRL 2-7**

2.3.16 Operational Fare Media Lists

The NPT System shall employ a number of different Fare Media lists that shall be stored in and used by the NPT equipment and system in order to process Smart Media. Contractor shall provide information on format, size, and characteristics of these lists and how these lists are to be actively managed to ensure that their capacities are not exceeded for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 2-6, FDR 2-5**

These lists are described below:

2.3.16.1 *Bad Number List*

This list is stored by the CDCRS only and has no size restrictions. This list shall store all known Smart Media ~~card~~identification numbers which cannot be used in the NPT System. These shall include those defined by SEPTA and its partners as well as credit and debit card numbers.

Contractor shall provide information on format, size, refresh frequency and characteristics of the list, as well as the Contractor-provided functionality that will enable SEPTA to actively manage the list, for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 2-7, FDR 2-6**

~~2.3.16~~2.3.16.2 *Invalid Fare Media List*

This list is created by the CDCRS extracting selected Smart Media numbers from the Bad Smart Media List based on criteria selected by SEPTA. Each NPT device shall locally maintain an invalid media list, which shall consist of entries downloaded from the CDCRS. A minimum of 250~~500~~,000 Smart Media number entries shall be provided with addition or deletion of individual entries possible at the NPT equipment. Ranges of invalid Fare Media shall be possible, with each range taking no more than three entries in the list. Contractor shall provide information on format, size, and characteristics of the list, as well as the Contractor-provided functionality that will enable SEPTA to actively manage the list, for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 2-8, FDR 2-7**

2.3.16.3 Positive List

This list is created by SEPTA and shall be stored by the CDCRS and the NPT equipment. ~~This list shall have a capacity of not less than 150,000 Smart Media numbers.~~ This list shall store selected known Smart Media card numbers which can be used in the NPT System without further verification required. Such Smart Media card numbers shall include those of SEPTA Employees and Customers (for which auto-replenish services have been enabled and remain authorized) who continue to satisfy SEPTA's eligibility requirements. These shall include ~~those~~Customers defined by SEPTA and its partners. The Positive List shall have a capacity of no less than 250,000 Smart Media numbers, with the ability to allocate additional capacity via the CDCRS. Contractor shall provide information on format, size, and characteristics of the list, as well as the Contractor-provided functionality that will enable SEPTA to actively manage the list, for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 2-9, FDR 2-8**

~~2.3.18~~2.3.17 Communications

For the NPT System, all communications and systems interfaces shall be designed to be both robust and secure. Because SEPTA anticipates accepting credit and debit cards on devices throughout the NPT System, all devices, networks, and the entire CDCRS shall comply with the Payment Card Industry (PCI) Data Security Standard (DSS) and the Payment Application Data Security Standard (See Section 5). The~~i~~se requirements apply~~ies~~ to all NPT Devices~~, including HSDs, OBPs, and ASDs,~~ and are~~is~~ applicable to all forms of communication, including wireless, leased-lines, and SEPTA provided Fiber optics (including the link between the Primary and Secondary CDCRS).

End-to-end encryption shall be provided for all data transferred between an item of NPT equipment and the CDCRS, and between the CDCRS and external financial payment networks.

All connections shall incorporate redundant data paths to ensure reliable systems communications. All communications interfaces shall, to the extent possible, automatically isolate and/or recover from failures and errors. These communications systems shall also be responsible for providing adequate bandwidth to each NPT device such that there are acceptable levels of data throughput, as defined by SEPTA.

2.3.18 Software Updates

All NPT equipment shall be able to accept software revisions/updates downloaded through the ~~normal~~applicable data exchange process (as defined in Section 18) at the stations, on vehicles, at bus depots/trolley barns and when communicating to the CDCRS. When the download is complete and the equipment has acknowledged the receipt of the download, the CDCRS shall indicate in its database that the update has been completed. Attempts to install an update shall only be performed after the complete software has been received and accepted by the NPT equipment. Incomplete updates shall be retained by the equipment and upon a retry of data upload by the NPT equipment, the update shall resume from the point of communication interruption.

2.4 Revenue Security and Accountability

Regardless of the payment method, transaction type, Fare Media used, or device involved, all NPT transactions shall be individually recorded, and PCI DSS-compliant transactional information shall be transmitted to the CDCRS. Information included in each transaction record shall include all pertinent data to permit a complete reconstruction of the transaction and thorough audits of the NPT System and contain standard summary-level information needed to consolidate all revenue sources for management reporting. Such audits shall be possible from the unit (device) level to the system level, and all sub-categories between.

NPT devices that are on-line (that is, they have a continuous high-speed communications link with the CDCRS) shall seek authorization of all transactions prior to the conclusion of each transaction. Off-line or intermittently on-line NPT devices shall transmit all recorded (not previously transmitted) transaction records as necessary to support the needs of the System.

As with any modern fare collection system, revenues will occur in tangible form (coins, bills, tokens) and electronic form (such as when a credit/debit card or a machine-readable fare instrument is used). The NPT System shall employ the highest levels of security for all transaction types to safeguard all revenues.

For coins, bills, and tokens, the NPT System shall utilize high security locks, vaults, designs, and methods to prevent unauthorized access to cash. From the time that a coin, bill or token is inserted into a piece of NPT equipment until the time that the cash is reconciled with the SEPTA bank deposit, the NPT software shall track it.

All NPT devices that collect or store cash shall maintain accurate counts of all stored monies. Upon demand by an authorized user at a CDCRS workstation and periodically, at an interval predetermined by SEPTA, the value of the monies and tokens collected and remaining within the NPT equipment shall be forwarded to the CDCRS. In addition, NPT devices that collect or store cash shall transmit a message to the CDCRS when the device reaches a specific value of revenue stored within the device, as well as when a cash storage container is full.

For all electronic forms of revenue and transactions, the NPT equipment and system elements (including communications) will be fully compliant with PCI DSS. The NPT System shall ensure that all transactional data, including but not limited to, that associated with credit card and debit card transactions, are secure and available to only valid users with the proper security clearance.

The location and status of all Fare Media, whether in SEPTA's possession or that of a third party, shall be tracked at all times. The CDCRS shall centrally manage Fare Media inventory records and controls.

All ~~SEPTA-issued~~SEPTA Fare Media shall incorporate the highest levels of data security practical. For ~~long-term use Smart~~SEPTA Issued Smart Media, all data shall be encrypted using no less that 128-bit encryption keys and DES encryption algorithms. Fare Media that is incapable of supporting encryption (such as Limited Use Media and magnetic media) shall incorporate non-standard encoding schemes, such as arbitrary-length data fields, data field interleaving (non-contiguous data fields), multiple checksums, and other methods to "scramble" encoded data.

All contactless and wireless communications shall be encrypted using encryption keys that are distinct from those used elsewhere in the system, and shall utilize at least 128-bit keys and DES encryption algorithms.

2.4.1 Payment Tracking

All Customer transaction records created as a result of fare payments shall contain sufficient information to completely recreate the payment transaction. This information shall include the specific definition of the payment media used including the following types and subtypes of payment media:

- C~~c~~ash;
- C~~c~~redit card (by issuer including MasterCard, Visa, American Express, Discover);
- D~~d~~ebit card (VisaDebit, MasterCard Debit, Visa payWave, MasterCard Paypass, Discover Debit);
- P~~p~~ersonal check;
- Transitchek; and

- Traveler's Check(s)

All transaction records shall be transferred to the CDCRS and all information on fare payment shall be retained throughout the report creation process to permit summarization by type and subtype of media (e.g., Visa). This shall require summarization and aggregation of transactions by payment media (e.g., credit card) and subtype of media (e.g., MasterCard). Summary totals shall also be able to be provided by payment media.

Transactions which do not involve payment of any kind by the Customer, including but not limited to, utilization of an Authority-issued fare credit memo or issuance of Replacement Smart Media, shall be listed as a zero-fare transaction. In the event that Smart Media is issued by the Authority as a replacement for defective Smart or lost Smart Media, the information associated with the Media and/or Account shall be transferred to the new Media and the results of this transaction shall be identified as a revenue transaction with zero dollar ($0). This transaction shall have no impact on any revenue account or revenues received, except for the replacement fee (if any) which shall be identified as revenue.

2.5 Reliability Requirements

Reliability requirements defined in this specification are to be achieved by the end of system reliability testing, as a condition of final acceptance of the system. Reliability requirements are provided in Table 2-2~~Table 2-2~~~~Table 2-1~~ through Table 2-3~~Table 2-3~~~~Table 2-2~~. A cycle shall ~~include, but not be limited to:~~

~~A.the complete processing of one transaction;~~

~~B.the complete issue of one item of Smart Media;~~

~~C.the complete emptying of a cashbox.~~

~~"Processing one transaction" is~~ be defined as follows~~ for each type of NPT equipment~~:

A. One complete fare payment (FVD, ASD, ~~RSD,~~ HSD, etc.)~~.~~ This would include all required passenger actions from commencement of the Fare Media selection through the payment and issue of the Fare Media and providing a receipt as required).

B. One complete passage through the Turnstile aisle, from use of the Fare Media in the free area through exiting the aisle into the paid area.

C. One complete passage from the paid area through the free area using a Turnstile.

~~D.One complete passage through the PET aisle, from use of the Fare Media in the free or paid area through exiting the aisle into the paid or free area.~~

~~E.~~D. One complete fare verification at an OBP, including required operator button presses and Smart Media usages.

~~F.~~E. One complete Fare Media validation for the MID when operating as a platform validator.

~~G.One complete issuance of a Smart Media with encoding and printing complete.~~

~~H.~~F. One complete payment of the parking fee. This would include all required passenger actions from commencement of the parking selection through the fee payment (and issue of the receipt as required).

~~I.~~G. The complete printing of one receipt or one report from the HSD~~R~~/ASD printer.

H. The complete payment at the Pay on Foot Machine of the parking fee and the encoding/issue of media for exit.

I. The complete open/close cycle of a parking gate.

J. The complete processing of media for exit using the Exit Reader Unit

The cycle shall be considered complete with the creation and storage of a transaction record.

The Contractor shall be responsible for implementing a failure reporting mechanism that provides hard evidence that a failure meets one of the ~~above~~ conditions identified in Section 21.13.5.2 and is therefore not to be included in reliability calculations.

Table 2-2 – Reliability of Equipment in Mean Cycles Between Failure (MCBF)

Equipment Type	MCBF (Transactions)
Fare Vending Device – Full Function	11,000
Fare Vending Device – Cashless	17,500
~~Fare Vending Device – Limited Use~~	~~14,000~~
Subway/Elevated Turnstile (overhauled)	40,000
Subway/Elevated Turnstile (new)	40,000
~~Faregate~~Railroad Turnstile	30,000
HSD/ASD printer (peripheral)	20,000
~~Smart Media Encoder~~	~~60,000~~
Parking Payment Station	20,000
Ticket Issuing Machine	25,000
Exit Reader Unit	40,000
Parking Gate	40,000
Pay on Foot Machine	12,500

Table 2-3 – Reliability of Equipment in Mean Time Between Failure (MTBF)

Equipment Type	MTBF (Hours) (In Service)
Station Wireless Data Network Components	25,000
Centralized Data Collection and Reporting System	35,040
On-Board Processors	17,520
~~Retail Sales Device~~	~~17,520~~
Administrative Sales Device	8,500
Handheld Sales Device	17,520
Media Information Display	17,520
Vehicle Detection System	8,000
Facility Full Signs	10,000
Contactless Access Reader	15,000

2.6 Maintainability Requirements

Equipment design shall enable personnel to easily inspect and troubleshoot the NPT equipment, perform maintenance, and repair or replace components, in order to minimize assembly downtime.

Each item of NPT equipment and removable assembly shall incorporate a unique serial number affixed in a secure manner. This serial number shall be located in an easily visible location and shall be bar-coded using a standard barcode format.

Automatic diagnostic test routines and test equipment shall be included in all NPT System equipment to aid technicians in troubleshooting malfunctions. These test routines shall guide technicians through procedures providing the ability to isolate defects to the lowest level replaceable assembly. Location of each test point shall be easily identified by using color coding, number coding (in English), or other equivalent means. All equipment must have clear labels and/or symbols written in English that at a minimum indicate safety, warning, servicing steps, and wiring connections.

Components requiring frequent adjustment shall be conveniently located to facilitate access and adjustment utilizing "fingertip maintenance" techniques, as defined within this document. Electrical and mechanical subassemblies and parts shall be packaged in readily replaceable assemblies.

Assemblies requiring removal for off-site maintenance shall be limited to a weight of 30 pounds (US). Assemblies that weigh more than 20 pounds (US) shall be mounted on hinges and/or rollout slides.

Where dissimilar metals meet, protection against galvanic corrosion shall be provided. Removable non-assemblies shall be designed to facilitate exchange or replacement through the use of self-alignment mechanisms, which shall minimize or eliminate adjustments or calibrations.

2.6.1 Preventive Maintenance

For the Preliminary Design Review, the Contractor shall provide a matrix that will clearly delineate the following items: **PDR 2-10**~~:~~

A. Preventive Maintenance frequency for all NPT devices based upon time and transactions;

B. Identification of all tasks to be performed as part of Preventive Maintenance. This identification shall include a brief description of the work, and any parts, materials or components required;

C. Time required to complete each defined preventive maintenance task.

No more than one (1) person shall be required to perform on site preventive maintenance on a single device. Contractors shall provide a matrix or matrices that clearly indicate Preventative Maintenance tasks that do/do not fall under the category of ~~Fingertip~~ Preventative Maintenance at the Conceptual Design Review. **CDR 2-9**

2.6.2 Corrective Maintenance

Corrective Maintenance, which is defined as repairs necessary to return a device to revenue service, shall take no longer on site than defined herein. During the Preliminary Design Review, the Contractor shall provide a matrix or matrices that will clearly delineate remedial maintenance tasks that can be easily completed on site in the defined time parameters and those that cannot be easily completed on site within the defined time parameters. **PDR 2-11**

Each identified task shall include a brief description of the work, and the estimated time to complete the task.

Facilities-based equipment shall require no more than 15 minutes of on-site repair time to return the unit to service. On-board NPT equipment shall require no more than 10 minutes of on-site repair to return the unit to service. To the greatest extent possible, all devices shall utilize standard hardware and components that are commercially available within the United States from multiple suppliers, and designed to maximize interchangeability in both use and maintainability.

No more than one (1) person shall be required to perform on-site remedial maintenance on an individual unit of equipment.

2.6.3 Revenue Servicing

Revenue servicing of FVDs shall not require more than 3 minutes to complete. This time will be measured from the moment the device door is opened to the moment the door is latched closed and the unit returns to full operational status. Revenue servicing includes the following tasks:

A. Exchange coin ~~box~~vault;

B. Exchange bill vault;

C. Replace/Replenish ~~Smart~~ Fare Media supply;

D. Remove/Replace supplemental coin hoppers;

E. Replenish Fare Media;

F. Complete readiness diagnostic test to verify proper feed of media stock and seating of money devices;

G. Print necessary reports.

Equipment shall be designed to return to operational status only after readiness diagnostics determines that ~~Smart~~ Fare Media stock feeds and money devices are positioned for proper operation, recording of sales, revenue and reporting of the status of cash and supply of ~~Smart~~ Fare Media.

For each FVD, three (3) ~~of each~~ of each type of cash container incorporated within the FVD shall be provided as part of the NPT System.

2.7 Bill and Coin Configuration Modifications

Until the last implementation phase is complete and accepted by SEPTA, the Contractor shall be responsible for ensuring that the coin and bill acceptance and processing software and hardware components accommodates the bills, coins and tokens in circulation, up to the maximum number of denominations accepted and processed by the NPT equipment. The Contractor shall update the equipment configurations to address these requirements prior to the issuance of the coins and bills to the US public.

Prior to implementing these configuration changes, they shall be fully tested to the satisfaction of SEPTA. Once SEPTA has provided their acceptance of the test results, the Contractor shall be responsible for deploying these changes throughout the NPT system without SEPTA intervention or assistance.

The Contractor shall be responsible for providing all hardware, software, and personnel required to deploy these configuration changes.

At the conclusion of the warranty period, the Contractor shall deliver all necessary special tools and other equipment to enable SEPTA to perform bill and coin configuration modifications without Contractor support.

2.8 Nonproprietary Technology

It is the intent of SEPTA to procure the NPT System based on open standards. SEPTA understands that the equipment (hardware) and associated internal logic (software and firmware) are largely proprietary to each Contractor, and these items cannot be standardized. However, the following shall be standardized:

A. Media – Whether contactless or magnetic, the media shall be available for purchase by SEPTA from multiple sources. Media specifications shall be defined and documented to the extent required allowing SEPTA to procure media in a competitive manner. These specifications and associated documentation shall be provided to SEPTA and become the property of SEPTA at the completion of Pphase 2. **CDRL 2-8**

B. Media Encoding Schema –The media encoding schema (e.g., how data is stored on the media, the associated security algorithms/keys, and card/reader authentication schemes and other information, processes and data) shall be defined and documented by the Contractor, and shall become the exclusive property of SEPTA. These specifications and associated documentation shall be provided to SEPTA become the property of SEPTA at the completion of Pphase 12. **CDRL 2-9**

C. Equipment and System Interfaces – The equipment and system interfaces shall be defined and documented and shall be licensed to SEPTA for use and distribution as SEPTA sees fit for NPT System operation.

D. Interface Protocol – The Contractor shall provide all Interface Protocols and definitions of message structure between all NPT System equipment at all levels of the system, including communication between all equipment and sub-systems and the CDCRS and its constituent servers and application processes (both internal to SEPTA and external to SEPTA such as the inter-bank and non-bank financial clearing systems for transaction settlement.) This information shall be provided to SEPTA and become the property of SEPTA at the completion of Pphase 2. **CDRL 2-10**

The ability for SEPTA to share this information with third parties shall not be hindered by any proprietary technologies, licenses or other encumbrances by the Contractor or its subcontractors.

In addition to the above, the system shall be delivered with a user-friendly means of operationally updating fare-processing rules without major software updates to the system. The Contractor shall build the system in a flexible manner to allow SEPTA to update at the CDCRS the fare rules and logic without involvement by the Contractor.

In addition to the specific non-proprietary requirements identified above, the NPT System shall be designed and developed to enable the incorporation of devices, components and systems supplied by multiple manufacturers. The NPT System shall not be limited to the utilization of hardware and system components available only from the Contractor.

Section 3 – SEPTA Specific Requirements
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3 SEPTA SPECIFIC REQUIREMENTS

3.1 Regulatory Requirements and Safety

This Section specifies the regulatory and safety requirements for prosecution of the work and supplements the requirements specified in the Contract. The Contractor is required to assure that all employees, subcontractors, and suppliers/vendors, while on the work site and/or in the conduct of the Contract, comply with the provisions of this section.

The Contractor shall take every precaution necessary to assure the safe access and egress of all SEPTA patrons and employees, the safe and continuous operation of all SEPTA vehicles, ensure the appropriate protection of the environment as well as the safety and general welfare of the public at large.

3.1.1 Submittals

The Contractor shall furnish a copy of the Contractor's employee safety program to SEPTA within 30 days from receipt of the Notice to Proceed.

3.1.2 Quality Assurance

The Contractor shall daily monitor and document the compliance and performance of the requirements set forth in this section consistent with appropriate SEPTA Work rules and Local, Commonwealth of Pennsylvania, and Federal rules and regulations. The Contractor shall document their compliance with all of the above-referenced codes.

The Contractor's employee safety program, as a minimum, shall include but not be limited to the following:

A. Construction Orientation

B. OSHA Inspection and Compliance

C. General and Site Specific Safety

D. Workmen's Compensation Reporting

E. Fall Protection/Personal Protective Equipment

F. Confined Space

G. Hazardous Materials

H. Trenching and Excavation

I. Cranes

J. Electrical Protection

K. Drug and Alcohol

L. Public and Passenger Protection

The Contractor shall provide a qualified safety officer who shall be responsible for all safety-related activities until the completion of the work. The safety officer shall report all on-the-job injuries at once to SEPTA and submit all paperwork pertaining to such injuries, as required.

The Contractor's superintendent or safety officer shall, as a minimum, hold weekly (toolbox) safety meetings with all of the Contractor's personnel. Subjects, time, and location may be set at the Contractor's convenience. SEPTA requires at least three (3) days prior notice of location and time of each meeting and an agenda shall be submitted to SEPTA. Minutes of each safety meeting shall be provided to SEPTA at each regularly scheduled project coordination meeting.

The Contractor is required, by the Contract, to maintain an alcohol and drug free environment. The Contractor shall describe in their employee safety program how the Contract stipulation is to be accomplished and maintained. Please note that SEPTA reserves the right to restrict access to its property, because of the inherent safety hazards to its employees and general public. Any person shall be removed and barred from SEPTA property if in the opinion of an appropriate SEPTA representative that this person constitutes a safety risk.

3.1.3 General Safety Requirements

All work shall be performed in accordance with rules, regulations, procedures, and safe practices of SEPTA, the Commonwealth of Pennsylvania, OSHA, and all other governmental agencies having jurisdiction over the work.

The following safety rules are highlighted from the aforementioned documents and are considered especially applicable to all of the Contractor's employees in regard to conduct while on SEPTA property:

A. Contractor's employees shall wear hard hats, suitable work shoes or boots (as required), safety vests and full body cover clothing, at all times, and safety glasses if required.

1. Hard hats shall be ANSI-Z89.1, Class E.

2. Work shoes shall have nonslip soles. Permanent metal plates or cleats on the sole or heel of shoes are prohibited. Shoelaces are to be kept short so they do not pose a tripping hazard. Athletic shoes, sandals, open-toed shoes, moccasins and/or shoes with heels higher than 1" are not permitted.

3. Contractor personnel shall wear eye protection for all structural track and specialized work activities and any other protective equipment in accordance with the applicable OSHA regulations. Eye protection shall be safety glasses with rigid side shields that comply with ANSI Z-87.1. Prescription eyewear shall also meet the same requirements as described above, or the individual shall wear equivalent eye protection over their prescription glasses or contact lenses.

4. The safety vest shall be ANSI 107, Class 2 high-visibility with a yellow-green background and 2-inch retro-reflective striping.

5. The Contractor's personnel shall wear long pants (without cuffs) and, at a minimum, short sleeve shirts.

The Contractor shall take all necessary precautions and provide protective measures to prevent injury to the public and damage to property of others. Before commencing operations, the Contractor shall furnish and erect construction fencing or barricades and signage, as specified, for the safeguarding of the public against accident or damage resulting from the Contractor's operations, and as required to prevent unauthorized access to the work and to the storage areas. The Contractor shall maintain the protective measures and/or construction fencing until the work is complete and removal is approved by SEPTA.

The Contractor shall dismantle and remove construction fencing when required or when directed by SEPTA.

3.1.4 Emergency Procedures

The Contractor shall set up emergency procedures and prepare written guidelines discussing such procedures for the following categories:

A. Fire;

B. Injury to employees;

C. Injury to general public;

D. Property damage, including property of utilities, i.e., gas, water, sewage, electrical, telephone, or pedestrian and vehicle routes;

E. Hazardous/toxic material spill discharges;

F. Site evacuation.

Copies of all guidelines for emergency procedures shall be written and posted prior to the initiation of actual construction. Posting shall include emergency telephone numbers and directions to and from the nearest hospital. The Contractor shall have standing arrangements for the transportation and hospital treatment of any employees who may be injured or who may become ill. These guidelines shall be included in the Contractor's written safety program and shall be submitted to SEPTA.

The Contractor shall provide and fully equip a first aid station at the site, for first-aid service to any that may be injured in the progress of the work.

SEPTA operational emergencies will be handled by the senior SEPTA Operations personnel present. This individual “The Incident Commander” is responsible for summoning the number of persons required by the situation and assignment of all recommended procedures.

3.1.5 Protection of SEPTA Facilities

The Contractor shall be cognizant of and bound by SEPTA's safety rules and regulations specified herein and conduct operations in strict accordance with same.

SEPTA shall be the sole judge of protection necessary for the safe operation of its facilities.

SEPTA's Facilities and/or Structures shall not be utilized by the Contractor for temporary scaffolding and/or support for the construction effort. However, a Contractor may request SEPTA's consideration for such action. The Contractor shall provide a detailed plan to utilize SEPTA's Facilities and/or Structures. The plans will be submitted for SEPTA's review and approval prior to the initiation of any work. SEPTA also reserves the right to have the drawings and supporting calculations sealed by a Professional Engineer registered in the Commonwealth of Pennsylvania if deemed appropriate.

3.1.6 Storage and Handling of Materials

The Contractor shall store equipment and materials at the job site in accordance with instructions of the Authority and in conformance with applicable regulatory provisions. The Contractor shall not store unnecessary items at the job site. Flammable materials shall not be stored in confined spaces, or other areas such as subways, tunnels, and building basements. Flammable materials shall be stored in accordance with applicable NFPA 30 guidelines. The Contractor shall enforce the instructions of the Authority regarding such items as fires and smoking.

The Contractor shall take care to prevent any structure from being loaded with a weight, which will endanger its security or the safety of persons.

Where it is permitted to store materials on streets, the Contractor shall place such materials in a secured place in accordance with local jurisdictions so as to cause minimum obstruction to traffic and the public safety. The Contractor shall not place materials within 15 feet of fire hydrants nor obstruct drainage gutters or inlets. The Contractor shall obtain and pay for all required permits relative to storage of materials.

3.1.6.1 Materials Handling

Reinforcing steel shall not be used as a lifting ("pick") point on any load nor as a guyline anchor.

All scrap material of any kind, type, or nature shall be placed daily into designated confined areas or containers specifically supplied for this purpose. Containers shall be removed from the job site when full.

All loose material on platforms or other exposed locations shall be removed or secured at the end of each day to prevent dislodgment by train movement, wind, vandalism or other causes.

The Contractor shall assure that all chemicals, paints, solvents, and cleaners are maintained per OSHA's hazard standards. Discarded chemicals shall be disposed of in accordance with Pennsylvania D.E.P. requirements. Copies of all Material Safety Data Sheets (MSDS), OSHA Form 20, and the Product Use sheets shall be sent to SEPTA. All training shall be done in accordance with OSHA's Hazard Communication Standard.

3.1.7 Snow Removal

The Contractor shall remove all snow and ice within the project site as required for the proper protection and prosecution of the work. The Contractor shall at all times provide and maintain adequate protection against weather so as to preserve all work, materials, equipment, apparatus, and fixtures free from damage.

The Contractor shall not use sodium chloride (or any chloride) on any facilities adjacent to SEPTA electric rail lines where the possibility exists that melting mixture may leach onto the contact rail within the Railroad Right of Way.

3.1.8 Welding

Gas or electric cutting, burning, or welding shall be done in accordance with the guidelines of NFPA 51 B. Spark shields and a fire watch must be posted when burning. A supply of water shall be readily available. All oxygen/acetylene bottles must be removed and stored outside of all tunnels at the end of the workday. While in use in the tunnel, they shall be attended at all times. At no time when not in use shall oxygen and acetylene bottles be stored together.

3.1.9 Utilities

As per 73 P.S., § 176, et seq., the Contractor is required to notify utilities prior to all excavations. The Contractor shall be held responsible for any damage done to any utility in the prosecution of the work. The Contractor shall exercise any precautions necessary to prevent damage in working underneath or adjacent to any underground structure. If it becomes necessary for a utility company, through emergency procedures or because of unforeseen conditions, to repair, reconstruct, relay or relocate utilities within the Contract area, after work has commenced by the Contractor, then the said utility company and the Contractor shall make suitable arrangements to overcome such interference. No compensation shall be allowed to the Contractor for the disruption to his work. A no-cost time extension may be granted in accordance with the Contract to the Contractor by SEPTA for the delay that has occurred.

All of the above shall be accomplished at no extra cost or charge to SEPTA.

3.1.10 Environmental Protection

Environmental protection considerations consist of, but are not limited to, the following factors:

A. Natural resources, including air, water, and land.

B. Solid waste disposal.

C. Noise.

D. Control of toxic substances, hazardous materials, and radiation.

E. The presence of chemical, physical, and biological elements and agents that adversely affect and alter ecological balances.

F. Degradation of the aesthetic use of the environment.

G. Historical, archaeological, and cultural resources.

3.1.10.1 General Requirements

The Contractor shall provide and maintain environmental protection as defined herein.

A. The Contractor's operation shall comply with all applicable Federal, Commonwealth and Local laws, ordinances, and regulations pertaining to environmental protection.

B. Compliance of Subcontractors with the provisions of this and various other sections of these Specifications shall be the responsibility of the Contractor.

C. The Contractor shall not use equipment from which factory-installed antipollution and noise control devices have been removed or rendered ineffective through lack of proper maintenance.

D. The Contractor shall provide adequate pollution controls for painting and surface preparation in compliance with the State Department of Environmental Resources Regulations.

3.1.10.2 Protection of Natural Resources

It is intended that the natural resources within the project boundaries and outside the limits of permanent work performed shall be preserved in their existing condition or be restored to an equivalent of the existing condition, as approved by the Authority upon completion of the work. The Contractor shall confine its on-site construction activities to areas defined by the Contract Drawings and Specifications or directed by the Authority.

<u>Protection of Project Site and Existing Roadways:</u>

Debris or rubbish of any kind shall not be dumped onto the site or roadways. This shall include paint splatters and spillage during painting operations. Care shall be taken to prevent damage and injury to personnel, vessels, and vehicles using roadways, or areas accessible to pedestrians. Devices shall be provided and maintained by the Contractor as required to prevent such occurrences. Material or items falling onto roadways shall be promptly removed at the Contractor's expense.

3.1.10.3 Land Resources

Except in areas indicated to be cleared or excavated, the Contractor shall not remove, cut, deface, injure, or destroy trees, shrubs, or vegetation. No ropes, cables, or guys shall be fastened or attached to any existing nearby trees for anchorage unless otherwise permitted by the Authority. Where such use is permitted, the Contractor shall be responsible for any resulting damage.

The use of herbicides is not permitted unless otherwise specified.

A. The Contractor shall submit a plan for protecting existing trees and vegetation that are to remain and that may be injured, bruised, defaced, or otherwise damaged by construction operations. Rocks that are displaced into uncleared areas shall be removed. Monuments, markers, and works of art shall be protected prior to the start of the operations. A preconstruction survey, including photographs, shall be performed by the Contractor, and a written report of the survey shall be furnished to SEPTA within five (5) days of its request by the Authority.

B. Repair and Restoration: All trees, vegetation, and other landscape features that are to remain and become scarred or damaged by the Contractor's equipment or operations shall be repaired and restored to their original condition at the Contractor's expense. The Authority shall approve the repair and restoration program prior to its initiation and after completion.

C. Water Resources: At all times, measures shall be taken to prevent oil, gasoline and other hazardous substances from entering the ground, drainage areas, sewers, streams, and other local bodies of water.

D. Wildlife Resources: The Contractor shall not disturb native habitats adjacent to the project construction area.

3.1.10.4 Erosion and Sediment Controls

The Contractor shall conform to all applicable requirements of the Department of Environmental Resources of the Commonwealth of Pennsylvania with respect to erosion and sediment control measures, to prevent discharge into storm water discharge systems and active waterways.

Burning of ground cover shall not be permitted.

3.1.10.5 Toxic Substances

The Contractor shall comply with the Toxic Substance Control Act, P.L. 94-469 (TSCA). This includes:

A. No toxic chemical substance, mixture, equipment, container, sealant, coating, or dust-control agent shall be used except in accordance with all provisions of the TSCA as interpreted by the rules and regulations of 40 CFR 761.

B. Any toxic chemical substance, mixture, equipment, container, sealant, coating, or dust-control agent found stored within the project area shall be immediately reported to the Authority in writing and work shall be stopped in the area. The Authority shall make arrangements for the removal of the toxic materials, after which the Contractor may continue work in the area.

3.1.10.6 Control and Disposal of Chemical and Sanitary Wastes

Trash shall be picked up and placed in containers that shall be emptied on a regular schedule. Handling and disposal shall be conducted as to prevent contamination of the site and other areas, and shall not be disposed of in wetlands or burned on the right-of-way. On completion, the area shall be left clean and in natural condition. As part of this, the Contractor shall:

A. Transport all waste, including excess excavated material, off the site and dispose of it in a manner that complies with the Federal, Commonwealth, and Local requirements. The Contractor shall secure a permit or license prior to transporting any material off the site. Waste materials shall not be burned on the site.

B. Transport the garbage to a pickup point or disposal area.

1. Chemical waste shall be stored in corrosion-resistant containers, removed from the project site, and disposed of as necessary, but not less frequently than monthly. Disposal of chemical waste shall be in accordance with standard established practices as approved by the Authority. Fueling and lubricating of equipment and motor vehicles on the site shall be conducted in a manner that affords the maximum protection against spills and evaporation. Lubricants to be discarded, including burned oil, shall be disposed of in accordance with approved procedures meeting Federal, Commonwealth, and Local regulations. For oil and hazardous material spills that may be large enough to violate Federal, Commonwealth, or Local regulations, the Authority shall be notified immediately.

3.1.10.7 Dust Control

Dust shall be kept down at all times, including non-Working hours, weekends, and holidays. Soil at the site, station platforms, haul roads, and other areas disturbed by the Contractor's operations and materials stockpiled for the project shall be treated with dust suppressors or covered to control dust. Dry power brooming shall not be permitted. Vacuuming, wet mopping, wet sweeping, or wet power brooming shall be used instead. Air blowing shall be permitted only for cleaning off non-particle debris, such as that from reinforcing bars. Sandblasting shall not be permitted except as otherwise specified elsewhere. Only wet cutting of concrete block, concrete, and asphalt shall be permitted.

The Contractor shall comply with all applicable provisions of the National Emission Standards for Asbestos (40 CFR 61 Subpart B), and regulations of the City of Philadelphia Air Management Services Department.

The Contractor shall inspect all vehicles for dirt prior to their leaving the construction site. Dirt, soil, and rubble likely to be dislodged during transit shall be removed from the trucks and other vehicles prior to leaving the site.

The Contractor shall ensure that equipment transporting material to and from the site that may become airborne is covered.

The Contractor shall not cause or permit fugitive particulate matter to be emitted into the outdoor atmosphere from any source such that emissions are visible beyond the project property line.

3.1.11 Protection of Existing Water and Sewer Lines

When the equipment axle load exceeds 15 tons, the Contractor shall provide and work from timber mats placed over existing underground water lines and sewer lines.

3.2 Norristown High Speed Line Safety Requirements

This section specifies the general safety requirements governing the Contractor's activities when its work impacts the active Norristown High-Speed Line (NHSL) right-of-way.

The information contained in this section is intended to provide guidance and safety precautions to the Contractor when working on a live rail line. The Contractor is advised that SEPTA shall operate trains over this location during the performance of work under the Contract, except as specified otherwise. The Contractor shall comply with all parts of this section, as well as with the general intent of this section.

3.2.1 Responsibility

The work covered by the Contract shall involve safety of persons and property on a live electrified rail line. Therefore, relevant skill and experience is required of the Contractor to do its work safely. The Contractor shall be responsible for the safety of its construction operations. The Contractor shall, therefore, be expected to post adequate watchpersons and/or protective devices to protect its work crews, equipment, and the work site. Pertinent safety rules, which shall be followed, are listed in, but not limited to Sections 3.2.2through 3.2.8. The Contractor shall exercise proper care at all times.

3.2.2 Operations

When work is being performed by the Contractor under active train operations by SEPTA, the safety and continuity of operation of the trains by SEPTA shall be of the first importance. They shall, at all times, be protected and the Contractor shall arrange its work accordingly. Whenever the work may affect the safety or movement of trains, the method of doing such work, together with the proposed sequence of operations and time schedules for same, shall be submitted to the Authority for approval.

Before any construction or installation on SEPTA property may begin, the Contractor shall submit a written plan to SEPTA indicating the impact to passenger flow and SEPTA operations. SEPTA will prohibit shut downs and diversions on Holidays, ~~and~~ Holiday Weekends and during Special Events.

Additionally, the Contractor shall perform work near other vendors without disrupting operations of the vendors.

No work shall be prosecuted until such approval has been obtained. However, such approval of the Authority or duly authorized representative will not be considered as a release of Contractor from responsibility for any damage to SEPTA by the acts of the Contractor, its employees, and/or its Subcontractor's.

In the event of an unplanned discontinuation of train service due to the Contractor's operations, the Contractor is not only liable for any injury or damage that might occur, but also for the full cost of any detour of train traffic, shuttle bus service and any associated costs.

3.2.3 SEPTA Personnel

Flagperson: SEPTA Flagpersons are responsible for the safety and continuity of operations. The SEPTA Flagperson shall have authority to direct the stoppage of trains. Any sharing of protective duties between SEPTA and the Contractor within the work site can be considered coincidental.

Project Manager: The Project Manager or a duly authorized representative shall have complete authority in matters related to the safety of SEPTA's operations and facilities.

Pilots: If the Contractor wishes to occupy live or operating tracks with the track equipment, the Contractor shall request a SEPTA pilot who will obtain exclusive track occupancy on the live track. All SEPTA pilots shall be requested from the Project Manager a minimum of 1 week in advance of the required starting time.

3.2.4 Contractor's Personnel

Protection Assurance Representative: The Contractor's Protection Assurance Representative (representative) may be the Superintendent, Safety Officer, or responsible foreperson. The representative shall be present at all times when the Contractor's employees are working within the SEPTA operating envelope and under the requirements of this section. In general, the representative shall be responsible for day-to-day oversight of the Contractor's gang watchperson and employees so that they are working safely, according to all parts of this section, to coordinate construction activities with SEPTA's Flagging personnel.

Gang Watchperson: The role of the Contractor's Gang Watchperson is solely for the purpose of safety for the Contractor's employees where external influences, i.e., rail traffic, shall expose the workers to a safety hazard. The gang watchperson must be on site with each work crew at all times. If it becomes necessary for the watchperson to leave the site, work shall be suspended until he/she returns or is replaced by another qualified gang watchperson.

3.2.5 Right of Way Restriction

A. Work Zones:

1. Fouling type work is defined as follows:

    i. For Contractor's work at other than station platforms which is four (4) feet or less from the near rail of operating track.

    ii. For Contractor's work which extends off the edge of a station platform.

2. For Contractor's work which is outside of the above limits that may foul. SEPTA will protect its service from the Contractor's operations in the work area by establishing work zones.

3. The Work Area is defined as a linear space in or adjacent to the track area. The Work Area starts (in the direction of normal train movement) where the first worker is working or piece of equipment is set up and ends where the last worker is working or piece of equipment is set up.

    i. A work zone will be established by SEPTA for fouling type or on or about the operating tracks.

    ii. SEPTA will determine if the work zone requires single tracking or slow speed operations.

4. Applicable work zone signs or portable signals at prescribed distances from the Contractor's work area define the work zones established by SEPTA for the control of train operations. SEPTA provided flagpersons are required when fouling type work is being performed. No work shall be done in the track area when visibility is poor.

Where fouling is not possible or if working in de-energized tracks or a de-energized track, which can be physical, separated from an active track, the above is revised as follows: The Contractors non-certified employees are allowed to work in such areas. The Contractor's supervisors, safety supervisor, and foreperson shall attend the track safety seminar and obtain certification.

The Contractor shall insure that the Contractor's equipment will not foul any track until proper protection has been afforded. While trains or cars are passing on an adjacent track, any work that has the potential to foul shall be stopped.

The Project Manager shall have the right to restrict the operations of fouling or On-Track equipment when, in the Project Manager's opinion, the equipment is not in satisfactory condition to be safely operated or where operation will adversely affect the track structure. The Project Manager shall also have the right to prohibit the operation of any fouling or On-Track equipment by any Contractor-employed operator who is, in the Project Manager's opinion, not qualified or able to operate said equipment in a safe manner.

When any excavation extends below the bottom of the crossties, or where the stability of the railroad embankment and/or structure may be affected by excavation, such excavation shall be adequately braced by the Contractor. Prior to starting any such excavation, detailed drawings of the proposed bracing method shall be prepared and submitted to the Project Manager for his approval. When deemed appropriate by SEPTA's Project Manager, the shop drawings shall be accompanied by structural calculations sealed by a Professional Engineer licensed in the Commonwealth of Pennsylvania.

3.2.6 General Safety Rules

The following safety rules of SEPTA are applicable to all of the Contractor's employees and those of its subcontractors in regard to conduct while on or close to the track area:

A. At all times while working on or adjacent to operating tracks, the Contractor, its Subcontractors, and all of their employees, shall closely observe the applicable flagging rules and regulations of SEPTA.

B. The Contractor shall be responsible to ensure that all of its employees and the employees of its Subcontractors are familiar with the safety rules, safety instructions and safe performance of work. These employees shall so conduct themselves so as not to violate any of such flagging or safety rules.

C. Prior to the start of construction, all of the Contractor's employees scheduled to work on or near trackage shall attend a safety seminar on track safety rules conducted by SEPTA. If these individuals are replaced, during the course of the Project, the replacements and any other new employees shall also be required to attend this seminar, before being able to work. Re-certification is required on an annual basis.

D. Before permitting a work person on the track, the Contractor shall hold a job briefing conducted by the Contractor-employed Protection Assurance Representative" (representative) and verify and document that the foreperson and gang watchperson have an understanding with all employees as to the location they will go when necessary to clear for trains. The Contractor's representative shall make certain that the SEPTA Flag person responsible for track safety explains the track safety methods being utilized during the work. These job briefings will be documented by the Contractor at the time of the briefing(s). The record of "Job Briefings" shall be maintained by the Contractor for inspection by SEPTA.

E. The Contractor's gang watchperson must give their entire attention to watching for trains and warning the employees and are prohibited from performing any other duties. They must not leave their posts until instructed by SEPTA that the protection is unnecessary or other watchperson have been assigned and are in position and watching in the direction of an approaching train.

F. The Contractor‘s Protective Assurance Representative shall be responsible to insure the safety of all its personnel and be equipped with audible and visible warning devices to warn its personnel of the approaching trains.

G. The Contractor's Protective Assurance Representative shall, before permitting employees on or close to the track, ensure that all employees shall have an understanding as to where they shall go when necessary to clear for trains.

H. The Contractor's job forepersons presence at the work site is mandatory while the work is being performed on or close to the track area.

I. A maximum of four non-certified Contractor's employees who are not performing work may enter track areas where third rail power is energized accompanied by a certified employee, (SEPTA or Contractor's) with the approval of the Train Dispatcher or a duly authorized representative.

J. While working with scaffolding or non-conductive ladders on the platform, the Contractor's employees shall secure scaffolding/ladder to eliminate rolling or falling.

K. When small hand tools or construction equipment are used in electrified territory, the Contractor shall exercise due care including the clearance requirements to safeguard persons and property in the area. If the required clearance cannot be maintained or any hazards are, involved, prior guidance from SEPTA's Project Manager shall be requested.

L. The Contractor's employees shall consider all tracks as operating tracks and be on the alert for trains operating in either direction at all times. When it is necessary to walk in the track area, it is the Site Superintendent and/or Foreperson/Gang Watchpersons responsibility to let the train operator's know where the employees are. To do this, first notify and gain approval of the Train Dispatcher, protect the employees by displaying a lighted lantern, flashlight, and/or flags at all times. At first indication of an approaching train, get off the track promptly, and conceal light from train operator's view.

M. Any employee leaving the work area for any reason shall receive permission from the on-site safety supervisor and protect himself with a lighted lantern or flashlight. He shall follow route to and from the work location designated by the foreperson in order to avoid crossing of track insofar as possible.

N. When standing in the track area, the Contractor's employees shall allow sufficient room for the car and third rail shoes, which extend beyond the car body to clear body, clothing, or any object they may have in their hands. This includes keeping their coats buttoned up so that they cannot catch on any part of a moving car.

O. The Contractor's employees shall not step on track behind stopped trains. Trains overrunning station platforms may have to be reversed to place doors properly for opening.

P. Carry and use hand held flashlights when visibility is restricted, and at all times from dusk to dawn.

Q. When hearing a flagperson's warning of the approach of a train, the Contractor shall remove tools and material clear of the track and depart the track area to the catwalk or platform immediately without interfering with the pathway of train.

R. Avoid track switches by walking around them.

S. Contractor's watchpersons shall observe and acknowledge horn signals conveyed from operating trains as required. A warning signal from a train operator must always be acknowledged by a signal to proceed when you are in the clear except when you are working under protection of flag person.

3.2.7 Electrical Safety

Third Rail Safety Rules:

A. The Contractor's employees shall not step, stand, walk, sit, or use the third rail or protection board/cover as a step.

B. The Contractor's employees shall not contact the third rail unless specifically required in the performance of duty. When working directly on the third rail, it shall be de-energized.

C. The Contractor's employees shall not carry metal objects when close to the third rail.

D. Keep as far as possible from the third rail during wet conditions.

E. The Contractor's employee shall never assume that the third rail is dead. When directed by the Controller that it is de-energized, the employee's shall remain isolated from the circuit if it is necessary to work close to it. Avoid stepping on loose material piled close to the third rail.

F. The Contractor's employees, standing on a platform or catwalk, shall allow sufficient room to clear the third rail shoes which extend beyond the car body, and any object you may have in your hands, and not come in contact with any third shoe of a car, all shoes are energized if at least one shoe is in contact with the third rail.

G. The Contractor's employees shall not walk between the running and third rail of any track.

H. The Contractor's employees shall be aware of additional tripping hazards to avoid including third rail anchors (braces) and cable feeds.

I. The Contractor employees shall not look at train collector shoes during movement, particularly at track switches (turnouts) and third rail gaps.

Overhead Wires

A. When equipment is used in electrified territory or in the vicinity of Verizon, PECO, as well as SEPTA overhead wires, the Contractor shall exercise special care to safeguard all persons in the area. Special attention shall be given in the vicinity of overhead bridges and other structures where the wires may be depressed.

1. All overhead wires, including catenary, transmission, and signal lines in electrified zones, shall be considered live at all times.

2. Insulating covering of wire shall not be depended upon for protection against shock.

3. No employee of the Contractor shall do any work near high voltage wires of apparatus where it is possible for any part of employee body or tools and material with which he is working to come within ten (10) feet of such wires.

4. Use of metal ladders is forbidden in the area of overhead wires.

3.2.8 Emergency Guidelines

When an emergency occurs, endangering life of a person that requires that power be de-energized, the most responsible person shall call the Control Center. They shall give the proper location requiring de-energizing by indicating the closest station, signal number, proper track numbers, and line.

In such a case of electrical contact, personal judgment, and initiative has to be used; bearing in mind that the rescuer's safety should not be imperiled. Contact with a live third rail and/or overhead wire may prove fatal in a matter of seconds. The most important thing is to stop the flow of electricity through the victim's body and then apply mouth-to-mouth resuscitation (or CPR when necessary and if qualified to do so) until he or she recovers consciousness or trained help arrives. Once a victim is freed from the overhead wire, do not move him or her unless they can do so under their own power. Except for qualified rescuers, moving an injured person may result in further injury.

If a fire in the vicinity of the third rail, overhead wire, or cable can be readily extinguished, use a dry chemical extinguisher, do not use water.

Emergency phones numbers

Control Center: 215-580-8560

Note: DO NOT use emergency phone numbers for non-emergency situations such as confirming flagging, single tracking or power outage requests.

3.3 Railroad Safety Requirements

This section specifies the general requirements and safety regulations governing the Contractor's activities when its work impacts an active SEPTA Railroad.

The information contained in this section is intended to provide guidance and safety precautions to the Contractor when working on a live SEPTA rail line. The Contractor is advised that SEPTA will operate trains over this location during the performance of work under the Contract, except as otherwise specified. The Contractor shall comply with all parts of this Section and all parts of SEPTA's Roadway Worker Protection manual (SRW).

3.3.1 Responsibility

The work covered by the Contract involves safety of persons and property on a live electrified rail line. Therefore, relevant skill and experience is required of the Contractor to do its work safely. The Contractor shall be responsible for the safety of its construction operations. The Contractor shall be required to post adequate watchpersons and/or protective devices to protect its work crews, equipment and the work site as directed by the Employee-in-Charge of railroad safety. Pertinent safety rules that shall be followed are listed in, but not limited to, Sections 3.3.2through 3.3.8. The Contractor shall exercise proper care at all times.

3.3.2 Operations

When work is being performed under active train operations, the safety and continuity of operation of the trains by SEPTA shall be of the first importance. They shall, at all times, be protected and the Contractor shall arrange the work accordingly. Whenever the work may affect the safety or movement of trains, the method of doing such work, together with the proposed sequence of operations and time schedules for same, shall be submitted to the Project Manager for prior approval.

Before any construction or installation on SEPTA property may begin, the Contractor shall submit a written plan to SEPTA indicating the impact to passenger flow and SEPTA operations. SEPTA will prohibit shut downs and diversions on Holidays, ~~and~~ Holiday Weekends and during Special Events.

Additionally, the Contractor shall perform work near other vendors without disrupting operations of the vendors.

~~A.~~No work shall be started or prosecuted until such approval has been obtained. However, such approval of the Project Manager, or duly authorized representative shall not be considered as a release of Contractor from responsibility for any damage to SEPTA by the acts of the Contractor, its employees, and/or its Subcontractor's employees.

~~B.~~In the event of an unplanned discontinuation of train service due to the Contractor's operations, the Contractor is not only liable for any injury or damage that might occur, but also for the full cost of any detour of train traffic, shuttle bus service and any associated costs.

3.3.3 SEPTA Personnel

Employee-in-Charge: SEPTA will designate an employee to be responsible for providing a safe operation and On-Track protection. The Employee-in-Charge (EIC) may be a senior foreman, track supervisors, Flagperson and/or any other qualified individual. The Project Manager will coordinate the activities of the EIC with the Contractor's Safety Officer and/or the Contractor's designated On-Track Protection Assurance Representative.

A. The EIC will determine the method of providing protection to be used according to the SEPTA operating rules.

B. The EIC will conduct a job briefing as prescribed by the operating rules before any track is fouled. The job briefing is not complete until all the Contractor's employees acknowledge an understanding of the On-Track protection procedures being used.

C. The EIC will not release the working limits until all the affected Contractor's workers have been notified and are either clear or are protected by train approach warning.

Flagperson: SEPTA Flagpersons are responsible for the safety and Continuity of operations. The SEPTA Flagpersons shall have authority to direct the stoppage of trains. Any sharing of protective duties between SEPTA and the Contractor within the work site can be considered coincidental.

Electric Traction Protection Personnel: SEPTA's electric traction Class A employees are responsible for the coordination and de-energization of catenary and power circuits. Wires and attachments of wires shall be treated as live (energized), unless noted by SEPTA that the wires have been de-energized and grounded. If the Contractor wishes to de-energize the system, the Contractor must request SEPTA Class A employees.

Pilots: If the Contractor wishes to occupy live or operating tracks with On-Track equipment, the Contractor shall request a SEPTA pilot who will obtain exclusive track occupancy on the live track.

Project Manager: The Project Manager, or a duly authorized representative, has complete authority in matters related to the safety of SEPTA's Operations and Facilities. The Project Manager, or a duly authorized representative, is also responsible to support the Contractor's planning and coordination of their safety effort related to SEPTA's Operations and Facilities.

The Contractor is responsible for submitting an outage or fouling request in a timely fashion in order to avoid delays to the work. SEPTA requires as a minimum two (2) week notice to assign personnel once a fouling or outage request is approved.

3.3.4 Contractors Personnel

Protection Assurance Representative: The Contractor's Protection Assurance Representative (representative) may be the Superintendent, Safety Officer or responsible foreperson. The representative shall be present at all times when the Contractor's employees are working within the SEPTA operating envelope. The representative must ensure that the requisite On-Track protection job briefings are held and all employees engaged in work requiring On-Track protection attend. In general, the representative shall be responsible for day-to-day oversight of the Contractor's gang watchperson and employees so that they are working safely according to all parts of this section and to coordinate construction activities with the EIC.

Gang Watchperson: The role of the Contractor's gang watchperson is solely for the purpose of safety for the Contractor's employees when external influences, i.e., rail traffic or highway traffic, may expose the workers to a safety hazard. One or more gang watchperson shall be on site with each work crew at all times. If it becomes necessary for a watchperson to leave the site, work shall be suspended until he/she returns or is replaced by another qualified gang watchperson.

3.3.5 Right of Way Restriction

A. Fouling: An operating track is fouled for operating safety purposes when any individual and/or object is closer than four (4) feet from the near rail of the track. Equipment shall be considered as fouling the tracks when working in such a position that any movement whether intentional or unintentional or failure of the equipment, with or without load, will foul the track. The Contractor is advised that the use of equipment, which has the potential to foul live or operating tracks, shall be restricted to weekday non-peak hours – and/or weekends.

B. The Contractor is hereby advised that certain types of equipment shall not be permitted to work under live wires. No extras shall be allowed because of equipment restrictions. Refer to Paragraph H.

C. The Contractor shall insure that the Contractor's equipment will not foul any track until proper protection has been afforded. While trains or cars are passing on an adjacent track, any work that has the potential to foul shall be stopped.

D. The Project Manager shall have the right to restrict the operations of fouling or On-Track equipment when, in the Project Manager's opinion, the equipment is not in satisfactory condition to be safely operated or where operation will adversely affect the track structure. The Project Manager shall also have the right to prohibit the operation of any fouling or On-Track equipment by any Contractor-employed operator who is, in the Project Manager's opinion, not qualified or able to operate said equipment in a safe manner.

E. When any excavation extends below the bottom of the crossties, or where the stability of the railroad embankment and/or structure may be affected by excavation, such excavation shall be adequately braced by the Contractor. Prior to starting any such excavation, detailed drawings of the proposed bracing method shall be prepared and submitted to the Project Manager for his approval. When deemed appropriate by SEPTA's Project Manager, the shop drawings shall be accompanied by structural calculations sealed by a Professional Engineer licensed in the Commonwealth of Pennsylvania.

3.3.6 General Safety Rules

The following safety rules are considered especially applicable to all of the Contractor's employees with regard to conduct while on SEPTA property. The Contractor's foreperson or gang watchperson will be responsible to insure the safety of all the Contractor's personnel. The Contractor shall furnish and equip its foreperson and/or gang watchperson with the equipment as specified in the SRW to warn the Contractor's personnel of the approach of trains.

A. All Contractor Employees prior to working in any capacity that has the potential to foul, and/or working within ten (10) feet of railroad tracks shall attend a SEPTA safety seminar on safety rules and operating procedures (SRW Course). The Contractor’s employees must demonstrate an understanding of and proficiency in the SRW manual. Contractor’s employees who are added during the course of the project shall also be required to attend this seminar and demonstrate an understanding of and proficiency in the SRW manual before being able to work. The attendance certification (current date) from this seminar shall be logged into the SEPTA database. Re-certification is required on an annual basis.

B. Contractor-employed supervisors, foreperson, and gang watchpersons shall be responsible for the safety, safety instructions and safe performance of all employees under their immediate supervision. They must see that all employees working under their supervision receive warnings of approaching trains and other equipment in time to reach a safe place as per the SRW. Inexperienced employees must be instructed by immediate supervisors of the safe methods of performing their duties.

C. All Contractor employees working on or near an active track must attend an On-Track protection job briefing. This briefing shall be held, prior to performing any work that has the potential to foul track, or at a minimum, would require the individual to be within 10 feet of any active track or any time job conditions change such that On-Track protection procedures differ from those covered in the initial job briefing. An active track is any track that has the potential for train or On-Track equipment operations.

D. The EIC will conduct the job briefing to explain the On-Track safety procedures being utilized.

1. The Contractor's Protection Assurance Representative responsible for the overall supervision of Contractor employees shall ensure that the requisite job briefings are held, that all employees attend, and sign the job briefing form. At a minimum, the job briefings must cover the following information, if applicable:

    i. The identification of the EIC.

    ii. A review of operational and safety conditions.

    iii. The means by which On-Track safety is to be provided.

    iv. The positioning of any individuals responsible for providing warning to roadway workers.

    v. The type of signals that will be used to convey the warning of an approaching train.

    vi. The location where roadway workers will be required to go to clear for trains.

    vii. The identification of the SEPTA employee responsible for communicating with trains.

    viii. The type of signals that will be used to signal it is safe to resume work.

2. SEPTA will maintain a written record of all individuals who attend the job briefing.

E. No Contractor shall perform any work that has the potential to foul an active track, or at a minimum, would come within 10 feet of an active track, without the approval and/or presence of a qualified and authorized SEPTA representative.

F. The Contractor shall require employees to carry hand held lights when working from dusk to dawn, in tunnels, or when visibility is restricted.

G. The Contractor's employees shall consider all tracks as operating tracks and be on the alert for trains operating in either direction at all times, and walk facing the direction from which trains in regular operations will approach. In the event that track area visibility remains poor after institution of remedial measures (as described in 5 above), work in the track area may be restricted.

H. The Contractor's employees shall STOP before crossing any tracks and look for trains approaching in either direction. The Contractor shall instruct employees not to cross tracks unless there is time to walk slowly, not to take chances, and not to step on the head of the rail.

I. The Contractor's employees shall insure that clothing cannot catch onto any part of a moving car.

J. The Contractor's employees shall not step on track behind stopped rail cars, particularly those arriving at stations, due to the possibility of rail cars being moved in reverse directions.

K. The Contractor's employees shall not attempt to carry heavy materials across tracks without permission of proper authorities.

L. The Contractor's employees shall keep hands and feet clear of power switches, switches, switch equipment, and frogs.

3.3.7 Catenary & Overhead Electrical Lines

When handling work near overhead wires, the Contractor's employees shall observe the following:

A. All overhead wires, including catenary, transmission, and signal lines in electrified zones, shall be considered energized at all times.

B. Insulating covering of wire shall not be depended upon for protection against shock.

C. No employee of the Contractor shall do any work near electrical wires or apparatus where it is possible for any part of the employee's body or tools and material with which the employee is working to come within ten (10) feet of such wires, unless a SEPTA Overhead Maintenance employee is assigned to observe the safety of the operation. Use of metal ladders is forbidden.

D. When equipment is used in electrified territory or in the vicinity of Verizon Telephone, PECO, as well as SEPTA overhead wires, the Contractor must exercise special care to safeguard all persons in the area. Special attention must be given in the vicinity of overhead bridges and other structures where the wires may be depressed. If, in the opinion of the Project Manager, the required clearances cannot be maintained or any hazards are involved, a SEPTA Overhead Maintenance employee (Class A Employee) must be requested. All required protection personnel shall be SEPTA employees.

If a safety situation arises requiring an immediate power shutdown, notify the SEPTA Railroad Operation (RROC) - Superintendent at 215-580-8668, and the SEPTA Project Manager.

In a case of electrical contact, personal judgment and initiative has to be used, bearing in mind that the rescuer's safety should not be imperiled. Contact with a live overhead wire may prove fatal in a matter of seconds. The most important thing is to stop the flow of electricity through the victim's body and then apply mouth-to-mouth resuscitation (or CPR when necessary and if qualified to do so) until he or she recovers consciousness or trained help arrives. Once a victim is freed from the overhead wire, do not move him or her unless they can do so under their own power. Except for qualified rescuers, moving an injured person may result in further injury.

3.3.8 Roadway Worker Protection Manual

In addition to the above, the Contractor must follow all requirements of the Roadway Worker Protection Manual (SRW). If there is doubt as to the meaning of any procedures specified, the EIC shall be consulted prior to the commencement of work, which requires fouling of any track.

3.4 Subway/Elevated Safety Requirements

This section specifies the general requirements and safety regulations governing the Contractor's activities when its work impacts an active Subway/Elevated Line.

The information contained in this section is intended to provide guidance and safety precautions to the Contractor when working on a live rail line. The Contractor is advised that SEPTA shall operate trains over this location during the performance of work under the Contract, except as specified otherwise. The Contractor shall comply with all parts of this section, as well as with the general intent of this section.

3.4.1 Responsibility

The work covered by the Contract shall involve safety of persons and property on a live electrified rail line. Therefore, relevant skill and experience is required of the Contractor to do its work safely. The Contractor shall be responsible for the safety of its construction operations. The Contractor shall, therefore, be expected to post adequate watchpersons and/or protective devices to protect its work crews, equipment, and the work site. Pertinent safety rules, which shall be followed, are listed in, but not limited to, Sections 3.4.6, 3.4.7, and 3.4.8. The Contractor shall exercise proper care at all times.

3.4.2 Operations

When work is being performed under, active SEPTA train operations the safety and continuity of train operation shall be of the first importance. Train operation shall, at all times, be protected and the Contractor shall arrange work accordingly. Whenever the work may affect the safety or movement of trains, the method of doing such work, together with the proposed sequence of operations and time schedules for same, shall be submitted to the Project Manager for approval.

Before any construction or installation on SEPTA property may begin, the Contractor shall submit a written plan to SEPTA indicating the impact to passenger flow and SEPTA operations. SEPTA will prohibit shut downs and diversions on Holidays, ~~and~~ Holiday Weekends and during Special Events.

Additionally, the Contractor shall perform work near other vendors without disrupting operations of the vendors.

No work shall be prosecuted until such approval has been obtained. However, such approval of the Project Manager or a duly authorized representative shall not be considered as a release of the Contractor from responsibility for any damage to SEPTA by the acts of the Contractor, its employees, and/or its subcontractor's employees.

In the event of an unplanned discontinuation of train service due to the Contractor's operations, the Contractor is not only liable for any injury or damage that might occur, but also for the full cost of any detour of train traffic, shuttle bus service and any associated costs.

3.4.3 SEPTA Personnel

Flagperson: SEPTA Flagpersons are responsible for the safety and continuity of operations. The SEPTA Flagperson shall have authority to direct the stoppage of trains. Any sharing of protective duties between SEPTA and the Contractor within the work site can be considered coincidental.

Pilots: If the Contractor wishes to occupy live or operating tracks with on-track equipment, the Contractor shall request a SEPTA pilot who will obtain exclusive track occupancy on the live track. All SEPTA pilots shall be requested from the Project Manager a minimum of 1 week in advance of the required starting time.

Project Manager: The Project Manager or a duly authorized representative shall have complete authority in matters related to the safety of SEPTA's operations and facilities.

Qualified Protection Employee (QPE): A SEPTA employee qualified on operating rules, physical characteristics, and on-track protection procedures and is responsible for establishing on-track protection and safety. The QPE is responsible for conducting Job Briefings relative to on-track protection, and works with the Contractor’s PAR to ensure proper oversight of activities.

3.4.4 Contractor's Personnel

Protection Assurance Representative (PAR): The Contractor's Protection Assurance Representative (representative) may be the Superintendent, Safety Officer or responsible foreperson. The representative shall be present at all times when the Contractor's employees are working within the SEPTA operating envelope and under the requirements of this Section. In general, the PAR shall be responsible for day-to-day oversight of the Contractor's watchperson and employees so that they are working safely, according to all parts of this Section, to coordinate construction activities with SEPTA's Flagging personnel.

Watchperson: The role of the Contractor's gang watchperson is solely for the safety for the Contractor's employees when external influences, i.e. rail traffic, shall expose the workers to a safety hazard. The watchperson must be on site with each work crew at all times. If it becomes necessary for the watchperson to leave the site, work shall be suspended until he/she returns or is replaced by another qualified watchperson.

3.4.5 Right of Way Restrictions

SEPTA shall protect its service from the Contractor's operations in the Contractor's work area by establishing SEPTA Work Zones. Within a SEPTA Work Zone are one or more SEPTA Work Areas. A SEPTA Work Zone is the pre-arranged limits of a work project along the right-of-way, which is then defined for operational safety purposes in bulletin information disseminated to SEPTA personnel. A SEPTA Work Area is the actual working limits within the pre-defined boundaries of the SEPTA Work Zone. The SEPTA Work Area is more clearly defined visually in the field by the erection in place of specific SEPTA Work Area signage.

A. A SEPTA Work Zone will be established by SEPTA for work on or about the operating tracks as follows:

   1. For Maintenance or work that is unable to normally clear 15 seconds before train arrival.

   2. For Contractor's work, which extends off the edge of a station platform that is unable to normally clear 15 seconds before train arrival.

   3. For Contractor's work which is outside of the above limits that may foul.

4. For track(s) adjacent and accessible to tracks placed out of service for work.

5. For Contractor's employee(s) requiring protection when working on or about operating tracks.

B. Contractors Work Area

1. Fouling is defined as any type of work that may strike or interfere with the safe passage of trains.

2. The limits of the SEPTA Work Area, in accordance with SEPTA operating rules, is visually identified in the field by a Stop Sign (or substitution of a Work Area Speed Limit Sign by the Flagperson) and a Work Area Resume Speed Sign. The approach to the Work Area is visually identified in the field by an Approach Sign.

The SEPTA Work Zones established by SEPTA for the control of train operations are defined by applicable Work Area signs or portable signals, set at prescribed distances from the Contractor's actual work area. The spacing of the SEPTA Work Areas and positioning of SEPTA Flagperson are prescribed based on safe stopping distances or emergency situations. The Contractor's employees shall confine themselves to stay within the limits of their SEPTA Work Area at all times. Movement out of the SEPTA Work Area into another SEPTA Work Area or another SEPTA Work Zone with personnel, equipment, and/or material shall not be permitted and shall be considered a violation of the safety regulations.

Note: A SEPTA Work Zone is not required when the Contractor’s work is two (2) feet or less from the trackside edge of a station platform, and not fouling. However, the Contractor, is responsible for placing workers portable warning signals at the entrance to the platforms in accordance with SEPTA’s safety rules.

The Contractor shall insure that the Contractor's equipment will not foul any track until proper protection has been afforded. While trains or cars are passing on an adjacent track, any work that has the potential to foul shall be stopped.

The Project Manager shall have the right to restrict the operations of fouling or on-track equipment when, in the Project Manager's opinion, the equipment is not in satisfactory condition to be safely operated or where operation will adversely affect the track structure. The Project Manager shall also have the right to prohibit the operation of any fouling or on-track equipment by any Contractor-employed operator who is, in the Project Manager's opinion, not qualified or able to operate said equipment in a safe manner.

When the Contractor is working outside of an area, as defined in Section 3.4.5, where fouling is not possible or if working in de-energized tracks of the Market Frankford Subway/Elevated (MFSE) or a de-energized track which can be physically separated from an adjacent Broad Street Subway (BSS) or (MFSE) track provisions, of Section 3.4.6.C are revised as follows:

A. The Contractors non-certified employees are allowed to work in such areas. The Contractor's supervisors and foreperson shall attend the track safety seminar and obtain certification in accordance with Section 3.4.6.C below.

When any excavation extends below the bottom of the crossties, or where the stability of the railroad embankment and/or structure may be affected by excavation, such excavation shall be adequately braced by the Contractor. Prior to starting any such excavation, detailed drawings of the proposed bracing method shall be prepared and submitted to the Project Manager for approval. When deemed appropriate by SEPTA's Project Manager, the shop drawings shall be accompanied by structural calculations. Both the shop drawings and calculation shall be sealed by a Professional Engineer licensed in the Commonwealth of Pennsylvania.

3.4.6 General Safety Rules

The following safety rules of SEPTA are applicable to all of the Contractor's employees and those of its subcontractors in regard to conduct while on or close to the track area:

A. At all times while working on or adjacent to operating tracks, the Contractor, its Subcontractors, and all of their employees, shall closely observe the applicable flagging rules and regulations of SEPTA.

B. The Contractor shall be responsible to ensure that all of its employees and the employees of its Subcontractors are familiar with the safety rules, safety instructions and safe performance of work. These employees shall so conduct themselves so as not to violate any of such flagging or safety rules.

C. Prior to the start of construction, all of the Contractor's employees scheduled to work on or near trackage shall attend a safety seminar on track safety rules conducted by SEPTA. If these individuals are replaced during the course of the Project, the replacements and any other new employees shall also be required to attend this seminar, before being able to work. The attendance certification is logged into SEPTA's database. Re-certification is required on an annual basis.

D. Before permitting workpersons on the track, the Contractor shall hold a Job Briefing conducted by the Contractor-employed Protection Assurance Representative and/or SEPTA QPE (as prescribed by SEPTA's Rail Construction Safety Plan) and verify and document that the foreperson and watchperson have an understanding with all employees as to the location they will go when necessary to clear for trains. The Contractor's PAR shall make certain that the SEPTA QPE responsible for track safety explains the track safety methods being utilized during the work. These Job Briefings will be documented by the Contractor at the time of the briefing(s). The record of "Job Briefings" shall be maintained by the Contractor for inspection by SEPTA.

E. The Contractor's watchperson must give their entire attention to watching for trains and warning the employees and are prohibited from performing any other duties. They must not leave their posts until instructed by SEPTA that the protection is unnecessary or other watchperson have been assigned, are in position, and watching in the direction of an approaching train.

F. The Contractor's Protection Assurance Representative shall be responsible to insure the safety of all personnel. The Contractor shall furnish and equip its foreperson or watchperson with audible and visible warning devices to warn personnel of the approach of trains.

G. The Contractor’s Protection Assurance Representative shall, before permitting employees on or close to the track, ensure that:

1. All employees shall have an understanding as to where they shall go when necessary to clear for trains.

2. All employees performing work on or about operating energized tracks may use worker’s portable warning signal if deemed necessary in accordance, with SEPTA's Operating Rules. The warning signal can be a Starlight Lantern, Model 215-TL or approved equal. Contractor shall have to replace with an "Amber" lens cover to be in conformance with these regulations.

H. The Contractor’s job forepersons presence at the work site is mandatory while the work is being performed on or close to the track area.

I. A maximum of five non-certified Contractor's employees who are not performing work may enter track areas where third rail power is energized accompanied by a certified employee, (SEPTA’s or Contractor's) with the approval of the Train Dispatcher or a duly authorized representative.

J. While working with scaffolding or non-conductive ladders on the platform, the Contractor’s employees shall secure scaffolding/ladder to eliminate rolling or falling.

K. When small hand tools or construction equipment are used in electrified territory, the Contractor shall exercise due care including the clearance requirements to safeguard persons and property in the area. If the required clearance cannot be maintained or any hazards are involved, prior guidance from SEPTA's Project Manager shall be requested.

L. The Contractor's employees shall consider all tracks as operating tracks and be on the alert for trains operating in either direction at all times. When it is necessary to walk in the track area, it is the Site Superintendent and/or Foreperson/Watchpersons responsibility to let the train operators know where the employees are. To do this, first notify and gain approval of the Train Dispatcher, protect the employees by displaying a lighted lantern, flashlight, and/or flags at all times. At first indication of an approaching train, get off the track promptly, and conceal light from train operator's view.

M. Any employee leaving the work area for any reason shall receive permission from the on-site safety supervisor and protect himself with a lighted lantern or flashlight. He shall follow route to and from the work location designated by the foreperson in order to avoid crossing of track insofar as possible.

N. When standing in the track area, the Contractor's employees shall allow sufficient room for the car and third rail shoes, which extend beyond the carbody to clear body, clothing, or any object they may have in their hands. This includes keeping their coats buttoned up so that they cannot catch on any part of a moving car.

O. The Contractor's employees shall not step on track behind stopped trains, particularly those that have just arrived at stations, due to possibility of train having overrun the platform and being reversed to place doors properly for opening.

P. The Contractor's employees shall carry hand held flashlights at all times when working at night, in the tunnel area or when visibility is restricted.

Q. The Contractor's employees provided with a flagperson, when hearing flagpersons whistle and/or watchpersons horn warning of the approach of a train, shall place tools and material clear of the track and depart the track area immediately to the nearest platform or place of safety without interfering with the pathway of passengers.

R. The Contractor's employees shall avoid track switches by walking around them.

S. The Contractor's employees shall observe and acknowledge whistle signals as required. A warning whistle from vehicle operator must always be acknowledged by a proper hand, lighted lantern, or flashlight signal to proceed when you are in the clear except when you are working under protection of flagperson. If carrying a light, it must be concealed after proceed signal is given.

3.4.7 Third Rail Safety

The Contractor shall require each employee to:

A. Not stand on, walk on, sit on, or use the third rail or protection board/cover as a step.

B. Not come in contact with the third rail unless specifically required in the performance of duty. When working directly on the third rail, it shall be de-energized by SEPTA.

C. Not carry metal objects when close to the third rail.

D. Keep as far as possible from the third rail during wet conditions.

E. Never assume that the third rail is dead. When directed by SEPTA that it is de-energized, remain isolated from the circuit if it is necessary to work close to it. Avoid stepping on loose material piled close to the third rail.

F. Not come in contact with any third rail shoe of a car, as all third rail shoes are energized if at least one shoe is in contact with the third rail.

G. Not walk between the running and third rail of any track.

H. Avoid additional tripping hazards and be aware of third rail anchors (braces) and cable feeds.

I. Not look at train collector shoes during movement, particularly at tracks switches (turnouts) and third rail gaps.

J. Metal and/or electrically conductive ladders shall not be used.

3.4.8 Emergency Guidelines

The following procedures shall be observed by the Contractor's personnel in the event of any emergency:

A. When an emergency occurs endangering life of a person that requires the power off, contact the Train Dispatcher. Contact the Train Dispatcher by the fastest means available, either by radio, emergency call box located on platforms, or telephone (215) 580-8555. Give the proper location requiring de-energizing by indicating the closest station, proper track number, and line.

B. In such a case of electrical contact, personal judgment and initiative has to be used; bearing in mind that the rescuer's safety should not be imperiled. Contact with a live third rail may prove fatal in a matter of seconds. The most important thing is to stop the flow of electricity through the victim's body and then apply mouth-to-mouth resuscitation (or CPR when necessary and if qualified to do so) until he or she recovers consciousness or trained help arrives. Once a victim is freed from the third rail, do not move him or her unless they can do so under their own power. Except for qualified rescuers, moving an injured person may result in further injury.

C. If a fire in the vicinity of the third rail can be readily extinguished, use a dry chemical extinguisher, do not use water.

3.5 Media-Sharon Hill Safety Requirements

This section specifies the general safety requirements governing the Contractor's activities when its work impacts the Media-Sharon Hill Line (MSHL) right-of-way.

The information contained in this Section is intended to provide guidance and safety precautions to the Contractor when working on a live rail line. The Contractor is advised that SEPTA shall operate trains over this location during the performance of work under the Contract, except as specified otherwise. The Contractor shall comply with all parts of this Section, as well as with the general intent of this Section.

3.5.1 Responsibility

The work covered by the Contract shall involve safety of persons and property on a live electrified rail line. Therefore, relevant skill and experience is required of the Contractor to do its work safely. The Contractor shall be responsible for the safety of its construction operations. The Contractor shall, therefore, be expected to post adequate watchpersons and/or protective devices to protect its work crews, equipment, and the work site. Pertinent safety rules, which shall be followed, are listed in, but not limited to, Sections 3.5.2 through 3.5.8. The Contractor shall exercise proper care at all times.

3.5.2 Operations

When work is being performed by the Contractor under active train operations by SEPTA, the safety and continuity of operation of the trains by SEPTA shall be of the first importance. They shall, at all times, be protected and the Contractor shall arrange its work accordingly. Whenever the work may affect the safety or movement of trains, the method of doing such work, together with the proposed sequence of operations and time schedules for same, shall be submitted to the Project Manager for approval.

Before any construction or installation on SEPTA property may begin, the Contractor shall submit a written plan to SEPTA indicating the impact to passenger flow and SEPTA operations. SEPTA will prohibit shut downs and diversions on Holidays, ~~and~~ Holiday Weekends and during Special Events.

Additionally, the Contractor shall perform work near other vendors without disrupting operations of the vendors.

~~A.~~No work shall be prosecuted until such approval has been obtained. However, such approval of the Project Manager or duly authorized representative will not be considered as a release of Contractor from responsibility for any damage to SEPTA by the acts of the Contractor, its employees, and/or its subcontractors.

~~B.~~In the event of an unplanned discontinuation of train service due to the Contractor's operations, the Contractor is not only liable for any injury or damage that might occur, but also for the full cost of any detour of train traffic, shuttle bus service and any associated costs.

3.5.3 SEPTA Personnel

Flagperson: SEPTA Flagpersons are responsible for the safety and continuity of operations. The SEPTA Flagperson shall have authority to direct the stoppage of trains. Any sharing of protective duties between SEPTA and the Contractor within the work site can be considered coincidental.

Project Manager: The Project Manager or a duly authorized representative shall have complete authority in matters related to the safety of SEPTA's operations and facilities.

Pilots: If the Contractor wishes to occupy live or operating tracks with on-track equipment, the Contractor shall request a SEPTA pilot who will obtain exclusive track occupancy on the live track. All SEPTA pilots shall be requested from the Project Manager a minimum of 1 week in advance of the required starting time.

Qualified Protection Employee (QPE): A SEPTA employee qualified on operating rules, physical characteristics, and on-track protection procedures and is responsible for establishing on-track protection and safety. The QPE is responsible for conducting Job Briefings relative to on-track protection, and works with the Contractor's PAR to ensure proper oversight of activities.

3.5.4 Contractor's Personnel

Protection Assurance Representative (PAR): The Contractor's Protection Assurance Representative (representative) may be the Superintendent, Safety Officer, or responsible foreperson. The representative shall be present at all times when the Contractor's employees are working within the SEPTA operating envelope and under the requirements of this Section. In general, the PAR shall be responsible for day-to-day oversight of the Contractor's gang watchperson and employees so that they are working safely, according to all parts of this Section, to coordinate construction activities with SEPTA's Flagging personnel.

Gang Watchperson: The role of the Contractor's Gang Watchperson is solely for the purpose of safety for the Contractor's employees where external influences, i.e., rail traffic, shall expose the workers to a safety hazard. The gang watchperson must be on site with each work crew at all times. If it becomes necessary for the watchperson to leave the site, work shall be suspended until he/she has returned or is replaced by another qualified Gang Watchperson.

3.5.5 Right of Way Restrictions

Work Zones:

1. Fouling type work is defined as follows:

    i. For Contractor's work at other than station platforms which is four (4) feet or less from the near rail of operating track.

    ii. For Contractor's work which extends off the edge of a station platform.

    iii. For Contractor's work which is outside of the above limits that may foul.

2. SEPTA will protect its service from the Contractor's operations in the Contractor's work areas by establishing SEPTA Work Zones. Within a SEPTA Work Zone are one or more SEPTA Work Areas. A SEPTA Work Zone is the pre-arranged limits of a work project along the right-of-way, which is then defined for operational safety purposes in bulletin information disseminated to SEPTA personnel. A SEPTA Work Area is the actual working limits within the pre-defined boundaries of the SEPTA Work Zone. The SEPTA Work Area is more clearly defined visually in the field by the erection in place of specific SEPTA Work Area signage.

3. The Contractor's work area is defined as a linear space in or adjacent to the track area. The Contractor's work area starts (in the direction of normal train movement) where the first worker is working or piece of equipment is set up and ends where the last worker is working or piece of equipment is set up. The Contractor's work area shall remain within the SEPTA Work Area. The limits of the SEPTA Work Area, in accordance with SEPTA operating rules, is visually identified in the field by a Stop Sign (or substitution of a Work Area Speed Limit Sign by the Flagperson) AND a Work Area Resume Speed Sign. The approach to the Work Area is visually identified in the field by an Approach Sign.

    i. A SEPTA Work Zone will be established by SEPTA for fouling type work on or about the operating tracks.

ii. SEPTA will determine if the SEPTA Work Zone requires single tracking or slow speed operations.

4. Applicable SEPTA Work Area signage or portable signals at prescribed distances from the Contractors work area define the SEPTA Work Areas for the control of train operations. The Contractor's employees shall confine themselves to staying within the limits of their SEPTA Work Area at all times. Movement out of the SEPTA Work Area into another SEPTA Work Area or another SEPTA Work Zone with personnel, equipment, and/or material shall not be permitted and shall be considered a violation of the safety regulations. SEPTA Flagpersons are required when fouling type work is being performed. No work shall be done in the track area when visibility is poor.

A. Where fouling is not possible or if working in de-energized tracks or a de-energized track, which can be physically separated from an active track, the above is revised as follows: The Contractor’s non-certified employees are allowed to work in such areas. The Contractor's supervisors, safety supervisor, and foreperson shall attend the track safety seminar and obtain certification.

B. The Contractor shall insure that the Contractor's equipment will not foul any track until proper protection has been afforded. While trains or cars are passing on an adjacent track, any work that has the potential to foul shall be stopped.

C. The Project Manager shall have the right to restrict the operations of fouling or on-track equipment when, in the Project Manager's opinion, the equipment is not in satisfactory condition to be safely operated or where operation will adversely affect the track structure. The Project Manager shall also have the right to prohibit the operation of any fouling or on-track equipment by any Contractor-employed operator who is, in the Project Manager's opinion, not qualified or able to operate said equipment in a safe manner.

D. When any excavation extends below the bottom of the crossties, or where the stability of the railroad embankment and/or structure may be affected by excavation, such excavation shall be adequately braced by the Contractor. Prior to starting any such excavation, detailed drawings of the proposed bracing method shall be prepared and submitted to the Project Manager for his approval. When deemed appropriate by SEPTA's Project Manager, the shop drawings shall be accompanied by structural calculations sealed by a Professional Engineer licensed in the Commonwealth of Pennsylvania.

3.5.6 General Safety Rules

The following safety rules of SEPTA are applicable to all of the Contractor's employees and those of its subcontractors in regard to conduct while on or close to the track area:

A. At all times while working on or adjacent to operating tracks, the Contractor, its subcontractors, and all of their employees, shall closely observe the applicable flagging rules and regulations of SEPTA.

B. The Contractor shall be responsible for ensuring that all of its employees and the employees of its subcontractors are familiar with the safety rules, safety instructions and safe performance of work. These employees shall so conduct themselves so as not to violate any of such flagging or safety rules.

C. Prior to the start of construction, all of the Contractor's employees scheduled to work on or near trackage shall attend a safety seminar on track safety rules conducted by SEPTA. If these individuals are replaced, during the course of the Project, the replacements and any other new employees shall also be required to attend this seminar, before being able to work. Re-certification is required on an annual basis.

D. Before permitting workpersons on the track, the Contractor shall hold a Job Briefing conducted by the Contractor-employed Protection Assurance Representative and/or SEPTA QPE (as prescribed by SEPTA's Rail Construction Safety Plan) and verify and document that the foreperson and watchperson have an understanding with all employees as to the location they will go when necessary to clear for trains. The Contractor's PAR shall make certain that the SEPTA QPE responsible for track safety explains the track safety methods being utilized during the work. These Job Briefings will be documented by the Contractor at the time of the briefing(s). The record of "Job Briefings" shall be maintained by the Contractor for inspection by SEPTA.

E. The Contractor's gang watchpersons must give their entire attention to watching for trains and warning the employees and are prohibited from performing any other duties. They must not leave their posts until instructed by SEPTA that the protection is unnecessary or other watchpersons have been assigned, are in position, and are watching in the direction of an approaching train.

F. The Contractor's Protective Assurance Representative shall be responsible to insure the safety of all its personnel and be equipped with audible and visible warning devices to warn its personnel of the approaching trains.

G. The Contractor's Protective Assurance Representative shall, before permitting employees on or close to the track, ensure that all employees shall have an understanding as to where they shall go when necessary to clear for trains.

H. The Contractor's job forepersons presence at the work site is mandatory while the work is being performed on or close to the track area.

I. A maximum of four non-certified Contractor's employees who are not performing work may enter track areas where third rail power is energized accompanied by a certified employee, (SEPTA or Contractor's) with the approval of the Train Dispatcher or any duly authorized representative.

J. While working on scaffolding or non-conductive ladders on the platform, the Contractor's employees shall secure scaffolding/ladder to eliminate rolling or falling.

K. When small hand tools or construction equipment are used in electrified territory, the Contractor shall exercise due care including the clearance requirements to safeguard persons and property in the area. If the required clearance cannot be maintained or any hazards are involved, prior guidance from SEPTA's Project Manager shall be requested.

L. The Contractor's employees shall consider all tracks as operating tracks and be on the alert for trains operating in either direction at all times. When it is necessary to walk in the track area, it is the Site Superintendent and/or Foreperson/Gang Watchperson's responsibility to let the train operators know where the employees are. To do this, first notify and gain approval of the Train Dispatcher, protect the employees by displaying a lighted lantern, flashlight, and/or flags at all times. At first indication of an approaching train, get off the track promptly, and conceal light from train operator's view.

M. Any employee leaving the work area for any reason shall receive permission from the on-site safety representative and protect himself with a lighted lantern or flashlight. He shall follow the route to and from the work location designated by the foreperson in order to avoid crossing of track insofar as possible.

N. When standing in the track area, the Contractor's employees shall allow sufficient room for the car and third rail shoes, which extend beyond the carbody to clear body, clothing, or any object they may have in their hands. This includes keeping their coats buttoned up so that they cannot catch on any part of a moving car.

O. The Contractor's employees shall not step on track behind stopped trains. Trains overrunning station platforms may have to be reversed to place doors properly for opening.

P. Carry and use hand held flashlights when visibility is restricted, and at all times from dusk to dawn.

Q. When hearing flagpersons' warning of the approach of a train, the Contractor shall remove tools and material clear of the track and depart the track area to the catwalk or platform immediately without interfering with the pathway of the train.

R. Avoid track switches by walking around them.

S. The Contractor's watchpersons shall observe and acknowledge horn signals conveyed from operating trains as required. A warning signal from a train operator must always be acknowledged by a signal to proceed when you are in the clear except when you are working under protection of a flagperson.

3.5.7 Electrical Safety

Overhead Wires

When equipment is used in electrified territory or in the vicinity of Verizon, PECO, as well as SEPTA overhead wires, the Contractor shall exercise special care to safeguard all persons in the area. Special attention shall be given in the vicinity of overhead bridges and other structures where the wires may be depressed.

A. All overhead wires, including catenary, transmission, and signal lines in electrified zones, shall be considered live at all times. Insulating covering of wire shall not be depended upon for protection against shock.

B. No employee of the Contractor shall do any work near high voltage wires or apparatus where it is possible for any part of employee body or tools and material with which he is working to come within ten (10) feet of such wires.

C. Use of metal ladders is forbidden in the area of overhead wires.

3.5.8 Emergency Guidelines

When an emergency occurs endangering life of a person that requires that power be de-energized the most responsible person shall call the Control Center. Give the proper location requiring de-energizing by indicating the closest station, signal number, proper track number, and line.

In case of electrical contact, personal judgment and initiative has to be used; bearing in mind that the rescuer's safety should not be imperiled. Contact with a live overhead wire may prove fatal in a matter of seconds. The most important thing is to stop the flow of electricity through the victim's body and then apply mouth-to-mouth resuscitation (or CPR when necessary and if qualified to do so) until he or she recovers consciousness or trained help arrives. Once a victim is freed from the overhead wire, do not move him or her unless they can do so under their own power. Except for qualified rescuers, moving an injured person may result in further injury.

If a fire in the vicinity of the third rail, overhead wire, or cable can be readily extinguished, use a dry chemical extinguisher, do not use water.

Emergency phones numbers:

Control Center 215-580-8560

Note: DO NOT use emergency phone numbers for non-emergency situations such as confirming flagging, single tracking or power outage requests.

3.6 Maintenance Facilities Safety Requirements

This section specifies the regulatory and safety requirements governing the Contractor's activities. The Contractor shall take every precaution necessary to assure the safe access and egress of all SEPTA patrons, vehicles and employees, the safe and continuous operation and maintenance of buses, trolleys and trains, as well as the safety and general welfare of the public at large.

Contractor employed supervisors, forepersons, and gang watchpersons shall be responsible for the safety, safety instructions, and safe performance of all employees under their immediate supervision. Inexperienced employees must be instructed by their immediate supervisors of safety methods in performing their duties. The Contractor shall arrange to have appropriate employees attend SEPTA safety training classes as required in Sections 3.1, 3.2.6, 3.3.6, 3.4.6, 3.5.6, and 3.7.6.

A. No work shall be started or prosecuted until approval has been obtained. However, such approval of the Engineer or his duly authorized representative will not be considered as a release from responsibility for any damage to the Authority by the acts of the Contractor, its employees, and/or its Subcontractor's employees.

B. The responsibility for cooperation in the maintenance of SEPTA traffic will be entirely upon the Contractor and no claims may be made against SEPTA for delay or any other interference that may have caused the Contractor's operations to be delayed in connection with any work under the Contract.

1. While concrete breaking or cutting is done, suitable barriers must be erected to protect passengers, passers-by, SEPTA employees, and others from flying debris, dust, and rubble. When masonry saw cutting is done, a water washdown must be run simultaneously.

2. Before crossing traffic lanes or vehicle storage areas, STOP and look for vehicles approaching in either direction. Do not cross traffic lanes, tracks or vehicle storage areas with oncoming vehicle movement.

3. During a period of material delivery by the Contractors onto SEPTA property, the Contractor shall provide a traffic flagperson, who will be utilized to control movement of vehicles and other equipment. A Contract flagperson must also be present during periods of construction, which may adversely affect passenger and employee safety as well as transit vehicles.

3.6.1 Safety Rules for Construction near Overhead, Catenary, and Third Rail Operations

A. Prior to commencing any work, the Contractor shall ensure strict compliance with sections 3.2 through 3.7, and during prosecution of work, will likewise be in strict conformance with all SEPTA Safety Regulations.

B. The safety and continuity of SEPTA's operations shall be of the first importance. They shall, at all times, be protected and the Contractor shall arrange his work accordingly. Whenever the work may affect the safety of movement of vehicles, the method of doing such work, together with the proposed sequence of operations and time schedules for same, shall be submitted to the Project Manager for approval. No work shall be started or prosecuted until such approval has been obtained. However, such approval of the Project Manager or his duly authorized representative will not be considered as a release from responsibility for any damage to SEPTA by the acts of the Contractors, his employees, and/or his Subcontractor's employees. Erection work in the vicinity of any track, catenary, and/or overhead wire shall require a plan for the Project Manager approval.

3.6.2 Track Safety

Before crossing any tracks, STOP, and look for vehicles approaching in either direction. Do not cross tracks unless you have time to walk slowly, and do not take chances.

When standing beside tracks, be sure that clothing cannot catch on any part of a moving vehicle. Loose clothing is dangerous.

Do not step behind stopped vehicles, due to possibility of vehicles being reversed. All workers shall receive warnings of approaching vehicles and other equipment in time to reach a safe place.

Work Near Overhead Wires, Catenary, and Third Rail: All overhead wires, including catenary, transmission and signal, and all third rail in yards and shops, are to be considered live at all times. Metal ladders shall not be used.

Contractor employed supervisors, forepersons, and gang watchpersons shall be responsible for the safety, safety instructions, and safe performance of all employees under their immediate supervisors. They must ensure that all men working under their supervision receive warnings of approaching vehicles and other equipment in time to reach a safe place. Inexperienced employees must be instructed by their immediate supervisors on safe methods in performing their duties.

3.6.3 Barricades and Other Protection

When it is necessary to maintain public use of work areas involving sidewalks, entrances to building and vehicular roadways, the Contractor shall protect the public with appropriate guardrail barricades, temporary fences, and/or other devices approved by SEPTA. Such protection shall guard against flying materials, falling or moving material, equipment, hot or poisonous materials, flammable or toxic liquids, gases, open flames, energized electrical circuits or other harmful exposures.

All open excavations must be properly barricaded and shall be lighted at the end of each workday and shall be illuminated from sunset to sunrise.

All project temporary facilities and controls used in conjunction with the work must be removed and disposed of. All costs for such removal and disposal shall be borne by the Contractor who furnished the temporary facility or control.

Contractors working within drive-through bays must erect lighted caution barriers a minimum of 100 feet in front of the scaffolding on which their crews are working.

3.7 Light Rail Tunnel Safety Requirements

This section specifies the general requirements and safety regulations governing the Contractor's activities when its work impacts an active Light Rail Tunnel Line.

The information contained in this section is intended to provide guidance and safety precautions to the Contractor when working on a live rail line. The Contractor is advised that SEPTA shall operate trains over this location during the performance of work under the Contract, except as specified otherwise. The Contractor shall comply with all parts of this section, as well as with the general intent of this section.

3.7.1 Responsibility

The work covered by the Contract shall involve safety of persons and property on a live electrified rail line. Therefore, relevant skill and experience is required of the Contractor to do its work safely. The Contractor shall be responsible for the safety of its construction operations. The Contractor shall, therefore, be expected to post adequate watchperson(s) and/or protective devices to protect its work crews, equipment, and the work site. Pertinent safety rules, which shall be followed, are listed in, but not limited, to Paragraphs E, G, and H of this subsection. The Contractor shall exercise proper care at all times.

3.7.2 Operations

When work is being performed under active SEPTA train operations the safety and continuity of train operation shall be of the first importance. Train operation shall, at all times, be protected and the Contractor shall arrange its work accordingly. Whenever the work may affect the safety or movement of trains, the method of doing such work, together with the proposed sequence of operations and time schedules for same, shall be submitted to the Project Manager for approval.

Before any construction or installation on SEPTA property may begin, the Contractor shall submit a written plan to SEPTA indicating the impact to passenger flow and SEPTA operations. SEPTA will prohibit shut downs and diversions on Holidays, ~~and~~ Holiday Weekends and during Special Events.

Additionally, the Contractor shall perform work near other vendors without disrupting operations of the vendors.

~~A.~~No~~No~~ work shall be prosecuted until such approval has been obtained. However, such approval of the Project Manager or a duly authorized representative shall not be considered as a release of the Contractor from responsibility for any damage to SEPTA by the acts of the Contractor, its employees, and/or its Subcontractor's employees.

~~B.~~In the event of an unplanned discontinuation of train service due to the Contractor's operations, the Contractor is not only liable for any injury or damage that might occur, but also for the full cost of any detour of train traffic, shuttle bus service and any associated costs.

3.7.3 SEPTA Personnel

Flagperson: SEPTA Flagpersons are responsible for the safety and continuity of operations. The SEPTA Flagperson shall have authority to direct the stoppage of trains. Any sharing of protective duties between SEPTA and the Contractor within the work site can be considered coincidental.

Pilots: If the Contractor wishes to occupy live or operating tracks with on-track equipment, the Contractor shall request a SEPTA pilot who will obtain exclusive track occupancy on the live track. All SEPTA pilots shall be requested from the Project Manager a minimum of 1 week in advance of the required starting time.

Project Manager: The Project Manager or a duly authorized representative shall have complete authority in matters related to the safety of SEPTA's operations and facilities.

Qualified Protection Employee (QPE): A SEPTA employee qualified on operating rules, physical characteristics, and on-track protection procedures and is responsible for establishing on-track protection and safety. The QPE is responsible for conducting Job Briefings relative to on-track protection, and works with the Contractor’s PAR to ensure proper oversight of activities.

3.7.4 Contractor's Personnel

Protection Assurance Representative (PAR): The Contractor’s Protection Assurance Representative (representative) may be the Superintendent, Safety Officer, or responsible foreperson. The representative shall be present at all times when the Contractor is working within the SEPTA operating envelope and under the requirements of this Section. In general, the PAR shall be responsible for day to day oversight of the Contractor’s gang watchperson and employees so that they are working safely according to all parts of this section to coordinate construction activities with SEPTA’s Flagging personnel.

Gang Watchperson: The role of the Contractor's gang watchperson is solely for the safety for the Contractor's employees when external influences, i.e. rail traffic, shall expose the workers to a safety hazard. The gang watchperson must be on site with each work crew at all times. If it becomes necessary for the gang watchperson to leave the site, work shall be suspended until he/she returns or is replaced by another qualified gang watchperson.

3.7.5 Right of Way Restrictions

Work Zones

A. Fouling type work is defined as follows:

1. For Contractor's work at other than station platforms which is four (4) feet or less from the near rail of operating track.

2. For Contractor's work which extends off the edge of a station platform.

3. For Contractor's work which is outside of the above limits that may foul.

B. SEPTA will protect its service from the Contractor's operations in the Contractor’s work areas by establishing SEPTA Work Zones. Within a SEPTA Work Zone are one or more SEPTA Work Areas. A SEPTA Work Zone is the pre-arranged limits of a work project along the right-of-way, which is then defined for operational safety purposes in bulletin information disseminated to SEPTA personnel. A SEPTA Work Area is the actual working limits within the pre-defined boundaries of the SEPTA Work Zone. The SEPTA Work Area is more clearly defined visually in the field by the erection in place of specific SEPTA Work Area signage.

C. The Contractor’s work area is defined as a linear space in or adjacent to the track area. The Contractor’s work area starts (in the direction of normal train movement) where the first worker is working or piece of equipment is set up and ends where the last worker is working or piece of equipment is set up. The Contractor’s work area shall remain within the SEPTA Work Area. The limits of the SEPTA Work Area, in accordance with SEPTA operating rules, is visually identified in the field by a Stop Sign (or substitution of a Work Area Speed Limit Sign by the Flagperson) AND a Work Area Resume Speed Sign. The approach to the Work Area is visually identified in the field by an Approach Sign.

1. A SEPTA Work Zone will be established by SEPTA for fouling type work on or about the operating tracks.

2. SEPTA will determine if the SEPTA Work Zone requires single tracking or slow speed operations.

D. Applicable SEPTA Work Area signage or portable signals at prescribed distances from the Contractor’s work area define the SEPTA Work Areas for the control of train operations. The Contractor's employees shall confine themselves to staying within the limits of their SEPTA Work Area at all times. Movement out of the SEPTA Work Area into another SEPTA Work Area or another SEPTA Work Zone with personnel, equipment, and/or material shall not be permitted and shall be considered a violation of the safety regulations. SEPTA Flagpersons are required when fouling type work is being performed. No work shall be done in the track area when visibility is poor.

Where fouling is not possible or if working in de-energized tracks or a de-energized track, which can be physically separated from an active track, the above is revised as follows: The Contractors non-certified employees are allowed to work in such areas. The Contractor's supervisors, safety supervisor, and foreperson shall attend the track safety seminar and obtain certification.

The Contractor shall insure that the Contractor's equipment will not foul any track until proper protection has been afforded. While trains or cars are passing on an adjacent track, any work that has the potential to foul shall be stopped.

The Project Manager shall have the right to restrict the operations of fouling or On-Track equipment when, in the Project Manager's opinion, the equipment is not in satisfactory condition to be safely operated or where operation will adversely affect the track structure. The Project Manager shall also have the right to prohibit the operation of any fouling or On-Track equipment by any Contractor-employed operator who is, in the Project Manager's opinion, not qualified or able to operate said equipment in a safe manner.

When the Contractor is working outside of an area, as defined in Section 3.7.5, where fouling is not possible or if working in de-energized Light Rail tracks or a de-energized light rail track which can be physically separated from an adjacent Market Frankford Subway/Elevated (MFSE) track provisions, Section 3.7.6.C. is revised as follows:

A. The Contractors non-certified employees are allowed to work in such areas. The Contractor's supervisors and foreperson shall attend the track safety seminar and obtain certification in accordance with Section 3.7.6.C below.

3.7.6 General Safety Rules

The following safety rules of SEPTA are applicable to all of the Contractor's employees and those of its subcontractors in regard to conduct while on or close to the track area:

A. At all times while working on or adjacent to operating tracks, the Contractor, its subcontractors, and all of their employees, shall closely observe the applicable flagging rules and regulations of SEPTA.

B. The Contractor shall be responsible to ensure that all of its employees and the employees of its subcontractors are familiar with the safety rules, safety instructions and safe performance of work. These employees shall so conduct themselves so as not to violate any of such flagging or safety rules.

C. Prior to the start of construction, all of the Contractor's employees scheduled to work on or near trackage shall attend a safety seminar on track safety rules conducted by SEPTA. If these individuals are replaced, during the course of the Project, the replacements and any other new employees shall also be required to attend this seminar, before being able to work. The attendance certification is logged into SEPTA's database. Re-certification is required on an annual basis

D. Before permitting workpersons on the track, the Contractor shall hold a Job Briefing conducted by the Contractor-employed Protection Assurance Representative and/or SEPTA QPE (as prescribed by SEPTA's Rail Construction Safety Plan) and verify and document that the foreperson and gang watchperson have an understanding with all employees as to the location they will go when necessary to clear for trains. The Contractor's PAR shall make certain that the SEPTA QPE responsible for track safety explains the track safety methods being utilized during the work. These Job Briefings will be documented by the Contractor at the time of the briefings. The record of Job Briefings shall be maintained by the Contractor for inspection by SEPTA.

E. The Contractor's gang watchperson must give their entire attention to watching for trains and warning the employees and are prohibited from performing any other duties. They must not leave their posts until instructed by SEPTA that the protection is unnecessary or other watchpersons have been assigned, are in position, and are watching in the direction of an approaching train.

F. The Contractor's Protection Assurance Representative shall be responsible to insure the safety of all personnel. The Contractor shall furnish and equip its foreperson or gang watchperson with audible and visible warning devices to warn personnel of the approach of trains.

G. The Contractor's Protection Assurance shall, before permitting employees on or close to the track, ensure that:

1. All employees shall have an understanding as to where they shall go when necessary to clear for trains.

2. All employees performing work on or about operating energized tracks and not fouling shall carry and display a Worker's Portable Warning Signal in accordance, with SEPTA's Operating Rules. The warning signal can be a Starlight Lantern, Model 215-TL or approved equal. Note that the Lantern may be furnished with a "Blue" lens cover. The Contractor shall have to replace this lens with an "Amber" lens cover to be in conformance with these regulations.

H. The Contractor's job forepersons presence at the work site is mandatory while the work is being performed on or close to the track area.

I. A maximum of four non-certified Contractor's employees who are not performing work may enter track areas where third rail power is energized accompanied by a certified employee (SEPTA's or Contractor's) with the approval of the Train Dispatcher or any duly authorized representative.

J. While working on scaffolding or non-conductive ladders on the platform, the Contractor's employees shall secure scaffolding/ladder to eliminate rolling or falling.

K. When small hand tools or construction equipment are used in electrified territory, the Contractor shall exercise due care including the clearance requirements to safeguard persons and property in the area. If the required clearance cannot be maintained or any hazards are involved, prior guidance from SEPTA's Project Manager shall be requested.

L. The Contractor's employees shall consider all tracks as operating tracks and be on the alert for trains operating in either direction at all times. When it is necessary to walk in the track area, it is the site superintendent and/or foreperson gang watchperson's responsibility to let the vehicle operator know where the employees are. To do this, first notify and gain approval of the train dispatcher, then protect the employees by displaying a lighted lantern or flashlight at all times. At first indication of an approaching train, get off the track promptly, and conceal light from vehicle operators.

M. Any employee leaving the work area for any reason shall receive permission from the on-site safety supervisor and protect himself with a lighted lantern or flashlight. He shall follow route to and from the work location designated by the foreperson in order to avoid crossing of track insofar as possible.

N. The Contractor's employees shall not step on track behind stopped trains, particularly those that have just arrived at stations, due to possibility of train having overrun the platform and being reversed to place doors properly for opening.

O. The Contractor's employees shall carry hand held flashlights at all times when working at night or in the tunnel area.

P. Contractor's employees provided with a flagperson, when hearing flagperson's whistle and/or watchperson's horn warning of the approach of a train, shall place tools and material clear of the track and depart the track area immediately to the nearest platform or place of safety without interfering with the pathway of passengers.

Q. Contractor's employees shall avoid track switches by walking around them.

R. Contractor's employees shall observe and acknowledge whistle signals as required. A warning whistle from vehicle operator must always be acknowledged by a proper hand, lighted lantern, or flashlight signal to proceed when you are in the clear except when you are working under protection of flagperson. If carrying a light, it must be concealed after proceed signal is given.

3.7.7 Overhead Wires

A. When equipment is used in electrified territory or in the vicinity of SEPTA electrical distribution cable as SEPTA overhead wires, the Contractor shall exercise special care to safeguard all persons in the area. Special attention shall be given in the vicinity of tunnel structures where the wires may be depressed.

1. All overhead wires, including catenary, transmission, and signal lines in electrified zones, shall be considered live at all times. Insulating covering of wire shall not be depended upon for protection against shock.

2. Use of metal ladders is forbidden in the area of overhead wires.

3.7.8 Emergency Guidelines

When an emergency occurs endangering life of a person that requires the power off, contact the Controller by the fastest means available, either by radio, emergency call box located on platforms, or telephone (215) 580-8565. Give the proper location requiring de-energizing by indicating the closest station, proper track number, and line.

In a case of electrical contact, personal judgment and initiative has to be used; bearing in mind that the rescuer's safety should not be imperiled. Contact with a live overhead wire or third rail may prove fatal in a matter of seconds. The most important thing is to stop the flow of electricity through the victim's body and then apply mouth-to-mouth resuscitation (or CPR when necessary and if qualified to do so) until he or she recovers consciousness or trained help arrives. Once a victim is freed from the overhead wire, do not move him or her unless they can do so under their own power. Except for qualified rescuers, moving an injured person may result in further injury.

If a fire in the vicinity of the overhead wire can be readily extinguished use a dry chemical extinguisher, do not use water.

3.8 Special Project Procedures

This section provides for the procedural requirements to enable the Contractor to plan and be granted concurrence for track outages, single tracking, service disruptions, and or diversions specified under the Contract.

Work crews and equipment, which SEPTA will make available to a Contractor.

The Contractor requesting approval to procure and operate track cars and/or high rail vehicles shall conform with procedures detailed below.

3.8.1 Submittals

Requests for service outages, shutdowns, diversions, and Site Specific Work Plans (SSWP) shall be submitted to the Authority by the Contractor for concurrence 21 calendar days prior to event requested. The Authority will respond within seven (7) calendar days of receipt of the submittal. Changes to the submittal once reviewed by the Authority, are also subject to a subsequent review by the Authority. These submittals must be annotated and reissued weekly to reflect changes to the scope or schedule created during the period between the original issue and the date of operation. No later than 10 days before a planned (the above referenced) operation, a new revision of the submittal incorporating all changes and reflecting the final work plan, must be submitted to the Authority.

Should the Contractor desire to cancel an approved operation, the written cancellation request shall be received by the Project Manager, a minimum of 7 calendar days prior to the operation date so that affected SEPTA operations can be rescheduled. Late cancellation requests shall result in the outage costs being assessed against the Contractor.

3.8.2 Request for Outages and Diversions

Requests for single tracking, track outages, and diversions, and a Site Specific Work Plan(s) (SSWP) for single tracking requests shall be submitted to the Project Manager by the Contractor for concurrence a minimum of 21 calendar days prior to the planned track outage work. The Project Manager will respond within seven (7) calendar days of receipt of the submittal.

The submittal, as well as changes to the submittal once reviewed by the SEPTA Project Manager, are also subject to a subsequent review by SEPTA Operations. These submittals must be annotated and reissued weekly to reflect changes to the scope or schedule created during the minimum 21-day period between the original issue and the date of operation. No later than 10 days before a planned track outage usage, a new revision of the submittal incorporating all changes and reflecting the final work plan must be submitted to the Project Manager.

Should the Contractor desire to cancel an approved track outage, the written cancellation request shall be received by the Project Manager a minimum of 7 calendar days prior to the track service usage date so that affected SEPTA operations can be rescheduled. Late cancellation requests shall result in the outage costs being assessed against the Contractor.

3.8.2.1 Request for Track Usage

The Request for Service (as defined above) shall be a time-scaled logic network. This network is to fully detail the extent of work proposed and the Contractor's plan and means for accomplishing same in the inclusive (#TBD) day period. Specific separate operations and planned service disruptions should be highlighted in these submittals.

The SSWP shall provide a description of work; time scaled hourly logic network, breakdown of labor force, materials, and the type of equipment that will be utilized. The SSWP shall include the Contractor's watchperson, required SEPTA flagging and support, construction methods, arrangements for emergency clearing and restoration of service, and sketches for defining the configuration of rail service and other operational elements at the end of the Contractor's outage.

All work by SEPTA Force Account Track, Signals, etc. and subsequent reviews that has the potential of delaying either the work by the Contractor, or the restoration of service, must be identified clearly in terms of scope and schedule for coordination with others.

SEPTA will not grant (as referred above) until the Contractor's SSWP has been reviewed by the Engineer and approved by SEPTA in writing.

The Contractor shall not perform any of the work required (as referred above) until written approval has been received from SEPTA.

3.8.2.2 Request for Surface Diversions

A. Bus

B. Light Rail

3.8.2.3 Request for SEPTA Support

A. Flagging

B. Signal

C. Power

3.8.2.4 Request for SEPTA Services

A. Work Crews

B. Professional

C. Equipment

3.8.3 Track Car / High Rail Vehicle (TC/HRV)

The Contractor shall formally request, by submittal, all track or hi-rail equipment proposed to be utilized for the work of the contract. The submittal shall be directed to the Authority for review and approval. This submittal shall include the equipment's physical characteristics, which include, but are not limited to the following:

A. Manufacturer's catalog cuts by showing all dimensions.

B. Any subsequent modifications noted and dimensioned.

C. Vehicle Identification Number, or serial number.

D. Must have a current Pennsylvania vehicle safety inspection sticker, if rubber tired.

E. If subway operation is planned, it must be diesel powered and equipped with either a catalytic converter or exhaust scrubber meeting U.S. Bureau of Mines Schedule 24 emissions.

F. Limiting physical dimensions of the operating mode.

G. The Project Manager will provide a clearance diagram and attach to their section if available. The Contractor shall also provide the following on-board equipment.

1. All powered vehicles will be equipped with a steering wheel lock.
2. Hydraulic outriggers will be equipped with locking pins.
3. Guards will be installed at all wheel pinch points.
4. All powered vehicles will have an ABC type fire extinguisher.
5. A tow bar and coupler adapter for rescue.
6. A clearance placard in the cab using the correct print.
7. Boom tie-down if applicable.
8. Wheel chocks to secure on rail if left unattended.
9. Railroad lighting package to provide marker lights for the end of consist.
10. Horn

H. Each vehicle shall have a unit number clearly marked on its exterior.

I. If operation of multiple consists is planned, each configuration shall be submitted for review as “Arrangement A, B, C, etc.” The traction and braking effort in comparison to the prime mover shall be calculated and provided.

J. A recovery plan shall also be provided for review detailing how the Contractor proposes to re-rail or recover disabled on-track equipment once it is operating on the rail.

3.8.3.1 Testing

SEPTA will inspect the equipment and grant approval if it meets safety standards or refuse operation of the equipment if it is not in safe condition, before any equipment may be placed on the rail. Any repairs or modifications found to be required will be done at no cost to SEPTA and a yard retest will be held. SEPTA will yard test equipment to determine actual performance in curves and crossover before granting permission for use. If the equipment is utilized to deliver materials, the loading shall also be reviewed for clearance. All requested consists will be tested at this time.

A. If any modifications are made after the initial yard test, the Contractor will notify the Authority in writing with details and receive approval before using it again on track.

B. If the approved vehicle or track car is taken off the project for another job and then returned, the Contractor must certify in writing that it is still in its original condition. If there is any question, a yard test and inspection will be scheduled at no additional cost to SEPTA.

3.8.3.2 Operation

A qualified SEPTA employee will assist the Contractor to place the equipment on the track. The SEPTA pilot must be on board when such equipment enters a siding or a point of access to the main rail. The SEPTA pilot as a minimum will ride the vehicle to and from the work zone.

The Contractor shall operate this equipment within the work zone specified in the Bulletin Order issued for that work. In addition, the following rules apply to the Contractor's personnel when placing equipment on the rail after receiving authorization from a qualified SEPTA Employee.

A. The TC/HRV driver shall perform a visual inspection to see that the track car and its consist is in a safe operating condition before being operated. Track cars shall not be operated if found in an unsafe condition.

B. The TC/HRV shall display a white light to the front and red light to the rear when visibility is restricted and at night. High Rail Vehicles shall have headlights on high beam when moving.

C. The TC/HRV shall not trail through spring switches or semi-automatic switches unless switches are properly lined.

D. The maximum speed for the movement of any TC/HRV is governed by the appropriate Operating Rule Book.

E. The TC/HRV shall be operated at a speed, which will permit them to stop short of any obstruction, improperly lined switch, or broken rail.

The Contractor shall include training of TC/HRV drivers in the appropriate part of their safety plan, and develop and maintain an updated log of these personnel.

The recovery plan will be kept in each powered vehicle and updated as changes are made.

All equipment shall comply with the appropriate requirements of 49CFR part 214; Final Rule, Roadway Maintenance Machine Safety.

3.9 ~~Construction~~ Project Facilities and Temporary Controls

3.9.1 Description

The Contractor shall provide temporary facilities and controls needed for the performance of its work including, but not necessarily limited to:

A. Field office for the Contractor's personnel;

B. Sanitary facilities;

C. Enclosures such as tarpaulins, barricades and canopies;

D. First-aid facilities;

E. Temporary fencing and other safety devices for pedestrian and vehicular traffic as well as isolating the construction area;

F. Entry Control.

3.9.2 Product Handling

The Contractor shall maintain and protect all temporary facilities and controls in proper and safe condition throughout progress of the work.

3.9.3 Temporary Utilities and Services

Power and Lighting

The Contractor shall provide, maintain, and pay for all costs of temporary electrical and lighting services required at the site for the proper performance and inspection of work. The level of lighting shall not be less than the existing. Remove services and lighting after completion of work and repair of all damages.

The Contractor shall provide area distribution boxes so located that the individual trades may furnish and use 100 ft. maximum length extension cords to obtain power and lighting at points where needed for work, inspection, and safety.

The Contractor shall provide all necessary items such as breakers, transformers, panel boards, and cable required for the service. The Contractor shall provide a complete distribution system expanded as required during the construction including wiring devices, outlets, distribution panels, transformers, cable, and other related work necessary to provide a temporary power system for use during construction.

The Contractor shall pay all costs associated with the utility tie-ins, physical plant, maintenance of system throughout construction, removal of same at project completion and any other items necessary in providing temporary power and light.

The temporary power and lighting system shall at all times conform with the applicable codes and regulations of OSHA, NEMA, UL, and the local municipality.

Heating

The Contractor shall provide and maintain heat necessary for proper conduct of operations.

3.9.4 ~~Access, Storage, and Parking Areas~~ Project Clean-Up

Upon final acceptance of the work, the Contractor shall clean up the work areas and leave them in a neat and orderly condition. The Contractor shall dismantle and remove all temporary fencing and barricades and other temporary items installed, unless otherwise directed by the Authority. The Contractor shall repair all damaged areas to their original condition.

3.9.5 NPT Field Office

The Contractor shall provide two separate field offices, one for the Contractor's and the other for SEPTA's use. These temporary office spaces shall be co-located, but must provide separate field offices for each. The Contractor shall bear all costs associated with providing and maintaining the NPT Field Office including all services and other items described in this Section through project completion, i.e. final project acceptance plus 30 days.

The field offices shall be located within one-half mile of SEPTA's Headquarters at 1234 Market Street, Philadelphia PA. The contractor shall submit a plan detailing SEPTA's Office and associated appententures including parking and a bill of materials of all required office equipment and supplies for the review and approval by SEPTA within 15 days of NPT.

The Contractor shall guard against unauthorized or illegal entry and protect the field office against vandalism, theft and mischief. The Contractor shall be responsible for the replacement and/or compensation for any item owned by the SEPTA or its employees or otherwise provided for project use, which is related to the subject work, that is removed or damaged as the result of vandalism, theft, mischief or illegal entry to the field office.

The Contractor's Project Manager shall be present at said office at all times while its work is in progress. The Contractor shall keep readily accessible, at the field office, copies of both the Technical Specification and all project related submittals

Field offices shall have sufficient lighting to provide a minimum of 100-foot candles at desk level, uniformly lighting all areas. In addition, each office shall have grounded duplex electrical receptacles around interior walls at approximately 10-foot spacing. There shall be an adequate number of circuits to handle the load.

Each field office shall be weathertight, with barred (if deemed necessary) windows and doors, each equipped with screens and adequate locking devices. Exterior doors shall be equipped with cylinder locks and dead bolts, both keyed alike and also provided with burglar-proof bars and locks across the doors. Provide six sets of keys.

Each field office shall have automatically controlled heating and air-conditioning systems with thermostats, capable of maintaining the office at an ambient temperature ranging between 64 and 78 degrees F. The Contractor shall provide fuel and bear all costs in connection therewith. In addition, all exterior wall, ceilings and floors shall be insulated.

The floor shall be covered with resilient flooring material such as asphalt tile or linoleum.

Each field office shall incorporate the following spaces:

A. Restroom: Include a restroom with lavatory, toilet, plunger, soap holder, toilet paper, holders, paper towel dispenser, wastepaper basket, mirror, sink with hot and cold water supply. The restroom shall also include a closet or shelf to hold supplies.

B. Kitchen: Include a kitchen with microwave oven, coffee maker, counter or table space, cabinet(s) for supplies, and at least two duplex outlets on two separate circuit breakers for appliances.

At the completion of the project, the Contractor shall provide for the removal of all temporary field office and/or equipment.

3.9.5.1 Field Office Services and Utilities

The Contractor shall be responsible for provide the following utilities and services to each field office, and bear all costs in connection therewith:

A. Water, sewer, and electrical utility and communications services as required.

B. Continuous telephone service within the field office and bear all costs in connection therewith, including long distance telephone charges until final completion and acceptance of the work. Each separate telephone line shall have voice mail, except for the facsimile line. The Contractor shall provide telephone service and equipment as follows:

1. Project Manager: one separate phone line (number) on one speakerphone instrument.

2. Project Engineer: one separate phone line (number) on one speakerphone instrument.

3. Field Engineers one separate phone line (number) on one telephone instrument for each of the three Field Engineers.

4. Facsimile machine (All in one machine): One separate phone line (number) for the FAX machine.

5. Conference telephone: One Polycom SoundStation conference telephone shall be provided and installed on a work table. Each of the three Field Engineer's telephone lines shall be bridged and terminated in three jacks near the conference telephone such that one of the three can be selected to plug in the conference telephone.

C. Broadband Internet service, 10Mbps download speed: The Contractor shall provide continuous Internet access through an Internet Service Provider (ISP).

3.9.5.2 Field Office Equipment

Each field office shall include, but not be limited to the following standard equipment:

- All-in-One Laser color printer, scanner, copier, fax on a sturdy table
- Armchairs
- Bookcases
- Chairs
- Coat Rack
- Coffee Maker
- Cork board, 3' wide by 4' high
- Credenza
- Desks, office type
- Desks, computer type
- Desk Lamps (one per office type desk)
- Desktop computers and accessories
- Drafting Table, T-square and Stool

- File Cabinets (lockable, lateral, four drawer, 3 feet wide)
- Fire Extinguisher (for class A, B, C fires)
- First Aid Kit (wall mount)
- General Office Supplies (e.g. staplers, pencils, pads)
- Hole punch
- Hole Punch, Three hole, heavy duty
- HVAC (Heating and Air Conditioning)
- Key locker (two each, 12 key capacity)
- Leased Vehicle
- Lockers, 15 inches wide by 72 inches high
- Microwave oven
- Network accessories and Internet Service
- Office Lighting
- Plan storage rack, 24 inch sticks
- Radios, portable, UHF
- Refrigerator
- Sanitary Facilities and supplies
- Storage Cabinets, 3’ wide by 6’ high, lockable
- Telephones
- Thermometer, indoor wall mount
- Wastepaper Baskets
- Water Cooler with appurtenances
- Work Tables, 3’ wide by 6’ long
- Wall Clock

- White boards for dry erase markers, 4' wide by 3' high, with markers, eraser and cleaning kit

The above products shall be provided in a new condition, and shall be sturdy and durable.

3.9.5.3 Field Office Maintenance

The Contractor shall provide continuous maintenance off all field office facilities and services throughout the duration of this project. This shall include:

A. Daily janitorial service for offices and toilet facilities and provide toiletry supplies as necessary. The Contractor shall clean the windows bi-weekly. Maintain a supply of coffee, disposable cups and additives.

B. All electrical and communications tie-ins for the field office and provide continuous maintenance of utility tie-ins during the project.

C. Repairing or refinishing any damaged areas as required.

D. Repairing or replacing computers, printers, and network equipment within 48 hours of becoming inoperable or defective.

3.9.5.4 Field Office Vehicles

The Contractor shall provide at his sole cost and expense two sport utility vehicle (SUV) such as a Ford Explorer, Chevrolet Blazer or Dodge Durango and all items related to supporting the use of the vehicle. The vehicle shall be used solely by SEPTA for SEPTA Project personnel to perform their field inspection and related project duties. The vehicle shall not be older than one year, with a maximum accumulated mileage of 15,000. The vehicle shall be provided to SEPTA for use not later than thirty days after Notice to Proceed.

The Contractor shall be responsible for paying for and maintaining the insurance, registration, state inspection, maintenance and repair of the vehicle, gasoline and oil. An oil company credit card shall be provided to SEPTA to purchase fuel, oil and windshield wash fluid for the vehicle. The Contractor shall pay the credit card charges. A suitable replacement vehicle shall be provided whenever the original vehicle requires maintenance or repair.

The vehicle shall include the following features: Air conditioning, 4.0 liter engine, four-wheel drive, 5-speed automatic transmission, four-wheel ABS brakes, seating for five people, AM-FM radio, 52" amber LED / Halogen overhead warning light bar with forward and rear facing 360 degree rotating beacons and / or strobe lights. The light bar shall have a rear facing "Traffic Advisor" directional warning signal incorporated into the light bar.

The vehicle shall be provided for the duration of the Contract. The vehicle shall be retained and utilized by SEPTA for the same duration as the field office.

The Coordinating Contractor shall pay all expenses related to the vehicle including providing a parking space at the field office location.

3.9.5.5 Field Office Parking

The Contractor shall provide a minimum of three (3) parking spaces within the vicinity of the each Field Office dedicated for SEPTA vehicles.

3.9.5.6 Video Conferencing Equipment

To support the project, the Contractor shall provide a video conferencing system. This video conferencing system shall be web based and run over ~~a~~an TCP/IP protocol. The video conferencing system design shall utilize Quality of Service (QoS) protocols to support real-time communications within the TCP/IP architecture. The video conferencing system shall satisfy the following real-time communication performance parameters averaged over a maximum period of one (1) hour during SEPTA's normal business hours:

- Packet Latency shall be less than 100 milliseconds (from speaker to viewer/listener). This latency shall include delays from encoding, transmission, and decoding the signal.
- Packet Jitter shall be less than 40 milliseconds and shall be measured as the packet inter-arrival time.
- Packet Loss shall be less than 0.1%.

The above listed real-time performance parameters shall be applicable to traffic flowing through all access links between the host networks of video conferencing participants and the SEPTA WAN.

This video conferencing system shall be a commercially accessible system that can be accessed by an unlimited number of users via a web-based application from a desktop or laptop.

Video Conferencing Hardware

To support the video conferencing hardware, the Contractor shall provide two video conferencing stations for SEPTA. These video conferencing stations shall include:

A. 42" Widescreen (16:9 aspect ratio) LCD Flat Panel Monitor with DVI, VGA, S-Video, and HDMI inputs

B. Video Conference Camera that incorporates:

1. 340 degree Pan and 120 degree tilt

2. High Zoom Ratio AF Lens: 18x Optical + 12x Digital

3. Minimum illumination less than 1 Lux

4. NTSC Signal System

5. 720x480 Resolution

C. One echo cancelling conference room microphone

D. Four (4) lapel type wireless microphones

E. All necessary cabling

F. All necessary computer and network hardware to integrate conference equipment and properly operate a video conference without dropped communications or lag.

3.9.5.7 SEPTA Project Office

The SEPTA field office shall have a minimum of 850 square feet of usable area. This space shall be divided into areas and equipped as follows:

A. Project Manager's office: Office desk, credenza, computer desk, desktop computer and accessories, bookshelf, two guest chairs with arms, white board with accessories, key box.

B. Project Engineer's office: Office desk, computer desk, desktop computer and accessories, bookshelf, one guest chair with arms, white board with accessories.

C. Field Engineers' areas (three): Office desk, one guest chair with arms, bookshelf.

D. Open work area: Supply cabinet, two lateral file cabinets, white board with accessories, cork board, the All-in-one printer / copier / scanner / fax specified above, two work tables end-to-end with eight low-back arm chairs and conference telephone, coat rack with sturdy hangers, key box, drafting table with stool, plan rack, five lockers.

Each office desk shall have a swivel high back five-legged armchair, desk top lamp, in / out mail bin, wastepaper basket, tape dispenser, stapler, 18" ruler, scissors and desktop holder for miscellaneous items. Desks shall be lockable and two keys provided. Each desk shall also have a multiple outlet strip with circuit breaker and surge suppression.

Electronic Equipment

For the SEPTA Project Office, the NPT Contractor shall provide:

A. Two (2) Dell Dimension 4700 desktop PC with:

1. Dell UltraSharp 1905FP 19" Flat Panel Display
2. 4GB memory
3. Dual 160GB Serial ATA Hard Drives (minimum)
4. Video card, sound card, speakers, Dell Quietkey Keyboard, Microsoft Optical USB mouse with scroll button, Integrated 10/100 Ethernet and MS Windows 7 Professional operating system. Compact Flash and Secure Digital card reader, Dual Optical drives consisting of 16x DVD-ROM Drive and 16x DVD+/-RW. Norton Internet Security and AntiSpyware and with anti-virus subscription maintained. 1GB USB 2.0 Flash memory key. A 10 pack of DVD +R discs, 100 pack CD-R, 100 standard size CD cases, Roxio Easy Media Creator, CD label kit with 100 laser compatible CD labels. Microsoft Office Professional Edition, Microsoft OneNote, and Adobe Acrobat Elements. For all software including operating systems, the latest edition shall be provided, the original CD-media and a hard copy manual. Provide an Uninterruptible Power Supply (UPS) with capacity to handle the desktop PC.

B. All-in-one laser network ready, color printer, copier, scanner, fax machine and ancillary items: Provide the following or approved equal:

1. HP Color LaserJet 2840 All-in-One, with memory card slot, network ready with standard accessories including print cartridges. Provide one, 10' USB 2.0 cable.

2. A separate, sturdy table to support the printer, cable modem and switch / router.

3. A multiple outlet strip with circuit breaker and surge suppression including for telephone line. Provide and maintain on hand one spare print cartridge of each color.

4. Supplies for all printers for an average usage of approximately 10,000 copies per month, including one on-hard spare of all print cartridges

C. Radios: Provide five each of the following radios and accessories:

1. Motorola HT-750 radio Model Number - AAH25SDC9AA3AN, 16 Channel UHF Portable Radio. To include Battery P/N - HMN9008A 7.5 Volt Nickel Metal Hydride, Antenna, Rapid Desk Charger, Lapel Microphone, Leather Case, 2 Year Warranty, Operator Manual and one spare battery per radio. Provide one service manual that will be retained by SEPTA's radio shop.

D. Linksys BEFSR81 EtherFast Cable Router with 8-Port Switch and CAT 5E cables. Install CAT 5E cabling, jacks and equipment and setup network.

1. Connect Cable modem to router / switch.

2. Connect router / switch with CAT 5E cables to desktop computer desks, to the network printer on printer table and to each office desk.

3. Provide a jack at each point for termination. Provide ten feet patch cables, or longer cables if necessary, to enable connection of all devices.

4. Patch cables shall reach any point within an office.

5. All cables are to be installed in a professional manner including the avoidance of tripping hazards.

E. Provide a multi-outlet surge protector for each computer desk, the all-in-one table and each office desk for power connections.

F. Install hardware at each desk to enable a security cable to be connected and not easily removed.

3.9.5.8 Contractor's Project Office

The Contractor's office shall have an adequately sized and equipped conference room in their field office to hold Project Meetings such as coordination meetings with other prime contractors. The conference room shall include a projector and screen for PowerPoint presentations.

~~The Contractor shall establish an NPT Field Office for the duration of this project. Within this office, the Contractor shall provide SEPTA with dedicated space.~~

~~The Contractor shall furnish and maintain a field office with a telephone within the SEPTA service area for the entire period of construction. The Contractor's Project Manager shall be present at said office at all times while its work is in progress. The Contractor shall keep readily accessible, at the field office, copies of both the Technical Specification and all project related submittals.~~

~~The physical location of the compound should be in an area that can be reasonably accessed from SEPTA headquarters, and will require written approval of SEPTA. The Contractor shall submit to SEPTA this plan for the NPT Field Office within 90 days after Notice to Proceed (NTP).~~

~~The Contractor shall provide all necessary security for this Field Office. Additionally, the Contractor shall provide a minimum of three (3) parking spaces within the vicinity of the NPT Field Office dedicated for SEPTA vehicles.~~

3.9.6 Temporary Barricades, Enclosures, and Fencing

The Contractor shall provide all temporary barricades required by the Phasing Plans, including barricades for designated Contractor work areas, Contractor laydown areas, and public access for areas that must remain open during a phase.

The Contractor shall submit drawings of the proposed temporary barricades for SEPTA's review. Barricades shall not be installed until the drawings for them have been reviewed by SEPTA.

The temporary barricades shall be as follows:

A. Barricades shall enclose and prevent entry into the work area and shall be full height and dustproof.

B. Barricades shall be constructed of materials suitable for location. Wood construction shall conform to the AFPA "National Design Specification for Wood Construction", the latest edition. As a minimum, the barricades shall be constructed of 5/8 "thick APA rated exterior grade plywood. Framing members shall be Spruce-Pine-Fir No.2 or better, a minimum of 2" x 4" and larger sizes as necessary, spaced at a maximum 16" on center to provide a rigid temporary structure to resist all applicable loads.

C. Barricades shall be painted on all solid surfaces exposed to public view.

D. Traffic cones and/or stakes with ribbons shall not be used in SEPTA Stations to differentiate construction areas in lieu of barricades.

