TECHNICAL SPECIAL PROVISION

FOR

Installation of SR 93 (I-75) Virtual Bypass System near
Wildwood to Provide Commercial Vehicle Enforcement

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Page 1 of 28

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TABLE OF CONTENTS

1-1. SYSTEM DESCRIPTION....4

1-1.1 DESCRIPTION OF FUNCTIONALITY....4
1-1.2 REFERENCES....6

1-2. MATERIALS....6

1-2.1 FUNCTIONAL REQUIREMENTS....6
1-2.2 QUARTZ PIEZOELECTRIC WEIGH IN MOTION SENSORS....7
1-2.3 POLE MOUNTED WIM CABINETS AND CAMERA CABINETS....7
1-2.4 VIRTUAL WEIGH IN MOTION CLIENT COMPUTER....8
1-2.5 VIRTUAL BY PASS SYSTEM....9
1-2.6 FIXED BI-DIRECTIONAL COMMUNICATION SUBSYSTEM....13
1-2.7 CLIENT COMPUTER....13

1-3. METHODS OF CONSTRUCTION....14

1-3.1 INSTALLATION PLAN....14
1-3.2 PERFORMANCE MONITORING AND QUALITY ASSURANCE PLAN....14
1-3.3 OPERATIONS AND MAINTENANCE PLAN....15
1-3.4 STAFFING CERTIFICATION....15
1-3.5 TRAINING PLAN....15
1-3.6 WARRANTY....16
1-3.7 PROJECT INVENTORY....17
1-3.8 SUBMITTALS....17
1-3.9 INTERFACE CONTROL DOCUMENTS....18
1-3.10 FIELD DEVICE INSTALLATION....19
1-3.11 SYSTEM BURN-IN AND TESTING....20
1-3.11.1 Burn-in and Acceptance Test Plan....20
1-3.11.2 Burn-in: Contractor Testing for 14-Calendar Day....21
1-3.11.3 Hot Wash-up....22
1-3.11.4 Acceptance Performance Test (APT) for 30-Calendar Day....22
1-3.11.5 Final System Inspection....23
1-3.11.6 Final Acceptance Test Report....23
1-3.11.7 Corrective Action Plan....23
1-3.12 OWNERSHIP OF DATA....24
1-3.13 PRIVACY REQUIREMENTS....24

1-4. BASIS OF PAYMENT....24

PRICE AND PAYMENT WILL BE FULL COMPENSATION FOR ALL WORK AND MATERIALS SPECIFIED IN THIS SECTION..24

APPENDIX A – Figures

Figure 1: Picture of Display Settings....26
Figure 2. Picture of Vehicle Overview....27
Figure 3 . Picture of Vehicle Details....28

List of Acronyms

APL.....Approved Products List

APT.....Acceptance Performance Test

CJIS.....Criminal Justice Information Services

CSE.....Communications Security Establishment

DDR.....Double Data Rate

DVD.....Digital Versatile Disk

Fax.....Facsimile

FDOT.....Florida Department of Transportation

FIPS.....Federal Information Processing Standard

ICD.....Interface Control Document

ITN.....Invitation to Negotiate

ITS.....Intelligent Transportation System

ITS America™.....Intelligent Transportation Society of America

LPR.....License Plate Reader

MCSAW ..... Office of Motor Carrier Size & Weights

MOT.....Maintenance of Traffic

NEC®.....National Electrical Code®

NIST.....National Institute of Standards and Technology

NTP.....Notice to Proceed

O&M.....Operations and Maintenance

OCR……..Optical Character Recognition

PCI.....Peripheral Component Interconnect

PRISM…….. Performance and Registration Information Systems Management

1-1. System Description

The FDOT Virtual Bypass System (VBS), hereinafter referred to as the SYSTEM, shall include the design, furnishing, and installation of equipment; integration; testing; and a four-year operations and maintenance (O&M) period for the full system and subsystems described in this Technical Special Provision. The Contractor shall meet all the requirements specified herein. The term Contractor will be used throughout this document to refer to the Proposer whose proposal will be accepted by the FDOT to implement the VBS project. The objective of the Department is to have a fully operative SYSTEM which shall accurately and automatically detect possible bypass vehicles while in motion.

1-1.1 Description of Functionality

A. The SYSTEM shall automatically detect possible overweight vehicles traveling on bypass route at a capacity of 1200 per hour.
   1. Vehicle weights on trucks traveling on bypass route shall be detected by Quartz Piezoelectric Weigh-in-Motion (WIM) sensors.
   2. Maximum weight and axle spacing limitations shall be programmable.
   3. Vehicles exceeding the pre-programmed limitations shall activate an overview camera.
   4. Overview images with WIM data information shall be transmitted via broadband cellular modem communication to the client computer for one year after final acceptance of the project.
   5. The client computer for the site shall be located in administration building of SR 93 (I-75) southbound WIM station between CR 484 and SR 44.
   6. The overview images and WIM data shall be posted on web pages that run on the FDOT server. These images shall be available for display on the officer's laptop without the use of proprietary equipment or software. This shall be accomplished through Internet Explorer
   7. Maximum weight and axle spacing limitations shall be programmable and password protected.
   8. The system shall provide means for entry, storage, and printing of static weights from laptop located in patrol car.
   9. The system must allow the operator to manually enter static weights on their laptop
   10. The system shall store both WIM gross weight and manually entered static weights which shall be used for WIM scale auto-calibration.
   11. The system shall store both WIM and manually entered static weights and auto-calibrate as detailed below:
       a. Shall calibrate the WIM sensor based on speed ranges
       b. Shall calibrate the WIM sensor based on vehicle classification
       c. System must have the capability to determine and update 10 different dynamic calibration factors based on speed and 13 based on classifications

B. The SYSTEM shall provide continuous and efficient data gathering of truck weights, overview pictures and license plate picture with OCR :
   1. Capture and post overview images on web page server 24-hours a day. Daytime images shall be color and night time images shall be black and white
   2. Trucks are divided into potential violators and non-violators.
      a. Potential violators are trucks in violation of any of the following:
         (1) Florida weight requirements;
         (2) Posted speed limit;
         (3) Off the WIM (Trucks that do not pass over WIM correctly or bypassing the WIM in the Southbound CR 475 lanes. The WIM software shall identify the direction of the vehicles by the order in which the loop detectors are activated in succession, i.e. Northbound CR 475 vehicles traveling in the Southbound CR 475 lanes);
         (4) Over dimension length and/or internal bridge;
         (5) Random (The SYSTEM will select any truck at random).
         (6) In the overdue citation database (Hot List)
         (7) Performance and Registration Information Systems Management (PRISM)
         (8) Commercial Vehicle Information Systems and Networks (CVISN)
      b. Non-violators are trucks not violating any of the preceding.
   3. The equipment involved in the process includes:
      a. Quartz Piezoelectric WIM sensors
      b. Off scale sensors
      c. Loop detectors to:
         (1) Activate WIM sensors
         (2) Activate overview and LPR cameras.
         (3) Activate illuminator for LPR camera.
      d. Loop detectors in the Southbound CR 475 lanes to detect Northbound CR 475 attempting to bypass the WIM sensors in the Southbound CR 475 lanes.
      e. Overview camera (Color by day and black/white by night).
      d. LPR camera (black/white by day and black/white by night).
      e. Laser detector and loop detector to
         (1) Activate USDOT reader
      f. USDOT reader camera (black/white by day and black/white by night).
      g. Pole mounted WIM cabinets.
      h. Client computer located in the southbound SR 93 (I-75) WIM station administration building control room.

C. Work for a complete SYSTEM that is comprised of off the shelf only items and includes, but is not limited to, the following package components and accessories as described in these Technical Special Provisions:
   1. Quartz Piezoelectric WIM sensors
   2. Presence detector.
   3. Loop detectors in the Southbound CR 475 lanes.
   4. Overview and LPR cameras with poles.
   5. US DOT reader cameras with poles.
   6. Off scale sensors.
   7. WIM System controller
   8. Illuminator/Illuminators

9. Weigh station client computer.
10. Software for:
    a. The SYSTEM.
    b. The camera control.
    c. Web pages and database search

1-1.2 References

A. Applicable Standards:
    1. FDOT Standard Specification for Road and Bridge Construction.
    2. National Fire Protection Association (NFPA):
        a. 70 - National Electric Code (NEC).
    3. National Electrical Contractors Association (NECA).
    4. American Society of Testing and Materials (ASTM):
        a. E1318 - 02 - Standard Specification for Highway Weigh-in-Motion (WIM) Systems with User Requirements and Test Methods.
    5. FDOT Design Standards for Design, Construction, Maintenance, and Utilities Operations on the State Highway system. Index 600 – Maintenance of Traffic and FDOT Standard Specification for Road & Bridge Construction – 2010.