Temporary Doors: The temporary barricades shall have a reasonable number of hollow metal doors and frames, with locksets, at locations acceptable to SEPTA. The locksets on the doors requiring SEPTA access for operational and safety reasons shall be keyed to SEPTA's Standard Lock System.

On a daily basis, the Contractor shall maintain the temporary barricades in a "like new" condition. The Contractor shall remove graffiti and restore surfaces on a continual maintenance basis. Maintenance shall continue until the barricades are removed.

The Contractor is required to enclose areas required by SEPTA for access and maintenance. If these areas are in public areas, they shall be secured with temporary barricades and doors in accordance with the above requirements. The Contractor shall take all means to alleviate any or all tripping and falling hazards both within the work site but also in public areas. Areas where the general public or passengers may fall shall be secure and covered.

3.9.7 Security

The Contractor shall provide adequate security measures to protect material, equipment, and work from all incidental and intentional damage or theft at all project site locations, staging areas and fabrication yards. The use of guard dogs and the possession of firearms on SEPTA property are prohibited. Security measures shall include, at a minimum, the following:

A. Exterior lighting of 20 – 30 lux within any yard areas.

B. 8' high chain link fence enclosure with gate(s) so the yard areas may be fully secured during non-work periods. Chain link fence fabric to have openings no greater than 25mm.

3.10 Project Identification Signs and Other Signage

The work specified in this Section consists of furnishing and installing project identification signs and temporary construction signs as described below and required by the Technical Specification.

The Contractor shall be responsible for Project Identification and Temporary Signs.

3.10.1 Submittals

The Contractor shall submit the following:

A. Shop drawings of each sign scheduled to be utilized during construction. Indicate materials, size, location, fonts, and colors proposed for use.

B. After consultation with the Project Manager, the sign information as listed below, for review and approval by SEPTA.

1. Sketch and narrative description identifying the location, orientation and mounting height of each sign.

2. Total quantity of each sign to be utilized

3. Name, address, telephone number, and key contact person of the company responsible for the fabrication of the sign.

C. Hardware and mounting details for erection of each sign.

3.10.2 Job Conditions

All signs shall be commercial quality and approved by SEPTA prior to fabrication.

The Contractor shall install Project Identification Signs within forty-five (45) calendar days after the Notice to Proceed. The Contractor shall provide four Starburst project signs to accommodate work conducted on up to four stations simultaneously. The Contractor shall move the signs as work progresses to follow-on locations. All signs shall be maintained in good condition, and replaced if necessary.

For Temporary Signage, refer to SEPTA Dwg. G025.

The No Trespassing Sign is to be installed within the Contractor's Project compound and other areas to be determined by the Project Manager. SEPTA's Graphic Department will furnish an electronic copy.

Signs of personal nature, such as business advertisements or labor union notices will not be permitted.

3.10.3 Project Identification Sign

3.10.3.1 Construction

Signs shall be cut from a standard 4' x 8' x ¾" thick, waterproof exterior A-B grade plywood with a smooth, finished surface. Edges shall be rounded to a 1/8" radius. Joints will not be permitted.

Mounting Material

The Contractor shall provide mounting frames and hardware of such quality to be able to support the sign under all weather conditions for the duration of the project.

Unless surface mounted, signs shall be supported with frames constructed from pressure treated dimension lumber, or other approved non-conductive material, of sufficient size to brace against weather conditions.

All surface mounted signs shall be secured using anchoring devices approved by SEPTA.

All signs and frames shall be constructed from galvanized screws or bolts with nuts and washers. All hardware visible in the finished assembly shall be painted to match the adjoining surface of the sign or mounting.

All posts shall be constructed from pressure treated dimensional lumber or other non-conductive material acceptable to SEPTA.

Paint

The Contractor shall paint sign surfaces, posts and mounting frames with one coat of primer sealer and two coats of white semi-gloss enamel on all sides and edges.

The Contractor shall paint sign text and/or graphics on Project Signs using “Warm Red” and “Reflex Blue”, as indicated on the applicable sign sketch(es) attached at the end of this section.

All paints shall be manufactured for exterior use by a manufacturer acceptable to SEPTA.

Acceptable Fabricator

All signs shall be fabricated by a company specializing in and having documented experience in the fabrication of graphic signs.

3.10.3.2 SEPTA Project Sign

The Contractor shall be provided with a sketch of a sample of the 4’ x 6’ SEPTA Project Sign.

A. SEPTA will provide the Contractor with a proof copy of the information to be displayed on the SEPTA Project Sign no later than 90 days after NTP.

B. The Contractor shall obtain the services of a graphic sign company to transfer the information contained on the SEPTA provided computer disk onto 0.1 mm pressure sensitive vinyl with Weather-All Fluorinated Polyurethane Coating, or approved equal film. The vinyl shall be mounted onto the sign surface. Available graphic sign companies include, but are not limited to, the following:

1. Berry & Homer, Inc., Philadelphia, PA;

2. Burton Photo Industries, Inc., Philadelphia, PA;

3. Liberty Graphic Systems, Inc., Feasterville, PA; or

4. Ridgeway's, Philadelphia, PA.

C. The Contractor shall not include information on the SEPTA Project Signs except that contained on the proof copy as provided by SEPTA.

D. The Contractor is responsible for advising the Project Manager of any problems that occur during the production of the SEPTA Project Sign.

3.10.4 Temporary Signs

Temporary signs are considered to be any sign not previously outlined above that is required to be erected during the construction phase of the project and removed at the completion of the construction phase of the project. These signs include, but are not limited to, Field Office signs, and safety and instructional signs for workers and visitors. This section does not include signs utilized and required for the purpose of identifying public street traffic closures and/or detours, and pedestrian and passenger control.

Field Office Signs:

A. Size: 4' x 5' wide.

B. Letter with black enamel paint, using block letters at least 4" high, with the Contract name. Contract number, and the words "CONTRACTOR'S FIELD OFFICE" or "SEPTA'S FIELD OFFICE" as appropriate with each word painted on a separate line.

C. Where the field offices to be identified are not readily visible from the work site entrance, a directional arrow shall be painted on the sign and the sign shall be located near the entrance. In this case, additional signs of reduced size with the words "CONTRACTOR'S FIELD OFFICE" or "SEPTA'S FIELD OFFICE" shall be provided as necessary to direct traffic to, and identify the field office location(s).

A. TEMPORARY SIGNS (Refer to Dwg. SEPTA G025)

No Trespassing Sign

A. Sign base will be white baked enamel aluminum, 12" wide, 18" high, and 0.062" thick. Additional prints of two colors will be used; fire red and black. 1" border on the top and both sides and 1/2" border on the bottom.

B. Sign Information

1. 1" down from the top is a 10" wide x 2.75" high fire red block with reversed out white copy at 1.5" Helvt. Med. Acct. A. K. Rev. M that reads: **WARNING** centered in caps.

2. 5" down from the top is the baseline for 0.75" Helvt. Med. Acct. A. K. Rev. M, black copy to read: **NO TRESPASSING** centered in caps.

3. 8.75" down from top is the center of a 6" fire red outlined circle .5" thick with a diagonal 45 degree slash from the upper left to the lower right of the circle. Behind the circle and slash is a 4.5" pictograph of a walking pedestrian.

4. 13" down from the top is the baseline for 0.75" Helvt. Med. Acct. A. K. Rev. M, in black copy to read: **AUTHORIZED** centered in caps.

5. 14.125" down from the top is the baseline for 0.75 Helvt. Med. Acct. A. K. Rev. M, in black copy to read: **PERSONNEL ONLY** centered in caps.

6. 16.5" down from the top is the baseline for 0.375" Helvt. Med. Acct. A. K. Rev. M, broken down in 4 lines of black copy to read:

All Others Will Be Prosecuted In

Accordance With the Penalties Provided

In Section 3503 of The Pennsylvania

Crimes Code.

Centered with initial caps.

7. 17.5" down from the top, flush right, is the base line for 0.5" SEPTA logo in black.

C. Fasteners shall not be incorporated in the sign. Contractors can drill holes in the signs to mount them on fencing, walls, and barricades not to obstruct the message of the sign.

3.10.5 Inspection

Prior to erection, all signs shall be examined to verify that the size, material, and wording is in accordance with the approved shop drawings.

The Contractor shall examine areas and conditions under which the signs are to be located. Prior to erection, the Project Manager must be notified of any conditions that may differ from the information identified on the sign submission.

3.10.6 Erection

The Contractor shall install signs in accordance with approved shop drawings and as directed by the Project Manager. All non-surface mounted signs shall be supported on a minimum of two posts, anchored into the ground at a depth sufficient to provide rigid support of the sign during all weather conditions. Signs shall be provided as follows:

A. Project Signs and SEPTA's Field Office Signs at places designated by SEPTA.

B. No Trespassing signs shall be posted on every side at 40' spacing on all temporary fences and walls, barricades and compound fencing.

C. Temporary Signs (Refer to SEPTA Dwg. G025)

1. Provide one sign for SEPTA's field office to indicate the owner's location.

2. Provide and install other temporary signs deemed necessary for the project by SEPTA. Refer to Signage List (Refer to Dwg. G025).

Sign Maintenance

The Contractor shall maintain all signs throughout the course of construction from installation until contract completion, keeping them clean, free from graffiti, in good repair, and free of obstruction. The Contractor shall provide and maintain adequate protection against weather so as to preserve all work, materials, equipment, apparatus, and fixtures free from injury or damage. The Contractor shall maintain all signs free of all unrelated signs, posters, painting, advertising and defacement of any kind. Within five days of notice, the Contractor shall clean, repair or replace signs as necessary to maintain them in a "like-new" condition.

Within five days of final acceptance of the project by SEPTA, all project identification and temporary signs must be removed and disposed of. All costs for the removal and disposal of signs shall be borne by the Contractor.

3.11 Amtrak Safety Requirements

The safety rules of Amtrak are applicable to all of the Contractor's employees and those of its subcontractors in regard to conduct while on or close to the Amtrak property. The Contractor and its subcontractors must have a SEPTA representative with them while on Amtrak property. The Contractor shall not contact Amtrak directly but all communication with Amtrak must be initiated by SEPTA. Refer to the Amtrak safety exhibits Appendices A.3 "Amtrak EP301401141A Safety and Protection of Railroad Traffic and Property," A.4 "Amtrak PTE 2006-12-01- Permit to Enter upon Property," and A.5 "Amtrak Contract Requirements/Specifications" for complete instructions.

Section 4 – Fare Media
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4 FARE MEDIA ~~PROCESSING~~

The New Payment Technology (NPT) System shall utilize multiple forms of new media for payment of transportation services. This section specifies types of Fare Media to be employed and associated processing and hardware requirements, including:

- types of Fare M~~m~~edia issued and processed by the NPT System;
- Fare M~~m~~edia handling module requirements;
- fares ~~provided~~supported within the NPT System; and
- F~~f~~are M~~m~~edia tracking needs.

New media issued by SEPTA and SEPTA-partners shall primarily be C~~c~~ontactless Smart Media ("Smart Media"), which shall be closed-loop, open standard, account-based Media incorporatinge~~e~~ electronic memory and contactless communications methods. To ensure that SEPTA Smart Media has the widest possible opportunity for account reload at non-SEPTA locations, SEPTA requires that SEPTA Smart Media also have a magnetic stripe for reloading purposes only.

SEPTA's NPT System and SEPTA Smart Media (both the contactless and magnetic interfaces) as provided by the Contractor under the NPT Contract shall be certified as compliant with the standards of a contact and contactless open standard payment platform of the U.S. financial services industry. Acceptable open standard payment platforms include MasterCard PayPass®, Visa payWave®, American Express ExpressPay®, and Discover Zip®. Contractor shall submit the proposed open standard payment platform to SEPTA for review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 4-1, PDR 4-1.**

SEPTA requires that the Contractor acquire a license that entitles the NPT System to utilize the Approved open standard payment platform. This license shall be valid for the life of the NPT System. The license and all rights associated with license shall be transferred from the Contractor to SEPTA upon Final Acceptance of the NPT System. **CDRL 4-1**

The Contractor shall configure the NPT system to process all forms of payment and all Smart Media in accordance with the requirements of the open standard payment platform license.

The validity of ~~the presented~~ Smart Media presented for payment of transportation services shall be verified via account information stored in the Central Data Reporting and Collection System (CDCRS) as described in Section 5 ~~(account-based) and/or based on the information stored on the Smart Media itself (media-based)~~.

The NPT System shall accommodate Smart Media in any form, which is ISO/IEC-14443 compliant, including NFC-based devices. While it is anticipated that the majority of Smart Media shall be credit card-sized media, the use of key fobs, watches, mobile phones and any other similar ISO/IEC-14443 compliant devices shall be usable in the NPT System, as determined by SEPTA.

~~Limited Use~~Magnetic Fare Media shall be issued by the NPT System for short-duration ~~term usage~~ticketing purposes. The validity of this presented media for transportation services shall be verified based on the information stored on the media itself and also shall be verified against the CDCRS for fraud mitigation purposes (see Section 4.7).

The Contractor shall supply new Fare Media to be issued by SEPTA and utilized within the NPT System. All Fare Media shall fully comply with all standards referenced herein except where otherwise specifically identified ~~otherwise~~.

All NPT System equipment that process fares shall be equipped with Smart Media Processors (SMPs). The SMPs shall be capable of processing all Smart Media that is accepted by the NPT System, and shall satisfy all performance requirements defined herein.

Some NPT System devices shall also be equipped with Magnetic Media Swipe Readers and Magnetic Media Dispensers to issue and process magnetic fare media.

NPT System equipment shall accept Smart Media provided by registered and authorized partner organizations such as local employers, adjoining public transit agencies, universities, etc. The NPT System shall also accept compatible contactless media that is available to the public from third parties, including Contactless Credit and Debit media.

The NPT System shall initially accommodate all fares as presently provided by SEPTA (see tariff in Appendix A.22), subject to on-going change of the values associated with these fares as well as fare products due to fare and policy changes by SEPTA.

4.1 Media Processing and Dispensing Modules

The NPT System equipment shall incorporate media processing and dispensing modules as required to satisfy SEPTA's fare policies. The Contractor shall provide certification documents for the SMP and Smart Media Dispenser Module from a qualified, independent third party testing firm as confirmation that the devices are fully compliant with ISO/IEC-14443 and open standard payment platform requirements. These certifications shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 4-2**

Similarly, the Contractor shall provide certificates during the Preliminary Design Review from a qualified, independent third party testing firm confirming that the ~~l~~SEPTA~~ong term and limited use~~ Smart Media meets all ~~relevant~~ required ISO/IEC-14443 and open standard payment platform requirements. **PDR 4-3**

4.1.1 Smart Media Processors

NPT System equipment shall incorporate Smart Media Processors (SMPs) to electronically read and, when necessary, modify data encoded on Smart Media. The SMPs shall:

- Fully comply with the most recent version of the ISO/IEC-14443 standard, including recent revisions to ISO/IEC-14443-2 that support new data bit rates up to 848 kilobits per second;
- Accept Smart Media using both ISO/IEC-14443 Type A and Type B communications signal interfaces;
- Incorporate hardware certified as fully compliant with relevant portions of the most recent version of the Europay / ~~Visa /~~ MasterCard / Visa (EMV) Integrated Circuit Card Specifications for Payment Systems Standards and EMV Contactless Specifications for Payment Systems. Smart Media Processors shall be certified compliant as EMV Level 1 and Level 2 terminals.
- Incorporate hardware which can fully accommodate the EMV Entry Point standard for contact and contactless payment media;
- Include the necessary hardware and embedded firmware to accept and keep secure the encryption keys required to process (encrypt and de-encrypt) data read from and communicated to the Smart Media;

- Include the necessary software functionality to process all Smart Media to be accepted by the NPT System, including ~~SEPTA-issued~~SEPTA Smart Media, Ppartner ~~-issued~~ Smart Media, and Contactless Credit~~/ and~~ Debit Media.

- Properly read all Smart Media not less that 99.995% of the time the Smart Media is properly presented to the SMP. All data read shall be properly transferred and stored without data loss.

When SEPTA elects to accept EMV-based Smart Media then, the Contractor shall:

- Provide certification documents for the SMP from qualified, independent third party testing firm confirming that the SMP is fully compliant with EMV Contactless Specifications for Payment Systems requirements. The certification documents shall be submitted for SEPTA review and approval not less than sixty (60) days prior to activation of the EMV requirements and not more than ten (10) days after certification has been completed. **CDRL 4-2**

- Be responsible for obtaining timely recertification for all NPT System elements as software changes are made which require recertification prior to warranty completion. **CDRL 4-3**

- Have all elements of the NPT System recertified to verify full compliance with EMV Contactless Specifications for Payment Systems at the completion of the warranty and prior to responsibility for the NPT System transferring to SEPTA. **CDRL 4-4**

4.1.2 Smart Media Dispenser Modules

NPT field equipment shall dispense ~~both~~ SEPTA ~~-Issued Long Term and Limited Use~~ Smart Media.

~~For long-term use SEPTA-Issued Smart~~SEPTA Issued Smart ~~Media,~~ Smart Media Dispenser Modules shall read data from ~~and encode data to~~ the Smart Media as required to satisfy all relevant functional requirements stated herein. The ~~SEPTA-Issued Smart~~SEPTA ~~Issued~~ Smart Media information shall then be forwarded to the CDCRS ~~(~~where an account shall be automatically created ~~and data stored for account-based Smart Media)~~. Aall SEPTA Issued and Partner Issued Smart Media shall be anonymous unless the Smart Media is registered by the Customer.

~~For Limited Use Smart Media (LUM), Smart Media Dispenser Modules shall read data from and encode data to the Smart Media (or Smart Media account) as required to satisfy all relevant functional requirements stated herein. In addition, dispensers for LUM shall also print information on the Smart Media.~~

The Smart Media Dispenser Modules shall comply with the most recent version of ISO/IEC-14443, and be capable of reading and encoding using both Type A and Type B communications signal interfaces.

4.1.3 Magnetic Media Swipe Readers

Magnetic Media Swipe Readers shall:

- ~~Be able to r~~Read and process existing SEPTA magnetic media (see Appendix A.10 "SEPTA Magnetic Pass Specifications 2006"), and bank issued magnetic credit and debit media;
- Read data from both ISO/IEC-7811 Track 1 and Track 2 simultaneously;
- Permit the customer to retain control of the media at all times;
- Never capture the magnetic media;
- Never alter the contents of the magnetic stripe; and
- Successfully read magnetic media ranging in thickness from 8 mils (.008 inch) to 3~~0~~5 mils (.03~~5~~0 inch). Magnetic read heads shall automatically adjust to the thickness of the media being read, and when properly maintained, shall withstand no less than 500,000 reads without degradation in read success rates.

The use of magnetic media dip readers is prohibited.

4.1.4 Magnetic Media Dispenser Modules

Using Magnetic Media Dispenser Modules, FVDs, TIMs and POFMs ~~that dispenses magnetic media~~ shall encode and verify magnetic data, and print information on the Magnetic M~~m~~edia as required to satisfy all relevant functional requirements of the contract.

All magnetic media printing shall be by direct thermal technology.

The dispenser module shall cancel (overprint with "VOID" or other text as directed by SEPTA) and capture all media that fail the magnetic verification process within the FVDs, TIMs and POFMs.

~~The~~ For ~~the~~ SEPTA ~~transit~~ Magnetic Media, Magnetic Media Dispenser Modules shall encode media using the existing SEPTA magnetic data format. ~~Transactional information shall be sent to the CDCRS upon issuance of any Magnetic Media. The CDCRS shall use this data for fraud mitigation purposes. The proposed set of transactional information shall be subject to SEPTA review at Conceptual Design Review and approval at Final Design Review. **CDR 4-1 FDR 4-1.**~~

The Magnetic Media Dispenser Modules shall also be able to accept and process a magnetic ticket to meet SEPTA's functional needs. First read accuracy for the accepting and processing Magnetic Media shall be not less than 99.95%. Second read accuracy shall be not less than 99.995%.

Contractor shall provide a magnetic encoding system for the parking Magnetic Media, to meet the functional needs of the parking requirements within the NPT System. The structure, content and format of data to be written to Parking Magnetic Media shall be subject to SEPTA review at Conceptual Design Review and approval at Final Design Review. **CDR 4-2 FDR 4-1**

4.2 Media

The Contractor shall supply the following Ffare Mmedia to be issued and processed by the NPT System:

- ~~Long-term Use Smart~~SEPTA ~~Issued~~ Smart Media, ~~which shall comply with the requirements identified in Section 4.2.2 and~~ shall be designed for repeated use over a minimum expected life of three years. This Smart Media shall support customer processing for ~~both~~ account-based ~~and media-based~~ Smart Media for pre-paid value, post-paid ("pay as you ride") value (account-based only), fixed period passes, pre-paid and post-paid (account-based only) rides/trips, floating period passes, embedded transfer privileges, and any combinations of these requirements.

- ~~LUM, which shall be used for limited quantity trip Fare Media. It shall enable customers to pay their fare and enter the system through Turnstiles and Passenger Encounter Targets, and, as necessary according to SEPTA fare policies, shall include transfer privileges to connecting subway/elevated and bus services. LUM shall support single ride, day pass, weekend pass, low-value stored value, and other short-duration fare types. This fare media shall not be replenished, and shall be designed to be disposable.~~

- Magnetic Fare Media, which shall be used to support ~~-~~single trips and other similar short-term fares. This type of fare media shall be issued as read-only, shall utilize the existing SEPTA magnetic encoding format, shall not be capable of being replenished, and shall be designed to be disposable. SEPTA's complete Magnetic Pass Specifications is provided in Appendix A.10 "SEPTA Magnetic Pass Specifications 2006."

In addition to the above fare media, the NPT System shall, at designated locations, with designated devices, accept cash, credit media, ~~and~~ debit media and Open Payment Smart Media for fare payment, including adding fare products to ~~Smart Media and~~ Smart Media accounts.

Neither cash nor tokens shall be accepted for fare payment by the turnstiles or faregates. ~~No cash and token transactions shall occur at the turnstile or faregate arrays.~~

4.2.1 Security

Smart Media shall incorporate comprehensive security schemes to ensure that the ~~data stored on the~~ Smart Media cannot be cloned or deciphered by an unauthorized individual through the use of standard, third party smart card reading devices, “brute force” or other methods known at the time of the start of the Final Design Review.

The final security measures proposed to be in place for the initial implementation phase shall be submitted for SEPTA review and approval at the Final Design Review. **FDR 4-2** Until the warranty has expired, the Contractor shall redesign and modify any or all elements of the NPT System to ensure its ability to withstand all attempted security breaches without loss of any NPT System or Smart Media security.

4.2.2 ~~Long-Term Use Smart~~SEPTA ~~Issued~~ Smart Media

~~To satisfy performance requirements defined herein, the Contractor may propose writing of transaction data to the Smart Media. If data is written to the Smart Media, the Smart Media shall possess sufficient memory to satisfy the encoding format and data capacity requirements, as well as provide at least 50% excess data storage capacity.~~

~~The content and format of data to be written to SEPTA-issued Smart Media shall be subject to SEPTA review at Conceptual Design Review and approval at Final Design Review. **CDR 4-1 FDR 4-2**~~

~~The Contractor shall convey to SEPTA all intellectual property rights associated with any long-term use Smart Media including the encoding format and communication protocols, according to the terms of the Contract.~~SEPTA Smart Media shall incorporate a unique card number for the purpose of establishing a customer’s account within the CDCRS. Configuration and processing of the unique card number shall be in compliance with open standard payment platform license provided in accordance with the NPT Contract. In the event that an EMV-enabled card is proposed as SEPTA Smart Media, except for the data required for EMV processing, no data shall be written or re-written to the SEPTA Smart Media by any item of NPT Equipment.

Distribution of ~~Smart~~SEPTA ~~Issued~~ Smart Media shall be through multiple channels, including:

- FVDs;
- SEPTA Customer Service Centers;
- Third-party locations;
- NPT Customer ~~Service~~ Support Center;
- Internet; and
- Employers.

All SEPTA Smart Media shall be in accordance with the open standard payment platform licensing agreement entered into for the NPT System. ~~All~~ SEPTA~~long-term use~~ Smart Media shall be ISO/IEC-14443 compliant, either Type A or Type B. ~~While most of this Smart Media shall be credit card sized (compliant with ISO/IEC-7810), t~~The NPT System shall support ~~other~~ any Smart Media ~~sizes,~~ form factors, and devices (such as stickers, key fobs, cell phones, etc.) so long as the Smart Media complies with all relevant parts of the ISO/IEC-14443 standard.

Contractor shall provide quantities of not less than five (5) other ISO/IEC 14443 Smart Media (e.g., memory cards, building access cards, etc.) which ~~could~~can be used in the NPT System. These other Smart Media shall be tested to verify that they can be processed properly by the NPT System.

Additionally, SEPTA ~~issued long-term use~~ Smart Media shall:

- Include a microprocessor capable of supporting multiple applications.
- ~~I~~incorporate a magnetic stripe compliant with ISO 7811 parts 1 through 6.~~;~~
- Employ sophisticated dynamic encryption methods, which shall employ triple Digital Encryption Standard (3DES) or Advanced Encryption Standard (AES) algorithms.
- Provide a minimum of 4 kilobytes of Non-Volatile Random Access Memory (NVRAM).

- When in an ISO/IEC-7810 compliant form, SEPTA Smart Media shall be a card constructed of laminated layers, and at least the central layer shall be composed of Polyester (PET) plastic. A thin clear plastic layer laminated to the card shall protect all pre-printed graphics. All long-term Smart Media in standard card form shall comply with most recent versions of ISO/IEC-10373 and ANSI INCITS 322 for durability.

- Have a pre-encoded unique ~~16-digit~~ serial number encoded on the embedded chip. These serial numbers shall be unalterable.

Deliveries of ~~l~~ SEPTA ~~ong-term use~~ Smart Media shall be made under controlled conditions, with the SEPTA Smart Media packaged in batches of 100. ~~-~~The packaging for each batch shall be sequentially numbered and bar coded. Additionally, each ~~fare~~ SEPTA Smart Media instrument shall have a unique, sequential inventory control number assigned to it at the time of manufacture. All fare instruments, even those that are to be otherwise blank, shall have ~~the~~ a unique ~~last four (4) digits of the~~ sequential serial number ~~and the complete inventory control numbers~~ printed and engraved on one side of the Smart Media. The proposed approach for development and application of serial numbers, and associated Media inventory control mechanism, shall be subject to SEPTA review at Conceptual Design Review and approval at Final Design Review. **CDR 4-3 FDR 4-3.**

The Contractor shall provide an electronic file containing the inventory control numbers and associated serial numbers of all fare media in each batch. The CDCRS shall include a function to import these files into the NPT database via the Smart Media Manager (see Section 19). As SEPTA Smart Media are distributed, authorized SEPTA employees shall be able to change the inventory status of each batch.

Excluding the NPT System Contractor, ~~l~~ SEPTA ~~ong-term use~~ Smart Media shall be available from no less than two manufacturers located within the United States. SEPTA shall retain all rights to the marketing and logo for the Smart Media and any materials distributed with the Smart Media, such as sleeves.

In addition to the sequential serial number, ~~A~~all SEPTA ~~long-term use~~ Smart Media shall be delivered with ~~no~~ encoding on the microprocessor and on the magnetic stripe that is in accordance with the open standard payment platform licensing agreement entered into for the NPT System.~~other than the Smart Media serial number and the inventory control number.~~ The proposed magnetic and microprocessor data to be encoded on the SEPTA Smart Media shall be subject to SEPTA review at Conceptual Design Review and approval at Final Design Review. **CDR 4-4 FDR 4-4.**

SEPTA~~Long-term use~~ Smart Media shall be supplied in a variety of designs and color schemes as provided by SEPTA, as well as those that are blank on at least one side to accommodate custom printing.

~~**4.2.3 Limited Use Fare Media**~~

~~**4.2.4 The limited use fare media shall be:**~~

~~**4.2.5 Limited Use Contactless Smart Media – These shall be Contactless Smart Media, which are less durable than long-term use Smart Media with validity information stored on the media when it is issued. The validity data shall be able to be modified based on usage.**~~

~~**4.2.6 Magnetic Fare Media – These shall be magnetically encoded media with validity information stored on the media when it is issued. This data shall remain unchanged upon usage.**~~

~~**4.2.7 Limited Use Contactless Smart Media**~~

~~**4.2.8 Limited Use Contactless Smart Media (also known as LUM) shall be low-cost disposable contactless smart cards that may not support data encryption or decryption, and therefore only partially comply with the ISO/IEC-14443 standard. This LUM shall be available from multiple manufacturers.**~~

~~**4.2.9 Each LUM shall have a pre-encoded unique serial number encoded on the embedded chip and printed on the surface of the media.**~~

~~**4.2.10 The Contractor shall convey to SEPTA all intellectual property rights associated with the LUM, including the encoding format and communications protocols, according to the terms of the Contract.**~~

~~4.2.11 LUM shall have ISO/IEC-7810 credit card dimensions (excluding thickness, which shall be as thin as possible while providing sufficient durability).~~

~~4.2.12 The Contractor shall supply paper-based contactless Smart Media in two forms:~~

~~4.2.13 Rolls or fan-fold stacks, with a minimum of 1,000 limited use media per roll or stack. The FVD shall issue these media; validity and other information shall be printed on the document at the time of issue using direct thermal technology. The serial number shall be unalterable, shall be pre-printed on each card, and shall be the same as the encoded serial number. The non-thermal side of the media stock shall include pre-printed information and graphics; these designs shall be provided by SEPTA.~~

~~4.2.14 Individual die-cut media in pre-bundled batches of 100. These shall be pre-printed with SEPTA-approved graphics, and shall require no additional printing applied upon issuance. The serial number shall be unalterable, and shall be pre-printed on each card.~~

~~4.2.15 The packaging for each roll/stack and batch shall be sequentially numbered and bar coded.~~

~~4.2.16 FVDs shall dispense LUM and encode them with expiration and other usage restriction data at the time of issue. Upon usage, the NPT device shall allow boarding or entry only after confirming that the fare instrument is valid.~~

~~4.2.17 As necessary, upon usage, the NPT device shall alter data contents of the media. If the LUM is used as a read-only fare instrument, the NPT devices shall also utilize passback control (as identified in Section 10.5.4) as necessary to ascertain the validity of the media for boarding or entry.~~

~~4.2.18~~4.2.3 Magnetic Media

New and existing ~~SEPTA-issued~~SEPTA Magnetic Fare Media, shall be dispensed by NPT devices and processed by Magnetic Media Swipe Readers. The Magnetic Fare Media shall be encoded~~,~~ using SEPTA's existing magnetic format (see Appendix A.10 "SEPTA Magnetic Pass Specifications 2006")~~,~~ with expiration and usage restriction information to support SEPTA's fare policies.

The CDCRS and the NPT device shall use the encoded information to determine whether to grant the user boarding or entry based on SEPTA's fare policies and the transactional information sent to the CDCRS by the Magnetic Media Dispenser Module upon issuance of the Magnetic Media. As read-only fare instruments, the CDCRS and the NPT devices shall also utilize passback control (as identified in Sections 9.5.4 and 10.5.4) as necessary to ascertain the validity of magnetic media for boarding or entry. .Each item of Magnetic Media shall incorporate a unique printed and encoded serial number.

Magnetic encoding shall use the same track, format and data as SEPTA's existing magnetic encoding. Magnetic stripe material on the card shall comply with ISO/IEC-7811-6. The content and format of data to be written to the magnetic media shall be subject to SEPTA review and approval at the Preliminary Design Review. **PDR 4-4** The Contractor shall convey to SEPTA any intellectual property rights associated with magnetic media data encoding according to the terms of the Contract.

~~In the event that the selected solution includes issuance of limited use magnetic media by the FVDs, the limited use m~~Magnetic media shall have validity information printed upon issue via direct thermal technology. The content and format of printing shall be subject to SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 4-5, FDR 4-5**

All magnetic ticket stock shall employ high-coercivity magnetic material suitable for encoding at 1750 Oersted. The magnetic material shall be securely attached to the ticket stock and shall resist peeling, abrading, and cracking in normal patron use. The stripe shall be located to accommodate data encoding compatible with SEPTA's existing magnetic tickets.

Magnetic ticket stock shall be paper or polyester. Paper media shall be no less than 0.010" (10 mil) thick. Polyester media shall be no less than 0.007" (7 mil) thick.

The Contractor shall supply magnetic media in rolls or fan-fold stacks, with a minimum of ~~2~~1,000 ~~limited use~~ magnetic media per roll or stack. The Contractor shall also supply magnetic media as individual, die-cut stock. The non-thermal side of the media shall include pre-printed information and graphics; these designs shall be provided by SEPTA.

Deliveries of ~~-~~die-cut Magnetic Media shall be made under controlled conditions, with the Magnetic Media packaged in batches of 50. The packaging for each batch shall be sequentially numbered and bar coded. Additionally, each fare instrument shall have a unique, sequential inventory control number assigned to it at the time of manufacture.

Contractor-supplied magnetic media shall be available from a minimum of three (3) U.S. based manufacturers and shall meet SEPTA's existing magnetic media specifications.

~~Read-only magnetic media compliant with all aspects of ISO/IEC-7816 shall be usable in the NPT System and linked to an account in the same manner as the long-term use Smart Media described earlier in this document. This Smart Media shall be distributed in the same manner as the long-term use smart cards and shall provide the same functionality.~~

The NPT System shall employ magnetic media for the single use ~~Subway/Elevated~~ fares. For the Subway/Elevated service ~~T~~these ~~magnetic media shall be usable in the Subway/Elevated environment and shall employ a unique ticket type. T~~hese magnetic media shall be:

~~•issued only by Subway/Elevated FVDs;~~

- magnetically and visually identified as usable only at ~~on~~ the Subway/Elevated ~~service~~station where purchased;
- valid for use for a SEPTA-configurable time period (from 1 to 240 minutes, with an additional setting for unlimited time period of validity:

~~•settable by SEPTA at the CDCRS (initially set to fifteen minutes); and~~

~~•different for each Subway/Elevated station; and~~

- ~~be~~ subject to anti-passback requirements for all usages.

~~In addition, this magnetic ticket shall also include a length of validity, at which time, whether the media is used or not, the media shall no longer be valid.~~Magnetic Media shall also be used for Regional Rail ~~single~~round trip tickets. ~~-~~These ticket shall be:

- identified magnetically and visually for zones of validity;

- valid for use for a SEPTA-configurable time period (from 1 to ~~240~~1440 minutes, with an additional setting for unlimited time period of validity~~.~~; and

- ~~be~~ subject to anti-passback requirements for all usages.

~~4.2.19~~4.2.4 Partner-Issued Smart Media

Owners of compatible (ISO/IEC-14443 compliant) Smart Media issued by organizations with contractual agreements with SEPTA may register their fare instruments with SEPTA, and thereafter use a linked account on the CDCRS for payment and replenishment purposes. Such fare instruments (such as those issued by adjoining public transit agencies), shall be accepted by NPT devices for boarding or entry only after the NPT device receives confirmation from the CDCRS~~s~~ that the fare instrument is linked to a valid account according to fare policies established by SEPTA.

~~At no time shall the NPT device alter the contents of the data stored on~~ Partner ~~Issued Contactless~~ Smart Media~~. As~~ shall be read-only fare instruments, and the NPT devices shall also utilize passback control (as identified in Sections 9.5.4 and 10.5.4) as necessary to ascertain the validity of Partner ~~Issued Contactless~~ Smart Media for boarding or entry.

~~4.2.20~~4.2.5 Bank-Issued Media

Boarding or entry/exit shall be granted to bank-issued contactless credit and contactless signature debit media users only after the NPT device has received authorization for the transaction according to the business rules and fare policies established by SEPTA.

It shall not be possible to utilize bank-issued ~~card~~ magnetic ~~encoding~~media for boarding or entry/exit purposes.

~~4.2.21~~4.2.6 Hybrid Media

~~SEPTA~~ The NPT System shall ~~also~~ be capable of issuing Hybrid Smart Media which uses open standard payment platform and is processed in an account-based manner. This Hybrid Smart Media shall be ~~based on the~~ SEPTA ~~i~~Issued Smart Media ~~-~~and shall have the magnetic stripe encoded with SEPTA-defined information. ~~with the incorporation of a magnetic stripe compliant with ISO 7811 parts 1 through 6. General purpose reloadable media shall not be acceptable as Hybrid Media.~~

~~This shall~~ Hybrid Media shall be used to permit information to be encoded for SEPTA employees and SEPTA-designated customers (such as CCT customers). SEPTA will define the type of information to be encoded on the magnetic stripe not less than sixty (60) days prior to the Preliminary Design Review and the Contractor shall present the data format for SEPTA approval at the Final Design Review. **FDR 4-6**

4.3 ~~Fare Media~~ Transaction ~~Processing~~Speed

Transaction speed is of the utmost importance to a successful public transit payment system. The NPT System shall conduct usage transactions within the maximum times specified below.

Table 4-1 - Maximum Transaction Times

Transaction Type	Maximum TRANSACTION TIME at Each Device	
	Turnstile, Faregate, OBP, and MID	HSD, RSD, ASD, and FVD
Use ~~SEPTA-Issued~~ SEPTA~~Long-Term Use Contactless~~ Smart Media for Boarding or Entry	500 ms	750 ms
~~Use SEPTA-Issued LUM for Boarding or Entry~~	~~500 ms~~	~~750 ms~~
Use Partner~~-Issued~~ Contactless Smart Media for Boarding or Entry	600 ms	850 ms
Use Bank~~-Issued~~ Contactless Credit Media for Boarding or Entry/Exit	600 ms	850 ms
Use ~~SEPTA-Issued~~SEPTA Magnetic Media (Read-Only) for Entry	250 ms	500 ms

When ~~account-based~~ Smart Media is used in any manner within the NPT System, the NPT equipment on which it is processed shall be in on-line communications with the CDCRS to permit the validity of the Smart Media to be verified (see Section 4.6).

~~When media-based Smart Media is used, the NPT equipment may be either on-line or off-line as the information required to discern validity will be stored on the Smart Media (see Section 4.6.)~~

Transaction times shall be measured as defined in this Technical Specification, and shall include all processing steps, including:

- Media authentication, transaction authorization, and all other automated steps necessary to conduct transactions.

- Where lists are retained (either at the device or the CDCRS) of fare instruments to be rejected (e.g.(i.e. ~~"hotlist~~Invalid Fare Media List, Bad Number List~~" and "passback list"~~, etc.), or accepted (~~i.e. "good list"~~e.g., Positive Number List), ~~or to have transactions conducted (i.e. "autoload list" or "action list"),~~ all transaction times shall be measured with these lists at their required maximum capacities.

- Velocity checks.~~;~~

- Where a barrier mechanism is utilized to facilitate entry to SEPTA's transportation system (such as at the Turnstile or ADA Faregate), the transaction time is considered complete when the turnstile/faregate release is activated and the customer receives a visual and aural indication of successful or unsuccessful transaction completion~~:. the barrier is released or opened, and the customer can enter into the gated area.~~

- Where an automated non-barrier mechanism is utilized to facilitate entry to SEPTA's transportation system (such as at the OBP, HSD or MID), the transaction time is considered complete when the customer or conductor ~~-~~receives a visual and aural indication of successful or unsuccessful transaction.

At the conclusion of each usage transaction, the NPT device shall convey to the customer, audibly and visually, the success or failure of the transaction, including any failure reasons, and the status of the fare instrument ~~(such as remaining time or value, if media-based)~~. The content and format of messages conveying transaction success/failure reasons shall be subject to SEPTA review and approval at the Preliminary Design Review. **PDR 4-6**

Each transaction at either an SMP or MMSR shall also include comparison of the ~~SEPTA-issued~~SEPTA Fare Media to an Invalid Fare Media List (see Section 2.3.16) to determine if the media should be rejected and reported.

When such a ~~SEPTA-issued Smart~~SEPTA ~~Issued~~ Smart Media item is identified, the SMP shall automatically encode the media as deactivated. When NPT equipment is communicating in an on-line manner with the CDCRS, the ~~Invalid Fare Media~~Bad Number List ~~used~~ on the CDCRS shall be ~~the one stored on the CDCRS~~ used and when such communication is not available for a SEPTA definable period of time, ~~the~~ the Invalid Fare Media List resident in the NPT device shall be used.

The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

Commercially available open standard e~~E~~nd-to-end encryption shall be provided for the processing of all Smart Media. All data transmitted between the sales devices and the CDCRS from time of presentation to the SMP to response regarding validity of the Smart Media shall be encrypted. Method of end-to-end encryption shall be provided by the Contractor to SEPTA for review at the Conceptual Design Review and for SEPTA approval at the Final Design Review. **CDR 4-5 FDR 4-7**

4.4 Fare Flexibility

For maximum flexibility and to provide the ability to accommodate future SEPTA fare policy requirements, the NPT System shall be able to vend and process the present fare types available and offered by SEPTA as well as other fare types not presently offered by SEPTA. These fare types shall include, as a minimum:

- stored value (with and without transfer capability);
- stored trip (single-trip, round-trip and multi-trip with and without transfer capability);
- tag-on at the origin location and tag-off at the intermediate and destination locations:
    - with the appropriate charge ~~deducted~~calculated for the trip ~~at each location~~;
    - with a default fare charged if the customer does not tag-off for the trip;
    - with the pass/ticket validity verified at each location.
- fixed period passes (calendar based) including the ability to limit the number of usages of the pass for any calendar period (e.g., day, week, month, etc.) and for the entire pass period;
- floating period passes including the ability to limit the number of usages of the pass for any calendar period (e.g., day, week, month, etc.) and for the entire pass period;
- upgrades to other services;
- ID cards;

- special event media including:
    - transportation to/from a special event;
    - transportation to/from a special event together with media for the special event itself;
    - media for the special event itself provided that the customer has valid transportation for the date of the event.

In the event that the FVD issues a special event media item, it shall be encoded and printed on Magnetic Fare Media ~~LUM~~ and shall include, in to addition Fare Media validity information, the name of the event~~.~~, the start date of the event, the end date of the event and a minimum of one graphic.

The NPT System shall be able to process multiple passengers on a single item of Smart Media. ~~:~~

The Smart Media shall be able to accommodate:

- SEPTA fares which accommodate multiple customers, including the Freedom Pass; and~~Freedom Pass – in accordance with SEPTA Fare Policy, ….Bill to complete….~~
- Pay as You Go (PAYG)~~ …..~~ fares:
    - If the Smart Media includes a calendar or period pass: the initial fare shall be processed as a pass transaction and subsequent transactions as Adult stored value transactions:
    - If the Smart Media does not include a calendar or period pass: all transactions shall be processed as Adult stored value transactions:

A description of operation and settings for multiple passengers using a single item of Smart Media shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 4-6, PDR 4-7**

SEPTA shall be permitted to add, delete, and modify, via the CDCRS, the fare types vended and accepted by each of the NPT System equipment types without Contractor intervention. These fare types shall also be assignable to one or more of the following:

- customer type (e.g., full fare, child, student, senior, disabled, employee);
- peak, off-peak, no restrictions;
- day of week restrictions plus validity start and end time for each day of validity as well as for each day of the week;
- service type (e.g., local bus, subway, Regional Rail);
- anti-passback checking or no anti-passback checking;
- fare media type (e.g., fixed period pass, stored value, trip-based, pending period pass, free trip).

Dates and times for activation and deactivation for each shall be able to be assigned. This will provide for these fares to be displayed and sold on specific dates, days of the week and for specific time periods. The addition or modification to existing fares accepted and processed by the NPT System shall be easily completed via the CDCRS without any intervention from the Contractor or any of its sub-contractors.

The NPT System shall provide the capability, through SEPTA-modifiable controls, to provide for customer incentives for processing of all Smart Media-based fares. These incentives shall be in the form of purchase discounts, frequent rider bonus plans, add-value bonuses, free companion access/travel and service guarantee refunds. Any or all of these incentives shall be able to be assignable for the Smart Media account.

Accounts shall be ~~able to be~~ set up for ~~both media-based and account-based~~ Smart Media~~, as needed~~ to meet the functional requirements. The accounts shall remain anonymous unless the customer registers the account. Once registered, the customer shall be able to link the account to a credit or debit account for automatic replenishment and for balance protection purposes.

4.5 Fare Activation

The NPT ~~System devices~~equipment shall permit any valid fare stored in a customer's account ~~or on an item of Smart Media~~ to be activated for immediate use, based upon pre-set selections by the customer. These actions shall be able to be performed at any SMP, via the Internet and through the ~~Remote~~ NPT Customer Support Center. Prior to the date and time of activation selected by the customer, the customer shall be able to reverse any activation of a fare product selected.

4.6 Fare Issuance and Verification

Fare validity shall be verified according to the fare policies determined by SEPTA. Fare validity shall be positively ascertained each time Smart Media is properly presented to an SMP. ~~.~~

Only one Pre-Paid fare product shall be permitted to be loaded in an account at any one time. The CDCRS shall enable customers to load stored value to the same account in addition to the Pre-Paid product. The CDCRS shall be able to record all Pre-Paid fares purchased for the account, applying all fare policies, and reporting usage of the SEPTA-issued Fare Media throughout the NPT System.

~~For all account-based processing:~~

~~an anonymous account is created and maintained on the CDCRS when an item of Smart Media is issued or updated. The account shall store all validity information.~~

~~v~~Validity shall be determined by the CDCRS and validity data shall be stored in the CDCRS.

~~For all media-based processing:~~

- ~~validity information shall be stored on the Smart Media when issued and replenished, and a record of the event shall be stored in a mirrored account on the CDCRS.~~
- ~~validity shall be revised (according to the SEPTA defined policy) upon each usage as needed. Validity will be determined based on the presence of acceptable fare instrument or value in conjunction with the use of a hot list at each NPT device.~~

4.7 ~~Smart~~ Fare Media Traceability

Transactional information shall be automatically sent to the CDCRS upon issuance of any Magnetic Media or SEPTA Smart Me~~E~~dia at an NPT device. The CDCRS shall use this data for fraud mitigation purposes. The proposed set of transactional information shall be subject to SEPTA review at Conceptual Design Review and approval at Final Design Review. **CDR 4-7 FDR 4-8.**

All ~~Smart~~ Fare Media shall be tracked throughout the NPT S~~s~~ystem. In order to detect fraudulent media use, the NPT S~~s~~ystem shall review all transactions on a daily basis, checking for the following conditions:

- The same Fare Media ~~serial~~identification number at different locations within too short of time span. This routine shall compare the time between transactions with a minimum travel time look up table.
- A ~~serial~~ Fare Media identification number~~,~~ which has not been issued by the NPT S~~s~~ystem.
- Smart Media whose use has exceeded the total issued/added value.
- Excessive use of ~~Smart~~ Fare Media, based on a SEPTA-defined number of instances over a SEPTA-defined period of time.
- Invalid accounts.

Transactions and associated Fare Media found to be in violation of one of the above conditions shall be separately stored by the CDCRS for review by an analyst. During the review, the analyst shall be able to add the ~~serial~~ Fare Media identification number to the Invalid Fare Media List, review prior media history for that ~~serial~~ Fare Media identification number, remove the ~~serial~~ Fare Media identification number from the violation list, or defer decision on the violation. Regardless of action taken by the analyst, the suspected violation, Fare M~~m~~edia ~~serial~~ identification number, and action taken shall be archived for future review. The Contractor shall provide a detailed description of the Fare M~~m~~edia tracking system at the CDR for SEPTA review and at the Final Design Review for SEPTA approval. **CDR 4-8 FDR 4-9**

SEPTA shall be able to select specific types of ~~Smart~~ Fare Media to be tracked in order to provide for the most efficient operation. This would permit certain fare types to be omitted, such as transfers and single trip media~~s~~. ~~All smart media shall be~~ able to be tracked ~~in this manner tracked.~~

Section 5 – Payment Transaction Processing
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5 PAYMENT TRANSACTION PROCESSING

Smart Media employed in the NPT System shall operate in an account-based manner and conform to open standards in processing SEPTA fare payments. The NPT System shall accept and process SEPTA Issued Smart Media and Partner Issued Smart Media as well as Contactless Credit and Debit Smart Media issued by the financial services and payments industries, as identified in Section 4. This section defines:

- processing of the Smart Media to verify its authenticity and validity;
- calculation of the fare required for the trip, based upon the trip segments collected;
- collection of payments associated with fares calculated and Smart Media purchases; and
- forms of payment accepted by the NPT System.

Based on authenticity and validity verifications, appropriate charges shall be made to NPT System Smart Media accounts and credit/debit media accounts. Customers shall then be permitted access to SEPTA transportation services.

Fare Media as identified in Section 4 shall be processed, authorized, and settled by the NPT System. The CDCRS, utilzing the BCPS, shall provide for communication with financial institutions (banks and/or clearinghouses) for the purposes of obtaining authorization to complete a transaction with a credit card or debit card, or to load value to an account within the Central Data Collection and Reporting System (CDCRS).

The CDCRS shall include all application software and all interfaces shall be fully compliant with the PCI DSS and PA DSS standards in effect, as identified in Sections 5.4.1 and 5.4.2.

End-to-end encryption shall be provided for the processing of all Smart Media. All data transmitted between the sales devices and the CDCRS from time of presentation to the Smart Media Processor (SMP) to response regarding validity of the Smart Media shall be encrypted.

5.1 Transaction Processing

5.1.1 General

Data shall be read by the SMPs incorporated into the NPT equipment and forwarded in real-time over the communications networks described in Section 18 to the CDCRS. The following shall be performed by the CDCRS in an account-based manner:

- All calculations of fares and payments due;
- All verifications of Smart Media validity; and
- All authorizations of the Smart Media for access to SEPTA transportation services.

All payment transactions using SEPTA Smart Media, Partner Smart Media, and third-party Smart Media(such as contactless credit cards, debit cards, GPR cards, and closed-loop, open standard reloadable cards) shall be processed, authorized, and settled by the NPT system in accordance with the requirements of the open standard payment platform license as described in Section 4. However, SEPTA Smart Media and Partner Smart Media usage transactions shall be processed solely by the CDCRS and shall not be processed by any financial services or payments industry network.

All Smart Media shall either be processed as Pay-As-You-Go trips or Pre-Paid trips. The complete set of applicable criteria shall be applied to each trip in determining the final cost of each trip, or a sequence of related trips as defined by SEPTA, that are taken with an individual piece of Smart Media that is associated with a single transit account.

- Pay-As-You-Go – payment via a charge to a contactless credit or debit card – no SEPTA-defined account provided.
- Pre-Paid – a pass has been identified/funds have been prepaid specifically for transit usage and are stored in the Smart Media account on the CDCRS. The CDCRS shall support both SEPTA Smart Media and, at SEPTA's discretion, Partner Smart Media for the sale and replenishment of Pre-Paid fare products. These shall not be processed by any financial services or payments industry network.

Acceptable forms of payment within the NPT system are as follows[1]:

- Cash;
- Personal Check;
- Smart Media;
- TransitChek;
- Visa (credit cards and debit cards);
- MasterCard (credit cards and debit cards);
- Discover (credit cards and debit cards);
- American Express (credit cards and debit cards);
- ACH (direct deduction from the user's bank or checking account);
- Payment by Employer-sponsored account or Transit Check Account. (These payments are for Employer Subsidized accounts and related Smart Media only).

Except at FVDs, the NPT System shall be have the flexibility to accept alternative payment methods, such as "branded-wallets" which ultimately rely on credit and debit for Electronic Transfers of Funds (EFT), and "non-bank network solutions" that rely on the Automated Clearing House (ACH) for EFT. This capability shall be enabled in a manner consistent with the intended use of the alternative payment methods such as use with web-based sales, or at certain SEPTA Partner retail sales locations that are not on SEPTA property.

Sales by all NPT equipment shall be summarized based on payment methodology for all Customer purchases. These summaries shall be based on the method of payment and the following summaries shall be provided as a minimum, as applicable by equipment type:

- credit card – by card brand (e.g. MasterCard, Visa, American Express, Discover);

[1] Appendix A.17 "SEPTA Credit-Debit Transaction Volumes CY 2008" is appended to the Technical Specification to support the Contractor's understanding of the Volume of Credit-Debit transactions processed by SEPTA for the Fiscal Year 2008.

- debit card – by card brand (e.g. MasterCard, Visa, American Express, Discover);
- cash/token;
- personal check;
- TransitChek.

5.1.2 Smart Media Purchase

An account shall be created in the CDCRS when each item of Smart Media is issued.

- When SEPTA Smart Media is purchased at an item of NPT equipment, the CDCRS shall create an account in the CDCRS and associate the account with the Smart Media dispensed. Transaction processing shall be completed in real time, such that once the transaction is completed the Customer may immediately use the Smart Media for payment of transportation-related services at any contactless reader in the NPT system.
- When a SEPTA or Partner Smart Media account is replenished at an item of NPT equipment, over the Internet, or through any SEPTA-approved account replenishment location, the CDCRS shall update the account in the CDCRS with the purchase information. Transaction processing shall be completed in real time, such that once the transaction is completed the Customer may immediately use the Smart Media for payment of transportation-related services at any contactless reader in the NPT system.

5.1.3 Bankcard Processing

5.1.3.1 General

Valid credit cards and debit cards issued by financial institutions shall be accepted for the purchase of Fare Media and for payment of fares. These payment transactions shall be processed, authorized, settled and accounted for through the requisite NPT network servers (e.g., OBPMS, SDMS, SMS and RMS), back to the CDCRS. The CDCRS, via the BCPS, shall handle all interfacing necessary for verification of bankcard transactions with clearing institutions selected by SEPTA. The CDCRS, including all application software and interfaces, shall be fully compliant with PCI DSS standards in effect at the time the CDCRS enters revenue service.

The Contractor shall be responsible for execution of all technical and procedural steps to comply with processing requirements for bankcard and open payment processing. This includes, but is not limited to applicable requirements of card associations, providers of merchant services, and issuing financial institutions and other certified issuers of open payment media and devices.

The Contractor shall be responsible for development, testing, and certification of the interface connection between the BCPS to each card clearinghouse. The Contractor shall also provide all associated software and hardware for purposes of encrypting and transmitting the required data for determination of card validity and fund availability for approving (or rejecting) bank card transactions initiated at all NPT equipment.

The communications interface between the BCPS and the clearing house(s) shall utilize a transparent TCP/IP protocol, with a dedicated IP address and TCP/IP port. The Contractor's interface shall provide for an approved commercially available hardware encryption solution. Bankcard transactions shall be processed, authorized, settled, and accounted for through the BCPS and its data communications facility, utilizing the services of one or more card clearing institutions. Software resident on the system to accommodate the electronic payment type shall conform to applicable ABA, ISO/IEC, Federal Regulations (including "E" and "Z"), and standards for electronic payment processing. All devices and systems that process credit cards shall adhere to the requirements of the PCI DSS.

The NPT System shall be capable of simultaneously processing bankcard transactions from all NPT devices and to the associated bankcard clearing institutions. The system shall be sized and configured such that the length of time to completely process a transaction does not under normal conditions exceed the maximum time as identified in Section 4, including the time for network traffic. This time is measured from the time a bankcard transaction is sent from the NPT field device to the time the authorization is received back at that same device, and includes the time required for authorization by a financial institution. The CDCRS shall monitor and report on both the time the card is read and the time at which authorization is communicated to the customer to oversee NPT System compliance with this requirement.

The NPT System shall support the logging, storage, backup, and retrieval of information regarding such data transmissions, including timing of the transmission, data transmitted, and status of the transmission, for both individual transactions and entire files, such as settlement files.

5.1.3.2 Credit Card Processing

The CDCRS shall serve as the central processor for Customer purchases that have credit cards as the payment medium. Valid credit card data shall be passed from the NPT equipment through the CDCRS to a clearinghouse for transaction approval. Software resident on the CDCRS to accommodate credit and debit card payments shall conform to applicable ISO/IEC, and federal standards for this kind of transaction.

Credit cards used for Smart Media purchases shall be compared to the Bad Number List (see Section 2) to limit SEPTA exposure to fraud. Velocity checks shall be performed in addition to the other checks and verifications performed, for each item of Smart Media processed. These checked shall be performed within the transaction times identified in Section 4.

In addition to standard bank authorization processing, the Contractor shall enable the CDCRS to control acceptance of credit cards based on criteria typically used in merchant acceptance of bank cards. These controls typically take the form of velocity checks in which data on historical usage are compared to the current transaction being requested at the point of sale or entry to the transportation system. The CDCRS shall perform these velocity checks as part of the acceptance of Fare Media prior to the start of the authorization process.

To support use of credit cards, the CDCRS shall, at a minimum, provide the following:

- Check the credit card number for that sale against SEPTA-definable and modifiable tables (velocity check parameters) that define:
    - The minimum sale amount (e.g. $3.00);
    - Maximum sale amount regardless of Fare Media type sold;
    - Maximum sale amount regardless of Fare Media type sold in a defined period;
    - Maximum sale amount for any particular Fare Media type in a defined period;
    - Maximum Fare Media in a defined period for any particular Fare Media type in a defined period; and
    - Maximum Fare Media sales total in a defined period.
- All parameter settings for functions described under this heading shall be table-driven. Tables governing velocity checks for credit cards shall function independently from those for other card types.
- Maintain authorized credit card sales information on a rolling, 6-month basis, with the oldest data archived in a manner consistent with the requirements of Section 19.2.4.
- Route transactions to appropriate financial institutions and/or clearinghouses for authorization.
- Complete authorization requests within the maximum time as identified in Section 4.

- Transmit the results of the authorization request to the initiating NPT device for completion of the transaction, and record all required information within the CDCRS for reporting, reconciliation, and auditing purposes.

- At the end of each business day, as mutually agreed by SEPTA and the merchant acquirer, automatically provide banks/clearing houses with necessary settlement data.

- If the authorization request is approved, and the Fare Media and a receipt are issued, confirm the sale and record for settlement, audit, and tracking purposes.

    - If the Fare Media is not issued, or the Customer has not passed through the faregate/turnstile aisle within the designated time period, generate a reversal for the bank/clearing house, and record the reversal and the bank/clearinghouse response for reporting, reconciliation, and auditing purposes.

    - If the authorization is denied, display the required denial message at the NPT Device and record for audit and tracking purposes.

    - If the Fare Media is issued, and communication drops, for any reason prior to confirmation of the sale at the CDCRS, the transaction shall be put in a “hold” status for completion when the system is restored.

- Utilize a standard interface and protocol, as approved by SEPTA, for communications and data transfer.

5.1.3.3 Debit Card Processing

The CDCRS shall serve as the central processor for customer Fare Media purchases that have debit or ATM cards as the payment medium. Valid card and transaction data shall be passed from an NPT device through the CDCRS to a clearinghouse for transaction approval. Software resident on the CDCRS to accommodate this payment option shall conform to applicable ISO/IEC-8583 interface standards and federal requirements for this kind of transaction.

Velocity checks shall be performed in addition to the other checks and verifications performed, for each item of Smart Media processed. These checked shall be performed within the transaction times identified in Section 4.

To support the use of debit cards at all NPT Devices, the CDCRS shall:

- Receive hardware encrypted debit card transmissions from the devices, and transmit hardware-encrypted messages to financial institution for transaction authorization.
- Check the debit card number for that sale against internal tables (velocity check parameters) that define:
    - Minimum sale amount (e.g., $3.00);
    - Maximum sale amount regardless of Fare Media type sold;
    - Maximum sale amount regardless of Fare Media type sold in a defined period;
    - Maximum sale for any particular Fare Media type in a defined period;
    - Maximum Fare Media for any particular Fare Media type in a defined period; and
    - Maximum Fare Media sales total in a defined sales period.
- All parameter settings for functions described under this heading shall be table-driven. Table governing velocity checks for credit cards shall function independently from those for other card types.
- Maintain rolling 6 months worth of debit card sales information, with the oldest data archived in a manner consistent with the requirements of Section 19.
- Complete entire authorization process within the maximum time as identified in Section 4.
- Transmit the results of the authorization request to the initiating device for completion of the transaction, and record all required information within the CDCRS for audit and tracking purposes.

- If the authorization request is approved, and the Fare Media and a receipt is issued, confirm the sale and record for settlement, audit and tracking purposes, and the Fare Media is not issued, generate a reversal for the bank/clearing house, and record the reversal and the bank/clearing house response for audit and tracking purposes.

- If the authorization is denied, display the denial code and customer message at the device, and record for audit and tracking purposes.

- If the Fare Media is issued, and communication drops, for any reason, prior to confirmation of the sale at the CDCRS, the transaction shall be put in a “hold” status for completion when the system is restored.

- If the Fare Media is not issued, or the Customer has not passed through the faregate/turnstile aisle within the designated time period, generate a reversal for the bank/clearing house, and record the reversal and the bank/clearinghouse response for reporting, reconciliation, and auditing purposes.

- Utilize a standard interface and protocol, as approved by SEPTA, for communications and data transfer.

The Contractor shall not introduce technical or design features that prevent forward compatibility with standards of the financial services and payment industries. SEPTA requires that all aspects of the NPT System comply with generally accepted operating procedures and practices for processing electronic funds transfers of the financial services and payments industries.

5.1.4 Automatic Replenishment

The NPT System CDCRS shall provide automatic replenishment functionality for Smart Media accounts. The number of accounts that permit automatic replenishment shall have no limit.

A functional description of automatic replenishment shall be provided at the Conceptual and Preliminary Design Reviews for review by SEPTA and for approval by SEPTA at the Final Design Review. **CDR 5-1, PDR 5-1, FDR 5-1** This information shall include the design or the operational flows, screens, functions and other similar information and shall included increasing detail with each design review step. **CDRL 5-1**

The following methods of automatic replenishment shall be provided.

5.1.4.1 Subscription Replenishment

With Subscription Replenishment, a customer's registered account is automatically loaded with a pre-determined, approved value when the available stored value balance falls below a defined amount or when a calendar pass expires. As such, there are three types of Subscription Replenishment programs:

- Recurring Value Program - customers receive a set stored value replenishment each period based on receipt of payment at SEPTA. Once the payment has been received by SEPTA, an action list item is performed to add value to the account. A request for funds shall be initiated prior to adding value to the customer account.

- Recurring Calendar Pass Program - customers receive a calendar pass on a recurring basis. This can be initiated without payment of funds for the pass. If payment is not received in time, the privilege can be revoked, and as the payer is known, SEPTA can attempt to retrieve appropriate funds. With this, a customer's account has both a calendar-based pass and can have additionally a stored value purse. If the Customer uses Smart Media with a calendar pass for transportation services of a higher zone than is covered by the Customer's calendar-pass, then an appropriate amount (either upgrade or full fare) shall be deducted from the stored value purse, if this purse is activated and present in the Smart Media account.

- Threshold Value Program - Customers receive a set stored value replenishment each time the account value falls below a given amount, based on receipt of payment at SEPTA. Once the payment has been received by SEPTA, an action list item is performed to add value to the account. A request for funds shall be initiated prior to adding value to the customer account.

- Threshold Floating Pass Program – customers receive a set floating period pass each time they use their associated Smart Media when their account has no valid pass, based on receipt of payment at SEPTA. Once SEPTA receives payment, an action list item is performed to add the pass to the account. A request for funds shall be initiated prior to adding the pass to the customer account.

With a credit card, an authorization is requested, and if confirmed, the value and/or pass validity is added to the account. For other forms of payment, the system will only initiate a load to the Customer account when the system is directed to do so with a "confirmation" of payment.

5.2 Fare Calculations

Basic elements provided by the NPT System for the purposes of fare calculation and identification of validity for the Smart Media shall include the following as a minimum:

- All Smart Media "taps" at SMPs shall be recorded as portions of trips by the CDCRS;
- The CDCRS shall assemble trip portions into actual Customer trips based on SEPTA-defined parameters;
- All data read from "taps" and all payments made shall be transferred in real-time to the CDCRS. This data shall be stored in the CDCRS to support all business functions of the NPT System, including verification of Smart Media validity;
- Smart Media transactions shall append additional information to the data stream as needed, provided that neither the event of appending data nor the characteristics of the data conflict or interfere with compliance with open standards payment processing, or result in a degradation in NPT performance requirements; and
- All trips processed by the CDCRS shall be identified with an account number.

Prior to allowing the customer to enter the SEPTA transportation system, each "tap" shall be authorized in real-time by comparison to information stored in the CDCRS account or based on the validity of the Smart Media as provided by the banking network.

- For non-bank-issued Smart Media, all information about the status of the Smart Media account shall reside at the CDCRS; and

- For bank-issued and other Open Payment Smart Media the CDCRS shall authorize payments via interaction with the banking network.

The NPT System authorization process shall query the CDCRS for the following:

- Status of a Pre-Paid account on SEPTA and Partner-issued Smart Media;

- Validity of a Pre-Paid account on SEPTA and Partner-issued Smart Media;

- Status of a Pay-As-You-Go account on SEPTA and Partner-issued Smart Media;

- Validity of a Pay-As-You-Go account on SEPTA and Partner-issued Smart Media;

- Status of bankcard or a Pre-Paid transit account;

- Validity of bankcard or a Pre-Paid transit account;

- Status of bankcard or a Pay-As-You-Go transit account; and

- Validity of bankcard or a Pay-As-You-Go transit account.

If an authorization request returns an approval, then the NPT shall allow access to SEPTA's transportation services.

If an authorization request returns a denial, then the NPT shall prohibit access to SEPTA's transportation services. A denial response shall always end that sales transaction.

Contractor shall provide a fare pricing matrix to meet the requirements of each transit service as identified in Section 1 that shows how each transaction shall be priced for payment purposes at the Conceptual Design Review for SEPTA Review, and at the Final Design Review for SEPTA approval. **CDR 5-2, FDR 5-2**

5.3 Payment Aggregation

The CDCRS shall have the capability to aggregate Pay-As-You-Go trips into a single payment transaction. Individual Pay-As-You-Go trips shall be aggregated subject to table-driven parameters for either the duration of the aggregation period (i.e., number of business days) and/or the dollar amount of the payment transaction. The following parameters shall be provided for aggregation as a minimum:

- Time-based parameter settings shall be provided to permit SEPTA to define the period of time at which aggregation of trips into a payment transaction shall occur.
- Amount-based parameter settings shall be provided to permit SEPTA to define the dollar threshold when trips shall be aggregated and processed as a single payment transaction.
- The dollar value of the authorization amount in increments of $0.01.
- Brand, product and issuer types (i.e., card association brand, closed or open loop, etc.)

The CDCRS shall be able to set both parameters, individually and in combination.

Prior to executing a payment transaction, the CDCRS shall capture “taps” and perform necessary authorizations to allow or deny entry based on the status of the account. The CDCRS shall also provide parameter settings that govern how authorizations for Pay-As-You-Go fares are processed. These parameter settings shall allow SEPTA to set:

- The dollar value of the authorization amount at the time of the first tap within an aggregation period;
- Single or Double authorization capability.

The single authorization shall permit the CDCRS to authorize the Pay-As-You-Go only once during the aggregation period, at the first tap during the current period. The dollar value of the authorization shall be a table-driven parameter setting that is programmable at the CDCRS. The minimum authorization amount shall be $1.00; the maximum dollar amount shall correspond to the dollar threshold that shall stimulate an aggregated payment transaction and define the end of the current aggregation period.

The CDCRS shall also have the capability to initiate a second authorization at the moment that aggregation for payment is being processed. The NPT shall have the capability of reversing the initial authorization and processing the authorization at the conclusion of the aggregation period for the exact amount of the total purchase for Pay-As-You-Go.

The CDCRS shall be able to automatically repost aggregated transactions that have been denied. This capability shall be available for implementation in the event that SEPTA chooses to accept bank-issued and other Open Payment Smart Media. To support this capability, the CDCRS shall be enabled to capture decline codes returned by merchant acquirers and determine whether the decline was a "hard" decline (i.e., a lost or stolen card or device) or a "soft" decline (i.e., a temporarily inactive account because of an overdraft or similar status). The CDCRS shall have table-driven parameters for time and count that shall permit reposting of soft-declines.

5.4 Risk Mitigation

Risk mitigation shall be provided to ensure that risk performance falls within acceptable risk management performance as identified by the financial industry.

The Contractor shall comply with all risk management procedures and guidelines of the financial services industry and payment card associations regarding acceptance of contactless credit and debit, cards. Similarly, the NPT System shall apply those procedures and techniques in managing risk for Smart Media issued by SEPTA. The NPT System shall provide for the following mitigations:

- PCI Compliance;
- Fraud Detection;
- On-Line Operation;
- Orphan Mode Operation (store and forward);
- Chargeback Management.

Contractor shall provide complete information on all risk mitigation features and functions provided for the payment processing, including security measures implemented, to SEPTA at the Preliminary Design Review and at the Final Design Review for review and approval purposes. **PDR 5-2, FDR 5-3**

5.4.1 PCI Compliance

As the NPT System shall accept credit and debit media as a form of payment, the entire NPT System, all NPT devices that process credit or debit cards, all communications and computer systems comprising the entire NPT System and all interfaces with the existing SEPTA system components, shall be in full compliance with the Payment Card Industry (PCI) Data Security Standards (DSS) standards, for Level 1.

The version of PCI DSS presently in effect (version 1.2) requires that the Contractor build and utilize secure data networks for the NPT System, which protect cardholder data including the implementation of strong access control measures.

From time of initial NPT implementation through Acceptance of the NPT System, changes to the PCI DSS requirements shall be incorporated into the NPT System by the Contractor to ensure continuing PCI DSS compliance. As a part of each implementation phase and through the conclusion of the NPT System Warranty period as defined by the Contract, a PCI DSS certification expert shall be utilized by the Contactor to certify the compliance with the standards in force at the time of acceptance of each phase of implementation, as well as for final NPT System acceptance.

The Contractor shall also perform the following activities through the conclusion of the NPT System warranty period:

- Performing quarterly scheduled scanning for network security as well as internal and external vulnerabilities and correction of such vulnerabilities based on the published Security Scanning Procedures;
- Perform the annually required penetration testing;
- Track and monitor all access to network resources and cardholder data;
- Routinely perform Data Security Assessments.

Contractor shall furnish documentation at the Conceptual Design Review, Preliminary Design Review and Final Design Review to provide full details for the NPT System's compliance with all aspects of PCI-DSS. **CDR 5-3, PDR 5-3, FDR 5-4**

Contractor shall identify any existing SEPTA systems which are impacted by the NPT System that are not PCI compliant and shall notify SEPTA of these deficiencies not more than thirty (30) days after becoming aware of them. **CDRL 5-2**

5.4.2 PA-DSS Compliance

All System software that is used for the processing of credit card or debit card data shall meet of all requirements of the Payment Application Data Security Standard. Contractor shall identify and notify SEPTA of any changes to the standards that are instituted between the time of Notice to Proceed and System implementation and certify that their software meets these requirements.

Contractor shall furnish documentation at the Conceptual Design Review, Preliminary Design Review and Final Design Review to provide full details for the NPT System's compliance with all aspects of PA-DSS. **CDR 5-4, PDR 5-4, FDR 5-5**

5.4.3 Fraud Detection

The NPT System shall provide a dynamic review of ongoing and historical processing data in order to enable detection of suspicious purchase and usage activity. This dynamic review shall permit immediate remedial steps, primarily in the form of hot listing of contactless Smart Media and other Contactless Smart Media accepted for fare payment.

Contractor shall provide complete information on the fraud detection and identification features provided for the payment processing, including security measures implemented, to SEPTA at the Preliminary Design Review and at the Final Design Review for review and approval. **PDR 5-5, FDR 5-6**

5.4.4 On-Line Authorization

For all Smart Media, online access to the CDCRS is required for authorization. For contactless bankcards, access through the CDCRS to card association databases of active and inactive Smart Media shall be provided as discussed in Section 19.

The NPT System shall support risk management procedures, systems, and activities that extend across a full range of parameters, including but not limited to:

- Pre-Paid purchase amount by account;
- Pre-Paid fare product purchase by type;
- Frequency of Pre-Paid intra-business day purchase, set by time interval;
- Frequency of Pre-Paid inter-business day purchase, set by time interval;
- Frequency of Pay-As-You-Go usage by location and time;
- Total Value of Pay-As-You-Go usage, intra-business day purchase, set by time interval; and
- Total Value of Pay-As-You-Go usage, inter-business day purchase, set by time interval.

5.4.5 Orphan Mode Operation

In the event that real-time authorizations are interrupted because of telecommunications failures, or failures to receive an authorization response from the CDCRS within a SEPTA-specified time period (See Section 4), operation in the orphan mode shall be employed. During the time of operation in the orphan mode, the NPT System shall perform “stand-in” transactions until proper network communications are restored. The orphan mode authentication is distinct from the online, real-time authorization process typical of payment transaction processing; it is not governed by the merchant in the case of financial industry-issued Smart Media.

After communications is properly restored the NPT System shall upload data from orphaned NPT equipment, process the data, and then globally refresh all NPT equipment, components, and systems and account for all payment and usage transactions.

Orphan mode operation shall provide for and deploy additional risk mitigation procedures. These shall include such processes as authentication of the Smart Media or Fare Media at the point of presentment to the reader. Contractor shall provide complete information on the orphan mode, including additional security measures implemented to SEPTA at the Preliminary Design Review and at the Final Design Review for review and approval. **PDR 5-6, FDR 5-7**

5.4.6 Chargeback Management

In support of acceptance of payments made with bank-issued Smart Media, the NPT System shall support management of chargebacks, and related inquiries and disputes according to business rules and procedural requirements defined by card associations and merchant acquirers. Key business processes to be accommodated by the NPT System include, but are not limited to:

- Accessing, compiling, and responding with required transaction information;
- Assessing, processing and administering refunds;
- Processing and administration of payment adjustments for customer claims;
- Automated daily and monthly reconciliation by card types and by fraud and non-fraud chargeback categories;
- End-user initiated ad hoc status reports across all processing, reconciliation and reporting functions.

Contractor shall furnish documentation at the Conceptual Design Review, Preliminary Design Review and Final Design Review to provide full details for the chargeback processing methodologies and procedures **CDR 5-5, PDR 5-7, FDR 5-8**

5.5 Claims Processing

The NPT System shall efficiently provide supporting information to enable SEPTA to address inquiries and complaints from customers. Processing of claims supported by the back-office (other than charge backs) shall be addressed in two categories:

- Claims resulting from the sale or reload of Smart Media or open standard contactless devices at points of sale owned or operated by SEPTA;
- Claims of an inaccurate fare payment calculation resulting from the acceptance of Smart Media or open standard contactless devices. These claims may be for payments of Pre-Paid purchases, or as for Pay-As-You-Go transactions at fare gates, bus fare boxes, and other points of entry to SEPTA's transit system.

The NPT System shall gather and synthesize claims from all sources of Customer contact with the SEPTA, including but not limited to:

- The Web Site provided by the Contractor;
- Customers' phone communications with the Customer Call Center;
- Letters and e-mails directed to SEPTA.

Data captured for claims processing shall be consistent with data required for processing payment claims in an open standards, account-based system. At a minimum, the NPT System shall capture and process the following information:

- Customer name, address, phone number, and email account;
- Account number and payment media type and issuer;
- Claim reference number;
- Date, time and location of incident;
- Amount of claim;
- Description of claim, with comments field;
- NPT equipment serial number;
- Comments field for investigation process;
- Investigation result code;
- Approval code and authorizing entity or individual;
- Claim resolution amount;
- Method of claim resolution;
- Resolution date;
- Processing date.

Claim disposition shall be fully automated so that investigation and resolution can occur typically within the same business day.

The NPT System shall support the following resolution processes:

- Calculation of pro rata payment amounts for all fare products based on time and date of claim receipt;
- Menu driven selection of resolution codes and descriptions;
- Ability to apply credits to customer accounts for next business day payment;
- Reporting of claims resolved;
- Preparation of a consolidated financial statement and reconciliation to settlement files;
- Tracking of claims processed and outstanding claims in queue;
- Account closeout; and
- Transfers of balances and historical data to new accounts.

5.6 Data and Reporting Requirements

The NPT system shall support the logging, storage, backup, and retrieval of information regarding such data transmissions, including timing of the transmission, data transmitted, and status of the transmission, for both individual transactions and entire files, such as settlement files.

5.6.1 Payment Parameters

The CDCRS shall provide table-driven parameters for all elements associated with the payment processes. The range and flexibility of parameter settings available at the CDCRS shall permit SEPTA to set pricing by route, mode of transportation, time of day, pre-defined periods, and other criteria as warranted by SEPTA's fare policy or by SEPTA's procedures.

All parameter settings shall be controlled through the CDCRS and applicable to all accounts, whether active or inactive, in the NPT system. Contractor shall furnish documentation at the Conceptual Design Review, Preliminary Design Review and Final Design Review to provide full details on these parameters, including the proposed settings as a part of the Final Design Review. **CDR 5-6, PDR 5-8, FDR 5-9**

5.6.2 Data Integrity

The CDCRS shall support periodic data integrity checks for all data that is captured for reporting analysis. Accurate and complete file downloads are essential to the proper operation of the NPT System, including the reporting and analytical support functions.

5.7 Communications

The communications interface between the BCPS and the clearing houses shall utilize a transparent TCP/IP protocol, with a dedicated IP address and TCP/IP port. The Contractor's interface shall provide for an approved commercially available hardware encryption solution.

The Contractor shall be responsible for development, testing, and certification of the interface connection between the BCPS to each card clearinghouse. The Contractor shall also provide all associated software and hardware for purposes of encrypting and transmitting the required data for determination of card validity and fund availability for approving (or rejecting) bank card transactions initiated at all NPT equipment.

The NPT System shall be able to simultaneously process bankcard transactions from all NPT devices and to the associated bankcard clearing institutions. The NPT System shall be sized and configured such that the length of time to completely process a transaction does not under normal conditions exceed the maximum time as identified in Section 4, including the time for network traffic.

Section 6 – Site Installation Requirements
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6 SITE INSTALLATION REQUIREMENTS

6.1 Sitework

6.1.1 Demolition

6.1.1.1 General

6.1.1.1.1 Description

A. The work specified in this section consists of the demolition, removal, disposal and salvage of existing fareline equipment and facilities as required to execute the work of this Contract including but not necessarily limited to complete or partial demolition and removal of the following:
   1. Complete removal of all existing fareline equipment and support devices.
   2. Proper disposal from the project of any existing fare collection equipment and/or fareline hardware that is:
      a. Designated for removal but not noted for reinstallation;
      b. Not designated for retainage by SEPTA;
      c. Not designated as salvage material by SEPTA.
   3. The complete removal and proper disposal from the project of any temporary structures, platforms, electrical, mechanical, etc., that were required during the staged installation activities.

6.1.1.2 Execution

6.1.1.2.1 Preservation of References

A. Prior to removal, record location and designation of survey markers and monuments found within demolition area. Store markers and monuments during period of work. Restore survey markers and monuments upon completion of demolition work.

6.1.1.2.2 Maintenance of Pedestrians and Traffic

A. Maintain traffic as follows:
   1. Construct, maintain and remove on completion of work, temporary structures provided for protection of the public in accordance with applicable codes to ensure continuous safety of pedestrians and traffic.

2. Span cuts in traffic areas with steel plates or by other approved means. As required for the conditions for which it will be used, the thickness of the steel plate shall be determined by a Professional Engineer registered in the Commonwealth of Pennsylvania.
3. Keep pedestrian and traffic areas free from debris and spillage of materials.

6.1.1.2.3 Utility Work

A. General:
   1. Within public right of way confirm with the appropriate utility, that their facility has been either abandoned or relocated and that it is safe to proceed with the required demolition.
   2. Prior to commencement of operations, make all necessary arrangements with the proper authorities for the turning off and disconnection of utility services required for demolition operations, including gas, electric, telephone, sewers, water and other facilities encountered, unless otherwise indicated or directed by the utility owner.
   3. Bear all costs, including fees to utility companies and other agencies, resulting from this work and furnish the Project Manager with receipts showing proof of payment.
   4. If a utility is encountered which interferes with any equipment and facilities installation activities and is not indicated on the Contract Drawings, determine the disposition. If the utility is to be abandoned, remove the utility or fill abandoned pipe as approved by the utility owner.
   5. Piping, meter boxes, pits, manholes, inlets, valve boxes, cleanouts and vents shall be maintained by the NPT Contractor unless otherwise indicated.

6.1.1.2.4 Demolition and Removal

A. General:
   1. Remove all equipment as designated within specified drawings
      a. Removal must occur per required phasing, as noted on drawings.
   2. Repair, replace or "dress up" as required, surfaces adjacent to demolished areas that require such work as a result of the demolition work.

3. Prevent damage to pipes, conduits, wires, cables and structures above and below ground which are not designated for removal. Repair or replace damaged items to the satisfaction of the affected agency at Contractor's sole expense.
4. Remove trash and debris daily unless otherwise directed by the Project Manager and do not allow waste materials to accumulate.
5. Control and prevent the spread of dust to occupied portions of the site and avoid creation of a nuisance in the surrounding area.
6. During equipment and facilities installation activities, notify the Project Manager of items interfering with installation activities and not indicated on the Contract Drawings or specified herein to be removed.

6.1.1.2.5 Disposal

A. All materials resulting from demolition work shall become the property of the contractor, unless designated as salvage material by the Project Manager, and shall be removed from the limits of SEPTA property for proper disposition in compliance with applicable laws and regulations.
B. Legally dispose of debris off site only with permission of property owner where such debris is to be deposited and in accordance with codes and regulations of the jurisdictional authorities.
C. Do not burn debris on site.

6.2 Metals

6.2.1 Stainless Steel Handrails, Railings, and Partitions

6.2.1.1 General

6.2.1.1.1 Description

A. Stainless Steel Handrails, Railings, and Partitions, where provided, shall comply with these requirements.

6.2.1.1.2 Definitions

A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

6.2.1.1.3 Performance Requirements

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
   1. Stainless Steel: ASCE "Specification for the Design of Cold-Formed Stainless Steel Structural Members."

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
   1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 60 lbf per linear foot applied at any point and in any direction.
      b. Uniform load of 50 lbf per linear foot applied horizontally and concurrently with uniform load of 100 lbf per linear foot applied vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf per linear foot applied in any direction.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   3. Infill Area of Guardrail Systems: Capable of withstanding a horizontal concentrated load of 200 lbf applied to 1.0 sq. ft. at any point in the system including panels, intermediate rails, balusters, or other elements composing the infill area.
      a. Above load need not be assumed to act concurrently with loads on top rails of railing systems in determining stress on guard.

C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 150 deg F, ambient ; 212 deg F, material surfaces.
2. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

6.2.1.1.4 Submittals

A. Product data for mechanically connected handrails and railing systems, each kind of fitting, grout, anchoring cement, and paint products.
B. Shop drawings showing fabrication and installation of handrails and railing systems including plans, elevations, sections, details of components, and attachments to other units of Work.
    1. For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.
C. Samples for verification of each type of exposed finish required, prepared on components indicated below that are of the same thickness and metal indicated for final unit of Work.
    1. 6 inches long sections of each distinctly different linear railing member including handrails, top rails, posts, and balusters.
    2. Fittings and brackets.
    3. Assembled sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Sample need not be full height.
D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project names, addresses, names of architects and owners, and other information specified.
E. Product test reports from a qualified independent testing agency evidencing compliance of handrails and railing systems with requirements based on comprehensive testing of current products.
F. Test reports from an independent testing agency evidencing compliance of handrails and railing systems with ASTM E 985.

6.2.1.1.5 Quality Assurance

A. Single-Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Engineer Qualifications: Professional engineer legally authorized to practice in the Commonwealth of Pennsylvania and experienced in providing engineering services of the kind indicated for handrails and railing systems similar to this Project in material, design, and extent, and that have a record of successful in-service performance.
C. Standards: Comply with the requirements of the Americans with Disabilities Act, the ADA Accessibility Guidelines; the Philadelphia Building Code; and ANSI 117.1-92.

6.2.1.1.6 Storage

A. Store handrails and railing systems inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

6.2.1.1.7 Project Conditions

A. Field Measurements: Where handrails and railing systems are indicated to fit to other infrastructure, check actual dimensions of other infrastructure by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with installation activity progress to avoid delaying the Work.

6.2.1.2 Products

6.2.1.2.1 Metals

A. General: Provide metals free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.
B. Stainless Steel: Grade and type designated below for each form required:
    1. Tubing: ASTM A 554, grade as follows:
        a. Grade MT 316, No. 4 Finish.
    2. Pipe: ASTM A 312/A 312M, grade as follows:
        a. Grade TP 316, minimum wall thickness of
        b. All pipe shall measure 1½ inches actual outside diameter.
    3. Castings: ASTM A 743/A 743M, Grade CF 8M.
    4. Plate: ASTM A 167, type as follows:
        a. Type 316.
    5. Sheet: ASTM A 167, Type 316, with No. 4 Finish.

6. Bars and Shapes: ASTM A 276.
7. Handrail Post Brackets: Handrail Post Brackets: Subject to compliance with requirements, products that may be incorporated in the work include the following:
    a. Stainless steel Carlstadt self-aligning handrail post brackets #241 as manufactured by Julius Blum & Co., Inc. Provide special rail mounts where required at curved returns.
    b. # 304R stainless steel by TSM Tubular Specialties Manufacturing, Inc. Provide special rail mounts where required at curved returns.
8. Handrail Wall Brackets and Cover Flange: Subject to compliance with requirements, products that may be incorporated in the work include the following:
    a. Stainless steel Carlstadt self-aligning handrail wall brackets #221 with cover flanges as manufactured by Julius Blum & Co., Inc.
    b. # 304R stainless steel by TSM Tubular Specialties Manufacturing, Inc.

6.2.1.2.2 Welding Materials, Fasteners, and Anchors

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
    1. For stainless steel welded to structural steel: Follow AWS practices for welding rod selection and welding procedures.
B. Fasteners for Anchoring Railings to Other Equipment Installation Construction (construction): Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railings to other types of construction indicated and capable of withstanding design loadings.
    1. For stainless steel railings, provide fasteners fabricated from Type 316 stainless steel.
C. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
    1. Provide concealed fasteners for interconnecting railing components and their attachment to other work, except where otherwise indicated on the Drawings.

D. Post-installed Anchors: Provide anchors of proper type, size, and material fabricated from corrosion-resistant materials, capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified, independent testing agency.
    1. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete work.

6.2.1.2.3 Grout and Anchoring Cement

A. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without need for protection by a sealer or waterproof coating and is recommended for exterior use by manufacturer.

6.2.1.2.4 Fabrication

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than those required to support structural loads.
B. Assemble handrails and railing systems in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
C. Form changes in direction of members as follows:
    1. As detailed.
    2. By radius bends of radius indicated.
    3. By flush radius bends.
    4. By any method indicated above, applicable to change of direction involved.
D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Welded Connections: Fabricate handrails and railing systems for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
    1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    2. Obtain fusion without undercut or overlap. Remove welding flux immediately.
    3. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.
    4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
F. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's flanges, miscellaneous fittings, and anchors to interconnect handrail and railing system members to other equipment installation construction.
G. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.
H. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long with inside dimensions not less than ½inches greater than outside dimensions of post, and steel plate forming bottom closure.
I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.
J. Ease exposed edges to a radius of approximately 4/100 inch. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.
K. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.
L. Provide weepholes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.
M. Fabricate joints that will be exposed to weather in a manner to exclude water.

6.2.1.2.5 Finishes, General

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.

6.2.1.2.6 Stainless Steel Finishes

A. Remove or blend tool and die marks and stretch lines into finish.
B. Grind and polish surfaces to produce uniform directional textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.
C. Bright, Directional Polish: Match AISI No. 4 finish.
D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

6.2.1.3 Execution

6.2.1.3.1 Preparation

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete as masonry construction. Coordinate delivery of such items to Project site.

6.2.1.3.2 Installation, General

A. Fit exposed connections accurately together to form tight, hairline joints.
B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railing systems. Set handrails and railing systems accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
    1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
    2. Set posts plumb within a tolerance of 1/40 inch in 1 ft.
    3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/40 inch in 1 ft.
C. Field Welding: Comply with the following requirements:
    1. Fabricate railing components to minimize field welding.

2. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
3. Obtain fusion without undercut or overlap.
4. Remove welding flux immediately.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

D. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railing systems and for properly transferring loads to in-place construction.

6.2.1.3.3 Railing and Connections

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

B. Expansion Joints: Install expansion joints at locations indicated but not further apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side; fasten internal sleeve securely to one side; locate joint within 6 inches of post.

6.2.1.3.4 Anchoring Posts

A. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
   1. Non-shrink, nonmetallic grout.

B. Where railing posts to stringer connection is exposed, weld to stringer following AWS practices for welding stainless steel to structural steel.

C. Cover anchorage joint with a round steel flange attached to post as follows:
   1. Welded to post after placement of anchoring material.

6.2.1.3.5 Adjusting and Cleaning

A. Clean the stainless steel by washing thoroughly with clean water and soap, followed by rinsing with clean water.

6.2.1.3.6 Protection

A. Protect finishes of handrails and railing systems from damage during equipment installation activity period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
B. Restore finishes damaged during equipment installation and associated construction activities period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

6.3 Thermal and Moisture Protection

6.3.1 Firestopping

6.3.1.1 General

6.3.1.1.1 Description

A. This Section includes firestopping for the following:
   1. Penetrations through fire-resistance-rated floor infrastructure including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
   3. Sealant joints in fire-resistance-rated infrastructure.

6.3.1.1.2 System Performance Requirements

B. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
C. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the infrastructure penetrated.
D. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

1. Where firestop systems protect penetrations located outside of wall cavities.
2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
3. Where firestop systems protect penetrations located in infrastructure containing doors required to have a temperature-rise rating.
4. Where firestop systems protect penetrating items larger than a 4 inch diameter nominal pipe or 16 in^2 overall cross-sectional area.

E. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the infrastructure in which the joint occurs.

6.3.1.1.3 Submittals

A. General: Submit in accordance with Site Specific Work Plan (SSWP)
B. Product data for each type of product specified.
   1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.
C. Shop drawings detailing materials, installation methods, and relationships to adjoining infrastructure for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.
D. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirement.
E. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.
F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Project Managers and Owners, and other information specified.

6.3.1.1.4 Quality Assurance

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
   1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
   2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 2.5 Pa of water is maintained at a distance of ¾inches below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
      a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
      b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
   3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 2.5 Pa of water, as measured ¾inches from the face exposed to furnace fire. Provide systems complying with the following requirements:
      a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
      b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require SEPTA's prior approval. Submit documentation showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.
C. Installer Qualifications: Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary experience, staff, and training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.
D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
E. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
F. Coordinating Work: Coordinate fabrication of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.
G. Preinstallation Conference: Conduct conference at Project Site to comply with requirements of Section 20, regarding Project Progress Meetings.

6.3.1.1.5 Delivery, Storage, and Handling

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

6.3.1.1.6 Project Conditions

A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

6.3.1.1.7 Sequencing and Scheduling

A. Notify Owner's inspection agency at least 1 week in advance of firestopping installations; confirm dates and times on days preceding each series of installations.
B. Do not cover up those firestopping installations that will become concealed behind other infrastructure until Owner's inspection agency and authorities having jurisdiction, if required, have examined each installation.

6.3.1.2 Products

6.3.1.2.1 Firestopping, General

A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
    1. Permanent forming/damming/backing materials including the following:
        a. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
        b. Joint fillers for joint sealants.
    2. Temporary forming materials.
    3. Substrate primers.
    4. Collars.
    5. Steel sleeves.
C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

6.3.1.2.2 Fill Materials for Through-Penetration Firestop Systems

A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
B. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
C. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.
D. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:
E. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
F. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
G. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.

6.3.1.2.3 Fire-Resistive Elastomeric Joint Sealants

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable joint substrates indicated) O.
    1. Multicomponent, Nonsag, Urethane Sealant:
        a. Vulkem 922, Mameco International Inc.
        b. Dynflex, Pecora Corp.
        c. Dynatred, Pecora Corp.
        d. Dynatrol II, Pecora Corp.
        e. Sikaflex 2cn NS, Sika Corp.
        f. Sonolastic NP 2, Sonneborn Building Products Div., ChemRex Inc.
        g. Dymeric, Tremco Inc.
    2. Single-Component, Nonsag, Urethane Sealant:
        a. Isoflex 880 GB, Harry S. Peterson Co., Inc.
        b. Isoflex 881, Harry S. Peterson Co., Inc.

c. Vulkem 921, Mameco International Inc.
d. Sikaflex--15LM, Sika Corp.

6.3.1.2.4 Mixing

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

6.3.1.3 Execution

6.3.1.3.1 Examination

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

6.3.1.3.2 Preparation

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
   1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
   2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
   3. Remove laitance and form release agents from concrete.
B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

6.3.1.3.3 Installing Through-Penetration Firestops

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
    1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
    2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
    3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

6.3.1.3.4 Installing Fire-Resistive Joint Sealants

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

6.3.1.3.5 Field Quality Control

A. Inspecting agency employed and paid by Contractor will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
B. Inspecting agency will report observations promptly and in writing to Contractor and the Project Manager.
C. Do not proceed to enclose firestopping with other equipment installation activities until reports of examinations are issued.
D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

6.3.1.3.6 Cleaning

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from equipment installation operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

Section 7 – On-Board Processors
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7 ON-BOARD PROCESSORS

7.1 General

Contractor shall provide and install an On-Board Processor (OBP), incorporating an Operator Control and Display (OCD), adjacent to the ~~existing~~ upgraded farebox location for all Surface vehicles. The OCD shall be utilized for all operator actions, and preferably the existing Orbital mobile data terminal (MDT) shall be deployed as the OCD. This shall permit ease of operation by providing a single log-on and single interface point for the upgraded farebox and the OBP.

~~.~~ The OBP shall process all acceptable forms of Smart Media as defined in Section 4 and shall:

- Process Smart Media and receive Smart Media validity authorizations from the CDCRS, via wireless communication;
- Respond to operator's actions and selections;
- Display the Fare Media validity ~~and value~~ information to the Customer and operator;
- Display instructions and notices;
- Generate and store transaction data;
- Provide different audible annunciations for valid and invalid transactions;
- Incorporate diagnostics to sense and identify problems with the OBP;
- ~~Communicate with the replaced farebox via a communications interface provided within the replaced farebox (using either an SAE J-1708 connector or an RS232 connector as selected by the Contractor);~~
- Communicate with the upgraded farebox via a SAE J-1708 interface provided ~~within~~ by the farebox via external connector;
- Operate on a maximum of 12 Volts and 8 amps, provided by ~~via~~ the upgraded farebox via external connector;
- ~~Be powered utilizing power provided via a 12 Volt connector included within the replaced farebox;~~

- Communicate with the CDCRS to receive commands, transmit, and receive data regarding sales, revenue, accounting, status, and security information (via the wireless data transfer system and via the memory module).

Preliminary design drawings of the OBP showing all major assemblies and the interfaces with the ~~replaced~~ upgraded farebox shall be submitted for SEPTA approval at the Preliminary Design Review. **PDR 7-1**

The OBP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to replace the OCD, to upgrade processing performance, or to maintain compatibility with ISO/IEC-14443 standards as they evolve. When installed the OBP shall meet all ADA requirements as identified in Section 2.

A complete description of the functionality of the OBP shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as required within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 7-1, PDR 7-2, FDR 7-1**

7.1.1 Interface with the Farebox

The OBP shall interface with the upgraded farebox for power and wired communications. This interface shall occur via a 10-pin Canon Twist-Lock connector provided on the side of the upgraded farebox.

7.1.1.1 Communications Interface

The OBP shall provide an interface to the upgraded farebox to provide for a single point of log-on and control for both the NPT equipment and the upgraded farebox via the OCD (see Section 7.5.1). This shall permit, as a minimum:

- ~~-~~combination transactions (Smart Media plus cash/token) to be automatically processed~~, permit~~;
- the operator to ~~set the correct zone/location~~log-on to both the OBP and upgraded farebox;
- automatic verification of operator inputs at log-on; and
- ~~permit~~ response to Customer requests.

The OBP and the upgraded farebox shall communicate utilizing a SAE J-1708 interface and SAE J-1587 protocols. The upgraded farebox provides this ~~for two~~ interfaces ~~via two sets of three pins~~ within the provided 10-pin connector. The Contractor shall provide the capability for migration to the SAE J-1939 interface without the need for hardware modification. Messages originating from both the OBP and the upgraded farebox shall be accommodated and properly processed.

Through this interface with the upgraded farebox, the system shall provide a vehicle operator with a single location for log-on and to permit review of all details of a Customer's fare payment transaction. These details shall include, but not be limited to identification of passenger type, identification of payment completion, and all other necessary items.

This interface shall allow the OBP to accept data from the upgraded fareboxes regarding cash and magnetic media transactions as well as necessary event and alarm messages. In addition, this interface shall also provide for the transmittal of messages, user information, and all other necessary data between the upgraded farebox and the OCD.

~~An interface with the existing farebox shall not be provided. The OBP shall interface with the replaced farebox – either a new or an overhauled farebox.~~

~~For the replaced farebox, which will occur prior to or during the NPT System implementation, SEPTA requires that the OBP accept data transmitted from the replaced fareboxes on cash and magnetic media transactions. This shall provide for the transfer of displayed messages and other necessary data between the replaced farebox and the OCD.~~

~~This shall include, but not be limited to, such items as identification of passenger type, identification of payment completion and other similar items to provide the vehicle operator with a single location on the vehicle to review details of the Customer fare payment transaction.~~

~~The OBP shall provide an interface for the replaced farebox to provide for a single point of log-on and control for both the NPT equipment and the replaced farebox via the OCD. This shall permit combination transactions, permit the operator to set the correct zone/location and permit response to Customer requests. Until the existing farebox is replaced, the OCD shall control only the OPB.~~

~~When replaced, the farebox and OBP shall communicate, utilizing established standard interfaces – a SAE J-1708 interface and an RS232 interface. If SAE J-1708 interfaces and SAE J-1587 protocols are utilized, capability shall be provided for migration to the SAE J-1939 interface without need for hardware modification.~~

7.1.1.2 Power Interface

The OBP shall draw all power from the upgraded farebox via the external interface. This will~~shall~~ be provided via two pairs of pins within the provided 10-pin connector. Each pair of pins ~~shall~~ will be capable of supplying a maximum of 12 volts and both pairs of pins ~~shall be~~ capable ~~to~~of supplying a combined maximum of 8 amps.

7.2 Transaction Processing

The OBP shall process fare media as appropriate to the type of validity information stored, by the NPT System or Smart Media itself and as identified in Section 4.

Data to be stored and transferred to the CDCRS by the ~~NPT device~~OBP shall include, as a minimum:

- all events and alarms sensed;
- all events and alarms cleared, including the identification of the user which cleared the alarm;
- all completed and transactions, including all data needed to provide a complete record of the transaction;
- all invalid transactions, including reason for invalidity;
- all status changes of the device or any module incorporated;
- all configuration changes;
- all successful communications;
- all communication failures;
- all power failures and restorations;
- all accesses to the interior of the device;

- all commands issued by the maintenance, revenue service and other personnel; and
- additional information required to provide a complete audit trail for revenues and fare media.

7.2.1 Log-on

Log-on to the OBP shall not be permitted under any circumstance unless a solid-state memory module has been inserted into the OBP. This module shall be automatically locked into position once log-on by the operator has been completed. It shall be able to be unlocked and removed only after the operator has logged-off.

Logging-on and logging-off the OBP shall be conducted through the OCD and shall provide for simultaneous log-on to the upgraded farebox.

Logging on shall include the operator, route, run, block and direction. The log-on data shall be verified against a list of valid operators, routes, runs, blocks and directions. This information shall be controlled via authorized users, stored within the CDCRS, and transmitted to the OBP. ~~(entered by SEPTA, stored in the CDCRS and uploaded to the OBP)~~. If an invalid item of data is identified as being entered, then the OBP logic shall identify the invalidities and request re-entry of the data. These invalidities shall be stored in transaction records and transferred to the CDCRS for reporting.

7.2.2 Log-off

Upon log-off, all displays shall be extinguished and the OBP shall enter its low-power idle state. Log-off shall also occur automatically as part of the data transfer to the CDCRS. Automatic log-off of the OBP shall also be provided after a ~~programmable~~ SEPTA-settable amount of time has elapsed since the last transaction. This feature shall be enabled by a SEPTA-adjustable parameter. Upon any method of log-off, an event record shall be stored to indicate that a automatic log-off has occurred and the type of log-off shall also be identified`.

7.3 Data Storage

All data shall be stored in the OBP memory module until instructed by the CDCRS to purge transactions. The memory module shall have sufficient memory to locally store the Operational Fare Media Lists (see Section 2.3.16), a minimum of 50,000 transaction records, 2,000 summary records (including time segment records) and 2,000 event/alarm records before a memory full condition is reached.

This memory module shall be backed-up with a physically separate, redundant data module. The redundant data module shall be a compact flash RAM with a minimum capacity of 8GB. When the data storage capacity is exceeded, the OBP shall take itself out of service until the data can be successfully transferred and its memory cleared.

7.4 Global Positioning System

The OBP shall incorporate integrated hardware and software for a Global Positioning System (GPS), including the appropriate antenna where required. The GPS shall provide latitude and longitude information as well as stop information, and shall append this information to every transaction record. For the GPS System:

- Software shall be required for the CDCRS to configure, control and otherwise operate the GPS system, including setting up stops.
- GPS hardware and software shall meet the same operational and performance requirements as the OBP, including design review and submittal requirements.
- OBP performance shall not be degraded by integrating the GPS system into the OBP.

7.5 User Interface

The OBP user interface shall employ a graphical interface whose functions are straightforward and consist of no less than the following:

- A ~~read/write module~~ SMP capable of ~~reading and writing~~ processing fare media types that are employed by the NPT System to permit proper interoperation with all other NPT devices.
- A backlit color Customer graphical display readable in direct sunlight;~~.~~

- A simple “green / yellow / red” array to indicate the result of the transaction and status of the OBP;.
- an OCD to provide for all interaction of the operator with the OBP (see Section 7.5.1);
- An audio transducer capable of generating the specified tones; and
- A voice enunciator supported by a text to speech system.

Upon completion of each transaction, the OBP shall:

- display the results of the transaction on the Customer display and OCD;
- emit a distinct tone, based on transaction validity; and
- illuminate the proper LED.

Designs of the OBP instructions and related graphics shall be submitted for SEPTA review and approval as part of the Preliminary Design Review. **PDR 7-3**

7.5.1 Operator Control and Display

The OBP (and the replaced farebox when it is implemented) shall be operated using the OCD integral to the OBP. Preferably, the existing MDT installed on the Surface vehicles shall be used as the OCD.

If the MDT is not deployed as the OCD, then Tthe OCD shall include a 2-line display of 2016 characters per line (minimum) and a keypad with a minimum of 16 separate soft keys. All interaction by the operator with the OBP shall be through the OCD only.

In all cases, theThe OCD shall be used to command the OBP to alter fare sets and to operate the OBP, including selection of the destination zone and fareset for the Customers. In addition, every Customer transaction shall result in information to be displayed to the vehicle operator on the OCD.

Regardless of the method of supplying the OCD, tThe messages displayed and their wording shall be submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 7-4, FDR 7-2**

7.5.2 Customer Display

The OBP shall include a display to provide Customers with instructions and transactional information. The display shall be easily read under all conditions of ambient light throughout the day and night.

The display shall be capable of displaying at least four lines of alphanumeric text, each with a minimum of forty characters of at least 0.375 inches tall for each character. Results of all transactions and display of all messages for the Customer shall be provided on this display.

If a Smart Media ~~write~~ read failure occurs for three out of five consecutive processing attempts, or the OBP fails in any other manner such as to inhibit its operation, the device shall revert to its "Out of Service" mode and not accept any Smart Media for processing. This shall cause the visual indicator to become red, an event message to be stored and an “Out of Service” message to be displayed on the OBP and OCD.

Displayed messages shall be easily modifiable by SEPTA once the system is in operation. The messages displayed and their wording shall be submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 7-5, FDR 7-3**

7.5.2.1 LEDs

The OBP shall include three LEDs – one each in green, yellow, and red – to indicate the status of the last fare media transaction as well as the status of the OBP after the returning to the idle state.

The LEDs shall be located on the face OBP and shall be positioned so that they are easily visible in all ambient lighting conditions by a Customer using the OBP and the operator.

7.6 Fare Handling Hardware

7.6.1 Smart Media Processor

The OBP shall have an integrated commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4.

The SMP shall be modular and upgradeable so that it does not need to be replaced in its entirety to provide for additional Smart Media

functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

Contractor shall provide all information on the hardware, software, and parameters for the OBP and its elements identified in this section for SEPTA review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 7-2, FDR 7-4**

7.6.2 Control System

The OBP shall be controlled by an integrated Electronic Control Unit (ECU). The ECU shall be modular and shall control all aspects of the OBP, including communication via a secure network with the CDCRS. All authorization request responses, fare tables, operational parameters, settings, lists and other such information shall be downloaded from the CDCRS. All authentication requests, transaction records and data shall be sent to the CDCRS.

The OBP shall store all data from its operation in a solid-state memory module as defined in Section 7.3. All data sent from the CDCRS shall originate from this memory and all data received from the CDCRS shall be stored in this memory. This memory shall be unaffected by OBP power status.

The CDCRS shall be capable of downloading updated application software to the OBP. Upon receipt of new application software, the OBP shall automatically reset and begin operation with the new application software. Data transfer between the OBP and the CDCRS shall be as identified in Section 7.7.

7.6.3 Timeouts

The OBP shall provide SEPTA-adjustable time-out periods to return the OBP to the idle state in prescribed times between steps of a transaction and between transactions.

- An intra-transaction time-out function shall be provided which shall limit the time between selection of a transaction type and tagging of a ~~fare media~~Smart Media. If the Customer fails to tag a fare media for more than a preset number of seconds after selection of the transaction type, the transaction shall be automatically canceled and the OBP shall return to the idle state. SEPTA shall be able to program different time spans ranging from 1 to 15 seconds in increments of 0.1 seconds for the intra-transaction time-out operation of the OBP. As delivered, the intra-transaction timeout shall be set to five (5) seconds.

- Similar to the intra-transaction time-out described above, an inter-transaction time-out shall also be provided. This timer shall limit the amount of time the OBP waits after completion or cancellation of a transaction before resuming the idle state. The inter-transaction time-out shall be initially set to five (5) seconds but shall be adjustable by SEPTA from 0 to 15 seconds in increments of 0.1 seconds.

All time-outs shall be identified in the review of the transaction process that shall occur at the Preliminary Design Review, and shall be subject to SEPTA approval at the Final Design Review. **PDR 7-6, FDR 7-5**

7.6.4 Audible Tones

An audible tone shall be provided for the acceptance and processing of valid Smart Media. A second audible tone shall be provided for an unsuccessful transaction or upon the presentation of invalid media.

7.6.5 Operational Fare Media Lists~~Invalid Fare Media List~~

~~The OBP's Electronic Control Unit shall receive from the CDCRS and store a list of known invalid Smart Media serial numbers as defined in Section 2.3.16. All Smart Media presented to the OBP shall be verified against this list.~~ When the OBP is communicating with the CDCRS, the Bad Number List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the OPB shall be used. The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

7.6.6 Passback Control

Each OBP shall monitor all media usages to prevent use of any unlimited ride media products for more than one concurrent trip within a defined time period. All Smart Media presented to the OBP shall be verified against this list.

This time period, initially set to thirteen (13) minutes, shall be settable by SEPTA via a downloaded parameter. The control of passback shall be based on uses of Smart Media at an OBP for the present trip. All aspects of the passback controls and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 7-3, PDR 7-7**

7.6.7 Transaction Records

The OBP shall store transaction records for each transaction performed at the OBP as well as for each alarm, event and operator action that occurs at the OBP.

Each transaction record shall include the date, time, vehicle number, operator ID, and all pertinent data for the transaction. Additionally, transaction records shall include the location information as provided by the OBP GPS system, as defined in Section 7.4.

Summaries shall be kept of revenue and transaction data in the OBP. These summaries shall be provided to SEPTA for review, modification, at CDR and approval at FDR. **CDR 7-4, FDR 7-6**

Each transaction and summary record shall be recorded at the OBP and transmitted to the CDCRS immediately upon communication between the two. Each record shall be uniquely identified within the NPT System.

To protect against missed and duplicate data, each record transferred to or from the OBP shall be serialized. Each time the OBP data is successfully transferred the last transaction number shall be transferred to the CDCRS, and the serialized transaction number shall be automatically reset.

Each transaction record shall be unique within the NPT system and shall include the following information as a minimum:

- Smart Media serial number;
- Date and time of transaction;

- Vehicle number;
- OBP number;
- Run number;
- Route number;
- Vehicle location (GPS latitude and longitude);
- Fare/Transaction type;
- Number of Customers;
- Amount paid;
- Method of payment;
- Transaction number;
- Stop number information (if available).

The OBP shall generate an event transaction record for each of the following actions or incidents as a minimum:

- Failures and performance incidents, for use by maintenance personnel;
- Operator log-on incidents with operator number and other log-on information;
- End of transit business day (SEPTA programmable time, default is 3:00 am);
- Data transfer starts;
- Data transfer ends;
- The internal clock fails;
- The internal clock is reset;
- The OPB memory is about to overflow (SEPTA programmable memory percentage);
- Changing from one fare table to another;
- OBP powers off;

- OBP powers on;
- Operator log off, and method of log-off;
- Successful data transfer of transactional data;
- Unsuccessful data transfer of transactional data;
- Successful download of configuration data;
- Unsuccessful download of configuration data;
- OBP module failure;
- Security alarms, errors and intrusions – This information shall be stored in a separate security file at the CDCRS, access to which shall be protected by security password; and
- Results of automatic diagnostics.

Contractor shall provide a complete list of all conditions sensed and transaction records stored and maintained by the OBP for SEPTA approval. The structure and layout of all transaction records, as well as all data required for each type of transaction shall be identified by SEPTA at each stage of the design review with the final document fully describing each transaction record. **CDR 7-5, PDR 7-8, FDR 7-7**

7.6.8 Diagnostics

The OBP shall be capable of detecting basic internal malfunctions. The malfunction detection shall cover at least failure of power circuitry, control circuitry, opening of an access panel, interface failure, and any failure of the ~~Smart Media read/write unit~~SMP that could result in a false, incomplete, or corrupted encoding of Smart Media.

Internal diagnostic programs shall check the OBP and its interfaces for proper performance each time it is turned on and after every operator login and log-off. When the performance of any parameter is not according to specification, the OBP shall turn itself off and indicate this to the vehicle operator, both audibly and visually.

The detected deficiency shall be recorded in the OBP's memory for later extraction. Any failure that occurs apart from the diagnostic check shall also be recorded. When it is not possible to record the deficiency or failure, the occurrence shall be identified on the operator's display until acknowledged by the operator.

Out-of-service conditions shall be annunciated on the OCD. The information displayed shall indicate the type of failure that caused the OBP to shut down. A description of the maintenance and service indicators for the OBP shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 7-9**

~~**7.6.9Fare Tables**~~

~~OBP software shall have the ability to receive and store two (2) fare table files via the network. At minimum, the OBP shall have sufficient resources to store the most current fare table and one for future implementation. All necessary, printing formats for the fare tables shall reside within the OBP. When communications with the CDCRS is lost, a procedure with appropriate security shall be used for manually uploading data locally. The OBP shall be capable of handling the fare table as identified in Section 19.3.2.3.~~

~~Once a new fare table is created on the CDCRS, it shall be possible to download the new fare table to the OBPs via the data communications link. Once downloaded into the OBP, the new fare table shall be activated automatically in the OBP at the specified date/time as programmed by SEPTA.~~

~~The structure and layout of the fare table entries and the OBP's ability to accommodate existing and future fare policies, as defined in Section 4, shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews.~~ ~~**PDR 7-10, FDR 7-8**~~

7.7 Communications

Data transfer shall be performed via standard IEE 802.11n or greater wireless LAN technology. The OBP shall communicate with the CDCRS for data transfer actions. This interface shall provide for bi-directional transfer of all data. Functionality to be provided for the communications system shall include the following as a minimum:

- Transmitting Smart Media information to the CDCRS to provide fare validity and authorization for boarding;

- Uploading of all OBP stored transaction, alarm status and event data;
- Downloading of all parameter and fare table information to the OBP;
- Downloading of all data configuration modifications to the OBP;
- Downloading of the invalid fare media list and positive number list to the OBP;
- Downloading all valid operator, route, run, block and direction lists;
- Clock synchronization;
- Communication verification;
- Downloading of current geographic location information (stop data) to the OBP; and
- Provide program/software updates to the OBP.

Communications shall be provided with the ~~replaced~~ upgraded farebox via one of the communications interfaces installed within the ~~replaced~~ upgraded farebox. The data communication ~~-~~interface~~s~~ available for Contractor use will be a SAE J-1708 connector ~~and an RS232 connector~~. The Contractor shall utilize ~~one of these~~this interface~~s~~ for such communication.

~~When arriving at the Bus Depot/Trolley Barn and SEPTA-identified turn points, w~~When the OBP arrives in range of the wireless data communications system, the OBP shall communicate with the CDCRS and shall transmit OBP health/status information as well as all data stored by the OBP. Updates to parameters shall also be downloaded to the OBP at these times.

When the OBP is on the road and out of range of the Bus Depot/Trolley Barn ~~and SEPTA-identified turn points~~, but the wireless communication system is operating as identified in Section 18, the OBP shall communicate with the CDCRS and shall transmit OBP health/status information immediately upon change in any status, including memory capacity.

In cases of network failure, the OBP shall have sufficient capacity to store, at a minimum, ten days' event and transaction data. This information shall be stored in both the OBP main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored transaction data (e.g., alarm, event, sales) shall be automatically transmitted to the CDCRS.

The details of the configuration changes, communication interface and data transfer shall be subject to SEPTA review and approval at the Final Design Review. **FDR 7-8**

7.7.1 Hardware

The OBP shall include all hardware and software necessary for wireless data communications.

Wireless data communications shall be accomplished at the Bus Depot/Trolley Barns ~~and SEPTA-identified turn points~~ using the equipment installed at those locations. This equipment shall include access points and all other hardware and software elements to ensure that the data communications requirements throughout these technical specifications can be achieved and can interface into the Communications system specified in Section 18.

The OBP shall also have the capability to permit configuration modifications through the CDCRS and through the use of a portable programming device. The portable programming device shall not collect and store transaction data, but shall be used for downloading parameters and other operational information to the OBP. All configuration changes shall be tracked and the records of these changes shall be stored in the OBP memory and transferred with the transactional data to the CDCRS. These records shall include the portable programming device number used for data download.

7.8 Structure and Finish

The OBPs shall be compact, ergonomically designed, simple to use, and sufficiently robust to deter and withstand acts of vandalism and Customer abuse common to such on-board operations. The OBP and the enclosure shall be constructed of stainless steel or other suitably vandal-resistant~~, revenue service-proven~~ materials. The Contractor shall provide samples of the proposed material and finish of the OBP enclosure for SEPTA review and approval at the Preliminary Design Review. **PDR 7-10**

The Contractor shall supply all mounting hardware as required. Maintenance access to the OBP internal components shall be via one or more panels that are secured with electronic high-security locks and locking mechanisms.

All OBP access panels and doors shall be on the front or top face of the OBP~~, shall~~, shall be locked and ~~openable~~ opened with a key. The OBP shall detect the position and status of all access panels and shall go out of service and record an appropriate event whenever any access panel/door is opened. All security provisions, including lock(s) and access panel/door latching schemes for OBP shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 7-11**

~~High security locks and keys shall be furnished for review and approval by the SEPTA. Descriptive documentation and catalog cuts of all high security locks and keys for the OBP shall be submitted as part of the Preliminary Design Review. **PDR 7-13** Ten sets of keys shall be provided and shipped under separate cover directly to SEPTA prior to commencement of installation of any devices.~~

Design drawings of the OBP and all major assemblies shall be submitted for SEPTA review and approval as part of the Preliminary Design Review. **PDR 7-12**

Drawings and additional information depicting function, configuration, and arrangement of all Customer interfaces on the exterior of the OBP shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 7-13**

7.9 Installation

The OBP shall be installed adjacent to the farebox in close proximity to the front door, and be positioned so that an entering Customer may easily present their Smart Media. The mounting position of the OCD shall permit the operator to comfortably reach and manipulate all of the OCD controls and observe the OCD display.

The OCD position shall allow the operator to quickly inspect the display without undue head movement and operate the buttons without fully extending their arm. The OBP shall be capable of being mounted on the handrail and on a post/pedestal, to accommodate installation on the various types of vehicles. Installation shall not impede the progress of the Customer.

The OBP positioning shall allow for probing and cashbox removal of the existing farebox and the rapid removal of the OBP equipment from the vehicle. In addition, the OBP shall be installed to permit complete and unrestricted opening of OBP and farebox maintenance/access panels/doors. Contractor shall be responsible for the design of the installation of the OBP for each SEPTA vehicle type.

All costs incurred for removal or repositioning of the devices or handrails on any vehicle shall be the responsibility of the Contractor.

The location and mounting positions and methods of the OBP and OCD on each vehicle type in the SEPTA system shall be submitted for SEPTA review at the Preliminary Design Review, and for approval at the Final Design Review. **PDR 7-14, FDR 7-9**

Section 8 – Fare Vending Devices
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8 FARE VENDING DEVICES

8.1 General

Fare Vending Devices (FVDs) shall be deployed at locations and stations identified by SEPTA throughout their service area. Each FVD shall be designed to operate as both a stand-alone unit, and on-line connected to the Central Data Collection and Reporting System (CDCRS) via the SEPTA NPT Communications network outlined in Section 18.

The FVD, including all controls and instructions shall be designed to facilitate a quick understanding by the Customer for its intended use, along with a rapid response to instructions. SEPTA shall be able to customize the FVDs based on the functionality and types of modules installed as well as parameter settings. The FVDs and the functionality to be installed is provided in Table 8-1~~ Table 8-1Table 5-1~~.

When installed, the FVD shall meet all ADA requirements as identified in Section 2.

~~5.1.1~~8.1.1 Fare Vending

The FVD shall be able to vend all of the fares identified in Section 4.

FVDs shall support the control of SEPTA Fare Media stock whether issued in accordance with the requirements of this specification, or alternatively issued mis-encoded, jammed, or otherwise unfit for Customer usage. FVDs shall be designed to provide self-clearing functions, to include clearance of coin, currency and Fare Media jams.

~~5.1.2~~8.1.2 Payment Media Acceptance

FVDs shall be able to accept as payment valid U.S. currency, U.S. coins, current SEPTA adult tokens, value stored in ~~the~~ a SEPTA or Partner Smart Media account on the CDCRS~~electronic purses~~, credit media and debit media. Fare Media types processed and/or issued by the FVD shall include all those identified in Section 4.

When the FVD is communicating with the CDCRS, the ~~invalid Fare Media~~ Bad Number List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the FVD shall be used. The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

When processing ~~the~~ credit and debit media, the FVD shall request and process the Customer's zip code as part of the card authentication process. Should a non-U.S. credit card by used, the FVD shall use the method employed in the U.S. to accept foreign zip codes for credit card transactions.

FVD software shall have the ability to receive and store two (2) fare table files via the CDCRS. At minimum, the FVD shall have sufficient resources to store the most current fare table and one for future implementation. All necessary~~,~~ printing formats for the fare tables shall reside within the FVD. When communications with the CDCRS is lost, a procedure with appropriate security shall be used for manually uploading data locally.

~~5.1.3~~8.1.3 Device Configurability

The FVDs shall be fully configurable such that the functionality shall be able to be defined individually for each FVD, for a defined group of FVDs or for all FVDs. Different configurations shall be utilized to address the specific needs of each machine location. SEPTA shall be able to revise any configuration at any time through modification of parameters, activation/deactivation of modules or both.

~~As an example, four t~~Two distinct configurations of the FVD shall be provided: Full Function FVD~~, Limited FVD,~~ and Cashless FVD ~~and Subway/Elevated Magnetic FVD~~, to meet specific operational needs at a location. The functionalities required by type of FVD are shown in Table 8-1~~ Table 8-1~~~~Table 5-1~~. FVD software shall be modifiable and configurable to permit any function to be provided at any FVD based on the modules employed within the FVD. Functions to be provided include the following functions as well as those defined ~~above~~ in Table 8-1~~ Table 8-1~~~~Table 5-1~~:

- Accept valid credit and debit media issued by a qualified financial institution for payment of Fare Media purchases and replenishments;

- Accept stored value in a Customer account on the CDCRS as payment for the purchase of valid ~~Fare~~ Magnetic Media;

.

~~Table 8-1 – Fare Vending Device Configurations~~

Table 8-1 – Fare Vending Device Configurations

Feature	Full Function FVD	Cashless FVD
Accepts cash (valid US coins and currency) and current SEPTA adult tokens	✓	
Dispenses change	✓	
Accepts credit and debit media and issues receipts	✓	✓
Replenishes Customer accounts ~~(account-based only) or Smart Media (media-based)~~	✓	✓
Dispenses ~~(encodes, prints, issues) permanent Smart~~SEPTA ~~Issued~~ Smart Media	✓	✓
~~Dispenses (encodes, prints, issues) Limited Use Smart Media~~	~~✓~~	~~✓~~
Dispenses (prints and issues) magnetic media	✓	✓
Provides ability to pay for parking at adjacent SEPTA Parking Facilities as defined in TS Chapter 15	✓	✓
~~Provides Smart Media validation functionality as defined in TS Chapter 13~~	~~✓~~	~~✓~~
Accept ISO/IEC 14443-compatible new payment technologies such as contactless credit media, cellular phones employing Near Field Communications technology, etc.	✓	✓
Communicate over a secure wired or wireless connection within a station to process electronic forms of payment as well as provide equipment status.	✓	✓
Accept Partner ~~Issued~~ Smart Media	✓	✓
Issue printed receipts for Regional Rail On-Board transactions using a Receipt Token (magnetic ticket) provided by the Conductor	✓	✓

Passenger interface modules, components and processes (screens, buttons, ticket selection procedures, etc.) for all FVD types shall be the same for all FVD configurations.

A complete description of the functionality of the FVD shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality of the FVD as described within section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 8-1, PDR 8-1, FDR 8-1**

~~5.2~~8.2 Transaction Processing

The FVD shall be able to issue, process and validate fares for Customers based on the Fare Media and System needs as defined in Section 4. For the issue of ~~Smart~~ Fare Media, the following steps shall be employed:

- Customer shall select the fare type based on the selections displayed;
- Customer shall select the Customer category based on the selections displayed;
- Zones of validity shall be selected (if required);
- If the Customer is permitted to select the Fare Media type for the fare to be issued, the selection options shall be displayed:
  - The Magnetic Media is issued to the Customer.
  - The ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media is issued to the Customer. ;
- The account for the Smart Media is updated with the Smart Media validity at the CDCRS after payment is provided;
- ~~The Fare Magnetic Media is issued, replenished or updated for to the Customer.~~

All versions of FVD shall provide the Customer with the capability of having their Smart Media read and the validity information for the ~~on the~~ Smart Media (stored in the account on the CDCRS) displayed to the Customer. The Customer shall also have the ability to print this information on the receipt stock. In the event that the FVD or any other NPT device is not in on-line contact with the CDCRS, a disclaimer shall be printed on the receipt stock. ~~This shall include the information provided for the last 10 transactions. After selection of the function via the FVD, the FVD shall provide the Customer with the capability to print out this information via the receipt printer within the FVD. The Customer shall select the information to be printed, including receipts for previous transactions which shall include full information for that selected transaction.~~

When the Customer is adding value to their Smart Media account at an FVD, the FVD shall permit the Customer to select a pre-identified value to add as well as permitting the customer to enter the exact value to add.

When off-line, the FVD shall be able to vend Magnetic ~~Fare~~ Media only until a SEPTA-settable threshold value is reached for the vending of ~~Fare~~ Magnetic Media. Communication with the CDCRS shall be required and all data transferred for the threshold value to be reset, permitting the FVD to continue sales. In addition, when off-line the display and printing of transaction history and card usage shall not be available if the transactional information is not stored on the Smart Media.

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum, based on the installed configuration of the FVD:

- all events and alarms sensed;
- all events and alarms cleared, including the identification of the user which cleared the alarm;
- all completed transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- all cancelled transactions, including reason for cancellation;
- all changes in status of the device or any module incorporated;
- all configuration changes;
- the current configuration of the FVD;
- all successful communications;
- all communication failures;
- electronic serial numbers of all cash containers;
- power failures and restorations;
- all accesses to the interior of the device;
- all commands issued by the maintenance, revenue service and other personnel; and

- additional information required to provide a complete audit trail for revenues and Fare Media.

~~5.2.1~~8.2.1 Payment Methods

For the purchase of Fare Media at the FVD, the following payment methods shall be accepted, based on configuration of the FVD:

- Cash (valid U.S. Currency and coins);
- SEPTA adult tokens;
- Magnetic and contactless credit and debit media;
- ~~SEPTA-issued Smart~~Stored value contained in a SEPTA ~~Issued~~ Smart Media account;
- Partner ~~issued~~ Smart Media
- Authorized new payment technologies such as NFC devices as defined in Sections 2 and 4.

~~Multiple modes of payment methods for media sales and reloads shall be able to be used for a single transaction. The default methodologies shall be settable by SEPTA locally and from the CDCRS. Information for this multiple payment mode process shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 5-2, FDR 5-2**~~

For cash accepting FVDs, upon selection of a transaction type, the FVD shall automatically open the apertures for bill and coin acceptance. They shall close only upon the selection of a non-cash payment method or after a pre-determined time-out period.

For purchases using credit cards, the velocity checks as identified in Section 19.7.2.1.A shall be performed at the FVD prior to authorization request.

For purchases using debit cards, the velocity checks as identified in Section 19.7.3.B shall be performed at the FVD prior to authorization request.

~~5.2.2~~8.2.2 Transaction Cancellation

All transactions shall be capable of being cancelled prior to completion either manually by the Customer or automatically by the FVD.

To manually cancel a transaction, the Customer shall be able to press a clearly marked button on the front panel of the FVD.

Automatic cancellation of a transaction shall occur under the following conditions:

- A programmable time limit elapses prior to completion of the transaction type, and no additional time is requested by the Customer (default setting = 20 seconds);
- The maximum capacity of bill escrow is exceeded;
- The maximum number of coins for Fare Media payment has been exceeded~~reached~~;
- Insufficient coinage to dispense change when the Customer rejects overpayment option;
- Power failure prior to completion of transaction, when sufficient funds to purchase the selected Fare Media had not been inserted;
- Conditions during a credit or debit media transaction as indicated in ISO 8583;
- Programmable credit/debit media checks fail (as detailed in Section 19);
- The Fare Media cannot be dispensed due to slippage or jamming;
- The Fare Media cannot be dispensed due to insufficient stock for completion of the transaction;
- A failure occurs and the FVD ~~is unable to~~ cannot complete the transaction.

Upon either manual or automatic cancellation, the FVD shall provide the following:

- A “Transaction Cancelled” message shall be displayed on the display screen;
- Coins and bills in escrow shall be returned to the Customer;
- If a credit or debit media transaction is underway involving the adding of value to an item of Smart Media, a reversal message shall be transmitted to void the transaction in progress. A receipt shall be printed with the cancel/void message if the transaction has proceeded past the point at which credit or debit media has been used as payment; and
- If stored value is used as a payment method, the FVD shall require the passenger to re-present the stored value Fare Media for replenishment.

Conditions under which a transaction shall not be capable of being cancelled manually shall include:

- Cash transaction for which full payment for the purchase or reload has been tendered;
- Credit or debit media transactions for which clearinghouse authorization for the transaction has been received by the FVD.

The FVD shall be ready for processing the next transactions within 5 seconds of the cancellation (under normal operating conditions, when no more than 10 coins and 5 bills have been inserted, and including the inter-transaction time-out).

When an automatic cancelation of a transaction occurs and all of the Customer’s monies are not returned, the FVD shall provide the Customer with a printed receipt that provides transaction details and a failure code. This failure code shall be used for the refund on monies to the Customer.

If the FVD receipt printer is not operational when this occurs, the same information shall be displayed to the Customer on the FVD screen. This information shall be displayed for a SEPTA-settable time period, after which the FVD shall go out of service.

Information to be printed on receipts shall be presented to SEPTA for review purposes at the CDR and for Approval purposes at the FDR. **CDR 8-2, FDR 8-2**

~~5.2.3~~8.2.3 Transaction Speeds

Transaction speeds for the FVD sales transactions using various payment methods shall be as described below.

For all transactions, the time between the completion of the transaction (when the Smart Media is deposited in the media/coin return bin and all change is returned or the Smart Media account has been identified as updated as a final step). The ~~and the~~ FVD's readiness to begin another transaction shall not exceed 5 seconds (including the inter-transaction time-out).

~~5.2.3.1~~8.2.3.1 *Cash Transactions*

The time required to complete the sample cash transactions listed below shall not exceed the values presented in Table 8-2~~Table 8-2Table 5-2~~ provided that:

- All inserted coins and bills are inserted at maximum possible speed;
- All inserted coins and bills are accepted on the first insertion;
- All transactions are for the purchase of a single item of Fare Media.