1-2. Materials

1-2.1 Functional Requirements

A. The Contractor shall collect license plate-based probe data using automated LPR that the Contractor shall procure; install; test; and operate and maintain along SR 93 (I-75) and CR 475 in the Wildwood area. The Contractor shall provide all materials needed to supplement the utility power, and shall provide all equipment necessary to operate the VBS and transmit data to and from the FDOT, MCSAW SR 93 (I-75) Southbound Weigh Station between CR 484 and SR 44 for analysis.
B. The Contractor's LPR subsystem technology shall not be intrusive to pavement in any way, except for trigger loop.
C. The Contractor shall provide data that has been encrypted or truncated from each VBS via a standardized FDOT interface. The Contractor shall work with the Engineer to determine the exact nature of the standardized interface(s) and the format for all the data. As part of this process, the Contractor shall document all the interfaces necessary to support this project.
D. The Contractor shall provide the capability for FDOT technicians to trouble shoot the VBS using a windows based computer at deployment site.
E. The Contractor shall provide all software necessary to perform all maintenance and configuration activities.
F. The Contractor's system shall be capable of collecting data 24 hours per day, 7 days per week, and 365 days per year.
G. The Contractor's system shall be capable of collecting, storing, and transmitting all license plate data from each LPR station for configurable periods.
H. The data to be provided to the FDOT shall include the following attributes:
    1. Encrypted or truncated license plate identification.
    2. A timestamp for when each license plate number was collected.
    3. Identification of the data collection station.
    4. Confidence Value of each plate read.

I. The Contractor shall ensure that of all qualifying license plates that fully pass within the LPR field of view:
    1. The vehicle penetration rate, which is defined as the number of license plates captured divided by the total number of vehicles passing an LPR, shall be a minimum of 80 percent.
    2. At least 85 percent of license plates captured shall have a confidence level that is greater than or equal to 90 percent.
    3. No more than 10 percent shall have a confidence level between 70 percent and 90 percent.
    4. No more than 5 percent shall have a confidence level that is less than 70 percent. Qualifying license plates shall be characterized as being of current plates in the main land 48 states, Canadian Provinces and Mexican States issued, legally mounted, unobstructed, and undamaged.
    5. The system shall provide information concerning the system's health, including information on the VBS, power supplies, communications equipment, et cetera.
    6. Vendor's software shall have the capability for weight inspector or CVE officer to type in License Plate number and jurisdiction and do a data base search. Vendor will deliver software program documentation to FDOT Project Manager before project burn in begins and should any revisions be done during burn-in revised final edition of software program documentation delivered before Acceptance Performance Test can begin.

1-2.2 Quartz Piezoelectric Weigh In Motion Sensors

A. Quartz Piezoelectric WIM sensors:
    1. Sense the weight of each axle of the truck as it moves in motion over the sensors.
    2. Determine vehicle speed and axle spacing without the need of other in road devices.
    3. Sense, with the system software, any axles that fail to go fully over the sensors.
    4. Provide two sensors per vehicle path.
        a. Right wheel path shall consist of one – 9ft. (2.75M).
        b. Left wheel path shall consist of one – 9ft. (2.75M).
    5. WIM accuracy on vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be as follows as per ASTM E1318-02 Type III WIM System:
        a. Axle weights $\pm$ 20% (95% of trucks).
        b. Tandem weights $\pm$ 15% (95% of trucks).
        c. Gross weights $\pm$ 10% (95% of trucks).
        d. Axle spacing $\pm$ 6 inches or 5% (68% of axles), whichever is greater.

B. Sensors
    1. Degree of protection IP68.
    2. Have temperature compensation of .02% per degree C.
    3. Provide lightning and surge protection that is on the Approved Products List for Florida.

1-2.3 Pole Mounted WIM Cabinets and Camera Cabinets

A. Shall communicate with the Quartz Piezoelectric sensors, inductive loops, cameras, off scale sensors.

B. Shall mount on camera poles.

C. Construct Cameras in stainless steel NEMA 4 cabinets.

D. Made capable of supporting an interface for AVI equipment.

E. Receive cables from the Quartz Piezoelectric sensors, loops, off-scale sensors and cameras, and then transmit data to client computer through broadband cellular modem communication.

F. Include a module for terminating in-road and roadside items (Quartz Piezoelectric sensors, loops, off scale detectors, cameras) and provide necessary communication to client computer.

G. The WIM cabinets shall include power supply, convenience duplex outlet, light, and lightning/electric surge protection.