Table 8-2~~8-2~~ – Maximum FVD Transaction Times

Sample Transaction Content	Maximum Time to Complete
One bill inserted Two coins returned	12 seconds
Four coins inserted Two coins returned	14 seconds
Two bills inserted Four coins returned	15 seconds
One bill inserted Four coins inserted Two coins returned	17 seconds
Five bills inserted Four coins returned	25 seconds

If the FVD provides bill recirculation or uses supplemental bill dispensers as a source of change, assuming:

- All inserted coins and bills are inserted at maximum possible speed;
- All inserted coins and bills are accepted on the first insertion;
- All transactions are for the purchase of a single item of Fare Media; and
- Returned bills are distinct from inserted bills.

The time required to complete the sample transactions listed below shall not exceed the following.

Table 8-3~~8-3~~ – Maximum FVD Transaction Times (Recirculation or Supplemental Dispensers)

Sample Transaction Content	Maximum Time to Complete
One bill inserted Two bills returned	12 seconds
Two bills inserted One bill returned	12 seconds
One bill inserted Two bills returned Two coins returned	17 seconds
Five bills inserted Four bills returned	30 seconds

Where possible, FVD speed for completion of the transaction shall be optimized by the use of concurrent activities such as:

A. Dispensing of change shall occur concurrently with the transfer of any inserted bills from the bill escrow into the bill vault or recirculating modules (if applicable).

B. If change requirements call for dispensing change from multiple devices (the recirculating coin system and one or more modules of the supplemental change storage system), devices shall be activated simultaneously.

C. If a canceled transaction requires the return of coins and bills, both the coin and bill systems shall be commanded to do so simultaneously.

~~5.2.3.2~~8.2.3.2 *Bank Card Transactions*

Transaction times for bank card transactions for shall not exceed the following times (excluding PIN entry time and clearing house processing time):

A. When the CDCRS interface with the acquirer is on-line: 5 seconds;

B. When the CDCRS interface with the acquirer is inactive, including the attempt to establish communications: 10 seconds.

~~5.2.3.3~~8.2.3.3 *Smart Media Transactions*

Transactions shall occur in no more ~~than~~ time than is defined in Section 4. The processing shall include checking of all data, including a maximum-sized invalid Smart Media List review, ~~performing any pending automatic transactions (i.e., "autoloads"),~~ performing the necessary computations, and ~~encoding~~ storing all data as required. It is understood that some Smart Media transactions may require multiple "tags" of the card to the reader. In such cases, the second "tag" shall not be considered for the purposes of transaction speed calculations.

~~5.2.4~~8.2.4 Alarms and Events

Events, which result in a change of service status or a problem of any kind with the FVD, shall be reported to the CDCRS via the network, in real time, and shall also be recorded at the FVD. In cases of network failure, the FVD shall have sufficient capacity to store, at a minimum, ten days' event and transaction data. This information shall be stored in both the FVD main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored transaction data (e.g., alarm, event, sales) shall be automatically transmitted to the CDCRS.

~~5.3~~8.3 User Interface

For every type of user-interface hardware modules within the FVD, the Contractor shall provide a list with the manufacturer, model number, software/firmware version and other relevant information. This will permit SEPTA to understand which specific items of hardware are being used within the FVD and the commonality between the various NPT devices. **CDR 8-3, FDR 8-3**

~~5.3.1~~8.3.1 Customer Display

The Customer Display shall be an active matrix color, trans-reflective liquid crystal display, minimum 15-inch diagonal. The display shall be mounted at an angle that maximizes the ability of Customers to read the screen while at the same time ensuring that the alignment of any line/arrows to adjacent selection buttons (if utilized) leaves no doubt as to what text or graphic on the screen is associated with each button.

The display shall be capable of displaying in no less than 256-color graphics, and provide for fully programmable graphics for the entire viewable surface of the screen. The minimum resolution shall be ~~1024X760~~ 1024X768 dpi.

The display shall have a non-glare finish that can be easily read at all ambient light levels, including direct sunlight. The display shall produce a minimum of 1,000 nits brightness with at least a 750:1 contrast ratio.~~, and provide a level of visibility sufficient to allow all displayed instructions to be easily read by the Customer under all ambient light conditions and without the need for any peripheral light source.~~

The display shall be of industrial or military grade. It shall be vandal resistant, able to withstand direct blows as defined in UL certification testing. There shall be a cover panel, which shall be separate from the display, attached to the inside of the door, and easily replaceable. If an overlay is utilized its light transmission shall be 90% or greater.

~~The display shall be able to operate with the worst-case condition of ambient temperature requirements in combination with worst-case solar load as defined in Section 2 of this Technical Specification.~~

The display shall incorporate a “screen saver” function in a standard movie format (e.g., mpeg, AVI). This screen saver shall be able to be modified, replaced and/or deactivated by SEPTA without assistance from the Contractor or its representative. Settings for the screen saver shall also be able to be modified by SEPTA and shall include the time required for activation of the screen saver based on time of inactivity at the FVD.

Complete detailed information on the Customer display, including type of equipment and operation, as well as dimensioned drawings and exploded drawings, shall be submitted to SEPTA for review at CDR and PDR. **CDR 8-4, PDR 8-2**

All displayed information and screen layouts for all transactions and messages shall be provided to SEPTA at the Conceptual, Preliminary, and Final Design reviews for SEPTA review. **CDR 8-5, PDR 8-3, FDR 8-4**

~~5.3.2~~8.3.2 Customer Selection Methodology

Customer selections shall incorporate one of two methods for interaction with the FVD:

- Touch-screen; or
- Programmable soft buttons adjacent to and defined, no less than five on each side (left and right) of the display screen.

Using either of these selection methods, Customers shall be able to complete the transaction. As each selection is made, the display screen shall update to show only those options available for selection based upon the Customer selections and FVD operating status. All selections shall provide an audible tone upon being selected.

Touch screens, if incorporated, shall not be adversely impacted by operation in an outdoor, unsheltered environment. The screens shall be sealed and otherwise protected so that the sensitivity and operation of the screen is not affected by environmental conditions as identified in Section 2.

The FVD shall incorporate dynamically defined menus to accommodate all requirements of the SEPTA system. When the same function appears in several screens, its location shall be consistent among menu screens. At least ten selections shall be available for each displayed screen.

Certain functions shall be implemented in pre-defined pushbuttons that are always functional while the FVD is in service:

- One VOICE message pushbutton which, when depressed, shall cause message(s) to be annunciated to the Customer.
- One CANCEL pushbutton which, if activated before the correct fare has been inserted, shall cancel the fare category selected, return monies inserted, deactivate the voice message system (if activated), and restore displayed messages to English (if another language had been selected). No Customer-initiated cancellation of the transaction shall be possible once Fare Media printing or Fare Media encoding commences.

Front panel layout including design and location of pushbuttons and display screen shall be subject to SEPTA review and approval at the Preliminary Design Review. **PDR 8-4**

~~5.3.3~~8.3.3 Audible Tones

The FVD shall, in accordance with ADA requirements, emit a unique tone to provide audio feedback to the Customer each time any button is pressed and during circumstances where additional Customer input is required to complete the transaction. The volume of the tones shall be field-adjustable, and shall be audible in all station environments.

An audible tone shall be provided for the acceptance and processing of valid Smart Media. A second audible tone shall be provided for an unsuccessful transaction or upon the presentation of invalid media.

~~5.3.4~~8.3.4 Voice Instructions

Each FVD shall be designed for normal operation with voice instructions in English. SEPTA, however, requires that the FVDs shall be deployed with the following languages:

- English;
- Spanish.

The FVD shall have the functional expandability to accommodate not less than four (4) additional languages. SEPTA shall select these additional languages prior to CDR. When these additional languages are activated, screens, audio and graphics shall be provided in these activated languages.

The FVD voice instruction functionality shall be provided using a text to speech system, rather than stored audio messages. The voice instruction system shall support both SAPI4 and SAPI5 interfaces, and work within any Microsoft Windows® based speech application. Contractor shall provide the selection of voices for SEPTA review at PDR and selection at FDR. **PDR 8-5, FDR 8-5**

The FVD voice instructions shall normally be switched “off” until activated via the press of a VOICE button by a Customer. Once activated, the voice instruction system shall play audio instructions in concert with the visual messages and selection options that are displayed, and as necessary, describe FVD actions that have occurred which require a Customer response.

Until the information on the entire screen has been annunciated for the Customer, the displayed information shall not change due to transaction timeout or for other similar reasons, unless action has been taken by the Customer via selection of a subsequent function or depression of a button.

Voice instructions shall be terminated with either a subsequent press of the VOICE button, cancellation of the transaction ~~timing out of the VOICE due to Customer inactivity,~~ or completion of the transaction. Volume control by the Customer shall also be provided.

A conceptual description of voice messaging system hardware and operation shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 8-6**

~~5.3.5~~8.3.5 Instructional Graphics

An information display shall be provided on the face of the FVD in order to display instructions to the Customer on how to operate the FVD. The sequence of steps shall be clearly indicated by the use of graphics and symbols.

Instructions and graphics shall be designed to minimize glare and other effects of sunlight and ambient lighting that could otherwise reduce the readability of the instructions on the FVD.

~~5.3.6~~8.3.6 Service Indicator Light

FVDs shall have a visible service status indicator light on the cabinet that shall display the need for service. An exterior light/light system shall be provided, which serves to illuminate the face of the FVD to 20-foot candles as a minimum.

~~5.4~~8.4 FVD Report Printing

Each FVD shall provide preprogrammed report templates that shall be printed upon request for SEPTA Revenue Service staff using the receipt stock, available within each FVD.

At a minimum, the following reports shall be provided:

- Cash Container Contents – listing of value of contents by denomination of any cash container, its ID number, date/time installed in the FVD, date and time removed, ID of the individual performing the exchange, and FVD number for the machine involved. This report shall be created and stored for transfer to the CDCRS automatically when a cash container is removed. This report shall also be printed upon cash container removal, based on a SEPTA-settable parameter.

- Stock Report – report indicating the details of the media incorporated within an FVD at the time, as well as any media exchange activity, including prior and new serial number series.

- Media Failure Report – report detailing all partially-printed, non-printed, jammed, non-encoded, ”torn” and mis-encoded Fare Media and total number of media sold in the same period; between failure events.

- Error Logs – report of each error that occurred at the FVD. Each error log shall include the specific error code, description, and date and time that this error occurred.

- Credit and Debit Error Log – report detailing credit & debit rejection codes and transaction status.

- FVD Close-Down Reconciliation – report that is summarized for the machine period by payment method and sales category depicting the total sales by machine, expected bill and coin vault contents, actual counts for recirculating coin devices as well as auxiliary coin devices.

In addition to the above reports, the FVD shall be able to print a receipt for Regional Rail passengers who purchased an on-board fare. When the passenger ~~inserts~~swipes the magnetic ticket received from the conductor (the “receipt token”) ~~into~~through the ~~ticket~~magnetic media swipe reader reader ~~slot~~ on the FVD, the FVD shall retrieve the information from the CDCRS. Once retrieved, the FVD shall permit the passenger to print the receipt.

- If the passenger selects the receipt to be printed, a paper receipt shall be printed. The FVD shall then ~~erase and capture the receipt token and the FVD shall~~ send a message to the CDCRS indicating that the receipt has been printed and that printing the receipt for that transaction shall no longer be permitted in the system.

- If the passenger does not select for the receipt to be printed, the customer shall have the option of printing a receipt at another time.~~receipt token shall be returned to the passenger unchanged.~~

Format and content of each report shall be submitted to SEPTA for review at the Preliminary Design Review and approval at the Final Design Review. **PDR 8-7, FDR 8-6**

~~5.5~~8.5 Fare Media Control

The FVD shall provide control of all ~~media~~ Fare Media and receipt stock within the FVD. This shall include accounting for ~~media~~ Fare Media loaded into the FVD but not sold.

As part of the daily close/open processing the FVD shall capture the current (sequential) serial number for each of the stocks based on the information entered when stock is loaded.

The FVD shall provide a mechanism to account for unused media within the FVD and for setting the starting and ending number of the new stock through a method incorporated into the FVD cabinet. Additionally, personnel will enter the media serial numbers of any spoiled/unused Fare Media.

When there is a jam involving any of the feed mechanisms, the FVD shall retain the number of the last item of media issued from that feed.

Media maintenance activities shall always conclude with the generation of a report on the FVD receipt stock that includes, at a minimum:

- Authorized Personnel ID;
- FVD Number;
- Date and Time;

- Last Fare Media serial number issued per stock;
- Spoiled/jammed Fare Media serial numbers; and
- New starting/next sequential serial number per stock.

The Contractor shall provide a complete description of all aspects of the Fare Media Control software and hardware incorporated into the FVD for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 8-8, FDR 8-7** Contractor shall provide specifications for each type of media to be dispensed from each type of FVD. **PDR 8-9**

~~5.6~~8.6 Cash and Token Handling Systems

Contractor shall provide, for every type of fare handling hardware module within the FVD, a list with the manufacturer, model number, software/firmware version and other information to permit SEPTA to understand which specific items of hardware are being used within the FVD and the commonality between the various fare collection devices. **CDR 8-6, FDR 8-8**

Coin and bill bezels shall be designed to withstand vandalism, prevent minimum entry of liquids as defined in the environmental requirements while providing maximum ease of use for entry of tokens, coins and bills.

For each FVD, three (3) incremental items ~~of each~~ of each type of cash container incorporated within the FVD shall be provided to enable SEPTA to revenue service the NPT System.

~~5.6.1~~8.6.1 Bill Acceptance System

The bill acceptance system shall be a unit that has been proven in revenue service and be comprised of the following elements:

- A bill acceptor that shall validate U.S. currency notes inserted by Customers;
- An escrow assembly to hold inserted notes until completion of a transaction; and
- A secure bill vault to house the authenticated currency.

Access to the bill acceptor and escrow shall be possible without access to the vault. Access to both the validator and escrow assemblies shall be electronically monitored, creating and sending an event transaction to the CDCRS.

The bill acceptance system and its components shall be capable of remote configuration, re-initialization, and diagnosis of malfunctions. All specified diagnostic and operational reports that are available at the assembly shall also be attainable through the CDCRS.

The FVD shall accept the following denomination of U.S. Currency notes: $1, $2, $5, $10, $20. At least 13 different versions of bills shall be accepted and properly processed by the FVD. The Contractor shall provide a method and procedure, as well as any required special tools, in order to enable SEPTA, without Contractor assistance or intervention, to reconfigure the bill acceptor software and hardware to accept and verify future general circulation U.S. currency. Full detailed information on the bill acceptance system and its associated modules, including operation, dimensioned drawings and exploded drawings, shall be provided for review at Conceptual Design Review and for approval at Preliminary Design Review. **CDR 8-7, PDR 8-10**

~~5.6.1.1~~8.6.1.1 *Bill Acceptor*

All bills inserted for fare payment shall enter through a single entry slot sized and formed to permit easy insertion of bills. Bills shall be inserted in all four of the possible orientations and shall be verified and accepted through utilization of light and/or magnetic measurement techniques. Bills detected as invalid shall be rejected and immediately returned to the Customer.

A mechanical shutter shall secure the bill slot between transactions. The bill slot shall automatically open when the cash transaction has reached the point of receiving payment. It shall remain open once cash has been inserted until full payment has been received. If the Customer selects a non-cash form of payment, the bill slot shall automatically close and remain closed until the next transaction requires it to be ready to accept payment. The bill acceptor shall utilize visual and audible indications to assist Customers in determining when the acceptor is ready or not ready to receive bills.

The bill acceptor shall not attempt to transport bills to the escrow assembly until bill authentication is complete.

Acceptance Rate

The bill acceptor shall meet the following acceptance rates:

- 98% of valid bills shall be accepted upon initial insertion
- 95% of valid bills shall be accepted upon one reinsertion

The acceptance rate (AR) is defined as follows:

$$AR = \frac{I - R}{I}$$

where: I = Total number of valid bill insertions

R = Total number of valid bill rejections

This acceptance rate shall be ensured by a self-adjusting system, which accounts for differences between banknotes in circulation caused by production variances and unique aging characteristics. All counterfeit U.S. currency and all foreign currency shall be rejected

Bill Accuracy

The bill acceptor shall identify valid acceptable coins with at least 99.99% accuracy. Accuracy (A) is defined as follows:

$$A = \frac{V - M}{V}$$

where: V = Total value of bills accepted

M = Total value of incorrectly identified bills

~~5.6.1.2~~8.6.1.2 *Bill Escrow*

The bill escrow shall have the capability to hold a minimum of 13 bills, and not release or encash accepted and validated bills to the bill vault until the transaction has been successfully completed. If the transaction is not completed for any reason, the escrowed bills shall be returned to the Customer in a single action.

Bills being held in escrow shall not be affected by rejection of a bill by the acceptor. Escrowed bills shall be returned to the Customer upon any one of the following actions, which shall be easily configurable by SEPTA:

- Customer-generated or machine-generated cancel command;
- Expiration of the programmable preset time limit for completion of the transaction;
- Component required for completion of the current transaction fails; and
- FVD fails before completion of the transaction and goes into "Out of Service" mode.

~~5.6.1.3~~8.6.1.3 *Bill Vault*

A secure, serialized (both electronically encoded, and visually displayed from the outside) bill vault shall be provided. The bill vault shall automatically and neatly stack all accepted bills. The minimum capacity of the bill vault shall be 2,000 U.S. currency notes.

Whenever it is removed from the FVD, fully loaded bill vaults shall weigh no more than 20 pounds and be easily transportable. Bill vault shall not distort when fully loaded. When dropped to a concrete floor on any corner or side from a height of not less than three (3) feet, the full bill unit shall not suffer operational impediments or security breach. All bill vaults shall have an electronic locking mechanism integral to the bill acceptance system.

The bill vault shall be able to be installed in a single orientation only. If a bill vault is not properly installed, the FVD shall be inoperable and shall not be able to be placed into service. Removal and reinsertion of the same bill vault into the FVD shall place the FVD in a fault condition, sending an event immediately to the CDCRS, and the FVD shall not be placed into service.

~~5.6.2~~8.6.2 Coin Acceptance System

The FVD coin acceptor shall accept and count the value of SEPTA adult tokens, U.S. nickels (5¢), dimes (10¢), quarters (25¢), and dollar coins ($1.00). Dollar coins accepted and processed shall be those minted and issued commencing in 1979.

The coin acceptor and associated logic shall be capable of being programmed to accept at least four additional coin types of different electronic profiles and shall not require replacement or remanufacture of the coin acceptor or other FVD hardware. In addition, each FVD shall be capable of being individually configured to accept or prevent the acceptance of each of the above outlined coins and tokens.

The Contractor shall provide a method and procedure, as well as any required special tools, in order to enable SEPTA to reconfigure the coin acceptor software and hardware to accept and verify future coins.

The coin acceptance system shall include the coin slot, coin acceptor, coin recirculating components, coin vault, and supplemental coin hoppers. Whenever a coin vault, supplemental coin hopper, or coin vault is removed, a revenue service audit report shall automatically be generated, in both electronic and printed form. The electronic version of the audit report shall be immediately transferred to the CDCRS.

All coin acceptance system components shall be designed to withstand regular removal, replacement, and normal handling in a transit-operating environment without deformation, or in any way interfering with the insertion and removal process. The FVD shall automatically detect the presence or absence of each coin component and the type of coins contained in each component.

The coin acceptance system shall be able to verify and hold a minimum of 20 coins of any combination of denominations before canceling the transaction and returning all deposited funds. If a transaction is cancelled prior to inserting the complete fare, the value of coins, in exact denominations inserted, shall be returned. If the FVD fails to issue an item of Smart Media, due to a machine malfunction, the value of all coins inserted and validated shall also be returned.

A mechanical shutter shall seal the coin slot between transactions. The coin slot shall automatically open for cash transactions, and shall close when electronic payment options are selected. Full detailed information on the coin acceptance system and associated modules, including operation, dimensioned drawings and exploded drawings, shall be provided. **CDR 8-8, PDR 8-11**

~~5.6.2.1~~8.6.2.1 *Coin Slot*

The coin slot shall be stainless steel, shall be located on the FVD door, and shall be precisely matched to the coin acceptor assembly. The coin slot bezel shall not be part of the coin acceptor. An accurate, replaceable, full-size graphical representation of each accepted U.S. coin shall appear above the coin slot. The coin slot shall be sized to prevent simultaneous insertion of any two (2) valid U.S. coins side-by-side.

~~5.6.2.2~~8.6.2.2 *Coin Acceptor*

Each coin shall be verified using a process that considers diameter, thickness, weight, and metallic content. This device shall have a serialized number that is visually readable. The device shall be secure, and of sturdy construction, manufactured from stainless steel or another SEPTA-approved material.

Verification shall be accomplished through comparison of the inserted coins to stored standards for coins of the same denomination set by the U.S. Mint for those coins in general circulation. Rejected coins shall be returned to the Customer.

The Contractor shall provide the procedure and method necessary to initialize and re-configure the coin acceptor and verifier, to accept variations in minting for general circulation U.S. coinage, and future U.S. coins.

Acceptance Rate

The coin acceptor/verifier shall meet the following acceptance rates:

- 98% of valid coins shall be accepted upon initial insertion.
- 99% of valid coins shall be accepted upon one reinsertion.

All known counterfeit coins, common slugs, foreign coins, and coins of denominations not accepted by the FVD shall be rejected upon every insertion.

The acceptance rate (AR) is defined as follows:

$$AR = \frac{I - R}{I}$$

where: I = Total number of valid coin insertions

R = Total number of valid coin rejections

Coin Accuracy

The coin acceptor/verifier shall identify valid acceptable coins with at least 99.99% accuracy. Accuracy (A) is defined as follows:

$$A = \frac{V - M}{V}$$

where: V = Total value of coins accepted

M = Total value of incorrectly identified coins

~~5.6.2.3~~8.6.2.3 *Coin Vault*

A secure, serialized (both electronically encoded, and visually displayed from the outside) coin vault shall be provided to accept overflow of coins. Coin vaults shall be located within the FVD to facilitate easy and rapid exchange by revenue service personnel. The coin vault shall have a minimum capacity of 225 cubic centimeters. The device shall be secure, of sturdy construction, and manufactured from stainless steel or another SEPTA-approved material.

The operation of the coin vault shall be such that it is secure, with no openings when it is removed from the FVD. Removal of the coin vault shall automatically initiate the printing of a receipt (format and text configurable), reset the coin vault count within the FVD to zero, and transmit an event to the CDCRS. Coin vaults shall have an electronic locking mechanism.

Coin Vaults shall position correctly in a single orientation, and the FVD shall be inoperable, not permitting it to be placed into service if a vault is not properly positioned. Coin vaults shall not distort when fully loaded. The coin vaults either fully loaded or empty when dropped to a hard floor from a distance of 36" shall not suffer any operational impediments or security breaches. **PDR 8-12**

~~5.6.2.4~~8.6.2.4 *Coin Recirculating System*

The coin re-circulating system shall be able to hold a minimum of 50 coins of each of the accepted U.S. coin types and SEPTA adult tokens. The coin system shall also be capable of accepting the addition of a sixth coin type to the recirculation system. In addition, SEPTA shall have the ability to easily route or re-route any particular denomination of coin directly to the coin vault rather than to the coin re-circulating system. The device shall be secure, and of sturdy construction, manufactured from stainless steel or another SEPTA-approved material.

The FVD shall automatically detect the location of each coin unit, continuously monitor the contents of each, and adjust its operation accordingly. Coins shall be prevented from jamming in the system under all operating conditions. The FVD shall record the value and denominations of any coins transferred to and from the coin vault

Coin units shall be serialized (both electronically encoded, and visually displayed from the outside), provide for the safe deposit and secure storage of coins. The FVD shall automatically detect the presence or absence of each coin units and the type of coins contained in each unit; the FVD shall automatically adjust its operation accordingly. At no time shall a removed unit provide unauthorized access to coins. Removal of a coin unit shall not expose coins or provide access to any unauthorized areas within the FVD, and shall immediately send an event to the CDCRS.

When dropped from a height of three (3) feet on a concrete floor on any corner or side, the full coin unit shall retain its contents, shall not open, nor shall its locking mechanism be impaired.

The coin unit shall have a handle or handles placed to avoid injury, which provides adequate gloved-hand clearance for easy insertion, removal and carrying. The maximum weight when full shall not exceed 40 pounds.

~~5.6.2.5~~8.6.2.5 *Supplemental Coin Storage System*

At least three supplemental coin hoppers shall be provided as part of the FVD coin system. These coin hoppers, which shall not be part of the coin re-circulating process, shall provide safe and secure storage of coins and not allow insertion or removal of coins and/or the hopper(s) without proper, keyed access, and software commands.

These hopper(s) shall each have a capacity of at least 1,000 coins of any denomination (nickels, dimes, quarters, and dollar coins) chosen by the SEPTA. The coin hoppers shall be used as a supplemental stock of coins for automatic change making purposes, and shall operate as an integral component of the complete coin system.

The supplemental coin storage system shall be used as a source of change whenever doing so would result in fewer coins being returned as change or if the re-circulating coin system is unable to dispense proper change. The supplemental coin hoppers shall be serialized (both electronically encoded, and visually displayed from the outside), provide for the safe deposit and secure storage of coins. The device shall be secure, and of sturdy construction, and manufactured from stainless steel or another SEPTA approved material.

The supplemental coin hoppers shall be serialized (both electronically encoded, and visually displayed from the outside), provide for the safe deposit and secure storage of coins. When removed from the FVD an event shall immediately be sent to the CDCRS. The device shall be secure, of sturdy construction, and manufactured from stainless steel or another SEPTA approved material. The FVD shall continue to function without a full complement of coin hoppers, and it shall not be necessary for all FVDs to be equipped with identical coin hopper configurations.

When dropped from a height of three (3) feet on a concrete floor on any corner or side, the full supplemental coin hopper shall retain its contents, shall not open, nor shall its locking mechanism be impaired. The supplemental coin hoppers shall have a handle or handles placed to avoid injury, which provides adequate gloved-hand clearance for easy insertion, removal and carrying. The maximum weight when full shall not exceed 40 pounds.

~~5.6.2.6~~8.6.2.6 *Change-Issuance Functionality*

Change shall be issued to the Customer for those transactions where the cash value inserted exceeds the price of the purchased fare. The FVD change-making system shall first use coin that was deposited in an earlier transaction (i.e., “re-circulated”), and when unable to rely solely on that supply, shall then issue all change coins stored in hoppers. If the cancel button is activated by the Customer before completion of the Fare Media sales transaction, or the transaction is otherwise aborted, the value of the deposited coins in the exact denominations that were inserted shall be returned to the media/coin return tray.

Change shall be provided in the fewest number of coins available within the system. When coins are returned due to a cancelled transaction, the coins shall be returned in the exact denominations that were inserted. If a coin has reached capacity within the recirculation system, additional coins inserted shall be deposited in the coin vault.

For all coin acceptance system components, the removal and reinsertion of the same coin container into the FVD shall place the FVD in a fault condition, immediately send an event to the CDCRS, and require entry of a PIN to clear the alarm and place the FVD into service.

The FVD shall keep track of the contents of each cash container in the coin acceptance system and shall be able to detect when each change-issuing container is near or completely empty, and when the coin vault is near or completely full. These situations shall cause events to be recorded by the Electronic Control Unit (ECU) and transmitted to the CDCRS. The determination of a nearly empty condition shall be software controllable and adjustable by SEPTA.

~~5.6.2.7~~8.6.2.7 *Coin Commands*

The FVD shall provide authorized revenue service personnel distinct commands to manually initiate the addition of coins to the coin re-circulation system. When completed, an audit receipt shall be printed showing the number of coins in each unit; at the conclusion of replenishment, another audit receipt shall be printed showing the new quantities in each unit and the total value of coins added.

A command shall be provided via the service terminals to empty the recirculating coin hoppers to the coin vault. Supplemental coin hoppers shall not be affected by this command. This command shall be initiated through the service terminal and shall require an additional password to initiate. Initiation of this command shall cause an event message to be stored in the FVD memory, all revenue registers to be adjusted to reflect the contents of the coin vault and recirculating hoppers and the revenue report to reflect the change in the contents of the coin vault and recirculating hoppers. The Contractor shall provide a step-by-step description of how this procedure is performed and include copies of the before and after reports. **CDR 8-9, FDR 8-9**

~~5.6.2.8~~8.6.2.8 *Parameters*

A series of programmable parameters within the application shall allow the FVD to limit the amount of change dispensed in the event that surplus cash is deposited for the selected fare. For each denomination of coin issued as change, a separately programmable maximum quantity to be dispensed for any single transaction shall be provided. These parameters shall be adjustable by SEPTA at the CDCRS, and shall be initially set so that the FVD shall dispense no more than $18.80 for a single transaction. **PDR 8-13, FDR 8-10**

~~5.6.2.9~~8.6.2.9 *Exact Fare Mode*

In the “Exact Fare Mode”, the FVD shall have a maximum overpayment threshold. This parameter shall be adjustable by SEPTA, either through the CCS or locally at a FVD. SEPTA will provide the successful Contractor with the definition of the initial overpayment value parameter at the Final Design Review. **FDR 8-11**

The FVD shall enter the “Exact Fare Mode” when the coin re-circulating system and the supplemental coin storage system together contain insufficient coins to successfully complete a Fare Media sales transaction. While in the “Exact Fare Mode”, the coin-processing unit shall continue to accept inserted coins. When sufficient coins are inserted and placed into the coin re-circulating system, restoring change-making capabilities, the FVD shall without any intervention upgrade its status to full in-service operation.

~~5.6.3~~8.6.3 ~~Smart~~ Fare Media Processing

The FVD shall incorporate the following ~~Smart~~ Fare Media Modules for ~~Smart~~ Fare Media issuance and processing:

~~5.6.3.1~~8.6.3.1 ~~Smart~~ Fare Media Dispenser

The FVD shall issue ~~long-term use~~ SEPTA ~~Smart~~Fare Media to Customers. ~~Long-term Smart~~SEPTA Issued Smart Media shall be issued from a stacker and ~~short-term Fare~~ Magnetic Media shall be issued from stackers or rolls. All ~~Smart~~ Fare Media shall be encoded prior to issue to the Customer. This issuer shall not print on the SEPTA ~~long-term~~ Smart Media, but shall print on ~~short-term~~ Magnetic ~~Smart~~ Media.

At least two (2) stackers for the SEPTA ~~long-term~~ Smart Media and two stackers/rolls for the ~~short-term Fare~~ Magnetic Media shall be provided within the FVD. Each roll shall have a capacity of not less than one thousand (1,000) pieces of ~~short term Fare~~Magnetic Media and each stacker shall have a capacity of not less than four hundred (400) pieces of ~~long term Fare~~SEPTA Issued Smart Media.

~~Smart~~ Fare Media which is unable to be issued due to a material or encoding defect shall be encoded as invalid and shall be deposited in a bin with capacity of not less than 100 pieces of ~~Smart~~ Fare Media. A counter shall be provided so that when the bin nears a SEPTA-settable capacity it shall send a message to the CDCRS so that revenue servicing can occur. If capacity is reached before revenue service is performed, the FVD shall shut down.

The stackers and rolls shall operate independently of each other and also shall have one stack/roll backing up the other stack/roll for automatic replenishment of the primary stack/roll when it is depleted.

~~5.6.3.2~~8.6.3.2 Smart Media Processor

The FVD shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4.

The SMP shall be modular and upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

~~5.6.4~~8.6.4 Magnetic Media Processing

The FVD shall incorporate a Magnetic Media Dispenser Module as identified in Section 4.1.4 for issuance of Magnetic Fare Media as identified in Section 4.2, based on the configuration FVD settings.

~~5.6.5~~8.6.5 Receipt Printer

A receipt printer separate from the Fare Media printer/issuer shall be provided and it shall be able to print all alphanumeric characters in both upper and lower case and graphics. Printed characters shall be produced with a minimum height of 0.12 inches. The approximate height to width ratio of the characters shall be 5:3. The printer shall be of the direct thermal type.

Receipts shall be at least 2 inches by 4 inches, and shall clearly indicate that the document is a receipt and not a valid item of fare media, and shall contain information identified in Federal Regulation E and Z and as required by SEPTA. All data to be printed as a part of the receipt shall be selected by and changeable by SEPTA. This information shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 8-14, FDR 8-12**

~~*5.6.5.1*~~*8.6.5.1 Functionality*

A receipt shall be available for all FVD transactions. The Customer shall be provided with the opportunity to request a receipt at the end of their transaction. In addition, for the credit and debit media payments above the receipt-requirement thresholds, a receipt shall always be issued and this receipt shall meet all PCI DSS requirements, including suppression of all credit and debit card digits except for the last four digits. If there is no receipt stock available, the Customer shall be required to choose to complete a transaction without issuing a receipt.

Receipts shall be deposited in the media/change tray within three seconds after the Customer responds affirmatively to the prompt requesting whether a receipt is desired at the end of the transaction.

~~5.6.6~~8.6.6 Media/Coin Tray

The opening for the media/coin tray shall be recessed and covered with a clear polycarbonate spring-loaded or weighted door that opens inward, and which does not present a pinching hazard when opened and closed by Customers. The door shall be at least 0.25 inches thick and completely cover the opening when closed. The bin and its door shall be robust, scratch-resistant, and visually prominent. The geometry of the bin and its door shall minimize intrusion into the FVD by foreign objects while the media/coin return bin door is open. The bin shall be designed to drain any liquids placed in the bin to the outside of the FVD.

As soon as a Customer has completed payment for a transaction, or a transaction is canceled that results in coins being deposited in the media/coin return bin, a light in the media/coin return bin shall begin flashing. The media/coin return bin light shall continue flashing until five seconds after all Smart Media and coins have been deposited there by the FVD, or until the next transaction is initiated, whichever occurs first.

~~5.6.7~~8.6.7 Bank Card Processor

In order to process credit and debit media, a bank card processor shall be incorporated into the FVD for Customer payment of fares. The components which make up the ~~-~~bank card processor are the smart media processor, PIN Pad and the magnetic bank card reader.

~~*5.6.7.1*~~*8.6.7.1 Customer Key/PIN Pad*

In addition to the Customer selection buttons, a Customer Key/PIN pad shall be provided to support electronic payment transactions and to provide an alternative means of Fare Media selection when used in conjunction with the voice instructions feature on the FVD.

The Key/Pin pad shall conform to ISO/IEC and ANSI X.29 requirements for data entry equipment and encryption. Key/ PIN pad shall also support PCI-DSS and be capable of supporting DUKPT, and operation in both clear and encrypted mode. Buttons necessary to support electronic payment transactions (as defined by banking industry standards) shall be provided. All letters, numbers, symbols, and words on keys shall be wear and fade resistant. Key/PIN pad shall be spill and dust resistant.

Key/PIN pads shall employ tactile and audio feedback, in accordance with ADA requirements. Key pad/PIN pads shall also employ methods, visual and audible in concert with the Customer display to indicate to the Customer that their action has been recognized as either accepted or rejected.

Full detailed information on the Customer Key/PIN pad and its associated modules, including operation, dimensioned drawings and exploded drawings, shall be provided. **CDR 8-10, PDR 8-15**

~~5.6.7.2~~8.6.7.2 *Magnetic Bank Card Reader*

The FVD shall be provided with the capability of accepting magnetic credit and debit media as payment toward transactions. The bank card reader shall be a dedicated, commercially available "dip-insertion" type reader.

The bank card reader shall be able to read, translate, and transmit complete Track 1&2 data in accordance with ISO/IEC and ABA standards. Software for bankcard readers shall be in accordance with ANSI, ISO and ABA standards for data encryption.

Full detailed information on the bank card reader and its associated modules, including operation, dimensioned drawings and exploded drawings, shall be provided. **CDR 8-11, PDR 8-16**

~~5.6.7.3~~8.6.7.3 *Contactless Bank Card Reader*

Contactless bank cards shall be processed by the Smart Media Processor, as identified in Section ~~5~~8.6.~~4~~3.1.

~~5.7~~8.7 Control System

A microprocessor-based system, an Electronic Control Unit (ECU), shall be provided to control all functions within the FVD. The ECU shall be industrial grade, commercially available and specifically designed for the intended use, of being in continuous operation for the specified environment. The ECU shall have sufficient RAM to avoid the use of virtual memory as a means of temporarily supplementing RAM during normal FVD activities. The ECU shall permit plug-in upgradeability to double the amount of memory initially supplied, including memory for both primary and redundant data storage.

If non-volatile memory is provided in the form of electronic memory devices, memory storage shall be a minimum of 64 GB and shall be easily replaceable and upgradeable without requirement for any equipment redesign.

Access to the ECU shall be through an interface that is accessed within the FVD cabinet. SEPTA requires this interface be provided using either of the following methods:

- Provide an interface attachment point conveniently located so maintenance and/or revenue-servicing personnel can easily use a device such as a PDA or Blackberry® to access control system functions; or

- Provide a permanently mounted interface within the FVD cabinet that shall have an internal information display, and provide feedback to keypad entries, display statuses and error messages, etc.

The ECU shall contain electronic clock functionality. The clock shall be used to generate time signals to maintain accurate records. The clock shall also contain calendar data to determine year, month, and day including leap year without manual intervention. Automatic correction for time changes between standard and daylight savings time shall be provided. The clock shall reset with the correct time each time communication is successful with the CDCRS. An attempt to reset and correct the time shall occur at least once per day.

The ECU shall also control the functions of data collection and storage, and communications both within the FVD and to the CDCRS. Capacity shall exceed initial storage needs by at least 400%. The non-volatile memory device(s) shall be field replaceable without the use of special tools. All data contained in electronic non-volatile data storage modules in the FVD shall be protected from loss for a minimum of 365 days.

Each transaction shall be recorded at the FVD and transmitted to the CDCRS immediately upon communication between the two. Each transaction shall be uniquely identified within the system. Data required for each type of transaction shall be identified by SEPTA during the design review process and agreed at the Final Design Review. **FDR 8-13**

Full detailed information on all information stored by the FVD shall be provided as a data dictionary at the Conceptual Design Review and updated at the Preliminary and Final Design Reviews. **CDR 8-12, PDR 8-17, FDR 8-14**

Full detailed information on the ECU modules, including dimensioned drawings and exploded drawings, shall be provided. **PDR 8-18, FDR 8-15**

~~5.7.1~~8.7.1 Transaction Records

The FVD shall be capable of recording locally data representing no less than 50,000 transactions (see Section ~~8~~5.2). Each transaction record shall include the date and time of record creation and transaction sequence number.

The FVD shall be capable of detecting basic internal malfunctions. The malfunction detection shall cover at least failure of power or control circuitry, opening of an access panel, and any failure of any Fare Media unit that could result in a false, incomplete, or corrupted encoding of a Fare Media. The information displayed shall indicate the type of failure that caused the machine to shut down. A description of the maintenance and service indicators for the FVD shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 8-19**

The structure and layout of all transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 8-20, FDR 8-16**

~~5.8~~8.8 Communication System

FVDs shall communicate with the CDCRS to successfully meet the requirements of the installation and FVD operation. This shall include, as a minimum, communication:

- via integral standard Ethernet Interface with RJ45 connector(s); ~~and~~
- via wireless network interface built in, compliant with IEEE 802.11N Standard Protocols; and
- via the SEPTA NPT Mobile Broadband network. ~~.~~

All communications between the CDCRS and FVDs shall be encrypted. The method of encryption to be employed shall be provided to SEPTA for review and approval, and shall not contain any proprietary methods or tools for development, modification and/or operation. **CDR 8-13, FDR 8-17**

When off-line, the FVD shall be able to vend Fare Media only until a SEPTA-settable threshold value is reached for the vending of Fare Media as identified in Section 8~~5~~.2.

In addition to the above communications, an FVD shall be capable of being configured to communicate via the Wireless Broadband System, as outlined in Section 18.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual FVD through the use of a compact flash RAM with a minimum capacity of 8GB.

~~5.9~~8.9 Structure and Finish Requirements

Contractor shall provide detailed, fully dimensioned drawings of each type of FVD showing all external surfaces, Customer interfaces, internal components, slots, and displays, with the door open as well as closed, installed on its base. **CDR 8-14, FDR 8-18**

~~5.9.1~~8.9.1 Cabinet and Base

FVDs shall have an ergonomic external design that shall make the purpose of the FVD clear to passers-by. The FVD shall be no larger than 80" high, 36" wide, and 25" deep. FVDs shall be securely constructed free standing and capable of mounting to a flat floor surface inside or outdoors. Structural framing shall be made of stainless steel, employing monocoque construction.

The FVD shall be constructed of Stainless Steel, Grade 3~~16~~04. All exposed surfaces shall be finished with a #4 Brushed finish. The minimum thickness of the door shall be 3 millimeters. The minimum thickness of all other surfaces shall be 2 millimeters.

The FVD shall have a detachable base assembly or pedestal that is constructed of Stainless Steel, Grade 316, and acts as an integral member of the assembly structure. The base assembly or pedestal shall contain no mechanical components related to or required for the operation of the FVD. The base assembly or pedestal shall be securely anchored to the floor, possessing sufficient attachments to withstand static and shear loads experienced during machine operation and service. The base assembly shall have a lockable panel to permit access to wiring and mounting hardware within the base as well as any electrical connections.

All exterior surfaces shall be finished to permit easy removal of graffiti. Interior machine surfaces should also be primed and painted, unless they are stainless steel. Regardless of what materials are used, the types of material shall provide full protection against exterior and/or interior rusting.

FVDs shall have a one-piece outer door located on the front of the machine for revenue servicing and maintenance access. All door hinges and locking mechanism shall be both secure and isolated from view. There shall be no edges along the door into which a tool or other device could be inserted for leverage to pry the door ajar. All interior and exterior edges shall be sufficiently contoured so as to ensure safety.

There shall be a fold out shelf, able to support test equipment or a laptop computer, and tools.

There shall be a single power switch within the FVD. Any change in the position of this switch shall send an event to the CDCRS and initiate an orderly shutdown of the FVD.

All wires and cables associated with operation of the FVD shall exit from the bottom or the back of the cabinet to best suit the installation requirements.

The FVD cabinet shall have adequate ventilation and drainage that shall prevent any accumulation of water, water vapor or any other substance within the FVD that would impede optimum operation of the equipment and any of the components.

~~5.9.2~~8.9.2 Lighting

~~5.9.2.1~~8.9.2.1 *Exterior Light*

An exterior light/light system shall be provided, that serves to illuminate the assembly to 25 foot-candles.

The FVD shall be equipped with a lighting fixture to achieve the following:

A. Use LED or other low-power lighting sources;

~~A.~~B. Illuminate the front face of the FVD.

~~B.~~C. Consume less than 40 watts.

~~C.~~D. Protrude no more than four inches from the front face of the FVD and not create a bumping hazard.

~~D.~~E. Be weatherproof.

~~E.~~F. Be fully operable in the complete range of temperatures specified in Section 3.

~~F.~~G. Under all ambient lighting conditions, provide a level of lighting sufficient to allow instructions and other items on the front of the FVD to be easily read by the patrons without the need for any additional peripheral light source. Lighting intensity shall be suitable for vision-impaired patrons under the most adverse lighting conditions.

~~G.~~H. Meet the vandal-resistant strength requirements given above for the cabinet. The material, thickness, and finish of the fixture enclosure shall be the same as those for the FVD housing.

~~H.~~I. Keep dirt, moisture, and insects out.

~~I.~~J. Provide space at the front of the lighting fixture for a replaceable nameplate with graphics or text.

~~J.~~K. Contain a commercially available lamp(s) and circuits, and be constructed to allow easy replacement of the lamp with access obtained by use of a key.

~~K.~~L. Provide an ambient light sensor to automatically turn on the light fixture when ambient light conditions on the reading surface of the FVD falls below 25 foot-candles. A bypass switch inside the enclosure shall permit the lighting fixture to be switched on and off manually.

~~5.9.2.2~~8.9.2.2 *Interior Light*

The FVD shall have an internal light that shall provide sufficient illumination for service activities. This light shall be activated by opening of the door.

~~5.9.3~~8.9.3 Locks and Security

Door locking systems shall utilize the locking system as identified in Section 2.3.10. After unlocking and opening the FVD door, the machine shall automatically be placed into "Maintenance" status, and require the person opening the door to enter a Personal Identification Number (PIN). Failure to correctly enter a PIN within a programmable time frame shall trigger an intrusion alarm event and the activation of the internal audible alarm. A minimum of four levels of security for the PIN number shall be provided.

Each FVD door entry shall be recorded as an event at the FVD and transmitted in real time to the CDCRS. Alarms generated by an unauthorized intrusion shall be recorded separately as an event and shall be similarly transmitted in real time to the CDCRS.

All other locks employed in the FVD shall be unique for this system and for the components (i.e., coin system or Fare Media storage shall utilize different series of locks) they are controlling. These locks shall be similar throughout and keyed alike for all machines. Full information for all locks and locking mechanisms shall be provided at PDR and FDR. **PDR 8-21, FDR 8-19**

~~5.9.4~~8.9.4 Alarm Unit

Each FVD shall be equipped with an alarm unit, which shall monitor FVD security conditions and report security breaches. The alarm unit shall monitor the security status of the FVD independent of the ECU; if the ECU is disabled for any reason, the alarm unit shall continue to operate and monitor the FVD for security breaches and impacts. Each time that the alarm is activated, the service indicator light shall be activated and shall remain active until manually cleared by authorized SEPTA personnel.

Each FVD shall be equipped with an internal alarm mechanism that shall provide a clearly audible sound (the level shall be programmable by SEPTA) in the event of tampering or unauthorized intrusion. Each FVD shall additionally have the capability to be linked through the use of a dry contact relay to an external security system.

The FVD alarm unit shall:

- Detect status of the outer door lock and the opening of the outer door by switch, optical detector, or other means.
- Detect and report pending and active security breaches to the ECU when the ECU is operational.
- Be equipped with an electronic siren that shall be capable of emitting a sound level of at least 110 dB(A) measured at a distance of three feet with the door open. Whenever the siren is sounding, the FVD shall go out of service, and the Service Light shall be activated. When the siren is silenced, the FVD shall perform self-diagnostics and if possible, resume normal operations.

Each time the FVD is secured, the alarm unit shall reset and resume monitoring FVD security. Each time a security breach or impact is detected and the ECU is operational, an event record of the activation with date and time shall be created, stored, and reported.

The alarm unit shall be powered by a rechargeable battery that is trickle-charged while commercial power is available. During power outages, the alarm unit shall utilize battery power to continue to monitor the security status of the FVD

An adjustable mechanical impact sensor shall be provided that can detect severe frontal blows to the FVD and attempts at unauthorized or forced entry. The alarm unit shall activate the siren as soon as the impact sensor is triggered. All instances of alarm activation shall be recorded as events, shall be recorded locally at the FVD, and shall also be transmitted in an immediate manner to the CDCRS. In such cases, the siren shall shut off and re-arm after a separate SEPTA-adjustable time period (default 60 seconds) unless continued impacts or attempts at intrusion are detected.

Impacts of lesser force applied elsewhere to the FVD enclosure shall not cause the siren to sound. The impact sensor shall be initially set so that blows that are caused by a 1 pound object moving at 25 feet per second, applying perpendicular force in an area of 1 square inch anywhere on the FVD door shall cause the FVD siren to sound. SEPTA shall be able to adjust this sensor for greater or lesser sensitivity.

Full information on the alarm unit hardware, software, and parameters shall be provided to SEPTA for review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 8-15, FDR 8-20**

~~5.9.5~~8.9.5 Backup Power System

FVDs shall incorporate a backup power system, which shall be used to provide power to FVD machine systems in the event of an interruption of the main power source. The backup power system shall have the capacity to:

- Complete a Smart Media purchase transaction (only if payment for the Smart Media has been completed);
- Permit an orderly shutdown of FVD systems to occur;
- Provide power to the internal FVD Alarm Unit for at least a one hour period while the main power source is not available; and
- Permit transmission of all associated event data to the CDCRS, prior to the orderly shutdown of the FVD systems.

If the Contractor provides a rechargeable battery as the backup power source, the FVD shall contain the necessary equipment to maintain and re-charge the battery when necessary. Full information for the hardware and software for the backup power system shall be provided at the CDR and the FDR. **CDR 8-16, FDR 8-21**

Section 9 – Subway/Elevated Turnstiles
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9 SUBWAY/ELEVATED TURNSTILES

9.1 General

~~For the~~ All Subway/Elevated stations ~~that are to~~ shall be gated and~~,~~ the NPT System shall incorporate ~~SEPTA requires~~ a standard turnstile, with a tripod barrier.

~~Two~~ The types of turnstile devices ~~are required by SEPTA for the Subway/Elevated stations~~ are ~~as follows:~~

- ~~A standard turnstile, with a tripod barrier.~~

~~A full height turnstile;~~

- ~~An "ADA gate" that is fully ADA compliant through which physically challenged customers shall be able to pass.~~

~~When used within these specifications, the term "turnstile" shall mean both the standard turnstile and the full height turnstile unless otherwise stated.~~

Each Subway/Elevated turnstile (turnstile) shall communicate with the other ~~devices~~ turnstiles and ADA Fare Gates within the array ~~in the station~~ to share necessary information and with the Central Data Collection and Reporting System (CDCRS) via the Station LAN and the Subway/Elevated Network (see Section 18).

~~A new ADA gate shall be furnished and installed within each turnstile array to permit customers with disabilities and others who cannot use the standard gate to move between the free and paid areas of the station. It shall also serve as a service gate, emergency exit gate, and as a backup to the regular~~ standard ~~turnstile, when required. It shall consist of a reversible gate, whose motion in either direction is controlled, as well as a mounting post. Existing ADA gates shall not be deployed, in any manner, within in the NPT System. All ADA gates shall be new and meet the requirements identified in Section 10.~~

~~At Subway/Elevated locations selected by SEPTA, full height turnstiles shall be installed in place of or in addition to standard turnstiles.~~

~~The turnstiles and ADA gates shall **not** accept SEPTA tokens.~~ Neither cash nor tokens shall be accepted for fare payment by the turnstiles, whether overhauled or new.

The turnstiles ~~and ADA gates~~ shall ~~operate~~ function properly in all operating conditions found within the ~~SEPTA Subway/Elevated~~ station environment as identified in Section 2~~, including the following: direct sunlight, temperature ranges, temperature fluctuations, humidity, rainfall (with and without wind), freezing precipitation (with and without wind), physical shocks, vibrations, steel dust and electromagnetic interference~~.

The turnstiles ~~and ADA gates~~ shall:

- Communicate over the Station LAN and the ~~Subway/Elevated~~ Subway/Elevated Network to provide information as described in Section 18;
- Process the existing machine readable SEPTA ~~fare~~ Magnetic M~~m~~edia as well as all NPT media identified in Section 4;
- Communicate with the CDCRS for Smart Media validation and data transfer purposes;

~~All design submittals identified within this section apply to both the standard turnstile and ADA gate unless specifically identified as only one type.~~

A complete description of the functionality of the turnstiles ~~and ADA gates~~ shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section 9. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 9-1, PDR 9-1, FDR 9-1**

~~In the event that~~ Whether SEPTA elects to purchase new turnstiles or elects to overhaul the existing turnstiles in accordance with the requirements listed below, SEPTA requires that all turnstiles (overhauled or new) which become part of the NPT System comply with the requirements of this Section and operate seamlessly within the NPT System.

9.1.1 Overview of SEPTA's Existing Turnstiles

SEPTA recently received an engineering assessment of the existing stock of turnstiles using external consulting labor. It was determined that the existing turnstiles are structurally sound and can be used in a turnstile overhaul/upgrade program.[1]

The following components of the existing turnstiles are available for use for the turnstile overhaul program:

- Turnstile cabinet;
- Turnstile end display;
- Tripod head mechanism;
- Magnetic swipe reader housing.

SEPTA requires that the Contractor overhaul and upgrade the existing standard turnstiles. The existing standard turnstile~~s~~ components described above shall be overhauled, and the following modifications shall also be performed:

- The existing ~~turnstile~~ base plates shall be replaced with stainless steel base plates using stainless steel, Grade ~~316~~304~~16~~L;
- The base seals ~~of the turnstiles~~ to the floor in the station areas shall be replaced in their entirety to prevent water ingress;
- All conduit entrances to the standard turnstiles shall be reworked to prevent water and rodent ingress;
- All ~~turnstile~~ wiring and all electronic components (except those described above) shall be replaced with new;
- Grounding straps shall be provided on the top covers and side doors;

[1] The drawings from the SEPTA "Faregate Evaluation and Assessment" report dated ~~September 12~~March 09, 200~~98~~ provided by Parsons are appended to the Technical Specifications as ~~Exhibit~~ Appendix ~~9.1~~A.11. Also appended to the Technical Specification are Appendices A.8 "Turnstile Manuals" and A.12 "SEPTA Turnstile Operation and Service Manual."

- A new Passenger Display Unit shall be ~~integrated into the overhauled Turnstile~~incorporated;

- A Smart Media Processor (as described in Section 4) shall be integrated ~~into the overhauled turnstile~~ to accept and process Smart Media.

~~**Full Height Turnstiles**~~

~~New, full height turnstiles shall be provided as needed to meet the access, functional and security requirements. Full height turnstiles shall include a rotary barrier with multiple arms to prohibit passage through the aisle without proper processing of Smart Media interfaced with a control console incorporating an SMP, magnetic swipe reader, passenger display, passenger graphics, control system and other required components.~~

~~The height of the control console shall be the same as the height of the top of the standard turnstile. The width of the control console shall not be greater than the width of the existing turnstile.~~

9.2 Transaction Processing

~~The t~~Turnstiles shall be designed so that individuals are not able to traverse the aisle without a proper fare transaction having been completed. T~~he standard t~~urnstiles shall be able to process customers at a minimum rate of 30 customers per minute for valid entries and 45 customers per minute for exits (“freewheel”).

Where text is identified as being displayed by the turnstile, all such test shall be for illustrative purposes only, with the final text to be approved by SEPTA at the FDR. **FDR 9-2**

~~All turnstiles for the Subway/Elevated system~~Turnstiles shall process all acceptable NPT fare media as required in Section 4, including SEPTA’s existing magnetic media. After the Smart Media is read by the turnstile, a message shall be transmitted to the CDCRS to verify the Smart Media is valid for trip. The turnstile shall obtain the authorization, or denial, from the CDCRS.

When the turnstile is communicating with the CDCRS, the Bad Number List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the turnstile shall be used. The Positive

Number List shall also be used to verify the validity of Smart Media, as applicable.

~~When the turnstile is in on-line communications with the CDCRS, the Invalid Fare Media List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the time frames set in Section 4, the Invalid Fare Media List resident in the turnstile shall be used.~~

T~~he t~~urnstile logic shall permit at least five ~~or more~~ fares to be banked in the entry direction. The total number of banked fares shall be displayed and incremented for each valid banked passage ~~on the top display~~ and decremented for each banked fare passage, on the top display ~~for each valid banked passage~~.

All aspects of the banking multiple trips and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 9-2, PDR 9-2**

Each turnstile shall be capable of being set to any of the following f~~our~~ive operational modes:

- Open: Permit one entry (valid fare must be verified);
- Closed: Do not permit entry (fare media not accepted);
- Free Fare: Permit entry, no fare required;
- Free Entry/Lock Exit: Permit free entry to the paid area and deny exit. Typically, this is for emergency evacuation situations.
- Lock Entry: Permit exit and deny entry. Typically, this is for emergency exit ~~conditio~~situation~~n~~s.

Each turnstile may be set to any of the first three settings without regard to the settings of other turnstiles in the array. When the fourth or fifth setting ~~(Lock Entry)~~ is applied, it shall apply to all turnstiles within the array. The setting of each turnstile to the first three settings shall be capable of being set locally at the turnstile through a simple setting secured ~~in the console~~ but accessible by authorized personnel. ~~-~~In addition, ~~local~~ CDCRS control shall be provided ~~within the ADA~~each device ~~gate~~ to quickly set all turnstiles in an array to any of the ~~four~~ operational modes. ~~A command initiated at the CDCRS System shall place all turnstiles in the Lock Entry operational mode to accommodate emergency egress from the platform.~~

In the event of a loss of power to a turnstile, the device shall freewheel in the exit direction, while prohibiting any entry into a station.

~~Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:~~

~~All completed transactions, including Fare Media type and other data to provide a complete record of the transaction;~~

~~All cancelled transactions, including reason for cancellation;~~

- ~~All events and alarms sensed~~ including;
  - ~~All changes in status of the device or any module incorporated;~~
  - ~~All configuration changes;~~
  - ~~All successful communications;~~
  - ~~All communication failures;~~
  - ~~Power failures and restorations;~~
  - ~~All accesses to the interior of the device;~~
- ~~All events and alarms cleared, including the identification of the user which cleared the alarm;~~
- ~~All completed and transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;~~
- ~~All cancelled transactions, including reason for cancellation;~~

- ~~All changes in status of the device or any module incorporated;~~
- ~~All configuration changes;~~
- ~~All successful communications;~~
- ~~All communication failures;~~
- ~~Power failures and restorations;~~
- ~~All accesses to the interior of the device;~~
- ~~All commands issued by the maintenance, revenue service, and other personnel; and~~
- ~~Additional information required to provide a complete audit trail for revenues and fare media.~~

9.3 User Interface

Indicators and message displays shall be provided to inform the customer of the status of the aisle and the status of the turnstile ~~console~~, to indicate the results of the processed ~~media~~ transaction, to identify problems with the turnstile, to display information to the station agent and provide similar information to customers.

T~~he t~~urnstile<u>s</u> shall also provide multiple audible tones to indicate the results of an activity, e.g., valid media processing, invalid media, alarms, and other similar functions in order to provide customer feedback.

9.3.1 Graphics and Displays

~~The d~~D<u></u>isplays <u>shall be</u> provided on the turnstiles <u>and</u> shall identify turnstile status, display the transaction information, display the status of the customer's fare media and provide alerts to the customer.

All <u>turnstiles</u> ~~turnstiles~~ shall incorporate a contactless fare media target on the top, front, or side~~ of the console~~. ~~-~~Graphics shall be provided on or adjacent to the target to instruct customers on fare media usage.

Contractor shall submit detailed drawings identifying the locations for all displays and graphics on the turnstile for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 9-3, PDR 9-3**

9.3.1.1 Fixed Graphics

Fixed graphics shall be provided on each turnstiles ~~turnstile console~~ to clearly depict and guide customers to the locations of and correct use of the Smart Media Processor (SMP).

9.3.1.2 End Displays

~~Existing i~~Illuminated displays will be utilized at each end of a turnstile. Where available, existing displays shall be used.

One of the two following displays shall be illuminated and the other latent to indicate turnstile status:

- A symbol for "Entry Prohibited" to alert the customer not to use that particular aisle;
- A symbol for "Entry" to inform the customer to use that particular aisle to enter or exit the system.

An ~~small~~ indicator light shall also be provided on the top of and at both ~~ends~~ sides of the turnstile ~~console~~ to provide a visual signal that a reduced fare instrument is being used for entry.

The indicator lights shall illuminate ~~at both ends of the appropriate (right-hand) console~~ to alert station personnel standing on both the free and paid sides of the turnstile array that reduced fare media has been used in a successful entry transaction. The indicator light shall remain lit until the turnstile returns to ready mode. The design of this indicator light shall be reviewed at the First Article Test to verify visibility. If inadequate visibility is determined at that time, then corrections shall be implemented by the Contractor and verified by SEPTA prior to acceptance of the equipment design.

9.3.1.3 Top Displays

Variable message displays shall be provided on the top of each turnstile in each direction of passage to provide information to a customer regarding turnstile readiness, transaction success or failure, and media status. The top display shall be programmable to display various greetings and messages. Preprogrammed messages shall be provided for each of the various fare media verification processing results. A utility shall be provided within the CDCRS to enable SEPTA to change the messages without Contractor intervention.

Samples of the display with the preprogrammed message as well as the message change utility information shall be presented to SEPTA for review at the Conceptual Design Review and approval at the Final Design Review. **CDR 9-4, FDR 9-3** Final wording of messages to be displayed to the customers shall be defined at the Conceptual Design Review and finalized at the Final Design Review. **CDR 9-5, FDR 9-4**

9.3.1.4 Audible Tones

Each media transaction at the turnstile shall result in a directed local audible tone that alerts the media holder and nearby SEPTA personnel of the status of the transaction. Each transaction shall result in one of three distinct tones signifying one of the following conditions:

- Fare Media accepted, proceed through turnstile;
- Fare Media not accepted, entry not permitted; or
- Reduced-fare Fare Media ~~not~~ accepted, ~~do not~~ proceed through turnstile.

Each tone shall be programmable for both activation (“on”, “off”) and volume levels. At a minimum, these tones shall be clearly audible and distinguishable at a distance of not less than thirty (30) feet in an unenclosed environment. Proposed tones and volumes are to be submitted to SEPTA for approval at the Preliminary Design Review. **PDR 9-4**

9.4 Fare Handling Hardware

9.4.1 Smart Media Processor

The turnstile shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4. The SMP shall be integral to the turnstile and shall be housed within the turnstile cabinet.

The SMP shall be modular and upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

Contractor shall provide full information on the validity checking steps performed by the SMP for each fare type for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 9-5, FDR 9-5**

If the Smart Media is valid, the turnstile shall permit one entry per tag.

If the SMP fails, the customer display on the turnstile shall display "Magnetic Media Only" or other similar message and the turnstile shall remain in service. If the SMP fails in conjunction with a failure of the Magnetic Media Swipe Reader (MMSR), the turnstile display shall display “Out of Service” and the International Closed display at the entry end of the turnstile shall be lit.

9.4.2 Magnetic Media Swipe Reader

The existing swipe reader housing shall be used for the overhauled ~~faregat~~turnstile ~~e~~but the magnetic reader module provided within the MMSR shall be new. The existing magnetic reader module shall not be used in the NPT System.

The read-only MMSR shall be ~~made of stainless steel or other revenue service-proven material, shall be~~ located on top of the turnstile and shall properly process magnetic media which meet the ISO/IEC 7811 standards. Fare media orientation graphics shall be ~~engraved~~ displayed on the swipe reader to facilitate correct insertion and swipe of the fare media. ~~-~~The data read by the ticket processor shall be checked for validity. If the ticket is not valid, a "See Agent" message shall be displayed. If the ticket is valid, an “Enter” message shall be displayed.

If the MMSR fails, the customer display on the turnstile shall display "Smart Media Only" or other similar message and the turnstile shall remain in service. If the MMSR fails in conjunction with a failure of the SMP, the turnstile display shall display “Out of Service” and the International Closed display at the end of the turnstile shall be lit.

9.5 Control System

A microprocessor shall be provided in each turnstile and shall control and monitor all functions of the turnstile~~s~~. The failure of any microprocessor in any turnstile shall affect only one turnstile aisle.

Communication with the CDCRS shall be an integral element of the turnstile. ~~This c~~Communications shall occur via the NPT Subway ~~/~~ /Elevated Network outlined in Section 18. Communications between the Turnstiles and the CDCRS, including both the uploading and downloading of information shall occur as necessary to support the functional requirements of Sections 2 and 4.

It is anticipated that this communication shall include the transmission of all entry data, exit data, turnstile status messages, configuration, control, and parameter information as well any additional information required by the Contractor's system to support successful operation of the NPT System.

There shall be no dependency on maintaining communications with the CDCRS for normal operation. If communication with the CDCRS is interrupted, the turnstile shall continue to operate in the normal manner and shall upload all transaction data and turnstile status messages to the CDCRS when communication with the CDCRS is restored. The Fare Media to be accepted when there is a power failure shall be settable by SEPTA. Information describing this procedure shall be provided for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 9-6, FDR 9-6**

Each turnstile ~~console~~ shall have an internally maintained time and date clock. ~~-~~The turnstile's ~~console~~ clock shall synchronize with the CDCRS clock for all time-related data each time it communicates with the CDCRS.

The turnstile shall be able to be configured by the CDCRS through the downloading of operational and configuration data. All functions available shall be selectable from a menu when setting up the operation of the turnstiles. This configurable information shall include, among other items, the ability to accept/reject different types of fare media and reduced fares. All configuration information sets shall be saved by the CDCRS. All configuration and parameter settings shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 9-7, FDR 9-7**

Data shall be stored locally by the turnstile and transferred to the CDCRS, for all activity performed, including, but not limited to, valid fares processed, invalid fare processing attempts, alarms, events, changes in status and sensed conditions and data communication attempts (both successful and unsuccessful). Data stored at the turnstile shall be stored in non-volatile memory and shall not be lost even with total loss of power to the turnstile.

9.5.1 Downloading

Downloading from the CDCRS to the turnstile shall be used for the following purposes:

- Synchronize the clocks;
- Provide new fare tables;
- Execute commands;
- Provide updated software;
- Poll equipment for operational status;
- Download changes to system and equipment parameters;
- Provide lists and updates of lists ~~of invalid fare media~~identified in Section 2.3.16;
- Provide other data communication to ensure proper operation of the turnstiles.

In the event of loss of communication with the CDCRS, downloading shall be possible on a local basis for an individual turnstile ~~console~~ with the use of such devices as a portable programming device or a PC-compatible handheld or notebook computer.

Data communications methodology and downloaded information shall be identified and provided to the SEPTA for review at the Preliminary Design Review and approval at the Final Design Review. **PDR 9-8, FDR 9-8**

9.5.2 Uploading

All data existing at the turnstile data interface shall be transmitted to the CDCRS in a scheduled manner and upon request from the CDCRS.

9.5.3 Data Storage

All data shall be stored in the turnstile memory until instructed by the CDCRS to purge transactions. In the event communications cannot be established with the CDCRS for an extended period of time or a purge command is not received, data shall be retained locally, with storage for a minimum of ~~30~~50,000 entry transactions plus an equal number of event and alarm transactions. In the event data storage requirements are exceeded, the turnstile shall take itself out of service until the data can be successfully transferred and the memory cleared.

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed;
- All events and alarms cleared, including the identification of the user which cleared the alarm;
- All completed and cancelled transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failure;
- Power failures and restorations;
- All accesses to the interior of the device;
- All commands issued by the maintenance, revenue service and other personnel; and
- Additional information required to provide a complete audit trail for revenues and fare media.

9.5.4 Passback Control

Each turnstile shall monitor all media usages to prevent use of any unlimited ride media products for more than one concurrent trip within a defined time period at a station. This time period, initially set to thirteen (13) minutes, shall be settable by SEPTA via a downloaded parameter. The control of passback shall be based on all entries into a station and shall require continuous updating of information from all turnstiles at the station. Maintenance of the passback list, if required, shall be done in a distributed fashion at each turnstile and updated immediately based on the processing of each item of applicable media. All aspects of the passback controls and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 9-6, PDR 9-9**

9.5.5 Servicing Display and Keypad

An internal control, consisting of a display and keypad shall be incorporated into the turnstile to assist troubleshooting of the turnstile and for other servicing, control and access needs. The display shall have a minimum of two lines, each with a minimum of 16 characters, and a minimum character height of one-quarter inch. All locally settable parameters shall be accessed and entered through the display/keypad.

Safeguards shall be employed to assure that changes to the software cannot be performed through the display/keypad. Failure codes, which shall provide diagnostic information regarding problems to a subassembly level, shall be displayed upon addressing by means of the keypad. Diagnostics shall be continuous and automatic. Requests to perform each diagnostic test shall also be possible through the display/keypad.

~~**9.5.6 Fare Table**~~

~~The turnstile shall turnstile shall have the ability to operate under any of a minimum of two (2) fare tables residing in turnstile memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities. **CDR 9-6, FDR 9-7**~~

9.6 Communications

Turnstiles shall communicate with the CDCRS to suit the needs of the installation and turnstile operation. This shall occur, as a minimum, through an integral standard Ethernet Interface with RJ45 connector(s) for communications and via the Station LAN as defined in Section 18.

~~Turnstiles shall communicate with the CDCRS to suit the needs of the installation and turnstile operation. This shall include, as a minimum, communication:~~

- ~~Via integral standard Ethernet Interface with RJ45 connector(s); and~~
- ~~Via Station LAN as defined in Section 18.~~

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual turnstile through the use of a compact flash RAM with a minimum capacity of 8GB.

In cases of network failure, the turnstile shall have sufficient capacity to store, at a minimum, ten days' event and transaction data. This information shall be stored in both the turnstile main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored transaction data (e.g., alarm, event, sales) shall be automatically transmitted to the CDCRS.

9.7 Structure and Finish Requirements

This ~~equipment~~ turnstiles shall be constructed of stainless steel, or other revenue service proven material as approved by SEPTA, to meet the requirements of SEPTA, as defined in Section 2.

~~Upon loss of power, the turnstile shall stop processing fares and shall default to a Lock Entry mode. Upon restoration of power, the turnstile shall return to its normal operating state without manual intervention within five minutes.~~

Turnstile cabinets shall have hinged doors and covers providing direct access to the assemblies. Covers shall be equipped with devices to hold them in the fully open position. Top covers shall not penetrate an adjacent turnstile aisle when fully opened. Hinges shall be concealed and shall not protrude beyond the outer surface. The closing joint shall prevent unauthorized entry, as well as dirt, dust, and moisture from entering the cabinet.

The baseplate of the turnstiles shall be of stainless steel, Grade 316L.

Each turnstile shall have incorporated within its housing a two-position power switch, which shall be used to power down and power up the turnstile. In addition, a 120-volt duplex outlet shall be included within each turnstile.

Contractor shall provided dimensioned drawings of the turnstiles showing each side and with the doors and covers both opened and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the turnstile for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 9-7, PDR 9-10**

~~**Standard Turnstiles**~~

~~The baseplate of the turnstiles and the ADA gate shall be of stainless steel, Grade 316.~~ If new Turnstiles are selected, t~~T~~he ~~standard~~ turnstile footprint shall be identical to the footprint of the existing turnstiles so that minimal station modifications are required.

The barrier mechanism shall be a tripod arm, which shall minimize back cocking, and subsequent fare evasion. There shall be not be any gaps greater than two (2) inches between the turnstile barrier and the adjacent turnstile housing when the barrier is closed.

Closed tripod arms shall be able to sustain impacts in both directions of travel without permanent deformations or damage. The impact shall be equivalent to a 300 lb customer moving at 3 mph and striking the tripod arm at the end of the arm. A 300 lb downward force at the end of the tripod arm shall also cause no damage.

The force to rotate the tripod, at the maximum travel end of the tripod arm, shall not exceed 10 pounds.

Full Height Turnstiles

Dimensions of the full height turnstile shall meet the following minimum requirements:

- Passage Width: 27 inches
- Depth: 54 inches
- Width: 62 inches
- Passage Height: 84 inches
- Overall Height: 91 inches
- Barrier Tubing diameter: 1½ inches made of 14 gauge stainless steel

The barrier mechanism shall eliminate back cocking, and subsequent fare evasion.

The barrier shall be able to sustain impacts in both directions of travel without permanent deformations or damage. The impact shall be equivalent to a 300 lb customer moving at 3 mph and striking the barrier at its outermost end. A 300 lb downward force at the outermost end of the barrier shall also cause no damage.

The force to rotate the barrier, at the maximum travel end of the barrier tubing, shall not exceed 10 pounds.

Upon loss of power, the turnstile shall stop processing fares and shall default to a Lock Entry mode. Upon restoration of power, the turnstile shall return to its normal operating state without manual intervention within five minutes.

Turnstile cabinets shall have hinged doors and covers providing direct access to the assemblies. Covers shall be equipped with devices to hold them in the fully open position. Top covers shall not penetrate an adjacent turnstile aisle when fully opened. Hinges shall be concealed and shall not protrude beyond the outer surface. The closing joint shall prevent unauthorized entry, as well as dirt, dust, and moisture from entering the cabinet.

Each console shall have incorporated within its housing a two-position power switch, which shall be used to power down and power up the turnstile. In addition, a 120-volt duplex outlet shall be included within each turnstile console.

Contractor shall provided dimensioned drawings of the turnstiles showing each side and with the doors and covers both opened and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the turnstile for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 9-7, PDR 9-8**

9.7.1 ADA Gate

The ADA gate shall be compliant with all functional and construction requirements described in Section 10.9 with the exception of the following:

- The turnstile barrier shall be a hinged door or other similar barrier;
- The turnstile barrier shall have a smooth surface on both sides;
- The barrier shall be of sufficient height and width to provide the necessary access and egress control between the paid and free areas;
- The "wheelchair" sign or other SEPTA-approved ADA designator shall be affixed to both ends of the turnstile;
- A key operated unlatch shall be available on the turnstile for use by emergency personnel;
- Media processing shall be identical to the standard turnstile;
- The ADA gate shall sense the direction of travel through the turnstile, and shall sound an audible alarm if more than one Customer entry is detected in an entry mode. The alarm shall be SEPTA-adjustable in duration by software control between five and thirty seconds, and should be able to be reset or temporarily disabled from the CDCRS. This alarm condition shall also be transmitted to the CDCRS immediately upon occurrence;
- The ADA gate shall sense an open condition, and shall transmit a message to the CDCRS when the turnstile opening has exceeded the allowable time;

- The sound level of alarms shall be 80 dbA minimum measured 10 feet from the barrier with adjustment possible from within the turnstile or through software control. An external key switch shall be provided to deactivate the alarm.

SEPTA has purchased a small quantity of ADA barriers[2] as manufactured by Dudley and is currently in the process of deploying them. Where these devices are installed or planned to be installed, Contractor shall interface Fare Media processing components with these ADA barriers to integrate these ADA barriers into the NPT System as ADA gates. For all other locations, the Contractor shall deploy Contractor-delivered ADA gates in compliance with the requirements of the Technical Specification.

Contractor shall provided dimensioned drawings of the ADA gate showing each side and with the doors and covers both opened and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the turnstile for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 9-8, PDR 9-9.**

9.8 Installation

Upon installation of the turnstile, all loads generated by tripod arms shall be transmitted through the turnstile and into the station floor.

Turnstiles shall be capable of being installed adjacent to a wall and still provide for maintenance access. Servicing or maintenance access and activity shall not require the closing of any adjacent turnstile aisle.

The turnstile base shall be provided with not less than four mounting holes for securing the cabinet to the floor. Any specialized mounting devices shall be provided by the Contractor. The gap between the bottom of the turnstile and the flooring shall be filled to eliminate water ingress.

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[2] Information on the Dudley ADA gates purchased is appended to the Technical Specifications as Exhibit 9.2

All turnstiles shall be installed with power and communications supplied from conduit within the floor. The use of ramps or any other configuration to conceal cabling on or above the floor is prohibited.

SEPTA reserves the right to change the quantity of turnstiles ~~and ADA gates~~ installed in any array at any station prior to SEPTA approval of the installation drawings. Installation drawings and prerequisites for the turnstiles ~~and ADA gates~~ shall be provided to SEPTA for review at the Conceptual Design Review. **CDR 9-8**

Section 10 – Railroad Turnstiles
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10 ~~T~~REGIONAL RAIL AILROAD TURNSTILES

10.1 General

~~Two~~ The ~~types of turnstile~~devices ~~are required by SEPTA for~~ For the ~~Subway/Elevated~~Regional Rail stations that are to be gated, the NPT System~~.~~ shall incorporate a ~~SEPTA requires a~~standard, bi-directional ~~as follows:~~

~~A standard~~ turnstile, with a tripod barrier[1].

~~A full height turnstile:~~

- ~~An "ADA gate" that is fully ADA compliant through which physically challenged customers shall be able to pass.~~

~~When used within these specifications, the term "turnstile" shall mean both the standard turnstile and the full height turnstile unless otherwise stated.~~

Each Railroad turnstile (turnstile) shall communicate with the other turnstiles and ADA Fare Gates ~~devices~~ within the array ~~in the station~~ to share necessary information and with the Central Data Collection and Reporting System (CDCRS) via the Station LAN and the ~~Subway/Elevated~~ Regional Rail Network (see Section 18).

~~A new ADA gate shall be furnished and installed within each turnstile array to permit customers with disabilities and others who cannot use the standard gate to move between the free and paid areas of the station. It shall also serve as a service gate, emergency exit gate, and as a backup to the regular~~ standard turnstile, ~~when required. It shall consist of a reversible gate, whose motion in either direction is controlled, as well as a mounting post. Existing ADA gates shall not be deployed, in any manner, within in the NPT System. All ADA gates shall be new and meet the requirements identified in Section 10.~~

~~At Subway/Elevated locations selected by SEPTA, full height turnstiles shall be installed in place of or in addition to standard turnstiles.~~

[1] Appendices A.8 "Turnstile Manuals" and A.12 "SEPTA Turnstile Operation and Service Manual" are appended to the Technical Specifications.

Neither cash nor tokens shall be accepted for fare payment by the turnstiles, whether overhauled or new. ~~No cash and token transactions shall occur at the turnstile array.~~

~~The turnstiles and ADA gates shall not accept SEPTA tokens. Neither cash nor tokens shall be accepted for fare payment by the turnstiles, whether overhauled or new. No cash and token transactions shall occur at the turnstile array.~~

The turnstiles shall function properly in all operating conditions found within the station environment as identified in Section 2. The turnstiles shall:

~~The turnstiles and ADA gates shall operate properly in all operating conditions found within the SEPTA Subway/Elevated station environment~~SEPTA Regional Rail operating environment~~, including the following: direct sunlight, temperature ranges, temperature fluctuations, humidity, rainfall (with and without wind), freezing precipitation (with and without wind), physical shocks, vibrations, steel dust and electromagnetic interference.~~

~~The turnstiles and ADA gates shall:~~ shall:

- Communicate over the Station LAN and the Regional Rail~~Subway/Elevated~~ Network to provide information as described in Section 18;
- Process the existing machine readable SEPTA fare media as well as all NPT media identified in Section 4;
- Communicate with the CDCRS for Smart Media validation and data transfer purposes;

~~All design submittals identified within this section apply to both the standard turnstile and ADA gate unless specifically identified as only one type.~~

A complete description of the functionality of the turnstiles ~~and ADA gates~~ shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section 10~~9~~. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 10-1, PDR 10-1, FDR 10-1**

In the event that SEPTA elects to purchase new turnstiles or elects to overhaul the existing turnstiles in accordance with the requirements listed below, SEPTA requires that all turnstiles (overhauled or new) comply with the requirements of this Section and operate seamlessly within the NPT System.

10.1.1 Overview of SEPTA's Existing Turnstiles

SEPTA recently received an engineering assessment of the existing stock of turnstiles using external consulting labor. It was determined that the existing turnstiles are structurally sound and can be used in a turnstile overhaul/upgrade program.[2]

The following components of the existing turnstiles are available for use for the turnstile overhaul program:

- Turnstile cabinet;
- Turnstile end display;
- Tripod head mechanism;
- Magnetic swipe reader housing.

SEPTA requires that the Contractor overhaul and upgrade the existing standard turnstiles. The existing standard turnstiles components described above shall be overhauled, and the following modifications shall also be performed:

- The existing turnstile base plates shall be replaced with stainless steel base plates using stainless steel, Grade 316;
- The base seals of the turnstiles to the floor in the station areas shall be replaced in their entirety to prevent water ingress;
- All conduit entrances to the standard turnstiles shall be reworked to prevent water and rodent ingress;

[2] The drawings from the SEPTA "Faregate Evaluation and Assessment" report dated September 12, 2008 provided by Parsons are appended to the Technical Specifications as Exhibit 9.1

- All turnstile wiring and all electronic components (except those described above) shall be replaced with new;
- Grounding straps shall be provided on the top covers and side doors;
- A new Passenger Display Unit shall be integrated into the overhauled Turnstileincorporated;
- A Smart Media Processor (as described in Section 4) shall be integrated into the overhauled turnstile to accept and process Smart Media.

Full Height Turnstiles

New, full height turnstiles shall be provided as needed to meet the access, functional and security requirements. Full height turnstiles shall include a rotary barrier with multiple arms to prohibit passage through the aisle without proper processing of Smart Media interfaced with a control console incorporating an SMP, magnetic swipe reader, passenger display, passenger graphics, control system and other required components.

The height of the control console shall be the same as the height of the top of the standard turnstile. The width of the control console shall not be greater than the width of the existing turnstile.

10.2 Transaction Processing

The Railroad TThe turnstile shall be designed so that individuals are not able to traverse the aisle without a proper fare transaction having been completed. These turnstiles shall be able to be configured for a number of different operational functionality scenarios. Examples of the operational configurations that shall be available at the Railroad Turnstiles are as follows:be able to set so that valid fare is required for passage:

- Valid Fare Media is required for passage from unpaidfree to paid area only;

from free to paid area only

from paid to free area only

- Valid Fare Media is required for passage from ~~both free~~unpaid~~free and~~to paid areas, and from paid areas to ~~unpaid~~free areas;

- No Fare Media required for passage from paid area to ~~unpaid~~free area.

T~~he standard t~~urnstile~~s~~ shall be able to process customers at a minimum rate of 30 customers per minute for valid passages through the aisle with fare validity verification~~entries~~ and 45 customers per minute for valid passages through the aisle with no fare validity verification ~~exits~~ ("freewheel").

Where text is identified as being displayed by the turnstile, all such tex~~s~~t shall be for illustrative purposes only, with the final text to be approved by SEPTA at the FDR. **FDR 10-2**

~~All turnstiles for the Subway/Elevated system~~Turnstiles shall process all acceptable NPT fare media as required in Section 4, including SEPTA's existing magnetic media. After the Smart Media is read by the turnstile, a message shall be transmitted to the CDCRS to verify the Smart Media is valid for trip. The turnstile shall obtain the authorization~~,~~ or denial~~,~~ from the CDCRS.

When the turnstile is communicating with the CDCRS, the Bad Number List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the turnstile shall be used. The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

In order to facilitate multiple trips on one item of Fare Media, ~~When the turnstile is in on-line communications with the CDCRS, the Invalid Fare Media List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the time frames set in Section 4, the Invalid Fare Media List resident in the turnstile shall be used.~~

Turnstile logic shall permit at least five fares to be banked in the entry direction. ~~-~~The total number of banked fares shall be displayed and incremented for each valid banked passage and decremented for each banked fare passage, on the top display.

~~The turnstile logic shall permit five or more fares to be banked in a single direction when Smart Media is used to traverse the aisle. The total number of banked fares shall be displayed on the top display and decrement for each valid banked passage. When multiple fairs are banked, the initial fare shall be processed against any existing valid period pass. All remaining fares, including the initial fare (if no period pass exists) shall be processed as single trip adult fares.~~

All aspects of the banking multiple trips and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 10-2, PDR 10-2**

~~The turnstile logic shall permit five or more fares to be banked in the entry direction. The total number of banked fares shall be displayed on the top display and decremented for each valid banked passage.~~

Each turnstile shall be capable of being set to any of the following ~~four~~ six operational modes:

- Open: Permits one entry/exit (valid fare must be verified), in either direction;
- Free Fare: Permit entry, no fare required, in either direction;
- Intermediate: Permits one entry/exit (valid fare must be verified), in one direction, while allowing Free Fare in reverse direction.
- ~~Permit one entry (valid fare must be verified);~~
- Closed: Do not permit entry (fare media not accepted);
- Free Entry/Lock Exit: Permit free entryt to the paid area and deny exit. Typically, this is for emergency evacuation situations.
- ~~Free Fare: Permit entry, no fare required;~~
- Lock Entry: Permit exit and deny entry. Typically, this is for emergency exit conditions.
-

Each turnstile may be set to any of the first four settings without regard to the settings of other turnstiles in the array. When the fifth or sixth setting is applied, it shall apply to all turnstiles within the array. The setting of each turnstile to the first four settings shall be capable of being set locally at the turnstile through a simple setting secured but accessible by authorized personnel. In addition, CDCRS control shall be provided to quickly set all turnstiles in an array to any of the operational modes.

- With the exception of Lock Entry, e

Each turnstile may be set to any of the first threeabove settings without regard to the settings of other turnstiles in the array. When the fourth setting (Lock Entry setting) is applied, it shall apply to all turnstiles within the array. The setting of each turnstile shall be capable of being set locally at the turnstile through a simple setting secured in the console but accessible by authorized personnel. In addition, local control shall be provided within the ADA gateeach device to quickly set all turnstiles in an array to any of the fourany of the available operational modes. A command initiated at the CDCRS System shall place all turnstiles in the Lock Entry operational mode to accommodate emergency egress from the platform.

In the event of a loss of power to a turnstile, the device shall freewheel in the exit direction, while prohibiting any entry into a station.

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

All completed transactions, including Fare Media type and other data to provide a complete record of the transaction;

All cancelled transactions, including reason for cancellation;

- All events and alarms sensed including;
  - All changes in status of the device or any module incorporated;
  - All configuration changes;
  - All successful communications;

- All communication failures;
- Power failures and restorations;
- All accesses to the interior of the device;

- All events and alarms cleared, including the identification of the user which cleared the alarm;
- All completed and transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failures;
- Power failures and restorations;
- All accesses to the interior of the device;
- All commands issued by the maintenance, revenue service, and other personnel; and
- Additional information required to provide a complete audit trail for revenues and fare media.
-

10.3 User Interface

Indicators and message displays shall be provided to inform the customer of the status of the aisle and the status of the turnstile console, to indicate the results of the processed media transaction, to identify problems with the turnstile, to display information to the station agent and provide similar information to customers.

The turnstiles shall also provide multiple audible tones to indicate the results of an activity, e.g., valid media processing, invalid media, alarms, and other similar functions in order to provide customer feedback.

10.3.1 Graphics and Displays

~~The d~~Displays shall be provided on the turnstiles and shall identify the following turnstile status~~: , display the~~ transaction information, ~~display the~~ status of the customer's fare media, and provide alerts to the customer.

All ~~standard tu~~turnstiles~~turnstiles~~ shall incorporate a contactless fare media target on the top, front, or side ~~of the console~~. ~~-~~Graphics shall be provided on or adjacent to the target to instruct customers on fare media usage.

Contractor shall submit detailed drawings identifying the locations for all displays and graphics on the turnstile for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 10-3, PDR 10-3**

10.3.1.1 Fixed Graphics

Fixed graphics shall be provided on each turnstiles~~turnstile console~~ to clearly depict and guide customers to the locations of and correct use of the Smart Media Processor (SMP).

10.3.1.2 End Displays

~~Existing i~~Illuminated displays will be utilized at each end of a turnstile. ~~Where available, existing displays shall be used.~~

One of the two following displays shall be illuminated and the other latent to indicate turnstile status:

- A symbol for "Entry Prohibited" to alert the customer not to use that particular aisle;
- A symbol for "Entry" to inform the customer to use that particular aisle to enter or exit the system.

An ~~small~~ indicator light shall also be provided on the top of and at both ~~ends~~ sides of the turnstile ~~console~~ to provide a visual signal that a reduced fare instrument is being used for entry.

The indicator lights shall illuminate ~~at both ends of the appropriate (right-hand) console~~ to alert station personnel standing on both the free and paid sides of the turnstile array that reduced fare media has been used in a successful entry transaction. The indicator light shall remain lit until the turnstile returns to ready mode. The design of this indicator light shall be reviewed at the First Article Test to verify visibility. If inadequate visibility is determined at that time, then corrections shall be implemented by the Contractor and verified by SEPTA prior to acceptance of the equipment design.

10.3.1.3 Top Displays

Variable message displays shall be provided on the top of each turnstile in each direction of passage to provide information to a customer regarding turnstile readiness, transaction success or failure, and media status. The top display shall be programmable to display various greetings and messages. Preprogrammed messages shall be provided for each of the various fare media verification processing results. A utility shall be provided within the CDCRS to enable SEPTA to change the messages without Contractor intervention.

Samples of the display with the preprogrammed message as well as the message change utility information shall be presented to SEPTA for review at the Conceptual Design Review and approval at the Final Design Review. **CDR 10-4, FDR 10-3** Final wording of messages to be displayed to the customers shall be defined at the Conceptual Design Review and finalized at the Final Design Review. **CDR 10-5, FDR 10-4**

10.3.1.4 Audible Tones

Each media transaction at the turnstile shall result in a directed local audible tone that alerts the media holder and nearby SEPTA personnel of the status of the transaction. Each transaction shall result in one of three distinct tones signifying one of the following conditions:

- Fare Media accepted, proceed through turnstile;
- Fare Media not accepted, entry not permitted; or
- Reduced-fare Fare Media ~~not~~ accepted, ~~do not~~ proceed through turnstile.

Each tone shall be programmable for both activation (“on”, “off”) and volume levels. At a minimum, these tones shall be clearly audible and distinguishable at a distance of not less than thirty (30) feet in an unenclosed environment. Proposed tones and volumes are to be submitted to SEPTA for approval at the Preliminary Design Review. **PDR 10-4**

10.4 Fare Handling Hardware

10.4.1 Smart Media Processor

The turnstile shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4. The SMP shall be integral to the turnstile and shall be housed within the turnstile cabinet.

The SMP shall be modular and upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

Contractor shall provide full information on the validity checking steps performed by the SMP for each fare type for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 10-5, FDR 10-5**

If the Smart Media is valid, the turnstile shall permit one entry for each fare paid with the Smart Media.

If the SMP fails, the customer display on the turnstile shall display "Magnetic Media Only" or other similar message and the turnstile shall remain in service. If the SMP fails in conjunction with a failure of the Magnetic Media Swipe Reader (MMSR), the turnstile display shall display “Out of Service” and the International Closed display at the entry end of the turnstile shall be lit.

10.4.2 Magnetic Media Swipe Reader

A new Magnetic Media Swipe Reader (MMSR) shall be incorporated within each turnstile.~~turnstile~~

The read-only MMSR shall be made of stainless steel or other revenue service-proven material, shall be located on top of the turnstile and shall properly process magnetic media which meet the ISO/IEC 7811 standards. Fare media orientation graphics shall be engraved on the swipe reader to facilitate correct insertion and swipe of the fare media. The data read by the ticket processor shall be checked for validity. If the ticket is not valid, a "See Agent" message shall be displayed. If the ticket is valid, an “Enter” message shall be displayed.

If the MMSR fails, the customer display on the turnstile shall display "Smart Media Only" or other similar message and the turnstile shall remain in service. If the MMSR fails in conjunction with a failure of the SMP, the turnstile display shall display “Out of Service” and the International Closed display at the end of the turnstile shall be lit.

10.5 Control System

A microprocessor shall be provided in each turnstile and shall control and monitor all functions of the turnstile~~s~~. The failure of any microprocessor in any turnstile shall affect only one turnstile aisle.

Communication with the CDCRS shall be an integral element of the turnstile. This communications shall occur via the NPT ~~Subway / Elevated~~Regional Rail Network outlined in Section 18. Communications between the Turnstiles and the CDCRS, including both the uploading and downloading of information shall occur as necessary to support the functional requirements of Sections 2 and 4.

It is anticipated that this communication shall include the transmission of all entry data, exit data, turnstile status messages, configuration, control, and parameter information as well any additional information required by the Contractor’s system to support successful operation of the NPT System.

There shall be no dependency on maintaining communications with the CDCRS for normal operation. If communication with the CDCRS is interrupted, the turnstile shall continue to operate in the normal manner and shall upload all transaction data and turnstile status messages to the CDCRS when communication with the CDCRS is restored. The Fare Media to be accepted when there is a power failure shall be settable by SEPTA. Information describing this procedure shall be provided for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 10-6, FDR 10-6**

Each turnstile ~~console~~ shall have an internally maintained time and date clock. The turnstile's ~~console~~ clock shall synchronize with the CDCRS clock for all time-related data each time it communicates with the CDCRS.

The turnstile shall be able to be configured by the CDCRS through the downloading of operational and configuration data. All functions available shall be selectable from a menu when setting up the operation of the turnstiles. This configurable information shall include, among other items, the ability to accept/reject different types of fare media and reduced fares. All configuration information sets shall be saved by the CDCRS. All configuration and parameter settings shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 10-7, FDR 10-7**

Data shall be stored locally by the turnstile and transferred to the CDCRS, for all activity performed, including, but not limited to, valid fares processed, invalid fare processing attempts, alarms, events, changes in status and sensed conditions and data communication attempts (both successful and unsuccessful). Data stored at the turnstile shall be stored in non-volatile memory and shall not be lost even with total loss of power to the turnstile.

10.5.1 Downloading

Downloading from the CDCRS to the turnstile shall be used for the following purposes:

- Synchronize the clocks;
- Provide new fare tables;
- Execute commands;

- Provide updated software;
- Poll equipment for operational status;
- Download changes to system and equipment parameters;
- Provide lists and updates of lists ~~of invalid fare media~~identified in Section 2.3.16);
- Provide other data communication to ensure proper operation of the turnstiles.

In the event of loss of communication with the CDCRS, downloading shall be possible on a local basis for an individual turnstile ~~console~~ with the use of such devices as a portable programming device or a PC-compatible handheld or notebook computer.

Data communications methodology and downloaded information shall be identified and provided to the SEPTA for review at the Preliminary Design Review and approval at the Final Design Review. **PDR 10-8, FDR 10-8**

10.5.2 Uploading

All data existing at the turnstile data interface shall be transmitted to the CDCRS in a scheduled manner and upon request from the CDCRS.

10.5.3 Data Storage

All data shall be stored in the turnstile memory until instructed by the CDCRS to purge transactions. In the event communications cannot be established with the CDCRS for an extended period of time or a purge command is not received, data shall be retained locally, with storage for a minimum of ~~30~~50,000 entry transactions plus an equal number of event and alarm transactions. In the event data storage requirements are exceeded, the turnstile shall take itself out of service until the data can be successfully transferred and the memory cleared.

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed;

- All events and alarms cleared, including the identification of the user which cleared the alarm;
- All completed and cancelled transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failure;
- Power failures and restorations;
- All accesses to the interior of the device;
- All commands issued by the maintenance, revenue service and other personnel; and
- Additional information required to provide a complete audit trail for revenues and fare media.

10.5.4 Passback Control

Each turnstile shall monitor all media usages to prevent use of any unlimited ride media products for more than one concurrent trip within a defined time period at a station. This time period, initially set to thirteen (13) minutes, shall be settable by SEPTA via a downloaded parameter. The control of passback shall be based on all ~~entries into~~ usages at a station and shall require continuous updating of information from all turnstiles at the station. Maintenance of the passback list, if required, shall be done in a distributed fashion at each turnstile and updated immediately based on the processing of each item of applicable media. All aspects of the passback controls and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 10-6, PDR 10-9**

~~10.5.4~~

~~10.5.5 Passback Control~~

~~Each turnstile shall monitor all media usages to prevent use of any unlimited ride media products for more than one concurrent trip within a defined time period. This time period, initially set to thirteen (13) minutes, shall be settable by SEPTA via a downloaded parameter. The control of passback shall be based on all entries into a station and shall require continuous updating of information from all turnstiles at the station. Maintenance of the passback list, if required, shall be done in a distributed fashion at each turnstile and updated immediately based on the processing of each item of applicable media. All aspects of the passback controls and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 9-5, PDR 9-7**~~

~~10.5.6~~10.5.5 **Servicing Display and Keypad**

An internal control, consisting of a display and keypad shall be incorporated into the turnstile to assist troubleshooting of the turnstile and for other servicing, control and access needs. The display shall have a minimum of two lines, each with a minimum of 16 characters, and a minimum character height of one-quarter inch. All locally settable parameters shall be accessed and entered through the display/keypad.

Safeguards shall be employed to assure that changes to the software cannot be performed through the display/keypad. Failure codes, which shall provide diagnostic information regarding problems to a subassembly level, shall be displayed upon addressing by means of the keypad. Diagnostics shall be continuous and automatic. Requests to perform each diagnostic test shall also be possible through the display/keypad.

~~**10.5.7 Fare Table**~~

~~The turnstile shall have the ability to operate under any of a minimum of two (2) fare tables residing in turnstile memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities.~~ ~~**CDR 10-66, FDR 10-77**~~

10.6 Communications

Turnstiles shall communicate with the CDCRS to suit the needs of the installation and turnstile operation. This ~~shall~~ shall occur,~~include,~~ as a minimum, through an i~~communication:~~

~~Via i~~ntegral standard Ethernet Interface with RJ45 connector(s)~~; and~~ for communications and

~~V~~via the Station LAN as defined in Section 18.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual turnstile through the use of a compact flash RAM with a minimum capacity of 8GB.

In cases of network failure, the turnstile shall have sufficient capacity to store, at a minimum, ten days' event and transaction data. This information shall be stored in both the turnstile main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored transaction data (e.g., alarm, event, sales) shall be automatically transmitted to the CDCRS.

10.7 Structure and Finish Requirements

The~~is~~ turnstiles shall be constructed of stainless steel Grade 304L, except for the baseplate which shall be Stainless Steel of Grade 316L. ~~, or other revenue service proven material as approved by SEPTA, to meet the requirements of SEPTA, as defined in Section 2.~~

~~This equipment , including bases,shall be constructed of stainless steel, Grade 304or other revenue service proven material as approved by SEPTA, to meet the requirements of SEPTA. Upon loss of power, the turnstile shall stop processing fares and shall default to a Lock Entry mode. Upon restoration of power, the turnstile shall return to its normal operating state without manual intervention within five minutes.~~

Turnstile cabinets shall have hinged doors and covers providing direct access to the assemblies. Covers shall be equipped with devices to hold them in the fully open position. Top covers shall not penetrate an adjacent turnstile aisle when fully opened. Hinges shall be concealed and shall not protrude beyond the outer surface. The closing joint shall prevent unauthorized entry, as well as dirt, dust, and moisture from entering the cabinet.

Each turnstile shall have incorporated within its housing a two-position power switch, which shall be used to power down and power up the turnstile. In addition, a 120-volt duplex outlet shall be included within each turnstile.

Contractor shall provided dimensioned drawings of the turnstiles showing each side and with the doors and covers both opened and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the turnstile for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 10-7, PDR 10-10**

~~**Standard Turnstiles**~~

~~The base plate of the standard turnstiles and the ADA gate shall be of stainless steel, Grade 316.~~

~~The standard turnstile footprint shall be identical to the footprint of the existing turnstiles so that minimal station modifications are required.~~

The barrier mechanism shall be a tripod arm, which shall minimize back cocking, and subsequent fare evasion. There shall be not be any gaps greater than two (2) inches between the turnstile barrier and the adjacent turnstile housing when the barrier is closed.

Closed tripod arms shall be able to sustain impacts in both directions of travel without permanent deformations or damage. The impact shall be equivalent to a 300 lb customer moving at 3 mph and striking the tripod arm at the end of the arm. A 300 lb downward force at the end of the tripod arm shall also cause no damage.

The force to rotate the tripod, at the maximum travel end of the tripod arm, shall not exceed 10 pounds.

~~Full Height Turnstiles~~

~~Dimensions of the full height turnstile shall meet the following minimum requirements:~~

~~Passage Width: 27 inches~~

~~Depth: 54 inches~~

~~Width: 62 inches~~

~~Passage Height: 84 inches~~

~~Overall Height: 91 inches~~

~~Barrier Tubing diameter: 1½ inches made of 14 gauge stainless steel~~

~~The barrier mechanism shall eliminate back cocking, and subsequent fare evasion.~~

~~The barrier shall be able to sustain impacts in both directions of travel without permanent deformations or damage. The impact shall be equivalent to a 300 lb customer moving at 3 mph and striking the barrier at its outermost end. A 300 lb downward force at the outermost end of the barrier shall also cause no damage.~~

~~The force to rotate the barrier, at the maximum travel end of the barrier tubing, shall not exceed 10 pounds.~~

~~10.8 Upon loss of power, the turnstile shall stop processing fares and shall default to a Lock Entry mode. Upon restoration of power, the turnstile shall return to its normal operating state without manual intervention within five minutes.~~

~~10.9 Turnstile cabinets shall have hinged doors and covers providing direct access to the assemblies. Covers shall be equipped with devices to hold them in the fully open position. Top covers shall not penetrate an adjacent turnstile aisle when fully opened. Hinges shall be concealed and shall not protrude beyond the outer surface. The closing joint shall prevent unauthorized entry, as well as dirt, dust, and moisture from entering the cabinet.~~

~~10.10 Each console shall have incorporated within its housing a two-position power switch, which shall be used to power down and power up the turnstile. In addition, a 120-volt duplex outlet shall be included within each turnstile console.~~

~~10.11 Contractor shall provided dimensioned drawings of the turnstiles showing each side and with the doors and covers both opened and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the turnstile for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. CDR 9-7, PDR 9-8~~

~~10.12 ADA Gate~~

~~10.13 The ADA gate shall be compliant with all functional and construction requirements described in Section 10.9 with the exception of the following:~~

~~10.14 The turnstile barrier shall be a hinged door or other similar barrier;~~

~~10.15 The turnstile barrier shall have a smooth surface on both sides;~~

~~10.16 The barrier shall be of sufficient height and width to provide the necessary access and egress control between the paid and free areas;~~

~~10.17 The "wheelchair" sign or other SEPTA-approved ADA designator shall be affixed to both ends of the turnstile;~~

~~10.18 A key operated unlatch shall be available on the turnstile for use by emergency personnel;~~

~~10.19 Media processing shall be identical to the standard turnstile;~~

~~10.20 The ADA gate shall sense the direction of travel through the turnstile, and shall sound an audible alarm if more than one Customer entry is detected in an entry mode. The alarm shall be SEPTA-adjustable in duration by software control between five and thirty seconds, and should be able to be reset or temporarily disabled from the CDCRS. This alarm condition shall also be transmitted to the CDCRS immediately upon occurrence;~~

~~10.21 The ADA gate shall sense an open condition, and shall transmit a message to the CDCRS when the turnstile opening has exceeded the allowable time;~~

~~10.22 The sound level of alarms shall be 80 dbA minimum measured 10 feet from the barrier with adjustment possible from within the turnstile or through software control. An external key switch shall be provided to deactivate the alarm.~~

~~10.23 SEPTA has purchased a small quantity of ADA barriers[3] as manufactured by Dudley and is currently in the process of deploying them. Where these devices are installed or planned to be installed, Contractor shall interface Fare Media processing components with these ADA barriers to integrate these ADA barriers into the NPT System as ADA gates. For all other locations, the Contractor shall deploy Contractor-delivered ADA gates in compliance with the requirements of the Technical Specification.~~

~~10.24 Contractor shall provided dimensioned drawings of the ADA gate showing each side and with the doors and covers both opened and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the turnstile for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. CDR 9-8, PDR 9-9.~~

~~10.25~~10.8 Installation

~~[3] Information on the Dudley ADA gates purchased is appended to the Technical Specifications as Exhibit 9.2~~

Upon installation of the turnstile, all loads generated by tripod arms shall be transmitted through the turnstile and into the station floor.

Turnstiles shall be capable of being installed adjacent to a wall and still provide for maintenance access. Servicing or maintenance access and activity shall not require the closing of any adjacent turnstile aisle.

The turnstile base shall be provided with not less than four mounting holes for securing the cabinet to the floor. Any specialized mounting devices shall be provided by the Contractor. The gap between the bottom of the turnstile and the flooring shall be filled to eliminate water ingress.

All turnstiles shall be installed with power and communications supplied from conduit within the floor. The use of ramps or any other configuration to conceal cabling on or above the floor is prohibited.

SEPTA reserves the right to change the quantity of turnstiles ~~and ADA gates~~ installed in any array at any station prior to SEPTA approval of the installation drawings. Installation drawings and prerequisites for the turnstiles ~~and ADA gates~~ shall be provided to SEPTA for review at the Conceptual Design Review. **CDR 10-8**

Section 11 – Handheld Sales Devices
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11 HANDHELD SALES DEVICES

11.1 General

Handheld Sales Devices (HSDs) shall be compact devices that shall:

- Employ the latest commercially available version of Windows Mobile PC or approved equal;
- Process the Smart Media identified in Section 4 on board Regional Rail vehicles, on board Surface Fleet vehicles, at station locations as needed, and as required by SEPTA;
- Accept and process magnetic and contactless credit media as a method of payment for on-board sales transactions and provide ~~on-line~~real-time wireless authorization for such transactions;
- ~~Process rewritable Smart Media to a~~Accommodate on-board cash sales for Regional Rail;
- Allow printing of a Customer receipt via a wireless printer that is easy to carry and complies with union uniform and rules;
- As an alternative to using a printer, enable issuance of a Receipt Token, which is a pre-encoded Magnetic Media issued by a Regional Rail Conductor to a Customer in lieu of issuing a receipt. SEPTA Customers will take this token to a SEPTA Sales Outlet (FVD, ASD, Website, etc.) in order to obtain a receipt for the paid fare
- Provide support for media inventory control functionality and communicate this information to the CDCRS;
- Provide different audible and visual annunciations for each type of transaction (a minimum of five different audible tones shall be provided);
- Provide verification of parking fee payment at non-gated SEPTA parking locations. This enforcement process shall be provided for both permit and daily parking Customers (see Section 15);
- ~~Issue citations for parking violations;~~

- Provide for the recharging of the HSD on board the Regional Rail vehicles;
- Be GPS enabled and automatically determine current zone based on current location;
- Communicate with the CDCRS wirelessly to transmit data, receive and transmit text messages, and receive configuration and operations data via the charging/data cradle, which shall also be used to charge the HSD batteries;
- Store information needed to calculate a cash fare and for Conductor's waybill;
- ~~Store and display up to ten (10) SEPTA documents including, but not limited to, the following documents:~~
  - ~~oSafety Rules;~~
  - ~~oAir Brake/ Equipment;~~
  - ~~oEmergency Evacuation;~~
  - ~~oPassenger Operations Manual;~~
  - ~~oBulletin Orders (shall have a folder to accommodate on-going issuance of Bulletin Orders);~~
  - ~~oNORAC Operating Rules; and~~
  - ~~oRailroad Timetable.~~
- Satisfy all requirements of PCI for acceptance of Credit and Debit transactions.

The HSDs shall normally be used by SEPTA maintainers and on board rail vehicles by SEPTA Conductors and shall operate in a semi-protected rail system environment as identified in Section 2. HSDs shall also be used in an outdoor environment and shall be able to perform in adverse temperatures and endure rough handling.

11.1.1 Device Requirements

The Handheld Sales Devices (HSDs) shall be designed according to the following physical characteristics:

- The HSD processor speed shall be no less that 1.0 GHz.
- The HSD shall contain a minimum of 512 MB RAM
- The HSD shall contain a minimum of 4 GB Flash memory.
- The HSD display shall consist of a Transflective color LED (TFT-LED) display of no less than 65536 colors and shall be a minimum size of 2.8"L x 2.1"W (7.2 x 5.4 cm) and 3.5" diagonal (8.9 cm). The display shall support a minimum resolution of 320 x 240 (QVGA size) in a portrait orientation. The display shall employ an LED backlight.
- The HSD shall provide visual indicators to display HSD status. A minimum of three different indicators shall be provided.
- The HSD shall contain a minimum of two (2) expansion slots to accommodate Secure Digital High Capacity (SDHC) expansion media cards.
- The HSD shall contain a minimum of two (2) ExpressCard 54 expansion slots.

11.2 Transaction Processing

The primary use of the HSDs shall be for the reading of Smart Media and obtaining account validity information from the CDCRS (to ensure that a valid fare is available ~~on the media or~~ within the Customer account) for Regional Rail Services and for accommodating on-board cash and credit card sales. The HSD shall not be operational until a proper logon has been made to the HSD by a valid user.

To activate the HSD for use, the user shall logon to the device with, as a minimum, a username, and password. Smart Media may also be used as part of the logon process but a portion of the logon shall require data entry by the user, for security purposes.

The structure and layout of all transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 11-1, FDR 11-1**

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed;
- All events and alarms cleared, including the identification of the user which cleared the alarm;
- All completed transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failures;
- Power failures and restorations;
- All accesses to the interior of the device;
- All commands issued by the maintenance, revenue service, and other personnel; and
- Additional information required to provide a complete audit trail for revenues and Smart Media.

11.2.1 Logon

The HSD shall remain inactive and unable to perform any functions unless a proper logon has been completed as follows:

- Any one of the buttons is pressed on the HSD and "User ID" is displayed, together with a prompt, on the HSD display.

- The user will enter their unique user ID, a minimum of 6 characters, and press the “ENTER” key. If the user ID is valid, the HSD shall then display “Password.” If the user ID is invalid, then the HSD shall display "Invalid ID" on the first line of the display and “User ID” with prompt, on the second and third lines of the display. This step shall be repeated until a valid user ID is entered or three attempts have been made. After the third unsuccessful attempt, the HSD shall not permit logon until it has been reset by an authorized user via wireless communication with the CDCRS.

- The user will enter their unique password, a minimum of 6 characters, and press the “ENTER” key. If the password is valid, the HSD shall display “Ready” (the HSD Idle mode) and shall be in a state to verify smart cards. If the password is invalid for that user, then the HSD shall display “Invalid Password” on the first line of the display and “Password” with prompt, on the second and third lines of the display. This step shall be repeated until a valid password is entered or three attempts have been made. After the third unsuccessful attempt, the HSD shall not permit logon until it has been reset by an authorized user via wireless communication with the CDCRS.

- The user will enter the location/service type information for the transportation service for which the operation will occur.

- If the service selected is for Regional Rail, the username and current scheduling information shall be utilized to determine the route being run by the Conductor. The HSD will present the "best match" of all the known RRD trips that are assigned to the specified user. The User will be prompted with a confirmation screen, allowing to accept or reject the train/route that is offered. A rejection of the "best match" will cause the HSD to present all scheduled trains/routes that are available for the user, sorted by date. In addition, the Conductor will have the option of selecting manual entry and selecting the train/route information, based on the current date and time, combined with the current schedule information. The user shall not be allowed to specify a train/route that is not listed in the current RRD schedule.

A transaction record shall be stored for each successful logon, and each unsuccessful logon.

11.2.2 Log-off

The following log-off procedure shall be used by the Conductor:

- The user shall press the appropriate log-off key or key combination. The HSD shall display "Log-Off?" and a prompt.
- The user shall enter "Y" and press the "ENTER" key.
- The HSD shall close all files and deactivate itself.

A transaction record shall be stored for each successful log-off and aborted log-off. Automatic log off shall also occur prior to the data transfer process with the CDCRS as well as after a SEPTA-definable time period of no activity of from one minute to eight hours.

11.2.3 Additional Functions

The HSD shall also provide the user with the following functionality:

- Override the automatic location information generated by the GPS, on an as-needed basis, to accommodate the difference in location between where a Customer may have boarded a vehicle and when the Customer-user/HSD interaction occurs; and

- ~~Review the information on a Customer's Smart Media;~~

- ~~Store and display the contents of any system manual at any time;~~

- ~~Issue a receipt at the request of the Customer; and~~

- Operate all applications from the CDCRS (Section 19.6) through an internet web browser, via the wireless communications connection (Section 11.6).

In addition, the HSD shall provide for strict accounting of all Smart Media sales and shall include summary data as well as transactional data storage. The HSD shall accumulate fares by Customer type and other categories as required by SEPTA. These categories will be identified by SEPTA prior to the Preliminary Design Review. **PDR 11-2**

The Conductor shall be able to review all media sales made through the HSD since the last Conductor remittance. In addition, a function shall be included to provide the amount of cash to be remitted at any time desired. This function shall require an additional logon with a different password for increased security.

11.2.4 Customer Processing

When a Cc~~e~~ustomer's ~~s~~SmartFare ~~m~~Media is presented to the HSD, the HSD shall verify that the Fare Media has the appropriate ~~account~~ fare product associated with the trip, and shall look for~~transaction shall be verified for~~stored for~~~~:

- a valid pass for the destination zone;

- a valid "Open T~~t~~rip" which the Conductor will "Close" with the HSD after querying the customer for the destination location and entering the appropriate destination zone into the HSD;

- a valid fare deducted.

The following outlines the Cash and Credit Processing functions that are to be available at the HSD.

11.2.4.1 Cash Processing

The HSD shall be capable of being configured to process the following Customer transactions:

- Addition of Stored Value to existing Smart Media account, in predetermined amounts, by cash payment;
- Addition of Stored Value to existing Smart Media account, not limited to predetermined amounts, by cash payment;
- Addition of Stored Value to account associated with new, un-initialized, Smart Media, in predetermined amounts, by cash payment;
- Addition of Stored Value to account associated with new, un-initialized, Smart Media, not limited to predetermined amounts, by cash payment; and
- The sale of initialized and pre-valued ~~Smart~~ Magnetic Media, by cash payment.

11.2.4.2 Credit Processing

The HSD shall be capable of being configured to be able to process the following Customer transactions:

- Addition of Stored Value to existing Smart Media account, in predetermined amounts, by credit payment;
- Addition of Stored Value to existing Smart Media account, not limited to predetermined amounts, by credit payment;
- Addition of Stored Value to account associated with new, un-initialized, Smart Media, in predetermined amounts, by credit payment;
- Addition of Stored Value to account associated with new, un-initialized, Smart Media, not limited to predetermined amounts, by credit payment; and
- The sale of initialized and pre-valued ~~Smart~~ Magnetic Media, by credit payment.

11.2.5 HSD Report Requirements

In addition to receipts, the HSD shall ~~print~~ generate reports upon request by the user. The HSD shall be able to produce the following types of reports in order to support the operation of the NPT System:

- Transaction summary report – A summary of all Smart Media verifications, ~~Smart~~ Fare Media sold, and revenues collected during the user's shift.

- ~~Transaction detail report – Prints the last 10 transactions for the Smart Media presented.~~

- Maintenance report – A listing of all maintenance issues, which have arisen since maintenance was last performed for the device.

- Citation summary – A summary of all citations issued by the HSD user.

- Supervisor report – A listing of all users who have logged on to the device, a summary of the revenue collected, and ~~Smart~~ Fare Media issued by each user. This will also include logon failures and other similar transactions. These reports shall be uniquely serialized.

- Remittance report – A report that provides details of the revenues remitted by the user. These reports shall be uniquely serialized.

- Shift report – A report that provides details of sales and counts of Smart Media verifications performed during the shift, and including those logons and log-offs which have occurred between remittances.

A minimum of five additional reports shall be provided by the Contractor, as defined by SEPTA at the completion of the First Article Test.

The Contractor shall provide samples of these reports for SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 11-3, FDR 11-2**

11.3 User Interface

The HSD display/controls shall be accommodated in a single enclosure and shall be easily and comfortably held in one hand. Communication to peripherals shall be via wireless communication. The HSD shall weigh no more than one pound, including rechargeable batteries. The HSD shall be able to operate continuously for any of SEPTA's currently scheduled Conductor's shifts, and a minimum of 12 hours on a single battery charge.

The HSD shall be used for data entry and display of validity data, sales information, malfunction data and other messages to the user.

11.3.1 Operator Display

The HSD display shall provide users with instructions, prompts, and transactional information. The display shall meet the following minimum requirements:

- The display shall be easily read under all conditions of ambient light throughout the day and night. If necessary, a backlight shall be provided.
- The display shall be capable of displaying at least 100 characters with a pitch of 12 characters per inch.
- Displayed messages shall be easily modifiable by SEPTA once the system is in operation.

All prompts, instructions, displays, message formats, sample character fonts, and contents shall be subject to SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 11-4, FDR 11-3**

11.3.2 Validity Status Indicators

The HSD shall provide easily readable visual indication of the validity of processed Smart Media. The status indicators shall be different colors and displayed on the face of the HSD. All displays and information displayed shall be easily seen in all ambient light conditions. A minimum of three status levels shall be displayed as follows:

- Green indicator – Smart Media account is valid/bank issued media transaction is authorized;
- Red indicator – Smart Media account is invalid/bank issued media transaction is not authorized;
- Amber/other indicator – equipment malfunction or error.

While the HSD is in sleep mode, all of the indicators shall be extinguished or blank. For Smart Media that is processed, the HSD shall display the expiration date and time of the Smart Media validity for that trip.

The appropriate status indicator shall remain activated for a SEPTA-adjustable inter-transaction timeout period, or until the user processes another item of Smart Media; whichever occurs first. All visual indicators shall be subject to SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 11-5, FDR 11-4**

11.3.3 Audible Indicators

Coincident with the activation of the visual validity status indicators, the HSD shall emit a different, distinctive tone for each status indicator, the same as provided for other system devices, which interface with the Customers.

In addition, a distinct tone shall be emitted of low volume each time a push button is pressed. The tones shall be audible in the normal transit environments, and the volume of the tones shall be field-adjustable by SEPTA. All audible indicators shall be subject to SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 11-6, FDR 11-5**

11.3.4 Data Entry Keypad

The HSD shall include a data entry keypad for selecting functions, querying stored databases, entering data and to provide other functionality required to ensure proper operation as defined herein. The entry interface shall be either a combination of fixed and variable function buttons or a PDA-style combination of touch-screen display and pushbuttons.

The push buttons shall:

- Be made of revenue service-tested materials (subject to SEPTA approval);
- Not rotate;
- Be liquid proof to provide sealed contacts for all switches;
- Not be removable from the outside;
- Be easily replaceable from the inside; and
- Be non-fading.

If a touch screen is used, touch regions shall:

- Be sized so that use of a stylus is necessary only when alphanumeric text is being entered; and
- Provide an audible tone upon being touched.

11.3.5 Printer

The HSD printer module shall be a peripheral to the HSD user interface, which prints on thermally sensitive receipt stock. The HSD printer module shall weigh no more than one pound, including rechargeable batteries. A holster shall be furnished for each HSD printer module to provide a secure location during non-use. The HSD printer module shall be able to operate continuously for any of SEPTA's currently scheduled Conductor's shifts, and a minimum of 12 hours on a single battery charge.

The HSD printer shall be used for printing the following items:

- Bar codes as required for specific documents printed, such as shift reports;
- Receipts for sales transactions (automatic as required as well as on-demand as requested by the Customer);
- Shift reports and other reports;
- Citations for non-paying Customers, as appropriate;
- Warnings for non-payment; and
- Other reports as required by SEPTA.

The printer shall be able to print all alphanumeric characters in both upper and lower case. Printed characters shall be produced with a minimum height of 0.12 inches and a height up to 1.0 inch. The approximate height to width ratio of the characters shall be 5:3. The printer shall print on a single roll of commercially-available, standard, continuous thermal paper, nominally 2-1/4 inches wide and 75 feet in length. The HSD shall issue receipts which meet all Regulation E requirements and other banking standards promulgated by the American Bankers Association.

SEPTA shall be able to modify and restructure the receipts and reports issued using the CDCRS to provide new report and receipt formats.

The printer module shall be a separate, untethered unit utilizing Bluetooth communication with the HSD user interface. Pairing of the printer module with the HSD shall be governed in accordance with Section 11.8~~11.8~~11.9. The HSD holster shall include a location specific for the storage of the printer when it is in use. The printer module shall be activated by the HSD user interface via the depression of a soft button. It shall not be necessary to manipulate or otherwise activate the printer module in any way to print any reports.

11.3.6 Receipt Token

The HSD shall enable Regional Rail Conductors to issue a pre-encoded Magnetic Media as a Receipt Token in lieu of issuing a receipt. After processing a fare using acceptable forms of payment media (as defined in Section 4) the Conductor swipes a piece of pre-encoded Magnetic Media on the HSD Magnetic Swipe Reader. The fare payment transaction information is linked to the Receipt Token through the CDCRS. SEPTA Customers will take this token to a SEPTA Sales Outlet (FVD, ASD, Website, etc.) in order to obtain a receipt for the paid fare.

11.4 Fare Handling Hardware

11.4.1 Smart Media Processor

The HSD shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media processor (SMP) as identified in Section 4. The SMP shall be integral to the HSD. The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

The SMP external antenna shall not protrude from the exterior of the HSD enclosure and shall be made of materials that are impervious to weather conditions and resist overt vandalism.

11.4.2 Parking Permit Reader

The HSD shall have a commercially available Parking Permit Reader to process the parking permits as identified in Section 15. The Parking Permit Reader shall be a bar code reader, RFID or other similar commercially available reader. It shall be integral to the HSD and be able to read a parking permit through the windshield of a vehicle from a distance of approximately 10 to 15 feet.

11.4.3 Control System

For the Electronic Control Unit (ECU), which controls all aspects of the HSD, a microprocessor-based system shall be provided to control all functions. The microprocessor shall be commercially available and specifically designed for its intended use, that being continuous operation in the specified environment. The ECU shall have sufficient RAM to avoid the use of virtual memory as a means of temporarily supplementing RAM during normal farebox activities. The ECU shall permit plug-in upgradeability to double the amount of memory initially supplied, including memory for both primary and redundant data storage.

11.4.3.1 Fare Table

The HSD shall have the ability to operate under any of a minimum of two (2) fare tables residing in HSD memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities. **CDR 11-1, FDR 11-6**

11.4.4 Data Entry and Storage

The HSD shall not operate without the memory module properly installed. Data stored by the HSD shall consist of individual transaction records and transaction accumulation records. Each record shall incorporate a unique number for that HSD and shall be date/time stamped. Each record shall be stored in the HSD memory for transfer to the CDCRS. Data shall be stored for each item of Smart Media processed by the HSD as well as storage of alarms and events, incidents of status change, data communication incidents and inspector logons and log-offs.

The HSD shall contain its transaction storage memory within an easily removable memory module. This memory module shall be locked in place and shall require unlocking to remove it. Once removed, this memory module shall be able to be inserted into any HSD and communicate with the CDCRS via the charging/data cradle for data transfer.

The HSD shall store the violator database within its memory. The violator database shall provide for not less than 100,000 distinct violators, with each assigned a unique identifier. This identifier will be used to search for the violator in the database. The identifier field shall be not less than 32 characters and shall permit the entry of alphabetic and numerical characters. Special characters shall not be permitted for the violator database.

The structure, layout, and display of the records and data stored shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 11-7, FDR 11-7**

11.4.5 Power

The HSD and HSD Printer Module shall utilize one or more portable batteries to power the device. These batteries shall provide power to operate the HSD and its Printer Module for not less than twelve (12) continuous hours, with the read heads and any backlight activated not less than 50% of the time. Battery recharging shall take place in charging/data cradles while the batteries are located in the devices. Two complete sets of batteries for each HSD and HSD printer shall be provided.

When the HSD and HSD Printer Module have been inactive for a SEPTA-adjustable period (initially set to 5 minutes), they shall revert to a sleep mode requiring depression of a designated key to activate each unit. User logon shall not be again required if the HSD is in the sleep mode as described below.

A sleep mode shall be provided, which after a SEPTA-adjustable period in that mode (initially set to 30 minutes), the HSD and its Printer Module shall shut down completely, and shall require the user to log on to the HSD after restoring power.

It shall not be necessary, but it shall be possible, to remove the batteries from the HSD and its Printer Module to perform recharging. Full recharging of batteries shall require no more than six (6) hours. Batteries shall not hold a recharging memory (i.e., batteries shall be able to recharge at any time for any length of time without deteriorating the recharging life of the battery). The HSD and its Printer Module shall incorporate a visual indicator to inform the Conductor of a low battery condition. This indicator shall illuminate when less than one (1) hour of power remains. To conserve power, the activation of the battery low indicator shall be a parameter settable by SEPTA.

11.5 Recharging Cradle

A recharging cradle shall be provided for the HSD and its optional module. When an HSD and/or option module is placed in the recharging cradle, the HSD shall turn off to maximize charging speed.

This recharging cradle shall be capable of safely recharging the HSD using the power provided by the Regional Rail vehicles without risking danger to the operator or the unit. The power available on these vehicles is 110VAC at 48Hz. The Recharging Cradle must sufficiently protect itself against surges from the power source.

In addition to charging, it shall be possible to communicate with the HSD via the recharging cradle at an office location, as outlined in Section 11.6.

11.6 Data Communications

The HSD shall communicate with the CDCRS to suit the needs of the NPT System. This shall include, as a minimum, communication:

- Via the Wireless Broadband System;
- Via the Local Wireless System;
- Via the Recharging Cradle.

Both the Wireless Broadband System and Local Wireless System are outlined in Section 18. The HSD shall be equipped to handle communications with either system at any time. In the event that both systems are available concurrently, the HSD shall automatically defer to communication on the Local Wireless System.

Communication between the HSDs and the CDCRS, via the Recharging Cradle is intended to be used primarily for maintenance and diagnostics, as well as for use as a backup to the wireless communications systems. This includes the uploading of patches and firmware, as well as diagnostics when wireless communications is not functional.

Communications through the cradle shall be non-proprietary and shall use a TCP/IP protocol. Should the HSD be damaged at any time, the memory within the HSD shall be able to be removed and inserted within another HSD for data downloading purposes.

When requested from a connected computer, the recharging cradle shall provide for the full download of all data stored within the HSD.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual HSD through the use of a compact flash RAM with a minimum capacity of 8GB.

The HSD shall communicate with the equipment at the stations to obtain status and device health information. The HSD shall also be able control the devices remotely, to a limited extent, as well, including resetting devices, attempting to clear jams and placing devices out of service.

~~11.6.1Operator Communications~~

~~The HSD shall be capable of transmitting and receiving text messages from the CDCRS. This functionality is outlined in Section 19.~~

11.7 Structure and Finish Requirements

The HSD shall be a rugged, industrialized handheld computer with data entry keys, a display screen, Smart Media Processor and other elements needed to accommodate the functions as specified. It shall be designed and is intended for use in a commercial/industrial environment. The HSD shall include a display and push buttons to permit the inspector to input and review data.

HSDs and the peripheral HSD printer will be used in an outdoor environment and shall therefore be able to perform in adverse temperatures and endure rough handling, including frequent drops from four feet above ground level, as identified in Section 2.

The HSD and the peripheral HSD printer shall be designed to be easily and comfortably held in one hand. The maximum dimensions of the HSD and the peripheral HSD printer shall be 4" wide × 7" long × 1" deep. The HSD and the peripheral HSD printer shall each weigh no more than one pound, including batteries.

Alternatively, the HSD design may be derived from a commercially available Personal Digital Assistant (PDA). With this approach, a touch screen display may be used in conjunction with a limited number of buttons for fixed and variable use.

Conceptual drawings of the HSD and the peripheral HSD printer showing configuration, displays, and controls seated in charging/data cradles, in the holsters and held in a hand, shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 11-8**

HSD and the peripheral HSD printer hardware and software design, the functions provided, the procedures for Smart Media processing and the allocation of push buttons for each HSD and HSD printer function shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 11-9, FDR 11-8**

11.7.1 Holster

Each HSD and HSD Printer shall be supplied with a sturdy holster to hold the device. The holster shall be made of leather, nylon, or other sturdy material, and shall securely hold the HSD on the Conductor's belt. While in the holster, the HSD shall be completely covered, and a clasp or hook-and-loop fastener shall retain the holster cover in place over the HSD.

Design of the holsters shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 11-10**

~~11.8Conductor Applications~~

~~11.8.1Schedule Application~~

~~The HSD shall be provided with a Schedule application. This application shall provide users with the ability to provide Customers with current schedule information. It is intended that this application shall provide a Graphical User Interface that can query all current schedule information.~~

~~This application shall utilize scheduling information that is stored on the HSD. All schedule changes shall be published to the HSDs via the wireless communications, from the CDCRS.~~

~~11.8.2Operating Rules Application~~

~~Per the requirements of Section 11.1, the HSD shall be capable of storing and displaying a number of SEPTA documents.~~

~~These documents shall be stored on the HSD in a manner that they cannot be modified, by any user, at the device. These documents shall be able to be modified or updated only by authorized users through the CDCRS.~~

~~For each document, authorized users, via the CDCRS shall be able to post updates, notices, or bulletins regarding each document. This includes Bulletins and Division Updates for the SEPTA Operating Manual.~~

~~When updates and or revisions to any document in the Operating Rules application are made or when Bulletins and Division Updates are posted, each HSD shall provide notification to the user. This update shall notify the user of the change/update/revision, including a summary of the change/update/revision, as well as the ability for the user to acknowledge the update. This notification shall not be able to be removed until it has been acknowledged by the HSD User.~~

~~These HSD User acknowledgements shall be stored within the HSD and transmitted to the CDCRS.~~

~~11.9~~11.8 Device Administration

All user level administrative functions on the HSD shall be executed only when the requirements listed below are fulfilled:

- The HSD must be cradled and in communication with the CDCRS.
- An administrative level user name and password must be authenticated by the CDCRS.

11.9 Pairing of Bluetooth Devices

The HSD shall communicate with the printer module using the Bluetooth communication standard. The HSDs and the printer modules shall function in exclusive pairs and each member of an in-service pair shall not accommodate multiple or simultaneous pairings with any other Bluetooth devices. The pairing of the HSDs and printer modules shall be configured and changed only via the CDCRS.

The HSD and printer module shall not facilitate pairing without the use a PIN. A PIN of no less than six (6) alpha-numeric characters shall be required for successful pairing of devices. PINs shall be distributed via the CDCRS. Neither the paired HSD nor printer module shall at any time be in Bluetooth “Discovery Mode” while in regular service and operation. Active/Inactive Bluetooth connectivity between the HSD and printer module shall be indicated using standard color coded Bluetooth connection icons on the HSD display and LED indicators on the HSD and printer module.

11.9.1 Back-Up and Recovery

The paired HSDs and printer modules shall maintain their connectivity while within the operating range, as defined for Class 1 Bluetooth devices, for no less than twelve (12) continuous hours. Should the aforementioned range be exceeded and the connectivity interrupted, the paired HSD and printer module shall automatically re-establish their connection once the devices are again within the connection range for Class 1 Bluetooth devices. The HSD and printer module shall maintain a log of the duration of established and interrupted Bluetooth connections in between individual cradlings of the HSD. This log shall be cleared only by an administrative level user via the CDCRS.