H. Have the capability of sampling the outputs from the Quartz Piezoelectric sensors, loops, and off scale detectors over the full range of operating speeds and accurately determine the axle weights and axle spacing.

I. Shall provide ground buss for cables and lightning equipment.

J. Pole WIM Cabinets and camera cabinets shall have unique key that matches users existing master key system for door locking mechanism and not a standard traffic cabinet key.

1-2.4 Virtual Weigh In Motion Client Computer

A. The client computer shall be a Pentium microprocessor based microcomputer and shall operate under a version of Microsoft Windows that allows for optimal performance.
   1. Web Services will reside on the existing FDOT / MCSAW 64bit IIS server.
   2. If they cannot satisfy 140-2, separate PC (meeting corporate standard) at scale house requires dual network cards to separate network traffic.
   3. Provide wireless / encryption path, with administrative access to all devices for CJIS certification validation.

B. The minimum acceptable configuration shall include:
   1. Conform to FDOT Office of Information Security Administration current computer standards.
   2. System utilities and diagnostic software.
   3. Interface to the WIM electronics enclosure.
   4. Interface to digital outputs.
   5. High-speed analog to digital converter.
   6. Surge protection shall be from FDOT ITS APL.
   7. Internal modem card compatible with V.32 standards (56k full duplex) or greater.
   8. System password protected lock for user access restriction.
   9. Access ports, cables and accessories to provide a working system.

10. WIM system controller shall contain diagnostic software to analyze the condition of the weighing process:
    a. Loop closures.
    b. Sensors signal.
11. Calibration shall be continuously and automatically updated based on manual input of static scale weights or portable scale weights.
    a. System shall accept a minimum of 10 dynamic calibration factors based on speeds.
    b. System shall accept a minimum of 13 dynamic calibration factors based on classification of vehicle.
    c. System shall alert operator if any dynamic calibration factor changes by more than 20% from the nominal value.

1-2.5 Virtual By Pass System

A. The intent of this section is to ensure the WIM system controller is designed and constructed according to the specifications below:
    1. Shall be constructed in a standard outdoor pole mounted traffic control cabinet.
    2. Shall be capable of supporting an interface for AVI equipment.
    3. Shall receive data from Quartz Piezoelectric sensors, cables from loops, cameras, and transmit or store data as specified.
    4. Shall run Windows XP operating system with WIN 7 capabilities.
    5. Communication (fiber optic, phone, cell, fiber) to the outdoor pole mounted traffic cabinet shall be defined and allow access the following functions:
        a. Set over weight limits and determine which pictures should be transmitted to web page or patrol car laptop.
        b. Transmit pictures with WIM data to web page or and patrol car laptop.
        c. Transmit Federal Highway WIM planning data to defined location.
        d. Provide remote diagnostics.
        e. Allow MCSAW weigh inspectors and State of Florida law enforcement officers to physically type in actual static weights of trucks so the information can be used for auto-calibration as defined above. Values needed for each class of truck and at various speeds.
    6. System shall log data for commercial vehicles that are potential violators. The system shall process all data from detection devices to laptop computers within 12 seconds.
    7. System shall check for the following user-defined violations:
        a. Check for Gross Vehicle Weight (GVW) violations on selected classes.
        b. Check for Tandem violations on selected classes.
        c. Check for Axle violations on selected classes.
        d. Check for Bridge violations.
        e. Check for Speed violations.
        f. Confirm vehicle traveled within lane (off scale).
        g. Check LPR to databases for violations.
        h. Check USDOT reader to databases for violations.
    8. A daily report shall be generated that provides a time stamp list of vehicles, indicating their violation(s) and the file name(s) of the corresponding picture. The time stamp shall be used as a primary key for accessing details of the WIM record. In addition, the system shall be required to send monthly tabulation of trucks weighed, gross weight violators by class, axle, bridge violators and speed.

9. For testing purposes or emergencies, it shall be possible to log pictures of vehicles.
10. Shall include a module for terminating in-road items (loops, camera(s), etc.) and provide necessary communications.
11. Shall include power supply, convenience outlet, light, and FDOT Approved Product Listed (APL) surge protection for both lightning and electric.
12. Processor shall not be located within camera.
13. The cabinet shall be equipped with an approved heat diverter capable of maintaining a maximum internal temperature of 75°F or less in an environment with an ambient temperature of 110°F and 100% solar gain for its orientation.