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12 FAREGATES

12.1 General

SEPTA requires the delivery of new faregates ~~that will~~ that shall be installed at various access and/or egress locations at selected Subway/Elevated and Regional Rail stations[1]. The following two types of faregate ~~are required by SEPTA~~shall be provided:

- An "ADA" faregate that is fully ADA compliant through which physically-~~-~~challenged Customers shall be able to pass;~~.~~
- A full-height r~~R~~ot~~o~~ary faregate.

The ADA faregate ~~will~~shall replace all existing ADA ~~compliant~~ gates in the Subway/Elevated environment. The ADA faregate shall also be ~~as well as be utilized~~ deployed at~~at~~ gated Regional Rail Stations. Similarly, the present rotary gates shall be replaced ~~/ supplemented~~ with new rotary faregates and supplemental rotary gates shall be installed.

Either of the above faregates may be ~~SEPTA requires the delivery of high-speed throughput faregates and they be installed at various access and/or egress locations at selected stations. The faregate barrier shall be a panel (bi-parting leaf, paddle, or other configuration) to permit high-speed throughput for both entering and exiting Customers. The following two types of faregate are required by SEPTA:~~

~~A standard faregate, with bi-parting leaves that is reversible in direction.~~

~~An "ADA" faregate that is fully ADA compliant through which physically challenged Customers shall be able to pass.~~

[1] Appendix A.11 "SEPTA Faregate Evaluation Final Report 2009-03-09" to the Technical Specification provides the Parson's evaluation of SEPTA's existing faregates as of March 09, 2009

~~Multiple faregates~~ aligned with ~~turnstile~~faregates (Sections 9 and 10) in a row which shall constitute a ~~faregate~~barrier ~~-~~ faregate array. Release of a faregate barrier for passage through an aisle shall always be controlled by a Smart Media Processor and a Magnetic Media Swipe Reader located on the console to the passenger's right ~~of~~in the faregate aisle. Each faregate shall communicate with the other faregates in the station to share necessary information and the Central Data Collection and Reporting System (CDCRS).

~~An ADA faregate shall be furnished and installed within all faregate arrays to permit Customers with disabilities and others who cannot use the standard faregate to move between the free and paid areas of the station. It shall also serve as a service gate, emergency exit gate, and as a backup to the regular faregate array, when required. It shall consist of a reversible faregate and a mounting post, whose motion in either direction is controlled.~~

All design submittals identified within this Section apply to both ~~the standard faregate and the ADA~~all ~~-~~types of faregates specified unless specifically identified as only one faregate type.

Neither cash nor tokens shall be accepted for fare payment by the faregates. ~~No cash and token transactions shall occur at the fare gate array.~~

12.1.1 ~~A complete description of the functionality of the faregates shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. CDR 10-1, PDR 10-1, FDR 10-1~~ADA Faregates

New, bi-directional ~~An~~ ADA faregates shall be furnished and installed as necessary within an ~~barrier -~~ array~~s~~ to permit Customers with disabilities and others who cannot use the ~~standard faregate~~faregates to move between the ~~free~~unpaidfree and paid areas of the station. It shall also serve as a service gate, emergency exit gate, and as a backup to the ~~regular faregate array~~faregates, when required. It shall consist of a reversible faregate and a mounting post, whose motion in either direction is controlled~~ed~~able.

The ADA faregate barrier shall be a panel (bi-parting leaves, doors, paddles, or other similar mechanisms) to permit ~~high-speed throughput~~ passage through the aisle for both entering and exiting Customers. These panels shall be designed to minimize potential fare evasion. There shall be no gap two (2) inches or greater between any panel and the faregate cabinet or between two panels.

The~~is barrier~~ADA faregate shall open more slowly than it closes, with a ratio of opening to closing speed of approximately three to one. The faregate barrier shall have a smooth surface on both sides.

~~These ADA Faregates will be installed at various access and/or egress locations at selected stations.~~ The ADA faregate shall be of sufficient height and width to provide the necessary access and egress control between the paid and ~~free~~unpaidfree areas. The ADA faregate shall have an aisle with a minimum clear opening of 36 inches.

The use of a tripod barrier on the ADA f~~F~~aregate ~~is unacceptable~~shall not be permitted.

A complete description of the functionality of the ADA faregates shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 12-1, PDR 12-1, FDR 12-1**

12.1.2 Rotaory Faregates

New, bi-directional, full-height ~~full-height turnstiles~~rotary faregates shall be provided as needed to meet the access, functional and security requirements at selected stations. ~~Full-height turnstiles~~ Rotary faregates shall include a rotary barrier with multiple arms to prohibit passage through the aisle without proper processing of Smart Media ~~interfaced~~ together with a control console incorporating an SMP, Magnetic Media Swipe Reader~~magnetic swipe reader~~, passenger display, passenger graphics, control system and other required components.

The height of the control console shall be the same as the height of the top of the Subway/Elevated Turnstile~~standard turnstilefaregate~~. The width of the control console shall not be greater than the width of the existing Subway/Elevated ~~turnstilefaregate~~Turnstile.

A complete description of the functionality of the ~~R~~rotaory faregates shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 12-2, PDR 12-2, FDR 12-2**

12.2 Transaction Processing

~~The f~~Faregates shall be designed so that individuals are not able to traverse the aisle without a proper fare transaction having been completed. ~~The f~~Faregates shall be able to process all ~~fare and fare~~Fare M~~m~~edia types as identified in Section 4 based on the system needs as determined by SEPTA.

After the ~~Smart~~Fare Media is read by the faregate, a message shall be transmitted to the CDCRS to verify the ~~Smart~~Fare Media is valid for trip. The faregate shall obtain the authorization, or denial, from the CDCRS.

Customer throughput for f~~The f~~aregates ~~standard faregate~~ shall be ~~able to process Customers~~ as follows:

- ADA ~~F~~faregates — 5 to 30 Customers per Minute, based on SEPTA-configurable parameter
- Rot~~e~~ary ~~F~~faregates — 30 Customers per Minute

~~t a minimum rate of 45~~ 30 ~~Customers per minute for valid media transactions.~~ The above~~is~~ throughput is for valid ~~media~~Fare Media transactions and shall be maintained for all F~~f~~are M~~m~~edia mixes (magnetic or Smart Media transactions).

For the ADA f~~F~~aregate the throughput shall be a parameter that is settable by SEPTA from the CDCRS. As delivered, the ADA faregate shall provide for a throughput of not more 15 Customers per minute and not less than 12 Customers per minute. ~~Customers per Minute~~This parameter shall provide for a throughput range of 5~~1~~ to 30 passengers per minute.

When the faregate is communicating with the CDCRS, the Bad Number List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the faregate shall be used. The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

Faregate logic shall permit at least five fares to be banked in the entry direction. The total number of banked fares shall be displayed and incremented for each valid banked passage and decremented for each banked fare passage, on the top display.

~~The faregate shall be able to process fares on the fare media identified in Section 4 based on the system needs as determined by SEPTA.~~

~~When the faregate is communicating with the CDCRS, the Invalid Fare Media List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the time frames set in Section 4, the Invalid Fare Media List resident in the faregate shall be used.~~

~~The faregate logic shall permit five or more fares to be banked in a single direction when Smart Media is used to traverse the aisle. The total number of banked fares shall be displayed on the top display and decrement for each valid banked passage. When multiple fares are banked, the initial fare shall be processed against any existing valid period pass. All remaining fares, including the initial fare (if no period pass exists) shall be processed as single trip adult fares.~~

~~All aspects of the banking multiple trips and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. CDR 12-, PDR 12-~~

Each faregate shall be capable of being set to any of the following operational modes:

- Active: Presents a physical barrier to impede Customer movement in both directions. Permits one entry/exit (valid fare must be verified), in either direction;

- Passive (ADA Faregate Only): Controls Customer passenger flow through the use of sensors only. Does not present a physical barrier to impede Customer movement. Permits one entry/exit (valid fare must be verified), in either direction;

- Free Fare: Permits entry and/or exit, no fare required;

- Intermediate: Presents a physical barrier to impede Customer movement in both directions. Permits one entry/exit (valid fare must be verified), in one direction, while allowing Free Fare in reverse direction.

- Free Entry/Lock Exit: Permit free entry to the paid area and deny exit. Typically, this is for emergency evacuation situations.

- Lock Entry: Permit free exit and deny entry. Typically, this is for emergency exit situations.~~Actively controls Customer flow in one direction, while allowing free fare in the opposite direction.~~

The start and stop times for each of the identified mode settings shall be settable via the CDCRS.

Each faregate may be set to any of the first four above settings as an array or ~~independently without~~independently without regard to the settings of other faregates or faregates in th~~e~~at array. ~~The setting of e~~Each faregate shall be capable of being set locally at the faregate through a simple setting secured in the console but only accessible by authorized personnel. In addition for the ADA faregate, ~~In addition, a local control shall also be provided within the ADA faregate console to quickly set all faregates in an array to any of the above operational modes. A~~a key operated switch shall be available on the faregate for use by emergency personnel. Each usage of the key shall cause an event message to be created and transferred to the CDCRS.

A command shall be provided at the CDCRS that when initiated shall place all faregates in a mode to accommodate emergency egress from and prohibit access to ~~the~~ platforms. A command shall also be provided at the CDCRS that when initiated shall place all faregates in a mode to accommodate emergency access to the paid areas and prohibit egress from platforms.

Passback control requirements as identified in Sections 9.5.4 and 10.5.4 shall apply to all faregates.

The structure and layout of all transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 12-3, FDR 12-3**

12.3 User Interface

Indicators and message displays shall be provided to inform the Customer of the status of the aisle and the status of the faregate console, to indicate the results of the processed media transaction, to identify problems with the faregate, to display information to the station agent and provide similar information to Customers.

The faregate shall provide multiple audible tones to indicate the results of an activity, e.g., valid fare processing, invalid fare, alarms, and other similar functions in order to provide Customer feedback.

12.3.1 Graphics and Displays

The displays provided on the faregates shall identify faregate status, display the transaction information, display the status of the Customer's fare media, and provide alerts to the Customer.

All faregates shall incorporate a Smart Media Processor (SMP) and a Magnetic Media Swipe Reader (MMSR) on the top, front, or side of the console. Graphics shall be provided on or adjacent to the SM~~R~~P to instruct Customers on media usage.

Contractor shall provide detailed drawings identifying the locations for all displays and graphics on the faregate for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review. **CDR 12-3, PDR 12-4**

12.3.2 Fixed Graphics

Fixed graphics shall be provided on each faregate console to clearly depict and guide Customers to the locations and correct use of the SMP and MMSR.

For the ADA ~~F~~faregate, ~~A~~a "wheelchair" sign shall be affixed to both ends of the faregate. The sign shall be located above the Customer display. In addition, wheelchair decals shall be attached to the outside of the glass panels.

12.3.3 End Displays

Illuminated displays shall be provided at each end of a faregate. The displays shall be backlit and of sufficient brightness to be readable from a distance of 20 feet in all levels of ambient light, including direct sunlight. One of the two following displays shall be illuminated and the other latent to indicate faregate status:

- International symbol for “Entry Prohibited” to alert the Customer not to use that particular aisle.
- International symbol for “Entry” to inform the Customer to use that particular aisle to enter or exit the system.

An ~~small~~ indicator light shall be provided on the top of and at both ends of the faregate console to provide a visual signal that a reduced fare instrument is being used. The indicator lights shall illuminate at both ends of the appropriate (right-hand) console to alert station personnel standing on both the ~~free~~unpaid~~free~~ and paid sides of the faregate array that a reduced fare media has been used in a successful transaction. The indicator light shall remain lit until the faregate returns to ready mode.

The design of this indicator light shall be reviewed by SEPTA at the First Article Test to verify visibility. If inadequate visibility is determined at that time, then corrections shall be implemented by the Contractor and verified by SEPTA prior to acceptance of the design.

12.3.4 Top Displays

Variable message displays shall be provided on the top of each ADA faregate in each direction of passage to provide information to a Customer regarding faregate readiness, transaction success or failure, and fare media status. Top displays shall be capable of displaying a minimum of two rows of 20 alphanumeric characters, at least three-eighths (3/8) of an inch high, per line for the display of messages to the Customers. ~~CRT and LED displays shall not be provided.~~

The top display shall be programmable to display various greetings and messages. Preprogrammed messages shall be provided for each of the various fare media verification processing results. A utility shall be provided within the CDCRS to enable SEPTA to change the messages without Contractor intervention.

Display of remaining validity (value, time, trips, etc.) for an item of Smart Media shall be displayed to the Customer based on the faregate parameter settings. The NPT System shall provide for validity settings, which, until exceeded, inhibit the faregate from displaying the remaining validity to the Customer. This minimum validity shall be provided for each ticket type provided by the system.

Samples of the display with the preprogrammed message as well as the message change utility shall be presented to SEPTA for review at the Conceptual Design Review and approval at the Final Design Review. **CDR 12-4, FDR 12-4** Final wording of messages to be displayed to the Customers shall be defined at the Conceptual Design Review and finalized at the Final Design Review. **CDR 12-5, FDR 12-5**

12.3.5 Audible Tones

Each fare media transaction at the faregate shall result in a directed local audible tone that alerts the fare media holder and nearby SEPTA personnel of the status of the transaction. Each transaction shall result in one of four distinct tones signifying one of the four conditions:

- Fare Media accepted, proceed through faregate;
- Fare Media not accepted, entry not permitted; or
- ~~Fare Media not accepted, exit not permitted; or~~

- Reduced-fare media ~~not~~ accepted, ~~do not~~ proceed through faregate.

Each tone shall be programmable for both activation (“on”, “off”) and volume levels. At a minimum, these tones shall be clearly audible and distinguishable at a distance of not less than thirty (30) feet in an unenclosed environment. Proposed tones and volumes are to be submitted to SEPTA for approval at the Preliminary Design Review. **PDR 12-5**

12.4 Fare Handling Hardware

The faregates shall incorporate modules to process the fare media identified in Section 4 to permit Customer passage through the faregates.

12.4.1 Smart Media Processor (SMP)

The faregate shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4. The SMP shall be integral to the faregate and shall be housed within the faregate cabinet.

The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

~~Upon placement of the Smart Media near the target, faregate logic shall determine if the media is valid.~~ Contractor shall provide full information on the validity checking steps performed by the SMP for each fare type for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 12-6, FDR 12-6**

If the SMP fails, the Customer display on the faregate shall display "Magnetic Media Only" or other similar message and the faregate shall remain in service. If the SMP fails in conjunction with a failure of the Magnetic Media Swipe Reader, the faregate display shall display “Out of Service” and the International Closed display at the end of the faregate shall be lit.

~~The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.~~

12.4.2 Magnetic Media Swipe Reader

The read only Magnetic Media Swipe Reader (MMSR) shall be made of stainless steel. The MMSR shall ~~and shall~~ be located in close proximity to the SMP such that both are convenient for access ~~on top of the faregate~~. Fare media orientation graphics shall be engraved on the MMSR to facilitate correct insertion and swipe of the fare media. The data read by the MMSR shall be checked for validity. If the media is not valid, a "See Agent" message shall be displayed. If the media is valid, an “Enter” message shall be displayed.

If the MMSR fails, the Customer display on the faregate shall display "Smart Media Only" or other similar message and the faregate shall remain in service. If the MSR fails in conjunction with a failure of the SMP, the faregate display shall display “Out of Service” and the International Closed display at the end of the faregate shall be lit.

Design shall provide for ease of removal of the MMSR and replacement with a cover plate. This plate shall not reduce the security of the faregate.

12.4.3 ~~Directional Sensors~~Condition Sensing

The ADA faregate shall has sufficient sensors to sense an open condition. An alert message shall be transmitted from an ADA faregate to the CDCRS when the faregate opening has exceeded the allowable time. The allowable time shall be adjustable in duration by software control, between ten and sixty seconds. The alarm should be able to be reset or temporarily disabled from the CDCRS Workstation. Once an open faregate message has been transmitted, the ADA faregate shall transmit a faregate closed message upon closure of the faregate.

For the ADA faregate, sSufficient sensors shall be provided to detect the passage and direction of travel of every Customer moving through a faregate aisle in either direction. The sensors shall detect unauthorized passage of all between the unpaidfree and the paid areas when the Faregate is operating in Intermediate mode. This shall cause the faregate to prohibit passage and shall trigger generation, storage and transfer of an alarm message.

Contractor shall identify location and operation of all Customer sensors and their function to ensure proper processing at the aisle for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 12-7, FDR 12-7**

The ADA faregate shall detect the passage of multiple customers in a single file configuration, side-by-side configuration, or any additional configuration that physically allows more than one customer entry through the ADA gate for one permitted entry.

The faregate shall also be programmable by SEPTA to sound an alarm at the faregate for these invalid passages, including entry by more than one Customer. The sound level of alarms shall be 60 dbA and 90 dbA as measured 10 feet from the barrier. The volume and duration of the alarm shall be software controlled, individually settable by faregate, and adjustable from within the faregate and through the CDCRS.

The ADA fFaregate alarm condition shall also be transmitted to the CDCRS. Alarms shall be able to be reset or temporarily disabled from the CDCRS via any of the station control applications. An externally accessible key switch shall also be provided to deactivate the alarm.

This Details regarding the alarm, including volume, pitch, and volume shall be individually settable by faregate and the method of volume control shall be provided for SEPTA review and approval at the Preliminary Design Review. **PDR 12-8**

~~Contractor shall identify location and operation of all Customer sensors and their function to ensure proper processing at the aisle for SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 10-7, FDR 10-6**~~

12.5 Control System

A microprocessor shall be provided in each faregate and shall control and monitor all functions of the faregates. The failure of any microprocessor in any faregate shall affect only one faregate aisle.

Communication with the CDCRS shall be an integral element of the faregate. This communications shall occur ~~via the NPT Regional Rail Network~~as outlined in Section 18. Communications between the ~~F~~faregates and the CDCRS, including both the uploading and downloading of information shall occur as necessary to support the functional requirements of Sections 2 and 4.

Communication shall include the transmission of all entry data, exit data, faregate status messages, configuration, control, and parameter information as well any additional information required by the Contractor's system to support successful operation of the NPT System. Contractor shall provide all information on the hardware, software, and parameters for the faregates and other elements identified in this section for SEPTA review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 12-6, FDR 12-8**

Each faregate shall have an internally maintained clock. The clock shall synchronize with the CDCRS clock for all time-related data each time it communicates with the CDCRS.

~~The f~~Faregates shall be able to be configured (from the CDCRS) by downloading operational and configuration data to the faregate. All functions available shall be selectable from a menu when setting up the operation of the faregates.

This configurable information shall include, among other items, the ability to accept/reject different types of fare media and reduced fares. All configuration information sets shall be saved by the CDCRS. All configuration and parameter settings shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 12-9, FDR 12-9**

Data shall be stored locally by the faregate, and transferred to the CDCRS for all activity performed by the faregate, including, but not limited to, valid fare processing, invalid fare processing attempts, alarms, events, changes in status and sensed conditions and data communication attempts (both successful and unsuccessful). Data stored at the faregate shall be stored in non-volatile memory, and shall not be lost even with total loss of power to the faregate.

12.5.1 Downloading

Downloading from the CDCRS to the faregate shall be used for the following purposes:

- Synchronize the clocks;
- Provide new fare tables;
- Execute commands;
- Provide updated software;
- Poll equipment for operational status;
- Download changes to system and equipment parameters;
- Provide lists and updates of lists ~~of invalid media~~identified in Section 2.3.16;
- Provide other data communication to ensure proper operation of the faregates.

In the event of loss of communication with the CDCRS, downloading shall be possible on a local basis for an individual faregate console with the use of such devices as a portable programming device or a PC compatible handheld or notebook computer. Data communications methodology and downloaded information shall be identified and provided to SEPTA for review at the Preliminary Design Review and approval at the Final Design Review. **PDR 12-10, FDR 12-10**

12.5.2 Uploading

All data existing at the data interface shall be transmitted to the CDCRS on a scheduled basis.

12.5.3 Data Storage

All data shall be stored in the faregate memory until instructed to purge transactions by the CDCRS. In the event communications cannot be established with the CDCRS for an extended period of time or a purge command is not received, data shall be retained locally, with storage for a minimum of ~~30~~50,000 entry transactions plus an equal number of event and alarm transactions. In the event data storage requirements are exceeded, the faregate shall take itself out of service until the data can be successfully transferred and the memory cleared.

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed;
- All events and alarms cleared, including the identification of the user which cleared the alarm;
- All completed and cancelled transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failure;
- Power failures and restorations;
- All accesses to the interior of the device;
- All commands issued by the maintenance, revenue service and other personnel; and
- Additional information required to provide a complete audit trail for revenues and fare media.

~~**12.5.4 Passback Control**~~

~~Each faregate shall monitor all fare media usages to prevent use of any fare media for more than one concurrent trip within a defined time period. This time period, initially set to thirteen (13) minutes, shall be settable by SEPTA via a downloaded parameter. The control of passback shall be based on all entries into a station, and shall require continuous updating of information from all faregates at the station. Maintenance of the passback list, if required, shall be done in a distributed fashion at each faregate and updated immediately based on the processing of each item of applicable fare media. All aspects of the passback controls and settings shall be provided for SEPTA review at the Conceptual Design Review and approval at the Preliminary Design Review.~~ ~~**CDR 10-6, PDR 10-10**~~

~~**12.5.5**~~**12.5.4 Servicing Display and Keypad**

An internal control~~,~~ consisting of a display and keypad shall be incorporated into the faregate to assist with troubleshooting~~, of the faregate and for~~ servicing, control and access needs. The display shall have a minimum of two lines, each with a minimum of 16 characters, and a minimum character height of one-quarter inch. All locally settable parameters shall be accessed and entered through the display/keypad.

Safeguards shall be employed to assure that changes to the software cannot be performed through the display/keypad. Failure codes, which shall provide diagnostic information regarding problems to a subassembly level, shall be displayed upon addressing by means of the keypad. Diagnostics shall be continuous and automatic. Requests to perform each diagnostic test shall also be possible through the display/keypad.

~~**12.5.6 Fare Table**~~

~~The faregate shall have the ability to operate under any of a minimum of two (2) fare tables residing in faregate memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities.~~ ~~**CDR 12-87, FDR 12-1110**~~

12.6 Communication System

Faregates shall communicate with the CDCRS to suit the needs of the installation and faregate operation. ~~This shall include, as a minimum, c~~Communication~~:~~

shall be v~~V~~ia an integral standard Ethernet Interface with RJ45 connector(s)~~; and~~ with the Station LAN

~~Via Station LAN~~ as defined in Section 18.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual faregate through the use of a compact flash RAM with a minimum capacity of 8GB.

In cases of network failure, the faregate shall have sufficient capacity to store, at a minimum, ten days' event and transaction data. This information shall be stored in both the faregate main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored transaction data (e.g., alarm, event, sales) shall be automatically transmitted to the CDCRS.

12.7 Structure and Finish Requirements

~~This equipment~~ All faregates and consoles shall be constructed of stainless steel, Grade 304L, except that the faregate and console baseplates shall be constructed of stainless steel, Grade 316L.

~~stainless steel, or other revenue service proven material as approved by SEPTA, to meet the requirements of SEPTA. The baseplate of the Faregate shall be of stainless steel, Grade 316304.~~

~~The barrier mechanism shall accommodate high Customer volumes and shall not be tripod barriers. Barriers shall be panels (bi-parting leaves, doors, paddles, or other similar mechanisms) and shall minimize potential fare evasion. There shall be no gap of greater than two (2) inches between any panel and the faregate cabinet or between two panels.~~

~~Closed barriers shall be able to sustain impacts in both directions of travel without permanent deformations or damage to either the barrier or the mechanisms. The impact shall be equivalent to a 300 lb. Customer moving at 3 mph and striking the barrier at the point where both panels meet.~~

~~Upon loss of power, the turnstile faregates shall stop processing fares and shall default to a Lock Entry mode. Upon restoration of power, the turnstilefaregate shall return to its normal operating state without manual intervention within five minutes.~~

~~Upon loss of power, the faregate shall stop processing fares and shall default to a freewheel mode. Upon restoration of power, the faregate shall return to its normal operating state without manual intervention within five minutes.~~

Faregate and console cabinets shall be constructed with a rigid frame to which all exterior panels and interior components shall be attached. ~~-~~Cabinets of monocoque construction with integral structural members shall also be acceptable. Frames, panels, and doors shall be constructed with appropriate tooling that allows for complete interchangeability of all like panels, covers, and doors with consistent fits. All faregate cabinets shall have identical exterior dimensions and identical appearance.

Faregate and console cabinets shall have hinged doors and covers providing direct access to the assemblies. Covers shall be equipped with devices to hold them in the fully open position. Top covers shall not penetrate an adjacent faregate aisle when fully opened. Hinges shall be concealed and shall not protrude beyond the outer surface. The closing joints shall prevent unauthorized entry, as well as dirt, dust, and moisture from entering the cabinet.

Faregate and console~~Equipment~~ cabinets, including the base, shall withstand a concentrated load of 300 pounds applied to any one area of one square inch or a uniformly distributed load over an entire surface of 50 pounds per square foot without causing damage or permanent deformation. Plexiglas, used to cover displays, photocells and pictograms, plus the displays themselves, shall be excluded from these requirements.

Closed and locked barriers shall be able to sustain impacts in both directions of travel without permanent deformations or damage to either the barrier or the mechanisms. The impact shall be equivalent to a 300 lb. Customer moving at 3 mph and striking the barrier at the point where both panels meet.

Faregates shall be designed to provide adequate air circulation and ventilation. In addition, one or more heaters shall be provided to maintain a minimum operable temperature, as required based on operating conditions at installation locations. These heaters shall be thermostatically controlled and automatically activate and deactivate.

Each faregate shall have incorporated within its housing a two-position power switch, which shall be used to power down and power up the faregate. In addition, a 120-volt duplex outlet shall be included within each faregate console.

Contractor shall provide dimensioned drawings ~~of the~~ of both faregate types~~s~~ showing each side, with the doors and covers both opened, and closed. This shall also show the position of all modules, sensors, controls, connections and interfaces internal to the faregate for review by SEPTA at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 12-7, PDR 12-11**

12.7.1 ~~Final Design of each faregate shall be approved by SEPTA at the Preliminary Design Review. PDR 12~~ Rotary Faregates

Dimensions of the full height faregate shall meet the following minimum requirements:

- Passage Width: 27 inches
- Faregate Depth: 54 inches
- Faregate Width: 62 inches
- Passage Height: 84 inches
- Overall Faregate Height: 91 inches
- Barrier Tubing diameter: 1½ inches made of 14 gauge stainless steel

The barrier mechanism shall eliminate back cocking, and subsequent fare evasion. The force to rotate the barrier, at the maximum travel end of the barrier tubing, shall not exceed 10 pounds.

~~12.7.1 ADA Faregate~~

~~The ADA faregate shall be identical to the standard faregate with the exception of the following:~~

- ~~The faregate aisle a minimum clear opening of 36 inches.~~

- The ADA faregate shall permit the passenger throughput to be set to accommodate from five (5) to thirty (30) passengers per minute. This shall be a parameter that is settable by SEPTA from the CDCRS. As delivered, the ADA faregate shall provide for a throughput of not more 15 passengers per minute and not less than 12 passengers per minute.

- The ADA barrier shall open more slowly than it closes, with a ration of opening to closing speed of approximately three to one.

- The faregate barrier shall have a smooth surface on both sides.

- The barrier shall be of sufficient height and width to provide the necessary access and egress control between the paid and free areas.

- A "wheelchair" sign shall be affixed to both ends of the faregate. The sign shall be located above the Customer display. In addition, wheelchair decals shall be attached to the outside of the glass panels.

- A key operated switch shall be available on the faregate for use by emergency personnel.

- The ADA faregate shall sense the direction of travel through the faregate. The ADA faregate shall detect the passage of multiple customers in a single file configuration, side-by-side configuration, or any additional configuration that physically allows more than one customer entry through the ADA gate for one permitted entry. and The ADA faregate shall sound an audible alarm if more than one cCustomer entry is detected in entry mode. The alarm shall be adjustable in duration by software control between five and thirty seconds, and should be able to be reset or temporarily disabled from the CDCRS Workstation. This alarm condition shall also be transmitted to the CDCRS.

- ~~The ADA faregate shall sense an open condition and shall transmit a message to the CDCRS when the faregate opening has exceeded the allowable time. The allowable time shall be adjustable in duration by software control, between ten and sixty seconds. The alarm should be able to be reset or temporarily disabled from the CDCRS Workstation. Once an open faregate message has been transmitted, the ADA faregate shall transmit a faregate closed message upon closure of the faregate.~~

- ~~The sound level of alarms shall be 80 dbA minimum measured 10 feet from the barrier with adjustment possible from within the faregate or through software control. An externally accessible key switch shall be provided to deactivate the alarm.~~

~~Final Design of the faregate and barrier shall be approved by SEPTA at the Preliminary Design Review.~~ ~~**PDR 10-12**~~

12.8 Installation

~~Each faregate array shall be equipped with at least one ADA faregate per array. Additional ADA faregates shall be installed where necessary to accommodate structural or other station configuration needs.~~

Faregates shall be capable of being installed adjacent to a wall and still provide for maintenance access. Servicing or maintenance access and activity shall not require the closing of any adjacent faregate aisle.

The faregate base shall be provided with not less than four mounting holes for securing the cabinet to the floor. Any specialized mounting devices shall be provided by the Contractor.

All turnstiles shall be installed with power and communications supplied from conduit within the floor. The use of ramps or any other configuration to conceal cabling on or above the floor is prohibited.

SEPTA reserves the right to change the quantity of faregates installed in any array at any station prior to SEPTA approval of the installation drawings. Installation drawings and prerequisites for the faregates shall be provided to SEPTA for review at the Conceptual Design Review and approval at the Final Design Review. **CDR 12-8 FDR 12-11**

~~Dimensions of the full height turnstile shall meet the following minimum requirements:~~

~~Passage Width: 27 inches~~

~~Depth: 54 inches~~

~~Width: 62 inches~~

~~Passage Height: 84 inches~~

~~Overall Height: 91 inches~~

~~Barrier Tubing diameter: 1½ inches made of 14 gauge stainless steel~~

~~The barrier mechanism shall eliminate back cocking, and subsequent fare evasion.~~

~~The barrier shall be able to sustain impacts in both directions of travel without permanent deformations or damage. The impact shall be equivalent to a 300 lb customer moving at 3 mph and striking the barrier at its outermost end. A 300 lb downward force at the outermost end of the barrier shall also cause no damage.~~

~~The force to rotate the barrier, at the maximum travel end of the barrier tubing, shall not exceed 10 pounds.~~

Section 13 – Media Information Displays
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13 MEDIA INFORMATION DISPLAYS

13.1 General

Media Information Displays (MIDs) shall be deployed at selected locations as required by SEPTA, to ~~provide Customers with information regarding the fare products stored on their Smart Media, and where enabled, to~~ process Customer Smart Media at a Regional Rail station or other SEPTA-defined location.~~prior to boarding the train or other mode of transportation.~~

MIDs shall be compact, ergonomically designed, simple to use, and sufficiently robust to withstand the operational environment encountered in unsheltered Regional Rail stations and to deter acts of vandalism. The MIDs shall function in the following manner:

- ~~Electronically read an item of Smart Media and provide the current status and validity for Smart Media and/or relevant account;~~
- ~~Display current account/card value balance and period pass status;~~
- Be able to be ~~pre-~~programmed such that they know the station and fare zone in which they are located; and
- ~~Refund~~Advise the CDCRS that the Fare Media has been tagged at the MID, such that the CDCRS can "Close an Open Trip" at the appropriate fare ~~the difference between the zone fare deducted for the trip and the fare where the validator is located~~ (see Section 1).
- ~~Permit the selection of destination zone, and either determine availability and validity of a pass product, calculate and deduct the appropriate fare or send the appropriate information to the CDCRS to be handled with the Customer account;~~
- ~~Provide for the autoloading of a fare product or value to an item of Smart Media or account as identified in Section 2;~~
- ~~Activate a pending pass on SEPTA-Issued Smart Media;~~
- ~~Activate a trip on SEPTA-Issued Smart Media.~~

Preliminary design drawings of the MID in each of its configurations and all major assemblies shall be submitted for SEPTA approval at the Preliminary Design Review. **PDR 13-1**

~~Each MID shall be capable of being set to either one or both of the following operational modes:~~

- ~~Validation: Performs validation of a piece of media, including the activation of period passes and the initialization/conclusion of trip (setting of origination and/or destination);~~
- ~~Information Only: Provides information about the fare products stored on the Smart Media including current status, available balance and period pass validity of piece media, without making any changes to account, including activating a pass or trip.~~

The MID shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

A complete description of the functionality of the MIDs shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 13-1, PDR 13-2, FDR 13-1**

13.2 Transaction Processing

The MID shall incorporate a Smart Media Processor (SMP) to enable processing of Smart Media as appropriate to the type of validity information stored by the NPT System ~~or Smart Media~~ and as identified in Section 4. ~~As a part of each transaction, the MID shall determine if there is information to be added to rewritable Smart Media. If such an addition is required, then this shall be added to the Smart Media and a message provided to the Customer prior to completion of any other transaction.~~

The MID shall incorporate as part of its configuration data the location (zone, station, etc.) of installation. All fare calculations shall be performed at the CDCRS. ~~based on this installation location information.~~

When the MID is communicating with the CDCRS, the Bad Number List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the MID shall be used. The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

~~When the MID is in on-line communication with the CDCRS, the Invalid Fare Media List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the time frames set in Section 4, the Invalid Fare Media List resident in the MID shall be used.~~

~~When the MID is operating in the "Validate" operational mode, t~~The MID shall operate so that when a Customer presents Smart Media ~~– without pressing any selection buttons –~~ the MID shall advise the CDCRS that the Fare Media has been tagged at the MID, such that the CDCRS can "Close an Open Trip" at the appropriate fare (see Section 1)~~first check the associated account for a validity and perform the proper transaction (fare refund or fare deduction). period pass. If this is not available, the MID will enable an automatic charge (to the Smart Media or account as appropriate) of the single ride fare to Center City Philadelphia for the Customer's media type. In the Center City stations and for all other transaction types, Customers shall select their transaction by using the Customer destination zone selection buttons on the face of the MID prior to presenting their Smart Media to the MID's Smart Media Processing (SMP) module.~~ Upon completion of each transaction, the MID shall:

- ~~Display the results of the transaction on the Customer display;~~
- ~~Provide an audible translation of the results (if the "Audio" selection is activated by the Customer);~~
- Emit a distinct tone which identifies transaction validity; and
- Illuminate the proper LED.

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed;
- All events and alarms cleared, including the identification of the user who cleared the alarm;

- All completed ~~and~~ transactions, ~~including payment method, change issued, monies inserted and other~~with data to provide a complete record of the transaction;

- ~~All cancelled transactions, including reason for cancellation;~~

- All changes in status of the device or any module incorporated;

- All configuration changes;

- All successful communications;

- All communication failures;

- Power failures and restorations;

- All accesses to the interior of the device;

- All commands issued by the maintenance, revenue service, and other personnel; and

- Additional information required to provide a complete audit trail for revenues and Smart Media.

13.3 User Interface

The MID shall employ a user interface that is flexible, easy to understand by the Customer and configurable by SEPTA without the intervention of the Contractor or one of its representatives.

The interface shall consist of the no less than the following:

- A backlit ~~color~~ Customer graphical display, suitable for installation in unsheltered outdoor environments and readable in direct sunlight;

- A simple green / yellow / red LED array to indicate the result of the transaction; and

- An audio transducer ~~and voice enunciator; and~~

- ~~Customer~~

- ~~selection buttons.~~

Upon completion of each transaction, the MID shall identify the validity of the transaction~~display the results of the transaction~~ on the Customer display, emit a distinct tone, and illuminate the proper red, yellow, or green LED, based on the results of the transaction.

~~The MIDs shall display instructions to the Customers and accept Customer inputs in order to guide the Customer through each selection and validation process. Each screen that is presented to the Customer shall incorporate a "cancel" selection.~~

Upon Customer removal of the Smart Media from the “read” field of the MID, the unit shall revert to the "Ready" mode, enabled for processing the next item of Smart Media within one second.

Designs of the MID fixed instructions and related graphics shall be submitted for SEPTA review and approval as part of the Preliminary Design Review. **PDR 13-3**

13.3.1 Customer Display

The MID shall include a graphic display to provide Customers with the results of their transaction~~instructions and transactional information~~. The display shall be ~~easily read~~ readily visible under all conditions of ambient light throughout the day and night and shall be protected.

The~~e~~is graphic display shall be capable of displaying at least four lines of alphanumeric text. Each line of text shall accommodate a minimum of twenty four (24) characters, and each character shall be at least 0.375 inches in height. Results of all transactions ~~and display of all messages~~ for the Customer shall be provided on this display.

The display shall also incorporate a “screen saver” function in a standard movie format. This screen saver shall be able to be replaced and deactivated by SEPTA without assistance from the Contractor or its representative. Settings for the screen saver shall also be able to be modified by SEPTA, and such settings shall include the time required for activation of the screen saver based on time of inactivity at the MID. All timings and configuration and parameter settings shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 13-4, FDR 13-2**

If a Smart Media read and/or write failure occurs for three out of five consecutive processing attempts or the unit fails in any other manner such as to inhibit its operation, the device shall revert to its "Out of Service" mode and not accept any Smart Media for processing. This shall cause the visual indicator to become red and an “Out of Service” message to be displayed on the MID.

~~Displayed messages~~Screens shall be easily modifiable by SEPTA once the system is in operation. All ~~message~~ screen formats and contents shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 13-5, FDR 13-3**

13.3.2 LEDs

The MID shall include three LEDs – one each in green, yellow, and red – to indicate the status of the ~~last~~ Smart Media transaction.

- Green to indicate a successfully completed transaction;
- Yellow to indicate ~~low value or pending expiration of an unlimited ride pass (either on the Smart Media or account depending upon approach deployed)~~a problem with processing the Smart Media; and
- Red to indicate a failed transaction.

The status lamps shall be located on the face of the MID and shall be positioned so that they are visible in all ambient lighting conditions by the user of the MID. The LEDs shall be illuminated at the completion of the transaction for not less than two (2) seconds or until the ~~commencement~~ start of the next Customer transaction~~ or button selection,~~ , whichever is shorter.

~~13.3.3Customer Selection Keypad~~

~~The MID shall include a Customer selection keypad containing a minimum of eight (8) programmable Customer-operated selection keys. The selection keys shall:~~

- ~~Be made of stainless steel or revenue service-proven materials;~~
- ~~Have a flat front surface of approximately 1 square inch to provide proper finger contact;~~
- ~~Not rotate;~~
- ~~Provide an audible tone upon being depressed;~~
- ~~Protrude no more than 0.25 inches from the face of the front panel;~~
- ~~Be protected against vandalism, including impact resistance from pounding, such as by a person's foot or fist;~~
- ~~Be liquid proof to provide sealed contacts for all switches;~~
- ~~Not be removable from the outside;~~
- ~~Be easily replaceable from the inside;~~
- ~~Be spaced to accommodate labeling in conformance with ADA requirements; and~~
- ~~Be non-fading.~~

~~The Customer selection buttons shall be capable of being variably defined by SEPTA without outside intervention, with each button's active function defined by text displayed on the Customer graphical display adjacent to the button.~~

~~13.3.4~~13.3.3 Audible Tones

An audible tone shall be provided for the acceptance and processing of valid Smart Media. A second audible tone shall be provided for an unsuccessful transaction. A third tone shall be provided for ~~or upon the~~ presentation of invalid media.

~~13.3.5Audible Messages~~

~~The MID shall incorporate a Customer selection button to activate the "Audio" function for the MID. The activation of this function shall cause the information displayed to be "read" to the Customer and provided via voice annunciation means. The information displayed shall continue to be annunciated in this manner until the "Audio" function is deactivated or the transaction sequence is complete.~~

~~In addition, when this function is activated, the Customer shall be provided with a method to increase and decrease the volume of the voice annunciation.~~

~~Full details on the hardware, software, and settings for this functionality shall be provided for SEPTA review at the Preliminary Design Review and for approval at the Final Design Review.~~ ~~**PDR 13-6, FDR 13-4**~~

13.4 Media Handling Hardware

The MID shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media processor (SMP) as identified in Section 4.

The SMP antenna shall be located on the MID such that Customers have easy access to tag their Smart Media. The external antenna shall not protrude from the exterior of the MID enclosure. The MID ~~and~~ shall be made of materials that are impervious to weather conditions and resist overt vandalism.

The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

13.5 Control System

The modules within the MID shall be controlled by an Electronic Control Unit (ECU). The ECU shall also communicate via a secure network with the CDCRS. All items required for the MID to properly function including (but not limited to) ~~fare tables,~~ bad and acceptable media lists, Customer display formats~~text~~, configurable operating parameters, current date and time, and other such information shall be downloaded from the CDCRS. Transaction records and event records shall be stored in the ECU and then forwarded to the CDCRS based on SEPTA-selectable criteria.

The ECU shall incorporate an industrial grade microprocessor assembly. Each MID shall be able to operate as both a stand-alone system and as a device that is part of a comprehensive network of NPT ~~fare s~~equipment~~ystem devices~~ interfaced to the CDCRS.

There shall be two distinct, physically separate non-volatile memory locations for the storage of data within the device. One location shall be an easily removable and replaceable standard device. The other location shall be more permanent. The MID shall store all data from its operation in a solid-state memory module. ~~All~~

All data sent to the CDCRS shall originate from this memory and all data received from the CDCRS shall be stored in this memory. This memory shall be unaffected by MID power status.

The Contractor shall provide separate dimensioned drawings of the MID showing all displays~~, controls~~ and openings/interfaces with doors/covers both open and closed for review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 13-2, FDR 13-4**

13.5.1 Timeouts

The MID shall provide a SEPTA-adjustable time-out ~~periods~~ to return the MID to the idle state in prescribed times between ~~steps of a transaction and between~~ transactions.

- ~~An intra-transaction time-out function shall be provided which shall limit the time between selection of a transaction type and tagging of Smart Media. If the Customer fails to tag Smart Media within a preset number of seconds after selection of the transaction type, the transaction shall automatically be canceled and the MID shall return to the idle state. SEPTA shall be able to program different time spans ranging from 1 to 15 seconds in increments of 1 second for the intra-transaction time-out operation of the MID. As delivered, the intra-transaction timeout shall be set to 5 seconds.~~

~~Similar to the intra-transaction time-out described above, an inter-transaction time-out shall also be provided.~~ This timer shall limit the amount of time the MID waits after completion ~~or cancellation~~ of a transaction before resuming the idle state. The~~i~~s inter-transaction time-out shall be initially set to 5 seconds but shall be adjustable by SEPTA from 0 to 15 seconds in increments of 1 second.

All NPT System time-outs, including valid ranges, shall be identified ~~in the review of the transaction process that shall occur~~ at the Preliminary Design Review, and shall be subject to SEPTA approval at the Final Design Review. **PDR 13-6, FDR 13-5**

13.5.2 Transaction Records

The MID shall be capable of locally storing data representing no less than ~~10~~50,000 ~~-~~transactions.

The MID shall be capable of detecting basic internal malfunctions. The malfunction detection shall cover at least failure of power or control circuitry, opening of an access panel, and any failure of the Smart Media read/write unit that could result in a false, incomplete, or corrupted encoding of a Smart Media.

The information displayed shall indicate the type of failure that caused the ~~machine~~MID to shut down. A description of the maintenance and service indicators and displayed information for the MID shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 13-7**

The structure and layout of all transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 13-8, FDR 13-6**

Transaction and event data shall be uploaded to the CDCRS periodically throughout the SEPTA business day (times and frequency configurable by SEPTA). Contractor shall provide details on how SEPTA will make these changes. **CDR 13-3, PDR 13-9**

~~13.5.3Fare Table~~

~~The MID shall have the ability to operate under any of a minimum of two (2) fare tables residing in MID memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities. **CDR 13-4, FDR 13-8**~~

13.6 Communications

The MIDs shall communicate with the CDCRS at a frequency to meet the NPT real-time operational requirements (~~real-time~~ or as otherwise ~~determined~~approved by SEPTA). Communications links shall include, as a minimum, communication:

- Via integral standard Ethernet Interface with RJ45 connector(s); and
- Via wireless network interface built in, compliant with IEEE 802.11n Standard Protocols.

At a frequency acceptable to SEPTA, and at a minimum at the conclusion of each day, the MID shall upload all transaction data to the CDCRS. At the same time, the CDCRS shall download data to the MID ~~including items such as fare table updates~~, including but not limited to the SEPTA invalid Smart Media list, ~~autoload files,~~ encoding format updates, security keys, and date/time information.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual MID through the use of a compact flash RAM with a minimum capacity of 8GB.

In cases of network failure, the MID shall have sufficient capacity to store, at a minimum, 50,000 Customer, alarm and event transactions. This information shall be stored in both the MID main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored data (e.g., alarm, event, Customer) shall be automatically transmitted to the CDCRS.

13.7 Structure and Finish

The MID enclosure shall be constructed of non-rusting stainless steel (Grade ~~316~~304L) with a random orbital finish or other revenue service proven material as identified in Section 2. ~~The MIDs shall permit mounting to both a separate pedestal and to a wall, based on the needs of SEPTA. The Contractor shall supply pedestals, mounting brackets and all other mounting hardware as required to ensure a secure installation.~~

When installed, all displays and Customer controls shall be as high as possible yet still stay within the height restrictions of the Americans with Disabilities Act. Maintenance access to the MID internal components shall be via one or more panels that are secured with high-security locks and locking mechanisms. These access panels shall incorporate sensing to identify when any panel is opened and/or closed.

Access to the internal components of the MID shall be protected by appropriate locking devices to prohibit unauthorized access. Should unauthorized access to these internal components be gained, an intrusion alarm shall be generated and transferred to the CDCRS. This alarm shall have the highest priority and shall immediately be transferred from the MID to the CDCRS.

The MIDs shall permit mounting to both a separate pedestal and to a wall, based on the needs of SEPTA. The Contractor shall supply pedestals, mounting brackets and all other mounting hardware as required to ensure a secure and robust installation. Pole mounting shall not be permitted. Providing an MID which can only be pole-mounted shall not be permitted.

The Contractor shall provide drawings and supplier specifications and details of all locks, lock assemblies, and mounting hardware for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 13-10, FDR 13-7**

13.7.1 Installation

The MIDs shall be installed on station platforms and at other exterior locations, which may be unsheltered from the environment. Once installed the MID shall meet all ADA requirements as identified in Section 2.

Section 14 – Administrative Sales Devices
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14 ADMINISTRATIVE SALES DEVICES

14.1 General

Administrative Sales Devices (ASDs) shall be delivered as part of the NPT System and shall provide for the distribution and sale of Smart Media to SEPTA Customers.

The ASD shall be a based on a ruggedized desktop computer system, suitable for the defined functionality and shall employ Windows®-based software. T~~These Sales Devices shall be furnished in two different physical configurations: the Administrative Sales Device (ASD) and the Retail Sales Device (RSD):~~ his device shall allow authorized users to issue fare media, register Customers, add calendar passes and stored value to accounts and provide information on Smart Media usage history. The ASD shall also enable authorized users to establish linked accounts for Customers (i.e. link an external form of payment to a Customer account).

In addition, the ASD shall be able to research media/account history, correct erroneous charges, add or remove fare media from ~~hotlist~~bad number and invalid fare media-, and cancel fare media.

A complete description of the functionality of ASD shall be provided for SEPTA review and approval at each stage of the design review, with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 14-1, PDR 14-1, FDR 14-1**

- ~~The ASD shall be based on a desktop computer system. This device shall allow authorized users (such as SEPTA sales agents) to issue fare media, register Customers, add calendar passes and stored value to fare media (and/or accounts) and provide information on fare mSmart Media usage history. The ASD shall also enable authorized users to establish linked accounts for Customers (i.e. link an external form of payment to a Customer account or fare media). In addition, the ASD shall be able to research media/account history, correct erroneous charges, add or remove fare media from hotlist, and cancel fare media.~~

- ~~The RSD shall provide a reduced set of functions as compared to the ASD, and is not required to utilize a desktop computer system as its basis. This device shall provide limited Customer functions, primarily supporting authorized users with issuing fare media, as well as adding calendar passes and stored value to new and existing fare media (and/or~~their~~ account). The RSD shall provide current calendar pass and stored value information and no additional history.~~

~~A complete description of the functionality of each type of the sales devices shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included.~~ **~~CDR 14-1, PDR 14-1, FDR 14-1~~**

14.2 Functionality

The ASD shall provide the following functionality:

A. Communicate with the CDCRS to transmit and receive data on transactions and revenue, equipment status and activity, and to receive commands, transmit and receive data regarding sales, revenue, accounting, status, and security information automatically and/or on a scheduled basis;

B. Respond to all operator inputs;

C. Display Smart Media account validity and value information during and upon completion of a transaction;

D. Display Smart Media account validity and value information upon request by the ~~operator~~Customer and permit the validity to be printed for the Customer~~.~~;

E. Provide different audible annunciations for valid and invalid transactions;

F. Create and store transaction data for all activities and events;

G. Provide support for Customer payment of daily parking privileges at SEPTA-owned parking lots and garages, including the entering of all information needed to pay for that parking privilege (see Section 15);

H. Establish a new Customer account using the account setup function at the CDCRS as identified in Section 19;

I. Issue new Smart Media;

J. Permit Customer registration of Smart Media;

K. Process a receipt token and issue a receipt to the passenger from a Regional Rail transaction.

L. Link SEPTA ~~-issued~~ or Partner-issued Smart Media to a Smart Media account;

M. Link an external financial account to a Smart Media account for replenishment purposes;

N. Link monthly parking privilege to a Customer account;

O. Delink Smart Media from an account (internal or external linking);

P. Issue Smart Media associated with an account, including customization of such media with reduced fare privileges and printing of Customer picture on media, as required;

Q. Add unlimited ride passes, stored value, and stored trips to a Smart Media account;

R. Account for TransitChek, cash and check payments for Smart Media purchases;

S. Process and account for credit and debit card payments for Smart Media purchases;

T. Reverse Customer transactions, including credit/debit transactions;

U. Provide Customer reports on Smart Media account activity;

V. Enable Customers to report registered Smart Media as lost or stolen and to obtain replacement Smart Media for the same account;

W. Print receipts (with complete transaction information) for Customers upon request; and

X. Print local sales and Smart Media transaction activity reports.

~~14.2~~14.3 Transaction Processing

The ASD~~sales d evices~~ shall be able to issue and process Transaction and ~~the~~ Smart Media as outlined ~~identified~~ in Section 4 based on the system needs as determined by SEPTA.

Selection of functions to be accessed by an authorized sale device user shall be customized to each user based on their level of access privileges.

~~Smart Media shall be issued to Customers from stock of valueless (unencoded or unlinked to an account) Smart Media. Consequently, all Sales Devices shall encode one-time initialization records and other data as required to validate the Smart Media as part of the sales transaction.~~

Contractor shall provide all information on the hardware and peripherals for the sale device elements identified in this section for SEPTA review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 14-2, FDR 14-2**

The ASD shall accept all methods of payment as outlined in Section 5. ~~-~~In addition, the ASD shall provide summaries of the payments made for all Customer purchases. These summaries shall be based on each of the methods of payment accepted.

Transactions shall only be able to be processed by the ~~ACS~~ASD if the ~~ACS~~ASD is connected to the CDCRS. When CDCRS communications are not available, the ~~ACS~~ASD shall not process Smart Media or their associated accounts. The ~~ACS~~ASD shall be able to print Magnetic Media without CDCRS communication.

Whenever Smart Media presented to the ASD is on the Bad Number List, the ASD shall record the event. The “bad media presented” event record shall include the ASD device number, date, time, Smart Media serial number as well as the status encode prior to discovery of the Invalid Smart Media status.

14.3.1 Fare Table

The ASD shall have the ability to operate under any of a minimum of two (2) fare tables residing in ASD memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities. **CDR 14-3, FDR 14-3**

~~Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:~~

- ~~All events and alarms sensed, including access to prohibited functions;~~
- ~~All events and alarms cleared, including the identification of the user who cleared the alarm;~~
- ~~All completed transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;~~
- ~~All cancelled transactions, including reason for cancellation;~~
- ~~All changes in status of the device or any module incorporated;~~
- ~~All configuration changes;~~
- ~~All successful communications;~~
- ~~All communication failures;~~
- ~~Power failures and restorations;~~
- ~~All accesses to the interior of the device;~~
- ~~All commands issued by the maintenance, revenue service and other personnel.~~

~~**14.3**Invalid Smart Media List~~

~~The ASD shall incorporate an Invalid Smart Media List. For each piece of Smart Media that is presented, the ASD shall compare the item with this Invalid Smart Media List. The processing of media in accordance with the Invalid Smart Media List shall be as identified in Section 4.~~

~~When the ASD is in communications with the CDCRS, the Invalid Smart Media List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the time frames set in Section 4, the Invalid Smart Media List resident in the ASD shall be used. This list resident in the ASD shall be capable of storing recordings identifying no less than 250,000 individual pieces of media.~~

~~Whenever Smart Media presented to the ASD is on the Invalid Smart Media List, the ASD shall record the event and encode the media as being invalid, preventing all future use of the media. The "bad media presented" event record shall include the ASD device number, date, time, Smart Media serial number as well as the status encode prior to discovery of the Invalid Smart Media status.~~

14.4 Control System

The ASD shall be a microcomputer-based device with the necessary peripherals to perform the required functionality. The ASD shall utilize a third-party processor as the Electronic Control Unit (ECU), which shall control all functional aspects of the device. The general architecture of the ASD, including CPU and bus speed speeds, memory size and speed, shall be designed to meet the needs of the Administrative Sales Device and shall be provided to SEPTA for review and approval. **CDR 14-4**

The ASD shall use solid-state memory with sufficient capacity to store a minimum of 1,000,000 transaction records.

The ASD shall operate using 115V AC power and shall utilize appropriate power conditioning to ensure proper operation.

Data shall be stored for each transaction performed the ASD and securely transmitted to the CDCRS. All transactions shall be associated with the user signed-on when the transaction occurs.

The ASD shall be capable of reading the information on the Smart Media without modification, upon selection of the "Read" function by the user.

A complete description of the ASD shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 14-5, PDR 14-2~~PDR -6, FDR~~ 14-4**

All configuration and parameter settings shall be subject to SEPTA review at the Preliminary and approval at the Final Design Reviews. **PDR 14-3~~PDR -6, FDR~~ 14-5**

Dimensioned drawings of the ASD showing configuration, displays, and controls shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 14-4~~PDR -2~~**

14.4.1 Clock

The ASD shall maintain date and time of day by an internal clock which shall have a battery, or equivalent, backup to keep the clock running for at least 150 hours without input power. The clock shall maintain time to an accuracy of less than one-minute error within a one-year period. Time shall be synchronized between the device and the CDCRS each time data transfer occurs, regardless of the time depicted.

~~All sales devices shall also provide summaries of the payments made for all Customer purchases. These summaries shall be based on the method of payment and the following summaries shall be provided as a minimum:~~

- ~~credit card – by card brand (e.g. MasterCard, Visa, American Express, Discover)~~
- ~~debit card – by card brand (e.g. MasterCard, Visa, American Express, Discover)~~
- ~~cash~~
- ~~personal check~~
- ~~TransitChek~~

14.2.1ASD

The ASD shall provide the following functionality:

- **Communicate with the CDCRS to transmit and receive data on transactions and revenue, equipment status and activity, and to receive commands, transmit and receive data regarding sales, revenue, accounting, status, and security information automatically and/or on a scheduled basis;**

- **Respond to all operator inputs;**

- **Display Smart Media (or account) validity and value information during and upon completion of a transaction;**

- **Display Smart Media (or account) validity and value information upon request by the operator;**

- **Provide different audible annunciations for valid and invalid transactions;**

- **Create and store transaction data for all activities and events;**

- **Provide support for Customer payment of daily parking privileges at SEPTA-owned parking lots and garages, including the entering of all information needed to pay for that parking privilege (see Section 15);**

- **Establish a new Customer account using the account setup function at the CDCRS as identified in Section 19;**

- **Issue new Smart Media;**

- **Permit Customer registration of Smart Media;**

- **Process a receipt token and issue a receipt to the passenger from a Regional Rail transaction.**

- **Link SEPTA-issued or Partner-issued Smart Media to a Customer Smart Media account;**

- ~~Link an external financial account to Smart Media or a Smart Media account for replenishment purposes;~~

- ~~Link monthly parking privilege to a Customer account;~~

- ~~Delink Smart Media from an account (internal or external linking);~~

- ~~Issue Smart Media associated with an account, including customization of such media with reduced fare privileges and printing of Customer picture on media, as required;~~

- ~~Modify Smart Media validity;~~

- ~~Add unlimited ride passes, stored value, and stored trips to Smart Media or a Smart Media account;~~

- ~~Account for TransitChek, cash and check payments for Smart Media purchases;~~

- ~~Process credit and debit card payments for Smart Media purchases;~~

- ~~Reverse Customer transactions, including credit/debit transactions;~~

- ~~Provide Customer reports on Smart Media and Smart Media account activity;~~

- ~~Enable Customers to report registered Smart Media as lost or stolen and to obtain replacement Smart Media;~~

- ~~Enable Customers with dormant Smart Media (those that have not been used for 2 years or more, but which have not been reported lost or stolen) to have their Smart Media reactivated, fully restoring any previously unused value (excluding expired passes);~~

- ~~Print receipts (with complete transaction information) for Customers upon request; and~~

- ~~Print local sales and Smart Media transaction activity reports.~~

~~14.2.2RSD~~

~~The RSD shall provide the following functionality:~~

- Respond to all operator inputs;
- Display Smart Media account validity and value information during and upon completion of a transaction;
- Display Smart Media account validity and value information upon request by the authorized user;
- Provide different audible annunciations for valid and invalid transactions;
- Create and store transaction data for all activities and events;
- Communicate with the CDCRS to transmit and receive data on transactions and revenue, equipment status and activity, and to receive commands, transmit and receive data regarding sales, revenue, accounting, status, and security information automatically on a scheduled basis;
- Issue new Smart Media;
- Modify Smart Media account validity;
- Add unlimited ride passes, stored value, and stored trips to Smart Media ora Smart Media account;
- Account for cash and check payments for Smart Media purchases;
- Process credit and debit card payments for Smart Media purchases;
- Reverse Customer transactions, including credit/debit transactions that occurred at the RSD within the same sales day;
- Provide Customer reports on Smart Media and Smart Media account activity;
- Print receipts (with complete transaction information) for Customers upon request; and
- Print local sales and Smart Media transaction activity reports.

The RSD shall contain non-volatile memory, which shall record data for each Smart Media transaction processed by the RSD. The stored transaction data shall be unaffected by RSD power status

~~14.3~~14.5 User Interface

~~Each sales device~~The ASD shall be designed to provide quick transaction processing for all Smart Media, from selection of the fare to the issue of receipt after payment.

~~All sales devices~~The ASD shall securely process credit and debit media using a peripheral device or integral processor, together with a Customer PIN Pad.

A 17-inch flat panel display shall be used for all displayed messages and prompts (Section 14.6.1). User input shall be performed via a wireless keyboard and pointer device, and via a touch screen device.

~~14.3.1ASD~~

~~The ASD shall be a microcomputer-based device with the necessary peripherals to perform the required functionality. A 17-inch flat panel display shall be used for all displayed messages and prompts. User input shall be performed via a keyboard and pointer device, or via a touch screen device, which shall be interfaced to the microcomputer via wireless.~~

~~A m~~In addition, a minimum of ten (10) SEPTA definable function keys shall be provided on each device.

~~Dimensioned drawings of the ASD showing configuration, displays, and controls shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 14-2**~~

The allocation of the buttons for each of the ASD functions shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 14-5~~PDR 14-3~~, FDR 14-6**

~~14.3.2RSD~~

~~The RSD shall be a small countertop or wall-mounted device that incorporates a selection keypad and color display, or a touch screen, for input and review of selections and transaction progress. The following selection buttons shall be provided in order to support the functionality described in Section 14.2.2:~~

- ~~Telephone-type key layout (0-9, *, #);~~
- ~~Ten (10) additional SEPTA definable function keys;~~

- Separate “ENTER” key to complete information entry;
- Separate “CANCEL” key to cancel the transaction in process.

The buttons identified above shall provide for all functions as defined within these specifications. These buttons shall be programmable as to their function from the CDCRS.

The allocation of the buttons for each of the RSD functions shall be subject to SEPTA review at the Preliminary and approval at the Final Design Reviews. **PDR 14-4, FDR 14-4**

Dimensioned drawings of the RSD showing configuration, displays, and controls shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 14-5**

14.4Media Processing Hardware

All sales devices shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4. The external antenna shall not protrude from the exterior of the sales device enclosure and shall be made of materials that are robust and can accommodate rough handling. The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

The sales devices shall include a clearly identified target on the housing of the sales device and an internal RF antenna. The antenna shall be located to provide operators with easy access to Smart Media.

14.5Control System

All sales devices shall operate using 115V AC power and shall utilize appropriate power conditioning to ensure proper operation.

Data shall be stored for each transaction performed by a sales device and securely transmitted to the CDCRS. All transactions shall be associated with the user signed-on when the transaction occurs.

All sales devices shall be capable of reading the information on the Smart Media without modification, upon selection of the “Read” function by the user.

All configuration and parameter settings shall be subject to SEPTA review at the Preliminary and approval at the Final Design Reviews. **PDR 14-6, FDR 14-5**

Whenever Smart Media presented to the sales device is on the Invalid Smart Media List, the sales device shall record the event and encode the media as being invalid, preventing all future use of the media. The "bad media presented" event record shall include the sales device number, date, time, Smart Media serial number as well as the status encode prior to discovery of the Invalid Smart Media status.

When the sales device is communicating with the CDCRS, the Invalid Smart Media List stored on the CDCRS shall be used. When CDCRS communications are not available or transactions cannot be completed within the time frames set in Section 4, the Invalid Smart Media List resident in the sales device shall be used.

14.5.1Clock

The sales devices shall maintain date and time of day by an internal clock which shall have a battery, or equivalent, backup to keep the clock running for at least 150 hours without input power. The clock shall maintain time to an accuracy of less than one minute error within a one-year period. Time shall be synchronized between the device and the CDCRS each time data transfer occurs, regardless of the time depicted.

14.6ASD

The ASD shall utilize a third-party processor as the Electronic Control Unit (ECU), which shall control all functional aspects of the device.

The ASD shall use solid-state memory with sufficient capacity to store a minimum of 100,000 transaction records.

~~14.6.1Fare Table~~

~~The ASD shall have the ability to operate under any of a minimum of two (2) fare tables residing in ASD memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities.~~ **~~CDR 14-3, FDR 14-6~~**

~~14.6.2~~14.6 ~~ASD~~ **Peripherals**

The ASD shall incorporate various peripherals based on the installation location and required functionality. The ASDs shall automatically configure its software based on the peripherals detected when powered up. ~~These peripherals are described in the following paragraphs.~~

A complete description of all ASD peripherals shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 14-6, PDR 14-6**~~**PDR -, FDR 14-7FDR -**~~

Dimensioned drawings of the ASD and all peripherals, showing configuration, displays, and controls shall be submitted for SEPTA review and approval at the Preliminary Design Review. **FDR 14-8** ~~**FDR -2**~~

14.6.1 LCD Touch Screen

All ASDs shall have a commercially 17" (or larger) TFT Active Matrix LCD Touch Screen Display. This LCD Touch Screen shall be ruggedized and sufficiently harden to withstand the transportation and sales environment for which it will be deployed.

The LCD Touch screen shall meet the following criteria:

A.	Viewing Angle	160° (Horizontal) 160° (Vertical)
B.	NEMA Rating	5
C.	IP Rating	54

14.6.2 Media Processing Hardware

All ASDs shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4. The external antenna shall not protrude from the exterior of the ASD enclosure and shall be made of materials that are robust and can accommodate rough handling. The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

The ASD shall include a clearly identified target on the housing of the device and an internal RF antenna. The antenna shall be located to provide operators with easy access to Smart Media.

~~*14.6.2.1*~~14.6.3 Cash Drawer

All ASDs shall be delivered with a cash drawer, which shall securely hold cash associated with payment of transactions. The cash drawer shall be interfaced with the ASD. The ~~sales devices~~ASD shall control the opening of the cash drawer. When closed, the cash drawer shall automatically lock.

Reconciliation shall be provided for the cash drawer with the funds collected ASD Smart Media transactions. This information shall be included on the Remittance Report.

~~14.6.2.2~~14.6.4 Printer

~~All ASDs shall be delivered~~All ASDs shall be delivered ~~-~~with a printer to issue a receipt of the transaction to the Customer following transaction completion as well as for providing a printout of Smart Media transaction history information. The printer shall print on a single roll of continuous thermal paper. The printer shall be designed for easy loading of a new paper roll when the current one is empty, and shall have a cutting edge for cleanly and accurately tearing off the receipt by the operator to give to the Customer.

~~14.6.2.3~~14.6.5 Remote Customer Display

All ASDs shall be delivered with a remote Customer display. The remote Customer display shall be a device connected to the ASD by a cable, which displays the sales information to the Customer. The Customer display shall be a two-line 40 character LED or other high visibility display. Information displayed shall include data on each item of Smart Media, which is part of the transaction as well as the total owed, the number of items of Smart Media to be provided to the Customer, the change due as well as other transaction information, which may be deemed necessary by SEPTA.

The Contractor shall ensure that SEPTA can modify the messages displayed for each type of Smart Media through the CDCRS.

~~14.6.2.4~~14.6.6 Digital Camera

~~Some ASDs shall be delivered~~The ASD shall be capable of being connected with a ~~with a~~n optional digital camera. The ASD shall be designed to enable it to be connected to a Contractor-supplied, commercial grade digital camera and printer/encoder/issuer that can be used for issuing personalized Smart Media for designated Customers, including, but not limited to, employees, senior citizens, persons with disabilities, students, and police.

~~14.6.2.5~~14.6.7 Smart Media Photo Printer

The ASD shall be capable of being connected with an ~~Some ASDs shall be delivered with an~~ optional Smart Photo Printer. Equipment shall be provided to print graphics on Smart Media and issue them for usage within the NPT System. This equipment shall:

- Be desktop mounted;
- ~~Permit initialization of cards – 100 cards per hour;~~
- ~~Permit initialization and activation of cards – 90 cards per hour;~~
- Permit ~~initialization and activation of cards as well as~~ printing specified information on the cards (including digitally stored photographs) – 75 cards per hour;
- Interface to the CDCRS for data transfer purposes;
- Permit feeding the Smart Media one-by-one and in bulk, through the use of stackers/hoppers; and
- Automatically shut down after a pre-determined idle time.

Edge to edge printing shall be provided in full color at a resolution of at least 300 dots per inch using revenue service-proven technology.

The Smart Media Photo Printer may utilize ribbon rolls for printing. Ribbon rolls for each specific color or one color zone printing are acceptable. For either configuration, ~~If ribbon rolls are used for the color printing, then~~ each roll utilized shall accommodate printing for a minimum of 350 items of Smart Media.

14.6.8 Magnetic Processing Unit

A magnetic processing unit shall be provided to permit the ASD to issue and process magnetic Fare Media. This equipment shall:

- Be desktop mounted;
- Provide the same Magnetic Media issuing, encoding and printing capabilities as the FVD and as identified in Section 4.1.4;
- Be able to read and properly process magnetic tickets and receipt tokens issued by the NPT System; and
- Be able to be connected to any ASD without modification or addition to either software or hardware.

~~14.6.3Conductor Remittance Functionality~~

~~The ASDs shall incorporate a function to accommodate Regional Rail conductor remittances at defined locations. This function shall be activated for locations as defined by SEPTA and shall require additional security privileges to activate and execute.~~

~~The defined functionality to address this requirement shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews.~~ ~~**PDR 14-7, FDR 14-7**~~

~~14.6.4~~14.7 Reports

In addition to receipts, the ASD shall print reports upon request by the user. The ASD shall be able to produce the following types of reports in order to support the operation of the NPT System:

- Transaction summary report – A summary of all Smart Media verifications, Smart Media sold, and revenues collected during the user's shift.
- Transaction detail report – Prints the last 10 transactions for the Smart Media presented.
- Maintenance report – A listing of all maintenance issues, which have arisen since maintenance was last performed for the device.

- Supervisor report – A listing of all users, which have signed on the device, a summary of the revenue collected, and Smart Media issued by each user. This shall also include sign-on failures and other similar transactions. These reports shall be uniquely serialized.

- Remittance report – A report that provides details of the revenues remitted by the user. These reports shall be uniquely serialized.

- Shift report – A report that provides details of sales and counts of Smart Media verifications performed during the shift, and including those sign-ons and sign-offs which have occurred between remittances.

A minimum of five additional reports shall be provided by the Contractor, as defined by SEPTA at the Final Design Review.

In addition to the above reports, the ASD shall be able to print a receipt for Regional Rail passengers who purchased an on-board fare and were issued with a receipt token. –The passenger hands the receipt token to the attendant. When the attendant inserts the receipt token into the ticket slot, the ASD shall retrieve the information from the CDCRS. Once retrieved, the ASD shall print the paper receipt. The ASD shall then erase and capture the receipt token and the ASD shall send a message to the CDCRS indicating that the receipt has been printed and that printing the receipt for that transaction shall no longer be permitted in the system.

Contractor shall provide samples of these reports for SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 14-7, FDR 14-9~~PDR 14-8, FDR 14-8~~**

~~**14.7RSD**~~

~~The RSDs shall be equipped with an Electronic Control Unit that monitors and controls RSD operations, communications, user interface, and external equipment interfaces and monitors power . The RSD shall use solid-state memory with sufficient capacity to store a minimum of 25,000 transaction records. The Electronic Control Unit shall store and record all activity performed at the RSD.~~

~~14.7.1Printer~~

~~A printer that is integral to the RSD housing shall be provided to issue a receipt of the transaction to the Customer following transaction completion. The printer shall print on a single roll of continuous thermal paper, nominally 2-1/4 inches wide and 150 feet in length. The unit shall be designed for easy loading of a new paper roll when the current one is empty, and shall have a cutting edge for cleanly and accurately tearing off the receipt by the operator to give to the Customer.~~

~~14.7.2RSD Transactional Limits~~

~~Each RSD shall have limits that control the number and value of transactions that an RSD may conduct before transaction data is uploaded to the CDCRS. As each transaction is conducted, the RSD shall increment internal data registers that track the number and value of transactions. When either data register is within 75% of the defined limits for the RSD, the RSD shall initiate data communications with the CDCRS. Upon successful completion of data uploading, the data registers reflecting number and value of transactions since last data upload shall be zeroed.~~

~~If an RSD reaches the permitted limit of the number or value of transactions without data uploading, no further transactions shall be permitted until all transaction data is successfully transmitted to the CDCRS. Detailed information on the number and value control logic and processes shall be provided by the Contractor for SEPTA review at the Preliminary and approval at the Final Design Reviews.~~ **~~PDR 14-9, FDR 14-9~~**

~~14.7.3RSD Fare Table~~

~~The RSD shall have the ability to operate under any of a minimum of two (2) fare tables residing in RSD memory. Each of these fare tables shall be programmable to become the active set at a particular time and date and to expire at a particular time and date as well. They shall provide for pre-loading new fare tables for new fare levels and to implement short-term, temporary special fares (e.g., special event service or special fares for a day). The Contractor shall provide details on the fare table configuration, set-up, and capacities.~~ **~~CDR 14-4, FDR 14-10~~**

Each time the RSD communicates with the CDCRS, the fare table information shall be downloaded and stored on the RSD if the version is different from that previously stored on the RSD. New fare tables shall be activated automatically in the RSD at the specified date/time as programmed by SEPTA. Each entry in the fare table shall at a minimum contain the validity information and rules for each type of Smart Media accepted for each of the different transportation services.

14.7.4Reports

In addition to receipts, the RSD shall print reports upon request by the user. The RSD shall be able to produce the following types of reports in order to support the operation of the NPT System:

- Transaction summary report – A summary of all Smart Media verifications, Smart Media sold, and revenues collected during the user's shift.
- Transaction detail report – Prints the last 10 transactions for the Smart Media presented.
- Maintenance report – A listing of all maintenance issues, which have arisen since maintenance was last performed for the device.
- Supervisor report – A listing of all users, which have signed on the device, a summary of the revenue collected, and Smart Media issued by each user. This shall also include sign-on failures and other similar transactions. These reports shall be uniquely serialized.
- Remittance report – A report that provides details of the revenues remitted by the user. These reports shall be uniquely serialized.
- Shift report – A report that provides details of sales and counts of Smart Media verifications performed during the shift, and including those sign-ons and sign-offs which have occurred between remittances.

A minimum of five additional reports shall be provided by the Contractor, as defined by SEPTA at the Final Design Review.

~~Contractor shall provide samples of these reports for SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 14-10, FDR 14-11**~~

~~14.10~~14.8 Communications

The ASD ~~and RSD~~ shall communicate with the CDCRS primarily in on-line manner to transmit and receive all necessary information. This information shall include:

- All transactions and revenue data;
- Equipment status and activity, and to receive commands, transmit and receive data regarding sales, revenue, accounting, status, and security information automatically on a scheduled basis;
- Clock synchronization commands;
- Bad media lists;
- Fare tables; and
- Configuration Parameters.

The above information shall be communicated between ~~Sales Devices~~ASD and the CDCRS~~, when communications are available,~~ both automatically at a scheduled time~~,~~ and manually~~,~~ upon selection by the authorized user

Communications for ~~all Sales Devices~~the ASD shall be via the SEPTA NPT communications networks (see Section 18).

Data communications shall be provided at each installation location for each ~~sales device.~~ASD. ~~Each sales device~~The ASD shall only be capable of data communications direct with the CDCRS. All data transmitted between any sales devices and the CDCRS shall be encrypted.

~~All sales devices~~All ASDs shall be capable of being configured to communicate with the CDCRS via the following methods:

- Standard IEEE 802.11n Wireless LAN with the SEPTA Communications Networks;
- Ethernet (RJ45) Interface with the SEPTA Communications Networks;

- Dial-up Telephone Connection; and
- Via the SEPTA NPT Mobile Broadband network.

The above outlined systems are discussed in detail in Section 18. The communications systems shall be supported in each ~~Sales Device~~ASD through the use of a commercially available network card, utilizing a standard PC card interface, such as PCI or PCMCIA.

~~Each Sales Device shall only be required to support one network card at any time.~~

When data transfer of ~~sales device~~ASD data is successfully completed and the CDCRS acknowledges receipt of the data, all resettable transaction, event, and alarm data in the ~~Sale Device~~ASD memory shall be cleared. Data in non-resettable registers shall not be cleared.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual ~~Sales Device~~ASD through the use of a compact flash RAM with a minimum capacity of 8GB.

~~14.10.1~~14.8.1 ~~ASD~~Data Transmission

Communications for the basic ASD shall be via the SEPTA network and connection shall be required ~~for~~ before the ASD is permitted to begin operations. Each time a user logs into o~~u~~r out of the ASD, data transfer shall occur before any additional functions may be performed.

The ASD accept any updates to any information, parameters, or files stored locally~~,~~ from the CDCRS at any time. ~~The ASD shall i~~Immediately following the completion of any current transaction, the ASD shall update and install these files should such files be identified and available.

~~During operations t~~The ASD shall continue to operate in the event of a loss in communications. The ASD shall incorporate a maximum accumulated value setting stored on the Smart Media and identified as “sold” which, when reached, shall require transfer of all data to the SEPTA network before additional transactions can be completed. This shall serve to minimize SEPTA’s exposure to fraud while allowing for continued operations in the event of a communications failure.

Operation of the portable ASD shall not require any connection to the SEPTA NPT communications network in order to operate. However, operation of this device shall only be available for a user with supervisor privileges, and the device shall require connection to the SEPTA network to upload the data upon completion of the off-line transactions.

14.8.2 Events and Alarms

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed, including access to prohibited functions;
- All events and alarms cleared, including the identification of the user who cleared the alarm;
- All completed transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failures;
- Power failures and restorations;
- All accesses to the interior of the device;

All commands issued by the maintenance, revenue service and other personnel.

~~**14.8.2RSD**~~

~~Communications for the basic RSD shall be via the SEPTA network and connection shall be required for the RSD begin operations. Each time a user logs into our out of the RSD, data transfer shall occur before any additional functions may be performed~~

~~It is intended that the RSD shall be capable of functioning both when in constant communications with the CDCRS and when communications are not available.~~

~~When in constant communications the RSD shall operation in a manner similar to that outlined for the ASD, outlined in Section 14.8.1.~~

~~To support the functionality of the RSD when in a state where constant communications is not available, RSD must be enabled to support a threshold limit of sales. With this, the data communication of the RSD shall be able to be set to occur after an SEPTA-selectable value or number of transactions. Once this threshold has been met, the RSD shall be required to communicate with the CDCRS prior to the sale or processing of any additional Smart Media.~~

~~For each communication with the CDCRS, the RSD shall determine if updates to parameters or other files needed for proper operation of the RSD are available. The RSD shall update and install these files should such files be identified and available.~~

~~When the RSD initiates communications to the CDCRS, it shall attempt to establish a connection for a SEPTA-adjustable number of times, after waiting approximately two minutes between tries. If communications with the CDCRS are not established when all tries have been exhausted, an error message shall be displayed on the RSD display. All RSDs shall communicate with the CDCRS no less than once within and for every 24 period.~~

~~14.11~~14.9 Structure and Finish Requirements

The ASD ~~and RSD~~ shall operate in an indoor environment and shall not normally be subject to adverse humidity, temperatures, or temperature fluctuations. The device software shall be able to be configured remotely by SEPTA from the CDCRS to identify the Smart Media to be sold for each individual location. This shall permit SEPTA to, at any time, revise the type of Smart Media sold or processed at any location to suit SEPTA's changing needs.

The ~~sales devices~~ASD shall be capable of detecting basic internal malfunctions and shall annunciate failures immediately to the CDCRS. The malfunction detection shall cover at least failure of power or control circuitry, and any failure of the Smart Media read/write unit that could result in a false, incomplete, or corrupted encoding of Smart Media.

~~14.9.1ASD~~

The ASD and its peripherals shall be third-party commercially available devices. These devices shall be designed to operate in an environmentally controlled office location.

The ASD shall be based on a desktop PC with required peripherals. The ASD shall automatically configure itself, based on the peripherals connected, including a cash drawer. Communication shall be through the NPT data networks outlined in Section 18.

14.10 Portable Equipment

~~14.11.2~~

~~**A portable version of the ASD shall be provided which uses no networking to permit use at remote locations to store digital pictures and registration data. Upon connection to the CDCRS via the NPT data network (Section 18), all data shall be transferred to a fixed location ASD, and the process of issuing, encoding, and printing Smart Media shall automatically commence.**~~

~~14.9.2RSD~~

~~**RSDs shall be designed for placement on a counter top or desktop, with no fasteners. The unit shall require no other modules or external components for its operation, with the exception of connections for power and data communications. The RSD shall be a compact unit with minimal peripherals.**~~

14.10.1 ~~RSDs power consumption standard 60 cycle, 125V AC, consume less than 5 Amps.~~Portable Administrative Sales Device

A portable version of the ASD shall be provided. It is the intent that the Portable ASD (PASD) will provide SEPTA with all of the functionality of the ASD as outlined in Sections 14.1 through 14.5~~14.5~~.

The PASD shall be based on the Handheld Sales Device Platform and meet all requirements of Section 11. In addition, the PASD shall be capable of communicating wirelessly with a Digital Camera (Section 14.6.6~~14.6.6~~) and Smart Media Photo Printer (Section 14.6.7~~14.6.7~~).

A complete description of the functionality of PASD shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 14-7, PDR 14-8~~PDR 14-6~~, FDR 14-10~~FDR 14-7~~**

14.10.2 Mobile Administrative Sales Device Cabinet

The Administrative Sales Device and all of its peripherals shall be capable of being securely stored and transported within a mobile cabinet. This mobile cabinet shall be industrial grade with a powder coated finish, and be mounted on casters. This mobile cabinet shall feature an upper and lower compartment, as well a slide-out keyboard drawer. Within these compartments, there shall be provisions for securely mounting an ASD and all available peripherals.– Each compartment shall be capable of be securely locked.

When deployed, the cabinet shall incorporate two foldout shelves to provide a suitable workspace for Sales Agents.

~~-~~All electronics equipment shall be connected with a central power distribution module, which receives power from one electrical cord. This power distribution module shall provide power condition and surge protection to protect all electrical equipment within the cabinet.

The Mobile ASD Cabinet shall meet the following criteria:

A.	Weight	100 lbs. (maximum)
B.	Height	66 in. (maximum)
C.	Width	24 in. (maximum)
D.	NEMA Rating	4
E.	IP Rating	54

A complete description of the Mobile ASD Cabinet shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included**. CDR 14-8, PDR 14-9~~PDR -6~~, FDR 14-11~~FDR -7~~**

Section 15 – Parking Systems
Table of Contents

15 PARKING SYSTEMS

15.1 General

SEPTA provides paid parking at many of their Regional Rail stations as well as several other locations. Currently, two different types of parking systems are offered :

- Daily parking, where payment is made each day at the facility. There are two different types of daily parking systems:

  1. o pay-by-space;

  2. o pay-on-foot, within a gated, multi-story parking facility.

- Permit parking, where payment is made once per period of fixed duration (monthly or longer).

Payment for parking shall be provided for within the NPT System. At SEPTA-owned parking facilities, NPT shall provide both a Pay-by-Space and Pay-on-Foot system solution. Within both of these solutions, the NPT System shall allow for Permit parking.

A complete description of the functionality of each of the parking systems, including transaction processing and recording, shall be provided for SEPTA review and approval at each design stage. Design documents shall fully describe the operation, capabilities, and functionality as defined within this section. Design and wording of signage as identified within this section shall also be included. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 15-1, PDR 15-1, FDR 15-1**

All configuration and parameter settings shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-2, FDR 15-2**

15.1.1 Data Storage

Data to be stored and transferred to the CDCRS by the NPT device shall include as a minimum:

- All events and alarms sensed;
- All events and alarms cleared, including the identification of the user who cleared the alarm;

- All completed ~~and~~ transactions, including payment method, change issued, monies inserted and other data to provide a complete record of the transaction;
- All cancelled transactions, including reason for cancellation;
- All changes in status of the device or any module incorporated;
- All configuration changes;
- All successful communications;
- All communication failures;
- Electronic serial numbers of all cash containers;
- Power failures and restorations;
- All accesses to the interior of the device;
- All commands issued by the maintenance, revenue service, and other personnel; and
- Additional information required to provide a complete audit trail for revenues and Smart Media.

15.1.2 Fee Table

The parking equipment shall have the ability to operate under any of a minimum of ten (10) fee tables residing in memory. Each of these fee tables shall be programmable to become the active set at a particular time and date and to expire at a particular times and dates. While only one fee table shall be active at any one time, multiple fee sets shall be able to be activated and used within a single day to suit the various parking customer needs and to cover special parking rates such as evenings, weekends, holidays, “early bird”, “night owl” and other similar events.

They shall provide for pre-loading new fee tables for new fee levels and to implement short-term, temporary special fees (e.g., special event service). The Contractor shall provide details on the fee table configuration, set-up, and capacities. **CDR 15-2, FDR 15-3**

15.2 Pay by Space Parking ~~Equipment~~

A Parking Payment Station (PPS), as outlined in Section 15.2.4~~15.2.4~~15.3, shall enable Customers to pay for parking within individually numbered spaced at designated parking lots.

If a Customer does not have valid Smart Media before entering the parking area, payment can be made for parking privileges at the FVD (Section 5) or the ~~RSD~~ASD (Section 14) when the fare media is purchased. To support this, the functionally of the PPS shall also be provided within the FVD (Section 5) and the ~~RSD~~ASD (Section 14) to enable Customers to pay for parking along with the purchase of fare media.

If an FVD or ~~RSD~~ASD is used for payment of parking fees, revenues for parking fees shall be recorded and tracked separately from revenues for transportation fare payment. Payment may be made by any means accepted by the FVD and ~~RSD~~ASD.

Appropriate signage providing instructions to Customers on the procedure for paying for the parking shall be provided throughout each parking lot by the Contractor.

15.2.1 Transaction Processing

When utilizing the PPS, the customer shall: Enter the number of the parking space in which they parked;

- Select the duration of stay, including multiple days; and
- Provide the appropriate payment (see payment means identified above).

A receipt would be printed for the customer as proof-of-payment.

~~15.2.1~~15.2.2 Payment by ~~Cell~~ Phone, Text, E-mail

In addition to paying for pay-by-space parking privileges using the Parking Payment Station, Customers shall also be permitted to pay for their parking using their cell phone or over the Internet. Payment by the cell phone method shall be through the use of prompted voice responses as well as through sending a text message. Customers shall have the ability of electronically providing their parking lot number and space number to SEPTA and using their NPT customer account to pay for the parking fee.

Each of these payment methodologies shall require Customer pre-registration for this service. No manual input or interaction for payment purposes shall be required for execution and completion of these ~~payment~~ services

A complete description of this functionality shall be provided for SEPTA review and approval at each design stage. Design documents shall fully describe the operation, capabilities, and functionality as defined for this function. **CDR 15-3, PDR 15-3, FDR 15-4**

~~15.2.2Transaction Processing~~

~~When utilizing the PPS, the customer shall: Enter the number of the parking space in which they parked;~~

- ~~Select the duration of stay, including multiple days; and~~
- ~~Provide the appropriate payment (see payment means identified above).~~

~~A receipt would be printed for the customer as proof-of-payment.~~

15.2.3 Permit System~~Permit Issuance~~

Parking permits may be purchased at SEPTA sales locations, via SEPTA operated NPT website, or via the Customer Support Center.

When a monthly pass is purchased by a new parking permit Customer, a separate parking permit which has a visually verifiable expiration date shall be provided. ~~long-range transponder-type or secure bar code parking permit shall also be issued to the Customer.~~ The parking permit shall be displayed in the car by the Customer. The monthly pass shall be electronically linked to the parking permit and maintained in the system as long as payments are made in a timely manner per agreement between the Customer and SEPTA (or its designated agent).

When a monthly pass is purchased by renewing parking permit Customers, the Smart Media ID is provided, the link to the permit shall be maintained (or reactivated as needed) to retain validity of that permit.

~~15.2.4~~15.2.3.1 *Permit Processing*

The Handheld Sales Device (HSD), defined in Section 11 shall be the only equipment required to support the processing of permits at Pay-by-Space parking lots. No additional equipment shall be required.

~~15.2.5~~15.2.3.2 *Enforcement*

SEPTA parking payment enforcement officers shall utilize the HSD. When enforcement is performed, the enforcement agent shall select the appropriate function on the HSD and the information regarding parking payment associated with each parking space shall be accessible.

The enforcement agents shall use this information to visually verify that vehicles are located only in spaces for which payment has been received or that the car in the space has a valid SEPTA paid parking permit.

~~15.3~~15.2.4 Parking Payment Station

The PPS shall enable Customers to pay for parking within individually numbered space~~d~~ at designated parking lots. One or more PPS(s) shall be installed at each designated parking facility, as necessary to support SEPTA's operational needs.

Payment at the PPS shall be made with coins, credit media, debit media~~, stored value on Smart Media,~~ and stored value on a SEPTA customer account.

In addition to accepting and processing parking payments, the PPS shall provide Customers the functionality of an MID as detailed in Section 13.

~~15.3.1~~User Interfaces

The following user interfaces shall be provided on the PPS:

- LCD 4-line 40 character per line display;
- PIN Pad;
- User defined function buttons, minimum of four (4);
- SMP in accordance with Section 4;
- Coin insertion slot;

- Credit card acceptance slot;
- Receipt issue slot;
- Coin return cup.

~~15.3.1.1~~Customer Display

The display shall be mounted at an angle that maximizes the ability of Customers to read the screen while at the same time ensuring that the alignment of any line/arrows to adjacent selection buttons leaves no doubt as to what text or graphic on the screen is associated with each button. The viewing angle should be limited through the use of a polarizing filter to eliminate or reduce side viewing. The display shall have a non-glare finish that can be easily read at all ambient light levels, including direct sunlight.

The display shall be vandal resistant, able to withstand direct blows as defined in UL certification testing. The assembly shall be provided with a UV resistant ¼" polycarbonate cover panel that is also scratch resistant. The cover panel shall be separate from the display, attached to the inside of the door, and easily replaceable. If an overlay is utilized its light transmission shall be 90% or greater.

~~15.3.1.2~~15.2.4.1.1 *Customer Selection Buttons*

Customers shall use the selection buttons to complete the payment transaction. As each selection is made, the display screen shall update to show only those options that are available for selection based upon the Customer selections and operating status. All selections shall provide an audible tone upon being selected.

Buttons for the entry of numeric information shall also be provided and shall not be designated as function keys. The selection keys shall:

- Be made of stainless steel or service-proven materials;
- Have a flat front surface of approximately 1 square inch to provide proper finger contact;
- Not rotate;
- Provide an audible tone upon being depressed;

- Protrude no more than 0.25 inches from the face of the front panel;
- Be protected against vandalism, including impact resistance from pounding, such as by a person's foot or fist;
- Be liquid-proof to provide sealed contacts for all switches;
- Not be removable from the outside;
- Be easily replaceable from the inside;
- Be spaced to accommodate labeling in conformance with ADA requirements; and
- Be non-fading.

The payment station shall incorporate dynamically-defined menus to accommodate all requirements of the SEPTA parking system. When the same function appears in several screens, its location shall be consistent among menu screens.

~~**15.3.2Components**~~

~~***15.3.2.1***~~***15.2.4.2 Smart Media Processor***

Each PPS shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4.

The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

~~***15.3.2.2***~~***15.2.4.3 Coin Acceptance System***

The payment station shall have a coin acceptance system that ~~will~~shall verify and accept current U.S. Coins nickels (5¢), dimes (10¢), quarters (25¢), dollars ($1.00) and current SEPTA adult token. The coin acceptance system shall include the coin slot, coin acceptor, coin vault and coin return cup. Whenever a coin vault is removed, a revenue service audit report shall automatically be generated, in both electronic and printed form. The electronic version shall be forwarded to the CDCRS immediately upon generation.

All coin acceptance system components shall be designed to withstand regular removal, replacement, and normal handling in a transit operating environment without deformation, or in any way interfering with the insertion and removal process. The payment station shall automatically detect the presence or absence of each coin component and the type of coins contained in each component.

Each coin shall be verified using a process that considers diameter, thickness, weight, and metallic content. This device shall have a serialized number that is visually readable. The device shall be secure, and of sturdy construction, manufactured from stainless steel or another SEPTA-approved material.

Verification shall be accomplished through comparison of the inserted coins to stored standards for coins of the same denomination set by the US Mint for those coins in general circulation. Rejected coins shall be returned to the Customer.

Coins shall be stored in the coin vault at the completion of the transaction. The coin vault shall have a minimum capacity of 225 cubic centimeters. The device shall be secure, and of sturdy construction, manufactured from stainless steel or another SEPTA-approved material.

Coin Acceptance Rate

The coin acceptor/verifier shall meet the following acceptance rates:

- 98% of valid coins shall be accepted upon initial insertion.
- 99% of valid coins shall be accepted upon one reinsertion.

All known counterfeit coins, common slugs, foreign coins, and coins of denominations not accepted by the PPD shall be rejected upon every insertion.

The acceptance rate (AR) is defined as follows:

$$AR = \frac{I - R}{I}$$

where: I = Total number of valid coin insertions

R = Total number of valid coin rejections

Coin Accuracy

The coin acceptor/verifier shall identify valid acceptable coins with at least 99.99% accuracy. Accuracy (A) is defined as follows:

$$A = \frac{V - M}{V}$$

where: V = Total number of coins accepted

M = Total number of incorrectly identified coins

~~15.3.2.3~~15.2.4.4 *Receipt Issuing System*

A receipt printer shall be provided and it shall be able to print all alphanumeric characters in both upper and lower case. Printed characters shall be produced with a minimum height of 0.12 inches. The approximate height to width ratio of the characters shall be 5:3. The printer shall be of the direct thermal type.

Receipts shall be at least 2 inches wide by 4 inches long, ~~and~~ shall clearly indicate that the document is a receipt, and shall contain information identified in Federal Regulation E and Z and as required by SEPTA. Receipt rolls shall be not less than 230 feet in length All data to be printed, as a part of the receipt shall be selected by and be changeable by SEPTA. Receipts may be of shorter dimensions is the required information is printed, as approved by SEPTA at PDR. **PDR 15-4**

~~15.3.2.4~~15.2.4.5 *Bank Media Processor*

In order to process credit cards and debit cards, a bank card processor shall be incorporated into the PPS. The bank card reader shall be a dedicated, commercially available “dip-insertion” type reader.

The bank card processor shall be able to read, translate, and transmit complete Track 1 & 2 data encoded on credit/debit cards in accordance with ISO/IEC and ABA standards. Software for readers shall be in accordance with ANSI and ISO/IEC standards for data encryption.

A customer PIN pad shall be provided which operates in both the secure and clear modes to support electronic payment transactions and customer selections. The PIN pad shall conform to ISO/IEC and ANSI X.29 requirements for data entry equipment and encryption.

The PIN pad shall be capable of supporting DUKPT, and operation in both clear and encrypted mode. Buttons necessary to support electronic payment transactions (as defined by banking industry standards) shall be provided. The PIN pad shall be spill and dust resistant.

The PIN pad shall employ methods, visual and audible to indicate to the customer that their action has been recognized as either accepted or rejected.

Full detailed information on the bank card processor and its associated modules, including operation, dimensioned drawings and exploded drawings, shall be provided. **CDR 15-4, PDR 15-5**

~~15.3.3~~15.2.4.6 ~~PPS~~ Communications

PPS machines shall communicate with the CDCRS (Section 19) via the NPT Network (Section 18) to suit the needs of the installation and operation. To support this, the PPS shall be configured, as a minimum with:~~:~~

- integral standard Ethernet Interface with RJ45 connector(s); and
- wireless network interface, compliant with IEEE 802.11n Standard Protocols.

In addition, the PPS shall be capable of being configured to communicate via the Wireless Broadband System outlined in Section 18.

In the event of loss of communication, downloading and uploading of all stored information and operational data shall be possible on a local basis for an individual parking payment station through the use of a compact flash RAM with a minimum capacity of 8GB.

In cases of network failure, the PPS shall have sufficient capacity to store, at a minimum, ten days' event and transaction data. This information shall be stored in both the PPS main memory and in non-volatile memory. Upon successful re-connection of network operations, all stored transaction data (e.g., alarm, event, sales) shall be automatically transmitted to the CDCRS.

~~15.3.4~~15.2.4.7 ~~PPS~~ Structure and Finish

The PPS device shall be constructed of revenue service proven materials. All displays shall be protected by polycarbonate or other revenue service proven materials, which do not inhibit operation. Where metals are exposed, these shall be stainless steel with a random orbital finish.

All exterior surfaces shall be finished to permit easy removal of graffiti. Interior machine surfaces should also be primed and painted, unless they are stainless steel. Regardless of what materials are used, the types of material shall provide full protection against exterior and/or interior rusting.

~~15.4~~15.3 Pay-on-Foot Parking ~~Payment Equipment~~

Contractor shall furnish a Pay-on-Foot (POF) parking system for designated SEPTA garages, replacing the existing systems. The POF system shall:

- accept Smart Media for payment of the parking fee at the entry and exit lanes;
- issue a magnetic parking ticket and accept payment at a pay machine using cash, credit cards, debit cards and Smart Media; and
- accept Smart Media for Permit Parking.

A complete description of the functionality of the POF system and each type of equipment incorporated shall be provided for SEPTA review and approval at each stage of the design review with the final document fully providing:

- identification of each equipment type and component, including hardware manufacturer, model number, software/firmware version and other relevant information;
- dimensioned drawings for the equipment type-;
- complete operational descriptions;
- parameters, including valid ranges and initial settings and
- identification of all equipment functions.

Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 15-5, PDR 15-6, FDR 15-5**

The elements for the POF parking system are described below.

~~SEPTA operates a parking payment system for Pay-on-Foot at two gated parking garages. These systems include ticket-issuing machines, which currently issue magnetic media at entry locations. In addition, barrier gates are present at entry and exit lane locations.~~

~~To support the NPT System, these systems shall be integrated with a Smart Media Processor (SMP) to permit customers to utilize Smart Media for parking payment purposes.~~

~~Appropriate signage providing instructions to customers on the procedure for paying for the parking shall be provided at each location by the Contractor.~~

~~15.4.1Transaction Processing~~

~~The process for the use of the Pay-on-Foot system shall be based on the type of media that the customer has for use in the system.~~

~~If the Customer utilizes stored value, which is registered and provides for autoloading of value, the entry and exit of the facility shall be via the SMPs in the entry and exit lanes.~~

~~If the Customer utilizes stored value, which is not registered and does not provide for autoloading of value, the entry will be through the use of a Smart Media processor in the entry lane but exit shall require the use of a payment processing device (FVD or ASD) at the rail station. When the payment is made, the Customer shall be issued an exit ticket to permit exit from the facility. This shall ensure that there are no backups at the exit lane and shall permit the proper payment to be assured before the Customer advances to the exit lane.~~

~~15.4.2Permit Processing~~

~~At gated facilities, the verification of the parking permit shall be done automatically in the entry and exit lanes upon entry and exit of the vehicle at the facility. At these facilities, Smart Media shall be able to be used for entry and exit. A separate controller shall be provided locally to store the information from the entry lanes where Smart Media was used for entry. The information stored shall include date, time and Smart Media serial number. At the exit lanes when Smart Media is used, the serial number shall be looked up and passback shall be checked. When the validity is verified, the gate shall raise and the vehicle shall exit the facility.~~

~~15.4.3User Interface~~

~~The Customer shall interface with the entry lane equipment and with a payment means located at the station (if needed).~~

~~**15.4.4**Smart Media Processor~~

~~The existing parking equipment shall be upgraded with SMPs. These SMPs shall be used for payment of the parking fee or verification of validity of parking permit. These shall be interfaced to the Pay-on-Foot machines as a separate payment method.~~

~~SMPs shall meet the requirements of Section 15.3.2.1.~~

~~**15.4.5**Control System~~

~~A separate parking controller shall be provided locally to store the information from the entry lanes where Smart Media is used for entry. The information stored shall include date, time, and serial number. At the exit lanes when SEPTA Smart Media is used, the serial number, date, and time of entry shall be looked up and the fee shall be calculated. This amount shall be deducted from the Customer's Smart Media / account. Once the approval is received from the facility controller, the exit gate shall raise and the vehicle shall be permitted to exit.~~

~~The Electronic Control Unit (ECU) within the SMPs in the entry and exit lanes shall control all aspects of the customer processes.~~

~~**15.4.6**Communications~~

~~All SMPs for a parking location shall communicate wirelessly via IEEE 802.11n standard protocol, to the system controller (Section 15.4.5), where the parking information is located. The controller shall communicate with the CDCRS, via the NPT Network (Section 18). To support this, the Controller shall support communications via:~~

~~Standard Ethernet Interface with RJ45 connector(s); and~~

~~Wireless network interface built in, compliant with IEEE 802.11n Standard Protocols.~~

~~**15.4.7**Structure and Finish~~

~~SMPs shall be housed within stainless steel or other revenue service proven materials subject to approval by SEPTA.~~

15.3.1 Pay on Foot Machine (POFM)

The Pay on Foot Machine (POFM) shall accept Smart Media, coins, bills and credit cards and debit cards for payment of parking fees. The POFM shall employ hardware, software and functionality similar to that of the Full Service FVD, except as identified in this Section 15. These shall include, but not be limited to:

- Tokens shall not be accepted as a form of payment;
- Change shall not be issued in $1 coins, but shall be issued in bills;
- Bill vault capacity shall be 1,000;
- Bill escrow shall be not less than fourteen (14) bills;
- Coin vault capacity shall be not less than 75% of the FVD coin vault capacity;
- A minimum of two (2) hoppers shall be provided for the supplemental coin storage system; and
- Voice Instructions shall not be required.

The POFM, including all controls and instructions shall be designed to facilitate a quick understanding by the Customer for its intended use, along with a rapid response to instructions.

Appropriate graphics subject to approval by SEPTA shall be provided to furnish instructions to the Customers on the use of the POFM. Graphics shall also be provided to indicate the coin and bill denominations and payment methods accepted.

15.3.1.1 Payment Processing

For the payment of the parking fee at the POFM, the following payment methods shall be accepted:

- Cash (valid U.S. Currency and coins);
- Magnetic and contactless credit and debit media;
- SEPTA Issued Smart Media;
- Partner-issued Smart Media
- Authorized new payment technologies such as NFC devices as defined in Sections 2 and 4.

For purchases using credit cards, the velocity checks as identified in Section 5.2.3.2 shall be performed at the POFM prior to requesting credit card authorization.

For purchases using debit cards, the velocity checks as identified in Section 5.2.3.3 shall be performed at the POFM prior to requesting debit card authorization.

When the POFM is communicating with the CDCRS, the Bad Number List stored on the CDCRS shall be used for all Smart Media Payments. When CDCRS communications are not available or transactions cannot be completed within the times identified in Section 4, the Invalid Fare Media List resident in the POFM shall be used. The Positive Number List shall also be used to verify the validity of Smart Media, as applicable.

Customer Payment Procedure

The Customer shall insert the entry ticket into the POFM ticket slot. The POFM shall calculate the parking fee owed and display this information to the Customer, who shall select the payment method.

Upon selection of a transaction type, the POFM shall automatically open the apertures for bill and coin acceptance. They shall close only upon the selection of a non-cash payment method.

The Customer shall insert the appropriate coins/bills, insert their credit card or debit card or use their Smart Media to pay the parking fee. Once the payment process has been completed, the POFM shall re-encode the entry ticket with the exit validity and return the ticket as an exit to the Customer.

A receipt shall be issued, printed and cut only if requested by pushing the receipt request button. The receipt shall be requested within a user-settable time after payment.

A button shall be located on the face of the POFM to be used by Customers who have lost their tickets. Operation of this button shall cause a separate Lost Ticket rate to be charged and upon completion of the fee payment, an exit ticket shall be issued to the customer. All Lost Ticket transactions shall provided on an automatically generated daily report which shall be generated and sent to SEPTA-identified individuals each day.

Bank Note Dispenser (BND)

Rather than issuing change in $1 dollar coins, the POFM shall incorporate a bank note dispenser. This BND shall issue change in $1 and $5 bills, as a minimum. The BND shall have the capacity of 1,000 bills for each bill denomination dispensed.

15.3.1.2 Transaction Records

The POFM shall store transaction records for each transaction performed at the POFM as well as for each alarm, event and operator action that occurs at the POFM. The structure and layout of all transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-7, FDR 15-6**

The POFM shall incorporate memory for the storage of not less than 50,000 transactions. The transaction record to be stored by the POFM shall comprise, as a minimum, date and time of payment, machine number, fee paid and ticket entry data - entry lane, entry date & time plus ticket number and/or sequence number.

To protect against missed and duplicate data, each record transferred to or from the POFM shall be serialized. Each time the POFM data is successfully transferred the last transaction number shall be transferred to the CDCRS, and the serialized transaction number shall be automatically reset. Each transaction record shall be unique within the NPT System.

Transaction records shall be stored in the POFM and later transferred to the CDCRS. POFM shall communicate equipment status to the CDCRS upon request. The following events shall be detected and stored, as a minimum:

- Ticket Jam;
- Low Change;
- Low ticket stock;
- Servicing Required;
- Bill Vault Full;
- Bill Vault Early Warning;
- Coin Vault Full;
- Coin Storage Unit Empty – nickels;
- Coin Storage Unit Empty – Quarters;
- Recirculator Empty (plus coin type);
- Bill Dispenser Low (plus bill denomination);
- Bill Dispenser Empty (plus bill denomination);
- Data transfer starts;
- Data transfer ends;
- The internal clock fails;
- The internal clock is reset;
- The POFM memory is about to overflow (SEPTA programmable memory percentage);
- POFM powers off;

- POFM powers on;
- Successful data transfer of transactional data;
- Unsuccessful data transfer of transactional data;
- Successful download of configuration data;
- Unsuccessful download of configuration data;
- POFM module failure;
- Security alarms, errors and intrusions – This information shall be stored in a separate security file at the CDCRS, access to which shall be protected by security password; and
- Results of automatic diagnostics.

15.3.1.3 Revenue Servicing

When the front door is opened and revenue service operation is initiated, the following revenue servicing information shall be maintained and printed upon revenue servicing automatically:

- Bills accepted by denomination;
- Bills dispensed by denomination;
- Coins accepted by denomination;
- Coins dispensed by denomination;
- Dollar value of coins in coin vault;
- Coins by denomination in the change storage unit;
- Coins emptied from any change storage unit for audit purposes;
- Total number of tickets processed;
- Total number of tickets rejected;
- Total number of transactions cancelled;
- Total number of cash transactions;
- Total number of credit card transactions;

- Total number of debit card transactions;
- Total number of Smart Media transactions;

The revenue servicing information shall be maintained since last servicing and transferred to the CDCRS prior to resetting.

15.3.1.4 Diagnostics

The POFM shall be capable of detecting basic internal malfunctions. The malfunction detection shall cover all modules and shall include failure of power circuitry, control circuitry, opening of an access panel, interface failure, and any failure of the SMP that could result in a false, incomplete, or corrupted encoding of Smart Media.

Internal diagnostic programs shall check the POFM and its interfaces for proper performance each time it is turned on. When the performance of any parameter is not according to specification, the POFM shall create a transaction record and transmit it immediately to the CDCRS.~~.~~

Any failure that occurs apart from the diagnostic check shall also be recorded and immediately transferred to the CDCRS. Out-of-service conditions shall be annunciated display. The information displayed shall indicate the type of failure that caused the POFM to shut down. A description of the maintenance and service indicators for the POFM shall be submitted for SEPTA review and approval at the Preliminary Design Review. **PDR 15-8**

15.3.1.5 Structure and Finish

The POFMs shall be ergonomically designed, simple to use, and sufficiently robust to deter and withstand acts of vandalism and Customer abuse. The POFM and the enclosure shall be constructed of ~~ASTM #~~Grade 304L stainless steel with a random orbital finish or other suitably vandal-resistant materials. The Contractor shall provide samples of the proposed material and finish of the POFM enclosure for SEPTA review and approval at the Preliminary Design Review. **PDR 15-9**

15.3.2 Ticket Issuing Machine (TIM)/Exit Reader (XR)

Entry to and exit from the parking facility shall be accomplished through separate lanes within the facility.

- Each entry lane shall be equipped with a Ticket Issuing Machine (TIM) to issue a magnetic ticket to entering Customers and to permit use of Smart Media to enter.

- Each exit lane shall be equipped with an Exit Reader (XR) to process the Customers' exit tickets and Smart Media to permit exit from the parking facility.

The Contractor shall provide appropriate graphics as pre-approved by SEPTA, on or near the TIM/XR, either by displayed messages or by signage, to furnish the customer with parking instructions in English. This information shall include a sign affixed to the TIM alerting the Customer to press the button on the face of the TIM for ticket issuance.

The internal components and cabinets for the TIMs and the XRs shall be the same with the exception that the XRs shall not be required to issue tickets or incorporate ticket stock within this housing.

The TIM/XR shall operate in a stand-alone mode and shall be able to be interrogated by the CDCRS.

The TIM/XR shall only be active to function only if a Vehicle Detection System senses a vehicle in the lane.

The POF system shall incorporate a SEPTA-settable entry grace period. This shall be the time after the valid entry has been made into the parking facility during which the Customer's vehicle may exit the parking facility without payment. This grace period shall have a range of one (1) minute to one (1) hour.

The POF system shall incorporate a SEPTA-settable exit grace period. This shall be the time after the valid payment has been made during which the Customer's vehicle may exit the parking facility without additional payment. This grace period shall have a range of one (1) minute to one (1) hour.

15.3.2.1 Smart Media Processing

Smart Media shall be used at the entry and exit lanes for access to/egress from the parking facility, as well as using a magnetic ticket.

Using the TIM/XR, Customers shall be able to use their Smart Media at the entry and exit locations for entering and exiting a parking facility. Customers shall be able to use the Smart Media for payment (with a stored value purse on the Smart Media) and as a permit valid for a defined period of time.

- For stored value Smart Media, the verification of the Smart Media and deduction of the parking fee can be charged either at the entry or at the exit.
    - When the parking fee is deducted at the entry lane, when presented to the TIM, the validity shall be verified and the proper fee assessed and deducted from the account and the vehicle is permitted entry. At the exit lane if additional fees are required based on length of stay, deduction of the additional fees shall be performed at that time.
    - When the parking fee is deducted at the exit lane, when presented to the TIM, and the validity of the Smart Media is verified, the vehicle is permitted entry to the parking facility. When the Smart Media is presented to the XR in the exit lane, the validity shall be verified and the proper fee assessed and deducted from the account and the vehicle is permitted exit.
- For period permits stored on Smart Media the verification of the Smart Media shall also be performed automatically at both the entry and exit lanes. Validity shall be verified at both locations (by the TIM and by the XR)

If verification is not attained at the CDCRS for these Smart Media transactions, this shall be displayed to the Customer.

For each Smart Media transaction, complete information shall be stored to uniquely identify the transaction within the NPT System and to provide full accountability for the transaction.

The structure and layout of all Smart Media transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-10, FDR 15-7**

15.3.2.2 TIM Requirements

The TIM shall incorporate a Magnetic Media Dispenser, as identified in Section 4, to issue magnetic parking tickets to the Customers. These magnetic parking shall be issued by activation of a pushbutton on the face of the TIM.

The TIM shall fully dispense a ticket for retrieval by the customer in not more than 2.5 seconds from the time the ticket issue button is pushed, provided a vehicle is correctly detected as entering the entry lane.

Automatic ticket retraction shall be provided so that when a ticket is issued and remains in the ticket throat, when a vehicle backs out of the lane, the ticket shall be automatically retracted by the TIM, voided and rendered physically unable to be processed by the cashier terminal.

The TIM shall issue tickets printed with the date and time of entry, lane number and ticket serial number. The same data, at a minimum, shall also be encoded on the ticket, together with a unique facility code that identifies all tickets as having been issued at a particular parking facility. The printed and encoded ticket information shall be unique for each ticket to provide for ticket tracking functionality.

The TIM shall contain a memory capable of storing not less than fifty thousand (50,000) ticket transaction records to provide for situations when the TIM is off-line from the CDCRS. All records shall be transferred to the CDCRS once communication is re-established.

Maintenance Test Ticket

A switch, located in the interior of the TIM shall allow a properly authorized maintenance technician to manually issue a maintenance ticket while performing maintenance on the TIM.

Neither operation of this switch nor pulling of the ticket shall cause a Gate within the entry lane to raise, nor shall the parking facility occupancy counts be affected. These maintenance tickets shall have their data separated from all revenue transactions.

Each time that a TIM issues a maintenance ticket, the TIM shall record incrementally the issuance of such a ticket uniquely identified and counted. Additionally, the TIM shall store an event message of this action.

The maintenance ticket shall be encoded to uniquely identify it as a maintenance ticket. The maintenance ticket shall be processable by the POFM and recognized as such to permit testing of the integrity of the equipment but shall not be usable as a Customer ticket for entry into the parking facility.

Transaction Records

The TIM shall store data for every transaction, including normal and Backout transactions, and forward the data to the facility controller. Transaction data shall include transaction number, entry date and time, entry lane number, parking facility identification and ticket serial number, plus activity indicator (alarm or normal transaction).

Each TIM shall maintain a separate count of the total number of tickets issued, vehicle entries, Backout tickets and Gate movements and shall forward these independent counts to the CDCRS. The TIM shall detect and report the following status conditions to the CDCRS:

- Ticket stock low
- Ticket stock depleted
- Ticket jam
- In service
- Out of service - including reason (by error code number)
- Backout ticket
- Ticket retracted

When displaying and storing alarm and "out of service" status information, the TIM shall also display and store with the event record diagnostic data that provides sufficient information to detail the reason for "out of service" and alarm conditions. The structure and layout of all TIM transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-11, FDR 15-8**

15.3.2.3 XR Requirements

The XR shall incorporate a Magnetic Media Dispenser, as identified in Section 4, to process magnetic parking tickets to the Customers. The XR shall accept and process magnetic parking tickets issued by the TIM and those processed by the POFM as well as Smart Media.

The XR shall verify that valid payment has been provided and that the Customer is permitted exit from the parking facility. The XR shall return unacceptable tickets to the Customer and (1) display to the Customer the cause of rejection and (2) store an event message internally indicating the cause for rejection.

The XR shall contain a memory capable of storing not less than fifty thousand (50,000) ticket transaction records to provide for situations when the XR is off-line from the CDCRS. All records shall be transferred to the CDCRS once communication is re-established.

Transaction details shall comprise, at a minimum, ticket number, any ticket payment data, such as date and time, lane number and fee paid. The XR shall store internally a count of the number of tickets captured. The XR shall report to the facility controller the following status conditions:

- Ticket jam;
- In service;
- Out of service - including reason (by error code number)

The structure and layout of all XR transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-12, FDR 15-9**

15.3.2.4 Common TIM/XR Requirements

The TIMXR shall incorporate the following sub-systems and functions:

- Smart Media Processor – as identified in Section 4;
- Electronic Control Unit – as identified in Section 8.7;
- Diagnostics – as identified in Section 15.3.1.4;
- Communications – as identified in Section 8.8;
- Structure and finish – as identified in Section 2.

Tthe TIM/XR shall meet the structure and finish requirements as identified in Section 15.3.1.11.

15.3.3 Parking Gates and Vehicle Detection

15.3.3.1 Parking Gate Function

All entry and exit lanes shall be equipped with parking gates, with lift barriers. These shall be straight arm or bi-fold to suit the installation requirements at the facility. All entries and exits of vehicles while the gate is in the raised position shall be separately maintained, with counts provided hourly, as a minimum.

The gate shall operate with TIMs and XRs. The gate shall be designed to operate as both a stand-alone and on-line unit for continuous unattended operation.

The gate arm shall be constructed of wood and finished in a highly visible enamel. The gate shall be equipped with a breakaway gate arm flange to ensure a clean break of the gate arm if struck by a vehicle.

The gate shall be constructed so as to prevent any vehicle from passing under, or around, the arm when the gate is in a lowered (closed) position. When progressing downward, in the event that the gate comes into contact with a vehicle or other object, it shall immediately reverse direction and remain in the raised position until:

- lowered by remote command;
- a vehicle activates the gate closing loop by passing through the lane in the proper fashion; or
- upon expiration of the variable gate timer (user-settable from 1 to 15 seconds).

The CDCRS shall indicate "Gate Down", "Gate Up", "Gate Out of Service" status conditions for lane operation and monitoring.

15.3.3.2 Vehicle Detection

Vehicle detection shall be achieved by multiple loops within each entry and exit lane:

- Two (2) loops shall be utilized in each entry lane to activate each TIM. Where possible, dual loop vehicle detectors shall be utilized.
- Two (2) loops shall be utilized to activate each XR.

- An additional loop shall be provided in each lane just clear of the gate to initiate gate closing.

Vehicle detectors shall incorporate multiple frequencies, sufficient to eliminate interference between loops in adjacent lanes and within the same lane. Vehicle detectors shall be digital and self tuning. Sensitivity and accuracy of the detectors shall not be affected by the speed of the vehicle.

Vehicle detectors shall be provided within the parking equipment. Separate date and time stamped transaction records, as well as accumulated counts, shall be generated and stored for each of the following situations

- Ticket issue from the TIM shall take place only upon the sensing of a vehicle over the two activating loops in the correct sequence. Counts of such occurrences shall be generated after proper vehicle sensing.

- Ticket processing by the XR shall occur only upon the sensing of a vehicle over the activating loop. Counts of such occurrences shall be generated after proper vehicle sensing.

- If the vehicle detection system detects a vehicle backing out of any entry lane after a ticket is pulled, the ticket shall be voided and shall not be usable for fee payment at any POFM. (Hereinafter called "Backout type 1".) The vehicle detection system shall cause the CDCRS to increment the Backout type 1 count and store the event information.

- The vehicle detection system shall be able to sense and report to the CDCRS the occurrence of an illegal forward condition, which occurs when a vehicle enters the parking facility through a lane without a proper vend signal being generated by the revenue control equipment.

- The vehicle detection system shall be able to sense and report to the CDCRS the occurrence of an illegal reverse condition, which occurs when a vehicle exits the parking facility through a lane without a proper vend signal being generated by the revenue control equipment.

The structure and layout of all vehicle detection transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-13, FDR 15-10**

15.3.3.3 Transaction Data

Gate raise counts, illegal forward counts and illegal reverse alarms generated shall be communicated to the CDCRS in response to a polling request. These alarms, event messages and status messages shall be generated and stored within the gate or within other lane equipment, such as the TIM or the XR.

At a minimum, the gate shall sense the following conditions and provide event messages to the CDCRS which shall be dated and time stamped:

- "Gate up too long" - greater than 2 minutes;
- "Manual Gate raise";
- "Gate arm rebound";
- "Gate raised with key";
- "Gate lowered with key".

When displaying and storing alarms and "out of service" status information, the gate shall also display and store with the event record diagnostic data that provides sufficient information to detail the reason for "out of service" and alarm conditions. The structure and layout of all parking gate transaction records shall be subject to SEPTA review and approval at the Preliminary and Final Design Reviews. **PDR 15-14, FDR 15-11**

15.3.4 Lot Full Signs

The Contractor shall include software to permit the integration of Full signs at the approach road(s) to each POF parking facility. These full signs shall indicate space conditions according to three (3) categories of Customers as follows: Daily, Permit and Total occupancy. These signs shall be controlled by the CDCRS. Once full signs are installed, the parking system would operate as follows:

- A red lit sign displaying each combination of the conditions stated above shall indicate that there are no spaces remaining for the particular categories shown. These signs shall be easily readable from vehicles approaching the lot from a distance of fifty (50) feet or more.

- When there are daily Customer spaces remaining, the lot full -signs shall be extinguished.

- When no daily Customer spaces are available within a parking facility, the system shall cause the Full Sign to be illuminated, which shall in turn cause (1) the TIM to be inhibited and (2) the gate to remain in the down position, across the entry lane and inoperative for daily Customer customers. Permit customers shall be able to enter the parking facility when the sign is lit.

- Upon reaching a SEPTA-selected number of available spaces within each parking facility, the Full sign shall be extinguished and the entry lanes shall operate in the normal manner.

Section 16– Access Control System
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16 ACCESS CONTROL SYSTEM

16.1 General

As part of the NPT System, SEPTA shall transition to ISO/IEC-14443 compliant Smart Media for access to control facilities and locations, as well as for time reporting functions. The Smart Media shall provide a secure platform for both access and reporting functions.

To provide for the use of ~~SEPTA-issued Smart~~SEPTA Issued Smart Media for access control, Contactless Access Readers (CARs), using the same hardware as the Smart Media Processors identified in Section 4, shall be provided. The same item of ~~long-term Smart~~SEPTA Issued Smart Media used by SEPTA personnel as payment for transportation shall be used for access control.

To support and administer access privileges on SEPTA media, an Access Control Administration Server (ACAS), as outlined in Section 16.5, shall be provided.

The CARs shall verify access based on the information stored on a piece of Smart Media. This process shall be augmented by the information available from the ACAS, when available. However, the presence of an online connection to the ACAS shall not be necessary to provide controlled access at a CAR.

To facilitate access control with the new SEPTA issued Smart Media, all existing access readers currently installed on SEPTA property shall be replaced. In addition, certain SEPTA locations shall be upgraded with access control, which at present do not have this functionality.

A complete description of the functionality of the entire Access Control System shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within this section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 16-1, PDR 16-1, FDR 16-1**

16.2 Functional Requirements

The CARs shall operate in a read-only mode and shall not modify the data stored on the media. The CAR shall electronically read data on the Smart Media and access shall be either granted or denied at that particular location based on the access privilege information:

- When access is granted, the door associated with the CAR shall unlock for access and a green indicator light shall illuminate for a period of not less than two (2) seconds and an audible "granted" tone shall sound;

- When access is denied, the door associated with the CAR shall remain locked for access and a red indicator light shall illuminate for a period of not less than two (2) seconds and an audible "failure" tone shall sound.

If a CAR cannot read the Smart Media due to bad data, the red LED shall flash, the “failure” tone shall sound and a transaction record shall be generated and transferred to the ACAS, via the network connection.

If the CAR is off-line from the ACAS, the green LED shall flash, but no tone shall sound. The LED shall flash the entire time the CAR is offline. The CAR shall store an event message when it is sensed as being offline.

When online with the ACAS, access privilege verification shall be based upon the validity data stored on the Smart Media and in ACAS. When offline, these decisions shall be based on the Smart Media and on local decisions (based on the information stored in the CAR memory). The data required to be stored locally in the CAR shall include only that information needed to grant access.

In an online condition, the CAR shall process information-based instructions received from the ACAS, regardless of information stored on the media.

When access is granted and the door is unlocked, the door shall remain unlocked for not more than a SEPTA-settable time period. After this time period has expired, the door shall relock and another record shall be stored indicating the lack of passage.

After each use of media at a CAR, a transaction record shall be generated and transferred to the ACAS, via a network connection. When multiple activities occur for each “read”, such as expiration of a defined time period, a transaction record for each activity shall be stored. Any alarm or event transaction record shall be able to be forwarded to any location on the SEPTA WAN immediately, upon receipt at the ACAS

Programming the CAR shall be provided both via the ACAS and locally. If programming is performed locally, all information programmed shall be forwarded to the ACAS as soon as communication is available. This information shall be forwarded to the SEPTA-designated individual responsible for the ACAS.

16.3 User Interface

Interaction of the CAR with the individual shall be via an LED and an audible enunciator. Two LEDs shall be provided, one red and one green. Functionality of the LEDs shall be as identified in Section 16.2.

Audible enunciation shall be provided to indicate to the user the results of the media reading by the CAR. Functionality of the audible enunciators shall be as identified in Section 16.2

16.4 Smart Media Processor

The CAR shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media Processor (SMP) as identified in Section 4. The SMP shall be modularly upgradeable so that it does not need to be replaced in its entirety to increase memory capacity, to upgrade processing performance, to provide for additional Smart Media functionality or to maintain compatibility with ISO/IEC-14443 standards as they develop.

16.5 Access Control Administration Server

The basis for the Access Control Server (ACAS) shall be the Administrative Sales Device outlined in Section 14. The ACAS must include a Smart Media Processor, in addition to the standard monitor, keyboard, and mouse that are included with the ASD. However, the ACAS shall not include any other peripherals, required or optional, that are part of the ASD.

With the exception of peripherals, the ACAS shall fulfill all requirements for the ASD as outlined in Section 14.

16.5.1 Access Control Database

All data associated with the Access Control System shall be stored in a database structure. This database structure shall be based on that of a commercially available database product, such as Microsoft Access. Contractor's use and implementation of this database shall not contain any non-standard or proprietary instructions or commands.

The Access Control Database shall store all data relating to the operation of the Access Control System in one relational database file, consisting of multiple tables, stored procedures, and queries. The Access Control Database shall be ODBC compliant such that data may be exchanged as necessary with other compliant applications. The database manager shall support standard Structured Query Language (SQL) commands and queries.

The Contractor shall provide SEPTA with the means to configure all database tables, relationships, system queries, and automated procedures. This shall include all necessary functions to generate and modify both queries and to integrate with other software application.

16.5.2 Access Control Manager

Access Control Manager shall provide all necessary functions to support SEPTA's use of Smart Media for access control. This control may be accomplished via either online between the CAR and the ACAS or locally at the CAR, based on information encoded on the presented media.

To support access control, in an online environment, the Access Control Manager needs information regarding the location of all CARs and regarding Employee passes information. To support this, the Access Control Manager must communicate with the Local Application Server of the CDCRS (Section 19) to retrieve an active listing of employee-enabled passes. Through the Access Control Manager, it shall then be possible for access to be granted to a specific card, at a specific location, by looking up a CAR location and an employee ID, and selecting an option to grant access at this location. At no point in this process shall it be required that an employee ID be presented.

To support access control, in an offline environment, the Access Control Manager again needs information regarding CAR locations and active Employee passes. However, for this condition, an administrator shall be responsible for specifying the CAR for which access is to be granted, and then presenting the associated Employee pass(es). The Access Control Manager shall instruct the SMP on the ACAS to properly encode the card for access privileges at the previously specified CAR.

The Access Control Manager shall be responsible for verifying that all presented media are read against the list of eligible employees from the CDCRS (via the Local Application Server), to ensure that only valid employee media is processed. In addition, the Access Control Manager shall monitor the employee list, looking for any changes in passes that would be a cause for revocation of access permissions. For any employee pass that is deactivated, the Access Control Manager will immediately terminate all associated access permissions.

Through the ACAS, the Access Control Manager shall be capable of ~~writing~~ encoding the necessary magnetic data ~~information~~ to a SEPTA employee pass to enable locally authorized access control at the CAR. The information written to the card and the encryption method, are outlined in Section 4. The Contractor shall be responsible to identify any additional information that must be added to the ~~card~~Smart Media, beyond the requirements of Section 4, to support the needs of the access control functions. This information shall be submitted to SEPTA for review and approval.

The Access Control Manager shall be also be required to meet the requirements of Section 19.1 and 19.3

16.5.2.1 Access Reporting

In addition, the Access Control Manger shall provide users with the ability to track and report system information and events at a specific location or by one or more users. The software shall be provided to enable authorized users view predefined reports. The Contractor shall provide no less than ten predefined reports that will be provided as part of the Access Control Manager. These reports shall be defined by SEPTA prior to PDR. In addition, this application will allow authorized users to develop new or modify existing queries and reports.

This application shall be capable of running reports on demand or at predefined times. Users shall be capable of printing reports as well as exporting to common software application formats, including Microsoft© Word (.doc), Microsoft© Excel (.xls) and Adobe© Portable Document Format (.pdf).

This application shall also permit authorized users to design and customize reports. This feature shall allow users the ability to select, sort, and summarize data on associated fields, such as CAR, location/ station, time period, or user(s). The system shall provide the user with the abilities to generate reports utilizing various data sets, with grouping, sorting, and totaling capabilities. With this, menus and screens to support the generation of reports, as well as the timing and location of the resulting output shall be provided.

Reports and queries shall be capable of being executed as they are created and shall be capable of being saved and added to the Access Control Manager menu. Customized queries and reports shall be treated by the Access Control Manager, the same as any Contractor-supplied query or report. Authorized users shall also be able to edit and delete any customized query or report.

Predefined input forms for all information to be entered by system users shall be provided. These input forms shall be displayed on screens and provide “fill-in-the-blank” simplicity of use. Each blank on the input form shall correspond to a field in the associated database table. The general design of input forms shall be submitted for SEPTA’s review and approval.

Output format of all reports shall be of similar style. Each shall produce data in tabular form with columns clearly titled on each page.

Prepared report formats shall be provided by the Contractor at time of system and prototype testing. The reports and queries shall be presented in a menu form for selection at any time. Each shall have access permissions assigned to limit availability to those users authorized to utilize the query or report. Users shall have the option of routing standard report outputs to a workstation screen, a downloadable file, a temporary file for subsequent use, or to a selection of printers (either network or remote)

The validity of presented data shall be indicated on each query and report. If an item of equipment is not polled, query and report outputs shall clearly indicate for which items of equipment data is not included.

16.5.3 Data Retention

The Access Control Manager shall store all information for a pre-defined amount of time in the specified database format, and such information shall be available for SEPTA use in an accessible format. This time period shall be initially defined as five (5) years and shall be modifiable by an ACAS administrator. The ACAS allow for the move of detailed access control data older than this period of time, to offline storage per the requirements of Section 16.5.5.

Following successful archival of access control data, it shall be deleted from the ACAS database.

16.5.4 Data Redundancy

The ACAS shall be designed so that all data is stored redundantly. Redundancy shall be maintained throughout the system. The ACAS shall utilize a RAID 5 array for data storage.

Redundant information shall be stored so that no subsystem failure shall compromise copies of the data.

Procedures, documentation, and training shall be provided for restoration of data from any redundant sources in the event of failure in primary data storage. The Contractor shall provide details and information on the data redundancy scheme employed for SEPTA's review and approval.

16.5.5 Data Backup and Archiving

The ACAS shall have a means for regular automated backup and archiving to separate secure storage media. The back up process shall clearly define the appropriate verification, recovery and restoration procedures, and clearly demonstrate a successful process without loss or duplication of data. There shall also be defined processes for automated data archiving.

The Contractor shall be responsible for defining the backup and archive media as well as the associated procedures for both backup and archiving. The Contractor shall provide details and information on the data backup and archiving schemes employed for SEPTA's review and approval.

16.5.6 Disaster Recovery

The Contractor shall design the CDCRS system to be incorporated into SEPTA's Disaster Recovery Plan. This includes the establishment of a second, identical ACAS, to be deployed at SEPTA's Business Recovery Site. Both instances of the ACAS shall be responsible for being in constant communications via SEPTA's existing communications path between 1234 Market Street and the Business Recovery Site. Through this link, each ACAS shall be maintained as a mirror image of the other.

In the event that the main ACAS within SEPTA IT Department's Data Center is force offline for any reason, the backup ACAS at the Business Recovery Site shall seamlessly take control of access control operations

16.6 Communications

The ACAS shall be connected to all the CARs via SEPTA's existing WAN. To support this, each CAR shall:

- Be equipped with an RJ-45 Ethernet port;
- Support the TCP/IP protocol;
- Support both Dynamic and Static IP addressing.

The CAR shall be identifiable to the system by a unique numeric identifier. Use of the CAR's IP address for identification purposes is not acceptable.

Any contractor-installed network equipment shall meet all requirements for wired networking in Section 18.

16.7 Structure and Finish

The CAR shall be suitably enclosed to protect its electronics and its internal mechanisms. The CAR shall also permit behind-the-wall installation.

The CAR shall be of modular construction to permit simple plug-in replacement in the event of a malfunction. The CAR shall be constructed so that removal of the antenna shall not exceed ten (10) minutes.

Section 17– Revenue Processing System
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17 REVENUE PROCESSING SYSTEM

17.1 General

The NPT System shall incorporate a new Revenue Processing System. This system shall include software to track money containers, count their contents, and compare these to registered revenue. The NPT System shall provide the detailed information (cash contents and cash container serial number) from the NPT equipment to the NPT CDCRS. Data shall be transferred on a real time basis.

The Cash Room shall have one or more computer workstations connected to the CDCRS that are dedicated to revenue processing functions. These workstations shall allow authorized users to control the revenue reconciliation for the system and accountability for the Cash Room.

At no time shall these workstations display any data for the calculated contents of any cash container as determined by data extracted from NPT System components.

One or more similar workstations shall permit authorized individuals to read the barcoded serial numbers for the NPT System cash containers and have the totals of coins and bills counted (by denomination) verified automatically based on counts provided by the revenue counting equipment.

All cash containers shall have a permanent barcode affixed. This shall enable the serial number to be accessed to permit reconciliation of counted funds versus actual funds in the cash containers. The following are defined as cash containers in the NPT System:

- FVD bill vault;
- FVD coin vault;
- FVD coin hoppers; and
- FVD coin recirculator units.~~;~~

Additional equipment for the counting facility shall be supplied as necessary to assure that all funds are properly counted, and to permit routine audits of NPT equipment. Such equipment shall include one or more devices to:

- Purge and fill coin hoppers;
- To sort and count coins;
- To count bills; and
- To empty coin hoppers.

Information from all operations with the cash containers, the creation of transaction records, the association of revenues and the reconciliation between actual counts and registered counts shall be provided by the Cash Room Manager as identified in Section 19.

17.2 Bar Coding Requirements

Each cash container shall incorporate a permanent, unique serial number. This serial number shall be located in an easily visible location. The equipment serialization scheme shall be submitted at Final Design Review for SEPTA approval. **FDR 17-1**

All cash containers identified above shall have individual barcoded numbers, which shall be read and recognized when the cash containers are emptied at the Cash Room. Each cash container shall be identified with a barcode of standard format including a manually readable serial number of the barcoded number. This barcode shall be placed in an easily accessible location to permit manual reading as well as automatic scanning. This barcode shall be provided in the same location for each module of the same type. The barcode format and numbering scheme shall be provided for SEPTA approval at the Preliminary Design Review.

The CDCRS shall maintain and control all barcode software and any files, which are created, for use by the barcode system. This includes the lists for each of the different types of NPT equipment barcoded.

Barcode readers, interfaced to the NPT System, shall be provided at each workstation in the Cash Room for entering the cash container barcode into the NPT System during the revenue counting activities.

17.2.1 Barcode Reader

~~The b~~Barcode readers shall be a rugged and industrialized non-contact handheld scanner with ergonomic design characteristics. The barcode reader shall provide fast and accurate reading of all one dimensional (1D) bar codes, including damaged, dirty, and poorly printed one-dimensional ~~(1D)~~ bar codes. The barcode reader shall be easy-to-use, comfortable to hold, and intuitive to operate from either a standing or sitting position.

The barcode reader shall provide multiple modes of confirmation to the user to ensure clear interpretation of each read attempt. At a minimum, bright LED and beeper notifications shall be used with user adjustable settings included for each mode of notification. The bar code reader shall identify valid and complete reading of bar codes as well as invalid and incomplete reads, with clearly discernable methods of confirmation.

The barcode reader shall be designed and is intended for use in a commercial/industrial environment. It shall withstand rough handling including repeated drops from four feet above ground level to a concrete floor without damage or change in bar code reading capability and accuracy..

The barcode reader shall accurately read barcodes of at least five (5) mils (0.127 mm) in dimension. The barcode reader shall accurately decode barcodes at a maximum distance of at least twelve inches (12”) from the nose of the reader to the barcode.

The barcode reader shall utilize either keyboard wedge or USB cable standards for interfacing with the workstation. The barcode reader shall support power drawn from the host via the keyboard wedge or USB cable. The reader shall also support power supplied using an external power source. The supplied cable for interfacing with the workstation shall be coiled cable with a minimum length of nine feet (9’). The barcode reader software shall be compatible with Microsoft Windows XP® Operating System.

17.3 Bill Counting System

Bill counting hardware shall be provided and interfaced with the NPT System to permit the bills removed to be automatically faced, sorted, counted, and bundled into known denominations and values. A minimum of 19 different varieties of bills shall be able to be processed

by the bill counting system without need for hardware or software modification.

NPT System shall require the cash container barcode to be read prior to the bill counting system being permitted to operate. Once the barcode is scanned, all counts from the bill counting system shall be associated with that cash container.

The bill counting system shall permit multiple runs of bills to be performed and provide counts for each run, permitting the user to select the one to associate with the cash container.

All of these records shall be transferred to the CDCRS immediately upon their creation.

The bill counting system shall process not less than 1,000 bills per minute with the bills inserted in multiple orientations. The bills shall be stacked and faced in the same orientation once the processing is complete.

The user interface shall employ a flat panel touch screen monitor. The bill counting system shall be controlled by an industrial grade computer processor or current manufacture and proven in operation.

A complete description of the functionality of the bill counting system shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 17-1, PDR 17-1, FDR 17-2**

Bill Accuracy

The bill acceptor/verifier shall identify valid acceptable bills with at least 99.99% accuracy. Accuracy (A) is defined as follows:

$$A = \frac{V - M}{V}$$

where: V = Total value of bills counted

M = Total value of incorrectly identified bills

17.4 Coin Counting System

Coin counting hardware shall be provided and interfaced with the NPT System to permit coins to be automatically sorted, counted, and bagged by denomination. A minimum of seven different denominations of coins shall be processed by the coin counting system without need for hardware or software modification. The coin system shall accommodate at least eight containers for the sorted coins at one time.

NPT System shall require the cash container barcode to be read prior to the coin counting system being permitted to operate. Once the barcode is scanned, all counts from the coin counting system shall be associated with that cash container.

The coin counting system shall permit multiple runs of the coins to be performed and provide counts for each run, permitting the user to select the one to associate with the cash container.

All of these records shall be transferred to the CDCRS immediately upon their creation.

The coin counting system shall process not less than 4,000 coins in a minute.

The interface with the user shall employ a flat panel touch screen monitor. The coin counting system shall be controlled by an industrial grade computer processor or current manufacture and proven in operation.

A complete description of the functionality of the coin counting system shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 17-2, PDR 17-2, FDR 17-3**

Coin Accuracy

The coin acceptor/verifier shall identify valid acceptable coins with at least 99.99% accuracy. Accuracy (A) is defined as follows:

$$A = \frac{V - M}{V}$$

where: V = Total value of coins counted

M = Total value of incorrectly identified coins

17.5 Coin Hopper Emptying Devices

Devices to fully empty all versions of FVD coin hopper shall be provided and interfaced to the NPT System.

Coins emptied from these hoppers shall be counted using the coin counting system. Creation of transaction records and association of the counts with the FVD cash container shall be provided in the same manner as for other cash containers.

The coin hopper emptying devices shall process not less than ~~10,50~~00 coins in a minute.

As needed, the coins shall be able to be counted and the counts manually registered.

A complete description of the functionality of the coin hopper empting devices shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as described within section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 17-3, PDR 17-3, FDR 17-4**

Section 18 – Communications and Systems Interfaces
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18 COMMUNICATIONS AND SYSTEMS INTERFACES

18.1 General Requirements

For the New Payment Technologies (NPT) System, all communications and systems interfaces shall be designed to be both robust and secure. As required by Section 5, all communications networks, shall comply with the Payment Card Industry Data Security Standard (PCI DSS) and utilize End-to-End encryption. ~~All NPT devices, networks, and the CDCRS shall comply with the Payment Card Industry Data Security Standard (PCI DSS).~~ All connections, other than individual NPT device connections, shall incorporate redundant data paths to ensure reliable systems communications. All communications interfaces shall, to the extent possible, automatically isolate and/or recover from failures and errors. The NPT communications systems shall also be responsible for providing adequate bandwidth to each NPT device such that there are acceptable levels of data throughput, as defined by SEPTA.

All networks shall be designed, configured, and installed in a non-proprietary manner.

~~The~~ NPT Contractor shall contract directly with all wireless communications providers needed to meet the NPT System requirements. Provisions within such a contract shall be incorporated to ensure ~~that the~~that the wireless contract is assignable to SEPTA at the conclusion of the Contract period, at the same compensation rates meeting the same requirements as provided to the NPT Contractor.

~~All communications equipment that is installed on SEPTA's property shall be come property of SEPTA at the acceptance of each phase of implementation.~~

This Section also describes the communications cabling interface and demarcation requirements within SEPTA's communications rooms. The interface to SEPTA's existing communications infrastructure shall occur at the designated project demarcation points located inside these communications rooms. The subsystem cable type and interfaces required for each of the various equipment types are described within this Section.

The Contractor shall provide and install cabling and support equipment, including punch-down blocks, patch panels and other identified cable terminations between the fielded equipment located throughout each station facility and the local communications room. The demarcation type for each subsystem cable type shall be consistent at each facility and location.

All NPT Networks, including hardware and cabling, shall be designed to meet all financial transaction requirements outlined in all sections of the Technical Specification. Where the requirements of this section conflict with that of another section, the more stringent requirement shall be applicable.

Additionally, all requirements in this section shall be regarded as design minimums. The Contractor shall be responsible to meet or exceed any requirement of this Section, as necessary to support the transactional requirements outlined in all other sections of this Technical Specification and the Contract Documents. This includes responsibility for all leased services and for communications utilizing SEPTA provided fiber optics.

No portion of this Section 18 shall be interpreted as superseding this requirement.

18.1.1 Network Configuration Plan

Within 30 days of NTP, the Contractor shall submit a Network Configuration Plan to SEPTA for review and approval. **CDRL 18-1** The Contractor's Network Configuration Plan shall be sufficiently comprehensive to enable SEPTA, with a high degree of confidence, to review the Contractor's intended approach for network architecture and design as well as to verify that the Contractor will meet the stated requirements, and to enable SEPTA to monitor the contractual effort through all stages of NPT System implementation and warranty.

18.1.2 System Capacity and Availability

~~18.1.1~~*18.1.2.1 System Capacity~~Reliability~~*

All Contractor provided networks and sub-network elements (i.e. Access Points, switches, routers, and other S~~s~~ystem parts) shall have sufficient bandwidth to support the specified transaction times (See Section 4.3) of all devices, as outlined in Section 4, concurrently while in revenue operations 99.9% of the time. Conformance shall be determined for each individual LAN such as each Station LAN, Garage LAN, and sub-network elements as well as performance of the overall NPT system WAN.

Leased communications services, both wired and wireless, shall have the same capacity performance as Contractor supplied equipment, unless otherwise approved by SEPTA.

The Contractor shall provide reports regarding system capacity performance as requested by SEPTA, but at a minimum on a monthly basis showing daily performance.

~~**18.1.1**~~These capacity criteria shall apply to all scheduled and unscheduled network outages, regardless of whether the system is in Revenue Operations. No network maintenance activities shall be scheduled while the NPT System is in revenue operation. All scheduled network outages shall require prior written approval from SEPTA.

Details regarding System Capacity shall be submitted for SEPTA's review and approval as part of the Network Configuration Plan. This information shall be provided for ~~-~~SEPTA review at the Conceptual Design Review, Preliminary Design Review, and for approval at the Final Design Review. **CDR 18-1, PDR 18-1, FDR 18-1**

~~**18.1.1**~~

~~**18.1.1**~~

18.1.2.2 System ~~Capaci~~Availability

All Contractor provided networks and sub-network elements (i.e. Access Points, switches, routers, and other S~~s~~ystem parts) shall be in service to support the specified transaction times (See Section 4.3) of all devices, as outlined in Section 4, concurrently 99.99% of the time. Conformance shall be determined for each individual LAN such as each Station LAN, Garage LAN, and LAN elements such as switches, routers and Access Points, and other equipment, as well as performance of the overall NPT system WAN.

Leased wired communications services shall have the same availability performance as Contractor supplied equipment, unless otherwise approved by SEPTA.

All leased wireless communications shall be available in 95% of the SEPTA Service Area, 95% of the time measured on a daily basis, unless otherwise approved by SEPTA.

~~18.1.1~~These availability criteria shall apply to all scheduled and unscheduled network outages, regardless of whether the system is in Revenue Operations. No network maintenance activities shall be scheduled while the NPT System is in revenue operation. All scheduled network outages shall require prior written approval from SEPTA.

Details regarding System Availability shall be submitted for SEPTA's review and approval as part of the Network Configuration Plan. This information be provided for SEPTA review at the Conceptual Design Review, Preliminary Design Review, and for approval at the Final Design Review. **CDR 18-2, PDR 18-2, FDR 18-2**

~~18.1.1~~

~~All NPT networks shall be designed to be highly reliable. The NPT networks shall meet the following operational and reliability criteria:~~

- ~~Wired Networks: Have sufficient bandwidth to support the specified transaction times of all wired devices concurrently while in revenue operations 99% of the time, measured on a daily basis, at all wired locations.~~

- ~~Wireless Communications: Have connectivity and sufficient bandwidth to support the specified transaction times of all wireless devices concurrently while in revenue operations, in 95% of the SEPTA Service Area, measured on a daily basis, 95% of the time. This includes having a minimal signal strength of no less than -70dBAm as measured from inside any vehicle or station under normal operating scenarios~~

~~For the above criteria, reliability shall be determined independently for each network outlined in Section 18, and shall not be presented as an aggregate for the entire system. Furthermore, this reliability criteria shall apply to all scheduled and unscheduled network outages, regardless of whether the system is in Revenue Operations.~~

~~No network operations or maintenance shall be scheduled while the NPT System is in revenue operation.~~

~~All scheduled network outages shall require prior written approval by SEPTA.~~

~~Service Level Agreement~~

~~The above outlined reliability criteria apply to all leased services. For any leased service, including leased lines and wireless coverage, a Service Level Agreement (SLA) shall be provided.~~

~~The SLA shall, at a minimum:~~

- ~~Specify that for leased wired services, the service shall be available 99% of the time, measured on a daily basis, with sufficient bandwidth to~~

~~support the necessary transaction times of all devices concurrently while in revenue operations. This agreement shall not be restricted to times when the NPT System is in revenue operation, as maintenance operations will also rely on the leased services.~~

- ~~Specify that for leased wireless services, the service shall be available in 95% of the SEPTA Service Area, in 95% of the time, measured on a daily basis, with sufficient bandwidth to support the necessary transaction times of all devices concurrently while in revenue operations.~~

~~These agreements shall not be restricted to times when the NPT System is in revenue operation, as maintenance operations will also rely on the leased services.~~

~~A SLA shall be a guarantee to SEPTA, regardless of any agreements between the Contractor and the provider of the Leased Lines.~~

~~18.1.2~~18.1.3 Fiber-Optics

~~*18.1.2.1*~~*18.1.3.1 Multimode Fiber*

The NPT System, where necessary, shall utilize fiber optics cabling. This includes fiber optic interconnect cables, including but not limited to jumpers (patch cords) and pigtails, used to connect the Distribution Frame Patch Panels with fiber optic modems. Connectors on each end of these interconnect cables shall be compatible with the equipment connectors to which they are to be attached. The Contractor shall properly install and terminate all fibers including spares with approved connectors.

All cables shall be cut to proper length before assembly. No wires/cables shall be doubled back to take up slack. Cables shall be properly secured to the fiber management system or fiber equipment. Cable slack shall be provided to facilitate the removal and replacement of assemblies, panels, and modules for maintenance.

All multimode type fiber optic cable shall meet the following requirements of EIA/TIA-455-A:

A. Impact resistance of 25 impacts, maximum attenuation variation 0.2 dB;

B. Tensile strength 600 N (long term - operating), maximum attenuation variation 0.2 dB;

C. Low and high temperature bend, maximum attenuation variation 0.2 B;

D. Compressive strength 220 N/cm;

E. Cable twist one 360 degree twist in 4 meters maximum attenuation variation 0.1 dB;

F. Cable freezing meets or exceeds EIA/TIA-455-A paragraph 98 test criteria;

G. Cable flexing 25 cycle (2-x O.D. bends), maximum attenuation variation 0.1 dB;

H. Bend radius static tests;

I. Meet or exceed EIA/TIA-455-A paragraph 104 at 20x O.D.;

J. Meet or exceed EIA/TIA-455-A paragraph 33 at 10x O.D.;

K. Cable aging test 120 hours at 85 degrees C;

L. 96 hours maximum attenuation of 0.2 dB/km;

M. 120 hours maximum attenuation of 0.4 dB/km.

The fiber in all cables must be usable and meet the required specifications. Each optical fiber shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification. Each optical fiber shall be proof tested by the fiber manufacturer at a minimum of 100,000 psi.

All fiber shall

be flame retardant per the requirements of IEC 60332-3-24 and meet the low smoke requirements of UL 1685 and IEC 61034-2. In addition, all fiber shall be zero-halogen construction, per IEC 60754-2.

The fiber within any given segment between two devices shall be splice free. Each fiber shall be of graded index multimode design with a nominal core diameter of 62.5 plus/minus 1 microns and cladding diameter of 125 plus/minus 3 microns. Each fiber shall be doped silica core and cladding with an acrylate coating diameter of 250 plus/minus 20 microns. The coating shall be in physical contact with the cladding surface.

Each fiber shall meet or exceed the following optical characteristics:

A. Minimum dispersion bandwidth greater than 500 MHz-km at 1300 nm;

B. Attenuation less than 1 dB/km at 1300 nm

The Contractor shall provide interconnect cables (including jumpers and pigtails) in sufficient quantities and lengths to complete all required optical circuits. The performance characteristics of the breakout cable shall be certified to meet or exceed that of the distribution cable. Cable shall be specifically designed by the manufacturer for optical connector attachment. Each fiber shall be contained in a breakout jacket compatible with optical connectors specified elsewhere.

Fiber Optic cable installed in indoor areas (platform, mezzanine, basement, etc.) shall be tight-buffered fiber. Fiber Optic cable installed outdoors or partially outdoors shall be loose buffered fiber. The fiber optic cable from the station communication rooms to all equipment shall be breakout cable, and have a manufacturer specified installation pulling tension of 540 pounds (2400 N) minimum. The cable shall be rated OFNP per NEC Article 770.

Environmental

Cables shall operate over a temperature range of minus 40° to plus 70° Celsius at a relative humidity of 10% to 99% condensing.

Installation

Installation of fiber optic cable shall be in accordance with all manufacturers' criteria. In addition, all fiber optic cables shall meet the following criteria:

- The long term installed maximum tensile loading shall be 200 pounds or less;
- The bend radius shall not exceed the manufacturer's published specifications;
- Cable pulls shall be made by back-feeding or center-feeding cable;
- The manufacturer's recommended allowable tension load shall not be exceeded. If a winch is used, the tension of cable shall be monitored with a tensiometer during installation. There shall be no tension on the cable, excluding that due to cable weight, following installation.

Certification

Certification shall include the following information for each segment of cable:

A. Loss profile for multimode (850 nm and 1300 nm) fiber shall be determined with an OTDR or equivalent instrumentation. All reels of cable shall be tested before and after installation. The test results shall be provided to SEPTA.

B. Verification that each segment supports the required bandwidth.

Terminations

A. All fiber connector terminations shall be made with a ST connector, and meet all requirements outlined in Section 18.1.3.3~~18.1.2.3~~;

B. Fiber splices shall be low-loss mechanical type. Splice joint and protection covering shall have the pull strength of the original cable or fiber;

C. Fiber terminations at each field interface box shall be of the mechanical type with polished ends on both the connector and the fiber strand;

D. Cable terminations and splice losses shall be recorded for maintenance purposes and provided to SEPTA; and

E. No mechanical crimp connections shall be allowed.

Splices

A. Fiber optic splices shall be low-loss mechanical splices and shall be provided with protection, depending on the application, indoor/outdoor. Provide passive mechanical splices to similar fibers to the greatest extent possible.

B. Indoor (station) splices shall be placed in a splice tray or organizer. Combination splice tray and termination panel is an acceptable alternative. Protection for splices shall be per manufacturer's instructions.

C. Mechanical splices shall achieve an optical loss of less than 0.3 dB at 1310 nm. The amount of splice loss shall be stable over time and unaffected by changes in environmental or mechanical conditions.

Identification

Cables shall be labeled in accordance with Section 2.

Testing

After installation, the fiber optic cable shall be performance tested.

The Contractor shall provide the fiber optic cable test as defined in ANSI/TIA/EIA-568-A, ANSI/TIA/EIA-568-B.1, ANSI/TIA/EIA-526-14, ANSI/TIA/EIA-526-7. Testing shall assure overall integrity and satisfactory performance of all installed cables.

The Contractor shall perform the following tests on all fiber optic cable strands:

A. Insertion loss using a relative test.

B. Optical Time Domain Reflectometer (OTDR) tests shall be performed, end-to-end, in both directions and the loss profile of the cable, plus splices and connectors shall be recorded for future reference. Both pre-and post-launch test fibers shall be used at each end of the fiber optic cable during testing so that accurate loss measurements can be made for the near and far end connectors. The Contractor shall record the test results in both hard copy format (printouts) and in an electronic file format. The Contractor shall propose the electronic file format that is to be utilized for SEPTA's review and approval. **PDR 18-3**

C. Each local fiber shall be OTDR tested between the patch panels, through the local connectors to the end of the drop cable at the field device. Additionally, each local distribution fiber shall be OTDR tested from the end of the drop cable at the field device, through the local connectors to the patch panel.

Contractor shall provide all information on fiber optic cabling that is to be installed for SEPTA review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-4, FDR 18-3**

~~C.~~

~~18.1.2.2~~18.1.3.2 *Distribution Shelves*

Fiber optic distribution shelves (FODS) shall be provided for the termination and optical continuation of fiber optic cables with panel mounted bulkhead connectors in dedicated groupings called connector fields.

Connector fields shall contain 12 connectors per row, with enough bulkhead connectors to terminate every fiber of every cable at each station. The connector fields shall be identified by function, spare and cable number. All fibers in the communication room must terminate in the fiber optic distribution shelf (FO Patch Panel).

The FODS shall be EIA-310-C standard 19-inch rack mounting and consist of a compartment for termination/distribution cable tray and a compartment for a splice drawer. Each fiber optic distribution shelf shall be provided cable clamps sufficient in quantity and strength to secure fiber cables terminating in the FODS.

The FODS shall include sufficient bulkhead adapters for all fibers and sufficient corresponding optical fiber pigtail/jumper assemblies with the appropriate factory connectors to mate with the bulkhead adapters as shown on the Contract Drawings.

The termination/distribution shelves shall have sufficient tray areas for excess fiber storage with provisions to assure that optical fibers do not violate the recommended minimum bend radius.

The bulkhead panel shall include a designation strip for identification of the bulkhead connectors and connector fields.

Contractor shall provide all information on all distribution shelves that are to be installed for SEPTA review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-5, FDR 18-4**

~~18.1.2.3~~18.1.3.3 *Network Components*

Fiber Optic Connectors

Contractor shall provide optical fiber connectors on equipment and interconnecting optical cables. All connectors when mated shall be capable of withstanding a 10-pound pullout force applied to the cable with less than 0.1 dB optical degradation to the optical connection. All connectors when mated horizontally shall be capable of withstanding a 10-pound weight applied to the cable with less than 0.1 dB optical degradation to the optical connection. Connectors for cable ends shall consist of a stainless steel outer shell and ceramic fiber guide way. Connectors shall be capable of achieving less than 0.5 dB attenuation when installed per connector manufacturer's installation recommendations.

All connectors shall be of a design specifically matched to the optical fiber specified elsewhere. Fiber connector terminations shall be made with a ST-type connector exhibiting a loss of not more than 0.5 dB at 1300 nm. All mechanical terminations shall have polished ends.

Biconic and SMA derivative connectors shall not be supplied.

All optical connectors on the fiber cables shall be cleaned in compliance to optical connector manufactures specifications and covered with dust caps until connected to the fiber optic equipment/modules.

Contractor shall provide details regarding all types of Fiber Optic Connectors that are to be installed for SEPTA review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-6, FDR 18-5**

~~18.1.2.4~~18.1.3.4 *Transmission Equipment*

All transmission equipment shall be capable of transmitting data over a single multimode fiber or a pair of multimode fibers. The fiber optic modems shall be external standalone units with matching pairs. All modems shall be furnished from the same manufacturer.

All remote and equipment hub transceivers shall satisfy the following requirements:

- Data Format: 100Base-T Fast Ethernet
- Channels: 1 Duplex
- Baud Rate: Compliant with IEEE 802.3
- Bit Error Rate: <1.0E-10
- Optical Mode: Multimode
- Optical Budget: 13 dB
- Optical wavelength: 850 nm and/or 1300 nm
- Transmitter Launch Power: >-10 dBm
- Receiver Sensitivity: <-33 dBm
- Gain Control: Optical Automatic Gain Control (OAGC)
- Electrical Input Power: 13.5 VDC regulated
- Current Requirement: 300 mA
- Power Consumption: 0.2 W

- Power Factor: 3
- Protection: Solid-state short circuit protection

Environmental Operating

- Temperature range: -40° C to + 70° C
- Maximum Humidity: 95% relative, non-condensing
- Standards Emissions: FCC Part 15, ICES-003, AS/NZS 3548, EN55022
- Safety: UL 1950, CAN/CSA 22.2 NO. 950 95, EN60825
- Mechanical: Standalone Unit or Rack Mount

- Contractor shall provide all information on all transmission that is be installed for SEPTA review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-7, FDR 18-6**

~~18.1.2.5~~18.1.3.5 *Interconnect Hardware*

Installation shall include all required interface cable types as specified in this Section. The ability shall be provided to remove and replace any module in the communications system without requiring that the power supply be turned off and without disturbing the operation of any other modules in the same rack frame and power supply assembly. All modules shall be labeled on the front panel to identify the fiber passing through the module.

~~18.1.2.6~~18.1.3.6 *Distribution Frame*

The Contractor shall install sufficient quantity of Fiber Optic Distribution Shelves to terminate all of the fibers within the location equipment rooms. The Distribution Shelves shall be installed in the communication room cabinets. At each distribution panel, the Contractor shall terminate the fibers associated with the specific fiber optic group from each field device assembly to the optical bulkhead adapters.

The Contractor shall terminate the fibers that are designated as spare to the optical bulkhead adapters. The fibers shall be of appropriate lengths to allow for future splicing within the distribution frame and shall be appropriately identified (tagged). Appropriate protective coating shall be applied to all splices.

Each fiber optic modem pair shall have ~~six (~~four (4~~6~~) multimode fibers home run from an interface box to the communications/equipment room. There shall be ten (10) feet of slack cable coiled at both termination points. The interface box shall be sized appropriately and the fiber coiled in such a manner not to exceed the recommended minimum bend radius. All fibers, including spares, shall have the ends polished and terminated with type ST low-loss mechanical terminations. All fibers shall be labeled and tested according to industry standards. Connectors and cables shall be protected from the environment, and provide an acceptable means of protection from vandalism.

The fiber optic distribution cables from the communications rooms to the field devices shall be fitted with type ST connectors. At the communication room interface, each fiber optic cable shall be terminated at a fiber optic distribution shelf. Fiber optic patch cords shall be used for device interconnections.

~~18.1.3~~18.1.4 Wireless Communications

Wireless communications technologies shall be used for the transmission of data to and from mobile and handheld devices throughout the NPT System. All wireless communications shall be state of the art utilizing the latest commercially acceptable industry standards. The NPT System shall include expandability and upgradability to the latest technology with minimum hardware and software changes.

A complete description of all Wireless Communications shall be included with the Network Management Plan and provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as required within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 18-3, PDR 18-8, FDR 18-7**

~~18.1.3.1~~18.1.4.1 *Local Wireless Communications*

Local wireless communications shall be defined as all limited area networking coverage used throughout the NPT System. This method of communication shall be based on the IEEE 802.11n standard (or SEPTA-approved equal) for wireless networking.

To achieve maximum throughput the IEEE 802.11n network, the NPT System shall operate in the 5 GHz band. To ensure system integrity and security access points shall not be backwards compatible with previous IEEE 802.11 standards.

The operation of the 802.11n communications in the 2.4 GHz band is strictly prohibited.

For all occasions where the Contractor deploys IEEE 802.11n compliant hardware, it shall make full use of both Multiple-Input Multiple-Output (MIMO) and Channel-bonding (40 MHz) operation to the physical layer, as well as frame aggregation to the MAC layer. With MIMO, all IEEE 802.11n compliant hardware shall support Spatial Division Multiplexing (SDM).

It is intended that the use of IEEE 802.11n compliant networking, combined with wider bandwidth and MIMO technology, shall maximize the data transfer rates available to the NPT System.

Wireless Access Points

To support the NPT System, all wireless access points shall operate exclusively in 802.11n, 5 GHz, frequency band.

Contractor shall provide all information on all Wireless Access Points that are to be installed for SEPTA review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 18-4, FDR 18-8**

All wireless access points shall be manufactured by Cisco (or SEPTA-approved equal) and be suitably designed and manufactured in order to tolerate rugged use in the outdoor transit environment. These Access Points shall:

A. Be Certified IEEE 802.11n Compliant, or Approved Equal;

B. Support Multiple-Input Multiple-Output (MIMO) Technology;

C. Support Maximal Ratio Combining (MRC);

D. Support 20-and 40-MHz channels;

E. Support PHY data rates up to 300 Mbps;

F. Incorporate antennas to support ~~both 2.4GHz and~~ 5.0 GHz transmissions.

~~F.~~Any Wireless Access Points that support 802.11n communications in the 2.4 GHz band must have this functionality specifically disabled within the firmware of the device.

~~F.~~

Encryption

All wireless communications shall support non-proprietary methods for encryption of data. This encryption shall employ no less than 128-bit data encryption with WPA-TKIP/AES.

The Contractor shall be responsible for developing the methods to automatically and programmatically assign or update any digital encryption certificates used by the system. The use of manual delivery methods and permanent Pre-Shared Keys (PSK) encryption keys is not acceptable.

~~*18.1.3.2*~~*18.1.4.2 Wireless Broadband*

The Wireless Broadband System shall utilize either the Worldwide Interoperability for Microwave Access (WiMax) which is based on IEEE 802.16 or the 3rd Generation Partnership Project (3GPP)'s Long Term Evolution (LTE) systems, or SEPTA Approved equal.

The Wireless Broadband System utilized by the NPT System shall:

A. Meet the requirements of Section 18.1.2~~18.1.1~~ in providing communication between mobile NPT System devices and the CDCRS;

B. Be an All IP Network (AIPN) utilizing the TCP/IP protocols;

C. Seamlessly support the transition of NPT devices to available 3G and then to 2G based on network availability and outages;

The use of a 3G system that does not support the enhanced throughput of a 4G technology without a hardware upgrade is prohibited.

18.1.4.3 Possession of ~~the~~ Wireless Broadband Service

For the duration of the NPT project and up to the conclusion of the overall NPT System Warranty period, the Contractor shall provide, support and maintain control of the Wireless Broadband system. At no point during this period, shall SEPTA be required to interact directly with the wireless provider.

Any agreement between the Contractor and the Wireless Provider shall not affect nor supersede or reduce in any way the responsibilities of the Contractor to SEPTA.

During the closeout of this project, the Contractor shall be responsible for transitioning the control of all Wireless service to SEPTA.

A complete description all Wireless Broadband communications shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as required within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 18-5, PDR 18-9, FDR 18-9**

~~18.1.4~~18.1.5 Leased-Lines

The Contractor shall be responsible for establishing Leased Lines to provide network connectivity at SEPTA locations that do not yet have Fiber Optics cabling installed.

All Leased Lines shall meet the minimum requirement of T1, providing a minimum guaranteed transfer rate of 1.544 Megabits per second. Lease Lines may take advantage of a Frame Relay protocol.

Fractional T1 lines are prohibited.

All Leased Lines shall meet the requirements of Section 18.1.2~~18.1.1~~.

A complete description all Leased Lines shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality as required within this Section. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 18-6, PDR 18-10, FDR 18-10**

18.1.5.1 Possession of ~~the L~~Leased ~~ines~~Line Service

Prior to final completion of this project, the Contractor shall be responsible to SEPTA for the successful operation of these Leased Lines. At no point during this period, shall SEPTA be required to interact with the Leased Line provider.

Any agreement between the Contractor and the provider of the Leased Line shall not affect nor supersede the responsibilities of the Contractor to SEPTA.

During the closeout of this project, the Contractor shall be responsible for transitioning the control of all Leased Lines to SEPTA.

~~18.1.5~~18.1.6 Miscellaneous Equipment

The Contractor shall provide all miscellaneous equipment not expressly stated in this Section, but required by the Contractor's design. Contractor shall provide all information on any miscellaneous equipment that is to be installed for SEPTA review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 18-7, FDR 18-11**

~~18.1.6~~18.1.7 Enclosures

All NPT communications equipment shall be installed in NEMA rated cabinets and enclosures. All cabinets shall be NEMA 4X rated, stainless steel with full-hinged doors.

Equipment housing and its components shall be corrosion resistant. Any seams shall be continuously welded and ground smooth, with no holes or knockouts. Boxes shall include seamless foam-in-place gaskets to provide watertight and dust-tight seals.

Each enclosure/cabinet shall be provided with a nameplate on its front. Nameplate nomenclature shall be according to a schedule approved by SEPTA. Nameplates shall be of a black laminated plastic material with letters engraved on the plate in white. Secure nameplates on equipment with stainless steel screws.

Steel cabinets and enclosures shall not be painted.

Enclosures/cabinets shall be delivered to the construction site complete. All electrical devices shall be in place and wired. If any electrical devices or accessories must be shipped loose, they shall be delivered in the manufacturer's original unopened packaging.

Cabinets shall be provided with required accessories to mount internal electronic components, including but not limited to, DIN Rails and brackets, mounting panels, grounding kits, and lockable hardware with locks keyed to SEPTA's standard Cat 30 keys.

Enclosures/cabinets shall include rack mount-type power strips with sufficient outlets to connect all equipment and have at least ~~one~~two spare outlets remaining.

Enclosures/cabinets shall be sized with sufficient air space within the cabinet to accommodate wiring, allow for convenient equipment maintenance, and permit adequate heat dissipation for installed equipment. All enclosures shall be sized to accommodate the required equipment assemblies of the selected hardware to be enclosed.

Contractor shall provide all information on all enclosures that are to be installed for SEPTA review at the Conceptual Design Review and for approval at the Final Design Review. **CDR 18-8, FDR 18-12**

18.2 NPT Communications Networks

The Contractor shall be responsible for the design, installation, and testing of the NPT Communications Networks. These networks shall be responsible for the secure transmission of all data related to the NPT System, between the Central Data Collection and Reporting System (CDCRS) and all of the NPT System components.

This network shall utilize hardware that meets the requirements of Section 18.1.

The communications network shall be comprised of several distinct segments:

- The Subway Elevated Network;
- The Regional Rail Network;
- The Depot Network;

The requirements for the Cash Room Manager shall be included in one of the above communication networks. Each communications network shall be responsible for the transport of data between NPT devices and the CDCRS.

The Contractor shall be responsible for the selection of the communications protocol utilized for all NPT Communications Networks. This protocol shall be a secure, non-proprietary, based on an industry-standard, and shall operate reliably. This protocol shall be selected based on the physical configuration of the system and SEPTA's need for highly secure and reliable communications to satisfy operations and reliability requirements. Details regarding the ~~T~~the selected network protocol shall be included in the Network Management Plan and submitted ~~by the Contractor~~ for the review and approval by SEPTA at the Preliminary Design Review. **PDR 18-11**

All communications hardware shall be capable of operations and successful integration into the SEPTA environment. In addition, all data communications hardware shall be service proven and commercially available. This hardware shall meet the requirements of Section 18.1 and shall be, together with all certifications, submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-12, FDR 18-13**

18.2.1.1 Network Addressing

The Contractor shall be responsible for developing an IP addressing plan for all devices on the NPT network. The Contractor shall submit this plan to SEPTA for review and approval. The use of unallocated addresses or IP addresses assigned to others shall not be permitted.

Details regarding Network Addressing shall be included in the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-13, FDR 18-14**

18.2.2 Subway/Elevated ~~Network~~Wide Area Network

Within the SEPTA Subway/Elevated System, the Contractor shall design, implement, and test a ~~data~~ WAN~~network~~, dedicated ~~for~~to the NPT System ~~NPT~~. This network shall be deployed to provide secure transmission of all data related to NPT equipment in the Subway/Elevated system. It is intended that through this network, FVDs, Turnstiles, and all other NPT equipment shall have real time communications with the CDCRS.

The backbone of this network shall be fiber optic cabling installed as part of SEPTA's FOPP. Within the subway tunnels and elevated structures, this fiber optic cable runs the length of each line and directly connects both terminals. Within Center City, the platform also connects the fiber optic cable to the computer systems of SEPTA's headquarters.

SEPTA shall be responsible for providing cabling that connects the fiber optics bundle that runs along each route to the communications closet. Within each communications closet (one per station), the Contractor shall anticipate four (4) strands of single mode fiber optics, terminated on a rack. These four (4) strands are one TX and one RX in each direction.

It is intended that the Contractor shall utilize these fiber optics strands to establish a data ring with dual counter-rotating ring topology. The interface to this fiber optics communications shall occur at designated FOPP demarcation, located inside the communications rooms throughout the Subway/Elevated system and at 1234 Market Street

The Contractor shall be responsible for all network hardware, both at each Subway/Elevated station and at 1234 Market Street, as necessary to establish the data ring.

SEPTA shall be responsible for the maintenance of the FOPP, at all times.

Details regarding the Subway/Elevated WAN, including architecture, physical arrangement, and all necessary hardware shall be included in the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-14, FDR 18-15** The Contractor shall submit the design for the Subway/Elevated WAN, including installation and equipment details, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-2.**

18.2.2.1 Subway/Elevated Station ~~LAN~~Local Area Network

At all Subway and Elevated Stations, the Contractor shall ~~still~~ be required to establish a LAN to support NPT. The LAN shall serve to connect all NPT equipment at a station to the ~~fiber optics network~~Subway/Elevated WAN. In the Subway/Elevated environment, this shall include FVDs and Turnstiles.

At the station communications closet, the Station LAN shall be connected to the fiber optic ring at the specified demarcation point. This connection shall be responsibility of the Contractor.

All NPT equipment and connections within the communications room shall be maintained in a secure cabinet that is supplied by the Contractor. This cabinet shall be dedicated to the NPT System and shall serve to further limit access to the NPT network. This cabinet shall house the connection of the station LAN to the fiber data ring and that connection shall be responsibility of the Contractor.

As part of the Station LAN, the Contractor shall not install any additional network hardware at any station booth or secondary cabinet. Should the Contractor need additional network hardware, including modems and/or hubs, this hardware shall be installed within the FVDs, Turnstiles, or other NPT devices. For FVDs and Turnstiles, network hardware shall be installed in one device per logical grouping. NPT devices containing network equipment shall be designated as Primary or “A” equipment. All other devices shall be designated as Secondary or “B” equipment.

The Contractor shall be responsible for all networking cabling and hardware that are part of the Station LAN. All connections shall be made via either CAT 6 Ethernet cable or fiber optics as necessary due to cable length.

At most Subway/Elevated Stations, the Contractor may elect to utilize existing cabling that connects the Communications Closet with the existing A-Booth. Due to the physical configuration of the stations, this connection may either be CAT 5e ~~to~~or Fiber Optics. In the A-Booth, the connections end -as a pair of T568A connections at each end (conversion provided for Fiber Optics).- In the Communications Closet, the connection ends in a patch panel located in the existing OTN cabinet. At this location, a jumper will need to be run to the required NPT cabinet.

Should the Contractor choose to utilize these existing connections, they ~~are~~shall not be exempt from the requirements for PCI-DSS compliance. The Contractor shall be responsible for making any modifications necessary to these lines, including the securing of connections at either end, as necessary to fulfill all requirements of PCI-DSS.

This Connection between the Communications Closet and the Booth does not exist at the following Stations:

Market-Frankford Subway/Elevated Line

- 5th Street
- Margaret-Orthodox

Broad Street Line

- Fern Rock (for Cashier booth "G" near Regional Rail)
- City Hall

Subway-Surface Lines

- 19th Street (No Booth)
- 22nd Street (No Booth)
- 33rd Street (No Booth)
- 36th Street (No Booth)
- 37th Street (No Booth)

The Contractor shall be responsible for all networking cabling and hardware that are part of the Station LAN. All connections shall be made via either CAT 6 Ethernet cable or fiber optics as necessary due to cable length. ~~This~~The Contractor may ~~communications~~ utilize the pre-existing conduit within the stations ~~as~~ as outlined in Section 6. ~~All cabling and conduit shall be installed by the Contractor except at existing turnstile array locations. At existing turnstile array locations, the Primary turnstile shall be connected with secondary turnstiles utilizing existing conduit that runs beneath the array. At existing turnstile array locations, the Contractor shall not utilize existing cabling to connect the primary turnstile to secondary turnstiles. The Contractor shall replace all existing cabling with either CAT 6 Ethernet cable or fiber optics.~~

Supplied cabling and networking hardware shall be sufficient to support simultaneous communications of all NPT devices at the station.

The design and installation, including document and drawings, of ~~the~~ each Station LAN, including architecture, physical arrangement, and details of all necessary hardware shall be submitted, in station specific packages, ~~–~~ and shall be subject to SEPTA review and approval. **PDR 18-15, FDR 18-16** The Contractor shall submit the final design for the Station LAN, including installation and equipment details, in station specific packages, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-3.**

~~In addition, any Station LAN shall be capable of being expanded through the use of a Station Access Point, shown in Figure 18-2, and discussed in Section 18.3.2.1.~~

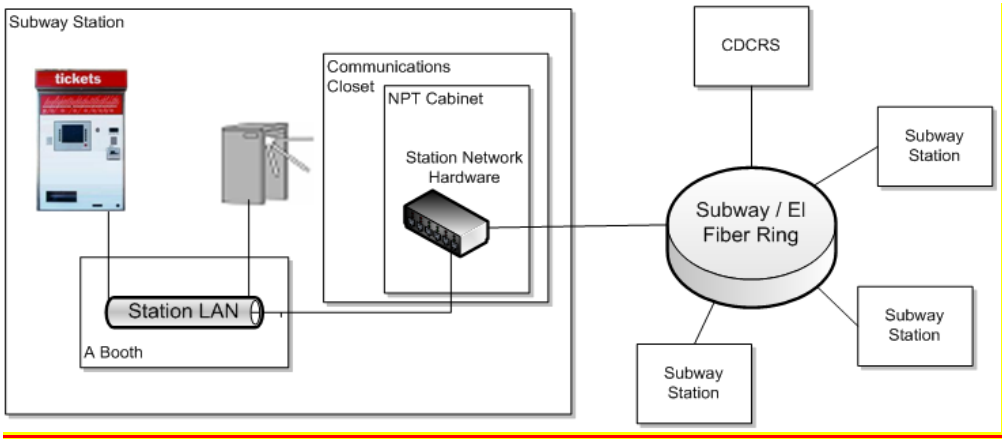

Figure 18-1 – Subway / Elevated Network

With a fiber optics network available, it is SEPTA's preference that all equipment in the subway/elevated system utilize a wired communications network. However, if necessary, SEPTA will consider limited deployment of devices on a wireless communications system~~, if necessary~~. For each application of wireless communications at a station, the Contractor shall be required to submit a request, justifying the use of wireless to SEPTA for review and approval.

18.2.2.2 Route 100 Extension

The Subway/Elevated Wide Area Network shall be extended to provide data communications to the Route 100 station at the Norristown Transportation Center. This extension shall be made by connecting the Subway/Elevated Station WAN with fiber optic cabling, running along the Route 100 right-of-way, installed as part of SEPTA's FOPP. This connection shall occur in the vicinity of the SEPTA's 69th Street terminal

SEPTA shall be responsible for providing cabling that connects the fiber optics bundle that runs along each route to the communications closet. Within the communications closet at 69th Street Station and Norristown Transportation Center, the Contractor shall anticipate four (4) strands of single mode fiber optics, terminated on a rack. These four (4) strands are one TX and one RX in each direction

Details regarding this extension to the Subway/Elevated WAN, including architecture, physical arrangement, and all necessary hardware shall be included in the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-16, FDR 18-17** The Contractor shall submit the design for the Subway/Elevated WAN, including installation and equipment details, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-4.**

At Norristown Transportation Center, the Contractor shall be responsible for establishing a LAN to support the required NPT equipment. This LAN shall be established in accordance with Section 18.2.2.1.

The design and installation, including document and drawings, of the Norristown Transportation Center LAN, including architecture, physical arrangement, and details of all necessary hardware shall be submitted, in station specific packages, and shall be subject to SEPTA review and approval. **PDR 18-17, FDR 18-18** The Contractor shall submit the final design for the Station LAN, including installation and equipment details, in station specific packages, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-5.**

18.2.3 Regional Rail Wide Area Network

For the Center City Regional Rail Stations (Temple University Station, Market East Station, Suburban Station, 30th Street Station and University City Station)~~Throughout the Regional Rail System~~, the Contractor shall design, install, and test a ~~data network~~WAN, dedicated to the NPT System. This network shall be deployed to provide secure transmission of all data related to NPT equipment in the Regional Rail system. It is intended that through this network, ~~F~~FVM~~M~~VD~~ID~~s, Railroad Turnstiles, ~~Sales Devices~~ASDs, and all other NPT equipment shall have real time communications with the CDCRS.

~~At the present time, SEPTA has fiber optics cables that are under its control only along certain portions of Right-of-Way and train routes. In addition to these segments, some areas have fiber optics cables that are under the control of a third party. As such, the Regional Rail Fare Data Network shall be comprised of several segments.~~

~~SEPTA Controlled Fiber Optics~~

~~Certain Regional Rail routes already have SEPTA controlled fiber optics cabling installed. These routes are from Center City to:~~

- ~~R2 – Warminster;~~
- ~~R3 – West Trenton (excluding Yardley and West Trenton stations);~~
- ~~R5 – Doylestown;~~
- ~~R8 – Fox Chase.~~

~~For Stations located along the above~~To serve the ~~–~~Center City Regional Rail Stations~~Regional Rail ,routes which have NPT equipment installed,~~ a data ring shall be installed. The Contractor shall provide all necessary hardware to develop this network, utilizing the existing fiber optics as the backbone. This shall be similar to that provided for the Subway/Elevated System in Section 18.2.1.1~~18.2.12.1~~.

At these locations, ~~For Stations located along the above Regional Rail routes which have NPT equipment installed,~~ SEPTA will now be responsible for providing fiber optics cabling to the communications closet or building located at or ~~near each station~~within the vicinity of the fareline. This SEPTA provided cabling will connect to the fiber optics bundle that runs along each route and will extend into the communications closet or building. ~~–~~Within each communications closet (one per station), the Contractor shall anticipate four (4) strands of single mode fiber optics, terminated on a rack. These four (4) strands are one TX and one RX in each direction

The interface to SEPTA's existing communications infrastructure shall occur at designated fiber optic equipment demarcations, located inside the communications closet or building at each station throughout the Regional Rail System and at 1234 Market Street.

Details regarding the Regional Rail WAN, including architecture, physical arrangement, and all necessary hardware shall be included in the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-18, FDR 18-19** The Contractor shall submit the design for the Regional Rail WAN, including installation and equipment details, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-6.**

~~Lines with No Fiber Optics~~

~~For any station within the Regional Rail System that is not along one of the routes defined above as having fiber optics cabling which has NPT equipment installed,, SEPTA shall not provide any communications systems, hardware, or cabling, to support NPT. The Contractor shall be responsible for obtaining leased lines to all of these stations. These lines shall be sized by the Contractor to support all necessary communications between the station and the CDCRS, and shall meet the requirements of Section 18.1.4.These lines are meant to serve as a temporary bridge to the NPT System, until SEPTA has installed fiber optics on those lines. The selection and design of the leased lines shall be subject to review and approval by SEPTA. PDR 18-95~~

~~These leased lines shall be integrated with the above outlined fiber optics network to as part of one cohesive data network.~~

18.2.3.1 Regional Rail Station Local Area Network~~AN~~

At ~~each~~ stations that incorporate gating, the Contractor shall ~~still be~~ be required to establish a LAN to support NPT. ~~_~~ This~~e~~ LAN shall serve to connect all NPT equipment at a station to ~~either t~~the ~~fiber optics network~~Regional Rail WAN ~~or leased lines~~. In the Regional Rail environment, this shall include ~~FVM~~IDs ~~as well as RSDs and~~ ASDs , FVDs, and Railroad Turnstiles within ticket offices, as shown in Figure 18-2 – Regional Rail Network

~~and any Parking Payment devices at each station~~.

At the station communications housing, the station LAN shall be connected to ~~either~~ the fiber optic ring ~~or the leased line~~ at the specified demarcation point. This connection shall be the responsibility of the Contractor.

At each station, the Contractor shall not anticipate any space within the communications closet or building that may be utilized by ~~NTP. Additionally, the Contractor must anticipate that for a given station, the supporting communications cabinet or building may be as much as 300 feet away from the actual station structure.~~ NPT.

As part of the Station LAN, the Contractor shall not install any additional network hardware at any station building or secondary cabinet. Should the Contractor need additional network hardware, including modems and/or hubs, this hardware shall be installed within the ~~FV~~MI~~Ds~~Turnstiles, FVDs, or other NPT devices. ~~For FVDs, network hardware shall be installed in one device per logical grouping.~~ NPT devices containing network equipment shall be designated as Primary or "A" equipment. All other devices shall be designated as Secondary or "B" equipment.

The Contractor shall be responsible for all networking cabling and hardware that are part of the Station LAN. All connections shall be made via either CAT 6 Ethernet cable or fiber optics as necessary due to cable length. This communications system shall utilize conduit within the stations as outlined in Section 6. Supplied cabling and networking hardware shall be sufficient to support simultaneous communications of all NPT devices at the station.

~~The Contractor shall be responsible for all networking cabling and hardware that are part of the Station LAN. All connections shall be made via either CAT 6 Ethernet cable or fiber optics as necessary due to cable length. All cabling and conduit shall be installed by the Contractor. Supplied cabling and networking hardware shall be sufficient to support simultaneous communications of all NPT devices at the station. The design and installation of the Station LAN shall be subject to SEPTA review and approval.~~ ~~**PDR 18-106, FDR 18-123**~~

~~In addition,Any~~ any ~~Station LAN shall be capable of being expanded through the use of a Station Access Point, shown in Figure 18-2, and discussed in Section 18.3.2.1.~~

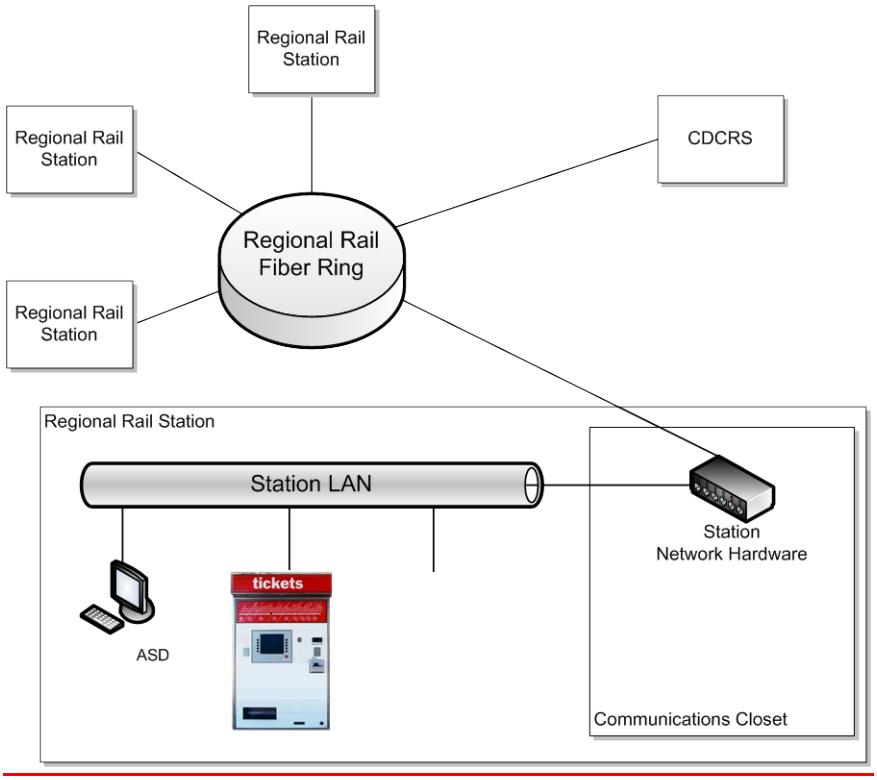

Figure 18-2 – Regional Rail Network

~~Figure 18-2 Regional Rail Network~~The design and installation, including document and drawings, ~~–~~of the Station LAN, including architecture, physical arrangement, and details of all necessary hardware shall be submitted~~,~~ in station specific packages, and shall be subject to SEPTA review and approval. **PDR 18-19, FDR 18-20** The Contractor shall submit the final design for the Station LAN, including installation and equipment details, in station specific packages, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-7.**

With a fiber optics network available, it is SEPTA's preference that all equipment in Center City Regional Rail stations utilize a wired communications network. However, if necessary, SEPTA will consider limited deployment of devices on a wireless communications system~~, if necessary~~. For each application of wireless communications at a station, the Contractor shall be required to submit a request, justifying the use of wireless to SEPTA for review and approval.

18.2.4 Depot Wide Area Network

A ~~wide area data network~~WAN shall be established to support the NPT data transmission requirements of the SEPTA Surface S~~s~~ystems. This network shall be responsible for the transmission of OBP and event data between the station access points at each of SEPTA's Bus Depots and Trolley Barns to the Central Data Collection and Reporting System (CDCRS).

For all bus depots and trolley barns, SEPTA shall not provide any communications systems, hardware, or cabling, to support NPT. The Contractor shall be responsible for obtaining leased-lines to each of these locations. These lines shall be sized by the Contractor to support all necessary communications between the depots/barns and the CDCRS, but at a minimum, shall be T-1 Lines.

At each depot and barn, the Contractor shall install a NPT communications cabinet, which shall be connected with the leased line service and shall serve as the central point from which a LAN shall be established.

Details regarding the Depot WAN, including architecture, physical arrangement, and all necessary hardware shall be included in the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-20, FDR 18-21** The Contractor shall submit the design for the Depot WAN, including installation and equipment details, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-8**

18.2.4.1 Depot Local Area Network

At all Depots, the Contractor shall still be required to establish a LAN to support NPT. This LAN shall serve to connect all NPT equipment at a station to the Depot WAN. In the Depot environment, this includes OBPs, as shown in Figure 18-3.

From the communications cabinet, the Contractor shall still be required to establish a LAN at each location. This LAN shall serve to connect all hardware and systems necessary to facilitate OBP data communications. This includes all wireless equipment, including one or more wireless access points, which are necessary to provide sufficient communications capacity to the bus fleet. ~~Connections between the communication cabinet and all other NPT devices shall be either CAT 6 Ethernet cables or fiber optics as necessary due to cable length. Installation of all cabling and conduit shall be the responsibility of the Contractor.~~

The Contractor shall be responsible for all networking cabling and hardware that are part of the Station LAN. All connections shall be made via either CAT 6 Ethernet cable or fiber optics as necessary due to cable length. This communications utilize conduit within the stations as outlined in Section 6. Supplied cabling and networking hardware shall be sufficient to support simultaneous communications of all NPT devices at the station.

Details regarding the Depot WAN, including architecture, physical arrangement, and all necessary hardware shall be submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-21, FDR 18-22.** The Contractor shall submit the design for the Depot WAN, including installation and equipment details, in Depot Specific documents, for SEPTA's review and approval prior to the commencement of any installation effort. **CDRL 18-9.**

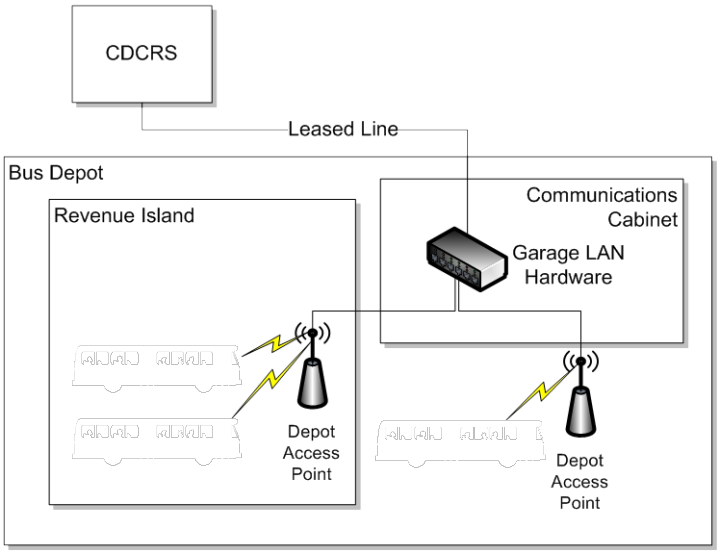

Figure 18-3 – ~~On-Board Processor~~Depot Network

18.3 Wireless Communications

Wireless communications shall be utilized extensively throughout the NPT System to support network communications to mobile NPT devices. This includes communications with all MIDs, OBPs and HSDs.

The Contractor shall be responsible for the development of the Wireless Communications systems outlined below. These systems shall meet the requirements of Sections 18.1.2~~18.1.1~~ and 18.1.4~~18.1.3~~.

Contractor shall submit the design for all wireless communications applications, installations and implementations for SEPTA's review at each of the Design Reviews and approval prior to the commencement of any installation effort. **CDRL 18-10**

18.3.1 Wireless Broadband Communications

The NPT System shall accept ~~SEPTA-issued~~SEPTA and Partner-issued Smart Media and contactless credit/debit media as fare payment in the mobile environment, as outlined in Section 4. This includes acceptance ~~at~~ by the OBPs, MIDs, HSDs and remote FVDs ~~and at the HSDs on the Regional Rail fleet~~, but could also include any other piece of NPT field equipment. To support the required transaction processing times, as required by Section 4, on the NPT mobile devices, the Contractor shall implement a Wireless Broadband Communications System for transmission of the transactional information to inter-bank or non-bank financial clearing systems for transaction authorization and settlement purposes.

The Contractor shall be responsible for establishing this Wireless Broadband Communications system for use by the NPT System, through a third-party wireless communications vendor.

Details regarding the use of Wireless Broadband Communications, including architecture, physical arrangement, and all necessary hardware shall be included within the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-22, FDR 18-23.**

18.3.1.1 Remote Media Information Displays

At some Regional Rail stations, Media Information Displays (Section 13) will be deployed to validate media and open/close trips. To support this deployment, a Wireless LAN will be established at these locations (18.3.2.2). This Wireless LAN shall connect with a Wireless Broadband modem for communications with the CDCRS.

The cellular modems will not always be installed indoors or in a sheltered location. These cellular modems must be robust and secure to operate in an environment that is exposed both to the elements and the general public.

The Wireless Broadband communications for the MIDs shall meet the requirements of Section 18.1 and shall be, together with all certifications, submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-23, FDR 18-24**. Site specific details regarding the configuration, placement, and installation of communications hardware shall be submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-24, FDR 18-25.**

18.3.2 Local Wireless Communications

Local Wireless Communications shall be ~~used at stations and~~ utilized at bus depots/trolley barns throughout the SEPTA NPT System. All Local Wireless communications shall at a minimum, comply with the requirements of Section 18.1.4~~18.1.3~~.

Details regarding the use of Local Wireless Communications, including architecture, physical arrangement, and all necessary hardware shall be submitted included within the Network Management Plan and submitted for SEPTA review at the Preliminary Design Review and finalized at the Final Design Review. **PDR 18-25, FDR 18-26.** ~~The use of the Local Wireless Communications is outlined in Sections 18.3.2.1 and 18.3.2.2~~

~~*18.3.2.1Station Wireless Communications*~~

~~The Contractor may elect to extend either the Subway/Elevated or Regional Rail networks through the deployment of Wireless Access Points at station locations.~~

~~These access points shall connect to the LAN at each station, which shall provide a data path from a wireless device to the Subway/Elevated and Regional Rail data networks. These Wireless Access Points shall be fully compliant with the IEEE 802.11n standard, as required for all Local Wireless Communications in Section 18.1.3.1.The access point shall be connected to the LAN via either CAT 6 Ethernet cable or fiber optics cable (based on length of connection) through conduit. Both the cabling and connection shall be the responsibility of the Contractor.~~

~~.~~

~~*18.3.2.2*~~*18.3.2.1 On-Board Processor Communications*

The NPT System shall communicate wirelessly with OBP. This wireless communication shall be provided at all Bus Depots and Trolley Barns, as part of the Depot Network. This shall be established using the IEEE 802.11n standard, as required for all Local Wireless Communications in Section 18.1.4.1~~18.1.3.1~~.

All vehicles shall upload and download data at startup, when entering the garage, while at the Revenue Islands, or at any time that a manual request for data is initiated from the OBP. This requires that the Depot Network be able to communicate at all times with OBP located anywhere within the Depot/Barn.

To support this, an IEEE 802.11n Wireless Access Point (WAP) shall be provided each Revenue Island and as necessary to provide coverage to all OBPs throughout all bus and trolley parking areas.

~~This coverage must provide adequate bandwidth to allow for complete data transfer to all buses while maintaining SEPTA's required throughput of buses.~~

~~To provide intermediate points of data transfer, OBP communications shall also be extended with compliant access points at major bus transfer points and hubs. At these various locations, Local Wireless Communications Access Points (18.1.3.1) shall be provided and be capable of communicating over the Subway / Elevated Network and Regional Rail Network in addition to the Depot Network.~~ All communications shall meet the requirements of Section 18.1 and shall be, together with all certifications, submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-26, FDR 18-27**. Site specific details regarding the configuration, placement, and installation of communications hardware shall be submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-27, FDR 18-28.**

18.3.2.2 Media Information Display Communications

The NPT System shall communicate wirelessly with MIDs. This wireless communication shall be provided at all Regional Rail stations where MIDs are to be deployed. This shall be established using the IEEE 802.11n standard, as required for all Local Wireless Communications in Section 18.1.4.1.

When presented with a piece of Smart Media, All MIDs shall upload account , time, and location information for processing at the CDCRS. This information will be used to determine the amount of the ride that has taken place. While the MID will present an indication that it has successfully read the Smart Media, no additional transaction information will be presented. As such, the CDCRS will not return information to the MIDs on a per-transaction basis.

To support this, an IEEE 802.11n Wireless Access Point (WAP) shall be provided at each station as where MIDs are required. This WAP will serve to establish a Wireless LAN that connects the MIDs with the Wireless Broadband connection, as outlined in Section 18.3.1.1.

The WAPs will not always be installed indoors or in a sheltered location. These WAPs must be robust and secure to operate in an environment that is exposed both to the elements and the general public.

All communications shall meet the requirements of Section 18.1 and shall be, together with all certifications, submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-28, FDR 18-29**. Site specific details regarding the configuration, placement, and installation of communications hardware shall be submitted to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 18-29, FDR 18-30.**

18.4 Business Recovery Site

For data redundancy and disaster recover, two identical instances of the CDCRS shall be constructed and maintained. The above outlined communications networks shall be linked to the primary CDCRS located within SEPTA IT Department's control center. This primary system shall be in constant communication with the backup system, provided at SEPTA's Business Recovery Site.

The Contractor shall be responsible for developing this network connection via SEPTA's fiber optic~~s~~ cabling installed between the 1234 Market Street Headquarters and SEPTA's Business Recovery Site.

~~on 4 strands of Single Mode Fiber being available between 1234 Market and the back-up Business Recovery Site.~~

SEPTA shall be responsible for providing cabling that connects the primary CDCRS to the Business Recovery Site. At the Primary CDCRS and Business Recovery Sites, the Contractor shall anticipate four (4) strands of single mode fiber optics terminated on a rack.

It is intended that the Contractor shall utilize these fiber optics strands to establish data communications between the two sites.

In the event of a failure of the primary CDCRS, the backup system shall be capable of operating all of the NPT System. As such, all hardware provided for this link shall be sized such that the requirements of Section 19 are still satisfied when the backup system is in operation.

Full information for all hardware and software for the Business Recovery site shall be subject to SEPTA review and approval. **PDR 18-30, FDR 18-31**

18.5 External Communication Interfaces

18.5.1 Financial Transaction Processing

The NPT System shall provide customers with the ability to use valid credit and debit media for payment of fares. SEPTA intends to have these financial transactions controlled by the CDCRS.

To accomplish this, the NPT System shall have a communication link with one or more financial institutions (banks and/or clearinghouses) for the purposes of processing financial transactions. These transactions shall include obtaining authorization to complete a transaction with a credit card or debit card and reconciliation of all completed and reversed credit and debit card transactions. These transactions shall also include collecting payment for automatically loaded (replenished) value to a stored value Smart Card Account from a linked checking or savings account.

A secure communications path (including all software) with necessary redundancy that successfully satisfies all standards and operational requirements (ISO/IES 8285, ABA, PCI) ~~is to~~shall be provided between the CDCRS and all financial institutions using end-to-end encryption methodology. This connection shall be a Digital Signal 3 (DS3), which is a digital signal level 3 T-carrier commonly referred to as a T3 line. This dedicated connection shall support a data rate for this type of signal of 44.736 Mbit/s.

18.5.2 Payment Card Industry

The NPT System shall accept valid credit and debit media as a form of payment. Because of the sensitive nature of credit/debit card transaction data, all NPT devices that read credit or debit cards, and all communications and computer systems comprising the fare collection system, shall be in full compliance with the latest versions of the Payment Card Industry's Secure Systems standard.

PCI Compliance is discussed fully in Section 5~~2~~. Special attention shall be paid to complying with the physical security requirements of PCI DSS during the installation process, especially the following:

- Physical access to routers, network hubs, wireless access points / gateways shall be restricted.
- There shall be no publicly accessible network jacks for the NPT System.

Contractor shall provide descriptions of how physical security compliance has been attained for PCI DSS. **CDRL 18-11** For all wireless communications, PCI DSS requirements and testing procedures for wireless environments apply and are mandatory. Supporting documentation to certify that the system meets the PCI DSS requirements shall be subject to SEPTA review and approval not less than sixty (60) days prior to commencement of installation of the NPT equipment. **CDRL 18-12**

18.5.3 SEPTA WAN

The SEPTA WAN is considered to be SEPTA's existing data network. At no point shall NPT data from any device be communicated via this network. All interactions between the NPT System and the SEPTA WAN shall occur via the CDCRS as outlined in Section 19.

Section 19 – Central Data Collection and Reporting System
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19 CENTRAL DATA COLLECTION AND REPORTING SYSTEM

This section of the Technical Specification identifies the functional requirements of the Central Data Collection and Reporting System (CDCRS). The CDCRS shall provide a comprehensive approach to monitoring, controlling, maintaining, and managing revenue information throughout the NPT System.

The CDCRS will include a central database for the retention of NPT transactional data, consolidated summary data, usage, and operational information. In addition, the CDCRS shall feature new applications to provide user interaction between the CDCRS and authorized users. The CDCRS shall also provide information to and from SEPTA'S legacy systems (see Appendix A.15 "NPT Book of Existing Systems") and to the new Building Access system, outlined in Section 16.

The Contractor shall be responsible for:

- Final detailed system design;
- Development of management and reporting applications;
- Fit analysis;
- Data conversion; and
- System installation and acceptance testing (Section 21).

19.1 General Requirements

The CDCRS shall be the data repository and control location for all NPT equipment.

CDCRS software and hardware shall be designed to meet industry standards for reliability, availability, and accuracy. All elements of the CDCRS shall provide stability and reliability levels resulting in system availability of no less than 99.9% of operating time, exclusive of routine maintenance.

Networking components of the CDCRS, including hubs, routers, network interface hardware, and other protocol and interface converters, shall experience no more than one failure per year. The CDCRS shall be designed to interface with all of the segments of the communications and network elements outlined in Section 18 in order to provide a single integrated set of controls and applications for the entire NPT System. This system shall serve as the central system through which SEPTA personnel will monitor and control all aspects of the NPT System. The CDCRS shall in turn interface with the SEPTA legacy systems, including those for finance.

The CDCRS shall be located within SEPTA's IT Data Center at their headquarters at 1234 Market Street.

The CDCRS shall be the system by which authorized SEPTA personnel will be able to monitor and control the NPT System. It is also the intent of SEPTA that all modes and NPT equipment function as a single fully-integrated system with a unified approach to data formatting, report generation, and downloads for fare tables and other data and software related information. The CDCRS shall allow authorized users to reconcile actual revenue against recorded revenue, to reconcile recorded revenues against schedules and accurately capture ridership statistics.

The user interface for the entire CDCRS, as well as all CDCRS applications, shall be web-based and shall permit authorized users to access the system through web-based applications from any workstation installed on SEPTA's WAN (Section 18). The CDCRS shall also permit authorized system users utilizing web applications to gain access to NPT System data for report generation. All application software used by the CDCRS shall be designed to be modular, structured, user friendly, and allow users to access all functions and features through a modern Graphical User Interface (GUI).

All programs and routines, including reports and databases for ad hoc reporting, shall be based on a single, current, Open Database Connectivity (ODBC) compliant, commercially available, relational database. The software shall allow for the user update of all database tables, parameters, and operational values in advance of the actual changes taking affect.

The NPT System shall allow for operational parameter tables to be created by the user and tested prior to being implemented across the NPT System. Changes shall be able to be fully tested and verified in a test environment. Historic parameters, operational values, and complete fare tables shall be automatically maintained and stored by the NPT System, until purged, as detailed in Section 19.2.4. This shall allow for the generation of reports based on historical data spanning changes in fares and other parameters.

The CDCRS shall provide transaction control, device polling, event and machine status reporting, provide a secure data repository for all event and transaction data, fare table development and implementation, NPT System administration (e.g. media stock control, media print layouts), system security, and control of all communications between the machines, servers, and other internal and external systems.

A complete description of the functionality of the CDCRS shall be provided for SEPTA review and approval at each stage of the design review with the final document fully describing the operation, capabilities, and functionality of the CDCRS as described within this Section 19. Sufficient detail shall be provided to permit verification that all required functions are satisfactorily included. **CDR 19-1, PDR 19-1, FDR 19-1**

19.1.1 General Software Requirements

The Contractor shall be responsible for providing all necessary software applications for operation, monitoring, and management of the CDCRS, networks, and all NPT devices.

The Contractor shall supply all necessary software applications and shall configure all software programs and the database for optimal system performance, including its associated networks. Standard commercially available software packages may be embedded in the system provided. All software requirements shall be applicable for all software.

The Contractor shall provide and install all software necessary for proper operation, including commercial software and operating systems, object code, annotated source code, and documentation together with all required programming tools, text editors, and supporting materials needed for normal operation and maintenance,

Contractor shall provide all programs necessary for proper NPT System operation, including commercial software and the operating system. Software shall be completely installed and include programs required for start-up, data editing, file processing and report generation to satisfy the requirements identified herein.

All system control, monitoring, and reporting software shall be capable of being run locally on the Application Server. This software shall also be capable of being run via any of the NPT servers or a standard workstation connected to this server, via SEPTA's WAN (Section 18), utilizing only a standard web-browser.

SEPTA shall be able to set up groupings of NPT equipment, by device type, for ease of monitoring and reporting purposes. These groups shall be able to be uniquely labeled within the NPT System and these group names shall be assigned to a drop down menu.

Groups shall also be able to be added together to form other named groups of the same equipment type. Groups shall consist of:

- equipment only;
- groups only; and
- equipment and groups.

When generating reports, monitoring and reviewing status of equipment, SEPTA shall be able to select one of the groups for the function.

The Contractor shall provide licenses for all third party software and core software in accordance with requirements stated in the Contract. The Contractor shall identify all third party software and shall provide SEPTA a listing of all software applications and tools used within the CDCRS at the Preliminary Design Review. **PDR 19-2**

The CDCRS shall allow control of designated system operational functions from remote locations.

The CDCRS software shall control and monitor system access, both for the system as a whole and its separate functions.

All accesses shall be controlled, recorded, and reported to specific locations as identified within these specifications. Access privileges for individual users shall be settable by the system administrator.

High-level security to fare tables, media layout functions and associated files to ensure protection from unauthorized access, tampering, or transmission shall be provided.

To facilitate ease of use all system functions shall be menu driven employing all GUI capability.

A context driven help function shall be provided.

For those functions common to the different types of NPT equipment, such as the fare table creation and downloads and the ad-hoc reporting, a single interface point for the function shall be provided. Through the selection of elements on the screen or other similar user-friendly processes, the function shall be performed and the software shall disseminate the proper information to the proper software modules for transfer to the different types of fare collection equipment.

19.2 System Architecture

The CDCRS shall be designed as a set of scalable applications. The use of suitable scaling techniques and technologies to properly size and configure the system to address both current and future needs shall be provided in the overall system architecture design. The overall system architecture design shall be provided by the Contractor to SEPTA for review at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 19-2, PDR 19-3**

The overall architecture of the CDCRS shall serve to isolate those functions supporting fare issuance, fare payment, revenue process operations, revenue reconciliation and ridership reconciliation, making them independent of all other CDCRS functions. The objective is to ensure that changes to and use of all other functions will not affect the primary activities of the system.

Examples of such non-media and networking functions include, but are not limited to:

A. Reports and Queries;

B. Fare Table Creation/Editing;

C. System and Device Monitoring;

D. System Configuration and Control;

E. Revenue management and reconciliation

F. Ridership management and reconciliation

G. Smart Media Design; and

H. NPT Device Software Updates

The CDCRS design shall be sufficiently robust, and to the extent possible, automatically isolate and/or recover from errors. The system shall employ Microsoft® Windows Server 2008 or SEPTA-approved equal.

Data communications equipment used by the CDCRS shall be service proven commercially available equipment employing and supporting industry standards and protocols. The detailed design of the CDCRS shall be developed by the Contractor for SEPTA's approval.

CDCRS software programs shall be modular and structured, developed using a "black box" approach. Modules should be able to be modified, recompiled, and replaced with a goal of isolating all affected changes to a specific function.

The CDCRS shall utilize Microsoft® SQL Server 2008 or Oracle® 11g as a database engine. The Contractor shall provide technical information on the database engine selected. **CDRL 19-1** CDCRS shall provide a suite of standard reports, which shall provide all basic information necessary to operate, maintain, and analyze fare system performance and revenue and ridership data. Additionally, SEPTA shall have the ability to generate reports using the CDCRS database in an ad-hoc manner through the use Crystal Reports 2008

The CDCRS shall be designed so that data is backed up to allow full recovery of the system (operating system, application software, database, utilities, and all data and transaction files) with no loss of data integrity.

The system shall provide for the automatic archiving at user programmable time periods of all transaction data and critical core software to secure media without user intervention. Contractor shall provide a description of how the system performs this archiving for SEPTA approval at the Final Design Review. **FDR 19-2**

19.2.1 Network Architecture

The CDCRS shall be established on its own LAN, separate of both the existing SEPTA WAN and all Communications networks outlined in Section 18.

All CDCRS servers shall be part of a single CDCRS Domain.

19.2.2 Data Transmissions

All NPT equipment, including mobile devices, shall be in constant communications with the CDCRS. NPT equipment will be capable of providing unsolicited data transmissions to the CDCRS at any time. With this, the CDCRS shall be able to handle communications from any combination of NPT equipment at any given time.

All NPT equipment shall be capable of being polled at any time the device is connected to or in communications with the NPT network, ~~while~~ whether it is in revenue service or not. Data communications equipment used shall be service-proven commercially available equipment employing and supporting industry standards and protocols. Data, including sales, event, and error data, shall be transmitted from each item of equipment for pre-selected and user modified time periods and available on demand. Received data shall be automatically processed and populated into all pertinent databases. The system shall record the date and time data was received from each device.

Transaction information shall include transaction number, payment information (as identified in Section 2.4.1), fare media usage, plus all other information including card/media serial number to provide a complete, unique and auditable transaction record. This transaction information format shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 19-4, FDR 19-3**

The CDCRS shall be capable of transmitting, receiving, processing, and storing data including simultaneous receipt and transmission of data to and from NPT equipment, while receiving report queries from users, data transmissions to/from the workstations and requests from other portions of the NPT network. In addition, the CDCRS shall track all data transmissions from each NPT field device, and verify that the transmitted data has been properly received by the NPT Database Server (NPTDS). Once a transmission of data from a NPT device has been successfully received and stored by the CDCRS, an acknowledgement statement shall be returned to the proper device. This acknowledgement shall serve as the notification to the device that the data has been replicated, and cannot be deleted from its local memory.

All software and event error code tables shall be available for editing through the CDCRS. Updated tables for error and event messages shall be downloaded to the appropriate equipment where they shall be resident.

19.2.3 Data Redundancy

The CDCRS shall be designed so that all data is stored redundantly. Redundancy shall be maintained throughout the system, and culminate when two verified backup copies are archived.

Redundant information shall be stored so that no subsystem failure shall compromise copies of the data.

The system shall include appropriate archival hardware and media.

Procedures, documentation, and training shall be provided for restoration of data from the various redundant sources in the event of failure in primary data storage, transmission or the NPTDS itself. The Contractor shall provide details and information on the data redundancy scheme employed to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 19-5, FDR 19-4**

The CDCRS shall be designed so that all data is stored redundantly. Redundancy shall be maintained throughout the system. Redundant information shall be stored so that no subsystem failure shall compromise copies of the data.

Procedures, documentation, and training shall be provided for restoration of data from any redundant sources in the event of failure in primary data storage. The Contractor shall provide details and information on the data redundancy scheme employed to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 19-6, FDR 19-5**

19.2.4 Data Backup and Archiving

The CDCRS shall have a means for regular automated backup and archiving to separate secure storage media. The backup process shall clearly define the appropriate verification, recovery, and restoration procedures, and clearly demonstrate a successful process without loss or duplication of data. There shall also be defined processes for automated data archiving. This process shall include both onsite backups for fast restoration and off-site backups for disaster recovery.

The Contractor shall be responsible for defining the backup and archive media as well as the associated procedures for both backup and archiving. The Contractor shall provide details and information on the data backup and archiving schemes employed for SEPTA's review and approval. **PDR 19-7**

19.2.5 Disaster Recovery

The Contractor shall design the CDCRS to be incorporated into SEPTA's Disaster Recovery Plan. This includes the establishment of a second, identical CDCRS, to be deployed at SEPTA's Business Recovery Site. Both instances of the CDCRS shall be responsible for being in constant communications via the fiber optics communications link outlined in Section 18. Through this link, each CDCRS shall be maintained as a mirror image of the other. With this, all functions of the CDCRS shall be available at either instance of the CDCRS.

In the event that the main CDCRS within SEPTA IT Department's Data Center is force offline for any reason, the backup CDCRS at the Business Recovery Site shall seamlessly and automatically take control of the NPT System. This process shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 19-8, FDR 19-6**

19.3 CDCRS Servers

19.3.1 General Hardware Requirements

All servers provided as part of the CDCRS, as shown in Figure 19-1, shall consist of computers and any necessary ancillary equipment. The servers and peripherals shall be state-of-the art commercially available computers, suitable for server functions, with properly sized memory and data storage. These servers shall all be rack mounted.

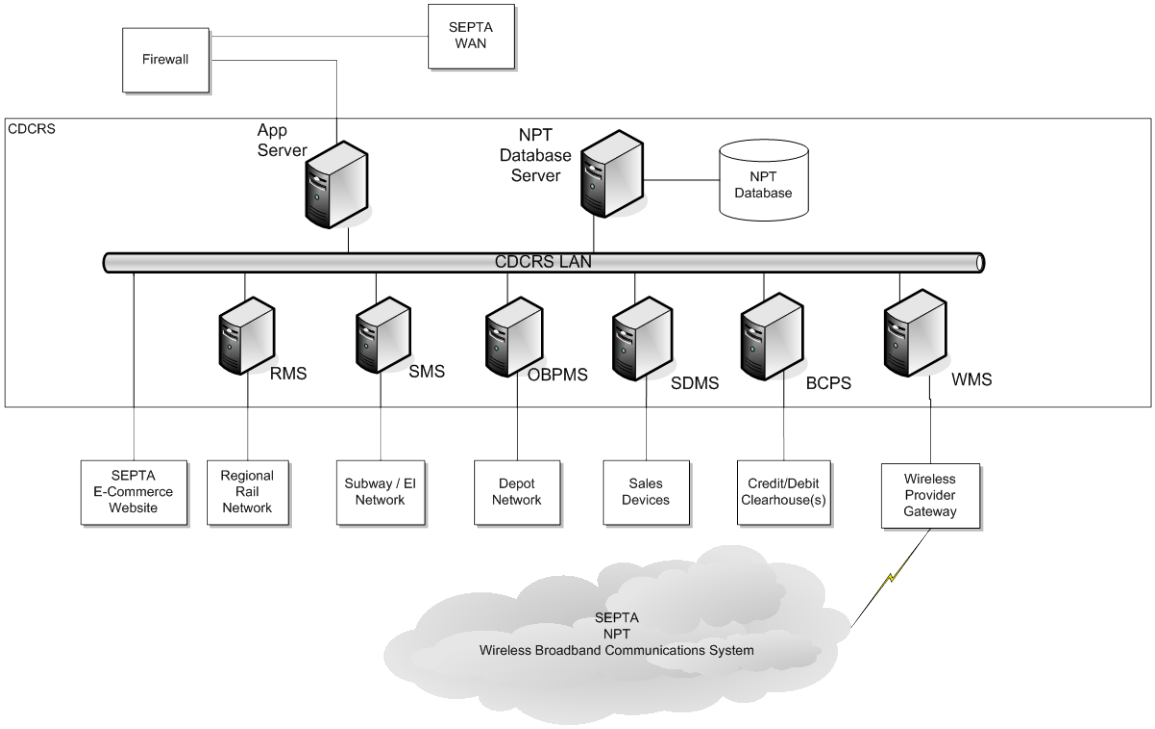

Figure 19-1 – CDCRS Servers

All servers shall incorporate service proven, industrial grade commercially available 64-bit processors made by Intel and utilizing Microsoft® Windows Server 2008 x64 or approved equal. All servers shall be capable of joining to a cluster, and shall support the ability to maintain, diagnose, and update the system by isolating one-half of the system from production.

All servers shall be designed to divide and replicate data among multiple hard disk drives through the use of a Redundant Array of Independent Disks (RAID). The NPTDS shall utilize a RAID 10 array. All other servers shall utilize RAID 1 as a minimum.

The servers shall have adequate capacity to retain data until redundant copies have been made and verified per the requirements of Section 19.2.3.

All CDCRS server hardware, operating systems, and relational database managers shall be from OEM suppliers approved by SEPTA.

The Contractor shall provide all computer hardware (central processing assembly, keyboard, video display, mouse, and all other necessary peripherals) with sufficient processing, memory, expandability, and data storage capacities to support successful operation of the CDCRS.

CDCRS capacity and performance shall meet the following criteria:

A. The system shall have adequate capacity to retain data until redundant copies have been made and verified elsewhere.

B. System shall have at least 100% excess storage and processing capacity, to be demonstrated by actual system operation.

C. Support for a minimum of 2,000,000 daily data transactions.

D. The hardware shall support and be compatible with all proposed software, and effectively process all events and transactions from the devices that are being furnished and shall provide sufficient capacity to accommodate a 50% increase in the number of devices and transactions.

E. To ensure security of credit/debit card customer PIN numbers, all transmissions from the CDCRS to outside services/switches and from/to the Smart Media sales equipment shall utilize a hardware encryption device that employs 3DES and satisfies all current PCI DSS requirements.

F. The CDCRS shall have redundancy to enable continued operation of critical security functions or of transaction functions without degradation that is obvious to the user.

All CDCRS servers shall be delivered to SEPTA with~~connected~~ an integrated~~with an~~ Uninterruptible Power Supply (UPS) and software with sufficient battery capacity to power for at least one-hour on battery power and provide a subsequent orderly shutdown.

The Contractor shall provide all necessary computer hardware to ensure that the CDCRS has no single point of failure.

A conceptual description of all CDCRS server hardware shall be submitted at the Conceptual Design Review for SEPTA's review and approval. **CDR 19-3** Final design details, including server manufacture, model, and other hardware selection is subject to SEPTA's review and approval at the Final Design Review. **FDR 19-7**

19.3.2 NPT Database Server

All data associated with this system shall ultimately be retained on the NPT Database Server (NPTDS). Microsoft® SQL Server 2008 or Oracle® 11g shall be used as the database. Contractor's use and implementation of either database shall not contain any non-standard or proprietary instructions or commands.

The NPTDS shall store all data relating to the operation of the NPT System in one relational database, consisting of multiple tables, stored procedures, and queries. The NPT database shall be ODBC compliant such that data may be exchanged as necessary with other compliant applications. The database manager shall support standard Structured Query Language (SQL) commands and queries.

Database tables and relationships shall be designed and developed to minimize the time required to perform queries and to generate reports without adversely impacting the operation of any other system functions.

Through the use of Microsoft® SQL Server, the Contractor shall provide SEPTA with the means to configure all database tables, relationships, system queries, and automated procedures. This shall include all necessary functions to generate and modify both queries and to integrate with other software application.

19.3.2.1 Summary Level Information

The CDCRS shall automatically generate daily summary tables from the detailed transaction detail. This summary level information shall provide daily revenue and passenger totals by station/stop, route, mode, etc. This summary level information shall not include any detailed transactional data. As such, the CDCRS shall generate these reports, at the close of business each day, from the detailed transaction records. Data included and format provided for the summary tables shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 19-9, FDR 19-8**

19.3.2.2 Database Retention

The NPTDS shall store all transactional information for a pre-defined amount of time in the defined database format (Section 19.3.2). This time period shall be initially defined as seven (7) year and shall be modifiable by an authorized user of the CDCRS. During this time period, transactional data shall remain available through the NPTDS and the CDCRS applications.

The CDCRS shall automatically move detailed transactional data older than this period of time, to off-line storage per the requirements of Section 19.2.3, and then delete it from the database.

While no longer loaded within the NPT database, older transactions data shall be archived and readily available for retrieval, reporting, and query purposes.

At no point shall the summary level, generated as outline in Section 19.3.2.1 be automatically deleted.

19.3.2.3 Fare Tables

The fare tables are an extensive set of tables that define the policies and prices for each transaction type. The fare table entries shall include all elements that are necessary to properly define the entry (e.g., the button assignment for a product, its price, the text to print on the media, data to be encoded and the format of this data, and the audio message to be played) and other require sales information and functionality to meet the NPT System requirements.

Fare tables shall support fare changes based on media types as well as on an exception basis. Exception-based changes include fare changes for an entire service, line/route, or a branch and down to the individual location. Similarly, means shall be provided to program special fares for designated special events such as sporting events for specific services, routes, line segments, and stations/stops. Fare tables shall be identified by the date and time they become effective as well as with a unique version number.

The software shall provide menu options to create, edit, display and/or print, and download to the end devices the fare tables that are used to generate media and receipts, to collect cash fares, to validate machine-readable fare media, and all other fare transactions. The "create" and "edit" functionality shall be coded so that it can be executed independently, if necessary. The fare table generation and manipulation software shall be maintained by and operated via the CDCRS.

Automated process will be put in place to copy any existing fare table effective-date to a new effective-date. This will reduce manual data entry by requiring the support staff to only key changes.

The NPTDS, shall be able to actively retain 100 fare tables. This shall include the current fare table, as well both previous tables and those that are in development and test for future deployment.

The ability to access fare table routines and files shall be controlled through a separate layer of user security.

Records shall be kept of all changes made to fare table components and associated files by user ID, date, time location, and modification made. At the device level, fare tables and associated files shall be tamper proof.

In the event of a network failure, means shall be provided to create a file for manual transfer to and from all NPT devices via backup media.

19.3.2.4 Revenue Model

The revenue model is a program that will be used to allocate collected revenue and fare media receipts to the associated mode of transportation. It shall calculate linked and unlinked ridership by media type, mode, and district.

Utilizing the ridership information available from the NPT System, the revenue model shall calculate the revenue allocation percentages and ride factors. The results of this calculation shall be used to calculate revenue and ridership by fare instrument, by mode and by district. For situations where the NPT System can not provide detailed information, including free interchange locations, the model shall allow for manual insertion of ride factors and allocation percentage as an addendum to the calculated information.

Additionally, the model shall utilize trend analysis to determine projections in ridership. These projections shall be capable of being amended to take into account events unknown to the system, like upcoming events in the city, or changes to SEPTA's system

At the end of each reporting interval, the revenue model shall generate the necessary information to support the transmittal of revenue information to the General Ledger.

19.3.2.5 Historical Data

The Contractor shall be responsible for the migration of all SEPTA historical data from SEPTA's existing legacy systems, which are outlined as being replaced by the NPT System. This shall include all data currently stored in SEPTA's 16 legacy revenue applications.

Migration Plan

The Contractor shall develop a plan for this migration and submit it to SEPTA for review and approval. **PDR 19-10.** This plan shall identify all sources of SEPTA legacy data, identifying all data fields and how these fields shall be translated into the data structure defined for the NPT Database.

As part of this Migration Plan, the Contractor must identify an approach for the transition of data from the legacy systems to the NPT Database for all data collected during the deployment of the NPT System, while the legacy systems are still in operation.

19.3.3 Domain Controller

All CDCRS servers shall be part of the CDCRS domain. As such, this domain shall be under the control of the CDCRS Domain Controller. This server shall be responsible for the management of all user privileges for the system. In addition, the Domain Controller shall be responsible for the distribution of the patches and updates across the CDCRS domain.

The Domain Controller shall be responsible for setting the standard time that will be used throughout the system. The network management servers (Section 19.3.4) shall be responsible for synchronizing with this time and ensuring that all NPT field devices are also synchronized with this time.

19.3.4 Network Management Servers

The CDCRS shall employ a set of servers that are responsible for the transmission of data between the CDCRS and the NPT devices. There shall be a server assigned to each data network outlined in Section 18 (See Figure 19-1). Each server shall be responsible for all data communications between all NPT devices associated with a network, and the components of the CDCRS. This includes connecting devices to the NPTDS and all software applications. These servers are outlined in Table 19-1.

The Network Management Servers shall be responsible for synchronizing the time of all NPT field devices with the CDCRS time, as set by the Domain Controller. This Domain Controller shall obtain the current time information from SEPTA's existing time server. The Contractor shall submit its plan for time synchronization for SEPTA's review and approval. **PDR 19-11.**

~~All servers shall obtain the current time information from SEPTA's time server.~~

All Network Management Servers shall meet the requirements outlined in Section 19.3.1.

Table 19-1 – Network Management Servers

Server	Locations Control	Network Communications
On-Board Processor Management Server (OBPMS)	Bus Depot and Trolley Barns	Depot Network
Subway Management Server (SMS)	Subway / Elevated Stations	Subway / Elevated Network
Rail Management Server (RMS)	Regional Rail Stations	Regional Rail Network
Sales Device Management Server (SDMS)	Sales Locations	Sales Device Network

19.3.4.1 On-Board Processor Management Server

The On-Board Processor Management Server (OBPMS) shall be responsible for all operations on the Depot Network (See Section 18). All OBPs on the surface routes shall communicate with the OBPMS, over the OBP Network, for transfer of all stored data and transfer of equipment parameters.

This OBPMS shall be capable of simultaneous (asynchronous) receipt of data from all depot locations. The server shall also be capable of simultaneous receipt of data from one or more OBP(s) while data is being transmitted to one or more devices OBP(s). In addition, the system shall be capable of simultaneous receipt and/or transmission of data to/from OBP(s) while processing report queries from workstation users as well as requests from other system components.

19.3.4.2 Subway Management Server

The Subway Management Server (SMS) shall be the device responsible for all operations on the Subway/Elevated Network (See Section 18). As such, all NPT equipment in the subway and elevated structures shall communicate with the SMS for transfer of all stored data and transfer of equipment parameters.

Data processing and transmission rates shall be capable of supporting all of the defined transaction processing times outlined in Section 2. Additionally, patrons shall perceive no delays due to equipment interaction with the SMS and workstation users shall not experience unreasonable delays.

The SMS shall consist of a computer and all necessary ancillary equipment. This system shall provide a communications link between the CDCRS and all NPT equipment on the Subway Tunnel Network via the Subway Tunnel network. This includes being able to perform all functions for transmittal and retrieval of information with any item of NPT equipment and any other subway station level hardware.

It shall be possible to utilize the Subway Tunnel/Elevated Network to expand data coverage for the surface fleet. This would result in a wireless access point for bus/trolley OBP communications being connected to the network. As such, the SMS and OBPMS shall interact for the successful transmittal of related data.

This SMS shall be capable of simultaneous (asynchronous) receipt of data from all stations. The server shall also be capable of simultaneous receipt of data from one or more devices while data is being transmitted to one or more devices. In addition, the system shall be capable of simultaneous receipt and/or transmission of data to/from NPT field devices while processing report queries from workstation users as well as requests from other system components.

19.3.4.3 Rail Management Server

The Rail Management Server (RMS) shall be the device responsible for all operations on the Regional Rail Network (See Section 18). As such, all NPT equipment on the rail network shall communicate with the RMS for transfer of all stored data and transfer of equipment parameters.

Data processing and transmission shall be at a rate suitable for the required task; Customers shall perceive no delays due to equipment interaction with the RMS and workstation users shall not experience unreasonable delays.

The RMS shall consist of a computer and all necessary ancillary equipment. This system shall provide a communications link between all equipment on the Regional Rail Network and SEPTA's WAN (Section 18). This includes being able to perform all functions for transmittal and retrieval of information with any item of NPT equipment or any other Regional Rail station level hardware.

This station level hardware shall include a wireless access point. This wireless access point shall conform to the wireless standards outlined in Section 18. As discussed, this access point is responsible for the transmittal of data with the conductor's handheld devices. The RMS shall be responsible for all data related communications between the handheld devices and the CDCRS.

It is anticipated that similar use of wireless technology shall be utilized to integrate new parking equipment into the NPT System. As described in Section 18, this system shall encompass both wireless parking equipment as well as handheld devices for parking enforcement. The RMS shall be responsible for all communications between this equipment and the CDCRS.

This RMS shall be capable of simultaneous (asynchronous) receipt of data from all stations. The server shall also be capable of simultaneous receipt of data from one or more devices while data is being transmitted to one or more devices. In addition, the system shall be capable of simultaneous receipt and/or transmission of data to/from all NPT devices while processing report queries from workstation users as well as requests from other system components.

19.3.4.4 Sales Device Management Server

The Sales Device Management Server (SDMS) shall be the device responsible for all operations retailed to the ~~NPT Sale Devices. These devices include both the RSD and~~Administrative Sales Device (~~-~~ASD~~)~~. As such, ~~all Sales Devices~~the ASDs shall communicate with the SDMS for transfer of all stored data and transfer of equipment parameters.

ASDs ~~and RSDs~~ will be primarily installed on the Rail and Subway/Elevated data networks. As such, the SDMS shall be capable of communicating with those networks.

Data processing and transmission shall be at a rate suitable for the required task; Customers shall perceive no delays due to equipment interaction with the SDMS and users shall not experience unreasonable delays.

The SDMS shall consist of a computer and all necessary ancillary equipment. This system shall provide a communications link between all ~~RSDs and~~ ASDs on the NPT networks and SEPTA's WAN (Section 18). This includes being able to perform all functions for transmittal and retrieval of information with any ~~Sales Device~~ASD.

This SDMS shall be capable of simultaneous (asynchronous) receipt of data from all stations. The server shall also be capable of simultaneous receipt of data from one or more devices while data is being transmitted to one or more devices. In addition, the system shall be capable of simultaneous receipt and/or transmission of data to/from all NPT devices while processing report queries from workstation users as well as requests from other system components.

19.3.5 Application Server

The Application Server shall be the device responsible for the operation of all NPT System reporting and management applications. As such, all other NPT servers shall communicate with the Application Server for transfer data and instruction to the software applications. These applications are outlined Table 19-2.

The Application Server shall consist of computer and all necessary ancillary equipment. This system shall provide the necessary link between the end-user applications and all of the other NPT servers.

This Application Server shall be capable of simultaneous (asynchronous) receipt of data from all other servers. The server shall also be capable of simultaneous receipt of data from one or more servers while data is being transmitted to one or more other servers. In addition, the system shall be capable of simultaneous receipt and/or transmission of data to/from servers while processing report queries from workstation users as well as requests from other system components.

The Application Server shall serve as the bridge been the NPT Network and SEPTA's existing WAN (Section 18). Users from any workstation on SEPTA's WAN shall be able to access NPT applications, via a web browser, Microsoft® Internet Explorer 7. Through the applications on this server, users will be able to monitor and configure NPT devices and CDCRS servers.

19.3.6 Bank Card Processing Server

The Bank Card Processing Server (BCPS) shall be the device responsible for the processing of all credit and debit card transactions across the NPT System. The BCPS shall support the functions defined in Section 19.5.1.4.

19.3.7 Server Virtualization

The Contractor may deploy the above servers as Virtual Machines (VMs). If the Contractor elects to deploy a Virtual solution, all servers above must be deployed as VMs.

The use of virtualization does not supersede any of the requirements of Section 18 of the Technical Specification.

All VMs shall be hosted on a Virtualization Server, utilizing Microsoft Hyper-V Server 2008 R2, or approved equal. This Virtualization server shall utilize computer hardware that is suitable to support the number of virtual servers that it supports.

In the event that the Contractor elects to utilize Virtualization, details shall be provided to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 19-12, FDR 19-9**

19.4 Data Access, Queries, and Reports

It shall be possible at the CDCRS to query any item of NPT data stored within the systems, including transactional information, alarms, status changes, and all other elements stored as transaction records. This shall include historical records as well as current information. If required, archived data shall be loaded.

All data received from NPT devices shall be retained by the CDCRS on the NPTDS.

19.4.1 Standard Reporting

The CDCRS shall provide the capability to query the system database to produce reports for auditing, cash, and media control, planning, fare management information, maintenance, and other similar requirements. This functionality is presented in Section 19.6.6, Reporting System. The software shall be provided to enable authorized users to view predefined reports.

In addition, this application will allow authorized users to develop new or modify existing queries and reports. Preprogrammed reports shall be generated by the report generation package outlined in Section 19.6.6.

The ODBC compliant database(s) on the NPTDS shall permit access to the data files with other database programs to produce reports, in addition to those provided by the Contractor.

The need for historical data analysis requires the system to have the ability to produce reports that span two or more changes in fare structure or level without special programming.

19.4.2 Ad Hoc Reporting

The CDCRS shall provide a mechanism for authorized SEPTA users to extract information directly from the NPT database through a report writer facility, Crystal Reports 2008. SEPTA shall be able to use any data items within the entire NPT database to create the ad-hoc reports. In development of these reports, SEPTA shall have the ability to sum columns, provide sub-totals and incorporate other functions necessary for SEPTA to prepare the needed management reports.

Menus and screens to support the generation of reports, as well as the timing and location of the resulting output shall be provided.

Once a report is defined, the system shall have the ability to display the output before printing, and store the definition for reuse.

Except as approved by SEPTA, system/ad hoc reports shall be generated by the report generation package provided.

19.4.3 System Queries

CDCRS shall provide a mechanism for extracting information directly through a query facility. CDCRS shall incorporate menus and screens to support the generation of queries, as well as scheduling the location of the resulting output. Once a query is defined, the system shall have the ability to display the output before printing, and save the query procedure for reuse.

The CDCRS shall be capable of generating all reports and queries necessary to integrate the new system with SEPTA existing applications. Queries shall be available for historical usage patterns for the NPT System, component failures, and network reliability rates.

19.5 System Interfaces

It is anticipated that the CDCRS shall interface with systems, both internal and external to SEPTA. The identification, design, and programming of necessary interfaces to existing application systems, shall be the Contractor's responsibility under the direction of SEPTA. Final approval regarding the necessity of identified interfaces and the subsequent design and programming of said interfaces shall be with SEPTA. **FDR 19-10**

19.5.1 External System Interfaces

Interface with the CDCRS shall be limited through security and appropriate password authorization. Every interface with the CDCRS shall contain safeguards (software and/or hardware) to prevent unauthorized intrusion and access to modification of data.

19.5.1.1 Interface with SEPTA WAN

A firewall examines all network traffic and blocks those transmissions that do not meet the specified security criteria.

To allow authorized users to be able to access the reporting and management applications available on Application Server, it must be accessible from the SEPTA WAN. However, the CDCRS must be protected from unauthorized access from the SEPTA WAN. To support this, the application sever shall be connected to SEPTA's WAN via a Cisco ASA5520 hardware firewall, or approved equal. This firewall shall examine all network traffic and block any transmissions that do not meet required security criteria.

Additionally, this firewall shall record all events and transmit them via a system log service to external SEPTA server for permanent storage.

19.5.1.2 SEPTA Network and Workstations

The CDCRS shall interface with SEPTA's existing WAN (Section 18) and all workstations that are connected to it. These terminals shall allow authorized employees access to defined system functions, including all applications on the Application Server, through the CDCRS security functions.

The connection between the CDCRS and SEPTA's WAN shall occur through the Application Server. This Server shall incorporate dual network card interfaces, and will serve as the bridge between the two data networks. All user interaction from the SEPTA WAN shall communicate with only the Application Server and its associated applications. Users and systems from SEPTA's WAN shall not be able to communicate with any other CDCRS server through the Application Server.

All commands and data access from the SEPTA WAN shall be recorded for audit purposes and will not affect CDCRS operations.

19.5.1.3 Alarms to SEPTA Police Dispatch

All alarm conditions shall immediately be recorded by the CDCRS and immediately communicated by the CDCRS to SEPTA's Police force. Alarms forwarded to this system shall include unauthorized entry into any NPT field device and failure of a field device to respond to a system assurance poll by CDCRS. A final list of alarm conditions to transmit to SEPTA's police force shall be developed for Final Design Review. **FDR 19-11**

The Contractor shall be responsible for formatting data forwarded to the police in the format specified by SEPTA for that system's ready acceptance. The format of the data feed requirements for SEPTA's police force will be provided to the Contractor by SEPTA.

19.5.1.4 Communications with Financial Institutions

The CDCRS shall provide for communication with financial institutions (banks and/or clearinghouses) for the purposes of obtaining authorization to complete a transaction with a credit card or debit card, or to load value to an account linked financial account. The CDCRS shall provide for the identification of telecommunications protocol requirements, the timing of automatic transmissions, and data elements that shall be transmitted.

The communications with the Financial Institutions shall be meet the reliability requirements of Section 19.1.

All communications shall be ISO/IEC-8583 compliant.

The ability to add, change, and delete such institutions shall be provided.

The system shall support the logging, storage, backup, and retrieval of information regarding such data transmissions, including timing of the transmission, data transmitted, and status of the transmission, for both individual transactions and entire files, such as settlement files.

The CDCRS shall automatically accept files transmitted to SEPTA, from such institutions, including, but not limited to, bank reconciliation files, bank identification number files, etc.

19.5.2 Interface with Legacy Systems

The CDCRS shall be capable of, but not limited to, interfacing with the following SEPTA legacy applications:

- General Ledger;
- Crew Management System and or a Scheduling System;
- CCT Reservation and Scheduling System;
- TrapezeFX;
- Fare Application Request Management (FARM);
- GFI Network Manager;
- MultiRail-PE;
- Police Dispatch; and
- Audio-Visual Public Address (AVPA) System

A functional description of interfaces for each legacy system shall be provided at the Conceptual and Preliminary Design Reviews for review by SEPTA and for approval by SEPTA at the Final Design Review. **CDR 19-4, PDR 19-13, FDR 19-12** This information shall include the design or the operational flows, screens, functions and other similar information and shall included increasing detail with each design review step. **CDRL 19-2**

19.5.2.1 General Ledger

The CDCRS shall incorporate menus and screens to support uploading of information to SEPTA's General Ledger System. Uploads shall consist of the information collected from all revenue handling units, summarized as required to fit the form requested by the General Ledger, defined as the GL Feeder. This information shall be provided by SEPTA at PDR. **PDR 19-14**

The system shall allow uploads to occur automatically at a programmable time of the day, along with the capacity to manually initiate the upload. This information shall be obtained from all NPT Field devices via the NPT data networks and network servers.

The system shall track failed uploads along with [SNMP] diagnostic messages, and the number of times transmission was attempted. This information shall be retained for reporting and statistical analysis. It will be used for audit and problem resolution, unit, and network "mean time between failures" rates.

19.5.2.2 Crew Management System

The CDCRS shall interface with the Crew Management System to provide the NPT system with both railroad train schedules and railroad crew schedules. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the Crew Management System data and file structure. This tool shall import all necessary data to populate the NTP Database with regards to railroad vehicle and crew schedules.

19.5.2.3 CCT Reservation and Scheduling System

The CDCRS shall interface with the CCT Reservation and Scheduling System ~~to provide the NPT system with all CCT related information, including eligible patrons, schedule trips, trip history, and trip costs. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the CCT Reservation and Scheduling System data and file structure. This tool shall import all necessary data to populate the NPT Database with regards to CCT data.~~ to support CCT/NPT System integration. This interface shall provide the NPT system with all CCT related information, including eligible patrons, schedule trips, trip history, and trip costs. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the CCT Reservation and Scheduling System data and file structure. These tools shall import all necessary data to populate the NPT Database with regards to CCT data.

For the CCT Operating Scenario, the CCT System may request payment for a Customer's ride at one of two times; when the Customer schedules the trip (pre-pay) or at the time of boarding (field-pay). To support these requests, CDCRS must be configured to accept a payment request from an external application.

~~19.5.2.4~~This payment request must include general trip information, unique trip identification number, date and time of trip, and cost of trip. In addition, this request must include sufficient information to properly identify the NPT System Account from which funds are being requested. When a piece of Hybrid Smart Media is swiped, this identification is simply the account number stored within the card. However, when no card is presented, as is the case during scheduling, sufficient account information, including name, address, and phone of the account on file must be transmitted.

~~19.5.2.5~~19.5.2.4 TrapezeFX

The CDCRS shall interface with the TrapezeFX to import all non-railroad vehicle schedules. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the TrapezeFX data and file structure. This tool shall import all necessary data to populate the N~~T~~PTDB with regards to non-railroad vehicle schedules.

~~19.5.2.6~~19.5.2.5 *Fare Application Request Management*

The CDCRS shall interface with the Fare Application Request Management (FARM) application for identification of customers eligible for either reduced fare or senior fare. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the FARM data and file structure. This tool shall provide a mechanism for identifying eligible customers and producing appropriate media from NPT equipment and applications. It shall not require NPT users to access the FARM application. Additionally, while the tool shall serve as the basis of establishing either reduced fare or senior fare media, a customer's confidential medical and personal information shall not be transferred into the CDCRS.

~~19.5.2.7~~19.5.2.6 *GFI Data System 7*

As part of the overhaul of the the Surface Fleet Fareboxes, the system will be upgraded to work with GFI's Data System 7. This system shall be responsible for the collection and consolidation of all revenue information from the Surface Fleet Fareboxes. The CDCRS shall interface with the GFI Data System 7 to retrieve all relevant farebox transaction and revenue related data. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the Data System 7 data and file structure. It shall not require NPT users to access the Data System 7 application.

~~19.5.2.8~~19.5.2.7 *MultiRail-PE*

The CDCRS shall interface with MultiRail-PE system to retrieve route and schedule information. It will be necessary to have the ability to exchange data on a daily basis. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the MultiRail-PE data and file structure. This tool shall provide a mechanism for identifying required schedules and information. It shall not require NPT users to access the MultiRail-PE application.

~~19.5.2.9~~19.5.2.8 *Police Dispatch*

The CDCRS shall be responsible for monitoring and logging error and alarm conditions from all NPT systems and devices. The CDCRS shall interface with the Police Dispatch system to transmit these alarms for appropriate action by SEPTA. While this shall include alrms for unauthorized entry and break-ins, it shall be possible to transmit any alarm or fault code from the CDCRS to the Police Dispatch system.

~~19.5.2.10~~19.5.2.9 *Audio-Visual Public Address System*

The CDCRS shall interface with the Audio-Visual Public Address (AVPA) system for information regarding train locations and on-time performance. This information shall be exchanged in a real-time basis to allow the NPT system to respond to system performance. The Contractor shall be responsible for developing a procedure and all necessary software tools that are capable of interfacing with the APVA data and file structure. This tool shall provide a mechanism for identifying required schedules and information. It shall not require NPT users to access the AVPA system.

~~19.6~~19.5.3 Application Programming Interfaces

~~19.6~~The CDCRS shall include a series of Application Programming Interfaces (APIs). These APIs shall enable SEPTA to develop customized interfaces between NPT and other applications/systems.

~~19.6~~In general, a set of APIs shall be provided for each of the following functions of the CDCRS:

- ~~19.6~~Cash Room Functions
- ~~19.6~~Configuration Functions
- ~~19.6~~Crew Remittance
- ~~19.6~~Equipment Maintenance / Inventory Control
- ~~19.6~~Fare Tables
- ~~19.6~~Reporting System
- ~~19.6~~Revenue Accountability
- ~~19.6~~Revenue Model

~~19.6~~• Smart Media Management

~~19.6~~• Station Management

~~19.6~~• System Monitoring

For each API identified above, a CDRL shall be provided at the Preliminary Design Review for review by SEPTA and for approval by SEPTA at the Final Design Review. **PDR 19-15, FDR 19-13** This information shall include all details of the API, interfaces, the design or the operational flows, functions and other similar information. **CDRL 19-3**

~~19.6~~

~~19.6~~

~~19.2~~19.6 Software Applications

The Contractor shall be responsible for providing all necessary software applications for operation, monitoring, and management of the CDCRS, networks, and all NPT devices.

The NPT software applications are shown in Table 19-2.

For each software application identified within this subsection, a CDRL shall be provided at the ~~Conceptual and~~ Preliminary Design Review for review by SEPTA and for approval by SEPTA at the Final Design Review. **PDR 19-16**, **FDR 19-14** This information shall include the design or the operational flows, screens, functions and other similar information and shall included increasing detail with each design review step. **CDRL 19-4**

Table 19-2 – Software

Applications	Primary Functions	Section	Legacy Systems Replaced
Cash Room Manager	Manages Revenue Counting at Cash Room	19.6.1	CVMS – Cash Vault Management System
Configuration Manager	Manages Configuration of all Hardware	19.6.2	
Crew Remittance System	Handles Cash Remittance from Regional Rail Conductors	19.6.3	CRS – Crew Remittance System
Equipment Maintenance and Inventory Control System	Hardware Maintenance and Inventory Control	19.6.4	ESCROW – Elec. System Containing Revenue Operations Work REMS – Revenue Equipment Maintenance System RITS – Revenue Inventory Tracking System CRS – Crew Remittance System (Inventory Module only)
Fare Table Manager	Provides Fare Table Management and Reporting	19.6.5	Replaces fare tables used by existing revenue applications: BISS - Boarding Instrument Surveillance System CRS – Crew Remittance System CVMS – Cash Vault Management System GFI Turnstile System PBM – Permit Buy Mail PROFIT – Payment & Recording of Fare Instrument Transactions PROFIT/Farebox – CRM feeder to PROFIT for farebox data PROFIT/PPass – Prepaid Pass and Token management PROFIT/RAD – Calculates & Allocate Ridership & Revenue Service Guarantee System
Reporting System	Generate System Reports and Queries	19.6.6	BISS - Boarding Instrument Surveillance System CARS – Collection & Analysis of Ridership Surveys CRS – Crew Remittance System CVMS – Cash Vault Management System ESCROW – Elec. System Containing Revenue Operations Work GFI Turnstile System PBM – Permit Buy Mail PROFIT – Payment & Recording of Fare Instrument Transactions PROFIT/Farebox – CRM feeder to PROFIT for farebox data PROFIT/PPass – Prepaid Pass and Token management PROFIT/RAD – Calculates & Allocate Ridership & Revenue REMS – Revenue Equipment

Applications	Primary Functions	Section	Legacy Systems Replaced
			Maintenance System RITS – Revenue Inventory Tracking System Service Guarantee System
Revenue Accountability System	Provides NPT Oversight functions for Revenue Department and Inspector General	19.6.7	CARS – Collection & Analysis of Ridership Surveys PROFIT – Payment & Recording of Fare Instrument Transactions PROFIT/Farebox – CRM feeder to PROFIT for farebox data PROFIT/PPass – Prepaid Pass and Token management Service Quality / IG
Revenue Model Manager	Provides Revenue Model Management and Reporting	19.6.8	PROFIT/RAD – Calculates & Allocate Ridership & Revenue
Smart Media Manager	Manages all Smart Media Functions	19.6.9	PBM – Permit Buy Mail Service Guarantee System BISS - Boarding Instrument Surveillance System
Station Manager	Monitors Activities and Hardware at all Stations	19.6.10	
System Status Monitor	Reports Status of all Devices, Stations, and Communications Links	19.6.11	GFI Turnstile System

~~19.22.1~~19.6.1 Cash Room Manager

The Cash Room Manager (CRM) shall provide revenue tracking and reconciliation. This shall provide SEPTA with the ability to track all revenues received and reconcile the registered revenues against the counted revenues on a cash container basis. The CRM shall automatically extract the necessary information from the Cash Room equipment. In addition, the CRM shall provide for the automatic reconciliation of the registered revenues against the counted revenues and provide a summary of the differences.

The CRM shall be capable of working with a barcode reader installed on a workstation. Through this barcode reader, the CRM shall be able to identify cash containers. After a container has been identified, the CRM shall process the entry of counts of bills and coins from the Cash Room money counting equipment. The CRM shall also allow for the manual input of other revenue counted at the Cash Room that cannot be directly imported by the system.

Following the count of all coins and bills, the CRM shall automatically compare the counts of the bills and coins and store data for the differences. From this, a reconciliation report showing the differences by cash container shall be generated. This reconciliation report shall be provided only through the use of a high-level password. The report shall also provide a daily total and summary for all cash containers and an overall revenue accuracy figure.

Through the Cash Room Manager, supervisors shall be able to enter the information on the bank deposit slips into the system in order to permit automatic reconciliation of the funds reported by the bank against those entered at the Cash Room. This shall be accomplished through a high-level function with a special password and user name.

A report shall be produced that provides details on the monies collected, counted, and reconciled.

~~19.22.2~~19.6.2 Configuration Manager

The Configuration Manger shall be responsible for managing the configuration of all field devices in the NPT System. This application shall be responsible for managing the addition, modification, and deletion of equipment functionality and equipment configurations utilizing a GUI menu-driven interface. This shall allow SEPTA the ability to change, test configurations, and program tables before being updated throughout the system. This system shall allow the ability to roll back to a previous configuration that has not been manually purged from the system. Any difficulties with the rollback shall be automatically identified and reported to the user.

This application shall have sufficient capacity to adequately support all hardware to be provided as part of this project.

All configuration files and operational parameters of the NPT equipment shall be managed by this application. The application shall store all necessary parameters on the NPT database and distribute parameter and configuration changes across all NPT networks.

~~19.22.3~~19.6.3 Crew Remittance System

The Crew Remittance System (CRS) is intended to be a direct replacement for the financial remittance processes of the current CRS system. As such, this application shall serve as a method by which Regional Rail conductors can submit revenues and fare media, collected onboard the train.

The CRS shall provide revenue tracking and reconciliation related to the Regional Rail Division, as collected through the HSD. This shall provide SEPTA with the ability to reconcile conductor's work against the conductor's schedule and provide SEPTA with the ability to reconcile the remitted revenues against the actual revenues. In addition, the CRS shall provide for the automatic reconciliation of the remitted revenues against the recorded sale information and provide information on the differences in report form.

~~19.22.4~~19.6.4 Equipment Maintenance and Inventory Control System

The Equipment Maintenance and Inventory Control System (EMICS) shall be responsible for all maintenance support necessary to support the NPT System. This software, through the system monitoring functions, shall track all problems associated with all revenue equipment, including but not limited to Fare Gates, Fare Vending Machines, Fare Boxes, and Handheld Sales Devices. As such, this application shall communicate with the SMS, OBPMS, RMS, and SDMS. The EMICS shall identify all necessary maintenance items, and provide a manner for tracking all associated maintenance activities.

Inventory Controls

EMICS shall manage the parts and component inventory of SEPTA NPT equipment and facilities, and it tracks reusable subassemblies that may be removed, repaired, and stored for subsequent re-use. This system shall be used to track revenue parts inventory via bar coding and scanners. The EMICS shall allow Contractor part numbers to be entered by SEPTA personnel into the NPTDS and correlated to the SEPTA parts inventory scheme for internal tracking and reordering. The Contractor shall provide a list of parts and machine components and subassemblies, with their part numbers, in an electronic database or spreadsheet format, to SEPTA for database entry.

The Contractor shall define all inventory components, which are to be tracked by the EMICS, to SEPTA for review and approval.

When the EMICS is run from HSD it shall support the use of a bar-code reader. This shall provide for the use of the HSD to read bar codes on all equipment and components. When a barcode is read into the HSD, the EMICS shall open the detailed data for the associated hardware, and allow for modification of related parameters. Additionally, the EMICS shall support a swap mode, where an HSD can be used to read two equal NPT devices or components, signifying to the system that the system has replaced one piece with the other.

Through this application, the history and warranty status of any component of a NPT device shall be capable of being tracked. The system shall also be capable of determining its currents location in the system, through all networking systems, or that is in for service.

Upon delivery of the EMICS, it shall be loaded with all NPT inventory information that is to be supplied as part of this contract.

Software/Firmware Controls

The EMICS shall be responsible for tracking and controlling all software and firmware that is loaded on all NPT field devices. This application shall track and report the current status of all software currently loaded on devices at any time. This system shall push all software and firmware updates to all NPT devices via all NPTDS Data Servers and NPT Data networks. However, no update shall be pushed through the mobile data network.

Maintenance

The EMICS shall manage all of SEPTA's NPT equipment maintenance activities. The EMICS shall receive, track, and report notices of equipment failures (partial or total loss of function) and notify appropriate service and maintenance personnel. In the event of a hardware failure, the EMICS shall open work orders for both field and shop repairs. In addition, this system shall schedule preventive maintenance tasks and maintain a history of each system device and component. The EMICS shall interface with the Maintenance Support Devices specified in Section 22.5.4 to Open, process, maintain, complete and close work orders.

The EMICS shall collect all maintenance and inventory data to generate daily maintenance activity reports.

To enable EMICS to perform its functions for the NPT System, it shall poll the CDCRS for system data that it receives which relates to each maintenance related event. This data shall also be retained by CDCRS and archived according the terms stated in Section 19.3.2.2. The preventive maintenance regimen scheduled and tracked by EMICS will be based upon preventive maintenance documentation provided by the Contractor.

Through the HSD with barcode reader, the EMICS shall be able to track revenue crew and truck locations.

~~19.22.5~~19.6.5 Fare Table Manager

The Fare Table Manager shall provide menu options to create, edit, display, and print, and then download to fare devices the fare tables that are used to collect cash fares, and sell and process fare cards. The "create" and "edit" functions shall be coded so that it can be executed independently and, if necessary, on a separate platform. The download function shall be separately coded for secure, restricted access.

The Fare Table Manager shall enable SEPTA to revise and implement fare tables that are system-wide and take affect either immediately or at a pre-programmed time and date. The capability shall also be provided to create and implement a special fare that is added to or substituted for an existing fare or fare table for a temporary period (i.e., with a programmed expiration time and date) and which may apply system-wide or for a specific service (e.g., special one-day sports event service).

Completed files shall be downloaded to the NPT Network Management Servers for distribution to all NPT Field Devices. Fare tables shall be identified by the date/time that they become effective.

For each of the fare tables that are retained in the NPT database, the Fare Table Manager shall provide for a description field, allowing one to identify the purpose of that table. Additionally, the Fare Table Manager shall control and categorize fare tables by the following classification:

A. Draft – A fare table that is in development but not yet finalized or approved for deployment.

B. Approved – A finalized fare table that has not yet been assigned for deployment to the NPT System.

C. Pending – A finalized fare table that has been assigned forthcoming dates for which it will be distributed to the NPT System. It shall not be possible to assign a pending date to a fare table that is in conflict with either the active or another pending fare table.

D. Active – The fare table currently distributed to the system. The Fare Table Manager provide validation to ensure that only one fare table may be classified as “active”.

E. Hold – A formerly active fare table that is to be retained for revenue reconciliation. A fare table that is at Hold status shall not be capable of being modified, reassigned to a Pending status, or deleted. Manual intervention shall be necessary to release a fare table from a Hold status.

F. Expired – A fare table that has been released from a Hold status. This fare table can be modified for future use, approved as is with new pending dates assigned, or deleted.

The ability to access fare table routines and files shall be tightly controlled through the CDCRS security functions. Regardless of the host system, the “create” and “edit” functions shall provide sufficient security to limit editing and transmissions only to authorized personnel working regardless of location or platform.

A. For audit/security purposes, records shall be kept of all changes made to fare table components and associated files by user ID, date/time, etc.

B. At the NPT device level, fare tables and associated files shall be tamper proof.

C. NPT field units shall generate text, such as station names, based on information from the fare table.

D. This text shall be combined with stored images and graphics, also downloaded from the CDCRS, to produce the printed media.

Fare tables shall be downloaded to the fare devices via the Network. In the event of a network failure, the Fare Table Manager shall provide the ability to create a file for manual transfer to the fare devices via a secure medium.

~~19.22.6~~19.6.6 Reporting System

The CDCRS Reporting System shall have an application for all aspects of its reporting capabilities. This application shall allow the user to retrieve standard reports. These reports would include the reporting functions outlined in Section 19.4. This application shall be capable of running reports on demand or at predefined times. Users shall be capable of printing reports as well as exporting to common software application formats, including Microsoft® Word (.doc), Microsoft® Excel (.xls), and Adobe® Portable Document Format (.pdf).

This application shall also permit authorized users to design customized reports. This feature shall allow users the ability to select, sort, and summarize data on associated fields, such as device, station, or time period. The system shall provide the user with the abilities to generate reports utilizing various data sets, with grouping, sorting, and totaling capabilities. With this, menus and screens to support the generation of reports, as well as the timing and location of the resulting output shall be provided. The application shall present the user with easy to use tools for report generation but shall also allow for the use of Structured Query Language (SQL).

Reports and queries shall be capable of being executed as they are created and shall be capable of being added to the menu of queries and reports. Customized queries and reports shall be treated by the CDCRS the same as any Contractor-supplied query or report. Authorized users shall also be able to edit and delete any customized query or report.

SEPTA shall have the ability to generate reports using the CDCRS database in an ad-hoc manner through the use Crystal Reports 2008.

Predefined input forms for all information to be entered by system users shall be provided. These input forms shall be displayed on screens and provide “fill-in-the-blank” simplicity of use. Each blank on the input form shall correspond to a field in the associated database table. The general design of input forms shall be submitted for review at the Preliminary Design Review. **PDR 19-17**

Output format of all reports shall be of similar style. Each shall produce data in tabular form with columns clearly titled on each page.

Prepared report formats shall be provided by the Contractor at time of system and prototype testing. The reports and queries shall be presented in a menu form for selection at any time. Each shall have access permissions assigned to limit availability to those users authorized to utilize the query or report. Users shall have the option of routing standard report outputs to a workstation screen, a downloadable file, a temporary file for subsequent use, or to a selection of printers (either network or remote)

The validity of presented data shall be indicated on each query and report. If an item of equipment is not polled, query and report outputs shall clearly indicate for which items of equipment data is not included.

Standard reports shall include, at a minimum, all of the reports outlined within SEPTA's New Payment Technologies Book of Existing Reports, as included in ~~the~~ Appendix A.14.

In addition, the system must also include reports that address the following:

Revenue & Ridership

A. Boardings: A report showing entrances at a station or group of stations by media type for a specified date or range of dates; service type or day of week; for a specified time period during the day. Intervals within the time period shall be specifiable down to a one minute degree of precision.

B. Budgeted vs. Actual Revenue: Anticipated revenue budgeted for a given period vs. actual revenues received for the same time period.

C. Credit / Debit Media Sales by Type: A report detailing all credit and debit transactions by type, both media type and credit type (Visa, American Express, etc.) for use in auditing the settlement of charges. This information shall be further segregated by date and by location.

D. Customers Onboard Report: A real-time total showing the number of customers believed to be onboard at a specified time by media type. This report shall be calculated by summing total boardings for the day less total exits.

E. Hot List Report: A list of all Media that will not be accepted by the NPT System.

F. Media Registration List: A database listing of all Smart Media currently registered with SEPTA, with a record of pertinent data for each type of Smart Media holder (e.g., name, address, telephone number, rider class, employer ID (if applicable), ~~Autoload payment account and~~ automatic replenishments and authorized thresholds.

G. Media Reload Transaction Summary: A report showing the total number of value reload transactions by location and payment type.

H. Media Sales: Number and total dollar value of sales, by type, and payment method; with breakout by location and device.

I. Media Use Report: A report showing all transactions for a given media type, media serial number, list of serial numbers, or range of serial numbers. In addition, the system shall have the ability to specify all cards purchased or used during a given time span at a particular station.

J. Origin/Destination: Original origin of linked or single rides shall be paired with the origin of the next linked or single ride to produce origin / destination pairs. Totals shall be displayed for the number of trips for each pair.

K. Revenue Model Allocation Report: A report detailing the availability of the actual allocation percentages and ride factors by period, which can be used for analysis and trend information.

L. Revenue Model Report: A detailed report of revenue and ridership assigned by fare instrument, by mode by district.

M. Revenue Model Summary Report: A summary level report of revenue and ridership assigned by fare instrument, by mode by district.

N. Ridership: Total Ridership, system-wide, this should show both linked and unlinked rides, by station this should show both entrances and exits from station. Ridership profiles by time of day, day of week, service type (weekday, Saturday, or Sunday), line, line segment, station, and by month should be generated with this report. Rides shall be linked if subsequent rides are taken within a user selectable time limit of a previous ride. Different time limits shall be settable for each mode.

O. Transaction Detail: A report listing all transactions, in detail, together with time date, device number, location and media type.

P. Transaction Summary: A report showing the total number of patron and service transactions, by transaction and media type.

Status & Maintenance

A. Cash Module Report: A report identifying the location of each bill vault, coin vault and change module and the time and date of its last change-out.

B. Component Failure Report: A report listing assembly failures, type of defect, time and date of failure, device ID and component ID (if applicable).

C. Device Activity Logs: A report depicting each activity that occurs at a NPT device. This report shall show the activity and the date and time that this activity occurred.

D. Device Availability: A report providing a snap shot in time with a summary and detail listings of the fare devices in & out of service, and the percentage of the total population in service.

E. Device Service History: A report listing all failures and service events, by NPT device.

F. Error Logs: A report of each error that occurs at the various fare devices. This report would depict the specific error code, description, and date and time that this error occurred.

G. Failure Report: A report listing equipment failures, type of defect, time and date of failure, media, device ID and component ID (if applicable).

H. Jammed Media Report: A report detailing all partially printed or non printed media indicating the percentage of media printed, if any, if a transaction was completed, and was money returned or accepted.

I. Maintenance Management Reports: Reports showing planned preventive and corrective maintenance work, by crew, as scheduled by the maintenance tracking system. Reports shall also be available showing due and overdue maintenance, by type of maintenance, by location or equipment type.

J. Parts Inventory: A report listing all serial numbered parts and subsequent exchange activity, including prior and current serial numbers.

K. Polling: A report showing the status of polling data from each device to the central computer system.

L. Service Employee Activities: A report of all employee interactions with the fare devices. This report shall include device number and location, time and date of entry and exit, and actions taken.

M. Service History: A report listing all failures and service events. As an option, an analysis of MTBF, MTTR, and / or MCBF should be included, as applicable.

N. Stock Control: A report indicating all current media numbers in FVDs as well as any stock exchange activity, including prior and current numbers.

Reconciliation

A. Bank Deposits: Detail of all components of bank deposits (coins, bills and checks by type and amount), by deposit number.

B. Close Down Reconciliation: A report for each device, showing total sales by payment method and sales category, expected vault contents, actual counts, and variance; generated by query and automatically when any unit storing cash is removed.