B. Remote Monitoring
   1. MCSAW weigh inspectors and State of Florida law enforcement officers shall have the capability to choose the vehicle and violation records to view based on the set of display settings (See *Figure 1: Picture of Display Settings* in Appendix A) below:
      a. Virtual WIM location.
      b. Number of vehicles to display at a time on Vehicle Overview page.
      c. Overview display filter – Display Vehicles, Display Bypass Violators Only, Display Weight Violators Only, Display Violators, weights, speed, over due citations, off scale, repeat truck tags per week and per month.
      d. Refresh Time for Overview Screen in 10 seconds.
   2. After choosing the display settings the Vehicle Overview screen (See *Figure 2: Picture of Vehicle Overview* in Appendix A) shall show the information below. The screen shall automatically update showing new vehicles that exceed the preset limits. The screen shall automatically refresh (minimum 10 sec) per the time display setting or manual refresh.
      a. Overview truck picture.
      b. Direction – Northbound or Southbound.
      c. Violations as defined in section 1-2.5.A,7.
      d. Date (MM/DD/YY) and Time (HH:MM:SS).
      e. License Plate with OCR (LPR).
      f. USDOT reader with OCR.
   3. From the Vehicle Overview screen a State of Florida law enforcement officer can click on a vehicle record to see the Vehicle Detail Screen (See *Figure 3: Picture of Vehicle Details* in Appendix A). This shall show a larger picture and detailed information such as:
      a. Vehicle Class.
      b. Speed.
      c. Gross Weight.
      a. Axle Spacing.
      b. Bridge Weights.
      c. Optional License plate image.
      d. Optional USDOT image.

C. Lightning Protection
   1. A comprehensive lightning protection system shall be provided with the system and covered by warranty. This lightning protection system shall be tested and modified to achieve a minimum of 10 OHM at grounding point.

2. The system including WIM sensors, WIM controller, and camera(s) shall be covered by the lightning protection system.

D. Minimum Overview (digital color) and LPR Camera (black/white) Specifications
1. Color digital is the primary type of data to be collected and black/white analog is secondary. The camera/optical character recognition shall capture a minimum of 80% of the alpha/numeric and jurisdiction on all truck license plates in both day light and night darkness. When the environment is no longer conducive to maintain this level of 80% confidence in color digital the system shall automatically switch to black/white analog.

E. Minimum USDOT Camera (black/white) Specifications
1. Furnish and install an automated USDOT number recognition system with all necessary hardware, cabling, database search engines, and software. The system must capture USDOT numbers displayed on the lateral surface of trucks for each travel lane.
2. Integrate the USDOT reader system output into the Sorter Software.
3. Automated System must respond with the USDOT number in less than six seconds. The period of six seconds includes image capture, OCR readout, hotlist check, and communications to the sorter.
4. System must download from a designated client computer (at southbound weigh station) an updated Hot List file (CSV or other format) every two hours.
5. System must check its USDOT readings against Hot List.
6. System must send a picture of the area of the vehicle where the USDOT number is located, along with the USDOT number to the Sorter Software.
7. System must be capable of automatically archiving images and also deleting images older than a specified date on a periodic basis. This requirement applies for both original DOT images and detected hot list violations.
8. Furnish an automated system that produces multiple USDOT number images per vehicle with varying flash, shutter and gain settings to ensure a high quality image regardless of weather or lighting conditions.
9. The system must provide effective USDOT number capture at night using a strobed light lighting source. Strobe to have color filter and directed so that driver distraction is minimized.
10. Duration of strobe may not exceed a total of 1.2 milliseconds (msec) per vehicle.
11. System must use dual trigger methods with a trigger reliability exceeding 90%.
12. Furnish an automated system that identifies and interprets USDOT numbers when displayed with other non-USDOT identifying information that may be displayed on the lateral side of a passing CMV including but not limited to carrier information, weight classifications and regional registration information.
13. Furnish an automated system with a USDOT number Average Daily Read Rate of at least 65% at speeds up to 50 miles per hour. Read Rate is defined as the daily number of USDOT numbers read correctly (ALL Digits) divided by the total number of trucks in a 24-hour period. Total number includes all trucks passing the system in a 24-hour period.
14. All system software must use the Microsoft Windows operating system.