C. Coin Activity Report: A report detailing device coin exchange activity, including prior and replenishment contents of affected receptacles, and listing all current quantities of coin receptacles

D. Credit and Debit Error Log: A report detailing credit & debit rejection codes and transaction status.

E. Daily Reconciliation: A report for each device showing total sales by payment method and sales category, expected vault contents, actual counts, and variance; generated automatically on a daily basis at a pre-set time (initially set at 3:30am).

F. Employee Activities: A report of all employee interactions with the NPT system. This report should include device number and location, time and date of entry and exit, and actions taken.

G. Fraudulent Media Use: A report listing media usage by media type, which violates system standards. The transaction database shall be checked for altered media values, illegal serial numbers, and usage at different stations, which violates minimum transit time between station standards.

H. Cash Room Facility Vault Activity: A report, by denomination, of all transactions into or out of SEPTA's Cash Room Facility vault. This report shall also include the purpose of the transaction - e.g. bank deposit, device receipts, device stocking, etc.

I. Variances: A historical report of all shortages and / or overages in the inventory control process. This report shall include NPT device number, vault numbers, counting machine numbers, and revenue collection and counting employees involved. A minimum discrepancy level shall be settable to eliminate minor differences.

~~19.22.6.1~~19.6.6.1 *Error Messages*

All software and tables shall be available for user editing through the Application Server. Updated tables for device error & event messages shall be downloaded to the devices where they will be resident.

~~19.22.7~~19.6.7 Revenue Accountability System

The Revenue Accountability System shall provide all functions that are necessary to support SEPTA's needs to perform oversight and auditing. This application shall allow for the inspection and review of details of all transactions related to an NPT device, vehicle, route, depot, or station. Here the application shall allow the user to query this information based on a set of parameters, including time and date, locations, equipment type, equipment number, line/mode, and other parameters as agreed with SEPTA at FDR. This system shall also allow for detailed transaction data to be queried based on the associated user of the system, including conductor, ticket sales agent, and cash room employee.

In addition, the application shall allow an authorized user to watch the detailed transactions of a particular NPT device in real-time.

~~19.22.8~~19.6.8 Revenue Model Manager

The Revenue Model Manager shall provide the necessary functions to support the management of the Revenue Model for the NPT System. This application shall be responsible for providing controls to analyze ridership trends and automatically correcting the Revenue Model correctly. In addition, it shall allow authorized users to make modifications to the model based on ridership projections.

~~19.22.9~~19.6.9 Smart Media Manager

The Smart Media Management Application shall provide all functions necessary for management of SEPTA's Smart Media and Magnetic Media. The Smart Media Manager shall provide for the entry of serial numbers and serial number ranges into the CDCRS when Fare Media is received. All Fare Media entered into the CDCRS shall be tracked by serial number – from arrival at SEPTA, through issue to a passenger and expiration/replacement/destruction of the item of Fare Media

~~.~~ Inventory control of all SEPTA ~~Smart~~ Fare Media shall be centralized within the Smart Media Manager. This shall include Fare M~~m~~edia ordering and return/replacement. In addition, the Smart Media Manager shall provide functions for Fare M~~m~~edia initialization, hot-list management, and registration. This application shall also be the interface for tracking ~~card~~ Fare Media usage and status by both SEPTA and its passengers.

The inventory controls of the Smart Media Manager shall provide for complete inventory control of all ~~Smart~~ Fare Media stocks, including stock transfers between units, as well as accounting for Fare M~~m~~edia inventory, including at a minimum:

A. Purchased but not issued;

B. In transit (from storage):

C. ~~Stock l~~Loaded into NPT field devices;

D. ~~Stock p~~Provided to ~~operator~~SEPTA employee;

E. Issued to ~~passenger~~customer;

F. Returned by ~~operator~~SEPTA employee;

G. Consigned to third-party organization for sale;

H. Returned unsold by third-party organization;

I. Returned unused by customer;

J. Returned partially used by customer in the event of a work stoppage;

K. Refund handling for service interruptions and/or delays;

L. Issuance of reduced fare media; and

M. Reported lost, stolen, or destroyed.

The system shall also allow for accounting for all ~~stock~~ Fare Media sold, spoiled, jammed, slipped, or missing, to provide a comprehensive system wide audit and control function.

All records shall be identified by mode, station, equipment number, and/or location as appropriate,

Service Guarantee Refunds

The Smart Media Manager shall support the needs of the Service Guarantee. This guarantee provides that for selected routes shall arrive at their final destination within 15 minutes of the scheduled arrival time or riders may request a free future trip. This guarantee applies to weekday service only and does not apply when service operates on a Saturday or Sunday schedule.

To support this, the Smart Media Manager must be able to interface with SEPTA's AVPA system Section (19.5.2.9), to provide for a record of all train/route information that would result in ~~riders~~ Customers being eligible for a Service Guarantee refund.

With this, the Smart Media Manager shall then allow for authorized users, to manually enter a service guarantee request. The system shall then compare the request against the ridership history for the ~~rider~~ Customer and compare this against the list of trains known to be eligible for a refund. Should a ~~rider's~~ Customer's request then be verified to be valid, the Smart Media Manager shall then refund the appropriate cost of the fare to the ~~rider's~~ Customer's~~media and/or~~ account.

Sales Support Files

The Smart Media Manager shall provide menu options to access, store, edit, display, and/or print, and download to the fare devices system files that support the sale of SEPTA ~~Smart~~ Fare Media. These files shall have the same security profile as the fare table files. ~~-~~These files may be provided to the CDCRS by other systems.

~~19.22.10~~19.6.10 Station Manager

The Station Manager shall be provided to control all NPT related activities as specific fixed locations, such as stations. Through this application, authorized users shall be able to define and change station configuration and hardware placement. The Station Manager shall also interact with the EMICS to support the change of devices at a location.

From the Station Manager, authorized users shall have the capability to remotely control all NPT field devices. Functions that can be remotely performed by an authorized user shall include the ability to place equipment in service or out of service, reconfigure components, and perform diagnostics at both the device and component levels. In addition, users shall be able to enable / disable any payment mode or module, and transfer any information or data. All modifications to the equipment functionality shall be recorded in the CDCRS database and reported immediately to the EMICS.

The Station Manager shall communicate with all NPT Network Management Servers to perform all necessary administrative functions to manage their associated networks of devices.

~~19.22.11~~19.6.11 System Status Monitor

NPT System and equipment status shall be updated and automatically maintained by the system through the System Status application. The System Status Monitor application shall monitor the status of all NPT Field Devices, NPT Data networks, and all data transfers. The Contractor shall install, configure, and activate network monitoring software, such as HP® OpenView or equivalent commercially available software. To support this monitoring, the System Status Monitor shall communicate with all NPT Network servers to perform all necessary administrative functions to monitor their associated functions.

This application shall provide a graphical representation for each station, with a status of all equipment at a station. Status shall be provided in five levels of detail - station, line subsection, line, operation (Regional Rail, Subway/Elevated, Bus Depots, etc.), and overall operation. No alarm shall automatically clear without SEPTA interaction.

When a station has more than one alarm in effect, the station shall be shown in the color of the highest priority alarm

The System Status application shall incorporate menu options to facilitate monitoring of each of the following:

A. NPT unit machine status;

B. NPT unit software status;

C. Effective date of fare tables and associated files;

D. System and unit security;

E. Network status;

F. Polling status; and

G. External system interface status (i.e., clearinghouse link).

The System Status monitor shall incorporate menus and screens supporting both the manual and automatic polling of transaction, status (receipts, change supply, media stock), and event log information. The system shall be able to designate the polling for all units of a particular type of fare device, a designated set of fare devices or individual units.

In addition, the System Status Monitor shall be able to monitor connections to external telecommunications networks, and shall incorporate menus and screens to support this function

~~19.6.12Payment via Cell Phone~~

~~Cell phone shall be able to be used for pay-by-space system payments. This payment methodology shall require the Customer to pre-register and include a SEPTA-approved payment method as part of their registration. Registration for this service shall be provided via the Internet as well as at the Customer Service Center.~~

All design requirements for the Customer Support System (see Section 24) shall apply. The CDCRS shall provide all necessary software and hardware required for the incorporation of this payment methodology into the NPT System.

A complete description of this functionality shall be provided for SEPTA review and approval at each design stage and shal include menu selections, screen layouts and other similar information to provide SEPTA a complete understanding of the functionality. Design documents shall fully describe the functionality as defined for this function. **CDR 19-4, PDR 19-14, FDR 19-12**

19.7Payment Processing

19.7.1Cash

No authorization or special processing shall be required at the CDCRS for cash payments.

19.7.2Bank Card Transactions

Valid credit cards and debit cards, issued by financial institutions, shall be accepted for the purchase of fare media and for payment of fares. These payment transactions shall be processed, authorized, settled and accounted for through the requisite NPT network servers (e.g., OBPMS, SDMS, SMS and RMS), back to the CDCRS. The CDCRS, via the BCPS, shall handle all interfacing necessary for verification of bankcard transactions with clearing institutions that shall be selected by SEPTA. The CDCRS including all application software and interfaces shall be fully compliant with PCI DSS standards in effect at the time the CDCRS enters revenue service.

The Contractor shall be responsible for development, testing, and certification of the interface connection between the BCPS to each card clearinghouse. The Contractor shall also provide all associated software and hardware for purposes of encrypting and transmitting the required data for determination of card validity and fund availability for approving (or rejecting) bank card transactions initiated at all NPT equipment.

~~The communications interface between the BCPS and the clearing house(s) shall utilize a transparent TCP/IP protocol, with a dedicated IP address and TCP/IP port. The Contractor's interface shall provide for an approved commercially available hardware encryption solution. Bankcard transactions shall be processed, authorized, settled, and accounted for through the BCPS and its data communications facility utilizing the services of one or more card clearing institutions. Software resident on the system to accommodate the electronic payment type shall conform to applicable ABA, ISO/IEC, Federal Regulations (including "E" and "Z"), and standards for electronic payment processing. All devices and systems that process credit cards shall adhere to the requirements of the PCI DSS.~~

~~The NPT System shall be capable of simultaneously processing bankcard transactions from all NPT devices and to the associated bankcard clearing institutions. The system shall be sized and configured such that the length of time to completely process a transaction does not under normal conditions exceed the maximum time as identified in Section 4, including the time for network traffic. This time is measured from the time a bankcard transaction is sent from the NPT field device to the time the authorization is received back at that same device, and includes the time required for authorization by a financial institution. The CDCRS shall monitor both the time the card is read and the time at which authorization is communicated to the customer, to monitor this requirement.~~

~~The system shall support the logging, storage, backup, and retrieval of information regarding such data transmissions, including timing of the transmission, data transmitted, and status of the transmission, for both individual transactions and entire files, such as settlement files.~~

~~*19.7.2.1Credit Cards*~~

~~The CDCRS shall serve as the central processor for customer purchases that have credit cards as the payment medium. Valid credit card data shall be passed from the fare devices through the CDCRS to a clearinghouse for transaction approval. Software resident on the CDCRS to accommodate this payment option shall conform to applicable ISO/IEC, and federal standards for this kind of transaction.~~

~~Cards used for media purchases shall be compared to a file of "bad" cards to limit SEPTA exposure to fraud. This file shall be updated on a daily basis, and then downloaded to the sales devices.~~

~~To support use of credit cards, the CDCRS shall:~~

~~A.Check the credit card number for that sale against SEPTA-definable and modifiable tables (velocity check parameters) that define:~~

~~1.The minimum sale amount (e.g. $3.00);~~

~~2.Maximum sale amount regardless of media type sold;~~

~~3.Maximum sale amount regardless of media type sold in a defined period;~~

~~4.Maximum sale amount for any particular media type in a defined period;~~

~~5.Maximum media in a defined period for any particular media type in a defined period; and~~

~~6.Maximum media sales total in a defined period.~~

~~These tables are maintained separately from the debit card tables.~~

~~B.Maintain a rolling 6 months worth of authorized credit card sales information, with the oldest data archived in a manner consistent with the requirements of Section 19.2.4.~~

~~C.Route transactions to appropriate financial institutions and/or clearinghouses for authorization.~~

~~D.Complete authorization requests within the maximum time as identified in Section 4.~~Complete entire authorization process within the maximum time as identified in Section 4.

~~E.Transmit the results of the authorization request to the initiating NPT device for completion of the transaction, and record all required information within the CDCRS for audit and tracking purposes.~~

~~F.At the end of each day, automatically provide banks/clearing houses with necessary settlement data.~~

~~G.If the authorization request is approved, and the media and a receipt are issued, confirm the sale and record for settlement, audit, and tracking purposes.~~

H.If the media is not issued, generate a reversal for the bank/clearing house, and record the reversal and the bank/clearinghouse response for audit and tracking purposes.

I.If the authorization is denied, display the denial code and customer message at the NPT Device and record for audit and tracking purposes.

J.If the media is issued, and communication drops, for any reason, prior to confirmation of the sale at the CDCRS, the transaction shall be put in a "hold" status for completion when the system is restored.

K.Utilize a standard interface and protocol, as approved by SEPTA, for communications and data transfer.

19.7.3Debit Cards

The CDCRS shall serve as the central processor for customer media purchases that have debit or ATM cards as the payment medium. Valid card and transaction data shall be passed an NPT device through the CDCRS to a clearinghouse for transaction approval. Software resident on the CDCRS to accommodate this payment option shall conform to applicable ISO/IEC 8583 interface standards and federal requirements for this kind of transaction.

To support the use of debit cards at all NPT Devices, the CDCRS shall:

A.Receive hardware encrypted debit card transmissions from the devices, and transmit hardware-encrypted messages to financial institution for transaction authorization.

B.Check the debit card number for that sale against internal tables (velocity check parameters) that define:

1.Minimum sale amount (e.g., $3.00);

2.Maximum sale amount regardless of media type sold;

3.Maximum sale amount regardless of media type sold in a defined period;

4.Maximum sale for any particular media type in a defined period;

5.Maximum media for any particular media type in a defined period; and

6.Maximum media sales total in a defined sales period.

These tables are maintained separately from the credit card tables.

C.Maintain rolling 6 months worth of debit card sales information, with the oldest data archived in a manner consistent with the requirements of Section 19.2.4.

D.Complete entire authorization process within the maximum time as identified in Section 4..

E.Transmit the results of the authorization request to the initiating device for completion of the transaction, and record all required information within the CDCRS for audit and tracking purposes.

F.If the authorization request is approved, and the media and a receipt is issued, confirm the sale and record for settlement, audit and tracking purposes, and the media is not issued, generate a reversal for the bank/clearing house, and record the reversal and the bank/clearing house response for audit and tracking purposes.

G.If the authorization is denied, display the denial code and customer message at the device, and record for audit and tracking purposes.

H.If the media is issued, and communication drops, for any reason, prior to confirmation of the sale at the CDCRS, the transaction shall be put in a “hold” status for completion when the system is restored.

I.Utilize a standard interface and protocol, as approved by SEPTA, for communications and data transfer.

19.8Automatic ReplenishmentAutoload

The NPT System CDCRS and installed NPT equipment shall provide automatic replenishment Autoload functionality for the Smart Media. Theis autoload number of accounts that permit automatic replenishment shall nhave no limit but shall be constrained by the CDCRS memory and storage capacities.functionality shall initially provide for a minimum of 1,000,000 unique Customer accounts with the ability to double the number of accounts without additional hardware or software.

A functional description of all automatic replenishment autoload functions shall be provided at the Conceptual and Preliminary Design Reviews for review by SEPTA and for approval by SEPTA at the Final Design Review. **CDR 19-45, PDR 19-15, FDR 19-13** This information shall include the design or the operational flows, screens, functions and other similar information and shall included increasing detail with each design review step. **CDRL 19-43**

The following methods of automatic replenishment shall be provided:

STwo methods of Autoload shall be provided and are as follows:

19.8.1Subscription AutoloadReplenishment

With Subscription AutoloadReplenishment, a customer's registered account is automatically loaded with a pre-determined, approved value when the available stored value balance falls below a defined amount or when a period pass expires. As such, there are three types of Subscription Autoload Replenishment programs:

- Recurring Value Program - customers receive a set stored value replenishment each period based on receipt of payment at SEPTA. This is accomplished through a request for funds initiated at the appropriate time. Once the payment has been received by SEPTA, an action list item is performed to add value to the account. A request for funds shall be initiated at the appropriate time.

Recurring Period Pass Program - customers receive a period pass on a recurring basis. This can be initiated without payment of funds for the pass. If payment is not received in time, the privilege can be revoked, and as the payer is known, SEPTA can attempt to retrieve appropriate funds. With this, a customer's account has both a period-based pass and can have additionally a stored value purse. When a period-pass is not covered by the time based pass, then an appropriate amount (either upgrade or full fare) is deducted from the stored value purse, if this purse is activated and present.

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- Threshold Value Program - customers receive a set stored value replenishment each time the account value falls below a given amount, based on receipt of payment at SEPTA. Once the payment has been received by SEPTA, an action list item is performed to add value to the account. A request for funds shall be initiated at the appropriate time.

- For the Recurring Value Program, customers receive a set stored value autoload each period based on receipt of payment at SEPTA. Once the payment has been received by SEPTA, an action list item is performed to add value to the account. A request for funds shall be initiated at the appropriate time. With a credit card, an authorization is requested, and if confirmed, the add value is put on the action list. For other forms of payment, the system will only initiate a load when the system is directed to do so with a "confirmation" of payment.

- For the Recurring Period Pass Program, customers receive a period pass on a recurring basis. This can be initiated without payment of funds for the pass. If payment is not received in time, the privilege can be revoked, and as the payer is known, SEPTA can attempt to retrieve appropriate funds. With this, a customer's account has both a period-based pass and can have additionally a stored value purse. When a period-pass is not covered by the time based pass, then an appropriate amount (either upgrade or full fare) is deducted from the stored value purse, if this purse is activated and present.

- Once the payment has been received by SEPTA, an action list item is performed to add the period pass to the account. A request for funds shall be initiated at the appropriate time. With a credit card, an authorization is requested, and if confirmed, the add value is put on the action list. For other forms of payment, the system will only initiate a load when the system is directed to do so with a "confirmation" of payment.

For the Threshold Value Program, customers receive a set stored value autoload each time the account value falls below a given amount, based on receipt of payment at SEPTA. Once the payment has been received by SEPTA, an action list item is performed to add value to the account. A request for funds shall be initiated at the appropriate time. With a credit card, an authorization is request, and if confirmed, the add value is put on the action list. For other forms of payment, the system will only initiate a load when the system is directed to do so with a "confirmation" of payment

With a credit card, an authorization is requested, and if confirmed, the value and/or pass validity is added to the account. For other forms of payment, the system will only initiate a load when the system is directed to do so with a "confirmation" of payment.

19.8.2Directed Autoload

An additional form of Autoload to be supported is "Directed Autoload". Directed Autoload has two variations.

The first variation or use of directed autoload is where the customer using the E-Commerce Site (Section 24) authorizes a value they select to be loaded onto their registered smart card the next time it is presented at a fare device. The customer presents credit card information that is sent for approval. The second Directed Autoload variation involves Transit Benefits, where the employer shall, through the E-Commerce Site (Section 24), administer their Transit Benefit program, directing the system the value to load on the smart cards for those in their employ.

Suitable procedures for negative listing of uncollectible credit cards and discontinuance of the autoload feature for a defined account and user shall be provided.

~~19.9~~19.7 System Monitoring & Control

~~19.9.1~~19.7.1 System Monitoring

The CDCRS shall be able to monitor the activity of the NPT devices and the communications networks that connects and supports these devices. This shall be accomplished through System Status application (Section 19.7.1~~19.9.1~~). The system shall monitor the following aspects of the NPT System:

A. All NPT equipment and Devices outlined in Section 4 through 17.

B. The Communications systems outlined in Section 18. This includes:

1. All losses of network communications, including line drops;
2. SNMP or equivalent diagnostics;
3. Polling status; and
4. Status of all CDCRS servers and hardware.

NPT Devices perform a variety of self-diagnostic functions. The CDCRS shall provide real time access to such status and diagnostic information. When devices register events, in both volatile and non-volatile memory, such information shall be made available to the CDCRS on a real-time basis. Such information shall include, but not be limited to, the devices internal software version number, fare table (effective date) in use, event description/code, etc.

This information either shall be transmitted to the CDCRS as part of the unit's start up procedure, or as it becomes available. Should the network connection to a device become inoperable, the information shall be transmitted to the CDCRS when the connection is restored. The Contractor shall provide complete technical information on the recovery from an off-line status to an on-line status.

The CDCRS shall retain this event data for reporting and statistical analysis. It will be used to generate historical usage patterns, unit and network "mean time between failures" rates, and reliability statistics for machine operations and network availability.

Given that most of this information will be repetitive and non-critical, the CDCRS shall be able to determine when active operator intervention is required. The following conditions require special handling:

A. At start up or start of any tour/start of day, the unit's internal clock setting shall be synchronized with the CDCRS host's internal clock based on time received from the SEPTA network clock. Any significant deviation shall be addressed.

B. At start up, the unit's, software version number, the effective dates of the fare table, associated files, and media layouts shall be compared to internal CDCRS table(s). Any discrepancies shall generate an automatic upload of the correct information.

C. When a security breach or failure occurs, a message is sent to the appropriate SEPTA department.

D. When any component in an assembly fails, the associated diagnostic messages shall be captured, stored, and transmitted to CDCRS in order to be made available to the SEPTA department(s).

A functional description of all monitoring functions shall be provided at the Conceptual and Preliminary Design Reviews for review by SEPTA and for approval by SEPTA at the Final Design Review. **CDR 19-5, PDR 19-18, FDR 19-15** This information shall include the design or the operational flows, screens, functions and other similar information and shall included increasing detail with each design review step. **CDRL 19-5**

~~19.10~~19.8 Communications with NPT Field Devices

~~19.10.1~~19.8.1 Downloads to NPT Field Devices

Manual and automatic transmission of prepared information from the CDCRS via the Network Management Servers, to all NPT field devices, shall include as appropriate, but not be limited to:

A. Software upgrades;

B. System clock time;

C. Fare tables;

D. Smart Media printing format updates;

E. Branches / Route;

F. Trains;

G. Runs;

H. Schedules;

I. Crewman schedule;

J. Crewman employee list;

K. Book of Rules.

The CDCRS shall be able to designate what will be downloaded, and to which units: All units of a particular type (e.g., all FVDS, HSDs, fareboxes, fare gates), sets of fare devices (e.g., defined by station, type of transit service or district), or individual devices (defined by port address).

The CDCRS shall provide the option of allowing control of downloads to be determined by the effective date associated with the information being downloaded.

Downloading shall not interfere with ~~the fare card~~Fare Media sales or ~~fare card~~Fare Media processing functions of any ~~fare~~ NPT System devices unless the information being downloaded is required for such ~~sales~~activities.

Whether automatically or manually initiated, system downloads shall include a method for ensuring that the information has been received intact and uncorrupted at the assembly level.

The system shall identify failed transmissions by an audible tone so that the problem can be addressed immediately. This feature may be activated or deactivated at user login.

The system shall track failed transmissions and provide diagnostic messages that include the SNMP message(s), the number of times transmission was attempted, and the assembly(s) affected. This information shall be retained for reporting, statistical analysis, audit, problem resolution, unit, and network "mean time between failures" rates.

~~19.10.2~~19.8.2 Polling Field Units

The CDCRS shall support both the manual and automatic polling of transaction, status (receipts, change supply, ~~m~~Fare Media stock), and event log information. The system shall be able to designate the polling for all units of a particular type of ~~fare~~ NPT System device, a designated set of ~~fare~~ devices or individual units. These functions shall be supported by the System Status Monitor (See Section 19.6.11)

Polling shall not require shutdown of a NPT System device. Polling shall not interfere with the ~~fare card~~Fare Media selling or processing functions of the unit.

CDCRS software shall include options for scheduled, manually initiated, and system initiated polling.

Once every 24 hours, each NPT System device shall be polled to confirm that all units have been polled and tour data transmitted to the CDCRS. Transmission of 24-hour transaction data shall be based on a 24-hour period defined by SEPTA (initially set as ending at 3:30am).

When polling for a ~~unit~~ NPT System device fails, there shall be two attempts to re-poll the failed unit. When polling fails, the CDCRS shall generate an event record and produce a printed report to notify personnel of the failure to poll, to ensure that units will either be re-polled or that their data will subsequently be read into the system from non-volatile storage media.

When ~~units~~ NPT System devices are re-polled for any reason, or data is read from non-volatile memory, the CDCRS software shall insure that duplicate data is not retained within the system, or passed on to any other system.

The system shall track failed transmissions, along with Simple Network Management Protocol [SNMP] diagnostic messages, the number of times polling was attempted, and the unit(s) affected. This information shall be retained for reporting and statistical analysis. It will be used for audit and problem resolution, unit, and network "mean time between failures" rates. Contractor shall provide full information on the polling methodology, settings, and parameters.

~~19.10.3~~19.8.3 Network System Assurance

The CDCRS shall routinely poll all wired NPT System field devices (excluding on-board and hand-held equipment) to assure that communication between CDCRS and device is active and secure. This polling shall occur automatically at intervals programmed by SEPTA (default = 15 second intervals; range = 5 seconds – 600 seconds). If the CDCRS does not receive a response to its polling initiative, the CDCRS shall resend its request for an additional number of times that is programmable by SEPTA (default = three times). If communication is not confirmed the repeated polling by CDCRS, then CDCRS shall notify service quality and police dispatch an alarm condition, including in the alarm report the equipment, equipment type, and location. Polling time intervals and resend values shall be programmable on the following basis: entire system, device type, device type and mode, device type and station. Polling shall not interfere with sales transactions or other primary functions of the field device.

~~19.11~~19.9 Network Security Functions

Appropriate security measures that are continuously active to prevent unauthorized intrusion to the operating system, applications, parameters, and other software modules, fully support PCI requirements and support password protection to levels prescribed by SEPTA shall be implemented.

Additional security measures, including password protection to levels prescribed, shall be included to prevent unauthorized access or modification to CDCRS software and associated tables. This shall incorporate the use of a Microsoft® SQL or an Oracle® interface, which will utilize the current SEPTA employee as the User ID. When the user has logged out, the User ID shall be cleared from the screen.

Reports for system security shall be available through the security administration function. At a minimum, these reports shall provide information on employee and technician access levels, access logs for logins, central functions, maintenance activities, and all security violations or attempts.

All components of the system shall operate in a virus-free protected environment. The CDCRS shall have sufficient measures (software, and /or hardware) in place and active at all times to ensure that all operating systems, applications and other software operates in a virus-free environment. The Contractor shall provide, install, and maintain a fully licensed, upgradeable commercially available anti-virus software application.

The CDCRS shall also contain controls to prevent unauthorized access to the operating system, applications, and other software modules.

A functional description of all security functions, including virus protection, shall be provided at the Conceptual and Preliminary Design Reviews for review by SEPTA and for approval by SEPTA at the Final Design Review. **CDR 19-6, PDR 19-19, FDR 19-16** This information shall include the design or the operational flows, screens, functions and other similar information and shall included increasing detail with each design review step. **CDRL 19-6**

~~19.11.1~~19.9.1 System Security

The CDCRS security function shall provide appropriate access to all CDCRS functions and system data. Functional access shall, at a minimum, provide for such things as fare table and associated file maintenance, design and access of report queries, system polling, and network configuration.

CDCRS security functions shall be separated into the following systems:

A. Network security.

B. Data Security, which shall, at a minimum, provide for four security levels: read only, update access, create, and delete.

C. Application Security, which shall be incorporated into each application attached to the CDCRS and controlled at three levels:

1. Application access

2. Form access

3. Function access within form (inquire, add, change, delete)

~~19.11.2~~19.9.2 Security Administration

The CDCRS shall support maintenance of access level tables through a security administration function. These tables shall be used to establish employee and employee group access to fare devices, Network, CDCRS, and data.

Reports shall be available through the security administration function. At a minimum, these reports shall provide information on employee and technician access levels, access logs for logins, critical CDCRS functions, maintenance activities, and all security violations or attempts.

A different password and user name shall be required for access to system administrator functions.

A different password and user name would not be required to access system administration functions to restrict access by application, by form and by function within form. Only administrators shall be able to get to forms that handle administration. With this, access shall be capable of being further restricted to what administrative functions can be perform, including inquire, add, change, and delete.

~~19.12~~19.10 Media Design

The CDCRS shall provide “create” and “edit” functionality for Fare M~~m~~edia design. This functionality for creating and designing Fare M~~m~~edia shall be completed by SEPTA staff without intervention by the Contractor. The Contractor shall satisfy this requirement through the integration of a non-proprietary, commercially available graphics software package.

The layout of all types of SEPTA’s ~~contactless Smart~~ Fare Media shall be defined, edited, displayed, and saved within the CDCRS and downloaded to the ~~fare~~ NPT System devices. With adequate security clearance, ~~Smart~~ Fare Media may be printed from the CDCRS for design and test purposes. When test Fare M~~m~~edia are produced, the word “VOID” shall be clearly visible on the Fare M~~m~~edia.

~~Smart~~ Fare Media layout shall allow specification of font faces, font sizes, and print density so that gray tones can be used. It is possible that F~~f~~are M~~m~~edia graphics will include both portrait and landscape formats, and the NPT System shall accommodate this. The software shall also allow inclusion, editing, and movement of graphics such as logos, images, OCR, bar codes, and patterns.

Layouts shall be created for each of the ~~Smart~~ Fare Media sold by the NPT devices. They will be identified as a set by the date that they become effective.

At a minimum, the software shall be able to retain the currently active Fare M~~m~~edia layout set, allow editing of that layout in a work area, and provide for multiple layout(s) with a future effective date for each of the defined Fare M~~m~~edia types.

Current and future Fare M~~m~~edia layouts shall be available for downloading to the ~~fare~~ NPT System devices through the network or when necessary to a file on a secured medium for manual transfer to the devices.

Expired Fare M~~m~~edia layouts shall be archived for future reference. Contractor shall provide detailed information on the procedures employed and the software used for the generation and storage of these Fare M~~m~~edia formats.

~~19.13~~19.11 Smart Media Key Security and Key Propagation

The CDCRS shall incorporate necessary software security and controls to maintain, distribute, and verify the keys used throughout the NPT System for the Smart Media activation and usage. The necessary hardware, protocols, and software shall be incorporated within the CDCRS to ensure that the Smart Media keys can be securely stored, modified, and propagated throughout the system on an as needed basis.

An additional layer of security shall be incorporated to further ensure that only authorized access to these Smart Media key functions is provided.

Section 20 – Program Management
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20 PROGRAM MANAGEMENT

20.1 General

This Section specifies the requirements for contract management. The management shall be sufficiently comprehensive to enable SEPTA to ascertain, with a high degree of confidence, that the Contractor will meet the requirements of this Specification, and to enable SEPTA to monitor the contractual effort.

The Contractor shall establish an organization to properly manage the NPT System design, manufacturing, implementation, and warranty. The organization shall be highly responsive to the needs of SEPTA as required in this Contract and shall be subject to approval by SEPTA. The Contractor shall provide and maintain a secure, on-line document review website to manage and maintain copies of all project documentation, reviews, correspondence, and submittals. This website shall be accessible by authorized SEPTA project staff. Unless otherwise identified, all project documentation and information shall be loaded to and maintained by this secure document review and sharing system.

Should the performance of any individual within the Contractor's project team not meet the expectations of SEPTA, the Contractor shall replace the individual with one approved by SEPTA. This change in the Contractor's project team shall not adversely affect the development, implementation, installation, and acceptance schedule as defined and shall require no modifications to compensation to the Contractor.

20.1.1 Project Manager

The Contractor shall designate a responsible individual on a full-time basis, fluent in English and subject to approval by SEPTA, to serve as Project Manager for the entire term of the project. This individual shall have prior experience in management of large, integrated system procurements and be familiar with design, subcontractor equipment procurements, construction, test, and inspection of systems similar to the New Payment Technologies (NPT) System.

This individual shall be granted full authority to render decisions on behalf of the Contractor pertaining to technical and commercial decisions on the Project. The Project Manager shall serve as the Contractor's representative in all meetings with SEPTA and/or their duly appointed representatives. No substitution of the Project Manager will be permitted without SEPTA's prior approval. The Project Manager shall be based in the Contractor's local office in the Philadelphia area and shall have staff capable of performing a liaison engineering function.

The Project Manager shall represent the Contractor during progress meetings, design review meetings, warranty, contract change negotiations, and open item meetings with SEPTA and, with the Project Manager's supporting staff, be capable of addressing all issues on the agenda for each scheduled meeting. The Project Manager shall arrange to have supporting staff members available for participation in these meetings, as required.

The Project Manager shall be responsible for ensuring all elements of the NPT System design, development, and deployment meet the technical and contractual requirements, including:

- Ensure that the project tasks are completed on time and within budget;
- Coordinate design and engineering activities;
- Furnish all submittals to SEPTA;
- Be the sole point of contact between SEPTA and the Contractor's project team, unless otherwise mutually agreed between the Contractor and SEPTA;
- Keep SEPTA fully informed of the status of the project;
- Hold periodic conference calls with SEPTA to provide project updates (these will increase in frequency during the implementation and installation periods);
- Promptly notify SEPTA of any problems or difficulties that may affect the timely or effective completion of the project or any scheduled deliverables.

The Project Manager shall be responsible for support provided by personnel or groups outside the project team during the period of performance for this contract, and shall have full authority to assign task priority as needed to meet the requirements of the project.

Removal or replacement of the Project Manager by the Contractor shall only be with the consent of SEPTA upon written notification from the Contractor, describing the reason for removal or replacement.

SEPTA reserves the right to request the Project Manager to be replaced with written notification provided to the Contractor. When notification is received, the Contractor shall replace the Project Manager and this replacement shall be subject to approval by SEPTA.

20.1.2 Management Plan

Within 30 days of NTP, the Contractor shall submit a Management Plan to SEPTA for approval. **CDRL 20-1** The Contractor's Management Plan shall be sufficiently comprehensive to enable SEPTA, with a high degree of confidence, to verify that the Contractor will meet the stated requirements, and to enable SEPTA to monitor the contractual effort through all stages of NPT System implementation and warranty.

The Management Plan shall be updated as necessary to incorporate all changes in the project, its implementation, or its schedule. The plan shall include:

A. An organization chart including a definition of levels of responsibility and authority within the Contractor team, and qualifications of all personnel therein.

B. The methods and communications to be used to control the program schedule, design reviews, technical performance, program changes, subcontracts, purchase orders, material procurement, in-service support, warranty, systems assurance analysis, tests, and demonstrations.

C. A description of the process to track and control project correspondence.

D. A Submittal List and Schedule listing drawings, documents, and data to be submitted for review and approval during the design review phase of the program, and a schedule for the submittal of this information.

E. SEPTA requires that the Contractor develop an updated and complete Contract Deliverables Requirement List (CDRL) based on the requirements identified in each Section of this Technical Specification. The CDRL shall contain the consolidated listing of all required data including specific format, quantity, frequency, and paragraph reference of submittal as required by the Technical Specification. Submittals include, but are not limited to, schedules, plans, procedures, reports, certificates, samples, certifications, test results, and as-built drawings. The CDRL list shall be in accordance with the following column headings:

1. Item Number;
2. Deliverable Description;
3. Requirements Reference Paragraph (i.e. location of requirement within the Contract Documents);
4. Scheduled Delivery Date(s);
5. Current SEPTA acceptance status (i.e., pending, approved, conditionally approved, disapproved);
6. Quantity: Number of documents, units, or copies required.

Every CDRL shall be updated to reflect the changes in design throughout the design, implementation, and warranty period so that the final set of CDRLs delivered at the end of the project shall represent the system design in place at the conclusion of the contract.

20.1.3 Submittal Review Prioritization Plan

To expedite the design review and approval process, the Contractor shall develop a comprehensive plan for prioritizing the review of submittals in cooperation with SEPTA. For this reason, the Contractor shall schedule a series of meetings with SEPTA within two weeks of submittal of the Management Plan to develop the Submittal Review Prioritization Plan ("Review Plan"). This plan will be based on the Drawing Schedule and CDRL submitted in the Management Plan, and will include drawings at levels of indenture below that of those in the Drawing Schedule. The Submittal Review Prioritization Plan, once agreed to, shall become part of the Management Plan. Subsequent updates to the Review Plan shall be ongoing as required to meet the needs of the Program.

The Prioritization plan will group submittals into categories based on their criticality to various phases of the program. Suggested submittal groupings are as follows:

- Advance submittals which must be reviewed and approved (informally, at least) early in the program to allow further design work to proceed. These should be key conceptual design submittals that define basic device and system configurations and demonstrate Specification compliance at the component and system level.
- Submittals which must be reviewed and approved prior to the start of procurement activities.
- Submittals which must be reviewed and approved prior to the start of manufacturing.
- Submittals which must be reviewed and approved prior to first article inspection.
- Submittals which must be reviewed and approved prior to the start of equipment testing.
- Submittals which must be reviewed and approved prior to delivery of the first device of each type.
- Submittals for which review and approval may be deferred to some point after delivery of the first device.
- As-built submittals.
- Submittals for information only (i.e., formal review and approval is not required).

It may, in some cases, be determined that drawings scheduled for completion at an early stage in the program do not require review until a later stage, depending on the agreed-upon criticality of those drawings to the overall design. SEPTA approval of the Submittal Prioritization Review Plan and the agreed-upon deferral of review and approval for a given submittal does not in any way relieve the Contractor from compliance with the Specification, or from the responsibility to produce a satisfactory design. Items not reviewed are not exempt from the requirements of the contract. Any items which are proposed as alternatives to the contract requirements must be submitted to SEPTA for review and approval prior to the start of procurement, whether identified as such in the original Review Plan or not.

The Review Plan shall also include a description of review program logistics, particularly those aspects of the program which supplement the traditional submittal and review process in order to accelerate design review and approval. These may include provisions for co-residence of cognizant Contractor and SEPTA personnel to expedite turnaround of submittals, non-binding up-front reviews that are contingent on ultimate receipt of supporting drawings, in-process design reviews convened as needed, and any other methods for expediting review that are deemed appropriate by the Contractor and SEPTA.

20.1.4 Risk Management Plan

Within 30 days of NTP, the Contractor shall submit a Risk Management Plan to SEPTA for approval. **CDRL 20-2** The purpose of the Risk Management Plan is to identify and mange potential risks that threaten to increase project costs, lengthen the project schedule or compromise project performance. The Risk Management Plan shall include the formal four-step process that includes Risk Planning, Risk Identification, Risk Analysis, and Risk Control. The Risk Management Plan shall include an associated Risk Management Process which continues throughout the project with the monitoring of potential risks and a well-planned response to correct problems as they occur.

20.1.5 Master Program Schedule

Within 30 days of NTP, t~~T~~he Contractor shall submit for SEPTA's review and approval a Master Program Schedule in accordance with the requirements of the Contract. **CDRL 20-3** ~~.~~

The Master Program Schedule shall cover all phases of the work and shall include the following:

A. Work item descriptions that convey the scope of work indicated. Work items shall be discrete items of work that will be accomplished under the Contract. Work items shall include the scheduled dates for submittal and required response dates for approval of Contractor drawings and documentation. Work items shall also include specific line items for all defined Milestone Payment Schedule payment events from the Contract Milestone Payment Schedule. It shall include the schedule for design reviews, procurement of materials and equipment, fabrication of materials and equipment and their installation and testing, delivery of SEPTA-furnished and other third party items and information, qualification tests and delivery, and testing of the NPT System. Estimated work item duration in whole working days shall be indicated for each work item of the schedule.

B. The sequence, successor, and predecessor interrelationships among work items shall be considered in developing the schedule and shall be included as indicated.

C. Work item descriptions shall be accompanied by narrative explanation of what the work item comprises and the basis for the estimated work duration.

D. Sufficient detail shall be provided to indicate the manufacturing, testing, shipment, storage, and installation status of each type of equipment and CDCRS item in the NPT System.

E. Sufficient detail shall be provided for the analysis, design, build, test, and implementation of each of the applications on the application server. Work details shall include, but not be limited to, review of legacy applications being replaced, gap analysis, data conversion plan, interface plan, integration plan, development milestones, milestone reviews, test plan, implementation plan and post-production support.

F. The Contractor's initially submitted schedule that is approved by SEPTA shall become the Base Line schedule. Subsequent schedule updates shall show performance against the original Base Line schedule.

~~E.~~G. The Contractor's schedule shall include work breakdown activities of sufficiently short duration to facilitate adequate tracking of each activity by both the Contractor and SEPTA.

20.1.6 Monthly Progress Reports

The Contractor shall submit to SEPTA a monthly progress report by the fifth day of each month that covers activities for the previous month. **CDRL 20-4**

Monthly progress reports shall include:

A. Updated Master Program Schedule highlighting the following items against the approved Base Line Schedule:

1. ~~-~~actual completion dates and start dates for activities completed during the report period;

2. ~~,~~estimated remaining durations for activities in progress;

3. ~~,~~estimated start dates for activities scheduled to start;

4. ~~,~~changes in the durations of activities ~~and minor logic changes~~(logic changes to the Master Program Schedule may not be made without SEPTA's approval);

5. ~~,~~narrative explanation of the cause of any schedule slippages, and identification of workarounds needed to make up for schedule slippage, as necessary;

~~1.~~6. ~~, and~~ activities not previously included in the master program schedule;

B. Updates to the Risk Management Plan showing existing or anticipated problems or issues, and the proposed work-around to address the issue;

C. Updated CDRL list, including current status of all deliverables;

D. Updated Submittal List and Schedule, including current status of all submittals;

E. Updated action item log showing current status of all action items as defined in Paragraph 20.1.7;

F. Updated Correspondence Log showing all project correspondence and anticipated response dates for open items of correspondence as defined in 20.1.8;

The Contractor shall also provide a narrative which shall state the work actually completed and reflect the progress in terms of days ahead of or behind the specified dates for each of the work items, as well as percent completed.

During the manufacturing, assembly, and testing phases, the Contractor shall supplement the narrative with digital color photographs to show the status of the work in progress and any problem areas. SEPTA may request supplemental details and photographs if the monthly progress report is determined to be inadequate.

20.1.7 Action Item Log

The Contractor shall maintain a log of all identified action items through the time of project completion. These action items shall be identified at design review meetings, Progress Review Meetings, and through correspondence. All action items shall have a responsible party assigned. No action item shall be assigned to SEPTA without SEPTA's knowledge and concurrence. Each action item in the log shall contain:

A. Item Number;

B. Description;

C. Requesting Party;

D. Assigned Party;

E. Status (open / closed / in progress / deferred / etc.);

F. Date Opened;

G. Date Closed; and

H. Progress Notes.

At any time, SEPTA shall be able to request from the Contractor a copy of the current action item list.

20.1.8 Correspondence Log

The Contractor shall maintain a log of all project correspondence through the time of project completion. All correspondence items shall have a responsible party assigned. Each correspondence item in the log shall contain:

A. Letter Number;

B. Description;

C. Requesting Party;

D. Assigned Party;

E. Status (open / closed / in progress / deferred / etc.);

F. Date Opened;

G. Date Closed; and

H. Progress Notes.

At any time, SEPTA shall be able to request from the Contractor a copy of the current correspondence log.

20.1.9 Contract Start-up Meeting

Within 30 days after NTP, a Contract Start-up Meeting shall be held in the offices of SEPTA. In attendance shall be SEPTA, the Contractor's project manager, and other appropriate SEPTA and Contractor personnel. The Contractor shall prepare an agenda for the meeting and, within five working days of completion of the meeting, the Contractor shall distribute draft meeting minutes. The Contract Start-up Meeting shall permit all parties to the contract to understand the overall schedule, terms and conditions, scope of work, and responsibilities. In addition, the parties shall discuss and identify the items to be submitted for the design reviews.

The Contract Start-up Meeting shall allow the Contractor and SEPTA to coordinate their activities. At the meeting, the Contractor shall also present its intended design and identify interface requirements.

The Contract Start-up Meeting shall also cover the following topics, which shall be addressed in the agenda prepared by the Contractor:

A. SEPTA and Contractor to review and confirm the procedural requirements of the Contract;

B. Contractor to provide conceptual information on proposed equipment and overall NPT System design, configuration, and layout;

C. SEPTA and Contractor to review intended operations and maintenance requirements;

D. SEPTA and Contractor to identify interface requirements between SEPTA and Contractor, especially regarding communications and installation interfaces;

E. Contractor to identify initial information and decisions required from SEPTA; and

F. Contractor to identify any requirements for which waivers will be requested.

20.1.10 Progress Review Meetings

Progress Review Meetings (PRMs) shall be held at least twice each month, at the offices of SEPTA or the Contractor as selected by SEPTA.

The Contractor shall prepare and distribute an agenda to all participants expected to attend the meetings seven days prior to the scheduled meeting date. **CDRL 20-5** The Contractor's Project Manager shall attend and chair these meetings.

As a minimum, the following topics shall be discussed:

- Introduce new attendees and areas of responsibility;
- Review minutes of previous meetings, amend minutes if necessary, and accept minutes;
- Review of the updated Master Program Schedule;

- Analyze work accomplished since previous meetings, including: design status, fabrication problems, product delivery problems, device installation problems, schedule slippages, problems arising from proposed changes, and other circumstances which might affect progress of the work;
- Discuss sequence of critical work and schedule of manufacturing using the Master Program Schedule and Monthly Progress Reports;
- Discuss engineering, manufacturing, and quality control;
- Discuss changed conditions and time extensions;
- Discuss corrective measures to maintain Progress Schedule when necessary; and
- Discuss work to be done in the next six weeks.

Each of the inquiries, reports, and requests for solution of problems presented during such meetings shall be answered, when possible, during the meeting; those not answered during the meeting shall be solved and the resolution documented and delivered in person or mailed to the SEPTA, within three (3) working days of the close of the meeting, or longer time frame if mutually acceptable. Project Review meeting minutes shall be prepared by the Contractor and submitted to SEPTA for review and approval.

20.1.11 Contractor Representatives

The Contractor, and its subcontractors, shall provide qualified technical and administrative support on SEPTA's property commencing with the arrival of the first device and concluding with the completion of the warranty program. The Contractor Representatives shall be fluent in English and fully qualified for the on-site tasks. Included among the personnel shall be a full range of engineering skills, until such time as all devices are accepted. All necessary specialized Contractor and subcontractor support shall be available, on short notice, to assist the on-site personnel in the investigation and resolution of device and system malfunctions.

Contractor Representatives must be identified by the Contractor and display appropriate identification while on SEPTA property. The Contractor's on-site personnel must undergo SEPTA's safety training prior to access to SEPTA facilities and adhere to all SEPTA Rules and Regulations.

20.2 CONTRACTOR'S QUALITY ASSURANCE PROGRAM

20.2.1 General

The Contractor shall establish and maintain an ISO 9001 compliant project specific Quality Assurance/Quality Control (QA/QC) system consisting of a program quality manual and supporting plans and/or procedures, which address the methods to be used to control the quality related aspects of all component, assemblies, software, and applications to be furnished and installed in accordance with the Contract Documents. The Contractor shall have all responsibility for the quality of all its work and shall ensure that the pertinent requirements for the achievement of quality are included in all relevant sub-contracts. As such, the QA/QC system shall be imposed both upon all entities within the Contractor's organization and on all subcontractors whenever Contract work is performed.

The Quality Assurance/Quality Control program shall include a description of the organization and shall identify the responsibilities and accountabilities of all personnel performing quality-affecting activities. The Quality Control plans and/or procedures shall include and/or reference those checklists and test and inspection forms to properly document the activities performed to achieve the quality of the Work.

20.2.2 Quality Assurance Program Plan

The Contractor shall prepare and submit for approval a Quality Assurance Program Plan that addresses control of the quality of the Contractor's design, equipment furnished, installation workmanship, testing, training, and documentation. This Plan shall also include Reliability Assessment Program elements.

A QA Program Plan shall be submitted to SEPTA within 60 days after NTP for review and approval. **CDRL 20-6** No manufacture of equipment or components shall be permitted by the Contractor until the QA Program Plan is approved by SEPTA.

The Contractor shall use and abide by the QA Program Plan to execute the work for the Contract. The QA Program Plan shall describe the methods for planning, implementing, and maintaining quality, schedules, and cost. The QA Program Plan shall contain a company policy statement that clearly defines the responsibilities of QA personnel. An organization chart shall be included to show the reporting relationships of all QA staff, and shall indicate the Contractor's QA/QC representative, who shall be a full-time employee of the Contractor. The QA/QC representative shall not report directly to the Contractor's Project Manager.

The QA Program Plan shall also contain a collection of all forms to be used for the documentation of quality control activities, which assure compliance of materials, processes, personnel, and products to the applicable specifications.

The QA Program Plan shall at minimum include procedures for the following activities:

A. Factory inspection and test processes and record maintenance.

B. Configuration Management Program, procedures, and records for Change Control and version management for both hardware and software. Changes shall include the following:

1. Fixes: corrections of malfunctions ("bugs") that are required in order to meet functional requirements as specified in this specification.

2. Updates: new software releases provided by the Contractor, whether for application software, operating system software, or third party software.

3. Enhancements: changes that provide improvement in the operation.

4. Modifications: changes necessitated by program changes.

5. Upgrades: augmentation and/or replacement of any system hardware.

6. Documentation revisions: updates to instructional documents or user's guide to reflect modifications to any existing software or other changes to systems' functionality.

7. Any other modifications to the hardware or software not specifically identified above.

C. Procedures and records for equipment handling; inventory; storage; delivery; design control; changes to documents; drawings; data; and specifications; release for shipment; shipping; evidence of compliance; corrective action; calibration/verification of measuring equipment and audit.

D. Software Development Quality Assurance Program, consistent with that indicated in IEEE Standard 730, IEEE Standard for Software Quality Assurance Plans or equivalent ISO 9001 standards for software quality assurance.

E. Quality Assurance program requirements for subcontractors.

F. System installation, inspection, and test processes and records.

G. Surveillance over all work, including subcontractors, for conformance and verification thereof with all Contract requirements.

H. Discrepancy control.

I. Evaluation and assessment of subcontractors' QA programs.

J. Feedback of problems, their resolutions to the Contractor's engineering and production departments, and corrective action.

K. Qualification and certification of all personnel performing work for this Contract.

20.2.3 Quality Assurance

As part of the QA/QC program for this project, the Contractor shall:

A. Engage an adequate number of skilled professionals who are thoroughly trained, experienced, and familiar with the specific requirements and methods needed for the proper performance of the Work.

B. Establish technical and administrative surveillance and/or audit methods to ensure the highest degree of quality, and to correct potential problems without affecting the Contract schedule.

C. Verify that the required quality control inspection, testing, and documentation activities have been performed to assure that the equipment, materials, and construction comply with the requirements of the Technical Specification.

D. Monitor quality control over suppliers, manufacturers, fabricators, products, services, site conditions, workmanship, and installation to produce work of the highest quality.

E. Take corrective actions in a timely manner to identify undesirable conditions affecting the quality of Work and the contract schedule.

F. All test results shall clearly include a statement that the item tested or analyzed conforms or fails to conform to the contract requirements. Each report shall be conspicuously stamped on the cover sheet in large red letters a minimum of ½ inch high "CONFORMS" or "DOES NOT CONFORM" to the Specifications as the case may be.

G. All test reports shall be signed by a testing laboratory's authorized person and countersigned by the Contractor. The Contractor shall provide all tests, reports, certifications and other documentation to the Project Manager promptly after the completion of tests.

H. The quality assurance functions shall include, but not be limited to:

Contract Review	· Factory and Field Testing
· Document Control	· Handling and Storage
· Procurement	· Packaging and Shipping
· Shop Fabrication	· Quality Records
· Field Fabrication	· Non Conformance Reporting
· Field Installation	· Corrective Action (s)
· Field Assembly	· QA Audits
· Receiving Inspections	· Training
· Final Inspection	· Control of In Process Activities
Software Controls	System Controls

I. The Contractor shall promptly reject work, which does not comply with the requirements of the Contract Documents. If the Contractor elects to propose that SEPTA accept work that is nonconforming, the Contractor shall reimburse SEPTA for the costs associated with the review of the nonconforming work by SEPTA's Project Manager.

J. Develop quality assurance forms in a format acceptable to SEPTA for all major elements of the work including any additional elements.

20.2.4 Source Quality Control

Regarding source quality control, the Contractor shall:

A. Document that each manufactured product and fabricated item is produced and tested to comply with highest quality standards. The Contractor shall perform required audits to maintain level of quality.

B. Document all software and system controls utilized during the analysis, design, build, test, and implementation of the NPT System including the CDCRS.

C. Not deliver material, manufactured product or fabricated item until certified quality assurance documents are satisfactorily reviewed by SEPTA.

D. Not schedule any factory tests/inspections by SEPTA until these documents are satisfactorily reviewed by SEPTA. Twenty-one (21) day's prior written notice is mandatory for (re) scheduling any factory tests/inspections by SEPTA.

SEPTA reserves the right to source inspect the manufactured product or fabricated item after acceptance of the certified quality assurance documents. Any and all costs related to re-inspection(s) by SEPTA shall be the responsibility of the Contractor.

The certified quality assurance documents shall identify and include any changes made to the material, manufactured product or fabricated item as compared to the Contract requirements and approved shop drawings. The Contractor shall describe as to how each change will affect the installation, space, and subsequent operations.

SEPTA's review of certified quality assurance documents and inspections shall not relieve the Contractor from its "primary" responsibility for the quality of work.

20.2.5 Site Quality Control

The Contractor shall identify an individual (CQC) within its organization for this Project, who shall be responsible for overall management of the Contractor's QA/QC system. The CQC shall meet the following requirements:

A. The CQC shall be experienced in the performance and supervision of the inspections and tests required by the specifications. The CQC shall be local to the SEPTA service area at all times that work is taking place and have complete authority to take any action necessary to ensure conformance with the Contract. The CQC will be the point-of-contact for all quality matters. The CQC is expected to represent the Contractor with respect to all QA audit and review activities performed on the Contractor by outside parties. The CQC shall be appointed by letter.

B. The CQC shall be responsible for the documented incoming inspection and determination of acceptability in conformance with Contract requirements of all material arriving at site. Receiving inspection(s) shall include the review of associated documentation where necessary to verify the compliance of the item. Segregate and remove from the site, any nonconforming and/or damaged material.

C. No work shall be performed at the site if the Contractor's Superintendent or his authorized representative, as approved by SEPTA, is not present at the location where work is being performed.

20.2.6 Software Version Verification

As part of the overall QA program after delivery and/or escrow of the NPT System software, at any time desired, SEPTA will have the capability to ascertain the versions of the software installed within the NPT System and to verify these versions against those installed in the equipment in service. This version control shall be provided as specified in Section 2.

All software source code shall be Ppprovided (i.e. delivered to SEPTA or placed in escrow in accordance with the requirements of the Contract). ~~This~~ Provided software shall consist of:

- Contractor developed software, object code, source code with comments and documentation, together with all Contractor developed programming tools, text editors, compilers and supporting materials necessary for providing an executable version of the software.

- Programming contained in ROMs, PROMs and for firmware.

In addition, third-party software and supporting materials necessary for providing an executable version of the software shall also be Ppprovided to SEPTA~~in the escrow~~. Each time that any version is revised, the Provided software ~~in the escrow~~ shall be updated accordingly.

All Provided software ~~from escrow~~ shall be available for verification each time there is a modification to the software by the Contactor. When this software is accessed by SEPTA, verification of the source code and tools shall be performed at the discretion of SEPTA.

Using the source code and all uninstalled and unmodified third party software and software tools, and following the directions provided by the Contractor, SEPTA shall generate the executable code software. Each software module shall generate and provide the proper version information when the executables are generated.

The Contractor shall provide all procedures and processes for the creation of the software modules from the source code to the executables, and for the checking and verification of the versions of each of the software modules against the version of software deployed in the field on NPT devices. This information shall be provided at the Final Design Review for SEPTA review and approval. **FDR 20-1**

20.2.7 SEPTA Quality Assurance

SEPTA may, at its discretion, perform its own QA monitoring of work done under this Contract, including monitoring of the Contractor's or subcontractor's QA activities. Such activities shall not reduce or alter the Contractor's QA responsibilities, nor reduce or alter the Contractor's obligation to meet the requirements of this document, including the schedule requirements.

After NTP, SEPTA or its designee will have the right of free access to facilities of the Contractor and subcontractors. This right will permit SEPTA to inspect, examine, and test items during manufacture and prior to shipment. On demand, the Contractor's Quality Assurance Plan, procedures, and records shall be made available to SEPTA for inspection and audit. In addition, copies of all drawings, diagrams, schedules, changes, and deviations shall be made available promptly upon request.

If requested, the Contractor shall provide to SEPTA a temperature-controlled and adequately lighted private office at the Contractor's manufacturing facility to accommodate a minimum of two people, and shall have access to toilet facilities. A telephone and access to the Internet shall be made available for SEPTA's use.

20.3 Design Reviews

A comprehensive program of submittals and reviews shall be conducted for all aspects of the project. Three design reviews shall be held: Conceptual, Preliminary, and Final. For each of these reviews, a series of documentation, samples, and demonstrations shall be submitted to SEPTA for review and approval. **CDRL 20-7, CDRL 20-8, CDRL 20-9**

Documents, drawings, and data to be furnished by the Contractor for approval by SEPTA shall include all information conveyed for the design review meetings, as described herein, including their completed, final form and all other submittals described in this Contract. SEPTA reserves the right to request additional documents and/or drawings as required to clarify and amplify the intent or meaning of documents and/or drawings furnished.

During these design review meetings, action items shall be identified, with each action item assigned to an individual for disposition by a pre-determined response date. All action items identified during the design reviews shall be recorded in the project action item log.

At least 30 days prior to each design review meeting, the Contractor shall submit the required copies of the agenda and a data package and required submittals covering information to be addressed in the meeting. Design review meeting minutes shall be prepared by the Contractor and submitted to SEPTA for review and approval within five (5) business ~~30~~ days after each meeting.

Attendance at design review meetings shall include representatives of the Contractor and appropriate Subcontractors and SEPTA-appointed representatives.

20.3.1 Review Procedures

The Contractor shall submit drawings, documents, procedures, and data in accordance with the Submittal List and Schedule provided in the Master Program Schedule. The Contractor shall submit for review and approval fifteen (15) copies of all documents, data, assembly and installation drawings required to convey concept, design, dimensions, maintenance, operation, and overall assembly aspects and interfaces required as a part of these design reviews. Drawings shall be accompanied by material specifications, process specifications, and test data required to permit review and approval of the drawings. Detailed parts drawings need not be submitted unless requested by SEPTA to permit review of another drawing.

SEPTA reserves the right to reject, without review, any document that is not in English or is not readily understandable due to lack of proper grammar, spelling, sentence structure, or punctuation. SEPTA is under no obligation to expend extraordinary effort to interpret poorly written or translated documents.

SEPTA reserves the right to request additional drawings, documents, or data, or any combination of documents, drawings, or data to support the review process. At the discretion of SEPTA, the Contractor may be issued an extension of time during the review period, should the Contractor have fulfilled the specified submittal requirements, and the additional information requested by SEPTA be of sufficient complexity and/or volume. Other contract deliverables including material samples, manufacturing plan, software prototypes and documentation, test plans, test procedures, and analyses shall be submitted in the quantities specified. Parts may be manufactured prior to review and approval of Contractor submittals, however, SEPTA reserves the right to refuse or require changes to such parts at the Contractor's expense should the design(s) fail subsequent review.

Except as provided below, SEPTA shall respond to submittals within twenty-one (21) calendar days after receipt. SEPTA shall respond to the Contractor at an address within the United States designated by the Contractor.

As submitted by the Contractor, the drawings, documents, and data shall be accompanied by a letter of transmittal listing drawing and document titles, numbers, and revisions.

No extension of time and schedule will be allowed for revision and resubmittal of Contractor's submittals, which have been "disapproved" or "conditionally approved." Such submittals shall be resubmitted and shall be reviewed and returned to the Contractor within the same time intervals as would be allotted to the drawings and documents when initially submitted. Drawings shall be submitted in an orderly and logical sequence to enable SEPTA to readily determine and review the interface relationships among elements and their subassemblies.

The Contractor shall maintain a record of Contractor and Subcontractor submittal status. This shall include drawing and document numbers, revision letter, drawing title, date submitted, transmittal document, disposition, and the document number identifying the disposition. This status shall be updated not less than monthly and submitted to SEPTA as part of the Monthly Progress Report.

20.3.2 Approval of Contractor Submittals

SEPTA's approval or disapproval will be provided within twenty-one (21) days of receipt of the entire submittal package in one of the three following categories:

- Approved as Submitted.
- Conditionally Approved. The Contractor may proceed in accordance with changes indicated and shall revise and resubmit the document, drawing, and data for SEPTA approval.
- Disapproved. The Contractor shall revise and resubmit the document, drawing, and data for SEPTA approval prior to commencing the affected portion of the work.

Design approval at any stage shall not relieve the Contractor of the obligation to meet all of the requirements of the Contract, except for those instances when the deviation has been explicitly requested by the Contractor and granted by SEPTA. Approval of a document, drawing, and data, which contain deviations from, or violation of, the Contract requirements does not constitute authority for that deviation or violation. Such deviations must be specifically and explicitly requested and granted by SEPTA in writing.

With the exception of the submittals identified as “approved as submitted” all other submittals shall require resubmission and approval by SEPTA within the same timeframes as identified within this section.

20.3.3 Environmentally Friendly Design

All NPT equipment design and the selection of all NPT equipment components shall be performed with an emphasis on the principles of energy efficiency, sustainable design, usage of post-consumer materials, usage of non-polluting and non-hazardous materials for manufacture, and other similar important aspects of the design, development, manufacture, implementation, and operation of the NPT System. Where available, high efficiency components shall be incorporated into the equipment

Information supporting these design concepts shall be provided for SEPTA understanding at each design review. This information shall include identification of specific methods to meet the important environmentally-friendly needs. Compliance with the RoHS directive shall also be provided.

Should SEPTA identify suitable environmentally friendly elements and components, best efforts shall be provided by the Contractor in order to maximize these elements, without severe adverse impact on system deployment.

20.3.4 Conceptual Design Review

The Conceptual Design Review (CDR) meeting shall be scheduled once the Contractor notifies SEPTA of their readiness for this milestone. The scope of the Conceptual Design Review involves discussion of conceptual information or the “Contractor’s Vision” of how it shall successfully address the requirements of the Contract for equipment design, configuration, layout, and functionality, system operations and maintenance requirements. The purpose of CDR is for:

- SEPTA and Contractor to review and confirm the procedural requirements of the Contract;
- The Contractor to present its vision of the intended design that will successfully satisfy the technical, operational and functional requirements;

- The Contractor to provide conceptual information on proposed equipment design, configuration, and layout;
- SEPTA and Contractor to review intended operations and maintenance requirements;
- SEPTA and Contractor to identify interface requirements between SEPTA and Contractor, especially regarding communications and installation interfaces;
- The Contractor to identify information and decisions required by SEPTA;
- SEPTA and Contractor to review the design information provided as a part of the CDR and to agree on any modifications required to meet the contractual or functional requirements.

The Contractor shall prepare conceptual design drawings, documentation, and data for review and approval by SEPTA. Upon receipt and review of the of Conceptual Design Review submittals, as identified in Section 20.3.1, the CDR meetings shall be held at a SEPTA designated location. Approval of all CDR submittals by SEPTA is a prerequisite to proceeding to the Preliminary Design Review.

SEPTA shall notify the Contractor within five (5) business days after receipt of all updated CDR information as agreed at the CDR meeting, whether its conceptual design is acceptable.

20.3.5 Preliminary Design Review

Upon received signed approval from SEPTA with the design concepts presented at the CDR, the Contractor shall prepare preliminary design drawings, documentation, and data for review and approval by SEPTA. SEPTA shall notify the Contractor within thirty (30) days after the CDR which submittals from the CDR items, which are required to be submitted in greater detail for the Preliminary Design Review (PDR). Upon receipt and review of these and all of the Preliminary Design Review submittals, as identified in Section 20.3.1, the PDR Meeting shall be held at the offices of the Contractor located in the United States. Receipt of all PDR documentation is required not less than fifty-six (56) days prior to commencement of any PDR meetings.

SEPTA shall notify the Contractor within ten (10) business days after receipt of all updated PDR information as agreed at the PDR meeting, whether its preliminary design is acceptable. At that time, SEPTA shall also provide the Contractor with a list of those PDR submittals that shall be required to be re-submitted with greater detail for the FDR meeting. Approval of all PDR submittals by SEPTA is a prerequisite to proceeding to the Final Design Review.

20.3.6 Final Design Review

The Final Design Review (FDR) shall take place when the design is essentially complete and the Contractor has received signed approval from SEPTA for the PDR submittals. The purpose of the FDR is to provide SEPTA and the Contractor a final opportunity to review, revise, agree, and finalize the details of the NPT System design prior to release of all designs for manufacture and systems development. FDR submittals shall include all finalized submittals of all required drawings, documents, and data.

Upon receipt and review of the Contractor's Final Design Review package, as identified in Section 20.3.1, the FDR meetings shall be held at SEPTA designated facility. Receipt of all FDR documentation is required not less than seventy-seven (77) days prior to commencement of any FDR meetings.

The FDR shall be deemed completed when the final issues regarding the design of the fare collection system hardware and software have been resolved, all open design issues have been resolved, the NPT System is found to be in accordance with the requirements of the Contract and SEPTA approves the FDR submittals.

~~20.4Installation and Interface Plan~~

~~As part of the Preliminary Design Review, the Contractor shall submit to SEPTA for review and approval an installation and interface plan. The installation and interface plan shall indicate the method of installation and connections, the installation schedule for each station and the Central Computer System, installation testing periods and any support requested of SEPTA to properly install the equipment.~~

~~The plan will provide information on the personnel assigned to the installation, their duties, and the on-site project manager for the Contractor for this phase of the project. As a part of this plan, installation templates shall be provided for each of the items of fare collection equipment provided as a part of this contract. These templates shall be submitted at the Preliminary Design Review and approved at the Final Design Review.~~

~~The Installation and Interface Plan shall include a description of the procedures to be followed for the implementation of a new system feature, a new equipment feature, and a new type of equipment. These procedures shall be general step-by-step procedures, which can be applied to the implementation of any new item of equipment or new feature and shall incorporate the use of the Maintenance Test Station as described in the Technical Specifications.~~

~~Approval of this plan by SEPTA shall be required prior to the delivery of any NPT component to the site.~~

Section 21 – Deployment, Installation and Testing
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21 DEPLOYMENT, INSTALLATION AND TESTING

This section covers the phased deployment plan, as well as the installation and testing requirements of the New Payment Technologies (NPT) System. The NPT System shall be deployed in a phased manner – by mode of transportation, by device and by available functionality within the overall NPT System.

21.1 Deployment Plan

~~The section describes SEPTA's required deployment phasing for the various elements of the NPT System.~~

SEPTA requires that NPT functionality be deployed in ~~four~~ three phases. Each of these phases shall be implemented system-wide over the existing SEPTA service area and fully installed and tested before deployment starts on the subsequent Phase. A graphical representation of the deployment ~~methodology~~ approach is appended to the Technical Specifications as ~~Exhibit 21.1~~Appendix A.21 "SEPTA NPT Deployment Plan."

~~In summary, t~~The deployment phases are as follows:

- **Phase 1 – Initial Deployment:** All prerequisite communications and control systems shall be installed and proven to be fully functional. Included is the deployment of a fully tested and completed CDCRS with all applications and associated network communications. The ~~remote~~ NPT Customer Support Center and E-Commerce site shall be established and capable of supporting all Customer needs. The NPT ~~Training~~ Test Lab facility shall be installed and fully operational.

- **Phase 2 – ~~SEPTA-Issued Smart~~SEPTAPartial Deployment ~~Issued Smart Media with Autoload~~:** The NPT System shall support ~~SEPTA-issued Smart~~SEPTA ~~Issued~~ Smart Media as well as Magnetic Media for fare payment transactions in the wireless environment. ~~with automatic replenishment of period passes.~~ The NPT System shall also support Open Payment Smart Media processing of Pay-As-You-Go fare payment transactions in the wired environment. A proof-of-concept test to verify the ability of the Contractor to comply with the Phase 3~~4~~ Mobile Wireless transaction processing speeds shall occur as part of Phase 2.

- **Phase 3 – Complete ~~Implementation~~Deployment ~~of SEPTA-Issued~~SEPTA ~~Media~~:** The NPT System shall support all forms of SEPTA, Partner and Open Payment Smart Media for fare payment transactions in the wired and wireless environment. ~~SEPTA Smart~~SEPTA ~~Issued Smart~~The ~~NPT System shall support SEPTA-issued~~SEPTA ~~Smart Media with automatic replenishment of period passes and stored value, as well as SEPTA-issued~~SEPTA ~~Smart Media without automatic replenishment capabilities.~~

- ~~**Phase 4 – Full Implementation of New Payment Technologies System:**~~ NPT System shall support all new payment technologies ~~required by the Technical Specification including Partner-issued Smart Media, contactless credit and debit cards,~~ including other ISO/IEC 14443 compliant media and NFC devices.

~~SEPTA requires that the NPT System be deployed as quickly as possible while ensuring a successful overall program as well as minimal impact on the SEPTA's Customer satisfaction levels. The duration of each implementation Phase will be based on the speed at which the required services and systems can be developed, tested, successfully implemented, and found to be in accordance with the specified requirements by SEPTA.~~

21.1.1 Phase Duration and System Testing

SEPTA requires that the NPT System be deployed as quickly as possible while ensuring a successful overall program as well as minimal impact on the SEPTA's Customer satisfaction levels. The duration of each implementation Phase will be based on the speed at which the required services and systems can be developed, tested, successfully implemented, and found to be in accordance with the specified requirements by SEPTA.

~~As stated previously, SEPTA requires that the NPT System be deployed as quickly as possible, while ensuring a successful overall system rollout. The duration of each deployment phase shall be based on the speed at which the required services and systems can be developed, tested, successfully implemented, and found to be in accordance with the Specification by SEPTA.~~

When a subsequent deployment Phase requires the implementation of a new function or set of functions into the accepted NPT System or any accepted NPT System element from a previous deployment phase, a comprehensive test of the feature and a regression test of its impact on the entire NPT System shall be conducted in the NPT ~~Training Simulator~~Test Lab (NPT TL~~TSL~~). The NPT T~~TS~~L shall mimic and represent the entire deployed NPT System. Subsequent to successful testing of the feature at the ~~TSL~~NPT TL, the feature shall be subjected to a limited test at selected NPT equipment locations in revenue service (to be determined by SEPTA) before implementation of the functionality occurs system-wide. The NPT Test Lab shall not be used for training purposes by the NPT Contractor.

Details for implementation of the NPT System for each of the Phases are as provided below. These Phases are additive – that is, implementation of a Phase requires that implementation of the previous Phase be complete and accepted by SEPTA. Unless specifically identified as removed, all functions deployed in a prior Phase are to remain functional in subsequent Phases.

21.1.2 Phase 1 – Initial Deployment

For phase 1, the NPT System will accept the same types of fare payments and fare media, and operate with the same types of fare collection and building access equipment as at present. The Customer shall not experience any change in the fare payment process as part of this phase.

21.1.2.1 Phase 1 Requirements

For Phase 1, the following requirements shall be completely designed, developed, installed, tested, and accepted by SEPTA for implementation purposes:

SEPTA Back-office

- The fully-functional CDCRS will be deployed with wired and~~/or~~ wireless communications links for all NPT and On-Board Processor (OBP) equipment. The CDCRS shall also be linked to ~~as well as links to~~ SEPTA's existing systems as well as external bank or non-bank financial clearing systems for settlement purposes.
- All CDCRS applications, as outlined in Section 19, shall be developed and tested.

- The fully-functional Back-up CDCRS shall be deployed at SEPTA's Business Recovery Site with wired and wireless communications links for all NPT and On-Board Processor (OBP) equipment as well as links to external bank or non-bank financial clearing systems for settlement purposes.

Subway / Elevated System

- Fiber optic network shall be deployed and fully functional at all stations;
- All NPT data rings shall be established and connected to all stations, 1234 Market Street, and the Business Recovery Site.

Surface Fleet

- All Bus Depots and Trolley Barns shall be connected with a new data communication link, dedicated to the On-Board Processor Management Systems (OBPMS).
- Twenty (20) On-board Processors~~A limited quantity of prototype~~ (OBPs) ~~will~~ shall be deployed on Surface Fleet as a pilot program.
- Communications Infrastructure shall be extended to Bus Depots and Trolley Barns, and shall be fully functional.

Regional Rail System

- Data communications links, as required, shall be established to all necessary stations.
- Twenty (20) Handheld Sales Devices (HSDs) ~~Prototypes will~~shall be used by Conductors to sell ~~Limited Use~~Round-trip Magnetic Media ~~(LUM)~~ on the Airport Line as a pilot program.
- Twenty (20) full function~~Limited quantity of~~ Fare Vending Devices (FVDs) will be deployed on the Airport Line and at other selected RRD Stations as a pilot program.

SEPTA Sales Offices

- Network infrastructure shall be deployed and fully functional in SEPTA Sales Offices to support installation of Administrative Sales Devices (ASDs).

NPT System ~~Training~~ Test Lab~~Facility~~

- The NPT ~~System~~ Test Lab~~Training facility~~ shall be fully installed and operational.

~~Remote~~ NPT Customer Support Center

- A remote, centralized NPT Customer Support Center providing Internet and telephone accessibility will be established and staffed to assist Customers with activities such as obtaining, registering and inquiring about the status of their Ff~~f~~are Mm~~m~~edia~~.~~, ~~as well as adding, altering, suspending, and changing subscriptions for Autoload fare products.~~

E-Commerce Site

- A secure Internet web site for the NPT System will be designed to support SEPTA's on-line sales. In addition to accepting and processing purchase requests, this site shall also provide SEPTA with necessary access to reports and other tools to fulfill (i.e., print and deliver) Fare Media sales from individuals as well as from groups (such as Employers) who purchase Fare Media in bulk quantities.

Employee Access Passes

- SEPTA employees shall be issued with customized ~~SEPTA Smart~~SEPTA Issued Smart Media, which encompasses both an NPT-compliant smart chip as well as a legacy SEPTA-compliant magnetic stripe. This media will function as fare media for transportation purposes as well as the employee ID for SEPTA building access purposes using the existing magnetic stripe.

21.1.3 Phase 2 – Partial Deployment

For Phase 2, the NPT System shall accept the same types of fare payments and Ff~~f~~are Mm~~m~~edia, and operate with the same types of fare collection equipment as at present except for the incremental functionality identified in this Section. The functional changes for this Phase are as follows:

- All elements of the NPT System shall provide for the distribution and processing of ~~SEPTA-issued Smart~~SEPTA ~~Issued~~ Smart Media ~~with automatic replenishment of period passes~~.

- SEPTA's existing building access control system at 1234 Market Street will be replaced with a new access control system that utilizes the NPT Smart Media.

- The NPT System shall support Open Payment Smart Media processing of Pay-As-You-Go fare payment transactions in the wired environment.

- A proof-of-concept test to verify the ability of the Contractor to comply with the Phase 3~~4~~ Mobile Wireless transaction processing speeds shall occur as part of Phase 2.

21.1.3.1 Phase 2 Requirements

Prior to implementation of Phase 2, all Phase 1 elements and functions, as well as the following incremental Phase 2 NPT System requirements, shall be completely designed, developed, installed, tested, and accepted by SEPTA for implementation purposes:

Subway/Elevated

- ~~All Subway/elevated stations shall be equipped with a limited number of new/retrofitted turnstiles, which process the new SEPTA-issued Smart~~SEPTA Issued Smart ~~Media as well as SEPTA's existing magnetic media.~~

- ~~All existing ADA Faregates shall be replaced with new ADA Faregates,~~ SEPTA Issued Smart~~which process the new SEPTA-issued~~SEPTA ~~Smart Media as well as the existing magnetic media; An ADA Faregate shall be provided for each turnstile array.~~

- ~~Subway/Elevated stations will be equipped with new Fare Vending Devices for sale of single ride media.~~

- At least 50% of all Turnstiles at each station shall be replaced with fully functional Overhauled or New Turnstiles.

- All ADA Faregates shall be replaced with fully functional new ADA Faregates of enhanced design.

- At least 50% of the required quantity of fully functional Fare Vending Device (FVDs) of each type shall be deployed at each station.

- New/overhauled Turnstiles and ADA Faregates shall

successfully process the following Fare Media for payment purposes: SEPTA Smart Media, SEPTA Magnetic Media and Open Payment Smart Media.

Surface

- ~~The entire Surface fleet will be equipped with OBPs and wireless communication capabilities. OBPs shall process the new SEPTA-issued Smart~~SEPTA Issued Smart ~~Media as well as the existing magnetic media.~~
- ~~Bus garages will be equipped with the required equipment to communicate wirelessly with OBP equipment.~~
- On-board Processors shall be installed and shall be fully functional on the entire Surface Fleet.
- NPT Equipment shall be deployed at Trolley Stations, Route 100 Stations, Bus Turnpoints and Remote Locations.
- Wireless Connectivity between all OBPs and SEPTA's NPT Network to support fare payment with SEPTA Smart Media shall be deployed and fully functional.
- The Proof of Concept Test to test Open Payment mobile wireless connectivity between the OBPs and the CDCRS shall have been successfully completed.

Regional Rail

- ~~Handheld Sales Devices (HSDs) shall be provided to all Conductors to verify passes stored on~~ SEPTA Issued Smart~~the SEPTA-issued~~SEPTA ~~Smart Media and to sell Limited Use Media.~~
- ~~Stations on the Regional Rail System shall be equipped with Fare Vending Devices for sale of Limited Use Media as well as Media Information Displays and Faregates, which process~~ SEPTA Issued Smart~~the new SEPTA-issued~~SEPTA ~~Smart Media and SEPTA's existing magnetic media.~~
- ~~Sales Devices shall be deployed at station locations to support sales of SEPTA Fare Media.~~
- ~~Stations shall be equipped with communications cabinets as necessary.~~

- Fully functioning HSDs shall be issued to all Conductors.
- Fully functional ASDs shall be installed at all downtown SEPTA RRD Sales Offices, and at selected other locations.
- 100% of the required quantity of FVDs of each required type shall be installed and fully functional at SEPTA's RRD stations.
- All Railroad Turnstiles and ADA Faregates shall be successfully deployed at the downtown RRD stations.
- Mobile wireless connectivity between all HSDs and the CDCRS shall be fully deployed and fully functional.
- New RRD Turnstiles and ADA Faregates shall successfully process the following Fare Media for payment purposes: SEPTA Smart Media, SEPTA Magnetic Media and Open Payment Smart Media.

Parking

- 100% of fully functional Parking Payment Stations (PPS) shall be installed at the selected Pay-by-Space SEPTA parking facilities.
- The PPS shall successfully process the following Fare Media for payment purposes: Cash, Credit/debit Media and SEPTA Smart Media.
- ~~Parking equipment shall be installed at selected locations to accept payment in cash and credit/debit media for parking privileges.~~

Sales Locations

- Administrative Sales Devices (ASDs) shall be deployed at sales locations[1] to distribute SEPTA M~~'s existing m~~agnetic M~~m~~edia, ~~the new SEPTA issued Smart~~SEPTA ~~Issued~~ Smart Media, establish Customer accounts~~,~~ and provide Customer support activities.

[1] SEPTA's Pass Sales Locations are appended to the Technical Specification as Appendix A.23.

Building Access Control and Reporting System

- The existing building access control system, at 1234 Market Street~~, at all locations currently deployed~~, will be replaced with a new system that supports the NPT Smart Media.

21.1.3.2 Smart Media Distribution and Sales

The existing fare media will continue to be sold in the same manner as present, but the following changes will also be implemented:

- Administrative Sales Devices will be deployed at SEPTA-staffed locations[1] for distribution ~~and establishment of Autoload subscriptions for~~ of ~~the new SEPTA-issued Smart~~SEPTA ~~Issued~~ Smart Media and establishment of NPT accounts;

- ~~Retail Sales Devices will be deployed at SEPTA sales locations with Non-SEPTA staff for distribution of the new SEPTA-issued Smart~~SEPTA Issued Smart ~~Media;~~

- Third party channels will distribute pre-encoded ~~SEPTA-issued Smart~~SEPTA Issued Smart Media that Customers will register through the NPT Customer Support Center for Auto Replenish~~load~~ purposes prior to use;

- Preferred SEPTA Partner merchants will distribute and SEPTA Smart Media and replenish NPT accounts using a web utility or using their pre-existing open payment point-of-sale devices;

- SEPTA ~~Limited Use Media~~Smart Media and Magnetic Media will be issued by Fare Vending Devices ~~and Handheld Sales Devices~~.

- Tokens shall be accepted at FVDs as value towards the purchase of trip-based Magnetic Media and Smart Media.

21.1.3.3 Smart Media Usage and Verification

In Phase 2, ~~replenishment of SEPTA-issued Smart~~SEPTA ~~Issued~~ Smart Media shall be fully-functional, and shall support both stored value and calendar passes. ~~restricted to Autoload passes.~~ Customers wishing to subscribe to repeat Autoloads, i.e., a new monthly pass or stored value load on the first of every month or at a pre-defined threshold, shall be required to register their card. Customer registration of Smart Media shall be supported at the NPT Customer Support Center, through the Website and at SEPTA-staffed sales locations.

This registration shall ~~create a central account and shall~~ identify the ~~card~~ Smart Media with a specific individual at a specific address, and require that a means of external electronic payment be identified for automatic replenishment of the Smart Media account.

The NPT System, via the NPT Customer Support Center, and other methods, shall provide registered Customers with means by which they can suspend, change, or cancel their Autoloads, as well as alter all other registration parameters, including changing their address and method of payment.

When a registered Customer adds, changes, or deletes an Autoload account, the NPT System shall alter the central database to reflect the Smart Media's new product subscription status.

When processed at any NPT System device, the validity of the ~~SEPTA-issued Smart~~SEPTA ~~Issued~~ Smart Media for the requested trip shall be verified with the account contained within the CDCRS as identified in Sections 2, 4 and 5~~4~~. The required transaction speed is applicable for processing by OBPs at any location and on any mode of transportation.

A proof-of-concept test will be held as part of Phase 2 to verify the ability of the Contractor to comply with the Phase 3~~4~~ Mobile Wireless transaction processing speeds.

21.1.4 Phase 3 – Complete Deployment

In addition to the functionality identified for Phase 2, the functional changes for this Phase are as follows:

- ~~NPT System will support SEPTA-issued~~SEPTA ~~Smart Media with automatic replenishment of stored value.~~

- ~~NPT System will support SEPTA-issued Smart~~SEPTA Issued ~~Smart Media that is not linked to an external account for automatic replenishment purposes.~~

- The NPT System shall also support Partner Smart Media in the wired and wireless environment.

- The NPT System shall support Open Payment Smart Media processing of Pay-As-You-Go fare payment transactions in the wireless environment.

- The NPT System shall support all new payment technologies including other ISO/IEC 14443 compliant media and NFC devices as defined in Sections 2, 4 and 5 of the Technical Specification.

21.1.4.1 Phase 3 Requirements

Prior to implementation of Phase 3, all Phase 1 and 2 elements and functions, as well as the following incremental Phase 3~~2~~ NPT System elements, shall be completely designed, developed, installed, tested, and accepted by SEPTA for implementation purposes.

~~To permit the functions in this Phase to be deployed, the following shall be provided on the NPT System elements:~~

SEPTA Back-office

- The ~~remote~~ NPT~~centralized~~ Customer Support Center will need the provision of additional web site and other NPT System functionalities in order to permit Customers with ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media and Partner Smart Media to manage their ~~addition of pass or stored value products to their~~ accounts, monitor and modify account parameters, as well as review Smart Media usage ~~as well as establish a stored value Autoload fare product~~.

Subway/Elevated

- 100% of all Turnstiles at stations shall be replaced with fully functional Overhauled or New Turnstiles.

- 100% of the required quantity of fully functional Fare Vending Devices (FVDs) shall be deployed at all stations.

- ~~All Subway/Elevated turnstiles will be replaced by new/retrofitted turnstiles, which process the new SEPTA-issued~~SEPTA ~~Smart Media as well as the existing magnetic media.~~

- ~~All Subway/Elevated stations will be equipped with new Fare Vending Devices. All FVDs shall have the ability to~~ SEPTA ~~Issued Smart~~add passes, and stored value to the ~~SEPTA-issued Smart~~SEPTA Issued Smart ~~Media and issue all SEPTA fares.~~

- Handheld Sales Devices shall be issued to station Customer service staff for provision of Customer service activities.

Surface

- The Surface Fleet Wireless Network shall be fully deployed and successfully functioning.

- 100% of required NPT Equipment shall be deployed at Trolley Stations, Route 100 Stations, Bus Turnpoints and Remote Locations.

- SEPTA's Smart Media dispersal network shall be fully deployed and successfully working.

- All OBPs shall process all acceptable forms of Smart Media as defined in Section 4.

- ~~No change~~

Regional Rail

- ~~All FVDs shall have the ability to add passes and stored value to SEPTA-issued Smart~~SEPTA Issued Smart ~~Media.~~All FVDs shall have the ability to dispense and replenish SEPTA Smart Media and issue Magnetic Media.

- 100% of fully functional Media Information Displays (MIDs or Platform Validators) shall be deployed at the SEPTA designated RRD stations.

- All FVDs, HSDs, MIDs, Railroad Turnstiles and ADA Faregates shall process all acceptable forms of Smart Media as defined in Section 4.

Parking

- Parking equipment shall accept all acceptable forms of Smart Media as defined in Sections 4 and 15 as fulfillment of payment for parking privileges. ~~SEPTA-issued~~SEPTA ~~Smart Media (Stored Value functionality) as payment for parking privileges.~~

- ~~Parking equipment shall accept parking permits stored on SEPTA Smart~~SEPTA Issued Smart ~~Media.~~

- Machine-readable Parking Permits shall be available for use.

21.1.4.2 Smart Media Distribution and Sales

The Smart Media shall be sold in the same manner as in Phase 1 and 2, but the following changes shall also be implemented:

- ~~The Administrative Sales Devices that are deployed at SEPTA-staffed locations shall also provide for distribution and establishment of stored value Autoload subscriptions as well as non-Autoload stored value and pass product sales for the new SEPTA-issued Smart~~SEPTA Issued Smart ~~Media.~~

- The NPT Customer Support Center as well as the Administrative Sales Devices that are deployed at SEPTA-staffed locations shall also provide for establishment of Partner Smart Media accounts within the CDCRS.

- ~~Retail Sales Devices will be deployed at SEPTA sales locations with Non-SEPTA staff for sale of stored value and pass product sales for the new SEPTA-issued Smart~~SEPTA Issued Smart ~~Media.~~

- ~~Customers will be able to add stored value and/or stored pass products to the SEPTA-issued Smart~~SEPTA Issued Smart Media at the FVD.

- ~~Tokens shall be accepted at Subway/Elevated FVDs for the purchase of trip-based Smart Media.~~

21.1.4.3 Smart Media Usage and Verification

The NPT System shall support full transition to New Media Forms for payment of SEPTA fares (includes SEPTA Smart Media, Partner Smart Media, Contactless Credit/Debit Media, RFID Cards, Cell Phones, etc.)

~~For Phase 3, capabilities of the SEPTA-issued Smart~~SEPTA Issued Smart ~~Media shall be expanded to include pass products that may be purchased without an Autoload, as well as stored value, which may be replenished by Autoload or by an independent transaction.~~

~~21.1.5 Phase 4~~

~~In addition to the functionality identified for Phase 3, the functional changes for this Phase are as follows:~~

- ~~All NPT System elements shall accept all acceptable forms of Smart Media as defined in Section 4. This includes SEPTA-issued~~SEPTA ~~or Partner-issued Smart Media (such as compatible building access cards, key fobs, NFC devices, cell phones, etc.) and Third Party Payment Mediums (such as contactless credit/debit media, etc.)~~

~~*21.1.5.1 Phase 4 Requirements*~~

~~Prior to implementation of Phase 4, all Phase 1, through 3 elements and functions, as well as the following incremental Phase 4 NPT System elements, shall be completely designed, developed, installed, tested, and accepted by SEPTA for implementation purposes.~~

~~To permit the functions in this Phase to be deployed, the following shall be provided on the NPT System elements:~~

~~SEPTA Back-office~~

- ~~The remote centralized Customer Support Center and the Administrative Sales Devices will need the provision of additional functionalities in order to permit Customers to associate Partner-issued Linked Smart Media to a Customer account in the CDCRS.~~

~~Subway/Elevated~~

- ~~All turnstiles shall process all acceptable forms of Smart Media as defined in Section 4.~~

Surface Fleet

- All OBPs shall process all acceptable forms of Smart Media as defined in Section 4.

Regional Rail

- All FVDs, HSDs, MIDs and Faregates shall process all acceptable forms of Smart Media as defined in Section 4.

Parking

- The Parking equipment shall process all acceptable forms of Smart Media as defined in Sections 4 and 15 as fulfillment of payment for parking privileges.

21.1.5.2 Smart Media Distribution and Sales

SEPTA-issuedSEPTA Smart Media will be distributed in the same manner as described in Phases 1 through 3, but the following changes shall also be implemented:

- The Customer Service Center as well as the Administrative Sales Devices that are deployed at SEPTA-staffed locations will process requests from SEPTA Customers to link Smart Media issued by a partner of SEPTA to a Customer account established within the CDCRS.

21.2 General Installation Requirements

All equipment removal and installation work shall be performed in accordance with the SEPTA-specific requirements identified in Section 3 and Section 6. Where the requirements below are in conflict with or are less restrictive than the requirements of Sections 3, the requirements of Section 3 take precedence.

21.2.1 Installation and Interface Plan

The Contractor shall submit to SEPTA for review and approval an Installation and Interface Plan (IIP). The IIP shall indicate the method of installation and connections, the installation schedule for each station and all NPT Equipment provided under the NPT Contract, as well as ~~and the Central Computer System,~~ installation testing periods and any support requested of SEPTA to properly install the equipment[2].

The IIP will provide information on the personnel assigned to the installation, their duties, and the on-site project manager for the Contractor for this phase of the project. As a part of this plan, installation templates shall be provided for each of the items of ~~fare~~NPT Equipment ~~collection equipment~~ provided as a part of the NPT~~is~~ contract. These templates shall be submitted at the Preliminary Design Review and approved at the Final Design Review.

The IIP shall include a description of the procedures to be followed for the implementation of a new system feature, a new equipment feature, and a new type of equipment. These procedures shall be general step-by-step procedures, which can be applied to the implementation of any new item of equipment or new feature and shall incorporate the use of the Maintenance Test Station as described in the Technical Specifications.

The Contractor shall submit an IIP for SEPTA review at the Preliminary Design Review **PDR 21-1**. The Final IIP shall be submitted for SEPTA's review and approval at the Final Design Review **FDR 21-1.**

Approval of the IIP by SEPTA shall be required prior to the delivery of any NPT component to the installation site.

21.2.2 Site Access and On-Site Work

On-site work for the installation and acceptance testing of NPT System equipment will be located in and around SEPTA facilities. The Contractor shall plan and execute safe access to the work site for on-site work. Such safe access shall be afforded to construction equipment, vehicles, and personnel in accordance with Section 3 of this document.

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[2] SEPTA's "Table of NPT Hardware Deployment Locations" is appended to the Technical Specification as Appendix A.25

Installation and testing of equipment on SEPTA vehicles will be the responsibility of the Contractor and will be conducted at SEPTA facilities.

The Contractor responsible for this contract shall take into consideration the following guidelines for on-site work:

A. Avoid disruption of SEPTA service and operations.

B. Avoid restricting public rights-of-way.

The Contractor shall be responsible for protecting all utilities, SEPTA equipment and property, streets, and private property, and shall repair any damage to same at Contractor's expense.

Access dates will be subject to revision as delivery, testing and installation of the NPT equipment progresses. Therefore, the Contractor shall incorporate flexibility into its installation schedule.

21.2.2.1 Site Specific Work Plan

The NPT Contractor shall develop a Site Specific Work Plan (SSWP) for each station, depot, and every other locations where work shall be performed as part of this contract. **CDRL 21-1** The intent of the SSWP is to provide SEPTA with a detailed description and breakdown of all construction and installation requirements necessary for any given location. This SSWP will provide a detailed description of all related work efforts that are to be undertaken as part of this contract for a given location, including detailed narrative.

The SSWP shall also provide detailed demolition and construction drawings to sufficiently outline equipment removal and installation of equipment, conduit, cabling, and any other materials are part of this project. In addition, the SSWP shall address all phasing of efforts at any given location, including with sub-contractors as well as with other efforts undertaken by SEPTA.

The Contractor must also detail how repairs will be made to ~~the~~SEPTA facilities and stations in the event that damages result from equipment removal, construction, or installation. This information includes the types of products (material, manufacturer, grade, color) and methods that are to be use to match the surrounding existing conditions. This information shall be provided in the SSWP.

The SSWP shall also provide a description of work and a breakdown of labor force that outlines labor, equipment, and responsibilities of each ~~impacting~~ party, including SEPTA Force Account labor.~~—~~ As part of this, the Contractor shall provide a time scaled hourly logic network that provides an hour by hour breakdown of the contractor's and others related activity.

The SSWP shall, as necessary, also include:

- Requirements for a Contractor's watchperson;
- Required SEPTA flagging and support;
- All related construction methods;
- Arrangements for emergency clearing and restoration of service;
- Sketches for defining the configuration other operational elements at completion of work.

In addition, ~~it~~in order to ~~may be necessary to~~ install ~~the~~NPT Equipment ~~system~~, the Contractor may need to foul a section of track or require a complete service outage. As noted in Section 3, the SSWP shall address all requirements for outage, including time and duration. While the SSWP must address any potential fouling or outages that will occur, it does not supersede or replace the need for an Outage or Fouling Request (as ~~submitted~~required by ~~in~~ Section 3).

The Contractor shall submit an outline of all SSWPs for SEPTA review at the Preliminary Design Review **PDR 21-2**. Final SSWPs, shall be submitted for SEPTA's review and approval at the Final Design Review **FDR 21-2.**

An SSWP for a given location must be submitted no less than 60 days prior to the commencement of work. No work may begin at a location until the related SSWP has been submitted by the Contractor and approved by SEPTA.

~~21.2.1~~21.2.3 Existing Equipment Removal

The Contractor shall supply all of the labor, supervision and materials required for the proper and complete removal of the existing fare collection equipment that the equipment to be furnished under this contract will ~~be~~ replac~~e~~ing~~.~~ Such removal shall be accomplished without damage to the removed equipment, the vehicle, or facility from which it was removed, or any equipment remaining on the vehicle or at the facility.

The Contractor shall be responsible for ensuring that the site from which equipment was removed is left in a safe condition and all hazards have been removed, which shall include at a minimum flush filling of any holes and removal of any exposed conduit stub-ups and wiring.

In addition, the Contractor shall be responsible to repair any damage or unsightly conditions that result from equipment being removed. As part of this, any repair or replacement work must match existing finishes and conditions. This shall be accomplished through the use of commonly utilized products and procedures and shall be subject to SEPTA's review and approval.

The Contractor should describe how this will be done in the SSWP.

~~21.2.2~~21.2.4 Removed Equipment Storage

The Contractor shall place the removed ~~existing~~ SEPTA fare collection equipment at a Contractor-provided local storage location for ~~subsequent transport~~review by ~~by~~ SEPTA.

After the implementation for the Phase has been accepted, SEPTA shall be provided the opportunity to review the removed equipment, identify equipment, modules and other components it wishes to retain and remove those components from the storage location.

After SEPTA has completed this review and removal, all remaining materials at the storage location shall become the property of the Contractor ~~….For bus depot based equipment, the Contractor will be directed by SEPTA to place the removed equipment in a temporary storage location at that facility. Removed equipment shall remain the property of SEPTA. Transport of removed equipment from the temporary local storage location will be the responsibility of SEPTA.~~

~~21.2.3~~21.2.5 New Equipment Installation

The Contractor shall supply all labor, supervision, and materials required for installation of all new NPT equipment. Installation of the new equipment shall include fastening and anchoring the equipment, and the installation of a NPT communications cabinet at stations with an existing communications closet. SEPTA shall provide power in the vicinity of the communications cabinet. Following NTP, the Contractor shall document all power requirements for the NPT communications cabinet, and shall provide detailed justification for any power requirements in excess of one (1), 110Vac, 60 Hz, single phase, 15A, circuit. **CDRL 21-2** ~~**CDRL 21-1**~~

Additionally, SEPTA ~~shall~~ will provide power ~~to~~ in the general proximity of all NPT Field Devices that will be~~as~~ deployed by the Contractor. The Contractor shall again document all power requirements for the field devices following NTP. **CDRL 21-3** ~~**CDRL 21-2**~~

~~21.2.4~~21.2.6 Station Equipment Installation

Station equipment mounting shall be in a secure, robust, and vandal- and burglar-proof manner. Cabinet mountings within the station shall be by means of four (as a minimum) stainless steel, 0.5-inch diameter anchor bolts, to be provided by the Contractor, which shall be embedded in the concrete platform by the Contractor according to the bolt manufacturer's instructions. Power and Communications connectivity will vary among the stations of the various modes of transportation. SEPTA shall provide power ~~to~~ in the proximity of the NPT equipment and field devices in accordance with the ~~above,~~ Section 21.2.5~~3~~.

No equipment may be installed within passenger shelters or waiting rooms.

The Contractor shall adhere to the following guidelines to establish ~~communication~~ connectivity for power and communications:

~~21.2.4.1~~21.2.6.1 Subway/Elevated

From the NPT communications cabinet, the Contractor shall establish a LAN at each station. As part of the station LAN, the Contractor shall not install any additional network hardware at any station booth or secondary cabinet. Should the Contractor need additional network hardware, including modems and/or hubs, this hardware shall be installed within the Turnstiles and FVDs. This hardware shall be installed only in the Turnstile nearest the A-Booth, and only in one FVD per logical grouping. NPT devices containing network equipment shall be designated as Primary or "A" equipment. All other devices shall be designated as Secondary or "B" equipment. ~~*Conduit cannot be located in ramped floors, but must be embedded in the floor in concrete.*~~

~~Documents and drawings detailing design and installation of equipment at each Subway/Elevated Station shall be submitted for SEPTA review at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 21-1, PDR 21-3**~~At each Subway/Elevated Station, the Contractor shall obtain power at an electrical demarcation point, within each station. The Contractor shall be responsible for the distribution of the power from the electrical demarcation point to all NPT equipment deployed at a station.

All conduit that is to be installed must be suspended from ceilings or walls, or embedded within concrete floors. Exposed conduit on floors is prohibited.

Documents and drawings detailing design and installation of equipment at each Subway/Elevated Station shall be submitted for SEPTA review at the Conceptual Design Review and for approval at the Preliminary Design Review. **CDR 21-1, PDR 21-3**

To support the Vendor in the development of the Equipment Installation Plan Appendix F to the Technical Specification contains complete sets of Subway/Elevated Station drawings, and existing and updated Fare Line drawings. Appendices F.1 "Subway-Elevated Drawing Summary" and F.2 "Subway-Elevated Updated Drawing List (100 percent Submittal)" provide guides to the types of drawings contained within the Subway-Elevated System Appendices.

For the Broad Street Line, Appendix F.3 "Broad Street Line" provides Station Drawings, Address Listings, Existing Fare Line Drawings, and Updated Fareline Drawings. Appendix F.4 "Market-Frankford Subway-Elevated" provides Station Drawings, Address Listings, Existing Fare Line Drawings, and Updated Fare line. The Updated Fareline Drawings for the BSL and MFSE illustrate SEPTA's intended renovations to the stations and proposed relocation of farelines at stations. Appendix F.5 "Pilot Smart Stations" provides the conceptual Station and Fareline location Drawings for SEPTA's Smart Station pilot. Appendix G.1 "Subway-Surface Station Drawings" provides all existing Station and fareline drawings for the Subway-Surface Trolleys.

~~21.2.4.2~~21.2.6.2 Regional Rail

~~RRD Routes with Fiber Optics Cabling~~

~~At these locations, the Contractor shall not anticipate any space within the communications closet or building that may be utilized by NTP. The Contractor shall anticipate that for a given station, the supporting communications cabinet or building may be in excess of 300 feet away from the actual station structure.~~

~~RRD Routes without Fiber Optics Cabling~~

~~The Contractor shall establish a LAN to support NPT and shall be responsible for obtaining leased lines to all of these stations. As part of the station LAN, the Contractor shall not install any additional network hardware at any station building or secondary cabinet. Should the Contractor need additional network hardware, including modems and/or hubs, this hardware shall be installed within the FVDs or other NPT devices. For FVDs, network hardware shall be installed in one device per logical grouping. NPT devices containing network equipment shall be designated as Primary or "A" equipment. All other devices shall be designated as Secondary or "B" equipment.~~

Center City RRD Stations

As part of the station LAN, the Contractor shall not install any additional network hardware at any station booth or secondary cabinet. Should the Contractor need additional network hardware, including modems and/or hubs, this hardware shall be installed within the ~~Faregates~~ Railroad Turnstiles and FVDs. NPT devices containing network equipment shall be designated as Primary or "A" equipment. All other devices shall be designated as Secondary or "B" equipment.

Separate electrical and communications wiring and cabling shall enter the NPT equipment, from underneath the base or from the rear of the unit as necessary to suit installation needs and as approved by SEPTA. The equipment shall be installed over any necessary junction boxes such that no wiring or cabling is exposed outside the cabinet or base.

The NPT System equipment cabinets shall have an integral base with suitable means for leveling the machines upon installation to accommodate floor slopes of maximum 3%. Access to the anchor bolts shall be through the hinged service front door or other access panels, subject to SEPTA approval, in a manner, which shall prevent unauthorized access.

The NPT System equipment shall be fully supported by their anchors, where possible and shall have integral adjustable features for the floor mounting, in order to allow the above-defined maximum floor slope.

NPT System equipment shall be aligned, positioned, and installed in accordance with requirements identified in the station drawings (see Appendix E.5 “RRD Station Drawings.” SEPTA will provide such requirements not later than 120 days prior to the first delivered item of equipment.

At the Center Cirty RRD stations, SEPTA shall supply power within the vicinity of each turnstile array and logical grouping of FVDs. The Contractor shall obtain power at these designated The Contractor shall be responsible for obtaining power at these locations and distributing it to all NPT equipment deployed at each station.

All conduit that is to be installed must be suspended from ceilings or walls, or embedded within concrete floors. Exposed conduit on floors is prohibited.

~~Installation design~~Documents and drawings detailing design and installation of equipment at Center City RRD stations shall be submitted for SEPTA review at the Conceptual Design Review and for approval at the Preliminary Design Review. Appended to the Technical Specification are Appendices E.10 "RRD Conceptual Design Report" and E.12 “RRD Center City Station Fare Lines” to support the Vendor in the development of the Equipment Installation Plan for the Center City RRD stations. **CDR 21-2, PDR 21-4**

All special tools required for the installation or removal of the NPT System equipment shall be provided to SEPTA as a part of the first equipment delivery.

Other Regional Rail Stations

For Regional Rail Stations where MIDs and/or FVDs are to be deployed, the Contractor shall establish a Wireless LAN. This wireless LAN shall provide communications to the MIDs and shall be responsible for wireless broadband communications to these stations.

As part of the wireless LAN, the Contractor shall not install any additional network hardware at any station building or secondary cabinet. Should the Contractor need additional network hardware, including modems and/or hubs, this hardware shall be installed within the FVDs or other NPT devices. For FVDs, network hardware shall be installed in one device per logical grouping. NPT devices containing network equipment shall be designated as Primary or "A" equipment. All other devices shall be designated as Secondary or "B" equipment.

~~Electrical power – reinsert de-mark language~~ At the Regional Rail Stations where MIDs and/or FVDs are to be deployed, the Contractor shall obtain power at an electrical demarcation point, located at or near each station. The Contractor shall be responsible for the distribution of the power from the electrical demarcation point to all NPT equipment deployed at a station.

All conduit that is to be installed must be suspended from ceilings or walls, or embedded within concrete floors. Exposed conduit on floors is prohibited.

To support the Vendor in the development of the Equipment Installation Plan for the Regional Rail Division, Appendices E.3 "RRD Station Addresses," E.4 "RRD Station Aerial Photos," E.5 "RRD Station Drawings" and E.6 "RRD Station Pictures" are appended to the Technical Specification. Appendix E.7 "RRD Characteristic Station Drawings" provides station drawings in accordance with SEPTA's RRD Characteristic Stations identified in Appendices E.8 "RRD Characteristic Stations Memo" and E.9 "RRD Station Characteristics (Updated)."

~~21.2.5~~21.2.7 ~~Surface System~~Depot and Barn Equipment Installation

At each Bus Depot and Trolley Barn, the Contractor shall install a NPT communications cabinet, which shall be connected with the leased line service and shall serve as the central point from which a LAN shall be established. As part of the LAN, the Contractor shall not install any additional network hardware, such as hubs and/or modems, except wireless access points, outside of the NPT communications cabinet.

To support the Vendor in the development of the Equipment Installation Plan for the Depots and Barns, Appendices B.1 “Facility Aerial Photos,” B.2 “Facility Drawings” and B.3 “Garages, Depots, and Field Office Addresses” are appended to the Technical Specification.

21.2.8 Surface System Equipment Installation

The Contractor is required to provide all labor, supervision as well as materials necessary for the proper installation of the On-Board Processor (OBD) equipment in SEPTA vehicles.

The OBP equipment will be positioned for maximum ease of passenger movement and vehicle operator operation. The installed position will allow for complete, unrestricted opening of all access door(s). The Contractor shall be responsible for modification to and repositioning of handrails and movement and reinstallation of other equipment, which may interfere with these access doors. The position of the equipment when mounted in the vehicle shall allow for clear view by the operator from a normal, upright driving position of the coin and bill insertion areas and the OCD.

The Contractor shall supply and install all the necessary wiring, protective devices, and mounting hardware necessary for the proper installation and operation of the equipment. All new undercarriage wiring will be suitably protected against the road elements and fastened in a manner so as not to interfere with normal vehicle operation and/or maintenance. No "butt connectors" shall be utilized under the vehicle.

To support the Vendor in the development of the Equipment Installation Plan for the Surface System, the SEPTA Surface Stations Media-Sharon Hill (MSH) and Norristown High Speed Line (NHSL) listings are appended to the Technical Specification as Appendices C.1 and D.1.

~~21.2.6~~21.2.9 CDCRS Installation

The CDCRS shall be installed in a location to be identified by SEPTA within 120 days of NTP. Power source of 110 VAC, 60 Hz will be available within 10 feet of the Server. Environmental control will be supplied by SEPTA.

The Contractor shall furnish and mount equipment onto which hardware shall be installed.

The Contractor shall furnish all interfaces required for communication with all other NPT System equipment and test the operation of the CDCRS once installed.

~~21.2.7~~21.2.10 Simulator Lab Installation

The Simulator Lab shall be installed in a location to be identified by SEPTA within 120 days of NTP. SEPTA will provide power at a central location within the designated area. The Contractor will be required to document all power requirements for the Simulator Lab devices within 45 days of NTP **CDRL 21-4**~~**CDRL 21-3**~~. SEPTA will provide environmental control at the designated location. As part of **CDRL 21-5**~~**CDRL 21-3**~~, the Contractor will be required to document the environment operating requirements for the Simulator Lab**.**

The Contractor shall furnish and mount all equipment onto which hardware shall be installed.

~~On-site work for the installation and acceptance testing of NPT System equipment will be located in and around SEPTA facilities. The Contractor shall plan and execute safe access to the work site for on-site work. Such safe access shall be afforded to construction equipment, vehicles, and personnel in accordance with Section 3 of this document.~~

~~Installation and testing of equipment on SEPTA vehicles will be the responsibility of the Contractor and will be conducted at SEPTA facilities.~~

~~The Contractor responsible for this contract shall take into consideration the following guidelines for on-site work:~~

~~A. Avoid disruption of SEPTA service and operations.~~

~~B. Avoid restricting public rights-of-way.~~

~~The Contractor shall be responsible for protecting all utilities, SEPTA equipment and property, streets, and private property, and shall repair any damage to same at Contractor's expense.~~

~~Access dates will be subject to revision as delivery, testing and installation of the NPT equipment progresses. Therefore, the Contractor shall incorporate flexibility into its installation schedule.~~

~~21.2.8~~21.2.11 Systems Integration

The Contractor shall work with SEPTA's Project Manager to coordinate with any system contractors of other interfacing systems, in order to facilitate the specified system interface.

21.3 NPT Test Program

The objective of the NPT Test Program is to ensure that all hardware, software, interfaces, supporting equipment, Smart Media, and other system elements furnished under this Contract meet all specified requirements within this document. Testing shall be conducted by the Contractor who shall maintain responsibility for satisfactory completion of the testing and system implementation.

SEPTA and/or its designated representatives will witness any and all tests, as determined by SEPTA.

SEPTA and/or its representatives may at any time during the duration of this contract perform additional testing, as determined by SEPTA. These possible actions shall not be included in any schedule assumptions made by the Contractor. The Contractor shall be responsible for preparation of all testing materials prior to conducting any tests, and preparing test reports providing the results of the testing, as defined in Section 21.2.9~~21.2.6~~.

21.3.1 Test Methodology

The Contractor shall plan, perform, monitor, and document all tests described herein. These tests are designed to document, verify, and prove that the requirements for NPT System, including all elements, subsystems, and the system as a whole, perform as specified. No testing by the Contractor or any Party or Agent acting on behalf of the Contractor shall commence until all design documentation affecting the respective equipment and relevant to the stage of the design has been reviewed and approved by SEPTA, and SEPTA has reviewed and accepted all related testing procedures and documents as defined in this Section 21.

Testing and verification of the operation and functionality of the NPT System shall commence after the final design of the system has been agreed and documented based on the Final Design Review meetings.

21.3.2 Test Program Plan

The Contractor shall develop and submit a comprehensive test program plan for SEPTA's review and approval. As part of this plan, the Contractor shall prepare applicable procedures, which shall govern the conduct of activity, surveillance, direction, and methods of observing and recording the pertinent data including handling of failures of equipment and inaccuracies of reports. The following elements at a minimum shall be included in the Test Plan for each of the tests required:

A. Tests to be performed up to final system acceptance;

B. Sequence of tests and, for each test, test prerequisites;

C. Identification of the Contractor's personnel to be involved in each test and a summary of their qualifications and duties;

D. Identification of the support, calibration instrumentation, test equipment and tools to be used for each test;

E. Technical publications and standards referenced;

F. Spares and consumables available for utilization during the testing;

G. Location of each test;

H. Staffing levels for maintenance and other personnel available during the testing, including a schedule;

I. Specific data to be collected during the test;

J. Test report format, including the method for reporting and summarizing the test results;

K. Method and format of record keeping for the failures identified during the testing; and

L. Corrective action procedures to be followed when failures and inaccuracies occur.

This test program plan shall be submitted to SEPTA at the Preliminary Design Review and must be approved by SEPTA prior to submittal of any test procedures specified within this Section. **CDRL 21-6** ~~CDRL 21-34~~

21.3.3 Test Procedures

The test procedures shall be provided separately for all tests and their component tests and shall include, as a minimum, the following:

A. Objectives of test, referencing the technical requirements that are being tested;

B. Test environmental conditions;

C. Detailed descriptions of test specimens including drawings, part numbers, inspection and test records, maintenance records and calibration records;

D. Detailed procedures of each test and test element;

E. Personnel (Contractor and SEPTA) required for performing the test, and their duties;

F. Test equipment to be used. Include any measuring equipment and/or any equipment aiding in the performance of the tests;

G. The level and schedule of preventive maintenance to be permitted during the test;

H. Pass/Fail criteria;

I. Procedure for Test Failure Resolution;

J. Test data sheet format;

K. A breakdown of the day-to-day schedule for performing the test;

L. A layout of the testing facilities to be used;

M. Test Reports

N. Summary of testing activities;

O. Test results.

The test procedures shall be provided to SEPTA 45 days prior to the scheduled date for each test to ensure that SEPTA will be able to review and approve the test procedures fifteen (15) days in advance of the test. Where required by SEPTA, the Contractor shall update test procedures and resubmit them to SEPTA prior to test commencement. **CDRL 21-7** ~~**CDRL 21-45**~~

21.3.3.1 Test Failure Resolution

The procedures to be followed for the resolution of test problems, failures, inaccuracies, and general test conduct ground rules of failure resolution shall be defined, and included in each of the test procedures. This information will be approved by SEPTA prior to commencement of the associated test identified within this Section. **CDRL 21-8~~CDRL 21-56~~**

21.3.3.2 Test Waiver Requests

At SEPTA's sole discretion, portions of the tests may be waived upon written request from the Contractor based on the waiver providing sufficient supporting information to demonstrate that:

A. The equipment has previously passed similar tests;

B. The equipment in the test documentation provides all the same functions as SEPTA system;

C. The operating environment is substantially similar to SEPTA environment;

D. Test documentation provided is from a certified testing lab (UL or European equivalent);

E. Tests performed are identical or functionally equivalent to the required SEPTA test for which the waiver is requested; and

F. The cost savings, which will be realized by SEPTA if the waiver is granted.

The Contractor shall identify those tests for which waivers may be requested at the Conceptual Design Review, including all information as identified above to support the requested waiver and the time by which the waiver is to be provided to the Contractor so as not to impact implementation. Waivers not identified at the CDR may not be requested at a later date unless they apply to new requirements. Waived tests will not constitute a change to the contract or system functionality. **CDRL 21-9~~CDRL 21-67~~**

21.3.4 Test Results Reports

Test reports, as identified in Section 21.3.3, shall be prepared in accordance with the test procedure and signed by all responsible witnessing parties. The test reports shall be submitted to SEPTA for approval of test completion within one week of completion of associated testing. SEPTA shall either accept or reject the test report, with reasons, within 21 days after receipt of test results. If SEPTA decides not to witness, or to not have a representative witness a test or tests, test reports shall nevertheless be submitted to SEPTA for approval.

Inspection reports, test certifications, and test reports shall be signed and certified by the Contractor's authorized Quality Assurance/Quality Control representative. The QA/QC representative shall submit daily inspection reports identifying participating personnel; equipment, material tests, results, and defects. Such reports shall be signed and certified by the Contractor's authorized QA/QC representative.

21.4 Component and System Level Testing

The Contractor shall subject all components of the NPT System – and the fully integrated system – to a rigorous testing regimen. The Contractor shall plan for, perform, monitor, and document all tests required to prove the design and acceptability of the NPT System, including all elements, subsystems, and the system as a whole, as well as the level of functionality required for each Phase of deployment. The Contractor shall furnish NPT equipment that meets the criteria specified for all tests. Testing shall not commence until all designs affecting the respective equipment and all related testing procedures have been approved by SEPTA.

Testing shall be conducted to coincide with the major implementation Phases of the project. Work on any succeeding Phase of the project without satisfactory completion of testing in a prior Phase shall be at the Contractor's risk.

21.5 Testing Phases

As the NPT System shall be implemented in several phases to suit the functional requirements of SEPTA, the functionality and equipment for the NPT System shall be tested to:

- verify that the hardware meets all environmental requirements (initially and when modifications are made to accommodate additional functionality);
- verify that the system performs as defined by SEPTA;
- verify that the CDCRS and all of its applications performs as required by SEPTA in these Technical Specifications; and
- ensure that there is no performance degradation when additional functions are implemented (rigorous regression testing shall be provided).

The timing for each of the testing elements is identified in Table 21-1.

Table 21-1 – Testing Requirements

	Phase	
Test Element	**Initial**	**Subsequent**
Network Operation Testing	Y	Y -
First Article Testing		
Functional Test	Y	Y
Cycling Test	Y	N
Environmental Tests	Y	Y - when Hardware added, deleted or modified
Maintainability Test	Y	Y - when Hardware added
Smart Media Compatibility Test	Y	Y
CDCRS Qualification Tests		
Report Generation Test	Y	Y
Station Data Exchange Tests	Y	Y
OBPMS Data Exchange Tests	Y	Y - when OBP Hardware added
Retail Sales Network Data Exchange Tests	Y	Y - when ~~RSD or~~ ASD changed
Security and Alarm Monitor Application Confirmation Tests	Y	Y
Workstation Activities Tests	Y	N
System Administration and Maintenance Tests	Y	Y - when Hardware added
System Interface Tests	Y	Y- partial
Application Verification Test	Y	Y
Factory Integration Test	Y	Y- partial
Production Testing	Y	N
Pre-Shipment Inspection	As desired by SEPTA	As desired by SEPTA
Pilot Test	Y	Y
Garage/Depot Test	Y	N
Installation Test	Y	N
Systems Integration Test	Y	Y
Bank Issued Media System Certification	Y	Y - when Credit Card/ Debit Card system changed
RMAT	Y	Y- partial

For tests performed subsequent to the initial tests (those performed in later phases), in addition to the new functionality provided, at least 10% of the previous functions tested shall be retested to ensure that the modifications to the system had no impact to system operation, function or performance. SEPTA shall approve all regression testing items.

21.6 Network Operation Testing

The CDCRS, network, and communication system, shall be fully installed and tested prior to the implementation of any NPT System field equipment. This testing shall be performed for all portions of the communications network, wired as well as wireless.

Once the CDCRS, network and communication systems have been each been installed as required for the initial implementation phase, in preparation for the NPT field equipment delivery, its connectivity shall be tested and verified by the Contractor.

In addition, this test shall also verify that the CDCRS, network and communication systems can fully support and operate as specified for each phase of the program at a capacity level representing 99% of the anticipated transaction load for that phase, based on the quantity and type of NPT equipment installed for that phase. The capacity verified shall be as identified in Section 2.3.15.4.

The Contractor's plan for this test shall be provided for SEPTA approval at the Final Design Review. This test plan shall identify all aspects of the testing to be performed as well as the test equipment and procedures to be used. **FDR 21-3**

This test shall be performed to demonstrate that the all network systems (wired or wireless) and all related sub-systems have been properly configured and optimized; and that they will operate fully and properly without a major system failure. This test shall be performed after all the inspections, checks and tests defined earlier in this section have been accepted.

As part of this, network connectivity and data communication shall be verified from each point within the NPT System where field equipment shall be installed and connected. This shall include the verification that all connection points have sufficient bandwidth to support the needs of the NPT System. Continuity shall be verified from each equipment connection point through to the CDCRS, through its external interfaces and back to the CDCRS.

The results of this test shall be reported to SEPTA in a report, which includes graphical illustration of results. This shall include maps of SEPTA service region, outlining connections, availability of communications, reliability, and available bandwidth. The map shall be divided as necessary to ensure that it presents geographical areas in sufficient size to allow for adequate dissemination of the data presented.

All instances of performance, which do not meet the specified requirements, shall be identified by the Contractor, and included in the test report. The test report shall also include a plan for resolution of these issues. The test report shall be provided not more than twenty-one (21) days after completion of the network testing.

Corrections required as a result of the testing and verification shall be performed by the Contractor prior to delivery of any additional NPT System field equipment.

21.7 First Article Test (FAT)

The purpose of this test shall be to demonstrate that the system furnished and installed provides all functions, features and requirements as specified are met. For the FAT, one of each type of equipment and fully functional CDCRS software and hardware shall be tested to ensure that all the features, functions and requirements are provided. The FAT shall be performed at the Contractor's facility in North America. Successful completion of this test shall serve as the prerequisite beginning production of system equipment. The FAT shall be considered successfully completed when all functionality has been verified, without exception.

At this level of testing, the equipment tested shall be equal to the final production devices.

This series of tests shall include:

A. Functional Test **CDRL 21-10** ~~**CDRL 21-78**~~

B. Environmental Tests **CDRL 21-11** ~~**CDRL 21-89**~~

1. Vibration Test **CDRL 21-12** ~~**CDRL 21-910**~~
2. Shock Test **CDRL 21-13** ~~**CDRL 21-1011**~~

3. Electromagnetic Effects Test CDRL 21-14~~CDRL 21-1112~~

4. Radiation and Electromagnetic Interference Test

CDRL 21-15~~CDRL 21-1213~~

5. Temperature/Humidity/Voltage CDRL 21-16~~CDRL 21-1314~~

6. Water Intrusion CDRL 21-17~~CDRL 21-1415~~

7. Dust Test CDRL 21-18~~CDRL 21-1516~~

C. Maintainability Test CDRL 21-19~~CDRL 21-1617~~

D. Interface Test CDRL 21-20~~CDRL 21-1718~~

E. Cycling Test CDRL 21-21~~CDRL 21-1819~~

F. Application Verification Test CDRL 21-22~~CDRL 21-1920~~

G. Network Interface Test CDRL 21-23~~CDRL 21-2021~~

21.7.1 Functional Tests

The Contractor shall provide functional test procedures that satisfactorily demonstrate all equipment functions to SEPTA.

The purpose of this test shall be to demonstrate correct operation for each type of equipment including all of the functions specified throughout this document, and all limiting conditions. An item of each type of equipment shall be required to successfully execute all hardware and software functions as defined and identified in the specifications, and any further definitions or clarifications made during the ensuing design process.

All performance level criteria requirements shall be tested and verified during these tests. The procedures for handling maintenance (trouble shooting, and correcting faults) and service functions (extracting data) shall also be successfully demonstrated, ensuring adherence to contractual requirements and shall be included in the test procedures identified above.

Each unit of equipment shall have passed the functional test before the environmental tests listed below are started.

21.7.2 Environmental Tests

The testing to be performed shall be as identified in the following subsections. The Contractor may suggest alternative testing protocols, standards and procedures for any or all of the defined environmental tests, but no waiver, exclusion, or modification shall be deemed granted by the Contractor in the design of the system or any of its components. Should a waiver not be granted or substitution not be permitted, the system shall meet all of the environmental requirements defined herein without change or modification to these technical requirements or associated other requirements.

All equipment software for the environmental test shall be identical to that which was exercised during previous tests.

~~All equipment shall be subjected to the following environmental test. The equipment shall be allowed to stabilize for a period of two (2) hours at each given environmental condition setting. Thereafter, the number of transactions to be processed shall be as indicated in Table 21-2 and the equipment cycled as per procedures established for Cycling Tests.~~

~~Table 21-2 – Environmental Test Conditions~~

~~Run No.~~	~~Exterior Temperature~~	~~Exterior RH(%)~~	~~Solar Loading~~	~~Input Voltage~~	~~# Transactions~~
~~1~~	~~Minimum per Table 2~~	~~20-40~~		~~125~~	~~250~~
~~2~~	~~Maximum per Table 2~~	~~50~~	~~Maximum per Section 2~~	~~125~~	~~250~~
~~3~~	~~80° F~~	~~95~~		~~Maximum per Section 2~~	~~250~~
~~4~~	~~80° F~~	~~95~~		~~Maximum per Section 2~~	~~250~~
~~5~~	~~32° F~~	~~80~~		~~125~~	~~250~~

~~Successful completion of this phase of the Environmental Test requires no more than one relevant failure as defined previously.~~

~~In addition, a water ingress test shall be conducted, simulating worst-case rain and wind conditions as specified in Section 2. Wind-driven rain (which may be simulated with water sprayed from a hose) shall be applied to all four faces of the all equipment for 15 minutes per side. After each 15-minute period, the equipment interior shall be inspected for water ingress. Any water inside the equipment shall be minimal and shall not result in hazardous conditions or potential component failure.~~

21.7.2.1 Vibration

The Contractor shall ensure that equipment proposed is both resilient and protected from vibration conditions expected in their intended environments.

Fixed Location Equipment

The purpose for this test is to ensure that the equipment can withstand the vibrations common to the installation environment, including proximity to both slow and fast moving passenger and freight trains. The testing for these various types of equipment shall include verification that the equipment operates properly at the completion of each of the testing cycles without modification or adjustment. Requirements for vibration testing shall conform to the following:

A. IAW EEIG 97s0665-, ERTMS/ETCS Environmental Requirements; Operational requirements per para.2.8.2.2, Track (lineside) and track side equipment, Fig 6; Test requirements per para 2.8.4.5 Vibration: 0.23g rms, frequency range 0 to 200Hz

Mobile Equipment

The Contractor shall ensure that equipment proposed is both resilient and protected from vibration conditions expected in their intended environments. The testing for these various types of equipment items shall follow requirements as defined in the specific standard tests, including verification that the equipment shall operates properly at the completion of each of the testing cycles below without modification or adjustment: The Contractor shall ensure that all equipment proposed shall be tested per MIL STD 810F, Method 516.5, Section 4.5.2.3, Procedure 1, with the following changes:

A. Continuous vibration at a frequency range between 0 and 6 Hz and at an acceleration level up to .01g.

B. Intermittent shocks of up to 0.1g, not exceeding 20-millisecond duration, half sine wave, and repeated at intervals of 0.5 to 2.0 seconds. These intermittent shocks shall be repeated not less than twenty-five (25) times.

C. Vibration: sweeps over a frequency range of 5 Hz to 150 Hz to 5 Hz at 1.5g acceleration. Each sweep shall occur over a 12-minute interval and shall be repeated five times. This shall be performed on all three axes and the cycling time shall be for one hour on each of the three axes.0.3g (rms), 5 to 200 Hz, Shock: 4g peak (instantaneous).

21.7.2.2 Shock

The purpose for this test is to ensure that the equipment can withstand the intermittent shocks common to the installation environment including proximity to both slow and fast moving passenger and freight trains, passenger abuse on the platform and attempts at intrusion and vandalism. Requirements for shock testing shall conform to ~~one of~~ the following:

A. The Contractor shall ensure that all equipment proposed shall be tested per MIL STD 810F, Method 516.5, Section 4.5.2.3, Procedure 1, with the following changes:

1. The half sine shock pulse shall have a peak value (A) of 5g and a duration (D) of 20 milliseconds.

2. The equipment shall operate normally after the shock tests and shall not have experienced broken or loosened components as a consequence of these tests.

and

~~Or~~

~~B. IAW EEIG 97s0665, ERTMS/ETCS Environmental Requirements; Operational requirements per para.2.8.2.2, Track (lineside) and track side equipment; Test requirements per para 2.8.4.2 IEC 68.2.27-Shock, test Ea, Test 1, The half sine shock pulse shall have a peak value (A) of 2g and a duration (D) of 11 milliseconds. This is executed with all the internal components; and~~

~~C.~~B. UL50 integrity against deflection. A drawn, embossed, flanged, or similarly strengthened door or cover made of metal having the thickness specified when a vertical force of 100 pounds (445 N) is applied at any point on the door or cover. The force is to be applied through a rod having a 1/2-inch (12.7 mm) square, flat steel face. For the test, the enclosure is to rest on its back on a smooth, solid, horizontal surface with the door closed and the cover secured as intended. If more than one test is necessary, separate samples are to be used for additional tests. This is to be tested on the top and all sides of the devices. There shall be no deflect inward more than 1/4 inch (6.4 mm)

21.7.2.3 Electromagnetic Effects

The Contractor shall ensure that all equipment proposed shall be tested for electromagnetic interference as per the following:

A. Susceptibility to Radiated Electromagnetic Energy - The equipment shall be tested for susceptibility to radiated electromagnetic energy per the requirements of MIL-STD-461E for radiated emissions, electric field. The equipment shall not sustain any permanent damage as a result of the exposure to these electromagnetic fields nor shall it lose its data in RAM storage. Loss of data relative to a transaction during the exposure is undesirable.

B. Susceptibility to Conducted Electromagnetic Energy - The equipment shall be tested for susceptibility to conducted electromagnetic energy per the procedures of MIL-STD-461E, Requirement CS116, utilizing the 400 volt, 5 microsecond pulse of both positive and negative polarity. The equipment shall not sustain any permanent damage as a result of application of the pulse energy nor shall it lose its data in RAM storage.

C. Radiation of Electromagnetic Interference – The Contractor shall be responsible for compliance with applicable Federal Communication Commission regulations (i.e., FCC Rules, Part 15, Subpart J) concerning conducted and radiated radio frequency energy and shall provide certification or test results verifying compliance.

Or

D. The following criteria shall also be considered for verification of testing as identified within this Section. The Contractor shall identify to which of these requirements their equipment shall conform and SEPTA shall approve the voltages, timings and other pertinent testing criteria:

1. IEC 1000-4-6 (= EN 61000-4-6) pertaining to conducted susceptibility
2. IEC 61000-4-3 (= EN 61000-4-3) pertaining to radiated susceptibility
3. IEC 61000-4-2 (= EN 61000-4-2) pertaining to electrostatic discharge

Or

E. The following criteria shall also be considered for verification of testing as identified within this Section.

1. FCC Part 15, Subpart B Class A (Conducted emissions), pertaining to conducted susceptibility.
2. FCC Part 15, Subpart B Class A (Radiated emissions), pertaining to radiated susceptibility.
3. SAE J-1113-13 pertaining to electrostatic discharge.

21.7.2.4 Temperature/Humidity

The temperature and humidity requirements for these tests are as identified in Table 21-2 below. Each of these tests are to be performed on each type of ~~field~~ NPT equipment, excluding those types which operate in an internal environment. This ~~, including~~ shall include FVDs~~fare vending machines~~, Railroad turnstiles, Subway/Elevated turnstiles, ~~and~~ ADA fare gates, ~~station fare card reader/encoders~~MIDs, handheld sales devices, OBPs, parking system equipment, portable equipment and data communications system equipment.

Once the specified temperature and humidity levels have been reached in the test chamber for a particular test, the NPT equipment undergoing testing shall be placed in the chamber and allowed to stabilize for a minimum of two hours prior to test commencement. The number of test cycles to be performed during each test and for each type of equipment shall be identified by the Contractor in the test plan and procedures, and subject to approval by SEPTA prior to test commencement.

~~Table 21-3 – Temperature/Humidity Test Cycles~~

~~Test No.~~	~~Temp (ºF)~~	~~Humidity~~
~~1~~	~~5~~	~~As low as possible~~
~~2~~	~~120~~	~~97%~~
~~3~~	~~85~~	~~75%~~
~~4~~	~~32~~	~~95%~~
~~5~~	~~95~~	~~As low as possible~~
~~6~~	~~95~~	~~99%~~

All equipment shall be subjected to the following environmental test. The equipment shall be allowed to stabilize for a period of two (2) hours at each given environmental condition setting. Thereafter, the number of transactions to be processed shall be as indicated in and the equipment cycled as per procedures established for Cycling Tests.

~~Table 21- Environmental Test Conditions~~

Table 21-2 – Environmental Test Conditions

Run No.	Exterior Temperature	Exterior RH(%)	Solar Loading	Input Voltage	# Transactions
1	Minimum per Table 2	20-40		nominal +5%	250
2	Maximum per Table 2	50	Maximum per Section 2	nominal power	250
3	80° F	95		Maximum per Section 2	250
4	80° F	95		Maximum per Section 2	250
5	32° F	80		nominal -5%	250

Successful completion of this phase of the Environmental Test requires no more than one relevant failure as defined previously.

21.7.2.5 Water Intrusion

All equipment installed in a station environment shall be subjected to and successfully pass UL 50 3R Water Ingress testing.

In addition, a water ingress test shall be conducted, simulating worst-case rain and wind conditions as specified in Section 2. Wind-driven rain (which may be simulated with water sprayed from a hose) shall be applied to all four faces of the all equipment for 15 minutes per side. After each 15-minute period, the equipment interior shall be inspected for water ingress. Any water inside the equipment shall be minimal and shall not result in hazardous conditions or potential component failure.

21.7.2.6 Dust Test

All NPT equipment, including indoor equipment such as the ASD and CDCRS, shall be subjected to and successfully pass a test that will verify whether suitable enclosures and filtering are provided to protect the equipment and its sensitive components such as printed circuit boards and memory storage device from malfunction resulting from dust particles, that could be as small as 1 to 200 microns, with a maximum concentration of 0.248 mg/cubic centimeters. Type 1 general-purpose Portland cement is to be used for the test media as it has a controlled maximum particle size (.0381mm to .0737mm). The air velocity at the outlet of the blower is to be at least 1000 feet (305 m) per minute, with the blower cycled for 15 seconds on and 30 seconds off, for the duration of the test. Where possible, positive air pressure and appropriate filtering shall be used to reduce the dust intake. This dust test shall include varying lengths of exposure as identified in Table 21-3~~Table 21-4~~.

Table 21-3 – Dust Exposure Test

Duration of Test	Fixed Location Equipment	Mobile Equipment
One Minute	x	X
Fifteen Minutes	x	x
Thirty Minutes	x	
Sixty Minutes	x	

21.7.3 First Article Enclosure Integrity Testing

Upon successful completion of the FACI, the First Article NPT devices shall be installed to a concrete floor in a manner identical to the proposed and SEPTA-approved installation method. Each enclosure shall then be subjected to the maximum forces as defined in Section 2 in the following manner:

A. In preparation for the test, each enclosure shall be leveled and fully secured.

B. Each device shall have the maximum horizontal force applied at the top of the enclosure, perpendicular to each of the enclosure's four sides. The force shall be applied for 30 seconds in each direction. For each force application, when the force is removed, the cabinet shall be inspected for deformations and inclination from perpendicular. Any deformations or deviation from perpendicular shall constitute test failure.

C. The NPT device shall have its door opened to between 90 and 120 degrees and the maximum weight applied to the edge of the door for 30 seconds. After the weight is removed, the enclosure shall be inspected for deformation and inclination from perpendicular. Any deformations or deviation from perpendicular shall constitute test failure.

21.7.4 Maintainability Test

The Contractor shall conduct a Maintainability Test of the equipment. The purpose of this test is to determine that the equipment tested conforms to the maintainability requirements specified. This will be accomplished by introducing specific faults as test cases and measuring the time required for a technician to correct the fault, successfully returning the equipment to revenue service. SEPTA shall select the failures at the commencement of the Maintainability Test.

The Contractor shall prepare a test outline for the maintainability test plan that shall identify the sample size[3] and a list of all faults to be introduced into the equipment. This list shall represent every known failure mode for each unit of equipment, and all functionality.

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3. The sample size shall be statistically valid and provides a high degree of confidence.

The MTTR for all NPT equipment shall be as identified in Section 2.6.2.

The test shall be conducted in the following steps:

A. The Contractor shall provide multiple units of the equipment to introduce failed components, mis-adjustments and incorrect settings. The simulated failures shall be introduced in proportion to their expected failure rate. No fewer than three (3) units shall be provided for each type of equipment.

B. The Contractor's maintenance personnel shall be unaware of the simulated failures and shall be assigned to repair the equipment.

C. The repair times shall be recorded and MTTR shall be compared, individually and collectively, with the advance list provided by the Contractor. All results will need to be approved by SEPTA. Repair times shall be measured from the time the maintenance personnel arrive at the equipment to the time the equipment is placed back into revenue service.

21.7.5 CDCRS Software Verification

As the final part of the First Article Testing, the CDCRS Software Verification shall be performed. The purpose of this test is to prove that each of the functions provided by each of the application servers operate as specified.

For this test, at least one of each type of field equipment is required so the functionality can be proven. This equipment, however, need not be connected in any way to the CDCRS except via simple network connection. The functions covered shall include all functions provided by any NPT server and shall include, for example:

- All functions controlled by the Application server;
- System setup, including security accesses, including network address allocation;
- System monitoring;
- Alarm generation and reporting;
- Fare structure creation and revision;
- Query and report generation and execution;

- Automatic generation of daily summary tables;
- Data archiving and recovery;
- Network server management and network problem identification;
- Conductor remittances and reconciliation;
- Smart Media tracking and inventory system.

The Contractor's plan for this test shall be provided for SEPTA approval at the Final Design Review. This test plan shall identify all aspects of the testing to be performed as well as the test equipment and procedures to be used. **FDR 21-4**

All instances of performance, which do not meet the specified requirements, shall be identified by the Contractor and included in the test report. Corrections required as a result of the testing shall be approved by SEPTA and performed by the Contractor prior to delivery of any additional NPT System field equipment.

21.7.6 Interface Test

This test shall be designed to evaluate how well and accurately the equipment and software provided within this contract interface together. The individual tests within this section shall be performed under varying conditions, using a statistically valid sample that will demonstrate all functions as specified for each equipment unit and the system, providing a high degree of confidence for the reliability. The interfaces to be tested shall include all interfaces between the NPT devices, including depot based equipment, fixed location equipment, mobile equipment, and all servers.

As a part of the interface test, verification of the proper interoperation with those external interfaces shall also be proven. These interfaces shall include those, which are external to the CDCRS. These shall include, but not be limited to:

- Wireless Communication System;
- Business Recovery Center;
- Clearinghouse;
- E-Commerce Site.

The software tested should be complete and ready for delivery to SEPTA. All potential functions and operational situations shall be included in the test in order to demonstrate that the interfaces meet all of the system requirements. This testing shall include the communications with and between all sub-systems as well.

The Contractor's plan for this test shall be provided for SEPTA approval at the Final Design Review. This test plan shall identify all aspects of the testing to be performed as well as the test equipment and procedures to be used. **FDR 21-5**

All instances of performance, which do not meet the specified requirements, shall be identified by the Contractor, and included in the test report. Corrections required as a result of the testing shall be approved by SEPTA and performed by the Contractor prior to delivery of any additional NPT System field equipment.

21.7.7 Application Verification Test

Each CDCRS application shall be tested to verify that is operating properly. All applications as identified in the various paragraphs in Section 19 shall be verified to ensure proper and expected operation. This shall include, but not be limited to, the following software applications:

- Cash Room Manager;
- Configuration Manager;
- Crew Fare Transaction Manager;
- Handheld Application;
- Equipment Maintenance and Inventory Control System;
- Fare Table Manager;
- On-Board Processor Manager;
- Reduced Fare Eligibility System;
- Reporting System;
- Revenue Accounting System;
- Revenue Model Manager;

- Smart Media Manager;
- Stations Manager;
- System Status Monitor.

Every menu selection shall be tested to ensure that the expectations of SEPTA are met and to ensure that the progression of the functionality for the applications are correct. This shall also include testing security and access to the various elements, forms and other items to be completed to execute the application, form functionality, reports resulting from the functional operation, interfaces to other SEPTA systems and CDCRS applications, parameter identification and modification to ensure that the parameter changes produce desired results, verification of ad hoc queries and other necessary functional elements. Also of critical importance is that each of these functions shall be timed in order to verify that the performance is also acceptable.

In addition, for those applications which are mirrored in the existing SEPTA system, parallel testing against these existing legacy systems shall also be included in the testing to ensure data concurrence between both systems

Separate test reports with the results of the application test shall be provided to SEPTA for approval and all deficiencies shall be corrected before the FAT can be considered completed and accepted..

21.7.8 Cycling Test

The cycling test shall be conducted for NPT System equipment as shown in Table 21-4~~Table 21-45.~~

A mix of fare types shall be used for the cycle test including, but not limited to, fare media configured as Adult, Child, Senior, Disabled and Employee categories. A mix of fare zones shall be used for Regional Rail one way and round trip media cycle tests.

Table Key for Media Type:

- ~~LT~~ SSM – ~~Long Term Smart~~SEPTA Issued Smart Media and Partner Smart Media;
- ~~LUM~~ MM – ~~Limited Use Media (test shall incorporate both Smart LUM and~~ Magnetic ~~LUM~~Media (issued by NPT System);
- Present – SEPTA's existing magnetic fare media from a third Party.
- Bankcard - ~~—~~Contactless Credit/Debit Smart M~~m~~edia and Open Payment Smart Media

In addition, the cycle test shall also include not less than 10% additional transactions with invalid media. The invalid media shall be verified against each type of equipment, which reads and verifies Smart Media as valid for a particular mode of transportation service. Issue of Smart Media shall include the storage of the validity information in the CDCRS account.

Table 21-4 – Cycle Test Requirements

Trial #	Media Type	Transaction Description	Qty.	Tests
FVD, ~~RSD,~~ ASD				
1	~~LT SM~~SSM	Issue with Monthly Pass stored	25	3
2	~~LT SM~~SSM	Issue with Stored Value	25	3
3	~~LT SM~~SSM	Issue with One Way Media	25	3
4	~~LT SM~~SSM	Issue with Round Trip Media	25	3
5	~~LUM~~MM	Issue with Monthly Pass stored	25	3
6	~~LUM~~SSM	Issue with Stored Value	25	3
7	~~LUM~~MM	Issue with One Way Media	25	3
8	~~LUM~~MM	Issue with Round Trip Media	25	3
9	~~LT SM~~SSM	Add Stored Value	30	3
10	~~LT SM~~SSM	Add Monthly Pass	40	3
11	~~LT SM~~SSM	Add One Way Media	40	3
12	~~LT SM~~SSM	Read information on Smart Media	80	1
13	~~LUM~~SSM	Read information on Smart Media	80	1
~~14~~	~~LT SM~~	~~Autoload Stored Value~~	~~55~~	~~1~~
~~15~~	~~LT SM~~	~~Autoload Monthly Pass~~	~~55~~	~~1~~
For trial 1-11, each is to be purchased using cash, credit media and debit media				

Trial #	Media Type	Transaction Description	Qty.	Tests
HSD				
1614	LT SMSSM	Read all media from trial 1	25	1
157	LT SMSSM	Read all media from trial 2	25	1
168	LT SMSSM	Read all media from trial 3	25	1
179	LT SMSSM	Read all media from trial 4	25	1
1820	BankcardLUM	Used at turnstile and checked at Zone 3Read all media from trial 5	25	1
1921	BankcardLUM	Onboard purchase of single tripRead all media from trial 6	25	1
202	BankcardLUM	Onboard purchase of Family Fare Read all media from trial 7	25	1
213	BankcardLUM	Onboard purchase of multiple adult fares Read all media from trial 8	25	1
224	LT SMSSM	Read all media from trial 9	30	1
235	LT SMSSM	Read all media from trial 10	40	1
246	LT SMSSM	Read all media from trial 11	40	1
257	LT SMSSM	Read all media from trial 124	55	1
268	LT SMSSM	Read all media from trial 135	55	1
279	LUMMM	Issue Media with exact fare	25	1
2830	LUMMM	Issue Media with change	25	1
2931	LUMMM	Issue Media with credit card	30	1
Media Information Display				
32	LUM	Validate One Way Media	50	1
33	LUM	Validate Round Trip Media (inbound)	50	1
34	LUM	Validate Round Trip Media (outbound)	50	1
305	LUMSSM	Verify Pass Zone 3Validate Stored Value Media	50	1
316	LT SMSSM	Validate One Way MediaReplenish for Zone 1	50	1
327	LT SMSSM	Validate Round Trip Media (inbound)Zone 2 – No change to Media	45	1
328	LT SMSSM	Validate Round Trip Media (outbound)Verify Pass – Zone 1	45	1
349	LT SMSSM	Validate Stored Value MediaVerify Pass Zone 2	50	1
3540	LT SMSSM	Read all media from trial 1	25	1
4361	LT SMSSM	Read all media from trial 2	25	1
3742	LT SMSSM	Read all media from trial 3	25	1
3843	LT SMSSM	Read all media from trial 4	25	1
3944	LUMMM	Read all media from trial 5	25	1
4045	LUMMM	Read all media from trial 6	25	1
416	LUMMM	Read all media from trial 7	25	1
427	LUMMM	Read all media from trial 8	25	1
48	LT SM	Autoload Stored Value	55	1
49	LT SM	Autoload Monthly Pass	55	1

Trial #	Media Type	Transaction Description	Qty.	Tests
On-Board Processor				
4350	LUMMM	Validate One Way Media	50	1
4451	LUMMM	Validate Round Trip Media (inbound)	50	1
52	LUM	Validate Round Trip Media (outbound)	50	1
4553	LUMMM	Validate Stored Value Media	50	1
4654	LT SMSSM	Validate One Way Media	50	1
4755	LT SMSSM	Validate Round TripMonthly Pass Media (inbound)	50	1
56	LT SM	Validate Round Trip Media (outbound)	50	1
5748	LT SMSSM	Validate Stored Value Media	50	1
4958	LT SMSSM	Read all media from trial 1	25	1
5059	LT SMSSM	Read all media from trial 2	25	1
5160	LT SMSSM	Read all media from trial 3	25	1
5261	LT SMSSM	Read all media from trial 4	25	1
62	LUM	Read all media from trial 5	25	1
63	LUM	Read all media from trial 6	25	1
64	LUM	Read all media from trial 7	25	1
65	LUM	Read all media from trial 8	25	1
66	LT SM	Autoload Stored Value	55	1
67	LT SM	Autoload Monthly Pass	55	1
5368	LT SMSSM	Pass + Pass upgrade (coin)	40	1
5469	LT SMSSM	Pass + Pass upgrade (bill with change)	40	1
5570	LT SMSSM	Pass + Pass upgrade (coin + bill)	40	1
5671	LT SMSSM	SVC + coin	20	1
5772	LT SMSSM	SVC + bill with change	20	1
5873	LT SMSSM	SVC + bill + coin	20	1
Sub/El Turnstile				
5974	LT SMSSM	Pass Usage	100	1
6075	LUMMM	Pass Usage	100	1
6176	Present	Pass Usage	100	1
6277	LT SMSSM	SVC payment	50	1
6378	LUMBankcard	SVC Value payment	50	1
79	LT SM	Autoload Stored Value	25	1
80	LT SM	Autoload Monthly Pass	25	1
6481	LUMMM	Validate Accept One Way Media	25	1
6582	LUMMM	AcceptValidate Round Trip Media	25	1
6683	LUMMM	AcceptValidate One Way Media	25	1
6784	LUMMM	AcceptValidate Round Trip Media	25	1
6885	LT SMSSM	Reject insufficient stored value	25	1
6986	LUMBankcard	Reject value on accountReject insufficient stored value	25	1
FaregateRailroad Turnstile/ADA Faregate				
7087	LT SMSSM	Pass Usage	100	21
7188	LUMMM	Pass Usage	100	21
7289	Present	Pass Usage	100	21

Trial #	Media Type	Transaction Description	Qty.	Tests
7390	LT SMSSM	SVC payment	50	21
7491	LUMBankcard	SVC payment	50	21
92	LT SM	Autoload Stored Value	25	1
93	LT SM	Autoload Monthly Pass	25	1
7594	LUMMM	AcceptValidate One Way Media	25	21
95	LUM	Validate Round Trip Media (inbound)	25	1
7696	LUMMM	AcceptValidate Round Trip Media (outbound)	25	21
7797	LT SMSSM	AcceptValidate One Way Media	25	21
7898	LT SMSSM	Validate Accept Round Trip Media (inbound)	25	21
99	LT SM	Validate Round Trip Media (outbound)	25	1
79100	LT SMSSM	Reject insufficient stored value	25	21
80101	LUMBankcard	Reject – insufficient insufficient stored value on account	25	21
81102	LT SMSSM	Reject depleted/expired/used OW/RT Medias	25	21
82103	LUMMM	Reject depleted/expired/used OW/RT Medias	25	21
PPS				
83104		Pay for daily parking by coins	200	1
84105	Bankcard	Pay for daily parking by credit card	200	1
85106	LT SMSSM	Pay for daily parking by Stored Value	200	1
107		Pay for daily parking by coins and cancel before completing payment	100	1
CAR				
86108	LT SMSSM	Verify card valid for access - Smart Media	200	1
87109	LT SMSSM	Verify card invalid for access - Smart Media	50	1
POFM				
88	Cash	Pay parking fee owed – single day	50	1
89	Credit Card	Pay parking fee owed – multiple days	50	1
90	Debit Card	Pay parking fee owed – multiple days	50	1
91	Smart Media	Pay parking fee owed – single day	50	1
92	Cash	Pay Lost Ticket fee owed – multiple days	50	1
93	Credit Card	Pay Lost Ticket fee owed – single day	50	1
94	Debit Card	Pay Lost Ticket fee owed – single day	50	1
95	Smart Media	Pay Lost Ticket fee owed – multiple days	50	1
POF System				
96	MM	Issue entry ticket	500	1
97	SSM	Process media at entry lane	100	1
98	MM	Process media at exit lane within grace period	100	1
99	SSM	Process media at exit lane within grace period	15	1
100	SSM	Process media at exit lane outside of grace period (1 day)	50	1
101	SSM	Process media at exit lane outside of grace period (2 days)	35	1
102	MM	Process media at exit lane outside of grace period (1 day)	50	1
103	MM	Process media at exit lane outside of grace period (2 days)	50	1

Trial #	Media Type	Transaction Description	Qty.	Tests
104	SSM	Use permit at entry lane	50	1
105	SSM	Use permit at exit lane	50	1

21.7.9 Report Generation Test

The system shall be provided with test data simulating SEPTA database for purposes of this test. Throughout this test, the date and time shall be modified a minimum of ten (10) times incorporating dates from a minimum of five (5) different years.

All functions requiring interface to the CDCRS, including all alarm, event, and boundary conditions and security provisions, in all possible combinations, shall be tested. These functions shall include, but not be limited to, the following:

A. Alarm transmission and all other device/component monitoring functions (for all devices);

B. Data transmission to the CDCRS (for all devices);

C. Data transmission from the CDCRS (for all devices);

D. Fare Table modification, download and verification simultaneously to all devices;

E. Configuration modifications from all devices;

F. Automatic report generation at the CDCRS.

The Contractor shall identify each integrated function in its Test Procedures, including the boundary conditions and security provisions for each item of equipment and operation. Where possible, at a minimum each report shall be verified against two other reports.

All data transmissions shall be inspected and tested for accuracy. Inaccurate data transmissions shall be recorded as a failure. The Contractor shall take any corrective action necessary to ensure the proper performance of all functions.

Samples of all reports available shall be generated by the CDCRS. Format, layout, page and column headers, data, and all other information shall be reviewed to confirm compliance with the designs approved at the Final Design Review subject to any subsequent agreements. Contents of the reports shall be compared with the known contents of the data. Successful completion of the test requires no discrepancies between report contents and known data as well as proper formats.

21.8 Production Acceptance Test (PAT)

This test will be performed by the Contractor at its North American facility to verify each item of equipment, is consistently manufactured, and fully complies with final functional requirements and hardware configuration. This test will occur for all equipment that will be part of both the Pilot Test and RMAT testing. Successful completion of the PAT is a prerequisite to delivery of equipment to SEPTA's sites for PIC verification, installation, and IAT testing.

Once this test is successfully completed, the equipment shall be available for shipment. The Contractor shall provide to SEPTA certification in writing, in addition to providing the actual test results for review, when the Functional Test has been passed. SEPTA will identify, when necessary, required modifications to be made and demonstrated before approving release for shipment. SEPTA shall have, at their discretion, the right to provide on-site oversight of the PAT.

21.9 Pre-Installation Checkout (PIC)

Prior to commencement of the Pilot Test, a Pre-Installation Checkout (PIC) Test shall be conducted at the Bus Depots/Trolley Barns. SEPTA will select five (5) sets of mobile equipment at random from delivered items plus the CDCRS including hardware and software to run all reports and provide data transfer for the PIC.

The test objectives are:

A. to confirm that there was no visible damage in the delivered equipment;

B. to visually inspect a random sample of mobile equipment for conformance with specifications;

C. to verify that the mobile equipments work as expected by exercising them to check log-on/log-off and to verify their operating functions by processing various fares;

D. to ensure that all data reports are produced in accordance with specifications; and

E. to determine by these procedures if installation can begin or corrections and/or adjustments are needed followed by a retest before installation can begin.

This equipment shall be set up at the Bus Depot/Trolley Barn by the Contractor in such a manner as to permit all of the above listed test objectives to be evaluated. The following sequence of tests shall be conducted as a minimum:

A. The mobile equipment shall be powered using a power supply(ies) furnished by the Contractor.

B. The mobile equipment shall be programmed for vehicle number and correct fares downloaded from the CDCRS.

C. Visual inspection of the mobile equipment shall be made to ensure that there is no physical damage and that all specified displays, messages, and prompting sequences including tone coordination occur as specified.

D. Log-on procedures shall be completed followed by processing at least three fares of each type provided in the fare structure for the system.

E. Log-off procedure and data collection shall be completed and CDCRS printouts reviewed.

Successful completion of PIC shall be a prerequisite for Pilot Test installation to begin.

21.10 Installation Acceptance Test (IAT)

This test will be performed by the Contractor at the sites selected by SEPTA to verify that the equipment, which successfully completed PAT testing, continues to perform as expected after it has been installed, and prior to revenue service. This test will occur for all equipment that will be part of both the Pilot Test and RMAT testing. IAT shall however not begin unless training to SEPTA employees had been provided and manuals that correctly represent and depict all functionality are provided. Successful completion of the IAT is a prerequisite to conduct of the Pilot Test.

21.11 Pilot Test

This test shall be performed after successful completion of the IAT on a predetermined set of equipment. This shall be performed at the commencement of each phase of the project. The test shall be conducted with a population of devices equal to no less than 10% of the quantity for the device being provided within this contract. If the number of devices or systems to be provided is equal to one, that device is not subject to the percentage factor. However, the single device and/or system shall be required to participate in the Pilot Test.

The Pilot Test will be conducted for a period of not less than five (5) consecutive weeks. The testing is designed to verify the system is operating in a reliable and accurate manner when subjected to actual in-service revenue conditions. The exact number of devices (by type) participating in the Pilot Test shall be decided upon no later than 60 days prior to the scheduled start of the FAT. This is shall encompass the initial complement of NPT equipment installed as agreed no later than sixty (60) days prior to the scheduled start of the FAT.

The first seven (7) days of the Pilot Test shall be designated as a settling period, but with all normal operations for revenue service carried out and accuracy and reliability data documented. Prior to this period, a Failure Review Board (FRB) shall be set up. The FRB shall review the reported failures, categorizing them for inclusion into the Pilot Test statistics. For each reported failure, the Contractor shall provide a plan as to the corrective actions necessary to repair the defect. The FRB shall review all failures and provide an analysis for the cause of the malfunction. At the end of the settling period, the Pilot Test shall begin and shall be conducted over the next twenty-eight (28) days. The Contractor shall be responsible for performing all maintenance actions during Pilot Test.

21.11.1 Test Requirements

The NPT equipment participating in the Pilot Test shall be operated in full revenue service during the Pilot Test. Requirements specified for both the Accuracy Test and the Reliability Test are identified in Table 21-5~~Table 21-6~~ and shall be met in order to pass the Pilot Test. When the Pilot Test is passed, the equipment shall remain in revenue service. The Pilot Test results and data collected shall be reviewed weekly by SEPTA.

Table 21-5 – Pilot Test Requirements

Week #	Reliability a (% of required MCBF)	Equipment Accuracy (data reporting)	Equipment Accuracy (payments)	Cash Container Audits
1 (settling period)	90.0%	99.0%	99.8%	2 failures at 95.0%
2	92.0%	99.5%	99.8%	2 failures at 96.0%
3	96.0%	99.6%	99.9%	2 failures at 97.0%
4	100.0%	99.7%	99.9%	2 failures at 98.0%
5	100.0%	99.9%	99.9%	2 failures at 98.0%

21.11.2 Accuracy Test

This test shall be conducted with all the Pilot Test equipment. This Pilot Test equipment shall be monitored daily and results recorded. The minimum accuracy requirements stated above shall be achieved during the test schedule. If during any week of the test, the Accuracy requirements specified are not achieved, for the periods indicated, SEPTA will have the right to suspend the Pilot Test.

In addition to the verification of the accuracy of the collected revenues, a data accuracy review shall be performed. This review shall serve to ensure that all data is reported properly and accurately. The test will also prove that the same information is consistently and accurately represented on reports. The test shall also verify that all column and row totals are properly and accurately calculated and that all alarms and messages sensed are recorded at the fare device and reported to the CDCRS.

All reports available from the fare devices and the CDCRS shall be printed on five (5) random days, at least once for each week during the Pilot Test. The dates for printing these reports will be randomly selected by SEPTA, with no prior knowledge provided. These reports will be used to perform the accuracy testing.

21.11.3 Reliability Test

This test shall be conducted with all the Pilot Test equipment. Each item of equipment shall be monitored throughout the test period. All conditions for equipment errors, repairs, adjustments, replacements, malfunctions, (of mobile equipments or parts/modules thereof) shall be fully documented for the entire test period.

The minimum reliability requirements stated within Table 21-5~~Table 21-6~~ shall be achieved during the specified period, in order for the Pilot Test to continue. If the MCBF requirements specified are not met at the period indicated, SEPTA will have the right to suspend the Pilot Test until the Contractor submits and implements a plan to rectify the error conditions.

For the computer systems, there shall be no more than one (1) failure of the any computer system throughout the duration of the test.

21.11.4 Failure of Pilot Test

In the event that the equipment or a system fails the Pilot Test, the Contractor shall have up to thirty (30) days to correct or update the equipment, so a retest can commence. If at the end of this Pilot Test re-test, the result is a failure, SEPTA may elect for cancellation of the contract.

21.12 Integration Testing

The purpose of this test is to verify that all NPT components are fully integrated to perform as a single system for SEPTA. Integration Testing shall ensure that all NPT equipment can successfully process the Smart Media issued and/or processed by the all other equipment procured under each contract. This test shall verify that each Smart Media processor within the NPT System encodes data and sets up accounts properly for all types of Smart Media identified in Section 4 and that each type of Smart Media can be properly processed by the equipment. The procedures to be used during the Integration testing shall be presented to SEPTA by the Contractor at PDR and finalized prior to the commencement of the RMAT. **PDR 21-5**

Each transaction performed as part of this test shall be performed using Smart Media that was initialized/sold/activated/replenished from each type of fare card processing device to ensure that cross-compatibility is provided.

With successful completion of this test, all software shall be "frozen" and no changes shall be made without authorization of SEPTA. The Contractor shall record version information for all software modules installed on the equipment. These records shall include the date and time the software was created, size of each file, and version number.

21.13 Reliability, Maintainability and Accuracy Test (RMAT)

The RMAT will begin after successful conclusion of all equipment installations and the successful completion of the Pilot Test. This test shall run for a period of not less than ninety-one (91) consecutive days and shall verify that the system is operating in a reliable and accurate manner for all installed equipment. This test shall be performed after all equipment, hardware and software has been installed, training has been completed (as identified in Section 23) and the manuals and documentation (as identified in Section 22) have been provided.

During the RMAT, reliability, maintainability, and accuracy will be recorded by Contractor personnel and reviewed by SEPTA at the 4th, 8th and 13th week stages to evaluate the performance for the preceding 4 or 5 week period, as applicable. The RMAT test results and data collected shall be reviewed weekly with SEPTA. Reliability, maintainability, and accuracy at each stage shall meet the performance requirements specified in these specifications.

System acceptance of the NPT System by SEPTA shall be require passing the RMAT and the Contractor furnishing all required hardware, software, spare parts, documentation, training, supplies and all other items and deliverables identified in these specifications. As with the Pilot Test, this test shall be performed for each Phase.

21.13.1 Reliability Test

All conditions of equipment errors, adjustments, replacements, malfunctions, and failures shall be fully documented by the Contractor for the entire test period for the RMAT. Procedures similar to the Pilot Test shall be used for the verification of the system reliability.

The following procedures shall be used to log chargeable failures associated with RMAT. The Failure Review Board (FRB) shall ascertain what constitutes a failure in the event of a disagreement. Details for the Failure Review Board are contained in the Special Terms and Conditions. An Equipment Maintenance Report **CDRL 21-24** ~~CDRL 21-21 22~~ shall be prepared to record all maintenance related incidents so as to classify chargeable or non-chargeable operating malfunctions and operating failures. All malfunctions and failures shall be tracked by equipment type, equipment number, module type and module serial number.

A. Operating Malfunctions;

B. Operating Failures;

C. Item Failures;

D. Design Failures.

Operating malfunctions and operating failures shall be recorded for each day to compile a malfunction and failure history by type of malfunction and to determine the total number of chargeable failures. An operating malfunction becomes an operating failure when the same malfunction occurs on three different mobile equipments. An example is a coin jamming on three separate FVD.

Operating Malfunction

An operating malfunction is defined as a random malfunction that does not cause the equipment to be inoperable but would require some form of maintenance to be rendered, such as a blown bulb. An operating failure is defined as any condition that causes the equipment to cease working, such as a logic board failure or media jam. Passenger induced malfunctions are non-chargeable. An item failure is defined as that failure of a particular module, which occurs three or more times.

Design Failure

If a design failure occurs, continuation of the test is at the discretion of SEPTA. A daily maintenance diary shall be kept together with the Equipment Maintenance Report to enable classification of chargeable operating malfunctions and failures, item failures and design failures.

Operating malfunctions and operating failures shall be recorded for each day to compile a malfunction and failure history by type of malfunction and to determine the total number of chargeable failures. An operating malfunction becomes an operating failure when the same malfunction occurs on three different mobile equipments. An example is an operator display burning out in three different OCDs or a coin jamming on three separate FVDs.

21.13.2 Accuracy Test

During the course of the RMAT, overall accuracy of the NPT System shall be evaluated. Weekly totals of the cash receipts collected from all cash accepting devices shall be tabulated by SEPTA. These totals shall be compared against the revenue totals as reported by the CDCRS during the service period in question. Within this section, revenues shall mean cash, bills, credit card transactions and debit card transactions as well as deductions from all types of Smart Media.

The physically counted revenues, when compared to the CDCRS reported totals, shall be within ±0.1%, including the value of recovered jammed coins and bills. Failure to meet this requirement for any week shall be fully investigated and reported by the Contractor.

For the NPT System to be accepted, the system accuracy of the reported cash receipts shall be within ±0.1% of the physically counted revenues during the entire test period. If discrepancies in the accuracy during the warranty period exceed ±0.1%, the Contractor shall take corrective action. This corrective action shall be subject to SEPTA approval. After corrective action has been taken, if system accuracy records indicate that the action taken was successful for a minimum period of 30 days, the fix shall be deemed satisfactory. If not, the Contractor shall take further action until system accuracy is equal to or better than the specified requirements.

There shall be no errors with the data re-encoding on magnetic media or data storage on smart cards, including calculation of the fare.

There shall be no data errors or inconsistencies between the data reported within the memories of each of the items of the equipment and the data stored within the CDCRS, or with the reports generate by the devices and CDCRS.

21.13.3 Revenue Service Event Audits

Periodically during the RMAT, as a minimum of one for each two-week period, SEPTA shall audit reports generated by the data system to confirm the accuracy and completeness of information presented. All event records shall be reviewed and compared to known events such as door openings for revenue service or maintenance, alarms, power outages, etc. All such known events shall be correctly represented in SEPTA reports.

21.13.4 Failure Review Board

Upon the commencement of revenue service, the Contractor shall be responsible for the compiling and reporting of all maintenance information as set forth. During this period, a Failure Review Board (FRB) shall be established. The FRB shall include membership as follows: Two representatives chosen by SEPTA and one representative from the Contractor, for a total FRB membership of three (3). The FRB shall be chaired by a representative of SEPTA Contracts Department, as a non-voting member.

The FRB shall determine whether reported NPT failures are valid failures, and determine what direct corrective actions will be required. The FRB shall convene weekly during the RST to review incident reports, classify failures, and assess system accuracy. Where differences in opinion arise, the rationale for categorization will be discussed and the chargeability determined by a vote of the FRB. Results of each meeting shall be documented and approved by SEPTA, and the affected Contractor. At the end of the RST, the FRB shall make a recommendation to accept the equipment or to extend the RST as necessary.

21.13.5 Failure Category Definition

The following conditions shall be used as a guide to classify failures.

21.13.5.1Chargeable Failure

A chargeable failure is any malfunction, which prevents NPT equipment from performing its designated function, or meeting its performance criteria, when used and operated under the environmental and operational conditions stated in these specifications.

Chargeable failures shall be used in computation of demonstrated reliability including intermittent failures, not otherwise excluded under non-chargeable failure types. In general, a chargeable failure can be assigned to one of the following categories

A. equipment design;

B. equipment manufacture;

C. equipment quality;

D. parts design;

E. parts manufacture;

F. parts quality;

G. software errors (If software errors are corrected and verified for 28 days in revenue service during the tests, such errors shall not be chargeable as equipment failures.)

H. equipment installation;

I. Contractor furnished operating, maintenance or repair procedures, tools, and equipment that cause equipment failure. (If procedures are correct and verified, such failures shall be chargeable as equipment failures.)

J. All failures shall be identified as chargeable, including those for which no cause could be found for the failure. Identification of a failure as non-chargeable shall be at the sole determination of the Failure Review Board based on the case set forth by the Contractor for non-chargeability, including identification of a failure as a non-chargeable failure as identified below.

21.13.5.2Non-Chargeable Failure

A non-chargeable failure is a malfunction caused by a condition external to the equipment under test, which is neither a functional, environmental, nor a test requirement in this specification and is not expected to be encountered during normal and correct operation of the equipment in revenue service.

Non-chargeable failures shall be considered non-chargeable failures and shall include the following:

A. Accident or mishandling;

B. Failure of test facility or test instrumentation;

C. Equipment failures caused by externally applied over stress conditions in excess of the approved specifications requirements contained herein. Certain patron-induced failures such as use of torn or mutilated Smart Media and abuse of equipment fall in this category.

D. Normal operating adjustments not as prescribed in the approved equipment operating and maintenance manuals.

E. Dependent failure(s) occurring with the independent failure that caused them.

F. Failures of expendable items having a specified life expectancy when operated beyond the defined replacement time of the item.

G. Failures caused by incorrect operating, maintenance or repair procedures.~~;~~

~~H. If incorrect procedures are employed and are different than (provided by the Contractor), it is not a chargeable failure.~~

21.13.6 Failure of RMAT

In the event that the equipment fails the RMAT, the Contractor shall have up to 28 days to correct or update the equipment. Following the modifications, the RMAT will retest for 28 additional days. Failure to pass the RMAT after this additional 28 days shall be cause for Termination for Default as defined in the Terms and Conditions.

A. Item Number;

B. Description;

C. Requesting Party;

D. Assigned Party;

E. Status (open / closed / in progress / deferred / etc.);

F. Date Opened;

G. Date Closed.

21.14 Wireless Broadband System - Proof of Concept

Prior to approval of Phase 2, a Proof of Concept (POC) test for the Contractor's wireless broadband system shall be successfully completed. The purpose of this test is to ensure that all NPT System Devices as well as the wireless broadband system are able to process all acceptable forms of Smart Media at the required transaction speeds when communicating over the wireless broadband system. Acceptable forms of Smart Media and required transaction speeds are defined in Section 4.2. Processing of Smart Media within the specified transaction times shall encompass all activities defined in Section 4.3 of this document, and shall include, but not be limited to, authentication and authorization of all forms of Smart Media ~~as well~~including ~~as~~ Contactless Credit / Debit Media.

The POC test shall be performed utilizing NPT System Devices that communicate over the wireless broadband system, and shall include, but not be limited to, OBPs and Handheld Sales Devices. The geographic area over which the test is performed shall be within SEPTA's service area and shall be representative of the diversity of wireless conditions that the NPT System equipment can be expected to experience in full revenue service across all modes of transportation offered by SEPTA.

The POC test shall be performed for a period of not less than five (5) consecutive weeks. The testing shall verify that the wireless broadband communication system operates correctly, reliably and accurately when subjected to actual in-service revenue conditions. The exact number, type and location of NPT System devices participating in the test shall be recommended by the Contractor no later than sixty (60) days prior to the scheduled date of this test, and shall be subject to SEPTA approval.

Testing performed shall be focused on all aspects of NPT system performance – from passenger interaction with all forms of NPT System equipment through the reporting of actual transaction data at the CDCRS. Accuracy and reliability requirements as defined for Phase 2 shall also be met during this POC test.

At the completion of the POC test, Contractor shall provide a report of the results. These results shall include all information required by SEPTA to ensure that the NPT System devices in conjunction with the wireless broadband system as provided by the Contractor demonstrates the ability to meet, or already meets, the requirements of SEPTA's Technical Specification.

Section 22 – Documentation, Parts and Tools
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22 DOCUMENTATION, PARTS AND TOOLS

The Contractor shall provide detailed documentation and manuals for all NPT equipment, devices, and software for the entire NPT System provided under this contract. The information provided in these manuals and documentation shall permit SEPTA to properly manage, operate, and maintain the NPT System without support from the Contractor. ~~In addition, t~~The information provided ~~in these manuals and documentation~~ shall permit SEPTA to integrate equipment provided by other suppliers into the NPT System without support from the Contractor. Such additional NPT equipment shall include items such as station, vehicle and CDCRS equipment, and components.

The documentation and manuals shall provide detailed descriptions of functionality, step-by-step processes for performing each of the system functions, full information ~~on~~for the definition and meaning of all parameters and other specific items of information as further defined within this section, appropriate to each manual.

The Contractor shall coordinate all activities with SEPTA to provide a comprehensive set of manuals and to update these manuals at each stage of NPT System deployment to ensure that they are current and reflect the NPT System as delivered.

Manual delivery shall follow the deployment phases as identified in Sections 1 and 21. For each of these phases, draft and final manuals and documentation shall be submitted by the Contractor to reflect the available functionality at each phase of deployment, as well as identify the changes that have occurred since implementation of the previous phase. Where documentation and manuals are not affected by the phasing, these shall not require any revision or additional deliveries by the Contractor.

At the conclusion of the final deployment phase, a final updated set of all manuals, both hardcopy and electronic source files, shall be provided to SEPTA reflecting the final as-deployed configuration of the NPT System.

22.1 General Requirements

All documentation provided for the NPT System shall be presented in English and utilize English units of measurements as commonly employed in the United States. Unless otherwise specified, documentation shall be written for a reader having no more than a secondary school education.

~~Care~~ Manuals shall ~~be taken to~~ provide easily understood directions and explanations and step-by-step instructions and shall include cross-references for all drawings, diagrams, and other illustrations referenced throughout the NPT System documentation and manuals.

Documentation and manuals shall be submitted directly to SEPTA by the Contractor. Any ~~documentation~~ materials received by SEPTA from a third party will not be considered received and will not be reviewed by SEPTA.

All documentation and manuals shall be provided both as printed hard copy publications and electronically as editable source files and PDF files on DVD media. The electronic media shall not be copy protected or encrypted in any way and shall not restrict SEPTA in their use and/or edit of these documents to suit their operational and other needs after final system acceptance. The electronic documents shall be provided in two distinct forms:

A. Source files using a SEPTA-approved version of Microsoft Office® suite;

B. Adobe Acrobat® pdf file format using the latest commercially available version of Adobe Acrobat for which an Adobe Acrobat Reader is available to the general public.

In the event that the Contract elects to use alternate software, subject to SEPTA approval, five (5) copies of the alternate software with full licenses, shall be delivered to SEPTA along with the first submittal of draft manuals.

Electronic versions of all final drawings, including the as-built drawings, shall be provided to SEPTA by the Contractor with delivery of manuals at the end of each installation phase. **CDRL 22-1** These drawings shall be reissued with each phase of deployment to show engineering changes made to any component or module up to the end of the warranty period for the Contract. **CDRL 22-2**

Contractor shall update manuals as required over the life of the Contract to reflect all configurations operational in the field. All manuals shall be furnished as controlled documents and each manual shall contain a unique number. All revisions shall be issued by manual number with control lists maintained as part of the manual.

SEPTA reserves the right to reproduce any submitted NPT manuals in written or electronic form, drawings and documentation for its sole use and purpose to maintain or operate the NPT System.

22.2 Formatting of Manuals

Manuals shall be formatted as follows:

A. All manuals shall be sequentially numbered with a control number by type of manual;

B. All information judged to be of a sensitive nature by SEPTA and/or Contractor for security reasons shall be identified as such no later than the Final Design Review and will be handled in a manner to be determined by SEPTA; **FDR 22-1**;

C. All sections shall be tabbed and labeled properly;

D. Maintenance and Operations manuals shall be designed for continuous, long-term service. All covers shall be approximately 1/16 inch (2 mm) thick, resistant to oil, moisture, and wear, to a high degree commensurate with their intended uses. Durable materials for long time service in the maintenance shop environment shall be used;

E. Manuals shall lie flat when opened and shall permit adding and replacing pages. Each copy of the manual shall be bound in three or more ring or post loose-leaf binders with the title lettered on both the front cover and spine;

F. If manual is in more than one volume, the volume(s) shall be appropriately numbered under the title, wherever it appears. Reinforced ring holes shall be used in all pages, data sheets, catalogues or other documents, or alternatively all pages shall be enclosed in a three-hole punched clear plastic sleeve;

G. The standard size manual shall be 8-1/2 inches by 11 inches with a maximum overall thickness of three inches per manual volume. Schematics, diagrams, illustrations, and drawings may be provided in either 8-1/2 x 11 inches or 11 x 17 inches sizes. The 11 x 17 inch size shall be folded and bound to conform to the 8-1/2 inch x 11-inch format. Folded sheets shall display identification on the last fold, readable without unfolding;

H. Final sets of manuals shall be serialized with numbers to be supplied by SEPTA. The numbers shall be permanently marked on the spine of the cover. Loose-leaf metal binder rings with locks shall be used to prevent undesired opening and to provide positive engagement when closed. Diagrams and illustrations shall not be loose or in pockets.

I. All printed materials shall be clearly reproducible by dry copying machines. This precludes the use of photographs and half-tone illustrations in any manual or training material delivered to SEPTA under this Contract. Line drawings, including exploded isometrics and three dimensional outline drawings are required in order to provide an easy reference for locating controls, displays, panels and other items or components on a unit of equipment. Contractor shall supply SEPTA with electronic copies of all images. Where appropriate, these digital images shall include labels and indicators (such as arrows) for identification purposes to individual equipment and component elements; and

J. Information for drawings and illustrations shall include; block diagrams, entity relationship diagrams, exploded views, illustrated parts breakdowns, and schematic drawings to facilitate descriptions of assemblies and the relationships of components, subsystems, and systems.

22.3 Documentation Development

All documentation shall be developed as progressively more detailed drafts with sufficient information to support interim activities, as outlined ~~as follows~~below.

The organization of the manuals shall treat the NPT System as an integrated system and not as a grouping of disassociated components. The manuals shall highlight the precautions to be taken by operating and service personnel to assure their safety while operating NPT equipment and performing maintenance and servicing operations.

Manuals furnished under this Contract shall be complete, modern, thoroughly organized, and authentic with no extraneous or irrelevant information and shall use ~~. The material in the maintenance manuals and parts catalogs shall be similarly organized and indexed, with~~ a standard numbering system. The numbering of the sections shall be consistent from one type of manual to another to allow easy cross-referencing among different manuals.

Each section of ~~the~~ each ~~maintenance~~ manual shall be subdivided, to the extent required by the subject matter, into the same chapters, to facilitate looking up specific topics or tasks. Coverage of the chapters shall include the following topics:

- General NPT ~~device~~ equipment description and operation, including how the device fits into the NPT System and interfaces with other devices and subsystems;
- Block diagrams;
- Functional schematics;
- Functional wiring and~~/or~~ piping diagrams;
- Troubleshooting techniques;
- Microprocessor software;
- Lubrication and cleaning, including frequency, methods and trade identifications of recommended materials, component location and description;
- Inspection and maintenance standards including wear limits, settings, and tolerances;
- Installation and removal; and
- Test and evaluation procedures.

~~The format of all data contained in the maintenance and parts manuals shall be consistent from section to section.~~

Upon SEPTA's approval of the Contractor's manual submittals, the manuals shall be considered as "Interim Manuals" until acceptance of the final phase. Following the issue of each Interim Manual, the Contractor shall provide revised pages covering any changes, whether required by change of design or procedures or due to error, and these revisions shall be kept current during the term of the Contract up to and including the completion of the operation, maintenance and warranty requirements of the Contract. Manual and catalog revisions shall be supplied to SEPTA before or coincidental with the arrival of the altered parts or components.

A new status sheet listing the effective dates of each page shall be included for each manual at the time updates are forwarded to the SEPTA. Each updated page shall be annotated with a vertical bar in the margin to ~~indicate~~ identify where material has been added, deleted, or revised.

22.3.1 Manual Outlines

The Contractor shall provide a detailed outline of each manual, stating its objective, audience and containing a discussion of each topic or chapter and sub-topics and their contents at CDR. **CDR 22-1** Two hard copy sets and one electronic copy set of each type of document, manual and drawing as described in this section shall be delivered by the Contractor at CDR. **CDR 22-2**

22.3.2 Preliminary Draft Manuals

Preliminary drafts of manuals shall be supplied for SEPTA review and comment at FDR. **FDR 22-2** These manuals shall be as complete and as comprehensive as possible and shall include within their contents listing all sections and subsections to be included within the final manuals. This shall permit SEPTA to identify missing information upon their review of the preliminary drafts.

Three~~Two~~ hard copy sets and one electronic copy set of each type of document, manual and drawing as described in this section shall be supplied as preliminary drafts for review and comment by SEPTA. SEPTA's comments will be provided to the Contractor at the commencement of the First Article Test (FAT). These draft manuals shall be provided for the initial implementation phase only.

22.3.3 Final Manuals – By Phase

For each of the deployment phases, complete final versions of the manuals shall be delivered by the Contractor for SEPTA review and approval no less than 45 days prior to the deployment of the devices and functionality for the NPT System. ~~Two~~ Three hard copy sets and one electronic copy set of each type of manual as described in this section shall be supplied for SEPTA review and comment. After SEPTA approval of the manuals, they shall be delivered in the required quantities as defined by Section 22.4 and shall be without identification of any changes or markups. **CDRL 22-3**

The final manuals shall be complete, accurate, shall fully represent the delivered functionality and operation for the deployment phase, and shall contain only that information which pertains to the system installed to that point. These manuals shall be provided in their final form, approved by SEPTA, prior to the use of the NPT equipment/System by the customers or by SEPTA.

22.3.4 Final System Manuals

The final NPT System manuals shall have incorporated all modifications or changes made to any part of the NPT System, based on the final design and agreements reached through the completion of the First Article Test (FAT) for the final implementation phase.

~~Two~~ Three hard copy sets and one electronic copy set of each type of manual as described in this section shall be supplied for SEPTA review and comment.

The documents shall not be considered complete and acceptable until SEPTA has reviewed all documentation and the Contractor has updated the manuals and documentation to completely reflect the final system operation. After SEPTA approval of the manuals, they shall be delivered in the required quantities as defined by Section 22.4 and shall be without identification of any changes or markups. **CDRL 22-4**

The warranty period for the NPT System and any equipment contained as part of the NPT System shall not commence until complete and final documentation, submittals and manuals, as specified herein, have been furnished by the Contractor and accepted by SEPTA.

22.3.5 Revisions

~~Revisions to a~~All manual~~s~~ revisions shall be recorded on a control list in the front of each manual. The list shall be updated and reissued by the Contractor with each revision. The record of a revision shall provide a sequential reference number, identify the nature of the change, the date of the revision, and page references of the revisions. The Contractor shall continue this ~~responsibility~~ until the warranty period expires. Revisions shall be prepared and submitted prior to the arrival of revised components or software to which the revision refers and immediately after relevant procedures are changed or errors are found and corrected.

Electronic versions of all drawings shall be provided to SEPTA by the Contractor with delivery of final manuals. These drawings shall be reissued with each revision to show engineering changes made to any component or module up to the end of the warranty period for the contract. **CDRL 22-5**

22.4 Required Manuals

The Contractor shall provide manuals by phase of deployment as identified in this Section in the quantities shown in Table 22-1.

Table 22-1 – Required Quantity of Manuals

Manual	Quantity
~~Management Manuals~~NPT Systems Operations Manuals	
NPT System Overview Manual	25
Management of Fare Media and SEPTA Accounts	25
~~Operations Manuals:~~	
~~Surface Fleet~~ FVD Operations Manual	~~25~~50~~2,200~~
Subway/E~~e~~levated ~~Operations~~ Turnstile Operations Manual	~~25~~50~~300~~
~~Railroad~~ Railroad Turnstile (PET) Operations Manual	~~25~~500~~50~~
MID Operations Manual	25
OBP Operations Manual	25
SD Operations Manual	25
CDCRS Operations Manual	25
CCT Operations Manual	25~~50~~
Parking Operations Manual	25~~50~~
~~Mobile Device Pocket Manuals:~~	
OBP Mobile Operator's Manual	2,200
Subway/~~e~~Elevated HSD Mobile Operator's Manual	300
Railroad HSD Mobile Operator's Manual	500
Parking HSD Mobile Operator's Manual	50
~~Revenue Management Manuals:~~	
Revenue Service of NPT Equipment	~~10~~25~~50~~
Cash R~~r~~oom Operations Manuals	5~~50~~
Revenue Reconciliation of NPT Equipment	5~~50~~
Security Manuals:	
NPT System Security Manual	~~10~~5
Maintenance Manuals:	
Field ~~Preventative~~ Maintenance Manual ~~for Each NPT Device~~	50
~~Field Troubleshooting and Corrective Maintenance for Each NPT Device~~Shop Maintenance Manual	25~~50~~
~~Bench-level Preventive Maintenance for Each NPT Device~~	~~25~~
~~Bench-level Corrective Maintenance Manual for Each NPT Device~~	~~25~~
~~Bench-level Overhaul Procedures for Each NPT Device~~	~~25~~
~~Illustrated Parts Manual~~	~~25~~
~~Test Equipment Manual~~	~~10~~
Special Tools Manual	~~5~~10
Illustrated Parts Manual	5
Integrated Schematics and Wiring Diagrams	5
Bill of Materials	5
NPT CDCRS~~Systems~~ **Manuals:**	
~~NPT CDCRS Manual~~	~~5~~

Manual	Quantity
Hardware Manuals	5
Application Documentation	~~2~~5
System Administrator/User Manual	5~~2~~
Database Management Manual	5~~2~~

22.4.1 NPT System Operations Manuals

~~22.4.1~~22.4.1.1 NPT Systems Overview Manual

The NPT System Overview Manual shall include a general overview of the entire NPT System and all of its devices and functionality. This shall include general information on all of the system devices including performance characteristics, dimensions, communications protocols, and capacity.

~~The i~~Illustrations shall show device configurations as well as the location of all systems and subsystems of the NPT System. ~~I~~To the greatest extent possible, layout illustration views shall be in perspective, with suitable cutaways to clarify equipment locations. The use of two-dimensional drawings shall be minimized. The manuals shall also provide a general description of the test and inspection equipment and special tools.

~~22.4.2~~22.4.1.2 ~~Management of Fare~~Fare Media and ~~SEPTA~~ Account Management~~s~~

The NPT Manual for Management of Fare Media and SEPTA Accounts shall provide detailed instructions on the methodology and systems by which SEPTA shall manage of all types of Fare Media as well as SEPTA's accounts associated with the Fare Media.

In addition, the manual shall incorporate step-by-step instructions on how to assist Customers utilizing the Customer Support Center functionalities provided in Section 24 of the Contract.

~~22.4.3~~22.4.1.3 Equipment Operations Manuals

Equipment Operations Manuals shall be provided for each ~~item~~ type of NPT equipment and computer system provided as a part of the overall NPT System. These manuals shall contain information needed to obtain an understanding of how the customer-operated equipment functions as well as how the SEPTA-operated equipment functions. This manual shall be written for use by operations, revenue servicing and supervisory personnel. The following are sample section topics as an example of the type of Information that shall be included:

A. General system description and familiarization material;

B. Screen shots of all screens;

C. All customer displayed information;

D. Screen flow diagrams;

E. All operator displayed information;

F. Customer operation and Interfaces;

G. Safety features;

H. Stocking of coins and Fare Media;

I. Location, function, and operation of pertinent controls, indicators, and switches;

J. Setup and shutdown procedures.

In addition, to the above, operations manuals shall incorporate step-by-step instructions to assist passengers with the normal operation of the equipment and resolving operational problems. These descriptions shall be supplemented with line drawings, including exploded isometrics and three dimensional outline drawings, to depict the resolution of passenger difficulties and equipment malfunction.

~~22.4.4~~22.4.1.4 Mobile Device Operator's Manual

The Operator's Manuals for mobile equipment (Handheld Sales Devices, On-Board Processors, etc.) shall be pocket size and printed on plastic coated paper, or the equivalent as approved by SEPTA, for portability and durability. The operator manual shall be no more than 3-1/4 inches wide by 6 inches high and no more than 1/4 inch thick. This manual shall provide step-by-step operation of the mobiles devices to permit SEPTA's Fare Media to be properly processed.

~~22.4.5~~22.4.1.5 Revenue Service of NPT Equipment

The Manual for Revenue Service of NPT Equipment shall include all necessary information to perform revenue service of all NPT equipment, including media stock replacement, off-line data collection, cash container exchange and all other revenue servicing operations required to ensure revenue security and accountability.

~~22.4.6~~22.4.1.6 Cash R~~-r~~oom Operations Manual

The ~~Manual for~~ Cash ~~-r~~Room Operations Manual shall include all information necessary to properly and safely operate all Cash R~~-r~~oom equipment provided under the Contract.

~~22.4.7~~22.4.1.7 Revenue Reconciliation of NPT Equipment

The manual for Revenue Reconciliation of NPT Equipment shall provide an understanding and instructions for balancing the collected revenues against sales for each type of NPT equipment.~~—~~ The manual shall also cover reconciliation of revenues from Cash Room~~Cash-room~~ equipment as well as credit/debit sales reports to ensure that the NPT System can be fully reconciled. The manual shall include instructions on understanding the revenue container reports issued by the NPT Fare Media sales equipment, balancing all monies, credit card usages and debit card usages, and settlement of accounts.

This manual shall be identified as "CONFIDENTIAL" and treated accordingly in NPT System development and documentation distribution as identified by SEPTA.

~~**22.4.8Security Manual**~~

~~To the greatest extent feasible, the Contractor shall not include in any of the documentation items related to the specific operations of, and/or maintenance of, security devices which may be used for fraudulent purposes or whose disclosure may compromise system integrity and revenue security~~

~~Information of this type as identified as the Final Design Review and submitted separately, clearly stamped CONFIDENTIAL in bold capital letters. **FDR 22-3** It shall be the Contractor's responsibility to verify with SEPTA's Project Manager what information shall be considered confidential.~~

~~SEPTA regards the documentation for the CDCRS programs, the hardware and software constituents of the money handling systems, and certain aspects of maintenance, constructional information and other similar elements to be security related and to be confidential.~~

~~SEPTA will provide the Contractor with a list of those items to be included in the Security Manual and removed from other manuals, based on the information received as part of the manual outlines received at the Conceptual Design Review and through the Final Design Review. If additional information is identified after the Final Design Review, SEPTA reserves the right to request additional changes to the contents of the Security Manual prior to the delivery of the final manuals.~~

~~22.4.9~~22.4.2 Maintenance Manuals

The Contractor shall provide maintenance manuals ~~for~~ covering both field maintenance and shop maintenance for all ~~each item~~types of NPT equipment and software. Each manual shall include drawings, which identify the various parts and assemblies in the equipment. The manuals shall identify all special tools required for any of the procedures.

Each type of maintenance manual shall contain, but not be limited to a description of operation; installation procedures; a complete parts identification diagram and list; troubleshooting procedures; inspection procedures; preventive maintenance procedures and schedule; repair procedures; diagnostic procedures and routines; descriptions of internal diagnostics; wiring diagrams; electrical schematics with board and cable identification; and adjustment procedures. ~~The following types of maintenance manuals shall be provided for each type of NPT equipment:~~

~~22.4.9.1~~22.4.2.1 Field Maintenance ~~Preventive Maintenance~~ Manual

A Field Maintenance ~~Preventive Maintenance~~ Manual shall be developed ~~for each NPT device, and shall~~ that contains all information needed to enable maintenance technicians to perform all necessary maintenance tasks, both corrective and preventive, ~~required~~ for the NPT equipment installed at any SEPTA-defined location. This manual shall cover:

A. ~~field~~ periodic inspections; ~~and~~

B. preventive maintenance activities;~~tasks including lubrication, inspection, and replacement of consumable items. The manual shall contain recommended field~~

C. preventative maintenance schedules for each type of NPT equipment;~~.~~

D. all information needed to diagnose problems and make adjustments, corrections and repairs in the field.

~~22.4.9.2Field Troubleshooting and Corrective Maintenance Manual~~

~~A Field Troubleshooting and Corrective Maintenance Manual shall be developed for each NPT Device, and shall contain all information needed to diagnose problems and make adjustments and repairs in the field to all NPT System components and sub-assemblies to restore the system to a normal operating condition in an efficient and timely manner.~~ The manual shall include, at a minimum: a general description of each subsystem, component, and subassembly; functional block diagrams; detailed schematics; and wiring diagrams.

The Field Maintenance Manual shall also include references as needed for using portable test equipment (PTE), bench testers, and shop test stands for maintenance, adjustment, test, and troubleshooting functions in support of various maintenance procedures.

~~22.4.9.3Bench-level Preventive Maintenance Manual~~

~~A Bench-level Preventive Maintenance Manual shall be developed for each NPT device. This manual shall contain detailed instructions on workbench preventive maintenance requirements and procedures as needed to enable maintenance technicians to perform all periodic inspection and higher-skilled preventive maintenance tasks. The manual should expand upon the Field Preventative Maintenance Manual. The manual shall contain recommended bench-level PM schedules for each type of NPT equipment.~~

~~22.4.9.4~~22.4.2.2 ~~Bench-level Corrective Maintenance~~Shop Maintenance Manual

A Shop Maintenance Manual shall be developed that includes all information needed to enable maintenance technicians to perform all necessary maintenance tasks, including overhaul, corrective and preventive, for the ~~l~~Lowest L~~l~~evel R~~r~~eplaceable U~~u~~nits (LLRUs), including assemblies, sub-assemblies and components, of all types of NPT equipment: All information required to bring an LLRU back into operation shall be incorporated into this manual, including:

A. detailed instructions on workbench preventive maintenance requirements and procedures as needed to enable maintenance technicians to perform all periodic inspection and higher-skilled preventive maintenance tasks;~~.~~

B. recommended bench-level PM schedules for each type of NPT equipment and LLRU;

C. all information needed to diagnose problems and make adjustments and work-bench repairs in a SEPTA maintenance facility on all NPT System components and sub-assemblies;~~.~~

~~A. A Bench-level Corrective Maintenance Manual shall be developed for each NPT Device. This manual shall contain all information needed to diagnose problems and make adjustments and work-bench repairs in a SEPTA maintenance facility on all NPT System components and sub-assemblies. Students shall be afforded the opportunity to perform more complex maintenance activities on the NPT devices in the shop environment such as troubleshooting devices and systems with faults artificially introduced in the equipment while using the appropriate subsystem test devices.~~

D. ~~The Bench-level Corrective Maintenance Manual shall provide~~ all information needed for in-shop repair and trouble diagnosis of the lowest replaceable component on the ~~Lowest Level Replaceable Unit (~~LLRU~~;)~~

E. a detailed analysis of each LLRU within the NPT System so that maintenance technicians can effectively inspect, troubleshoot ,maintain, adjust, repair and overhaul it;

F. recommended overhaul schedules for each type of NPT equipment and LLRU.~~.~~

In support of the shop maintenance activities to be performed, t~~T~~he Shop Maintenance Manual ~~manual~~ shall contain for each LLRU and for each type of NPT equipment:

A. ~~-~~detailed flow charts or approved equivalents;

B. ~~,~~ exploded parts diagrams and schematic drawings;~~, and~~

C. detailed analyses;~~ related to each LLRU so that SEPTA maintenance personnel will be able to effectively service, inspect, maintain, adjust, troubleshoot, and repair the LLRU.~~

D. ~~The manual should also include~~ a detailed troubleshooting section, which expands upon the information provided in the Field Maintenance Manual~~Field Troubleshooting and Corrective Maintenance Manual.~~.

The Shop Maintenance Manual shall also include references as needed for using portable test equipment (PTE), bench testers, and shop test stands for maintenance, adjustment, test, and troubleshooting functions in support of various maintenance procedures.~~..~~

22.4.2.3 Special Tools Manual

The Special Tools Manuals shall provide, operation, adjustment, maintenance, troubleshooting, and data storage instructions for all of the special tools / devices and test equipment used in support of maintenance, operation, and expansion of the NPT System. The manuals also shall contain replacement parts information.

The Special Tools Manual shall provide step-by-step instructions for each device. These devices shall include those special tools/devices, which provide for coin and bill adjustments and acceptance as well as the accompanying software.

~~**22.4.9.5Bench-level Overhaul Procedures Manual**~~

~~**A Bench-level Overhaul Procedures Manual shall be developed for each NPT device. The Overhaul Manuals shall contain a detailed analysis of each component of the NPT devices so that the maintenance staff can effectively service, inspect, maintain, adjust, troubleshoot, repair, replace, and overhaul it. The Overhaul Manuals shall include instructions for using portable test equipment (PTE), bench testers, and shop test stands for maintenance, adjustment, test, and troubleshooting functions as they apply to overhaul. The manual should expand upon the Bench-level Preventative Maintenance Manual. The manual shall contain recommended Overhaul schedules for each type of NPT equipment.**~~

~~22.4.9.6~~22.4.2.4 Illustrated Parts Manual

The Illustrated Parts Manual shall describe and identify each module, sub-assembly, and part within each piece of equipment with its related supplier identification number and Contractor identification number. Exploded drawings shall be provided to permit identification of all parts not readily identified by description.

~~A complete Bill-of-Materials giving a unique part number, description, generic name and generic part number for every component shall be provided. Diagrams and drawings shall identify every component in the NPT System and call-out each component with the unique part number as referenced in the Bill-of-Materials.~~

The Contractor shall provide a parts layout for every printed circuit board, specifically calling out each component, be it mechanical or electrical in nature, and showing its exact location.

22.4.2.5 Integrated Schematics and Wiring Diagrams

Totally integrated NPT System schematics relating to all NPT devices and systems shall include device and component identification, component values, waveforms, voltages, currents, resistance values, wire identification and connector identification. All components on PC boards shall be individually shown in the schematics. Schematics shall be comprehensive in nature and thoroughly detailed to permit use by SEPTA's shop maintenance staff to troubleshoot and repair NPT System components.

Integrated-wiring diagrams shall be provided for each type of equipment, and shall include the following drawings:

- Location in schematic and schematic designation;
- Type, model, and part number;
- Location on NPT System component;
- Function;
- Schematic symbol;
- Appropriate ratings data;
- Interface information, as appropriate;
- Pin-to-pin connector terminal designations and wire designations at both sides of each connection for connectors and terminal blocks;
- Subsystem-level wiring diagrams and schematics for each subsystem. The diagrams shall be compatible with the schematics;
- Drawings showing the location of all traces on the top and bottom and any through board connections of each printed circuit board.

~~**22.4.9.7Test Equipment Manual**~~

~~The Test Equipment Manual shall include all information necessary to allow proper and full use of all test and calibration equipment furnished. The manual shall provide instructions for test equipment operation, adjustment, maintenance, troubleshooting, and storage. The manuals also shall contain replacement parts information.~~

22.4.2.6 Bill of Material

A complete Bill of Material (BOM) shall be provided for each type of equipment prior to manufacture of any equipment for the NPT System. -The BOMs shall include a unique part number, description, generic name and generic part number for each component in the NPT System.

Diagrams and drawings shall identify each system component and shall call out each component with the unique part number as referenced in the BOM. Sub-component detail of commercial equipment such as computers and peripherals, at the discretion of SEPTA, may be limited to board or major component level. This information shall be provided fifteen (15) days prior to the commencement of any installation. **CDRL 22-6**

~~**22.4.9.8Integrated Schematics and Wiring Diagrams**~~

~~Totally integrated NPT System schematics relating to all NPT devices and systems shall include device and component identification, component values, waveforms, voltages, currents, resistance values, wire identification and connector identification. All components on PC boards shall be individually shown in the schematics. Schematics shall be comprehensive in nature and thoroughly detailed to permit use by SEPTA's shop maintenance staff to troubleshoot and repair NPT System components.~~

~~Integrated wiring diagrams shall be provided for each type of equipment, and shall include the following drawings:~~

- ~~Location in schematic and schematic designation;~~
- ~~Type, model, and part number;~~
- ~~Location on NPT System component;~~
- ~~Function;~~

- ~~Schematic symbol;~~
- ~~Appropriate ratings data;~~
- ~~Interface information, as appropriate;~~
- ~~Pin-to-pin connector terminal designations and wire designations at both sides of each connection for connectors and terminal blocks~~
- ~~Subsystem-level wiring diagrams and schematics for each subsystem. The diagrams shall be compatible with the schematics;~~
- ~~Drawings showing the location of all traces on the top and bottom and any through board connections of each printed circuit board.~~

~~22.4.10~~22.4.3 NPT CDCRS Manuals

The Contractor shall provide the following manuals for each CDCRS component and sub-system as defined below.

~~22.4.10.1~~22.4.3.1 Hardware Manuals

The Contractor shall provide Hardware Manuals, to include drawings, which identify the various parts and assemblies of the computer and server systems. The manuals shall contain start-up procedures, operating modes, interconnection diagrams, preventive maintenance procedures and programs, diagnostic procedures, and wiring diagrams with board and cable identification.

The manual shall also include those instructions, which are connected with each type of peripheral and component of the CDCRS as found in the standard manufacturer's information.

~~22.4.10.2~~22.4.3.2 Application Documentation

The Contractor shall provide complete documentation for each Contractor developed and furnished application for the NPT System, the CDCRS, and any other subsystems with a microprocessor or microcomputer incorporated. This documentation shall be written for a reader having a post-secondary education appropriate for computer technicians and other similar personnel.

The documentation provided shall also identify all third-party software integrated and/or interfaced to the NPT System software and shall include the version implemented. Software version information shall be provided for each manual and each software modification, which causes a change in the reported software version, shall be fully documented and this information incorporated.

The documentation for each version of Contractor developed and furnished application shall be complete and comprehensive to include, but not be limited to complete source code listings with fully documented statements; comprehensive flow charts; and block diagrams explaining the system as a whole and showing how the individual programs are interrelated.

Of particular importance are the software interfaces between the NPT System elements, including data fields and definitions of the messages transferred as well as the interfaces between the Contractor-developed software and the third party software.

These shall be fully defined, documented, and included in the appropriate manuals.

The software documents shall clearly identify what data elements are stored, the source of each data element, how data are structured, transferred and utilized. This shall include the software logic, processing rules, restrictions and exceptions, default conditions and hard and soft-wired parameters.

~~22.4.10.3~~22.4.3.3 System Administration/User Manual

The Contractor shall provide a user manual containing detailed operating instructions and procedures to be used for all CDCRS functions. Information in the manual shall be presented in terms that are meaningful to users. The manual shall include a system operation description (hardware and software) as it relates to the user's tasks. This manual shall also include complete operational and troubleshooting information on all interfaces to third party systems and between two subsystems.

Procedures shall be step-by-step with an explanation of how each step is performed, what parameters can be adjusted, and the effects resulting from varying each parameter. All user guidance and error messages shall be described, along with the steps necessary for recovery from error and troubleshooting guidance. This document shall also address all alarms, events, status messages, transaction formats and contents, and all communications by the CDCRS.

This documentation shall be provided using language appropriate to computer operations and professionals and other similar personnel.

~~22.4.10.4~~22.4.3.4 Database Management Manual

The Contractor shall provide a complete manual on all aspects of operation of the database on the system. This will include a Contractor prepared manual that describes how to use the system, its databases and all available reports, macros, menus and other elements of the Contractor provided programs. Data fields, data formats, a detailed data dictionary, and other information required for a complete and thorough understanding of all database structures and contents shall be provided.

This information shall also include the inter-relationships of database tables.

This documentation shall be provided using language appropriate to computer programmers, database administrators, and similar personnel.

22.4.4 Security Manual

To the greatest extent feasible, the Contractor shall not include in any of the documentation items related to the specific operations of, and/or maintenance of, security devices which may be used for fraudulent purposes or whose disclosure may compromise system integrity and revenue security.

Information of this type as identified as the Final Design Review and submitted separately, clearly stamped CONFIDENTIAL in bold capital letters. **FDR 22-3** It shall be the Contractor's responsibility to verify with SEPTA's Project Manager what information shall be considered confidential.

SEPTA regards the documentation for the CDCRS programs, the hardware and software constituents of the money handling systems, and certain aspects of maintenance, constructional information and other similar elements to be security related and to be confidential.

SEPTA will provide the Contractor with a list of those items to be included in the Security Manual and removed from other manuals, based on the information received as part of the manual outlines received at the Conceptual Design Review and through the Final Design Review. If additional information is identified after the Final Design Review, SEPTA reserves the right to request additional changes to the contents of the Security Manual prior to the delivery of the final manuals.

~~**22.4.10.5Special Tools Manuals**~~

~~The Special Tools Manuals shall provide, operation, adjustment, maintenance, troubleshooting, and data storage instructions for all of the special tools / devices used in support of maintenance, operation, and expansion of the NPT System. The manuals also shall contain replacement parts information.~~

~~These Special Tools Manuals shall provide step-by-step instructions for each device. These devices shall include those special tools/devices, which provide for coin and bill adjustments and acceptance as well as the accompanying software.~~

~~**22.4.11Bill of Material**~~

~~A complete Bill of Material (BOM) shall be provided for each type of equipment prior to manufacture of any equipment for the NPT System. The BOMs shall include a unique part number, description, generic name and generic part number for each component in the NPT System. Diagrams and drawings shall identify each system component and shall call out each component with the unique part number as referenced in the BOM. Sub-component detail of commercial equipment such as computers and peripherals, at the discretion of SEPTA, may be limited to board or major component level. This information shall be provided fifteen (15) days prior to the commencement of any installation.~~ ~~**CDRL 22-6**~~

~~**22.4.12Listing of Sources**~~

~~The Contractor shall provide by listing sources for purchasing components and parts that are commercially available, other than from the Contractor. Components and parts not so listed shall be considered by SEPTA to be proprietary and available by single source. This information shall be provided fifteen (15) days prior to the commencement of any installation.~~ ~~**CDRL 22-7**~~

22.5 Parts and Tools

22.5.1 Recommended Spare Parts

Spare parts shall be functionally interchangeable with their corresponding parts provided in the original equipment deliveries. All delivered spare parts in inventory shall conform to the latest functional version during the warranty period. However, in the case of upgrades that provide an increase in functionality and are not implemented to meet the performance requirements of this contract, existing spare parts inventory shall not be upgraded.

The Contractor shall have available at least two U.S. sources for all spare parts and consumables that are exchanged regularly during preventive maintenance, except Contractor designed spare parts. The Contractor shall also endeavor to have other spare parts available from two U.S. sources.

Packaging of spares and consumables shall consider the reliability of the parts and the requirements for inspection and inventory (e.g., the packaging selected for highly reliable parts shall be such that the parts can be identified, inspected, stored for long periods, and endure multiple inventory cycles).

22.5.1.1 Spare Parts Lists

A complete list of spare parts recommended as identified below, shall be provided by the Contractor. These list shall not include lump sum categories – where miscellaneous spare parts are included in a single entry. All spare parts shall shall be separately identified and priced. Spare parts recommendations shall include the following:

A. Grouping by type (including diagnostics and test equipment), subsystem, and special tools, as applicable, for stocking identification;

B. Generic name, trade name, description, rating, accuracy, Contractor's part number, contract price, manufacturers' names and part numbers (at least two manufacturers), drawing references, and correlation with the maintenance manuals;

C. Price;

D. Correlation of the recommended quantities with reliability requirements and lead time on the basis of the following classifications:

1. Wear - parts that may be expected to require regular replacement under normal maintenance schedules, such as mechanical parts subject to continuous operation;

2. Consumables - parts with an expected life of less than 5 years, such as indicator lamps;

3. Single Use - parts that normally require replacement after performing their function one time, such as fuses;

4. Long Lead Items - parts that are not readily available from distributors or the manufacturer, such as specially made components;

5. Exchange Assemblies - assemblies that will be exchanged with failed units (or units that are not responding as specified) on the supplied equipment and that must be inventoried as complete assemblies.

A cross-reference and indexing system shall be provided for replacement components common to more than one subsystem (whether NPT equipment, diagnostics and test equipment, or special tool). Such components shall have only one part number. All parts numbers shall correspond to numbers for such components in the Illustrated Parts Manual.

22.5.1.2 Recommended Consumable Parts

For the purposes of this Section, consumable parts shall be defined as those parts that are routinely replaced as part of the ~~planned~~ preventive maintenance of the NPT System equipment, and that once replaced are not expected to be used again. Consumable parts shall include such items as magnetic read heads on the Turnstiles.

The Contractor shall furnish a list of recommended consumable parts necessary to properly maintain the NPT System equipment ~~on an annual basis~~ for a three-year period, consistent with the Contractor's recommended maintenance practices. ~~The list of recommended consumable parts shall be predicated on Contractor and Subcontractor experience with the equipment in service on other properties and on the maintenance and reliability requirements of SEPTA.~~ This list shall be updated as the Contractor's design progresses and shall be finalized as part of the Final Design Review. **FDR 22-4** Consumption rate data and data on lead-time for procurement shall be made available to SEPTA in support of these consumable parts recommendations.

22.5.1.3 Recommended Replacement Parts

For the purposes of this Section, replacement parts shall be defined as those parts that are not routinely replaced as part of the ~~planned~~ preventive maintenance of NPT System equipment, but that are reasonably expected to require replacement from time to time due to random failure. ~~In general, replacement parts shall be used after the completion of the warranty period to address those needs that during the warranty period are met under the terms of the warranty.~~

The Contractor shall furnish a list of recommended replacement parts necessary to properly maintain the NPT System equipment for seven (7) years, consistent with the Contractor's recommended maintenance practices. ~~The list of recommended replacement parts shall be predicated on Contractor and Subcontractor experience with the equipment in service on other properties and on the maintenance and reliability requirements of SEPTA.~~ This list shall be updated as the Contractor's design progresses and shall be finalized as part of the Final Design Review. **FDR 22-5** Consumption rate data and data on lead time for procurement shall be made available to SEPTA in support of these replacement parts recommendations.

22.5.1.4 Recommended Repair Parts

For the purposes of this Section, repair parts shall be defined as those parts that are not routinely replaced as part of the ~~planned~~ preventive maintenance of the NPT System equipment, but that are reasonably expected to require replacement from time to time due to external causes such as vandalism, abuse, or accident.

The Contractor shall furnish a list of recommended repair parts necessary to properly maintain the NPT System equipment for seven (7) years. ~~The list of recommended replacement parts shall be predicated on Contractor and Subcontractor experience with the equipment in service on other properties and on the service environment and maintenance and reliability requirements of SEPTA.~~ This list shall be updated as the Contractor's design progresses and shall be finalized as part of the Final Design Review. **FDR 22-6** Data on lead-time for procurement of repair parts shall be made available to SEPTA in support of these repair parts recommendations.

22.5.1.5 Recommended Overhaul Parts

For the purposes of this Section, overhaul parts shall be defined as those parts that are expected to be replaced at planned intervals, typically as part of a Scheduled Maintenance Program, and that once replaced are expected to be remanufactured, overhauled, or reconditioned for further use.

The Contractor shall furnish a list of recommended overhaul parts to support a~~n~~ continuous, ongoing overhaul program to ensure proper NPT equipment functionality for each ~~such~~ NPT component, consistent with the Contractor's recommended maintenance practices. T~~he list of recommended overhaul parts shall be predicated on Contractor and Subcontractor experience with the equipment in service on other properties and on the maintenance and reliability requirements of SEPTA.~~ This list shall be updated as the Contractor's design progresses and shall be finalized as part of the Final Design Review. **FDR 22-7**

In the case of components that normally receive only a mid-life overhaul, the Contractor shall consider the likelihood of future technological obsolescence in making its recommendations. Consumption rate data and data on lead time for procurement shall be made available to SEPTA in support of these overhaul part recommendations.

22.5.1.6 Inventory

The Contractor shall provide SEPTA with an inventory of spare parts as selected by SEPTA upon review of the recommended spare parts list provided by the Contractor at the Final Design Review. **FDR 22-8** This spare parts inventory shall be delivered and stored at SEPTA-approved sites.

Prior to associated devices and equipment being placed in revenue service, SEPTA shall stipulate the minimum parts inventory required to be provided by Contractor at the aforementioned site. A schedule for the delivery of the balance of spare parts shall be provided by Contractor is subject to approval by SEPTA no less than thirty (30) days prior to commencement of installation. **CDRL 22-7**

SEPTA will make these parts available to the Contractor for repair of SEPTA equipment during the system test and warranty period provided the Contractor maintains an adequate balance of parts and promptly replaces all parts consumed or rendered inoperable for Contractor-required warranty and maintenance work. The Contractor assumes responsibility for these parts while they are in the custody and control of the Contractor.

The Contractor shall be responsible for maintaining the entire inventory of spare parts and returning to SEPTA the full quantity purchased by SEPTA in good working condition and upgraded to the latest functional version to meet the performance requirements of this contract at the conclusion of the warranty period. The Contractor shall be reimbursed for replacement spare parts that have been documented by the Contractor and approved by SEPTA as having been used for repair of vandalism.

This inventory shall be replenished to its original complement at the conclusion of the warranty period.

22.5.2 Listing of Sources

The Contractor shall provide by listing sources for purchasing components and parts that are commercially available, other than from the Contractor. Components and parts not so listed shall be considered by SEPTA to be proprietary and available by single source. This information shall be provided fifteen (15) days prior to the commencement of any installation. **CDRL 22-8**

~~22.5.2~~22.5.3 Tools, Test and Inspection Equipment

The Contractor shall provide a list of all special or custom tools or instruments required to install, maintain, or adjust any component in the NPT System. The Contractor shall also provide all test and inspection equipment necessary for maintaining, troubleshooting, testing, repairing, calibrating and inspecting all NPT System equipment. This shall include equipment for the support of back shop repair activities, and for field inspection and test of equipment as well as a complete test bench for each type equipment include as part of the NPT System.

Two sets of tools, test and inspection equipment shall be submitted to SEPTA prior to the conclusion of the NPT System warranty. The Contractor shall also provide a list of suppliers where supplemental special or custom tools or instruments can be purchased.

The list of special or custom tools, instruments, test and inspection equipment shall be provided for SEPTA review at CDR and for SEPTA approval at Final Design Review. **CDR 22-3 FDR 22-9**

Should any modifications to the list be required at different phases in the program, Contractor shall notify SEPTA prior to implementation of software or hardware, which would require such special tools.

~~22.5.3~~22.5.4 Portable Test Equipment (PTE)

~~22.5.3.1~~22.5.4.1 General

PTE shall be supplied for all NPT System equipment, to aid SEPTA's maintenance staff in maintaining, troubleshooting, and repairing the equipment.

Complete parts lists and schematic diagrams of the PTE and instructions concerning how to use them for their intended purpose shall be in the appropriate manuals described in Section 22.4.2~~22.4.2~~22.4.9~~22.4.9~~.

For each system there shall be system specific software to be utilized by a common PTE laptop (or tablet PC). A total of 10 laptop PC (or tablet PC) PTEs shall be furnished. Cabling shall be standardized to perform testing for all NPT System equipment.

It shall not be necessary to remove, dislodge, dismount, or disconnect any component, card, wire, chassis, terminal, or cable in order to perform periodic calibration, or trouble diagnosis while using PTE. The PTE shall include all cables, industrial grade connectors and associated equipment to interface with the test points.

~~22.5.3.2~~22.5.4.2 Functional Requirements

The PTE shall have loaded and available electronic copies of all maintenance manuals to facilitate maintenance technician inspection and repair of NPT System equipment.

The PTE shall be able to produce all of the operating commands and other input signals necessary to fully exercise all functions and components of the particular system or subsystem under test, and to measure or indicate all of the signals, responses and outputs produced by a system by means of indicators such as lamps, meters, oscilloscopes, or gages. It will be acceptable to require a visual check for system response such as closure of a contactor, provided that the responding item of equipment does not require removal of other equipment or use of hand tools to permit observation of response, and does not require the maintenance technician to move more than 15 feet (4.6 m) to make the required observation.

When used according to the instructions supplied by the Contractor, each PTE shall enable the maintenance technician to fully check and calibrate the system or subsystem under test and to locate and replace any removable component which has fully or partially failed. Response indicators and input-signal generators shall be built into the PTEs to the maximum extent possible, and shall have accuracy commensurate with the alignment tolerances specified.

~~22.5.3.3~~22.5.4.3 Physical Requirements

PTE shall perform under the environmental conditions imposed by the activities of the NPT System equipment field environment and repair facility. PTE shall be portable and suitable for industrial service for use on the shop floor, station environment, and use in the bus yard. The test equipment shall be self-protected in the event of an overload or short circuit condition.

The laptop PC PTEs shall, as a minimum, be state of the art at time of delivery and shall include RAM and hard storage capable of storing all system and subsystem test software and fault log downloads from an entire workshift.

Each PTE shall be housed in an aluminum or fiberglass suitcase-type enclosure with a removable cover suitable for use in a shop environment and as manufactured by Zero Manufacturing Co., Skydyne, or approved equal. All meters supplied as part of the PTEs shall be of a variety capable of withstanding industrial service.

The weight for any PTE shall not exceed 10 lbs. (13.6 kg) without the prior approval of SEPTA. If a supplier of equipment has developed an acceptable PTE for use with similar equipment on a previous contract, and the supplier plans to utilize the same design for this contract, and the weight of the unit is not more than 20 percent above the specified weight limitation, the Contractor may seek SEPTA's approval to utilize the existing PTE design.

~~22.5.3.4~~22.5.4.4 Cables

External hook-up multi-conductor cables shall be furnished to connect the NPT System equipment with the PTE. A minimum number of cable connections shall be used to connect the test equipment to the systems under test. Cables shall be flexible, abrasion resistant, and oil resistant. The connecting cables and hoses shall be stored within the PTE case.

The Contractor shall not require connection of external apparatus to the PTEs without the prior written approval of the SEPTA. In such cases, terminals shall be provided to allow connection of the required apparatus to the PTEs. However, such apparatus shall be considered part of the PTEs and shall be supplied with it on a one-to-one basis.

~~22.5.4~~22.5.5 Maintenance Support Device

The NPT System shall include a Maintenance Support Device (MSD) to assist the SEPTA maintenance personnel with corrective and preventive maintenance. The MSD shall interface with the Equipment Maintenance and Inventory Control System (EMICS), as specified in Section 19.6.4 and provide additional support for the maintenance of the NPT System. This additional support shall include, but not be limited to, work order processing and storage, and display of information from the maintenance and operational manuals. The MSD shall:

- Obtain health and status information from all equipment located at a station, via the wireless data network;

- Accept work order information from EMICS, via the wireless data network at a station, Bus Depot, Trolley Barn or other maintenance location within range of the wireless data communication system;

- Read bar coded information on the equipment and spare parts and store and transfer this information as required by SEPTA to support the EMICS;

- Interface with every type of NPT equipment and perform diagnostic routines and identify equipment problems;

- Permit the maintainer to enter all necessary data to complete the work order, to close the work order and transfer the data to the EMICS;

- Store and display, for maintainer review, the information in the maintenance and operations manuals; and

- Via the communications network, interface with the library workstations as specified in Section 23.6 to obtain updates to the maintenance and operational manuals.

~~22.5.4.1~~22.5.5.1 Hardware Requirements

To ensure proper operation and the ability to support the needs of the NPT System, the MSD shall:

- Be military grade equipment. It shall be designed and is intended for use in an industrial environment.

- Be provided with a rugged storage case for easy transport;

- Accept and store data through the use of a touch screen;

- Incorporate a bar code reader to read identification tags of equipment (see Section 6.7) and store this information in the electronic work order information for transfer to the CDCRS. Code 39 symbology;

- Incorporate a Smart Media Processor, as identified in Section 4, as a peripheral or integral element of the MSD, based on the processing unit employed;

- Provide an interface common to all NPT equipment to permit diagnostics to be run and maintenance data to be gathered. and

- Accommodate additional third party peripherals as required to expand the functionality as desired by SEPTA.

The Contractor shall provide details on all hardware elements of the MSD to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 22-1, FDR 22-10**

~~22.5.4.1.1~~22.5.5.1.1 User Interface

The MSD display shall provide users with instructions, prompts, and transactional information. The display shall be a touch screen display with a minimum 11-inch (as measured diagonally) viewing surface. The MSD shall be easily read under all conditions of ambient light throughout the day and night. It shall provide for a full-page view of the information within a manual.

Displayed messages shall be easily modifiable by SEPTA once the system is in operation. All prompts, instructions, displays, message formats, sample character fonts, and contents shall be subject to SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 22-2, FDR 22-11**

~~22.5.4.1.2~~22.5.5.1.2 Smart Media Processor

The MSD shall have a commercially available ISO/IEC-14443 compliant Type A and B contactless Smart Media processor (SMP) as identified in Section 4. The SMP shall be integral to the MSD.

The external antenna shall not protrude from the exterior of the MSD enclosure and shall be made of materials that are impervious to weather conditions and resist overt vandalism.

The SMP 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 maintain compatibility with ISO/IEC-14443 standards as they develop.

~~22.5.4.1.3~~22.5.5.1.3 Electronic Control Unit

For the Electronic Control Unit (ECU), which controls all aspects of the MSD, a microprocessor-based system shall be provided to control all functions. The microprocessor shall be commercially available and specifically designed for its intended use, that being continuous operation in the specified environment.

The ECU shall have sufficient RAM to avoid the use of virtual memory as a means of temporarily supplementing RAM during normal operations. The ECU shall permit plug-in upgradeability to double the amount of memory initially supplied, including memory for both primary and redundant data storage.

~~22.5.4.2~~22.5.5.2 Software Requirements

The MSD shall provide the following functionality, as a minimum:

- The MSD shall not be operational until a proper log-on has been made to the MSD by a valid user. To activate the MSD for use, the user shall log-on to the device with, as a minimum, a username, and password. Smart Media may also be used as part of the log-on process but a portion of the log-on shall require data entry by the user, for security purposes;
- All data entered into the MSD shall be stored as part of a transaction record (e.g., maintenance record, diagnostics record, work order);
- All data and activity performed after user log-on but before log-off shall be assigned to that user;
- Maintainer shall be able to enter and review work order information assigned to that maintainer. Maintainer shall also have the opportunity to update work orders and create new work orders, based on privileges defined by SEPTA for each maintainer or group of maintainers;
- Work order information shall be transferred between the CDCRS and the MSD shall occur when connection can be made through the wireless data network;
- All data stored in the MSD shall be transferred to the CDCRS when the MSD is returned to one of the central maintenance locations identified by SEPTA.~~;~~

Contractor shall provide details on all software elements of the MSD to SEPTA for review at the Preliminary Design Review and for approval at the Final Design Review. **PDR 22-3, FDR 22-12**

~~22.5.4.3~~22.5.5.3 Power Requirements

The HSD shall utilize one or more portable batteries to power the device. These batteries shall provide power to operate the MSD for not less than ten (10) continuous hours, with the read heads and any backlight activated not less than 50% of the time. Battery recharging shall take place in charging/data cradles while the batteries are located in the devices.

When the MSD has been inactive for a SEPTA-adjustable period (initially set to 5 minutes), they shall revert to a sleep mode requiring depression of a designated key to activate each unit. User log-on shall not be again required if the MSD is in the sleep mode as described below.

A sleep mode shall be provided, which after a SEPTA-adjustable period in that mode (initially set to 30 minutes), the MSD shall shut down completely, and shall require the user to log on to the MSD after restoring power.

It shall not be necessary, but it shall be possible, to remove the batteries from the MSD to perform recharging. Full recharging of batteries shall require no more than six (6) hours. Batteries shall not hold a recharging memory (i.e., batteries shall be able to recharge at any time for any length of time without deteriorating the recharging life of the battery).

As a minimum, two sets of rechargeable batteries shall be provided for each MSD. All required hardware for recharging the MSD using a standard 110VAC outlet shall be provided for each MSD.

~~22.5.4.4~~22.5.5.4 Data Communications

The MSD shall communicate with the CDCRS to suit the needs of the NPT System. This shall include, as a minimum, communication:

- Via the Wireless Broadband System;
- Via the Local Wireless System; and
- Via a direct, wired connection to the NPT System network.

The Wireless Broadband System and Local Wireless System are outlined in Section 18. The MSD shall be equipped to handle communications with any of the above communications methodologies at any time. In the event both wireless and wired communications methods are available concurrently, the MSD shall automatically defer to wired communications.

~~22.5.5~~22.5.6 Media Compatibility Verification System

~~22.5.5.1~~22.5.6.1 General

The NPT System shall accommodate a large variety of Smart Media, including those from potential partners. In order to ensure that the NPT System can properly read and process all smart media as desired by SEPTA, and that the NPT System equipment is capable of detecting improperly encoded, expired, counterfeit, and defective Smart Media, a Media Compatibility Verification System (MCVS) shall be provided by the Contractor.

~~22.5.5.2~~22.5.6.2 Functionality

This MCVS shall enable SEPTA to quickly and easily verify that Smart Media can be properly processed by the NPT devices, and identify what problems exist for those Smart Media, which cannot be processed. The MCVS shall operate only when in communication with the CDCRS and a valid user has properly signed-on.

The MCVS shall have the following functions:

- Read Smart Media and display, in a readable form, the contents and labels of all data fields encoded on the media and
- Verify that Smart Media is valid according to SEPTA's fare policies and the requirements of the NPT System;
- Easily identifies any data fields and elements that are invalid;
- Creates and modifies Smart Media with valid or invalid data, including Smart Media of types and categories not in revenue service but supported by the ~~Smart Media encoding format~~NPT fare table;

- Processes ~~Long-term Use Smart~~SEPTA Issued Smart Media, Partner Smart Media, ~~Limited Use,~~ and other forms of ISO 14443-compatible Smart Media, including NFC.

For special test purposes, the MCVS operator shall have the capability to change variable data on ~~a s~~Smart ~~card~~Media, in order to create "fraudulent" or "expired" ~~cards~~ Media and to test the treatment of those ~~cards~~ Media by the field devices.

Software for the MCVS shall be subject to SEPTA review at the Preliminary Design Review and approval at the Final Design Review. **PDR 22-4, FDR 22-13**

~~22.5.5.3~~22.5.6.3 Hardware

The MCVS shall be comprised of a desktop computer interfaced with a Smart Media Processor. This unit shall be suitable for desktop mounting. The MCVS shall be based on GUI software and utilize third party components. No propriety hardware shall be incorporated into the MCVS and all hardware components shall be available from at least three (3) suppliers other than the Contractor.

The MCVS shall be not operate in the off-line mode but must be connected to the CDCRS in order to function. All data from the operation of the MCVS, from log on to log off, shall be immediately transferred upon generation to the CDCRS and displayed to the appropriate SEPTA individual. Data generated at the MCVS shall not be co-mingled with SEPTA revenue and ridership data.

Hardware for the MCVS shall be subject to SEPTA review and approval at the Preliminary Design Review. **PDR 22-5**

~~22.5.5.4~~22.5.6.4 User Interface

The MCVS shall provide a simple user interface consisting of a series of field names and values. The field names shall correspond to the data fields encoded on the Smart Media, and shall be easily understood (acronyms and abbreviations shall be kept to a minimum). ~~-~~Each data field on the Smart Media shall be included in the MCVS user interface.

The MCVS shall automatically detect and display the proper screen or screens to depict the encoding format of the Smart Media being evaluated.

The design and layout of all MCVS screens shall be subject to SEPTA review at the Preliminary Design Review and SEPTA approval at the Final Design Review. **PDR 22-6, FDR 22-14**

22.5.7 Simulator Lab

A Simulator Lab shall be provided for the NPT system. This lab shall include at least two (2) operable items for each type of NPT equipment as well as an additional full CDCRS. **CDRL 22-9** ~~**CDRL 22-9**~~

The Simulator Lab shall not be used by the NPT Contractor for training purposes.

Associated cabling and control systems shall be provided to permit the equipment to be activated as a complete NPT system and to permit testing of all functions as identified in these specifications as well as training SEPTA personnel by SEPTA-designated personnel.

The lab shall also be used to observe and verify the operation of NPT devices and interactions between NPT devices as updated versions of software are deployed within the NPT System. The Simulator Lab shall be used to perform an exhaustive pre-revenue service test for each new NPT device functionality and each new software version prior to deploying these in the live NPT System service environment.

All problems and errors identified during the pre-revenue service tests of devices and software shall be corrected and verified as correct prior to the installation of the function and/or software into revenue service. In addition, the pre-revenue testing shall include regression testing to ensure that the updated functionality does not adversely impact any other pre-deployed function.

The design and layout of the Simulator Lab shall be subject to SEPTA review at the Preliminary Design Review and SEPTA approval at the Final Design Review. **PDR 22-7, FDR 22-15**~~**5**~~

22.6 Technical Documentation Library Workstations

Five (5) sets of Windows® based library workstations shall be supplied by the Contractor to support SEPTA's maintenance of documentation associated with the NPT System inclusive of all manuals, drawings, schematics, and training materials. Delivery of all five (5) sets of library workstation equipment shall coincide with the delivery of DVD's of the final manuals and catalogs. The library workstations shall be able to interface with the Maintenance Support Device, specified in Section 22.5.4, for transfer of maintenance and operational information, including updates of the operations and maintenance manuals.

The library workstation equipment shall enable SEPTA's personnel to view manuals and drawings on DVD, including all manuals, training materials and documentation defined in Sections 22 and 23. SEPTA personnel shall also be able to review and make revisions ~~and all training materials, make revisions and add new information to both paper and~~the source files of all NPT System electronic documents. The library workstation shall be delivered preinstalled with all necessary software (including all necessary licenses) to support SEPTA's ability to store, manage, review, modify and print all documentation delivered under the NPT System Contract.

Each library workstation shall be a state-of-the-art Windows-based PC as available at the time of delivery of the equipment to SEPTA. In addition, each library workstation shall include two (minimum) 300GB EIDE Hard Drives in place of the above-specified hard drive, a high-speed multi-disc with the capacity to hold all NPT System documentation discs simultaneously with at least one disk slot remaining available. The library workstations shall be delivered with a state-of-the-art remote data back-up system. ~~and a minimum 10 GB DAT backup tape drive. A~~Additionally a medium speed (8-10 page per minute), 600 dots per inch resolution laser printer shall be included for making hard copies of desired output. Microsoft Office® release shall be installed on each PC, release approved by SEPTA.

Five (5) DVD writer drives with all necessary cables, pre-mastering/mastering software shall also be provided. As a minimum, the drives shall be the equivalent of the year 2010 models capable of reading at 32X, writing at 8X and re-writing at 4X. It shall be capable of multi-session recording, on–the–fly recording, incremental packet writing, and disc–at-once/track–at-once recording. A minimum of 500 recordable DVD discs are to be supplied with each drive.

Section 23 – Training
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23 TRAINING

The Contractor shall provide a comprehensive program to educate and train SEPTA-designated personnel to operate, service, support, and maintain the New Payment Technologies (NPT) ~~equipment and system~~ System and equipment satisfactorily.

~~These~~ SEPTA-designated personnel shall include SEPTA employees as well as employees for contracted services and other individuals or entities as defined by SEPTA. This training program shall incorporate two training ~~session~~ methodologies:

A. training sessions provided by the NPT Contractor directly to SEPTA-designated training staff to enable SEPTA training staff to perform subsequent training in a train-the-trainer manner; and

~~A.~~B. training sessions provided by the NPT Contractor directly to SEPTA-designated personnel.

Training shall be provided as identified in Table 23-1.

Provision of training and delivery of training materials shall follow the ~~deployment~~implementation phases as identified in Section 21. For each of these phases, draft and final training documentation shall be provided to reflect the changes incorporated into each implementation phase.

Training for each phase shall include only those NPT System elements, which are included in that implementation phase unless approved otherwise by SEPTA prior to the commencement of any training. In addition, for all phases after the first phase, the Contractor shall include refresher training for those functions and features identified by SEPTA ~~as necessary,~~ not less than sixty (60) days prior to the commencement of the training for that phase.

Where training documentation is not affected by phased implementation of equipment and/or functionality, the training documentation shall not require any revision by the Contractor.

23.1 General Training Requirements

The Contractor shall be responsible for the following ~~training needs throughout all training activities~~:

A. Course development and modification;

B. Providing qualified instructors;

C. Generating and supplying handouts, manuals, classroom aids and training aids;

D. Supplying training materials for each trainee for each training session;

E. Conducting the necessary training sessions for each phase of implementation;

F. Providing training tests to ~~Testing trainees to~~ verify ~~personnel~~ proficiency;

G. Providing follow-up training sessions as required prior to completion of training for each phase;

H. Documenting, via DVD, a~~t least~~ minimum of one of each ~~type~~ of the different training sessions provided.

Training shall be provided by the NPT Contractor to bring SEPTA-designated personnel to the level of proficiency required for performing their respective duties.

The ~~NPT System training program shall be~~training sessions based on the "Train the Trainer" philosophy ~~to~~ shall allow future training ~~programs~~ courses to benefit fully from the NPT System training materials provided. SEPTA training personnel who will be responsible for training other SEPTA-designated personnel shall also receive instruction designed to enable them in turn to ~~perform~~ provide ~~NPT System program~~ training of all types of SEPTA-designated individuals.

The Contractor shall assume no knowledge of the features of the NPT System equipment on the part of the SEPTA-designated personnel, and shall design the training program to bring the level of student knowledge to one fully adequate for the objective. The Contractor may assume that all personnel possess the basic qualifications of their positions. ~~The Contractor's approach to this effort shall be based on the assumption that the Contractor's own interests, immediate and ultimate, are best served by a satisfactory training program.~~

~~Training shall be provided to bring SEPTA-designated personnel to the level of proficiency required for performing their respective duties.~~

All training ~~presentations and~~ materials shall be in English and shall use English measurements. Practical "hands-on" training ~~on~~ using the actual equipment, systems, and software shall occupy a significant portion of all training classes where appropriate. Hands-on training shall be provided for all lessons that involve all aspects of the system operation, maintenance, troubleshooting, setup, modification, and other similar functions that are required for the NPT System. Hands-on training shall also be utilized as a minimum for ~~systems~~ NPT applications, including file generation and revision, uploads and downloads.

The Contractor shall be responsible for providing all training aids and visual aids for the conduct of ~~these~~ all training sessions. At least one session of each different training course shall be ~~videotaped~~ video and audio recorded by the Contractor ~~onto standard DVD~~ and provided on standard DVDs as a deliverable at the completion of each implementation phase as part of the system acceptance for that phase. **CDRL 23-1**

~~All training materials, documents and recordings shall become the property of SEPTA at the conclusion of the training for each implementation phase.~~

~~Training shall be provided to bring SEPTA-designated personnel to the level of proficiency required for performing their respective duties. Formal training shall be augmented by informal refresher training as needed to maintain proficiency through the end of the warranty period.~~

Since the NPT System shall be implemented in several phases, to suit the functional requirements of SEPTA, training shall be provided at each ~~deployment~~implementation phase to ensure that new functionalities are accommodated into SEPTA business processes. All training materials, documents and recordings shall become the property of SEPTA at the conclusion of the training for each implementation phase.

Instruction shall be tailored to the specific needs of each class of personnel to be trained or familiarized on the system and equipment; e.g., maintenance-related emphasis for technicians; revenue collection and reporting emphasis for revenue personnel and management; general overview for executive management.

23.2 Instructor Qualifications

The Contractor shall provide experienced and qualified instructors to conduct all training sessions at locations designated by SEPTA and agreed with the Contractor. Unless otherwise indicated, all training sessions shall be conducted by the Contractor at SEPTA-provided locations within or near the SEPTA operations area. In the event that as permitted by SEPTA, the Contractor ~~elects to~~ provides training at locations which are not in or near the SEPTA operations area, costs for travel and subsistence for SEPTA-designated personnel and Contractor training personnel shall be borne by the Contractor.

The Contractor shall be responsible for insuring that the instructors ~~teaching~~ conducting these training courses are not only familiar with the relevant technical information, but are able to utilize proper methods of instruction, training aids, audiovisuals and other materials to provide for effective training. Instructors shall have performed similar training for other transit clients and shall have a proven, positive track record.

~~SEPTA shall have the right to direct that an instructor replaced, at no cost or schedule impact.~~ The Contractor shall submit ~~proposed instructor~~ qualifications for the proposed instructors, including experience in providing similar training to other clients, for SEPTA ~~approval~~ review at Preliminary Design Review and for approval at Final Design Review. **PDR 23-1, FDR 23-1** Even after an instructor is approved, SEPTA shall have the right to direct that an instructor be replaced, without adverse impact to implementation schedule or total NPT System cost.

Once an instructor is ~~named~~ identified as providing training for the NPT System, no change shall be permitted unless authorized in writing by SEPTA a minimum of thirty (30) days prior to the commencement of the affected training.

23.3 Training Schedule

All training shall be scheduled in coordination with and for approval of SEPTA **CDRL 23-2**. The schedule shall be consistent with the following factors:

A. Production equipment and system software are available to support “hands-on’ classroom training;

B. Completion of training will occur in time for SEPTA-designated personnel to perform their duties related to the new NPT System prior to system implementation;

C. Lag time between training completion and actual use of skills shall be minimal;

D. Availability of existing personnel may be affected by current responsibilities and may limit number of personnel available by time of day;

E. At the discretion of SEPTA, ~~M~~maintenance training shall occur prior to any field equipment installation, with scheduled field time provided for the technicians to observe and monitor equipment installation and acceptance testing rather than as identified in Sections 23.6.6 and 23.6.7;~~;~~

F. Proficiency testing shall be scheduled ~~in the field on installed and tested equipment~~ prior to system implementation.

As directed by SEPTA, the Contractor shall, during each implementation phase and through the warranty period, provide at least five (5) additional refresher-training sessions for all~~of any~~ of the courses provided at no additional cost to SEPTA. These refresher-training sessions shall be held in Philadelphia at SEPTA designated locations and shall accommodate the same number of individuals as the initial training session.

23.4 Training Program Plan

The Contractor shall submit a Training Program Plan for review by SEPTA at the start of the Preliminary Design Review **PDR 23-2** for the initial implementation phase and not less than ninety (90) days prior to commencement of implementation of additional functionality in subsequent phases **CDRL 23-3** The training program plan shall include the following information, as a minimum.

23.4.1 Program Description

A narrative description of the overall approach to the training program shall be provided, including the following:

A. General description of the training program;

B. Identification of all training courses to be provided;

C. Summary course descriptions;

D. Targeted trainees of each session;

E. Maximum number of trainees for each session;

F. Objectives of each class;

G. Sequence of training activities;

H. Training schedule.

23.4.2 Training Schedule

A schedule shall be included in the training program plan for each implementation phase. It shall take into account the training sequence, hours of instruction required for each class, number of personnel to instruct and desired classroom size, and the requirements identified in ~~Table~~ Table 23-1~~23-1~~.

~~It~~ The Training Schedule shall include:

A. ~~-~~the title of the training to be provided~~program~~;

B. general description of program;

C. intended audience; class size;

D. SEPTA facilities required (e.g., classroom size, shop requirements; sequence and timing of classroom, shop and field instruction and estimated hours required for each);

E. number of sessions,

F. prerequisite activities that must be completed in advance of the training; and

G. any other information to facilitate planning for and completion of the training program for each implementation phase.

23.4.3 Course Description

For each training course identified in the program description, the Contractor shall provide the following:

A. An outline of course content;

B. Prerequisite skills and knowledge of course trainees;

C. Training methods to be used (e.g., classroom presentation, hands-on practice, paper and pencil exercises, etc.);

D. Methods and criteria for evaluating performance, including an objective grading system to report progress of trainees during the training;

E. Resources to be provided by Contractor, e.g., system equipment and software, handout material, audio-visual equipment, digital video recorders (for documenting at least one class of each training course);

F. Resources required from SEPTA, including classroom, field and shop space; vehicles, facilities and other necessary items ~~with installed equipment, etc.~~;

G. Approximate time, in days and hours per day, required for classroom and field training for each course.

23.4.4 Contractor's Training Experience

All of the instructors provided by the Contractor shall be fully capable of transmitting in-depth technical information that can be understood by SEPTA participants. A detailed resume for each instructor shall be provided to the SEPTA for approval, 60 days prior to commencement of scheduled course instruction. **CDRL 23-4**

SEPTA will recognize the instructor as qualified when the individual:

A. Can communicate, in English, in a manner that allows the participants to understand;

B. Has been trained in adult teaching principles and methods and has had experience in conducting technical training courses;

C. Has an in-depth knowledge of the NPT system element under discussion, how it interfaces with other systems or subsystems, the procedures for isolating faults and troubleshooting, and is able to communicate that information to students in an effective manner;

D. Is able to design practical and written tests to determine the extent to which students understand and can apply the information that has been taught;

E. Has an in-depth knowledge of SEPTA Policies and Procedures concerning safety and operations.

23.5 Training Course Curricula and Materials

The Contractor shall submit a course curriculum and training materials for the initial implementation phase as a part of the Preliminary Design Review for review and as a part of the Final Design Review for approval by SEPTA. **PDR 23-3, FDR 23-2**

No training shall occur until such training materials have been approved by SEPTA. Training curricula shall be submitted to SEPTA for review and approval purposes not less than sixty (60) days prior to commencement of any training class for the NPT System.

For subsequent implementation phases course curriculum and training materials shall be provided as part of the updated training program plan as identified in Section 23.4. **CDRL 23-5**

The training material for each course shall include the following:

A. **Course Outline and Lesson Plan:** Lesson title, lesson objectives, instructing sequences (outline), tests, trainee competency pass/fail criteria, and summary. Maintenance courses shall include a section devoted to system fault analysis and troubleshooting. Operations courses shall include a section devoted to troubleshooting problems in support of customer assistance.

B. **Instructor Guide:** Used initially by the Contractor instructors, the Instructor Guide shall be in sufficient detail to enable SEPTA training personnel to present the course again at a later time to, in turn, train additional training personnel, newly hired or newly assigned SEPTA-designated personnel.

They shall include as a minimum, schedules for each course, outlines for the training modules, lesson plans, durations of each module, target audience and pre-requisites for each course, objectives, sequential lists of training materials, including instructions on how to present any working models or advanced technology training aids, copies of training aids for presentation (and hard copies for annotation), skills inventories (with answers), references to support materials, and any additional information deemed necessary for accurate reconstruction of the course.

The Instructor Guide should include instructor's notes explaining the methodology to be used for a particular section and information to be emphasized. Particular attention must be paid to safety concerns or dangers within the equipment. The lesson plan shall indicate when training aids will be used, or referred to, during the course instruction.

The Instructor's Guide must note references to the Student Guide. The Instructor Guide shall be reissued and shall include a copy of all information and materials used during the training sessions.

C. **Student Guides**: Student Guides shall be in addition to any manuals provided to participants. The Guides shall include notebook-sized copies of any training aids used by the instructor, including transparencies, annotated schematics, selected screen shots from technology-based training and key clips from video footage.

~~C.~~ The student guide shall also contain descriptive information, drawings and procedures for trainees to refer to during training courses and to assist them in achieving competency in their assigned duties. The student guide shall provide comprehensive information on all aspects of training as identified for each course and may include sections of draft manuals for clarity.

D. **Classroom Training Aids**: Classroom training shall make optimum use of Training Aids which shall include any Power Point presentations or alternate as approved by SEPTA, slides, posters, annotated enlargements of schematics, videos, working models, cutaway diagrams, cutaway views or sectioned sample hardware, custom simulators, computer-based training modules, interactive video or other appropriate technology-based training.

~~D.~~ The Contractor shall provide three-dimensional drawings/renderings of NPT equipment arrangements in electronic format, as approved by SEPTA.

Power Point presentations for use with laptop computer and data projector shall illustrate subassemblies showing component locations, component cutaways, schematics, and wiring diagrams. Power Point presentations depicting data and communications systems shall be animated and include direction of flow for the particular data element.

All illustrations/diagrams shall display NPT equipment in 3-D animation, as they would be seen from the viewpoint of a person actually performing the test, troubleshooting or doing the repair. Any diagrams shall be displayed with sufficient scale and clarity to permit all to see clearly.

E. **Training Support Equipment**: Where an actual set of NPT equipment or special tool/test equipment is planned for use as a training aid, an additional set, specifically for the purpose of training, shall be added to the number required for delivery. Contract spares will not be used for training. In addition, four laptops plus video/data projection equipment shall be provided for the train the trainer program and shall become the property of SEPTA at completion of the training program.

F. **Location:** Unless otherwise indicated, all training sessions shall be provided at SEPTA-provided locations in or near the SEPTA operations area. In the event that the Contractor proposes that training occur in a location, which is not in or near the SEPTA operations area, costs for SEPTA staff travel and subsistence shall be borne by the Contractor. . Note that SEPTA will not permit the NPT Simulator Lab to be used for NPT Contractor training purposes

G. **Times:** Class times shall be scheduled by the Contractor at least 30 days in advance of each class and shall be subject to SEPTA approval.

Training materials shall be kept consistent with system design and documentation, including manuals and drawings. Any updates to the system elements or procedures shall be reflected in the training materials and course curriculum through the completion of the training program, through all implementation phases.

All training materials shall become the property of SEPTA at the conclusion of the training course. All training submissions and schedules shall be subject to approval of SEPTA.

At the completion of all training courses, one set of camera-ready, letter quality originals suitable for reproduction for all training materials shall be delivered to SEPTA in addition to the final electronic versions of the training materials. SEPTA reserves the right to reproduce these materials for its use.

~~23.6Technical Documentation Library Workstations~~

~~Five (5) sets of Windows® based library workstations shall be supplied by the Contractor to support SEPTA's maintenance of documentation associated with the NPT System inclusive of all manuals, drawings, schematics, and training materials. Delivery of all five (5) sets of library workstation equipment shall coincide with the delivery of DVD's of the final manuals and catalogs. The library workstations shall be able to interface with the Maintenance Support Device, specified in Section 22.5.4, for transfer of maintenance and operational information, including updates of the operations and maintenance manuals.~~

~~The library workstation equipment shall enable SEPTA's personnel to view manuals and drawings on DVD, including all manuals and documentation defined in Section 22 and all training materials, make revisions and add new information to both paper and electronic documents. The library workstation shall be delivered preinstalled with all necessary software (including all necessary licenses) to support SEPTA's ability to store, manage, review, modify and print all documentation delivered under the Contract.~~

~~Each library workstation shall be a state-of-the-art Windows-based PC as available at the time of delivery of the equipment to SEPTA. In addition, each library workstation shall include two (minimum) 300GB EIDE Hard Drives in place of the above-specified hard drive, a high-speed multi-disc with the capacity to hold all NPT System documentation discs simultaneously with at least one disk slot remaining available and a minimum 10 GB DAT backup tape drive. Additionally a medium speed (8-10 page per minute), 600 dots per inch resolution laser printer shall be included for making hard copies of desired output. Microsoft Office® release shall be installed on each PC, release approved by SEPTA.~~

~~Five (5) DVD writer drives with all necessary cables, pre-mastering/mastering software shall also be provided. As a minimum, the drives shall be the equivalent of the year 2008 models capable of reading at 32X, writing at 8X and re-writing at 4X. It shall be capable of multi-session recording, on the fly recording, incremental packet writing, and disc at-once/track at-once recording. A minimum of 500 recordable DVD discs are to be supplied with each drive.~~

~~23.7~~23.6 Training Courses

The Contractors shall provide the courses identified in Table 23-1~~Table 23-1Table 23-1~~. ~~Descriptions of each type of training course are provided in the following sections. More than one class is identified for a particular type of course in most cases, due to the specific skills and personnel associated with the equipment.~~

~~The Contractor responsible for each class~~ For each class trained by the Contractor the Contractor shall provide hard-copy sets of student training materials for each identified class in quantities equal to the number of trainees identified in the table, plus an additional five (5) copies. Contractors shall also provide two electronic copies of the training materials ~~(on separate labeled DVDs~~ for each training class~~)~~ that are readable and reproducible in hard copy using the latest release of Adobe Acrobat Reader® available for usage by the general population or SEPTA-approved equivalent ~~and readily available~~ software.

~~In addition to the copies of student training materials, f~~Five (5) hardcopy sets of instructor's materials for each class shall also be provided to SEPTA.

Table 23-1 - Required Training

Training Class	Trainees	Train the Trainer	Section	No. of Trainees	Hours Per Class (per Device)	Quantity of Devices	Hours per Class	Estimated Attendees per Class	Class Sessions	Required Refresher Courses	Total Classes Required	Initial Student Training Materials
NPT System Overview	SEPTA Management and executive staff, third party sales agents	Yes	23.6.1	5	4	1	4	5	1	3	4	50
Surface Fleet Operations and Customer Assistance	Surface Fleet Operators, Supervisors	Yes	23.6.2	5	2	1	2	5	1	3	4	2200
Subway/Elevated Operations and Customer Assistance	Station Agents, Sales Agents (including third party), SEPTA Management	Yes	23.6.3	5	4	4	8	5	1	3	4	400
Railroad Operations and Customer Assistance	Railroad Conductor Staff and Supervisors	Yes	23.6.4	5	4	5	12	5	1	3	4	400
Parking Operations and Customer Assistance	Parking Operations and Management Staff	Yes	23.6.5	5	4	5	8	5	1	3	4	50
Field Maintenance	Maintenance Staff, SEPTA Management	No	23.6.6	50	40	8	320	10	5	3	8	50
Shop Maintenance	Maintenance Staff, SEPTA Management	No	23.6.7	50	40	8	320	10	5	3	8	50

Training Class	Trainees	Train the Trainer	Section	No. of Trainees	Hours Per Class (per Device)	Quantity of Devices	Hours per Class	Estimated Attendees per Class	Class Sessions	Required Refresher Courses	Total Classes Required	Initial Student Training Materials
Revenue Servicing of NPT Devices	Revenue, Internal Audit, Revenue Mgt.	Yes	23.6.8	5	4	4	12	5	1	3	4	20
Cash Room Operations	Revenue, Finance, Int. Audit	Yes	23.6.9	5	4	1	4	10	1	3	4	10
Revenue Reconciliation & Reporting	Revenue, Finance, Int. Audit, IT	Yes	23.6.10	5	8	2	8	10	1	3	4	20
CDCRS Systems Management Course	IT Systems, Int. Audit, SEPTA Management,	No	23.6.11	25	64	1	64	5	5	3	8	25
Network Administration Course	IT Systems, Int. Audit, SEPTA Management,	No	23.6.12	25	80	1	80	5	5	3	8	25
System Administration Course	IT Systems, Int. Audit, Controller, SEPTA Management,	No	23.6.13	25	64	1	64	5	5	3	8	25
Account and Fare Media Management	SEPTA Operations, CCT Operations, Human Resources, Revenue, Accounting, Customer Service, IT	No	23.6.14	25	64	1	64	5	5	3	8	25

Training Class	Trainees	No. of Trainees	Section
SEPTA System Overview Course	SEPTA Management and executive staff, third party sales agents	50	23.7.1
Surface Fleet Operations and Customer Assistance	Surface Fleet Operators, Supervisors	2,200	23.7.2
Subway/Elevated Operations and Customer Assistance	Station Agents, Sales Agents (including third party), SEPTA Management	400	23.7.3
Railroad Operations and Customer Assistance	Railroad Conductor Staff and Supervisors	400	23.7.4
Parking Operations and Customer Assistance	Parking Operations and Management Staff	50	23.7.5
Station Operations and Customer Assistance	Station Agents, Sales Agents (including third party), SEPTA Management	400	23.7.6
Field Preventive Maintenance for NPT Devices	Maintenance Staff, SEPTA Management	50	23.7.7
Field Troubleshooting and Field Corrective Maintenance for NPT Devices	Maintenance Staff, SEPTA Management	50	23.7.8
Bench-level Preventive Maintenance for NPT Devices	Maintenance Staff, SEPTA Management	50	23.7.9
Bench-level Corrective Maintenance for NPT Devices	Maintenance Staff, SEPTA Management	50	23.7.10
Bench-level Overhaul for NPT Devices	Maintenance Staff, SEPTA Management	50	23.7.11
Revenue Servicing of NPT Devices	Revenue, Internal Audit, Revenue Mgt.	20	23.7.12
Cash-room Operations	Revenue, Finance, Int. Audit	10	23.7.13
Revenue Reconciliation & Reporting	Revenue, Finance, Int. Audit, IT	20	23.7.14
CDCRS Systems Management Course	IT Systems, Int. Audit, SEPTA Management,	25	23.7.15
Network Administration Course	IT Systems, Int. Audit, SEPTA Management,	25	23.7.16
System Administration Course	IT Systems, Int. Audit, Controller, SEPTA Management,	25	23.7.17
Account and Fare Media Management	SEPTA Operations, CCT Operations, Human Resources, Revenue, Accounting, Customer Service, IT	25	23.7.18

~~23.7.1~~23.6.1 NPT System Overview ~~Course~~

Contractor shall provide an introductory training course to management and supervisory personnel on the NPT System as well as all devices deployed within the system. Focus of the course shall include all elements of NPT Equipment operation and shall be based on the NPT System Overview Manual defined in Section 22. Contractor shall assume that all trainees have a management level of education and experience. ~~The Contractor shall provide a minimum of four (4) hours of this training.~~

~~23.7.2~~23.6.2 Surface ~~Fleet~~ Operations and Customer Assistance~~Course~~

The Contractor shall provide a training course to SEPTA personnel for the operation of Surface ~~Fleet~~ NPT equipment and assistance of customers with Surface ~~Fleet~~ equipment-related problems. Training shall focus on understanding the operation of the equipment to provide customer assistance with problem resolution.

The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.

~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment.~~

~~23.7.3~~23.6.3 Subway ~~/~~ Elevated Operations and Customer Assistance~~and Customer Assistance Course~~

The Contractor shall provide a training course to SEPTA personnel for the operation of Subway~~ / /~~Elevated NPT equipment and assistance of customers with Subway/Elevated equipment-related problems. Training shall focus on understanding the operation of the equipment to provide customer assistance with problem resolution.

The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.

~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment.~~

~~23.7.4~~23.6.4 Railroad Operations and Customer Assistance ~~Course~~

The Contractor shall provide a training course to SEPTA personnel for the operation of Railroad NPT equipment and assistance of customers with Railroad equipment-related problems. Training shall focus on understanding the operation of the equipment to provide customer assistance with problem resolution.

The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.

~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment.~~

~~23.7.5~~23.6.5 Parking Operations and Customer Assistance ~~Course~~

The Contractor shall provide a training course to SEPTA personnel for the operation of Parking NPT equipment and assistance of customers with Parking equipment-related problems. Training shall focus on understanding the operation of the equipment to provide customer assistance with problem resolution.

The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.

~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment.~~

~~23.7.6Stations Operations and Customer Assistance Course~~

~~The Contractor shall provide a training course to SEPTA personnel for the operation of Stations NPT equipment and assistance of customers with Stations equipment-related problems. Training shall focus on understanding the operation of the equipment to provide customer assistance with problem resolution.~~

~~The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.~~

~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment.~~

~~23.7.7~~23.6.6 Field ~~Preventive~~ Maintenance for NPT Devices

The Contractor shall provide a training course to SEPTA personnel for performance of all ~~preventive~~ maintenance on NPT devices in a field environment. The training program shall be centered on the field ~~preventive~~ maintenance manual developed under the requirements of Section 22. This training shall cover:

A. power, wiring and connections, software, and communications;

B. preventive maintenance of the NPT equipment;

C. fingertip and first line maintenance;

D. equipment diagnostics and troubleshooting;

E. corrective maintenance; and

F. LLRU change-out.

The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.

~~The Contractor shall provide a minimum of forty (40) hours of training for each type of NPT equipment.~~Field maintenance training, approximately 40 hours per equipment type, shall commence not more than four (4) months prior to the expiration of the warranty or any Contractor provided maintenance period, whichever is later.

~~23.7.8Field Troubleshooting and Corrective Maintenance for NPT Devices~~

~~The Contractor shall provide a training course to SEPTA personnel for performance of corrective maintenance on NPT devices in a field environment. This course shall be provided to individuals tasked with the responsibility for field maintenance and module change-out for the equipment in the NPT System. The training program shall be centered on the field corrective maintenance manual developed under the requirements of Section 22, and shall focus on understanding the operation of the equipment to enable staff to perform fingertip and first line maintenance to keep the NPT equipment in service as much as possible.~~

~~The following will be provided as a part of the training course:~~

~~A. Instruction in power, wiring and connections, software, and communications;~~

~~B. Detailed instruction in module change-outs;~~

~~C. Detailed instruction in use of machine diagnostics and field troubleshooting; use of any special tools, software, or equipment for diagnostics.~~

~~The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.~~

~~A minimum of 40 hours of this instruction shall be provided for each NPT device deployed in the SEPTA operating environment.~~

~~23.7.9~~23.6.7 Shop Maintenance ~~Bench-level Preventive Maintenance~~ for NPT Devices

The Contractor shall provide a training course to SEPTA personnel for performance of ~~bench-level preventive~~ maintenance on NPT devices in a SEPTA shop environment. The training program shall be centered on the ~~bench-level preventive~~ shop maintenance manual developed under the requirements of Section 22 so that for each LLRU SEPTA maintenance personnel will be able to effectively service, inspect, maintain, adjust, troubleshoot, repair, and replace components. This training shall cover:

A. preventive maintenance;

B. in-shop repair and trouble diagnosis; and

C. module overhaul.

~~The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.~~

~~**23.7.10 Bench-level Troubleshooting and Corrective Maintenance for NPT Devices**~~

~~The Contractor shall provide a training course to SEPTA personnel for performance of bench-level troubleshooting and corrective maintenance on NPT devices in a SEPTA shop environment. The training program shall be centered on the bench-level troubleshooting and corrective maintenance manual developed under the requirements of Section 22.~~

~~The purpose of this course shall be to provide adequate instruction for the in-shop repair and trouble diagnosis down to each lowest level replaceable unit (LLRU) for each type of NPT equipment. The shop maintenance repair training course shall utilize the Maintenance Manual so that SEPTA maintenance personnel will be able to effectively service, inspect, maintain, adjust, troubleshoot, repair, and replace down to the LLRU.~~

The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.

The shop maintenance repair-training course shall instruct personnel in the proper use of using the Test Equipment. ~~A minimum of 40 hours of this training shall be provided for each NPT device deployed in the SEPTA operating environment.~~

Shop maintenance training, approximately 40 hours per equipment type, shall commence not more than four (4) months prior to the expiration of the warranty or any Contractor provided maintenance period, whichever is later.

~~23.7.11Bench-level Overhaul of NPT Devices~~

~~The Contractor shall provide a training course to SEPTA personnel for performance of bench-level overhaul of NPT devices in a SEPTA shop environment. The training program shall be centered on the bench-level overhaul manual developed under the requirements of Section 22.~~

~~The training shall take place using actual NPT equipment. At least two (2) units of each type of NPT equipment shall be supplied for the training and this equipment shall be provided for the entire period of the training.~~

~~The shop maintenance repair training course shall instruct personnel in the proper use of using the Test Equipment. A minimum of 40 hours of this training shall be provided for each NPT device deployed in the SEPTA operating environment.~~

~~23.7.12~~23.6.8 **Revenue Servicing ~~Course~~**

The Contractor shall provide training classes for the complete revenue service operation at stations and at other locations where revenues are collected using the NPT equipment. For the station and other "fixed location" equipment, this training shall cover all aspects of the media stock replacement, revenue container exchange, and of cash room processing.

The training program shall be centered on the Revenue ~~Service manual~~Service manual developed under the requirements of Section 22.~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment.~~

~~23.7.13~~23.6.9 **Cash R~~r~~oom Operations ~~Course~~**

The Contractor shall provide training classes on the safe and proper operations of all new Cash R~~r~~oom equipment provided under the Contract.

The training program shall be centered on the Cash ~~r~~Room ~~equipment~~ operations manual~~s~~ developed under the requirements of Section 22, and shall be performed in SEPTA's Cash ~~r~~Room using the actual delivered equipment.

~~The Contractor shall provide a minimum of four (4) hours of training for each type of NPT equipment~~.

~~23.7.14~~23.6.10 Revenue Reconciliation and Reporting ~~Course~~

In addition to the standard revenue service training, a separate training session shall be provided by the Contractor to selected SEPTA personnel for reconciliation of the revenues collected by the NPT sales devices, the Internet services and all credit card/debit card accepting devices.

The training program shall be centered on the Revenue Reconciliation manual developed under the requirements of Section 22

This shall cover all aspects of the cash reconciliation and the settlement process, including generation and interpretation of all related reports. Training materials shall be identified as "CONFIDENTIAL" and shall be sequentially numbered. A minimum of eight (8) hours of training shall be taught to Revenue Department supervisory personnel.

~~23.7.15~~23.6.11 CDCRS Systems Management ~~Course~~

The Contractor shall provide an experienced and qualified instructor who shall conduct training classes for the operation of all CDCRS components. The purpose of the training classes is to familiarize and train SEPTA personnel who will be operating the CDCRS.

Training shall be provided to fully familiarize IT, operations, planning, finance and other SEPTA-designated personnel with all aspects of the system software including the structure of the applications, tables utilized, network connections and settings, wireless communications protocols, as well as other similar information.

The training plan and training documentation shall be approved prior to the training. The trainer for this course shall be well versed in Microsoft® SQL Server 2008 software as well as all other third-party software systems and application software, since information shall be highly technical and more than just end-user type training. The trainees shall receive a minimum of sixty-four (64) hours of instruction by the Contractor to provide the necessary training for complete understanding and proficiency for the CDCRS operation.

At the conclusion of training, the involved SEPTA personnel, including the Database Administrators and Programmer Analysts shall have thorough understanding of:

A. NPT System limitations;

B. Applications' architectures;

C. Data flows;

D. Internal and external interfaces;

E. Communications protocols (wired and wireless);

F. Development tools used;

G. Directory structures;

H. Processing scripts;

I. Data dictionaries;

J. System flows;

K. Table structures and relationships;

L. Table growth;

M. Data conversion methods;

N. Recommended backup strategies;

O. Application programs.

Data diagrams shall be developed and provided to SEPTA as a part of the training materials. All programs shall be defined and described fully showing all inputs/outputs, samples of reports, logic flows and major functions described, as well as assumptions used during program development. Detailed system functional requirements shall also be provided.

~~23.7.16~~23.6.12 Network Administration ~~Course~~

The Contractor shall provide a course to familiarize personnel with the operation and management of the NPT Networks. The course shall be comprehensive and cover all functions related to the NPT Networks.

The course shall be designed so that, upon completion, a technician with a basic education in electronic fundamentals will be qualified to perform all levels of installation/setup, maintenance, and trouble-shooting of the equipment down to the component level for NPT Network and associated components.

This course, shall at a minimum, include the theory of operation and practical maintenance procedures for the NPT Networks.

The course shall be conducted in phases or levels and shall be designed to move from more general to specific information as the course progresses, with sensitive information to be discussed as the last element of the course.

The training program shall be centered on the Cash Room operations manual developed under the requirements of Section 22. The Contractor shall provide a minimum of eighty (80) hours of basic training. Additional training shall be provided for the security-sensitive information to be provided to authorize users only and this training shall be in addition to the basic training.

~~23.7.17~~23.6.13 System Administration ~~Course~~

The Contractor shall provide training ~~a course~~ to familiarize personnel with CDCRS ~~the~~ operation and management ~~of the CDCRS~~. T~~he course~~raining shall ~~be comprehensive and~~ cover all CDCRS functions ~~of the CDCRS,~~ including but not limited to:

A. Field device components and sub-systems monitoring and condition and status querying;

B. Device software configuration and downloading;

C. Remote control of device functions and operations;

D. Preparation and generation of Systems Reports;

E. All system programs, their operations, and execution;

F. Interpretation and understanding of all status messages, alarms, events, and indicators;

G. System and equipment restarting and rebooting;

H. Fare Media Management;

I. Data analysis and understanding;

J. Control of passwords for authorized personnel;

K. Security features and operations for authorized personnel;

L. Troubleshooting procedures and status monitoring.

The course shall be conducted in phases or levels and shall be designed to move from more general to specific information as the course progresses, with sensitive information to be discussed as the last element of the course.

All commercial programs used as part of the Data System shall have self-directed tutorial routines, where available, and on-line help routines as part of their software and documentation. All user programs delivered with the System shall include on-line, context sensitive help routines as part of their software.

The Contractor shall provide a minimum of 64 hours of basic training. Additional training shall be provided for the security-sensitive information to be provided to authorize users only and this training shall be in addition to the basic training.

~~23.7.18~~23.6.14 Account and Fare Media Management ~~Course~~

The Contractor shall provide a course to familiarize personnel with methodology and systems by which SEPTA shall manage of all types of fare media as well as SEPTA's accounts associated with the Fare Media. In addition, the training course shall incorporate instructions on how to assist Customers utilizing the Customer Support Center functionalities provided in Section 24 of the Contract.

The trainees shall receive a minimum of sixty four (64) hours of instruction by the Contractor to provide the necessary training for complete understanding and proficiency in providing customer support to the external users of the NPT System.

~~23.8~~23.7 Testing and Verification

The Contractor shall provide at least three (3) post-training tests for each type of training course. These tests shall provide not less than fifty (50) questions for each completed training class. Instruction shall be concluded when each participant achieves a score of 90% or higher on the tests. Re-tests, as needed, shall be conducted using a different post-test than the initial test used.

Each version of the test shall be provided to SEPTA as a part of the Training Program Plan for their review and for verification that the testing appropriately reflects, the material provided as part of the training.

~~23.9Training Simulator Lab~~

~~A training simulator lab shall be provided for the NPT system. This lab shall include at least two (2) operable items for each type of NPT equipment as well as an additional full CDCRS. **CDRL 23-6**~~

~~Associated cabling and control systems shall be provided to permit the equipment to be activated as a complete NPT system and to permit testing of all functions as identified in these specifications as well as training SEPTA personnel.~~

~~The lab shall also be used to observe and verify the operation of NPT devices and interactions between NPT devices as updated versions of software are deployed within the NPT System. The Training Simulator Lab shall be used to perform an exhaustive pre-revenue service test for each new NPT device functionality and each new software version prior to deploying these in the live NPT System service environment.~~

~~All problems and errors identified during the pre-revenue service tests of devices and software shall be corrected and verified as correct prior to the installation of the function and/or software into revenue service. In addition, the pre-revenue testing shall include regression testing to ensure that the updated functionality does not adversely impact any other pre-deployed function.~~

Section 24 – NPT Customer Support System
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24 NPT CUSTOMER SUPPORT SYSTEM

The Contractor shall provide all professional services and staff necessary to operate SEPTA's NPT Customer Support System for the duration of time identified in the Contract.

SEPTA plans to roll out the NPT System in phases as described in Section 21. The remote NPT Customer Support Center shall begin operations concurrent with the E-Cecommerce Web sSite services. Dependant upon the system design selected by SEPTA pursuant to issuance of a Contract, the Customer Support System shall be prepared to ~~begin supporting~~support the NPT System with funds stored ~~predominantly on the fare media (media-based approach) before evolving to a system where funds will be predominantly stored~~ and managed from individual accounts associated with ~~SEPTA Smart~~SEPTA ~~Issued~~ Smart Media and Partner Smart Media (account-based approach). ~~No matter which approach is utilized by SEPTA's NPT System (media-based or account-based), t~~The NPT Customer Support System shall provide Customers with the ability to view transactions, purchase fare products, and direct funds for auto-~~load~~-replenish or periodic loading of accounts.

SEPTA requires the ability to transition the responsibilities for these services to SEPTA or to another SEPTA-approved entity at the conclusion of the performance period of the Customer Support Services Contract. Accordingly, at the conclusion of the Customer Support Services performance period, the Contractor shall, at no charge, turn-over to SEPTA all items used by the Contractor to perform the Customer Support Services defined in this Section, including but not limited to, manuals, procedures, computers, applications, devices, tools and vehicles. Furthermore, the Contractor shall ensure that the design of the NPT systems used to facilitate the Customer Support Services shall have a clearly defined interface and are able to accommodate transition to SEPTA or a SEPTA-designated entity without the need for additional hardware or software changes. ~~In the event that changes are needed to the systems or systems interfaces to accommodate interfacing with a new entity's system, this work shall be performed by the Contractor at no additional cost to SEPTA.~~ SEPTA requires the ability for these systems to interface with and accommodate new elements and functionalities from a SEPTA-designated entity.

Contractor shall provide a full description of the architecture to be deployed for the NPT Customer Support System to meet all of

SEPTA's requirements ~~SEPTA~~ not more than ninety (90) days after NPT. **CDRL 24-1**

The NPT Customer Support Center shall operate independently of SEPTA's customer service center. However, both centers may require access to certain NPT information at the same time. All training will be the responsibility of the Contractor.

The customer care operations will utilize the defined E-C~~c~~ommerce functionality with a minimal number of additional screens to support the NPT Customer Support Center. SEPTA requires that the NPT Customer Support Center utilize Interactive Voice Response (IVR) technology, designed or leased, to minimize the number of calls handled by live operators.

Contractor-provided Customer Support functions shall focus on responding to issues specific to operation of the NPT System. Calls or other queries received by the Contractor related to SEPTA specific issues such as timetable or other such non-NPT System inquiries, shall be routed to the appropriate SEPTA department for handling.

The Contractor shall provide the following services as outlined in this section:

- Media Base Management:
    - Customer Inquiries, Complaints and Discrepancies;
    - Balance Protection;
    - Transit Benefits Program;
    - ~~Hotlist~~Invalid Fare Media List~~;~~
    - Bad Number List;
    - ~~Autoload~~Auto-replenishment;
    - Photo ID Media Management;
    - Reduced Fare Program.
- Customer Support:
    - Application Processing;
    - Mail Processing;

- Telephone-based Service;
- Internet-based Service;
- Employer Subsidized Smart Media Account Sales Processing;
- Remote Receipts;
- Preferred Vendor Smart Media Account Sales and Processing.

- Media Distribution Management:
  - Returns and Replacement;
  - Mail Distribution;
  - Internet Distribution.
- Financial Management:
  - Service Center Reconciliation;
  - Revenue Handling Requirements;
  - Revenue Handling for Check Customers;
  - Revenue Handling for Credit Media and Debit Customers;
  - Administration of SEPTA's Service Guarantee program.
- Performance Monitoring:
  - Monitoring and reporting on Key Performance characteristics as required in the Technical Specification.

These services shall be provided by phone, by US mail, by e-mail, and through the Contractor-developed and hosted E-Commerce Web sSite.

24.1 Media Base Management

24.1.1 Customer Inquiries, Complaints and Discrepancies

The Contractor shall provide efficient handling, investigation, and resolution of Customer requests for support with NPT fare media and devices, Customer inquiries, complaints, discrepancies, and potential fare disputes. Fare disputes shall be governed by the fare structure and fare policy of SEPTA. In order to resolve fare disputes, the Contractor's NPT Customer Support Representatives (CSRs) shall be familiar with SEPTA's fare structure and fare policy, and shall have electronic copies of reference materials at their individual workstations for fast and easy lookups. The NPT Customer Support System shall create a record of each Customer inquiry, complaint, discrepancy, and potential fare dispute. Each record shall include all details to necessary to describe the transaction. All records created on a daily basis shall be transferred to the CDCRS.

24.1.2 Balance Protection

All registered NPT Customers shall receive the protection of any unused stored value, stored rides or passes ~~balance~~ in their ~~SEPTA Smart~~SEPTA Issued Smart Media a~~A~~ccount and/or their Partner Smart Media account ~~as well as stored value, stored rides or passes encoded within the Fare Media~~. The Contractor shall replace ~~the~~ SEPTA Fare Media and the unused balance as confirmed by SEPTA's NPT database within 24 hours of the SEPTA F~~f~~are M~~m~~edia being reported lost or stolen. Customers shall be required to provide, and Contractor shall confirm, the Customer Log-on ID and Password for the registered Fare Media before issuing replacements.

24.1.3 Transit Benefits Program

Transit Benefits are Federal Government-supported, Employer-sponsored tax benefit programs through which Employers can provide employees up to the IRS federally-defined maximum per employee per month in tax-free benefits to be used for public transportation privileges (originally $120 but set to $230 for a temporary period of time) ~~o~~and~~r~~ public transportation parking privileges ($230).

At a minimum, the Contractor shall:

A. Distribute initialized ~~reloadable~~ registered Smart Media to Employers or individual Customers with separate purses, ~~(on card or~~ in the account~~),~~ for transportation and parking privileges;

B. Be responsible for set-up, processing and auditing required to perform and modify ~~Autoloads~~ auto-replenishments to employee Smart Media accounts;

C. Manage the a~~A~~uto-replenishment~~load~~ process for all scheduled benefit Autoloads so that participating employees automatically receive new value or pass loads in their account at the agreed-upon frequency;

D. Receive and distribute uploads of stored value or pass products to enable Customers to immediately access benefits backed by agreement of issuing program partner;

E. Provide E-Commerce and telephone customer care support to Employers;

F. Resolve Employer a~~A~~uto-replenish~~load~~ discrepancies;

G. Reconcile and audit all employer managed account activity;

H. Manage the monthly reconciliation of scheduled a~~A~~uto-replenishments~~loads~~ with the Employer Funds Transfer process.

Through the CDCRS Graphical User Interface, the Contractor shall have the ability to ~~hotlist~~ add lost, stolen, or discontinued Smart Media to the Invalid Fare Media List and the Bad Number List. These ~~Invalid Fare Media~~ Lists ~~can may~~ shall also be used for other Media base management functions, such as fraud management. Contractor shall update these lists ~~Invalid Fare Media List database~~ with the serial numbers of lost or stolen Smart Media. The list may be required to be downloaded to all ancillary devices to block use of lost or stolen Smart Media. Once blocked, only authorized personnel with the appropriate security clearances shall be capable of unblocking the Smart Media.

24.1.4 Auto-replenishmentload

Auto--replenishmentload services, as identified in Section 19, shall permit registered users to automatically load value to their accountSmart Media and/or the associated account on an "as needed" basis when the NPT Media is presented at NPT devices. Contractor shall review and approve or deny user applications for Aauto-replenishmentload services in accordance with SEPTA's business rules. Contractor shall enable Aauto-replenishmentload on Smart Media accounts in a remote manner (that is, not require the Customer to present the Fare Media in person or by mail).

Contractor shall administer a "Post-bill" model. When the Smart Media Smart Media account reaches a system threshold, the Smart Media account will load with a designated amount. The Participants Credit or Debit account will be billed for the value loaded ointo the Smart Media account. If funds are not successfully collected, the account will be negatively loaded for the value load of the Autoloadtransaction. The Smart Media or account shall then be placed in the Hotlist database preventing the next successive Autoload from taking place. The level of Hotlisting shall only block the Autoload event, rather than blocking all Smart Media usage. Contractor shall communicate the problem to the Customer for resolution using the communications methodology selected by the Customer when first registering for the media and/or account and associated Smart Media. Methodologies shall include phone, e-mail or US Mail.

Contractor shall manage Aauto-replenishmentload setup using the CDCRS GUI interface (See Section 19.8).

Customers shall be required to register or sign up their account in order to sign up for the aAuto-lreplenishmentoad service (See Section 2.4.2.4.3) . The Contractor shall support such sign up by telephone, fax, mail, e-mail, and over the Internet. At the time of sign-up, the account owner may be required to specify, at a minimum, the funding amount, and appropriate account to be used to pay for the value being loaded onto the account or, in the initial phase, on the Smart Media.

Customer applications received by fax or mail at the NPT Customer Support Center shall be approved or denied and loaded into the CDCRS system within two (2) working days of receipt of the application. Applications received by telephone or through the E-Commerce Web ~~s~~Site shall be approved or denied immediately. The only acceptable forms of payment for a Threshold Autoload (for example, reloading a fixed amount when the ~~Media/~~Account reaches a predetermined amount or reloading a calendar pass when the previous calendar pass expires) are Credit Cards and Debit checking accounts, as well as other acceptable external accounts such as a PayPal account and other such external accounts as ~~defiend~~defined in Section 4. Checks, money-orders, and electronic transit benefits may only be used for non-recurring ~~A~~a~~utol~~replenishments~~oads~~.

24.1.5 Photo-ID Media Management

Customized Smart Media shall be issued by the Contractor upon request with the employee's or participants' picture on the face of the NPT Media. Special requests for customized media will be billed to the requestor and not the Contractor. Contractor shall use the Media Photo ID software that interfaces with both the NPT Media printer and the camera.

24.1.6 Reduced Fare Program

The SEPTA Reduced Fare Program (RFP) allows Senior Citizens and Disabled individuals to access SEPTA transportation service at free or reduced fares Contractor shall process the applications and record customer data for the Reduced Fare Program (RFP). Contractor shall produce and distribute personalized Smart Media to eligible Senior Citizens and Disabled persons, including the capture and maintenance of the digital photographs for the RFP Smart Media. T~~he SEPTA Reduced Fare Program (RFP) allows Senior Citizens and Disabled individuals to access SEPTA transportation service at free or reduced fares~~

24.2 Customer Support

All customer support application software shall be designed to be user-friendly and provide quick response to user selections. The Customer Service screens and applications shall follow standard web page design practices and utilize “radio buttons,” check boxes, pull-down menus, fill-in-the-blank spaces, and other common features to simplify response to Customer queries and to assist when in-person Smart Media ~~registrations are performed.~~accounts are established.

24.2.1 Application Processing

In order to issue a Customer an item of SEPTA Issued Smart Media an account shall be provided in the CDCRS. All accounts shall be anonymous and shall accommodate a single tem of Smart Media unless a Customer Profile shall be created for the Customer and the Customer registers their Smart Media. Set up of a Customer Profile shall include all information to uniquely identify the Customer and shall incorporate the information as identified in Section 24.2.4.1.10, Customer Records, as a minimum.

After a Customer profile is set up and the Customer is registered then the Customer shall be able to assign multiple Smart Media to that Customer Profile. This shall permit all of the Smart Media to be more easily managed, including setup and maintenance of replenishment criteria and associated payment accounts. It shall be possible to associate all replenishment actions with a single payment method, and to provide different methods of replenishment for each Smart Media within the Customer Profile..

Contractor shall utilize a standard Customer application form in order to ~~register Customers that elect to register their~~establish new Customer Profiles and register Smart Media, assign existing and new Smart Media to an existing Customer Profile, ~~accounts~~ and issue new ~~SEPTA Smart~~SEPTA Issued Smart Media and setting up an account. Once assigned to a Customer Profile, the Smart Media shall not be able to assign the same Smart Media to another Customer Profile.

~~It is possible that an organization will register~~ distribute a block of ~~SEPTA Smart Media in the name of the company. The company would be responsible for the association of employees to~~ distributed ~~SEPTA Smart Media.~~

Contractor shall process, approve, and keep on file applications of each ~~registered~~ Customer Profile and account requested. The Contractor shall record each established Customer Profile and account ~~and~~ with associated Smart Media ~~issued by SEPTA or acceptable media issued by a SEPTA-partner and associated with a Customer Account~~.

Applications ~~may~~ shall be able to be provided ~~be received~~ by mail, telephone ~~or~~and through the SEPTA E-Commerce Web ~~s~~Site, then processed. Customers shall be provided a copy of their completed Customer Profile information via mail, e-mail, or other confirmation mechanism as approved by SEPTA and as selected by the Customer.

~~To establish an active new registered account, the Contractor must complete the registrations of pre-initialized~~distribute the SEPTA Smart Media. ~~Initialized~~ Smart Media ~~may~~ shall be provided ~~or mailed~~ to the Customer before ~~registration~~ Smart Media activation ~~i~~can be ~~s~~ completed. ~~(especially in the initial roll-out); however Customers shall be provided a copy of their completed registration information via mail, e-mail, or other confirmation mechanism as approved by SEPTA. T~~Once received, the Customer ~~must~~shall then activate the Smart Media using either the NPT Customer Support Call Center or the E-Commerce Web Site.

24.2.2 Mail Processing

Contractor shall establish procedures to ensure the proper control and handling of incoming and outgoing mail. The procedures shall cover handling mail that includes applications and payments, as well as mail concerning complaints, inquiries, or comments. Contractor shall develop responses in accordance with SEPTA guidelines.

Contractor shall estimate the daily quantities of mail based upon SEPTA's ridership statistics as well as the Contractor's experience in performing such activities. SEPTA's ridership statistics are provided in Appendix A.13 "FY 2009 Ridership and Revenue Totals by Fleet" to these Technical Specifications. ~~Contractor shall obtain bulk mail rates and other economies as can be achieved without sacrificing service.~~

24.2.3 Telephone-Based Service

The NPT system shall include a modern state of the art Inbound Customer Support Call Center. This system shall utilize an Automated Call Director (ACD) and Interactive Voice Response System (IVR) with its telephone systems. Contractor shall provide a complete description of the hardware and software to be deployed for the ACD~~S~~ and IVR systems. **CDRL 24-2** The ACD shall automatically route each inbound call to the IVR for processing prior to routing calls to Customer Support Call Center (CSCC) staff upon request by a Customer or upon presentation of a Customer issue that the IVR is not equipped to handle.

The Customer Support Call Center shall be located in the ~~Philadelphia~~SEPTA service area. Telephone calls in excess of the expected volumes shall be able to be accommodated at another location within the continental United States~~d~~. All performance requirements shall apply for all activities. Contractor shall describe the plan for accommodating all NPT Customer Support Call Center traffic and shall submit it to SEPTA for their review at PDR and for approval at FDR. **PDR 24-1**, **FDR 24-1**. ~~2~~

24.2.3.1 Interactive Voice Response System (IVR)

The IVR shall be used by the Contractor to identify the needs of the caller. Information such as Customer account numbers shall be obtained from the caller in an automated manner. Answers to simple questions such as account balances or pre-recorded information shall be provided by the IVR without operator intervention. Account numbers from the IVR ~~are~~ shall be compared to Caller ID data for security reasons and additional IVR responses shall be required if the caller ID data does not match the account record.

The IVR ~~must~~shall provide the capability for a Customer to press a single key and have the last IVR prompt repeated, and ~~must~~shall provide the capability for a Customer to request generic or menu-specific help from anywhere within the IVR menus. On invalid or no valid response, the IVR system shall have the capability to re-prompt the Customer with a different message each time the prompt is spoken.

The IVR is required to provide Customers with the option of speaking directly with a Customer Support representative. When transferring to an agent, the Customer details shall be transferred with the call. There shall be no more than five options on a voice menu, and no more than two levels of IVR menu.

Recording of all IVR messages shall occur in a professional recording studio to ensure consistent volume levels as well as good speech quality. If Voice Recognition technology is used by the IVR, callers shall be connected to a live agent after two failed voice recognition attempts.

New IVR callers need clear instructions on how to use the system. However, it is also important that frequent users can enter information as quickly as possible. The IVR system shall allow "type ahead," sometimes called "cut through," to permit users to enter data while the voice command is being spoken. Therefore, a frequent user would not have to wait until the end of "Please enter your account number" followed by hash, or "~~w~~Wait on the line to be connected to an operator,~~.~~ BEEP," ~~,~~ but could enter the account number in the middle of the sentence.

The IVR system ~~must~~shall be scalable such that phone lines can be easily added to the system as call volumes increase. Scalability ~~must~~shall include, but not be limited to, Customer volume and network architecture. System ~~must~~shall provide support for multiple languages (including English and Spanish). System ~~must~~shall provide the capability for Customers to leave a message after hours when no Customer Support Agents are available, and the ability for the Customer to review their recorded message prior to submitting it.

The IVR shall create Call Detail Records for each Customer call processed by the IVR. Call Details Records shall include all information to describe each IVR transaction. All Call Detail Records shall be transferred to the CDCRS.

On disconnection by the Customer, or the IVR System, the IVR System ~~must~~shall make the output line immediately available to other Customers. The IVR System shall be able to support the goal of a 98% call capture rate and the goal of a 2% call abandon rate.

24.2.3.2 Customer Support Call Center (CSCC) Requirements

Customers shall access Customer Support for the NPT Media by dialing a dedicated call-in number (actual number to be determined). ~~This Customer Support Call Center is to be physically located in Southeastern Pennsylvania within the SEPTA service area. SEPTA may consider the use of resources outside of the SEPTA service area to supplement the Customer Support Call Center for specific needs including, but not limited to, additional short-term capacity for peak demand and business continuity.~~

Hours of operation shall match those of SEPTA's Customer Service Department, which are currently 6:00 AM to 8:00 PM local time on weekdays and Saturdays, and 8:00 AM to 6:00 PM on Sundays and Holidays.

SEPTA will evaluate the NPT Customer Support Center hours in the future, and may modify the operating hours and contract based on Customer demand, as applicable.

SEPTA anticipates very strong initial Customer demand during the rollout of new fare media which will likely diminish as customers become familiar with the program. Customer Support Center staffing should be responsive to these changing business conditions. The average number of seconds a Customer shall spend waiting for a Customer Support Agent to answer the phone after being placed in the Queue by the IVR shall not exceed forty-five (45) seconds between the hours of 6:00 AM and 8:00 PM on weekdays and two (2) minutes at all other times.

The Customer Support Call Center system interface shall be designed to provide Customer Support Representatives with an easy-to-use, user friendly, and intuitive graphical user interface (GUI)~~;~~. The System shall utilize a Computer Telephony Interface (CTI) and support a CTI-centric GUI. The System shall employ audible screen reader software to allow system displays to be readable and usable by blind users. The System shall support TTY calls using ADA-accepted methods for communications with the Customer. The System shall support standard softphone features pertaining to queuing, call selection, and transfers. Features shall include but not be limited to the following:

- Support coordinated voice and data screen pops based on the Customer's ID and route the call and data simultaneously to the appropriate agent;

- Support agent to agent communications including conferencing, attended transfers, and unattended/blind transfers;

Support the transfer of appropriate data invoked when the transferring agent received the call as well as new data added prior to call transfer.

Customer Support Center representatives shall be trained to complete calls within three minutes. Supervisors shall monitor Customer Support Center representative call lengths and shall log on for calls longer than the timeframes specified above.

Customer Support Center representatives shall assist Customers as well as authorized agents from the Employer Transit Benefit and Preferred Vendor Sales programs routed from the IVR system with, at a minimum, the following issues:

A. Answers to questions regarding the NPT Media service;

B. Resolution of NPT Media related problems, such as Media malfunctions, Auto-replenishment~~load~~s, lost or stolen Smart Media;

C. Media replacement and value ~~refund~~ restoration requests, and verbal reports on the status of such requests;

D. Information on the unused value or calendar pass product remaining ~~on~~in a ~~a NPT~~ SEPTA or Partner Smart Media ~~or SEPTA~~ account. Unused value information shall be as of the last data upload for remote inquiries;

E. The reporting and replacement of lost/damaged/ ~~and~~ stolen Smart Media;

F. Auto-replenishment~~loads~~ set-up, modifications and discontinuance;

G. Add stored value or add pass transactions associated with a SEPTA or a Partner Smart Media account;

~~G.~~H. Complaints and Discrepancies;

~~H.~~I. Prices for fare products;

~~I.~~J. Statements;

~~J.~~K. Balance Protection;

~~K.~~L. Group Fare Accommodations;

~~L.~~M. Refunds.

For the agents from the Employer Transit Benefit and Preferred Vendor Sales programs Customer Support Center representatives shall provide assistance with all aspects of the operation of the software used by these agents.

For each Customer call transferred to a Customer Support Representative, the Call Detail Record shall include details invoked during the interaction between the Customer and the Representative. All Call Detail Records shall be transferred to the CDCRS.

Customer Support Call Center Productivity shall be monitored and reported employing industry standard metrics such as the Call Center Performance Index. The Contractor shall also utilize other Performance and quality metrics designed to monitor and support performance.

Contractor shall be responsible for recruiting, training, managing and providing feedback to Customer Support Center representatives to ensure a professional representation of services delivered by SEPTA to the public. The Contractor is a representation of SEPTA. SEPTA reserves the right to replace the Customer support management operations if performance is not considered representative of SEPTA.

~~24.2.3.1~~24.2.3.3 *Reporting Requirements*

Standard and ad-hoc reports shall be provided by the Contractor in order for SEPTA to monitor the customer service provided by the Contractor's Telephone-based Service. General requirements for the reports shall include, but not be limited to:

- An easy-to-use tool for use by managers and others with limited technical knowledge:
    - Reporting access shall be defined in accordance with various levels of authorization.~~;~~
- Ability to produce reports quickly as needed;
    - Ability to print and distribute reports locally, remotely from the CDCRS as well as from other authorized SEPTA locations;

- Ability to regenerate/reprint a report that has been previously generated.

- Ability to distribute reports through various media:
  - Manually, for printed reports;
  - By Fax;
  - Electronically (email).

- Reports ~~must~~shall consolidate information from a variety of sources including:
  - ACD;
  - IVR;
  - Calls transferred from-to the IVR System.

- IVR reporting ~~must~~shall include the following reports:
  - Daily call count (total calls / day / hour of day);
  - Trunk utilization (number of trunks busy at once at 15 minute increments for a day;
  - Activity report (number of times callers performed specific activities in a given day by hour);

~~o~~• The Customer Support ~~s~~System ~~must~~shall be able to print all current system speech into a printed text format so it can be manually checked for accuracy;

- The Customer Support S~~IVR s~~ystem ~~must~~shall have a capability at a minimum, to print out a variety of reports that break down caller usage by the various IVR features, time of day, demographic area (by phone number), etc;~~.~~

Draft reports shall be provided to SEPTA for their review at PDR and for approval at FDR. **PDR 24-2, FDR 24-2**

~~24.2.4~~Internet-Based Service

~~24.2.4.1~~24.2.3.4 *Web Design Services*

The Contractor shall develop and host a secure E-Commerce W~~w~~eb ~~s~~Site for the NPT System that shall share a common design theme with SEPTA's existing web site pages.

The E-Commerce ~~w~~Web ~~s~~Site shall provide sales and support services for all NPT functionality, including Customer account management.

24.2.3.4.1 Web Page User Interface and Functionality

The Contractor-designed E-Commerce web pages shall follow standard web page design practices and utilize "radio buttons," check boxes, pull-down menus, fill-in-the-blank spaces, and other common features to simplify product selection and purchases. The web pages shall include a "shopping cart" feature that allows users to add, delete, and modify selections, and when ready, conduct a single transaction to complete the purchase.

Each distinct web page type identified below shall be consistent within that type. (For example, if multiple Product Selection pages are required, all will share a common appearance and format.) Each distinct web page type shall be designed and optimized according to the purposes of the page.

Where user input is required, the Contractor-designed web pages shall support standard browser data entry operations such as the TAB key moving to the next data field, the ENTER key acting as "Submit" or "Go," etc.

The Contractor shall provide distinct web page types to support the NPT E-Commerce operations, and Customer support. At minimum, the Contractor shall develop the following web pages:

- SEPTA E-Commerce Start;
- SEPTA Customer Registration for NPT (New, Login, Modify, and other pages as necessary);
- NPT Product Selection;
- Shopping Cart Contents;
- Secure Checkout;
- Purchase Confirmation;

- Order Status;
- NPT Customer Subscription Management (New/Modify Subscribable Product Selection, Repeat/Subscription Payment Authorization, and other pages as necessary);
- Employer Administrative (Secure Login and multiple other pages to permit an Employer to efficiently manage their Employer Smart Media program);
- Smart Media Order Fulfillment (Login, generate sales order, update order status, query order processing status and other pages as necessary);
- SEPTA NPT Administration (Login and multiple other pages as necessary).

The SEPTA E-Commerce Web Site shall allow a Customer to log in to an established SEPTA account using a the account ID or user selected username and password. The web site shall provide a fully automated system for assisting the Customer with creating or changing an optional username, selecting and/or changing a password, or retrieving lost or forgotten log in information.

After a SEPTA configurable period of inactivity, all users logged into the E-Commerce Web Site shall be automatically logged off, at which time the user's session shall be directed to the E-Commerce Start page.

SEPTA E-Commerce Start Page

The E-Commerce Start Page shall be the destination for all links to the E-Commerce web site from other SEPTA web pages. The page shall provide general information about the E-Commerce site's features. In addition, the page shall include:

- Fill-in blanks for the user to enter login and password to begin a session and enter the site;
- A "Go" button to submit the entered login and password;
- A link to enter a new user registration;
- A link to the Employer Administrative login page;

- A check box to create a cookie on the user's device to remember the user's login and pre-fill that space. (By default, the checkbox shall be unselected.)

Previously registered users who successfully log into the E-Commerce web site shall be directed to the first Product Selection Page.

Except for the E-Commerce Start page, all web pages for general Customer use shall include a common set of buttons or tabs to facilitate navigation on the E-Commerce web site. These common buttons or tabs shall include at minimum:

- SEPTA Home – when pressed, this button shall request confirmation, and if confirmed, shall cause the user's E-Commerce session to terminate and return the user to the SEPTA home page;
- Log off – when pressed, this button shall request confirmation, and if confirmed, shall cause the user's E-Commerce session to terminate and return the user to the E-Commerce Start page;
- Registration – when pressed, this button shall navigate to the Customer Registration page;
- Subscriptions – when pressed, this button shall navigate to the Customer Subscription page;
- Shopping Cart – when pressed, this button shall navigate to the Shopping Cart Contents page;
- Check Out – when pressed, this button shall navigate to the Checkout page;
- Continue Shopping – when pressed, this button shall navigate to the first Product Selection page;
- Order Status – when pressed, this button shall navigate to the Order Status page.

All SEPTA and Employer Administrative pages shall also include a Log off button or tab, which when pressed shall terminate the user's session.

Customer Registration Page

All users shall be required to register with the SEPTA E-Commerce web site. First-time users shall be directed to this page by selecting the appropriate link on the E-Commerce Start page. Previously registered users shall be able to navigate to this page to review and edit registration information.

Data entry on this page shall be user-friendly and shall include pull-down menus and error checking where appropriate. Data fields to be entered shall include those identified in Section 24.2.3.4.10. Required fields shall be identified on the screen, and shall be determined during the Preliminary Design Review.

Upon completing the form and pressing a "Submit" button, the user shall be directed to the first Product Selection Page.

Product Selection Page

Driven by the Products database table described in Section 24.2.3.4.10, one or more Product Selection pages shall provide users with an easy-to-use interface to select products and quantities for purchase. Each product type available shall include a check box for selection, and a fill-in box for quantity. Each line on the Product Selection page shall also include the product's unit price.

When a product's check box is selected, a value of one shall be automatically entered into the quantity fill-in box. The user shall be able to enter other quantities in the fill-in box, but valid quantities for purchase shall be limited according to the parameter defined in the Products database table.

For each product that can be purchased by the user, the selection shall include a checkbox to permit the user to determine whether to print the item or to have it shipped.

Each Product Selection page shall include one or more highly visible "Check Out" and "View Shopping Cart Contents" buttons to facilitate the purchase process.

In addition, each Product Selection page shall include a highly visible "Customer Subscriptions" button to navigate to the Customer Subscription page.

Shopping Cart Contents Page

The Shopping Cart Contents page shall display a summary of the user's current product selections, quantities, extended prices for each item (unit price times quantity), any additional shipping costs per item, and total purchase value. Where applicable, the Shopping Cart Contents page shall also indicate whether a product is to be printed by the user or shipped.

The Shopping Cart Contents page shall enable users to delete any item, change the purchase quantity, and where applicable, change whether the product is to be printed by the user or shipped.

The Shopping Cart Contents page shall include highly visible "Check Out" and "Continue Shopping" buttons to facilitate navigation and the transaction process.

Checkout Page

Upon completion of product selection and pressing a "Check Out" button, the user shall be directed to the Checkout page. This page shall include the user's registration information (such as name and address) already filled in, and shall provide additional fill-in blanks, drop-down menus, radio buttons, and check boxes as required to complete the transaction. Fields populated from the User Registration page shall not be alterable on this page; any changes to this information shall require the user to navigate to the User Registration page.

The Checkout page shall provide a complete summary of the purchase, including the selected products, quantities, unit prices, extended prices, total product prices, sales taxes, shipping costs (including any per-item additional shipping costs), and total transaction value. Where applicable, the Checkout page shall indicate whether a product is to be printed by the user or shipped.

A default shipping method shall be displayed in a selection pull-down menu, with its associated price filled into the appropriate space on the transaction summary. Users shall be able to select an alternate shipping method; upon doing so, the transaction summary shall update automatically. At a minimum, the Checkout page shall offer shipping method choices of Regular (First Class mail), Preferred (Express Mail). If the user has opted to print all purchased products, the page shall offer no shipping method choice.

Users shall be required to select a payment method from a selection pull-down menu. Upon doing so, the appropriate fill-in boxes shall appear for the user to complete. If the user is paying by Credit Media, separate billing address fill-in blanks shall be provided, along with a check box to use the user's delivery address as the billing address. If the "use delivery address" check box is selected, the billing address information shall be automatically populated from the user's delivery address data. Credit Media payments shall also require the user to enter the Credit Media ID number (which is usually printed on the back of the Media).

The Checkout page shall offer all acceptable payment methods outlined in Section 5.

The Checkout page shall include highly visible buttons to:

- Submit – completes the transaction;
- Return for More Shopping – saves all information and returns the user to the first Product Selection Screen;
- Change User Information – navigates to the User Registration page. Upon return to the Checkout page, any changes in the user's registration information shall be incorporated in the relevant page fields.

Purchase Confirmation Page

Upon successful completion of transaction processing, a Purchase Confirmation page shall appear containing the transaction summary and a transaction number.

If the user has chosen to print any purchased items, a highly visible "Print Purchased Fare Media" button shall appear on the screen. When pressed, this button shall direct the user to the At-Home Fare Media Printing page.

Order Status Page

The Order Status page shall allow users to view the status of recent orders. For each of the user's previous orders during a SEPTA adjustable time interval, the page shall list:

- The transaction number;
- The date the order was placed;

- The value of the order;
- The current status of the order;
- The date of the current status;
- The shipping method (if applicable);
- The shipping tracking number (if applicable).

The transaction number and the shipping tracking number shall be hypertext link fields. When the user clicks on the transaction number, the Purchase Confirmation page for the transaction shall be displayed. –When the user clicks on a hypertext shipping tracking number, the user shall be redirected to the shipping company's web site for package tracking, with all appropriate fields pre-populated.

Customer Subscription Pages

When a user selects the "Customer Subscription" button, the system shall present a series of pages that shall enable the user to:

- View all subscriptions in effect;
- Add, delete, and modify subscriptions, including product types, quantities, frequency, subscription expiration date, payment method, shipping method, etc.;
- Review the status of a subscription order.

The Customer Subscription web pages shall appear and function similarly to the one-time transaction pages described above (Product Selection, Shopping Cart, Checkout, Purchase Confirmation, and Order Status), but be optimized for the subscription process. For example, the selection of products shall appear similar to the Product Selection page, except that only products that are eligible for subscription shall be shown (based on the contents of the Products database table as described in Section 24.2.3.4.10), and the option for user-printed Fare Media shall not be available. (All subscribed transactions shall be shipped to the Customer.)

If the user has any products in the Shopping Cart, the Customer Subscription page shall display an error message that informs the user that creating or modifying a subscription requires an empty shopping cart.

After adding a new subscription, or changing or deleting an existing subscription, the checkout process shall result only in the recording of the user's payment information. The Subscription Confirmation page (similar to the Purchase Confirmation page) shall provide the Subscription Transaction Identification number in lieu of a transaction identification number.

Status Reporting

Customers shall be able to select reporting of current validity as well as reporting usage.

When selecting "validity" reporting the Customer shall select this function from the available selections. The web site shall return the validity of the Smart Media, based on the last transaction found in the NPT System. The information provided shall also include the date, time and equipment location/route/station of last use. The Customer shall be able to print this validity information.

After selecting "usage reporting", the Customer shall be able to enter the start and end date of the transactions to be provided in the report. The maximum number of days for the search shall be a parameter settable by SEPTA, which shall initially be set to sixty (60) days. The reports shall be displayed to the Customer and the Customer shall have the capability to obtain the report output in pdf, Excel or hard copy form.

Employer Administrative Pages

Upon selection of the "Employer Administration" button from the SEPTA E-Commerce Start page, the user shall be prompted to enter the Employer's login identification and password. When successfully logged in, the E-Commerce site shall present a series of Employer Administrative pages that shall enable authorized users to:

- Add new employees to the Employer's table of benefit recipients;
- Delete employees from the displayed list of employees (As described the employee's entry in the data table shall not be deleted, but the employee status field shall be changed to indicate that the entry is no longer to be displayed);
- Modify the product an employee is to receive;

- Generate queries and reports of current and previous Fare Media orders and invoices;

- Submit payment to SEPTA via EFT.

Employers shall be able to purchase for their employees only those products available for bulk purchase.

SEPTA Administrative Pages

Access to these pages shall be restricted to authorized SEPTA personnel using login and password protection. These pages shall not be accessible by a link on SEPTA web site; authorized users shall be required to enter the secure web page address into their browser to gain access to the SEPTA Administrative Login page.

Once a user logs into the SEPTA Administrative pages, a menu shall be displayed to provide configuration control, administrative oversight, report and query generation, and other administrative tasks as required herein. Navigation around the Administrative Pages shall be straightforward, and shall be facilitated by the use of common buttons or tabs.

All SEPTA Administrative Pages shall be cable of being restricted such that they may only be accessed by specified IP addresses.

~~24.2.4.1.1~~24.2.3.4.2 Compatibility with SEPTA's Web Site

The Contractor-developed NPT web pages shall be connected with SEPTA's existing web pages. Users will have the ability to switch between pages hosted by the Contractor and those hosted by the current SEPTA web site host. Each Web site will have a link to the other Web site.

Log-in status for the Customer on the E-Commerce web site shall be preserved when switching between the E-Commerce web site and the current SEPTA web site. While switching between the E-Commerce web site and the current SEPTA site, Customers shall be automatically logged off from the E-Commerce web site following the SEPTA configured period of inactivity.

The PHP web programming language shall not be utilized in any portion of the E-Commerce site. All design aspects of the Contractor-developed web pages shall be subject to SEPTA review at PDR and approval at FDR. **PDR 24-3, FDR 24-3**

~~**PDR 24-12, FDR 24-1 2**~~

~~24.2.4.1.2~~24.2.3.4.3 Links to and from SEPTA's Web Site

SEPTA's current web designer shall add one or more links on its current web pages to direct users to the NPT sales and Customer Support web pages. The Contractor-designed web pages shall include one or more links back to relevant pages on SEPTA's web site. Every Contractor-designed web page shall include at minimum a link back to SEPTA home page and a link to SEPTA's Sales and Customer Support Start page. Both the Contractor and SEPTA shall identify additional links to SEPTA web pages or other web pages at the Preliminary and Final Design Reviews. **PDR 24-4, FDR 24-4**

~~24.2.4.1.3Web Page Types~~

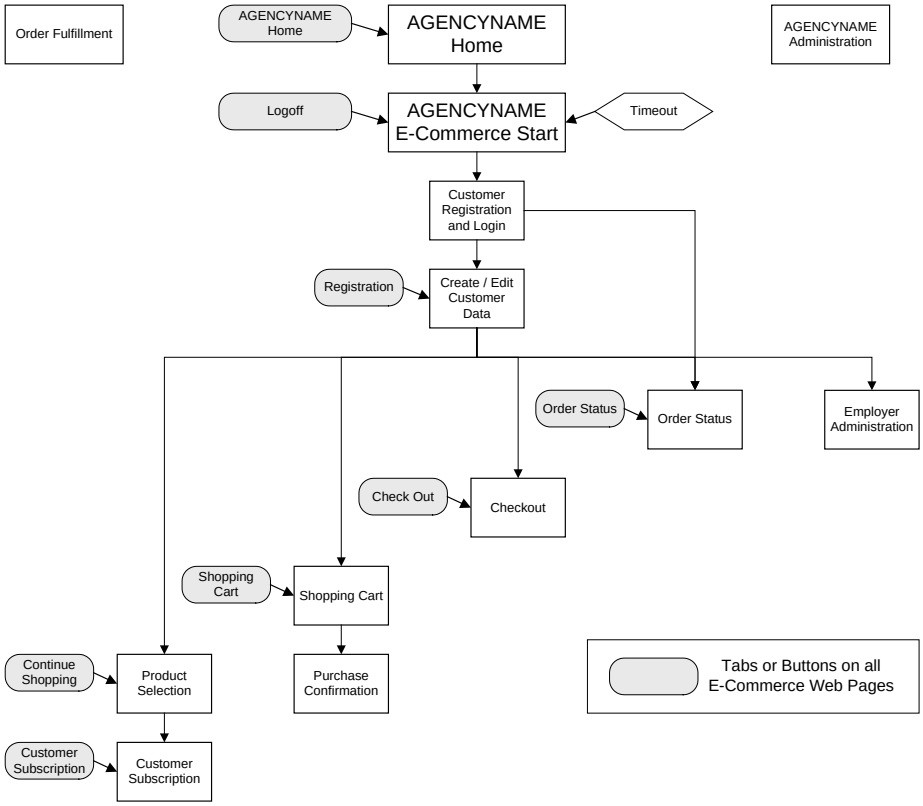
~~The Contractor shall provide distinct web page types to support the NPT E-Commerce operations, and Customer support. At minimum, the Contractor shall develop the following web pages:~~

- ~~SEPTA E-Commerce Start;~~
- ~~SEPTA Customer Registration for NPT (New, Login, Modify, and other pages as necessary);~~
- ~~NPT Product Selection;~~
- ~~Shopping Cart Contents;~~
- ~~Secure Checkout;~~
- ~~Purchase Confirmation;~~
- ~~Order Status;~~
- ~~NPT Customer Subscription Management (New/Modify Subscribable Product Selection, Repeat/Subscription Payment Authorization, and other pages as necessary);~~
- ~~Employer Administrative (Secure Login and multiple other pages to permit an Employer to efficiently manage their Employer Smart Media program);~~
- ~~Smart Media Order Fulfillment (Login, generate sales order, update order status, query order processing status and other pages as necessary);~~
- ~~SEPTA NPT Administration (Login and multiple other pages as necessary).~~

~~24.2.4.1.4~~24.2.3.4.4 Site Map

The site map below portrays ~~as~~ an example of one possible layout for the Contractor-developed E-C~~c~~ommerce web pages. It is supplied here for information purposes and to enhance the Contractor's understanding for this system element. The drawing as depicted shall not be construed to be a design that is definitive or, as a requirement of the Contract.

Figure 24-1: E-Commerce Web Site Map



~~24.2.4.1.5~~24.2.3.4.5 Performance Criteria

The Contractor-designed web pages shall utilize standard design languages, and shall support all web browsers in common use with open architecture at the time of contract award. The Contractor-designed pages shall support use by personal computers as well as hand-held devices such as Personal Digital Assistants (PDAs) and web-enabled cellular phones.

~~24.2.4.1.6~~24.2.3.4.6 Security

All web pages designed by the Contractor that include E~~e~~-~~c~~Commerce transaction data shall be certified secure to Verisign® or other similar standards. All transaction processing shall be compliant with the Payment Card Industry (PCI) Data Security Standard. Transaction data and all administrative and work order-processing web pages shall be secured with no less than 128-bit Secure Sockets Layer (SSL) encryption.

~~24.2.4.1.7~~24.2.3.4.7 Transaction Types to be Supported

Single Transactions

Using the selection screens, the "shopping cart," and the "check-out" (payment) screens, the Contractor-designed web pages shall enable Customers to purchase one or more products, in single, multiple, and combinations of single and multiple quantities.

Subscription Transactions for Individuals

Individual Customers shall be able to establish subscriptions for repeat transactions. Using similar screens for the single transactions, the subscription transaction screens shall enable Customers to create, modify, and delete subscriptions for one or more product types in various quantities. Options for subscriptions shall include payment methods, frequency of delivery, delivery method, etc.

Employer Subsidized Smart Media Sales

Employers participating in transit benefit programs for their employees shall be able to self-administer ~~the~~ new Smart Media accounts and as needed and the bulk purchase of Fare Media. Contractor-developed web pages shall provide an Employer's authorized users the ability to create, modify, and delete employee transit benefits.

~~24.2.4.1.8~~24.2.3.4.8 Cookies

Users of the E-Commerce web pages who enable their browser to store “cookies,” shall be able to opt to have the web page store on their computer or browser device information that will facilitate subsequent revisits to the web site. The cookie shall include prior data entry and selections, but shall exclude information that could be used to complete the payment information fields, such as the Customer’s Credit account number, expiration date, Credit Card ID (CCID), bank account information, and so forth. Using the cookie, the web page shall enable Customers to repeat previous one-time transaction selections, automatically fill in name, and address information, shipping preferences, etc.

~~24.2.4.1.9~~24.2.3.4.9 Administration

The Contractor-designed web pages shall be fully configurable, and offer authorized personnel the ability to modify the selection, price, descriptions, and images of products available for sale. Contractor shall provide change management procedures to support modifications to the w~~W~~eb site. All such changes to the web site shall be largely driven by changes to the product records in the database. As necessary, other data tables or easily configurable files shall be used to configure the product selection web pages. The order in which products for sale appear on the selection page shall also be easily configurable by authorized personnel.

Other transaction choices, such as payment methods (i.e.~~,~~ c~~C~~redit media types accepted), shipping methods, shipping costs, and so on shall be easily configurable by authorized personnel by modifying files or data tables.

Access to the configuration parameters and the product database shall be strictly controlled via password protection schemes and secure web pages.

As appropriate, special database queries and reports shall be provided to assist authorized personnel in monitoring, administering, and managing the web site. These reports and queries shall be available only to authorized personnel through the password-protected secure administrative web pages.

~~24.2.4.1.10~~24.2.3.4.10 E-Commerce Web Site Database

The Contractor shall supply a relational database as an integral part of the E~~e~~-C~~c~~ommerce W~~w~~eb S~~s~~ite. The database shall include one or more tables to record Customer information, transaction data, products for sale, pricing information, etc. All data stored in the database shall be compliant with the PCI Data Security Standard.

The database shall include reports and queries that utilize Structured Query Language (SQL) to enable SEPTA to assess sales history, revenue trends, individual patron transaction records, etc.

The E-Commerce Web Site database shall record all data necessary for authorized personnel to operate and manage on-line NPT sales.

When a new Customer "registers" with the web site, the appropriate records shall be populated. Changes to a Customer's records shall require the Customer to make the modifications.

Transaction records shall be created automatically for each completed transaction.

At minimum, the following tables and records shall be included in the database.

Customer Records

Stored in one or more tables, data records for each Customer shall include at minimum:

- Customer identification number (unique for each Customer);
- Customer login ID (unique for each Customer);
- Customer login password (This field shall be encrypted);
- Name (Title, Last, First, Middle, Suffix);
- Mailing Address (Street, City, State, ZIP);
- Billing Address (Street, City, State, ZIP);
- Phone;
- Customer email address;

- Unalterable indentifying information for Media associated with Customer Account (such as Smart Media Chip Serial number if deemed unalterable at time of NPT System implementation);

- Customer status (By manually setting this field to “deny,” it shall be possible for SEPTA to deny a Customer further purchases, but the Customer’s record shall remain in the database for recordkeeping purposes.)

Transaction Records

The web site shall support transactions that contain multiple distinct items in a single purchase, as well as multiples of each item purchased. While each transaction shall have a unique identifying number, to support multiple different items in a single transaction, it shall be possible for multiple records in the transaction database to share a common transaction ID. Each completed transaction record shall at minimum include:

- Sequential transaction ID (unique per transaction, but multiple products may be purchased in a single transaction, so multiple records may share the same sequential transaction ID);

- Transaction item number (For example, in a transaction of five distinct products, five separate transaction records shall be created with this field ranging from 1 to 5; in a transaction with only a single product, a single record shall be created and this field shall be 1);

- Subscription identification number (if applicable);

- Customer identification number;

- Order date;

- Product identification number;

- Purchased quantity;

- Unit price;

- Sales tax (if applicable, for the purchased quantity of the associated item);

- Total transaction item value (Where multiple product types are purchased in a single transaction, this field shall reflect the total of the specific product only, not the total of all product types purchased);
- Payment information (Multiple payment information fields shall be provided, which shall be determined by the payment method. All relevant payment data shall be included, and all payment data shall be encrypted as required to comply with the PCI Data Security Standard);
- Serial number (as applicable);
- Printed by user (yes / no);
- Shipping method (as applicable);
- Shipping cost;
- Shipping tracking number (as applicable);
- Order status (order entered / payment received / work order in progress / shipped / cancelled / etc.);
- Order status date (the date that the current order status was established);
- Order clerk identification (the identification of the clerk who generated the work order to complete the order, or the identification of the authorized user who manually changed the order status).

Product Records

Each product for sale on the web site shall have a unique identification number and the following data fields at minimum:

- Product identification number (unique for each product);
- Product description;
- Price;
- Additional shipping cost (Some non-fare items may require additional shipping costs. The system shall support such charges.);

- Sales tax rate (Some products may be exempt from sales tax and shall have an assigned value of zero for this field. Some jurisdictions have variable sales tax rates, depending on the product; this field shall support such variable sales tax rates.);

- Subscription availability (Customers shall be able to repeatedly purchase some products by setting up a subscription; it shall be possible to exclude some products from subscription purchases.);

- Bulk purchase availability (Employers shall be able to purchase Fare Media in bulk form for their employees. Only those products so designated shall be available for Employer bulk purchases.);

- Serial number (No / Pre-printed / Printed Upon Issuance);

- Maximum quantity per transaction (This value shall permit restrictions to quantity purchases, as well as to reflect limited stock availability.);

- Availability (It shall be possible to "discontinue" a product, but the database shall retain a record of the product for recordkeeping purposes. Discontinued products shall not appear on the web pages. It shall also be possible to temporarily assign a product as "out of stock" or "unavailable" status.)

Subscription Records

One or more tables in the database shall track subscriptions for repeated transactions. Each subscribed transaction shall have an independent record. The system shall support multiple independent subscriptions per Customer. Note that subscriptions shall be usable by individuals as well as by groups or Employers who wish to purchase Fare Media in bulk quantities at regular intervals.

At minimum, each subscribed transaction record shall contain:

- Subscription identification number (unique for every subscribed transaction);

- Subscription item number (As with one-time transactions, subscribed transactions shall support multiple distinct item types in a single subscribed transaction;

- Customer identification number;
- Subscription initiation date;
- Subscription expiration date (Customers shall be able to define a limit to the subscription. The Ee-eCommerce system shall also support unlimited subscriptions and a SEPTA defined and configurable maximum term);
- Subscription transaction frequency (i.e., weekly, monthly, quarterly, yearly);
- Customer payment information (This information shall be recorded only for Customers who opt for subscription purchases. The information shall vary according to the payment type selected, and storage of this information shall be in full compliance with the PCI Data Security Standard);
- Subscription product identification number;
- Subscription delivery method.

Employer / Employee Records

At least three specific data tables shall support periodic purchase transactions for Employers who wish to provide individualized transit benefits for their employees.

Employer Table

The database shall include a single table that contains information about all Employers participating in the Employer subsidy programs. Each record in this table shall contain at minimum:

- Employer ID number (unique for each Employer);
- Company name;
- Company address;
- Contact name;
- Contact phone number;
- Contact email address;
- Employer payment method (pre-paid / post-billed);

- Employer EFT payment information (This information shall be stored in encrypted form);
- Periodicity (i.e., how often the Employer's order is to be filled – weekly, monthly, quarterly, annually);
- Employer account login;
- Employer account password (At minimum, this field shall be encrypted);
- Employer status (It shall be possible to deactivate an Employer's participation in the program, but all records of the Employer shall be retained in the database for recordkeeping purposes.)

The Contractor shall provide one or more SEPTA a~~A~~dministrative web pages to enable authorized staff members to add, modify, and delete entries in the Employer Table.

Employer-Employee Tables

For each Employer participating in the subsidy program, a table shall contain information about all of the Employer's participating employees. Each record in the table shall contain at minimum:

- Employee ID number (This field shall be sequentially generated for the Employer. By appending this number to the unique Employer ID number, each employee shall be uniquely identifiable.);
- Employee name;
- Provided product identification number;
- Periodicity (i.e., weekly, monthly, quarterly, annually);
- Smart Media type;
- Assigned Smart Media serial number;
- Employee status (It shall be possible to discontinue an employee's participation in the program, but the database shall retain all records of the employee for recordkeeping purposes.)

The Employer-Eemployee table shall include no privacy-sensitive data such as social security numbers. It shall be the responsibility of the Employer to manage the associations between the Employee ID assigned by the system to the company's internal employee identification methods.

To minimize the administrative burden on SEPTA, the Contractor shall develop one or more Employer Administrative web pages as described in Section 24.1.1.1.124.1.1.1.124.2.4.1.3. To facilitate the initial population of this table, the Contractor shall also provide a means by which a simple spreadsheet, comma-delimited file, or other such means may be used to import data into the table.

Employer Transaction Records

Similar in nature to the transaction records for individual Customers described in Section 24.2.3.4.1024.2.3.4.1024.2.4.1.10, the Employer Transaction Records table shall include information about every completed Employer transaction. Data fields in this table shall enable SEPTA and the Employer to track the progress of orders and payments, as well as to review historical data regarding previously completed transactions.

Synchronization with NPT System

The Contractor shall be responsible for ensuring that the CDCRS Database and the E-Commerce Web Site Ddatabases interact. The Web Site Database shall be responsible for publishing information to the CDCRS any time a record is added, deleted, or modified. This includes when any transaction is completed or when a Customer has updated any on-line information. In addition, the E-Commerce Web Site Ddatabase shall be capable of receiving updated information from the CDCRS Ddatabase at any time, for any record. This includes media information, Customer information, as well as fare tables.

The E-Commerce Wweb Ssite Ddatabase shall not retain any information that is not published to the CDCRS.

24.2.4.1.1124.2.3.4.11 Transaction Processing

All applicable financial transactions conducted by the E-Commerce Web Site shall comply with ISO 8583. All Credit Media transactions shall utilize address verification and CCID verification.

~~24.2.4.1.12~~24.2.3.4.12 Subscription Transactions

The E-Commerce Web Site Database shall include subscription records as described in Section 24.2.3.4.10~~24.2.3.4.10~~~~24.2.4.1.10~~. These records shall be used to automatically generate purchase transactions according to the product, frequency, delivery method, and payment information contained in the records. While the E-Commerce site shall be a method for establishing and maintaining Automated Transactions, the CDCRS shall be responsible for processing all reoccurring transactions.

As part of the E-Commerce site, the Contractor shall also automatically send reminder e-mails to subscription patrons when their on-file Credit Media is about to expire, and when a subscription is about to expire. These reminder emails shall be sent to the Customer's email address on file. The warning period and frequency of emails shall be configurable by authorized users.

~~24.2.4.1.13Web Page Functionality and User Interface~~

~~The Contractor-designed e-commerce web pages shall follow standard web page design practices and utilize "radio buttons," check boxes, pull-down menus, fill-in-the-blank spaces, and other common features to simplify product selection and purchases. The web pages shall include a "shopping cart" feature that allows users to add, delete, and modify selections, and when ready, conduct a single transaction to complete the purchase.~~

~~Each distinct web page type identified in Section 24.2.4.1.3 shall be consistent within that type. (For example, if multiple Product Selection pages are required, all will share a common appearance and format.) Each distinct web page type shall be designed and optimized according to the purposes of the page.~~

~~Where user input is required, the Contractor-designed web pages shall support standard browser data entry operations such as the TAB key moving to the next data field, the ENTER key acting as "Submit" or "Go," etc.~~

~~After a SEPTA configurable period of inactivity, all users logged into the e-commerce web site shall be automatically logged off, at which time the user's session shall be directed to the E-Commerce Start page.~~

Except for the E-Commerce Start page, all web pages for general Customer use shall include a common set of buttons or tabs to facilitate navigation on the e-commerce web site. These common buttons or tabs shall include at minimum:

- SEPTA Home – when pressed, this button shall request confirmation, and if confirmed, shall cause the user's e-commerce session to terminate and return the user to the SEPTA home page;
- Log off – when pressed, this button shall request confirmation, and if confirmed, shall cause the user's e-commerce session to terminate and return the user to the E-Commerce Start page;
- Registration – when pressed, this button shall navigate to the Customer Registration page;
- Subscriptions – when pressed, this button shall navigate to the Customer Subscription page;
- Shopping Cart – when pressed, this button shall navigate to the Shopping Cart Contents page;
- Check Out – when pressed, this button shall navigate to the Checkout page;
- Continue Shopping – when pressed, this button shall navigate to the first Product Selection page;
- Order Status – when pressed, this button shall navigate to the Order Status page.

All SEPTA and Employer Administrative pages shall also include a Log off button or tab, which when pressed shall terminate the user's session.

SEPTA E-Commerce Start Page

The E-Commerce Start Page shall be the destination for all links to the e-commerce web site from other SEPTA web pages. The page shall provide general information about the e-commerce site's features. In addition, the page shall include:

- Fill-in blanks for the user to enter login and password to begin a session and enter the site;
- A "Go" button to submit the entered login and password;

- A link to enter a new user registration;
- A link to the Employer Administrative login page;
- A check box to create a cookie on the user's device to remember the user's login and pre-fill that space. (By default, the checkbox shall be unselected.)

Previously registered users who successfully log into the e-commerce web site shall be directed to the first Product Selection Page.

Customer Registration Page

All users shall be required to register with the SEPTA e-commerce web site. First-time users shall be directed to this page by selecting the appropriate link on the E-Commerce Start page. Previously registered users shall be able to navigate to this page to review and edit registration information.

Data entry on this page shall be user-friendly and shall include pull-down menus and error checking where appropriate. Data fields to be entered shall include those identified in Section 24.2.4.1.10. Required fields shall be identified on the screen, and shall be determined during the Preliminary Design Review.

Upon completing the form and pressing a "Submit" button, the user shall be directed to the first Product Selection Page.

Product Selection Page

Driven by the Products database table described in Section 24.2.4.1.10, one or more Product Selection pages shall provide users with an easy-to-use interface to select products and quantities for purchase. Each product type available shall include a check box for selection, and a fill-in box for quantity. Each line on the Product Selection page shall also include the product's unit price.

When a product's check box is selected, a value of one shall be automatically entered into the quantity fill-in box. The user shall be able to enter other quantities in the fill-in box, but valid quantities for purchase shall be limited according to the parameter defined in the Products database table.

For each product that can be printed by the user, the selection shall include a checkbox to permit the user to determine whether to print the item or to have it shipped.

~~Each Product Selection page shall include one or more highly visible "Check Out" and "View Shopping Cart Contents" buttons to facilitate the purchase process.~~

~~In addition, each Product Selection page shall include a highly visible "Customer Subscriptions" button to navigate to the Customer Subscription page.~~

~~Shopping Cart Contents Page~~

~~The Shopping Cart Contents page shall display a summary of the user's current product selections, quantities, extended prices for each item (unit price times quantity), any additional shipping costs per item, and total purchase value. Where applicable, the Shopping Cart Contents page shall also indicate whether a product is to be printed by the user or shipped.~~

~~The Shopping Cart Contents page shall enable users to delete any item, change the purchase quantity, and where applicable, change whether the product is to be printed by the user or shipped.~~

~~The Shopping Cart Contents page shall include highly visible "Check Out" and "Continue Shopping" buttons to facilitate navigation and the transaction process.~~

~~Checkout Page~~

~~Upon completion of product selection and pressing a "Check Out" button, the user shall be directed to the Checkout page. This page shall include the user's registration information (such as name and address) already filled in, and shall provide additional fill-in blanks, drop-down menus, radio buttons, and check boxes as required to complete the transaction. Fields populated from the User Registration page shall not be alterable on this page; any changes to this information shall require the user to navigate to the User Registration page.~~

~~The Checkout page shall provide a complete summary of the purchase, including the selected products, quantities, unit prices, extended prices, total product prices, sales taxes, shipping costs (including any per-item additional shipping costs), and total transaction value. Where applicable, the Checkout page shall indicate whether a product is to be printed by the user or shipped.~~

A default shipping method shall be displayed in a selection pull-down menu, with its associated price filled into the appropriate space on the transaction summary. Users shall be able to select an alternate shipping method; upon doing so, the transaction summary shall update automatically. At a minimum, the Checkout page shall offer shipping method choices of Regular (First Class mail), Preferred (Express Mail). If the user has opted to print all purchased products, the page shall offer no shipping method choice.

Users shall be required to select a payment method from a selection pull-down menu. Upon doing so, the appropriate fill-in boxes shall appear for the user to complete. If the user is paying by Credit Media, separate billing address fill-in blanks shall be provided, along with a check box to use the user's delivery address as the billing address. If the "use delivery address" check box is selected, the billing address information shall be automatically populated from the user's delivery address data. Credit Media payments shall also require the user to enter the Credit Media ID number (which is usually printed on the back of the Media).

The Checkout page shall off all acceptable payment methods outlined in Section 5.

At a minimum, the Checkout page shall offer the following payment methods:

- Visa;
- MasterCard;
- Discover;
- American Express;
- PayPal;
- ACH (direct deduction from the user's bank or checking account);
- Payment by Employer-sponsored account or Transit Check Account. (These payments are for Employer Subsidized accounts and related Smart Media only).

The Checkout page shall include highly visible buttons to:

- Submit – completes the transaction;

- Return for More Shopping – saves all information and returns the user to the first Product Selection Screen;

- Change User Information – navigates to the User Registration page. Upon return to the Checkout page, any changes in the user's registration information shall be incorporated in the relevant page fields.

Purchase Confirmation Page

Upon successful completion of transaction processing, a Purchase Confirmation page shall appear containing the transaction summary and a transaction number.

If the user has chosen to print any purchased items, a highly visible "Print Purchased Fare Media" button shall appear on the screen. When pressed, this button shall direct the user to the At-Home Fare Media Printing page.

Order Status Page

The Order Status page shall allow users to view the status of recent orders. For each of the user's previous orders during a SEPTA adjustable time interval, the page shall list:

- The transaction number;

- The date the order was placed;

- The value of the order;

- The current status of the order;

- The date of the current status;

- The shipping method (if applicable);

- The shipping tracking number (if applicable).

The transaction number and the shipping tracking number shall be hypertext link fields. When the user clicks on the transaction number, the Purchase Confirmation page for the transaction shall be displayed. When the user clicks on a hypertext shipping tracking number, the user shall be redirected to the shipping company's web site for package tracking, with all appropriate fields pre-populated.

~~Customer Subscription Pages~~

~~When a user selects the "Customer Subscription" button, the system shall present a series of pages that shall enable the user to:~~

- ~~View all subscriptions in effect;~~
- ~~Add, delete, and modify subscriptions, including product types, quantities, frequency, subscription expiration date, payment method, shipping method, etc.;~~
- ~~Review the status of a subscription order.~~

~~The Customer Subscription web pages shall appear and function similarly to the one-time transaction pages described above (Product Selection, Shopping Cart, Checkout, Purchase Confirmation, and Order Status), but be optimized for the subscription process. For example, the selection of products shall appear similar to the Product Selection page, except that only products that are eligible for subscription shall be shown (based on the contents of the Products database table as described in Section 24.2.4.1.10), and the option for user-printed Fare Media shall not be available. (All subscribed transactions shall be shipped to the Customer.)~~

~~If the user has any products in the Shopping Cart, the Customer Subscription page shall display an error message that informs the user that creating or modifying a subscription requires an empty shopping cart.~~

~~After adding a new subscription, or changing or deleting an existing subscription, the checkout process shall result only in the recording of the user's payment information. The Subscription Confirmation page (similar to the Purchase Confirmation page) shall provide the Subscription Transaction Identification number in lieu of a transaction identification number.~~

~~Employer Administrative Pages~~

~~Upon selection of the "Employer Administration" button from the SEPTA E-Commerce Start page, the user shall be prompted to enter the Employer's login identification and password. When successfully logged in, the e-commerce site shall present a series of Employer Administrative pages that shall enable authorized users to:~~

- ~~Add new employees to the Employer's table of benefit recipients;~~

- ~~Delete employees from the displayed list of employees (As described the employee's entry in the data table shall not be deleted, but the employee status field shall be changed to indicate that the entry is no longer to be displayed);~~

- ~~Modify the product an employee is to receive;~~

- ~~Generate queries and reports of current and previous Fare Media orders and invoices;~~

- ~~Submit payment to SEPTA via EFT.~~

~~Employers shall be able to purchase for their employees only those products available for bulk purchase.~~

~~SEPTA Administrative Pages~~

~~Access to these pages shall be restricted to authorized SEPTA personnel using login and password protection. These pages shall not be accessible by a link on SEPTA web site; authorized users shall be required to enter the secure web page address into their browser to gain access to the SEPTA Administrative Login page.~~

~~Once a user logs into the SEPTA Administrative pages, a menu shall be displayed to provide configuration control, administrative oversight, report and query generation, and other administrative tasks as required herein. Navigation around the Administrative Pages shall be straightforward, and shall be facilitated by the use of common buttons or tabs.~~

~~All SEPTA Administrative Pages shall be cable of being restricted such that they may only be accessed by specified IP addresses.~~

~~*24.2.4.2*~~*24.2.3.5 E-Commerce Hosting ~~and Transaction Processing~~*

The Contractor shall provide secure hosting services for the E-Commerce Web site designed to support SEPTA's on-line sales. In addition to accepting and processing purchase requests, the hosting service shall also provide SEPTA with necessary ~~access to~~ reports and other tools to fulfill and track ~~(i.e., print and deliver)~~ Fare Media sales from individual Customers as well as from groups (such as Employers, Retail Sales Locations and other venues) who purchase Fare Media in bulk quantities.

~~24.2.4.2.1~~24.2.3.5.1 Web Site to be Hosted

The Contractor shall provide web site hosting services for ~~all Contractor-developed pages for~~ the SEPTA E-Commerce Web Site, as well as the E-Commerce Web Site database and all associated Application Program Interfaces (APIs), including necessary interfaces for and integration with the existing SEPTA web site.

All hosted servers utilized to support the NPT E-Commerce site shall be dedicated to this site, and not ~~split~~ shared between multiple sites. The use of a shared ~~virtual~~ server (virtual or physical) to support this site is not allowed.

In addition, the database server ~~must~~shall be hosted on a different physical server than the web server.

If any server utilized for the NPT E-Commerce site is implemented as a Linux Server, an enterprise version of Linux, such as SUSE or RedHat Enterprise Linux ~~must~~shall be utilized. Any implementation of a Linux server ~~must~~shall have the SELinux security functions enabled. Furthermore, the server ~~must~~shall have the Tripwire intrusion detection software installed. Daily Tripwire reports shall be emailed to SEPTA IT Department's network administrator.

~~24.2.4.2.2~~24.2.3.5.2 Availability of Service

~~SEPTA considers the E-Commerce services to be mission-critical. As such, the~~ Contractor shall provide web site hosting services that are highly reliable and provide best-of-industry availability to SEPTA's on-line Customers. The hosted web site shall be available no less than 99.99% of the time. Down time shall be less than one hour per year.

~~24.2.4.2.3~~24.2.3.5.3 Server and Networking Equipment Location

All equipment on which the web site is hosted shall be installed in a secure location that complies with the PCI Data Security Standard.

~~24.2.4.2.4~~24.2.3.5.4 Secure Transactions / Encryption

All purchase transactions shall be secured, and shall utilize no less than 128-bit Secure Socket Layer (SSL) encryption. Similarly, all web pages utilized by administrators and work order clerks shall be secure sites utilizing 128-bit SSL encryption.

~~24.2.4.2.5~~24.2.3.5.5 Credit Media and Payment Processing

The Contractor shall provide all interfaces to the ~~Credit Media clearing and all other~~ payment service providers ~~snd~~and clearinghouses required to process the variety of payment methods identified in this Technical Specification. All applicable payment process shall comply with ISO 8583. All bankcard transactions shall include address verification and Credit Media ID (CCID) verification.

~~24.2.4.2.6~~24.2.3.5.6 Transaction Volume to be Supported

The Contractor shall provide web-hosting services that can process all sales volume, including maximum peak sales volumes experienced by the site, without unduly slowing the transaction speed as perceived by the end user. A minimum of 50,000 credit and debit transactions per hour shall be able to be processed by the hosted web software. During the duration of the contract, the Contractor shall also expand the capacity of the web ~~-~~site as necessary to support sales volume increases without limitation.

24.2.4 Employer Subsidized Smart Media Sales ~~Processing~~

It shall be possible for an organization to will distribute a block of SEPTA Issued Smart Media in the name of the organization such as an employer. The organization shall be responsible for the association of employees to distributed SEPTA Issued Smart Media.

~~24.2.5.1~~24.2.4.1 *Employer Account Sign-up Process*

Employers interested in participating in the subsidized Smart Media benefits program shall be able to apply via the E-Commerce Web Site, through the mail or at the Customer Support Call Center.

~~24.2.5.2~~24.2.4.2 *Participating Employer Database*

Upon satisfying SEPTA's requirements for participation in the program, the system shall automatically create a record for the Employer in the Employer database table and create an empty Employer-Employee database table as described in 24.2.3.4.10~~24.2.3.4.10~~~~24.2.4.1.10~~.

For each participating Employer, the E-Commerce Web Site Database shall contain a record in the Employer database table, and an Employer-Employee database table. The SEPTA Administrative Web Pages shall include the necessary page or pages to maintain and update the Employer database table.

~~24.2.5.3~~24.2.4.3 *Employer-Employee Database Table*

The Employer-Employee database table is defined in Section 24.2.3.4.10~~24.2.3.4.10~~24.2.4.1.10.

Initial Population

Two methods shall be provided for the initial population of Employer-Employee database tables.

- The Employer's transit benefit clerk shall be able to populate the table using the Employer Administrative web page to add new employee records one at a time.
- A file containing the necessary information, formatted as required in a spreadsheet or comma-delimited file shall be created by the Employer and transmitted to SEPTA's Employer transit benefit liaison. Using the tool described in Section 24.2.3.4.10~~24.2.3.4.10~~24.2.4.1.10, the data shall be imported into the Employer's Employer-Employee database table.

Ongoing Maintenance

Ongoing maintenance of the contents of the Employer-Employee database table shall be the responsibility of the Employer's transit benefits clerk. For Customer support purposes, SEPTA's transit benefits liaison shall also have the ability to modify any Employer's database tables.

While the web site shall be set up to automatically allocate the fare products to each of the employees' accounts, based on the ~~fare~~Smart M~~-m~~edia and periodicity identified for each employee, the Employer shall have the ability to add, delete and change records ~~–~~in their Employer-Employee data base whenever required. The employer shall have full control over all of their records in their Employer-Employee database.

At the end of the day, all fare products allocated to the employees accounts shall be identified and an electronic payment shall be made to SEPTA's bank. Each time fare products are allocated to an account, the amount owed shall be tallied to provide a grand total for the amount to paid to SEPTA for that day.

Each day that an Employer provides transit payment to an employee's account, an electronic payment shall be made to SEPTA's bank.

~~24.2.5.4~~24.2.4.4 *Employer Administrative Database Queries and Reports*

The Employer Administrative web pages shall include database queries and reports sufficient to enable the Employer to monitor and manage the transit benefits, track order, invoice, and payment status and history, and to project the cost of the next work order invoice.

~~24.2.5.5~~24.2.4.5 *Administrative Report and Query Functions*

The SEPTA transit benefit liaison shall be responsible for maintaining the Employer database table, and shall be able to do so via Administrative web pages.

Given that all data from the E-Commerce site is synchronized with the NPT Database, authorized users shall also be able to generate queries and reports from the E-Commerce Web Site Database to monitor all E-Commerce management activities via the Report Manager on the Application Server of the CDCRS (See Section 19).

24.2.4.6 Employer Sales Processing

Employers shall provide payments to SEPTA for the purchase of bulk Smart Media via Electronic Funds Transfer. Contractor ~~will~~shall assist SEPTA personnel with all reconciliation processes.

~~24.2.6~~24.2.5 Sales Fulfillment

Following all completed transactions, the E-Commerce site shall be responsible for publishing all details that relate to the transaction to the CDCRS. The CDCRS, via the Smart Media Manager, shall be responsible for generating work orders, to see that the order is fulfilled.

24.2.6 Remote Receipts

~~The~~C ~~c~~customers shall be able to obtain a receipt on the NPT Website for Regional Rail ~~customers~~fare products ~~who~~ purchased ~~an~~ on-board ~~fare via the web~~where a Receipt Token was provided to the customer. ~~-~~The customer shall navigate~~s~~ to the SEPTA E-Commerce site and selects the "remote receipt" function. The customer will be prompted to enter the ~~printed receipt number~~Receipt Token number. Once the ~~receipt~~ number is entered, the appropriate transaction information will be found in the NPT database and the results displayed to the customer.

The customer will be provided with an opportunity to print the receipt If printed, the transaction record shall be created and sent to the CDCRS indicating that the receipt has been printed and that printing the receipt for that transaction shall no longer be permitted in the system.

24.2.7 Preferred Vendor Sales Utility

The NPT System shall provide a web-based utility to permit sales entities to provide Smart Media services. These sales entities will sign-up with SEPTA, or its designated representative, to become an authorized sales and reload location for Smart Media. These sales locations shall not require any NPT System equipment but shall perform all functions through the web site using manual revenue collection processes.

Smart Media functionality shall be accomplished via a secure web-utility. Once the user has signed in to the site, the following functionality shall be provided, based on user passwords, security protections and access privileges:

- Sell blank Smart Media and ~~E~~establish new Smart Media accounts;
- Sell blank Smart Media and ~~append~~assign to an existing ~~new or existing account~~Customer Profile;
- Add value to a ~~s~~Smart ~~m~~Media account;
- Add pass products to a ~~s~~Smart ~~m~~Media account;
- Set up automatic replenishment of Smart Media account; and
- Other functions as designated by SEPTA.

Funds collected for all Smart Media sales shall be via the normal methods for the sales location. This web site shall provide a method for collection and transfer of funds associated with these transactions in an automated manner to a SEPTA account.

At the end of the day, all fare products assigned to a SEPTA or Partner Smart Media account by a Preferred Vendor shall be identified and an electronic payment for all transactions shall be made to SEPTA's bank. Each time fare products are allocated to an account, the amount owed shall be tallied to provide a grand total for the amount to paid to SEPTA for that day.

~~**24.3**~~

Payment via Cell Phone

24.2.8

Cell phone shall be able to be used for pay-by-space system payments. This payment methodology shall require the Customer to pre-register and include a SEPTA-approved payment method as part of their registration. Registration for this service shall be provided via the Internet as well as at the Customer Service Center.

All design requirements for the Customer Support System (see Section 24) shall apply. The CDCRS shall provide all necessary software and hardware required for the incorporation of this payment methodology into the NPT System.

A complete description of this functionality shall be provided for SEPTA review and approval at each design stage and shall include menu selections, screen layouts and other similar information to provide SEPTA a complete understanding of the functionality. Design documents shall fully describe the functionality as defined for this function. **CDR 24-1, PDR 24-5, FDR 24-5**

~~24.4~~24.3 Media Distribution Management

The Contractor shall be responsible for distribution of all media ordered by phone, through the NPT E-C~~c~~ommerce web site, or other SEPTA-approved methodology. This includes distribution of Media to individual SEPTA Customers as well as to employer-sponsored accounts, retail sales locations and other venues. Distribution management includes the distribution of new and replacement Smart Media to Customers.

~~24.4.1~~24.3.1 Media Returns~~, Refunds~~ and Replacements

Defective Smart Media that fail due to no fault of the Customer shall be replaced free of charge. ~~If the Customer has registered the NPT Media, the value shall be transferred to new Smart Media and/or to the Smart Media account.~~ Customers who lose or damage their Smart Media shall be assessed a replacement fee in accordance with SEPTA policy. During the replacement process, these replacement Smart Media shall be automatically identified with the Customers' accounts.

Contractor shall survey Customer behavior and experience with the Smart Media to determine reasons for issuance of replacement Smart Media. All damaged, non-functional Smart Media shall be returned to SEPTA for disposition. Contractor shall provide data in such a way as to assist SEPTA in developing a NPT Media life cycle profile and determination of any manufacturing defects in the Smart Media.

~~24.4.2~~24.3.2 Mail Distribution

Smart Media distributed by mail ~~with no value~~ shall be ~~activated Smart Media,~~ available for use in the system upon ~~an add value transaction~~ activation by the Customer. ~~If a Customer orders a NPT Smart Media with a pre-loaded value, the Smart Media shall also be distributed as activated. However,~~ Customers shall receive notification with their Smart Media, that they ~~must~~shall activate the media either by calling the Customer Support Call Center or via the E-Commerce Web Site~~call the NPT Service Center to activate the Smart Media~~. If the Customer has not called within a specified period of days, Contractor shall add the Smart Media serial number to the I~~i~~nvalid Fare Media List and Bad Number List. However, Contractor shall accept a verified Smart Media activation request and remove the Smart Media from the ~~invalid fare media list~~Invalid Fare Media List and Bad Number List at any time following.

Should the Smart Media be lost or stolen prior to activation by the Customer, the Smart Media shall be added to the Iinvalid Ffare Mmedia lList and the Customer sent new Media at no additional cost to the Customer ~~which contains the validity and privileges stored on the Smart Media that was reported as lost or stolen~~. The replacement Smart Media shall be automatically identified with the Customer's account.

~~24.4.3~~24.3.3 Internet Distribution

The SEPTA NPT E-Commerce web_site is capable of receiving Customer Smart Media orders. Contractor shall fulfill all Customer orders submitted via the SEPTA NPT E-Commerce Web ~~s~~Site.

~~24.5~~24.4 Financial Management

SEPTA Finance Department will be responsible for all bank reconciliations that result from NPT sales and reloads. SEPTA personnel will also investigate all Credit Media charge-backs. Contractor will assist SEPTA personnel with all reconciliation processes.

~~24.5.1~~24.4.1 Service Center Reconciliation

Contractor shall reconcile all funds received through the mail on a daily basis. All funds received shall be transferred to SEPTA's designated bank account prior to the end of each business day.

~~24.5.2~~24.4.2 Refund Handling for Check/Cash Customers

Contractor shall process refunds based on SEPTA's current fare policy. Refunds will be handled by the Customer Support Center in accordance with SEPTA's policies on this issue.

Refund Handling for Credit Media Customers

Contractor shall work to resolve Customer Credit or Debit Media disputes related to NPT Media purchases or loads. If necessary, escalated disputes shall be referred to SEPTA's Finance Department for resolution. No Credits or adjustments shall be issued by NPT Service Center outside of the refund process outlined in this Chapter of the Technical Specification. Contractor shall respond to Customer inquiries for information on recent Credit activity associated with NPT Media or associated account. Contractor shall be responsible for security of information and shall add to the Invalid Fare Media List and Bad Number List ~~Hotlist~~ any Smart Media known to be or suspected of being purchased with and registered to ~~a~~ stolen Credit or Debit Media.

~~24.5.3~~24.4.3 ~~Administration of SEPTA's~~ Service Guarantee Program Administration

The Contractor's Customer Support Center shall administer SEPTA's Service Guarantee Program utilizing the Service Guarantee application resident in the NPT System.

SEPTA guarantees service on all Regional Rail Lines, the Broad Street Subway, the Market-Frankford Line, the Route 100 Norristown High Speed Line, and the Route 101 (Media) and the Route 102 (Sharon Hill) trolleys. As part of the Service Guarantee Program, SEPTA guarantees that these lines will arrive at their final destination within 15 minutes of the scheduled arrival time or Customers will receive a free future trip. This guarantee applies to weekday service only and does not apply when service operates on a Saturday or Sunday schedule. The guarantee excludes extreme weather conditions, acts of God, and conditions beyond SEPTA's control.

The Customer Support Center shall distribute refund claims forms upon request by mail and e-mail, and shall also make the forms available for download and/or printing on the E-Commerce site.

The Customer Support Center shall review Customer requests for Service Guarantees and shall issue Service Guarantee adjustments to SEPTA Customers in accordance with SEPTA's Service Guarantee policy.

24.4.4 Reconciliation of Web-Based Revenues

The NPT System shall incorporate an application that tracks all Web-based sales and Employer revenue allocations to Employee accounts and verifies that the payments have been provided to SEPTA, as required.

For the Internet sales, the values of these sales shall be tracked and the electronic payment verified for each sale against the cleared payment. Missing payments shall be automatically identified and an exception report generated. All exception reports shall be provided on a daily basis, via email, to the designated SEPTA representative.

For the Employer transactions, at the end of each day, the all values assigned to accounts that day shall be summed and matched against payments. If there is a discrepancy between the amount owed and the amount of the electronic payment that day, the discrepancy shall be identified and reported as an exception, via email, to the designated SEPTA representative as well as the contact identified for that employer.

These exception reports shall provide sufficient information to permit SEPTA's representative to resolve the payment discrepancy.

~~24.6~~24.5 Performance and Staff Monitoring

Contractor shall supervise staff to meet the call center performance requirements including but not limited to wait times, call length, and customer satisfaction. All calls received into the call center shall be recorded. Supervisors shall monitor 10% of live calls and review 10% of each CSR's calls for feedback and performance evaluation.

In order for SEPTA to ensure that the Contractor provides a Customer Support System that meets the expectations of SEPTA and the requirements as identified, defined and/or described within this entire Section 24, the Contractor shall provide the following for SEPTA review and approval:

- A System Support Plan which includes the Staffing Plan and shall fully describe all of the elements of the Customer Support System and how all of its requirements shall be implemented by the Contractor;
- Fully developed and documented Procedures for operation of the entire Customer Support System, including all of its services and features; and

- Full design information documenting all System Applications provided as a part of, integrated into and/or incorporated into the Customer Support System.

24.5.1 Performance Monitoring

The Contractor shall enable SEPTA to monitor the performance of the NPT Customer Support Center by reporting on Key Performance Indicators (KPI) in clearly measurable terms. The following levels of performance shall be met and demonstrated through ongoing data capture and reporting:

- Time of completion of Media order (received via mail, internet). This time shall not exceed two (2) business days after receipt of the order;
- Time for handling incoming mail requests (i.e. applications, information requests) and outgoing mail. This time shall not exceed two (2) business days after receipt of the mail request;
- Average number of seconds a caller spends waiting for a Customer Support Agent to answer the phone after being placed in the Queue. This time shall not exceed forty-five (45) seconds between the hours of 6 a.m. and 8 p.m. weekdays. and two (2) minutes at all other times;
- Availability of a Customer Support Agent or the IVR to respond to Customer calls. The wait time shall not exceed two (2) minutes;
- Time between a reported lost/stolen Smart Media and the Smart Media being added to the ~~Invalid Fare Media List~~Invalid Fare Media List and Bad Number List in the NPT System. This time shall not exceed one (1) hour between the hours of 6 a.m. and 8 p.m. weekdays, and two (2) hours at all other times;
- Customer satisfaction rating of Support Center activities.

~~24.5.1~~24.5.2 Staffing Plan

Contractor shall submit a Staffing Plan for SEPTA to approve prior to implementation of the Customer Support Center. The plan shall be resubmitted for SEPTA approval purposes quarterly during the warranty period of the NPT System Contract, and annually thereafter. The plan shall include organization charts and job descriptions by position for all Customer Support Center operations staff.

Contractor shall utilize a personnel policy for both permanent and temporary personnel. Contractor shall perform semi-annual performance evaluations for full-time permanent personnel.

Since contractor staff will be handling SEPTA and SEPTA Customer funds, criminal background checks on all employees are required.

Contractor shall be bonded for all customer care activities.

~~24.5.2Performance Monitoring~~

~~24.6.3 The Contractor shall enable SEPTA to monitor the performance of the NPT Customer Support Center by reporting on Key Performance Indicators (KPI) in clearly measurable terms. The following levels of performance shall be met and demonstrated through ongoing data capture and reporting:~~

- ~~Time of completion of Media order (received via mail, internet). This time shall not exceed two (2) business days after receipt of the order CDRL 24-1;~~

- ~~Time for handling incoming mail requests (i.e. applications, information requests) and outgoing mail. This time shall not exceed two (2) business days after receipt of the mail request CDRL 24-2;~~

- ~~Average number of seconds a caller spends waiting for a Customer Support Agent to answer the phone after being placed in the Queue. This time shall not exceed forty-five (45) seconds between the hours of 6 a.m. and 8 p.m. weekdays. and two (2) minutes at all other times CDRL 24-3;~~

- ~~Availability of a Customer Support Agent or the IVR to respond to Customer calls. The wait time shall not exceed two (2) minutes;~~

- ~~Time between a reported lost/stolen Smart Media and the Smart Media being added to the invalid fare media list in the NPT System. This time shall not exceed one (1) hour between the hours of 6 a.m. and 8 p.m. weekdays, and two (2) hours at all other times;~~

- ~~Customer satisfaction rating of Support Center activities.~~

Section 25 – Support Services
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25 SUPPORT SERVICES

25.1 General

SEPTA is interested in exploring innovative ways to reduce SEPTA's current cost of collecting Customer fares. As such, SEPTA is seeking creative solutions for efficiencies and operational streamlining throughout the Customer payment model, and other means whereby SEPTA can reduce its operating costs, reduce in-house servicing and maintenance requirements, and offer "best value" both internally at SEPTA and to its Customers.

In order to accomplish this goal, SEPTA requires that the Contractor provide a premier support services program from start of revenue service through completion of the NPT System Warranty which includes the following elements:

- Maintenance Services;
- Revenue Services;
- NPT Network Administration Services;
- Credit and Debit Media Processing Services;
- Commercial Wireless Services.

SEPTA requires the ability to transition the responsibilities for these services to SEPTA or to another SEPTA-approved entity at the conclusion of the performance period of the Support Services Contracts. Accordingly, at the conclusion of the Support Services performance period, the Contractor shall, at no charge, turn-over to SEPTA all items used by the Contractor to perform the Support Services defined in this Section, including but not limited to, manuals, procedures, computers, applications, devices, tools and vehicles. Furthermore, the Contractor shall ensure that the design of the NPT systems used to facilitate the Support Services shall have a clearly defined interface and are able to accommodate transition to SEPTA or a SEPTA-designated entity without the need for additional hardware or software changes. ~~In the event that changes are needed to the systems or systems interfaces to accommodate interfacing with a new entity's system, this work shall be performed by the Contractor at no additional cost to SEPTA. This requirement applies to all Support Services inclusive of the Credit and Debit Media Processing Services as well as the Commercial Wireless Services.~~

25.2 Maintenance Services

SEPTA expects that all of the NPT equipment will be fully functional at all times. However, it is understood that there will be times when NPT equipment may be out of service awaiting support from a repair technician. It is SEPTA's intention to minimize the instance of these occurrences and to maximize Customer satisfaction with the NPT System through use of a proactive maintenance program for the following deployed NPT System elements:

- Regional Rail NPT Equipment;
- Surface Fleet NPT Equipment;
- Subway ~~/ /~~Elevated NPT Equipment;
- Parking NPT Equipment;
- Building Access Control NPT Equipment; and
- CDCRS and Communications NPT System Equipment.

25.2.1 Maintenance Requirements

The Contractor shall be responsible for maintaining the NPT System and equipment and shall also maintain the associated communications and control system in accordance with the requirements of the maintenance manuals as defined in Chapter 22 of the Technical Specification for this Maintenance Contract. The Contractor shall provide all labor, materials and consumables. Consumables shall not include ~~with the exception of~~ Fare Media stock, toner for computer system printers and NPT equipment receipt stock. ~~-~~The Contractor shall also provide all tools, transportation, test equipment, personnel communications, facilities, and supervision to maintain the NPT equipment.

The Contractor ~~is~~shall be responsible for all maintenance regardless of whether equipment failure is due to a component or software fault or is user-induced. Repairs to equipment damaged as a result of vandalism or force majeure shall be undertaken by the Contractor on a Task Order basis as part of this contract. The attribution of an equipment failure ~~incident~~ as an incidence of vandalism shall be subject to mutual agreement between SEPTA and the Contractor.

The objectives of this contract are to maximize availability of NPT equipment to the public and maintaining accuracy in sales and usage transactiongs and reporting fare system sales.

25.2.2 Responsibilities of the Contractor

Contractor responsibilities shall include the following, which are specified in greater detail in subsequent sub-sections:

- Field and Bench-level Preventive Maintenance: Perform field and bench-level preventive maintenance on all devices and components installed by the original equipment manufacturer of the equipment and its successor companies and on serviceable modulesas a part of the NPT System.
- Field and Bench-level Corrective Maintenance: Perform all field and bench-level troubleshooting and repairs on all NPT equipment installed as part of the NPT System.
- Emergency Response: Respond on-site to calls from SEPTA in the event of equipment alarm.
- Spare Parts Inventory Management: Manage the inventory of spare parts, materials and consumables that are required for the continued operation of the NPT system and its devices.
- Software Maintenance and Upgrades: Repair, tTest and load existing, new, modified or upgraded software and data tables tofor the NPT System and its installed devices or NPT System network.
- Technology Refreshment Services: Perform an overhaul proper maintenance and provide software upgrades on all system devices and/or replace devices with new to ensure that all NPT System devices will perform reliably in full revenue service. for five years after conclusion of the Maintenance Services Contract.
- Task Order Work: Perform task order assignments as defined by SEPTAas part of this contract.

25.2.3 Contractor Local Point-of-Contact

The Contractor shall identify a local point-of-contact that can be contacted by SEPTA personnel on a 24/7 basis. The point-of-contact shall be the individual in charge of local Contractor personnel at the time of the call. The Contractor shall provide ~~submit~~ a schedule each month ~~of the designated point-of-contact~~ identifying at all times of each day ~~including~~ the phone number for contacting the individual.

25.2.4 Field and Bench-level Preventive Maintenance

The Contractor shall be responsible for performing all field and bench-level ~~p~~Preventive ~~m~~Maintenance (PM) of the NPT equipment and modules. ~~Preventive Maintenance (PM) refers to periodic, scheduled procedures that ensure the equipment meets equipment reliability and availability targets with a minimum of corrective maintenance. T~~The Contractor shall perform preventive maintenance according to the tasks and cycles as they have defined in their final documentation. Included in this task is maintenance of the NPT System and equipment in compliance ~~of~~with revised government~~al~~ regulations and payment card industry standards.

No more than five (5) business days after receiving Notice to Proceed for Preventative Maintenance Services, the Contractor shall provide a plan for meeting the requirements of the preventive maintenance program, for SEPTA approval. **CDRL 25-1** The plan shall include a Preventive Maintenance Schedule form for reporting both planned and actual PMs for a given month both ~~in~~for the field and at a bench-level activities. The plan shall also include a PM checklist to be used by the technician in the field and on the bench to report completion of each task of a scheduled PM.

No less than five (5) business days before the start of each month, the Contractor shall submit a Preventive Maintenance Schedule, showing planned PM activities for the coming month. No more than five (5) business days after the end of the month, the Contractor shall resubmit the Preventive Maintenance Schedule for the previous month showing the planned preventive maintenance activity that was or was not completed. The Contactor shall keep a file, both electronic and hard copy formats, of all PM Checklists for the duration of the contract to be available for SEPTA inspection.

25.2.5 Field and Bench-level Corrective Maintenance

The Contractor shall be responsible for completing all field and bench-level ~~c~~Corrective ~~m~~Maintenance (CM) on the New Payment ~~T~~ Technologies (NPT) equipment and modules. ~~Corrective Maintenance (CM) refers to unscheduled repairs necessary to correct a machine malfunction. CM includes diagnostic testing, finger-tip repairs, component change out, and verification testing.~~

CM tasks include cleaning of equipment, removal of stains and markings due to minor graffiti, correction of all failures due to equipment error or component faults, and replacement of faulty or failed components or modules.

25.2.5.1 Field Level Corrective Maintenance

~~A field CM call is not complete until the unit is fully operational. Equipment left in a degraded mode is not operational for calculating equipment availability.~~

The Contractor shall monitor the status of equipment during normal SEPTA service hours. The Contractor shall log and respond to an equipment failure that is reported in any of the following ways:

- CDCRS report of equipment-detected fault;
- Contractor determination of unusual activity (e.g., no credit card sales at a FVD) requiring on-site investigation;
- Notification by SEPTA;
- Field observation by SEPTA or Contractor personnel.

During all stops at a station for PMs and CMs, the Contractor's personnel shall test, confirm, and log the operational status of all the equipment at a station. Inoperative equipment shall be reported, repaired, retested, and returned to service.

The Contractor shall respond to each CM call with the objective of maintaining a high level of availability of fully-functional equipment throughout the system. It is particularly critical that each location have at least one fully-functional item of equipment of each type operated by the passenger. The Contractor shall immediately dispatch field personnel to a location that has no fully-functional equipment, upon discovery of that situation.

A field CM call shall be timeds starting with the written or oral notification of the Contractor of the problem. Correction of the problem shall not be considered complete until the equipment maintained isresumes fully operational status. Equipment remaining in a degraded mode shall not be defined as operational for calculating equipment availability.

No more than five (5) business days after the end of the month, the Contractor shall submit a report of all field repair activity. The report shall be provided as an electronic database, using Microsoft Access/Excel or other SEPTA-approved software.

25.2.5.2 Bench-level Corrective Maintenance

After the Contractor changes out a faulty module or component in the field, the Contractor shall be responsible for repairing and testing the faulty unit in a bench-type environment. Repaired modules and components shall be returned to spare parts inventory to be available for future use.

Within five (5) business days after the end of each month, the Contractor shall submit a report of component repairs. The report shall include all work orders for component repair that were open at any time during the month, regardless of the date each was opened or the status at end of month.

25.2.5.3 Bench-level Overhaul

After the Contractor changes out a module or component in the field that is scheduled for overhaul, the Contractor shall be responsible for overhauling and testing the unit in a bench-type environment. Overhauled modules and components shall be returned to spare parts inventory to be available for future use.

Within five (5) business days after the end of each month, the Contractor shall submit a report of Overhaul activities. The report shall include all work orders for component Overhaul that were open at any time during the month, regardless of the date each was opened or the status at end of month.

25.2.6 Emergency Response

~~Although~~ SEPTA service ~~does not~~ currently operate~~s~~ at all times of the day ~~or~~ and week~~.~~ ~~Th, th~~ere are incidents that can occur at any time that may require the immediate response of Contractor personnel. The Contractor shall monitor equipment status at all times in order to respond to and correct NPT System problems.

In the event the Contractor receives an alarm of unauthorized intrusion into any NPT equipment, the Contractor personnel ~~will~~ shall follow the procedure agreed with SEPTA.

In the event of unauthorized entry that requires that the equipment be secured, the Contractor ~~will contact the Contractor Point-of-Contact who will~~ shall immediately dispatch a technician to the site to secure the equipment and its contents. In the event the unauthorized intrusion alarm is inadvertently caused by Contractor personnel, the Contractor shall immediately notify SEPTA.

The Contractor shall submit a report of unauthorized entry incident response~~s~~ within 24 hours of ~~the~~ each incident, providing details on the

- ~~-~~times of notification~~;~~~~,~~
- dispatch and arrival on-site~~;~~~~,~~
- ~~names of point-of-contact and~~ responding technician~~;~~~~,~~
- action taken on-site~~;~~
- and preliminary assessment of damage~~;~~ and~~.~~
- Inadvertent alarms shall also be reported.

The contract requires 24/7 availability as part of the contracted monthly fee. ~~Incident response and on-site activity shall be invoiced as part of this contract on a time and materials basis.~~

25.2.7 Spare Parts Inventory Management

The spare parts inventory ~~is and~~ shall remain the property of SEPTA. SEPTA will make this inventory available to the Contractor for use in maintaining the operating status of the NPT equipment. during performance of the maintenance of the NPT System The Contractor may use spare parts from this inventory, but ~~must~~ shall replace any such parts used free of charge within one month of use. All spare parts used by the Contractor shall be used in a "first-in first-out" inventory management process.

During the period of this contract, the Contractor shall keep a sufficient supply of spare parts on hand to ensure the unimpeded availability of NPT equipment. This inventory shall include a sufficient number of operational spares ~~of non-defective~~and cash containers to support timely revenue servicing of the equipment.

The Contractor and SEPTA shall jointly inventory the type, quantity, and condition of the spare parts components, modules, consumables, and equipment on hand at the commencement of the Contract. The Contractor shall be responsible for maintaining electronic records of ~~the~~ all spare parts, components, modules, consumables, and equipment ~~inventory~~ in an inventory control system. This shall include~~s~~ identification of the location (shop, counting room, at Contractor facility for repair, inventory, technician supplies, armored truck, or equipment unit and equipment type) of all spare parts in SEPTA's inventory. ~~All components and modules, which are reusable as operational spares or maintenance spares, shall be tracked by location on the system. The inventory control system shall be capable of tracking module location by shop, counting room, inventory, technician supplies, armored truck, or equipment unit and equipment type.~~

Changes in inventory, including the purchase of replacement parts and the disposal of non-serviceable units, shall be included in the end-of-month reports.

The Contractor shall inspect and test newly ordered spare parts as a condition of acceptance upon delivery to ensure that the products meet specifications.

At the conclusion of this contract, Contractor and SEPTA shall ~~record~~ again inventory the type, quantity, and condition of spare parts. It shall be the Contractor's responsibility to ensure that quantities in this final inventory ~~-~~are the same as the initial inventory and conditions of the spare parts reflect nothing more than normal wear and tear during the contract period. If spare parts are missing or damaged outside the limits of normal wear and tear, the Contractor shall, at their cost, ~~pay the cost to~~ purchase or repair spare parts to bring inventory levels back to the standards recorded at ~~Notice to Proceed~~the commencement of this maintenance Contract. SEPTA will approve any requested exceptions.

For the period of this Maintenance C~~c~~ontract, the Contractor shall be responsible for maintaining the quantities of parts in inventory, supplying SEPTA with any necessary replacement parts (above those needed to support the Maintenance Program) at the prices submitted on the Contractor's parts list. If a required part or component is no longer available from a third party supplier to the Contractor, the Contractor shall identify or develop a compatible replacement solution that retains the overall functionality of the original part or components at a price that is acceptable to SEPTA.

25.2.8 Software Maintenance and Upgrades

As a part of the Maintenance Contract, Contractor shall provide services to ~~T~~test and load new, modified, or upgraded software and data tables to system devices or system network. When the Contractor is notified of of a software incident, the Contractor shall respond immediately to SEPTA. After this response, the software maintenance commitments shall be as follows:

Table 25-1 – Software Maintenance Response Commitments

~~Table 25-1 Software Maintenance Response Commitments~~

Problem Severity Level	Problem Description	~~Response~~ System Recovery Time~~Time~~	Problem Resolution Time
Level 1: "Critical"	The NPT System or the Software is inoperable	1~~2~~ hours~~s~~	8 hours
Level 2: "Urgent"	One or more major functions of the NPT System or the Software is inoperable.	2 hours	1 day
Level 3: "Standard"	Software problem that impairs the performance of a minor function in the NPT System but for which a workaround is available.	12 hours	1 week
Level 4: "Low"	Problem in a rarely used function in the Software or the NPT System, or problem for which there is an easy and effective method of avoiding impact to the NPT System.	24 hours	Less than 2 weeks

Response times and resolution objectives shall be measured from the time of initial report of the problem to the Contractor by SEPTA using either telephonic, electronic or other auditable notification.

~~25.2.9~~Contractor will ensure SEPTA is not in violation of any software license agreements required in connection with the modification of the NPT System. Contractor will take no action that will void warranties of equipment, hardware or software belonging to SEPTA.

~~25.2.10~~25.2.9 Technology Refreshment Services

~~The Contractor shall perform an overhaul on all NPT System devices maintained under this Contract and/or replace these devices with new~~ From the time the first item of NPT equipment is installed, Contractor shall:

Rigorously comply with the agreed maintenance program requirements to ensure that the NPT System and all components attain the required useful~~;~~ life. Prior to conclusion of the Contractor's maintenance responsibilities SEPTA shall be able to, whenever desired, review all of the Contractor's maintenance records and NPT equipment to verify the maintenance has been performed properly.

Update of all third-party software to the most current applicable version. Exceptions for this update shall be at the discretion of and with the approval of SEPTA. ~~to ensure that the devices will perform reliably in full revenue service for five years after conclusion of the Maintenance Services Contract.~~

~~25.2.11~~25.2.10 Performance Requirements

The Contractor's performance will be measured based on the extent to which these objectives are achieved through satisfactory maintenance, revenue collection and processing, and technical support.

Failure to meet the requirements as identified shall permit not less than fifty percent (50%) and not more than ninety percent (90%) of the payments to be withheld from the Contractor until the specified requirements have been met~~, based on SEPTA's~~.

In order for SEPTA to ensure that the Contractor provides Maintenance Services that meet the expectations of SEPTA and fulfill the maintenance requirements as identified, defined and/or described within this Section 25, the Contractor shall provide the following for SEPTA review and approval:

- A Maintenance Services Plan which shall fully describe all of the elements of the Maintenance Services and how all of its requirements shall be implemented by the Contractor **CDRL 25-2**; and
- Fully developed and documented Procedures for all system maintenance provided **CDRL 25-3**.

~~*25.2.11.1*~~*25.2.10.1 Equipment Availability*

System availability will be measured at the commencement of the peak period during each day as well as during off-peak periods as defined below.

An item of equipment will be judged as available if it is fully functional; that is, all patron features must be available for customer use. Failure of one of more functions to be available for customer use shall render the equipment to be either degraded or out-of-service. Equipment that is not fully functional shall be considered to be unavailable for purposes of calculating availability. Excluded from the availability calculations:

- Equipment out of service due to the following external causes:
    - o Vandalism;
    - o Accidental damage caused by third-parties not associated with the Contractor;
    - o Acts of God which include: station flooding, tornados, rainstorms with driving winds, local earthquakes (moderate or greater), lightning strikes, fires, mudslides;
    - ~~oVoltage surges or lapses, which exceed specified Tolerances and which are not the fault of the Contractor;~~
    - o Equipment out of service for preventive maintenance activity that requires downtime exceeding six (6) hours and for which the scheduled downtime is pre-approved by SEPTA;
    - o Equipment out of service for retrofit or upgrade for which the scheduled downtime is pre-approved by SEPTA;
    - o Equipment which is fully functional with the one exception of being unable to process Credit Media or Debit Media transactions due to faults occurring within a third-party communications networks or credit card transaction clearinghouse.

Equipment ~~will~~ shall be considered "unavailable"~~in service and available~~ if ~~they have been~~ reported out of service by any party ~~by an individual other than SEPTA, Contractor or subcontractor staff and the report is not corroborated by either staff or by CDCRS report or query~~. ~~These third-party reports will be considered false alarms until proven otherwise.~~

Equipment identified as "unavailable" for the availability calculations will be those that are out of service or in degraded mode, due to causes that include all other problems except as identified above.

Maintenance on fare collection equipment shall be performed in such a manner as to provide for the following availability to meet AM rush hour requirements and throughout the AM rush hour. (For purposes of maintenance, the AM rush hour is defined as from 6 AM through 9 AM).

- 99.5% availability by device type 100% availability of for all equipment located at the stations, garages, and NPT equipment locations to meet AM rush hour requirements and throughout the AM rush hour. For purposes of maintenance, the AM rush hour is defined as from 6 AM through 9 AM.; and

- not more than one of each type of equipment shall be out of service at any location.

Maintenance on fare collection equipment shall be performed in such a manner as to provide for the following availability to meet PM rush hour requirements and throughout the PM rush hour. (For purposes of maintenance, the PM rush hour is defined as from 4 PM through 7 PM.)

- 100% 99.5% availability by device type of for all equipment located at the stations, garages, and NPT equipment locations; and to meet PM rush hour requirements and throughout the PM rush hour. For purposes of maintenance, the PM rush hour is defined as from 4 PM through 7 PM.

- not more than one of each type of equipment shall be out of service at any location.

- Availability at all other times shall provide for no more than one of each type of NPT equipment out of service at any location.

25.3 Revenue Services

SEPTA will be responsible for revenue servicing of the NPT System through the conclusion of the NPT System Warranty period. SEPTA requires that the Contractor provide revenue services for the NPT System in accordance with the requirements of the revenue servicing manuals as defined in Chapter 22 of the Technical Specification after conclusion of the Warranty period if the NPT Revenue Services Contractual Option is executed by SEPTA in accordance with the NPT System Contract.

Such rRevenue servicing activities shall include any or all of the following services in support of NPT Equipment deployed on Regional Rail (including remittances), Surface, Subway / /Elevated, and Parking environments:

- Cash Container Exchange;

- Coin Supply Replenishment;
- Fare Media/Receipt Stock Replenishment;
- Cash Counting;
- Cash Deposits;
- Prepare reports on revenue and transactions and on equipment performance and status;
- Regional Rail Remittances;
- Reconciliation and Settlement;
- Third Party Payment follow-up and Reconciliation.

In order for SEPTA to ensure that the Contractor provides Revenue Services that meet the expectations of SEPTA and fulfill the revenue service and auditing requirements as identified~~, defined~~ identified ~~and/or described~~ within this Section 25, the Contractor shall provide the following for SEPTA review and approval:

- A Revenue Services Plan which shall fully describe all of the elements of the Revenue Services to be provided as well as a description of how all of its requirements shall be implemented by the Contractor **CDRL 25-4**; and
- Fully developed and documented Procedures for all revenue service and auditing services provided **CDRL 25-5**.

25.3.1 Responsibilities of the Contractor

Contractor responsibilities shall include the following, which are specified in greater detail in subsequent subsections:

- NPT Equipment Revenue Servicing: Remove cash-handling modules from the NPT equipment~~, e.g., FVDs, parking equipment~~ and transport them to a location designated by SEPTA.

- Regional Rail Remittance. Accept revenues from Regional Rail conductors as part of their remittance of collected fare revenue (and expended cash fare receipts) and reconcile these revenues. Track and issue to conductors NPT HSDs and associated peripherals, Cash Fare Receipt pads and Receipt Tokens as required.

- Sales Office Revenue Collection: Pick up the cash revenue receipts from sales locations at Regional Rail and Subway/Elevated stations and transport to a location designated by SEPTA.

- Equipment Change and Fare Media Resupply: Replenish change-making coin supply, Fare Media, and paper receipt stock in NPT equipment., e.g., FVDs, ASDs, RSDs, parking equipment, etc.

- Sales Office Fare Media Resupply: Transport Fare Media and collect Fare Media from SEPTA and third party Fare Media sales offices (sales offices).

- Cash Revenue Processing and Reporting: Count and record cash removed, and transport for deposit purposes to a banking location designated by SEPTA.

- Periodic Audit Support: Remove, transport, and count and record , under SEPTA direction and supervision, theall coin, currency, and Fare Media on hand in a selected item of NPT equipment. and reconcile against reports of the expected contents.

- Revenue Accounting: Maintain financial records of revenue transactions and reconcile reports from CDCRS, bank, and clearinghouse.

- Periodic Audits: Count and record all coin, currency, and Fare Media removed from an item of NPT equipment selected for audit and reconcile against reports of the expected contents.

- Fare Media Procurement: Procure and supply Fare Media to be issued from the NPT equipment and to internal and external sales locations. Inspect and test ordered Fare Media stock as a condition of acceptance upon delivery to ensure that the products meet specifications.

25.3.2 Contractor Local Point-of-Contact

The Contractor shall identify a local point-of-contact that can be contacted by SEPTA personnel on a 24/7 basis. The point-of-contact shall be the individual in charge of local Contractor revenue service personnel at the time of the call. The Contractor shall submit a schedule each month of the designated point-of-contact at all times of each day including the phone number for contacting the individual.

25.3.3 Fare Media Inventory Management

The Contractor shall procure Fare Media for the NPT System on behalf of SEPTA and for other Fare Media on behalf of Other Transit Agencies as defined in Section 2.1.4. The Contractor shall be fully responsible for securing and controlling its inventory of Fare Media. The Contractor shall maintain records that track the location of each item of Fare Media that has been consigned, while in secure storage, in transport, in NPT equipment, and awaiting disposal. Unusable rolls/stacks or partial rolls/stacks of Fare Media tagged for disposal shall be secured until delivered to SEPTA for destruction. A record of possession shall be maintained at all times.

The Contractor shall include the status of ~~its~~the Fare Media inventory with its end-of-month reports.

SEPTA retains the right to audit and inspect the Fare Media inventory for the duration of the Contract.

25.3.4 NPT Equipment Revenue Servicing

The Contractor shall be responsible for the revenue servicing of all NPT equipment. Contractor shall be permitted to use elevators at the Subway/Elevated stations for the transport of the Fare Media stock and cash containers to the NPT equipment locations and the revenue receipts from the NPT equipment location~~a~~ back to the revenue service vehicles. ~~This~~ Revenue service shall involve the following activities:

- Retrieving revenue receipts from station and parking equipment. This entails removing coin and bill vaults from FVDs and inserting empty vaults in their place.

- Replenishing change-making coin supply. This entails removing hoppers from the FVDs and parking equipment and replacing each with a hopper containing a full supply of coin of the same denomination as the removed hopper.

- Replenishing Fare Media and paper receipt stock. This entails removal of an empty or partially-used roll/stack of stock and replacing it with a fresh supply. The number of Fare Media installed and the serial number of the first Fare Media are entered into NPT equipment memory to electronically monitor stock on hand. The Contractor shall also record the serial number manually for Contractor inventory control. Serial numbers may not be provided for receipts, dependant on stock type used

All revenue-handling modules removed from NPT equipment shall be delivered to the Cash Revenue Processing and Recording location prior to the end of the calendar day on which the modules are collected.

The Contractor personnel performing these duties shall follow proper step-by-step procedures during this activity to ensure that personnel and the general public are safe, revenue and Fare Media remain secure, transaction and revenue records are retained and secure, intrusion alarms are not inadvertently activated, hardware is not damaged and the NPT equipment is properly returned to customer-ready operation.

As a final step in revenue servicing, the assigned Contractor personnel shall perform a diagnostic check to ensure NPT equipment readiness for customer use.

The Contractor may perform revenue servicing during time periods pre-authorized by SEPTA. No more than one item of NPT equipment of any type at a station shall be out-of-service for revenue servicing or PM at the same time.

The Contractor shall be responsible for monitoring status via the CDCRS and scheduling and dispatching crew to perform revenue service before the NPT equipment can no longer accept additional cash transactions, or can longer issue change or Fare Media. The Contractor shall minimize Fare Media spoilage; that is, the unused Fare Media that is to be disposed.

Personnel performing any revenue servicing activity in the field shall not have access to information pertaining to the contents of any revenue-handling modules that are removed from the NPT equipment.

25.3.5 Regional Rail Remittance

The Contractor shall be responsible for all Conductor remittances and shall utilize the Crew Remittance System (as identified in Section 19.6.3) for management and reconciliation purposes. This shall involve the following activities:

- Collection of Revenues and ~~Smart~~Fare Media stock;
- Reconciliation of Conductor Revenues and ~~Smart~~ Fare Media stock (including Receipt Tokens);
- Issue of new ~~Smart Media~~Fare Media stock; and
- Replenish conductor's working fund, as necessary.

Revenue is remitted at defined locations and shall be verified against the conductor's waybill and the data entered into a Crew Remittance System. The status of all ticket stock shall be tracked in its database by individual serial number from distribution through destruction. Assortments of reports are available for tracking cash remittances, revenue against conductor work schedules and stock.

25.3.6 Office Revenue Servicing

The Contractor shall provide the following services to the Customer Service windows at all Subway/Elevated locations. The Contractor shall service these windows as part of each stop to revenue service the NPT equipment at that station.

25.3.7 Change-Making Supply

The Contractor shall be responsible for filling replacement hoppers prior to their transport to the field. Each unit shall be tested prior to their use.

Coins necessary to fill the change-making units in the FVDs will be provided by SEPTA.

Contractor shall maintain adequate inventory to ensure that FVDs band parking equipment can continue to make change as necessary. The Contractor shall maintain complete and up-to-date records that accurately account for the quantity of change by denomination in inventory and delivered to NPT equipment. The Contractor shall transmit these records daily via e-mail or as directed by SEPTA. These records and the inventory shall be made available for inspection and audit at any time by SEPTA.

When the change inventory reaches a pre-established level, the Contractor shall provide a written request for additional coins to SEPTA. SEPTA will approve the request, if valid, and authorize the bank to make the coins available to the Contractor. The bank fulfilling the authorization shall be the same bank to which Contractor makes the deposits.

25.3.8 Cash Revenue Processing and Recording

The Contractor shall be responsible for all cash picked up from the NPT equipment and sales offices until such cash is deposited into SEPTA bank accounts. Prior to deposit of cash, the Contractor shall sort and count the cash. The contents of each cash container shall be recorded individually for each cash container serviced.

Deposits from the sales window shall be delivered to the bank by the Contractor on the same day.

Cash processed shall be deposited no later than the business day following the day the cash was collected. Reports on the contents of each cash container serviced shall be provided to SEPTA no later than two business days immediately following the day the cash was collected. E-mailed reports are acceptable to meet this requirement.

Contractor shall be responsible for all shortages exceeding $10.00 between deposited cash and accounting reports for each cash container, unless an exception is approved by SEPTA.

25.3.9 Audits

SEPTA intends to audit at least one item of NPT equipment per week. This will entail removing all money and Fare Media, counting the money, and comparing the results to the contents that are reported by the CDCRS. The Contractor shall support this effort and this shall include (under SEPTA observation):

- Remove the cash containers;
- Remove all Fare Media;
- Empty the coins from hoppers into a sealed bag;
- Inspect the NPT equipment interior for coin, bills or Fare Media that may have fallen loose inside;
- Transport the removed contents to the Contractor cash counting facility;
- Count and record the contents, including money and Fare Media.

SEPTA will compare the actual recorded contents to the contents expected based on CDCRS reports. Discrepancies shall be further investigated by SEPTA as to cause.

25.3.10 Performance Requirements

The following requirements shall be achieved.

- All FVDs shall be revenue serviced prior to:
    - The bill vault reaching 90% of capacity
    - ~~.1~~o The coin vault reaching 90% of capacity
    - Any change unit being void of change for a period of more than two (2) hours
    - The depletion of any fare media stock for longer than one hour
- All PPSs shall be revenue serviced prior to:
    - ~~.2~~o The coin vault reaching 90% of capacity
    - Any change unit being void of change for a period of more than two (2) hours
    - The depletion of receipt stock for longer than one hour
- All deposits shall be made on the same business day as their reconciliation with the CDCRS.

- Sales offices shall be fully stocked by the first business day of each week. Orders shall be filled within 24-business hours of receipt of the order.

- Reconciliation of all revenues – manually counted versus as reported by the NPT System – shall be not less than 99.75%.

25.4 NPT Network Administration Services

SEPTA requires that the Contractor provide NPT Network administration services for the CDCRS outlined in Section 19.

In order for SEPTA to ensure that the Contractor provides Network Administration Services that meet the expectations of SEPTA and fulfill the network support requirements as identified, defined and/or described within this Section 25, the Contractor shall provide the following for SEPTA review and approval:

- A Network Administration Services Plan which shall fully describe all of the elements of the Network Support Services to be provided as well as a description of how all of its requirements shall be implemented by the Contractor **CDRL 25-6**; and

- Fully developed and documented Procedures for all network support activities provided **CDRL 25-7**.

25.4.1 Hardware and Networking

The following subsections outline the required services regarding the CDCRS hardware and network.

25.4.1.1 Hardware and Networking Maintenance

Tasks shall include the following as a minimum:

- Schedule regular hardware and networking preventive maintenance services;

- Report and install required fixes to correct hardware deficiencies and networking vulnerabilities. Maintain records and track status of all such requests. Ensure contact with vendors to keep current on the latest releases and fixes to software. Communicate modifications to SEPTA IT Department;

- Make provisions for the orderly implementation of hardware and networking configuration changes to minimize disruption of system services to passengers. Document changes accordingly and identify all identified deficiencies and problems. Perform and document needed corrective action;

- Manage the segregated test environment insulated from the production environment. Develop and implement test procedures. Perform testing of new hardware and networking configuration changes prior to migration to the production environment. Enforce procedures to ensure that only approved changes are implemented (e.g. receipt of modification request forms that outline changes to be made to software).

25.4.1.2 Hardware and Network Monitoring

Perform scheduled reviews of the system upkeep by checking the hardware components of the system to ensure they are operating within specified parameters. Sample tasks include, but are not limited to:

- Defragmenting disk files and purging obsolete files from directories;

- Checking run-time utilization parameters for file size allocations, processor loading, and response times;

- Maintaining logs of scheduled maintenance and records of system anomalies;

- Perform job scheduling and monitoring of all data interfaces both in and out of the CDCRS.

25.4.1.3 Fault Detection, Diagnosis and Correction

Tasks shall include the following as a minimum:

- Diagnose system faults and perform necessary corrective action. Log occurrences, capture pertinent data, and notify designated SEPTA personnel;

- Follow-up on corrective action by verifying that the fault has been appropriately and completely corrected and track all activities;

- Maintain electronic records of system faults and corrections and provide necessary reports to SEPTA departments as requested;

- Track failures for all NPT System hardware and network, components. Have repair and/or recovery processes in place for each;

- Research and address reported hardware and network problems.

25.4.1.4 Hardware Security Administration

Tasks shall include the following as a minimum:

- Manage physical access to data center. Maintain list of authorized personnel and monitor entry to and exit from secured areas.

25.4.1.5 Data Entry

Tasks shall include the following as a minimum:

- Enter, modify, and maintain system and application parameters. Report unauthorized modifications and accesses;

- Track changes to all system settings and parameters and ensure validity. Report unauthorized modifications and accesses.

25.4.1.6 Report Generation

Tasks shall include the following as a minimum:

- Produce ad hoc reports and queries as needed;

- Collect, maintain, and provide regular reports on data center and system administration activities for auditable reports of Contractor performance on contract;

- Provide administrative reports such as staff activity, attendance, and training as required by SEPTA to demonstrate satisfaction with terms in the agreement.

25.4.1.7 Documentation Library

Tasks shall include the following as a minimum:

- Establish and maintain a documentation library containing all materials for hardware, standards manuals, and procedure manuals developed during the project and ongoing maintenance, hardware inventory, and configuration operating and administrative procedures. Electronic copies and hardcopies of all documents shall be included in the library;
- Ensure that documentation needed for continued operation and management of the system is accurate and available;
- Update documentation based on system hardware modifications from all vendors, including third parties.
- Manage, maintain and administer the Library Workstations identified in Section 23.6.

25.4.1.8 End User Assistance

Tasks shall include the following as a minimum:

- Provide technical support to user department staff and attend internal/external meetings as needed;

25.4.2 Software and Applications

The following subsections outline the required services regarding the CDCRS software and applications.

25.4.2.1 Software Maintenance

Tasks shall include the following as a minimum:

- Schedule regular software preventive maintenance services;
- Perform software upgrades to maintain currency of operating system and application software. This includes third party software application upgrades, patches on host processors, servers and personal computer clients, ensuring software is maintained at a release level supported by the vendor and as appropriate within two release levels of the most current release;

- Report and install required fixes to correct software deficiencies. Maintain records and track status of all such requests. Ensure contact with vendors to keep current on the latest releases and fixes to software. Communicate modifications to SEPTA IT Department;

- Make provisions for the orderly implementation of software configuration changes to minimize disruption of system services to passengers. Document changes accordingly and identify all deficiencies and problems. Perform and document needed corrective action;

- Perform testing of new software configuration changes prior to migration to the production environment. Enforce procedures to ensure that only approved changes are implemented (e.g. receipt of modification request forms that outline changes to be made to software).

- Perform validation testing on updated Escrow Software. Validation testing shall occur both on the CDCRS and on all affected NPT devices any time new or revised software is generated. This testing shall be required prior to installation on the CDCRS or any NPT equipment. This task shall be compliant with the escrow requirements of Section 20.

25.4.2.2 Software Monitoring

Performance of scheduled reviews of the system upkeep by checking the software components of the system to ensure they are operating within specified parameters. Sample tasks include, but are not limited to:

- Maintaining logs of scheduled maintenance and records of system anomalies;

- Maintaining the virus protection system and performing needed detection sweeps;

- Perform job scheduling and monitoring of all data interfaces both in and out of the CDCRS;

- Review log files to ensure that all data transfers completed successfully and perform reconciliations to ensure interface content is accurate;

- Monitor the CDCRS to ensure that no unauthorized software has been introduced.

25.4.3 Fault Detection, Diagnosis and Correction

Tasks shall include the following as a minimum:

- Diagnose CDCRS faults and perform necessary corrective action. Log occurrences, capture pertinent data, and notify designated SEPTA personnel;
- Follow-up on corrective action by verifying that fault has been appropriately and completely corrected and track all activities;
- Maintain electronic records of CDCRS faults and corrections and provide necessary reports to SEPTA departments as requested;
- Track failures for all CDCRS software and application components. Have repair and/or recovery processes in place for each;
- Research and address reported software problems.

25.4.3.1 Application Backup and Archiving

Tasks shall include the following as a minimum:

- Perform scheduled data, application, and server backups as specified in SEPTA procedures;
- Ensure back-up media is properly stored, rotated on schedule, periodically tested and replaced, and damaged tapes are properly discarded;
- Maintain off-site back-ups, including an off-site active duplicate of the database disk array, which is synchronized in near real-time with the CDCRS;
- Follow archiving procedures and ensure media is logged, properly stored, maintained, viable, and accessible throughout required retention periods;
- Load archived historic data as needed to generate reports;

- Monitor inventory of media for primary and backup purposes and obtain replacements as needed;
- Provide production support with 24x7 coverage;
- Resolve production problems within acceptable turn-around limits;
- Provide mechanisms for restoration in the event of server failure or user error.

25.4.3.2 Software Security Administration

Tasks shall include the following as a minimum:

- Manage the addition of new users and workstations, as well as creation of network directories and granting of various access levels to the CDCRS applications.
- Manage authorized user access by assigning appropriate levels as required. This involves the creation of user credential (Login ID and Password). Perform periodical reconciliation of list of users with an authorized list. Develop and institute policy of password assignment, expiration, and change to limit exposure access by individuals to the functions authorized through user profiles or other such means as are available through the application or operating system;
- Research sign-on violations to determine if a pattern is evident and report any findings.

25.4.3.3 Data Entry

Tasks shall include the following as a minimum:

- Enter, modify, and maintain NPT System and application parameters. Report unauthorized modifications and accesses;
- Track changes to all application settings and parameters and ensure validity. Report unauthorized modifications and accesses.

25.4.3.4 Report Generation

Tasks shall include the following as a minimum:

- Produce ad hoc reports and queries as needed;
- Collect, maintain, and provide regular reports on CDCRS administration activities for auditable reports of Contractor performance on contract;
- Provide administrative reports such as staff activity, attendance, and training as required by SEPTA to demonstrate satisfaction with terms in the agreement.

25.4.3.5 Documentation Library

Tasks shall include the following as a minimum:

- Establish and maintain a documentation library containing all materials for hardware/software, standards manuals and procedure manuals developed during the project and ongoing maintenance, hardware inventory and configuration operating and administrative procedures. Electronic copies and hardcopies of all documents shall be included in the library;
- Ensure that documentation needed for continued operation and management of the CDCRS is accurate and available;
- Update documentation based on software changes and other software modifications, including version upgrades, software patches, and other software changes from all vendors, including third parties.

25.4.3.6 End User Assistance

Tasks shall include the following as a minimum:

- Provide technical support to SEPTA staff and attend internal/external meetings as needed.

25.4.4 Database

The following subsections outline the required services regarding the CDCRS database(s).

25.4.4.1 Database Monitoring

The Contractor shall perform scheduled reviews of the system upkeep by checking the database components of the system to ensure they are operating within specified parameters. Sample tasks include, but are not limited to:

- Reviewing integrity and synchronization of database.

25.4.4.2 Fault Detection, Diagnosis and Correction

Tasks shall include the following as a minimum:

- Diagnose CDCRS faults and perform necessary corrective action. Log occurrences, capture pertinent data, and notify designated SEPTA personnel;
- Follow-up on corrective action by verifying that fault has been appropriately and completely corrected and track all activities;
- Maintain electronic records of CDCRS faults and corrections and provide necessary reports to SEPTA departments as requested;
- Track failures for all NPT System database components. Have repair and/or recovery processes in place for each;
- Research and address reported database problems.

25.4.5 Performance Requirements

The following requirements shall be achieved.

- Hardware and software corrections, modifications and updates shall cause no more than two (2) cumulative hours downtime per year;
- CDCRS and data communication system shall have no failures, stoppages or slowdowns due to exploited security vulnerabilities;
- No customer or system data shall be lost due to security breaches;
- Provide requested reports within one business day of request by SEPTA;

- Accessibility of library information within one business day of receipt of materials;
- Testing of software upgrades in SEPTA's Training Lab shall occur within one (1) week of announcement of the upgrade release;
- Implementation of software upgrades within two (2) weeks of announcement of the upgrade release;
- Correction of identified software errors within forty-eight (48) hours of identification of the problem;
- Reports of monthly effort shall be provided no later than the fifth business day of the succeeding month.

25.5 Credit and Debit Media Processing Services (Non-Mandatory Option)

As a Non-Mandatory Option, SEPTA de~~requs~~ires that the Contractor provide Bankcard Processing Services from start of Revenue Service up to the conclusion of the NPT System Warranty period. These services shall include a contract with a financial institution or a financial services processor to function as an acquirer/processor to securely collect and process bank issued credit and debit media transactions in accordance with industry standards.

In order for SEPTA to ensure that the Contractor provides Credit and Debit Media Processing Services that meet the expectations of SEPTA and fulfill the requirements as identified, defined and/or described within this section, the Contractor shall provide the following for SEPTA review and approval:

- A Services Plan which shall fully describe the Credit and Debit Media Processing Services being provided, including metrics such as staffing, response times, fees and other similar elements. The Plan shall also include a description of how all of these requirements shall be implemented by the Contractor **CDRL 25-8**; and
- Fully developed and documented Procedures for all credit and debit processing activities provided. **CDRL 25-9**

The financial institution/processor shall transmit the transactions to the various credit and debit networks and act as the settlement agent for all bank issued credit and debit transactions.

Financial institutions/processors shall be ISO 8583 compliant, use triple Data Encryption Standard (3 DES) and adhere to ANSI X9 encryption standards. PCI DSS requirements shall be maintained at all times.

SEPTA requires that financial institutions/processors incorporate cardholder data protection systems within their systems, which surpass the requirements of on-going PCI-DSS compliance in order to minimize and/or eliminate the data security breach liabilities of SEPTA.

Modifications to accommodate changes to the applicable standards shall also be performed.

25.6 Commercial Wireless Services

SEPTA requires that the Contractor provide commercial wireless services to provide real-time communications with the mobile NPT System devices including, but not limited to, Surface Vehicles, MIDs, Remote FVDs and HSDs from start of Revenue Service up to the conclusion of the NPT System Warranty period. The Contractor is required to provide service in the entire SEPTA coverage area, and the system shall be configured to avoid "dead zones". If SEPTA's service areas are not all covered by the proposed commercial wireless communications approach, the Contractor shall provide a detailed description regarding how the Contractor intends to deal with "dead zones" or lower bandwidth areas.

In order for SEPTA to ensure that the Contractor provides Commercial Wireless Services that meet the expectations of SEPTA and fulfill the requirements as identified, defined and/or described within this section, the Contractor shall provide the following for SEPTA review and approval:

- A Services Plan, which shall fully describe the Commercial Wireless Services being provided, equipment incorporated, including metrics such as rates, response times, fees, speeds, and other similar elements. The Plan shall also include a description of how all of these requirements shall be implemented by the Contractor **CDRL 25-10;** and

- Fully developed and documented Procedures for all credit and debit processing activities provided. **CDRL 25-11**

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A.3	Amtrak EP301401141A Safety and Protection of Railroad Traffic and Property	RFP
A.4	Amtrak PTE 2006-12-01- Permit to Enter upon Property	RFP
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A.6	SEPTA Faregate Module Interface Drawings	RFP
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A.8.2	Turnstile Installation Drawing	Addendum 3
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A.11	SEPTA Faregate Evaluation Final Report 2009-03-09	Appended to SEPTA Letter to Proposers dated Nov. 3, 2009
A.12	SEPTA Turnstile Operation and Service Manual	Appended to SEPTA Letter to Proposers dated Nov. 3, 2009
A.13	FY 2009 Ridership and Revenue Totals by Fleet	Addendum 11
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