15. Provide at least one reference from an accredited law enforcement agency currently using the proposed system in a weigh station application.
16. Camera - Furnish USDOT cameras that comply with the following:
    a. Enhanced low light resolution (1.2 million pixels).
    b. Shutter speed of up to 1/7,000 sec exposure setting.
    c. Produces multiple USDOT number images per vehicle with varying flash, shutter and gain settings to ensure a high quality image regardless of weather or lighting conditions. Camera must capture up to 20 frames per second.
    d. AES encryption to NIST FIPS 197 with optional hardware data encryption.
    e. Operates during typical rain and snow events.
17. Automated USDOT Reader System Software - Integrate the USDOT System Software into the Sorter Software. Furnish the USDOT system software meeting the following requirements:
    a. Automated System must respond with the USDOT number in less than six seconds. The period of six seconds includes image capture, OCR readout, hotlist check, and communications to the sorter.
    b. Furnish an automated system with a USDOT number Average Daily Read Rate of at least 65% at speeds up to 50 miles per hour. Read Rate is defined as the daily number of USDOT numbers read correctly (ALL Digits) divided by the total number of trucks in a 24-hour period. Total number includes all trucks passing the system in a 24-hour period.
    c. Provide variants of the Optical Character Recognition (OCR) engine that are designed specifically for USDOT numbers. Provide OCR updates for new USDOT number designs as required.
    d. Utilizes internal camera controls to facilitate automated settings for optimum flash, gain and shutter configurations.
    e. Integrates into a wide variety of systems via relay output, RS232, TCP/IP Ethernet with socket and FTP protocols, as well as IP connectivity.
    f. Offer standard software JPEG compression.
    g. Provide a feature to enable or disable, at the user's discretion, "fuzzy-logic" character matching to enable the system to match common number character issues (o/0 and 8/B) or unknown characters.
    h. Captures a live, corresponding image of the vehicle and simultaneously displaying the captured USDOT number, along with the date and time stamp of the image for each USDOT number.
    i. Provides a permanent record of all interpretations and captured images in a chronological order at a rate of up to 45 images per minute as determined by the operator. The operator can directly input whether the interpretation is correct while viewing the image. The system must keep a record of the operator inputs.
    j. Operator interface that allows reviewing USDOT records associated with each vehicle record.
    k. Vendor's software shall have the capability for weight inspector or CVE officer to type in USDOT number and do a data base search. Vendor will deliver software program documentation to FDOT Project Manager before project burn in begins and should any revisions be done during burn-in revised

final edition of software program documentation delivered before Acceptance Performance Test can begin.

l. Decode USDOT numbers into a digital string and associate the captured image and USDOT number into a single vehicle record file.
m. Integrate the USDOT system readout into the Sorter Software.
n. System must download from a designated server an updated hotlist file (CSV or other format) every two hours.
o. System must check its USDOT readings against hot list.
p. System must be capable of automatically archiving images and also deleting images older than a specified date on a periodic basis. This requirement applies for both original DOT images and detected hot list violations.

18. Camera Housing - Furnish the camera housing to meet the following requirements:
    a. Fabricate from corrosion resistant aluminum, finished in a neutral color of weather resistant enamel.
    b. Equipped with tempered glass front window.
    c. Equipped with sunshield.
    d. Equipped with surge suppressors on all ungrounded conductors.
    e. Include mounting hardware to match mounting bracket.
19. Dual Trigger System
    a. System shall use a dual trigger system, laser and loop detector. Trigger must have a reliability exceeding 90% relative to all trucks. False triggers cannot exceed 5% of all trucks.
20. Lighting System
    a. System must use a strobed light with color filter so that light is near to invisible spectrum. Strobe duration cannot exceed a total of 1.2 milliseconds per vehicle and aimed to minimize driver distraction.

1-2.6 Fixed Bi-Directional Communication Subsystem

A. Dielectric Fiber Optic Cable (12 strands) Outside Plant (OSP) type
    1. Core/Cladding = 8-9/125 microns
    2. Attenuation @ 1310/1550 nm = 0.4/0.25 dB/km
    3. Bandwidth = approximately 100 Terahertz
    4. Tensile load strength for installation = 600 lbs minimum

1-2.7 Client Computer

A. Processor
    1. Intel Pentium 4 processor at 3 GHz with Hyper-Threading Technology.
B. Operating system
    1. Microsoft Windows (should be compatible with the WIM computer).
C. Memory
    1. 256 MB dual channel DDR 400 MHz.
D. Drives
    1. Two CD drives.
E. I/O Ports
    1. Front headphone jack.
    2. 8 USB 2.0 ports- 2 front/6back.

3. 1 Serial port.
4. 1 Parallel port.
5. 1 P/S2 style keyboard port.
6. 1 P/S2 style mouse port.
7. 1 integrated graphics port.

F. Slots
1. 3 PCI slots.
2. 1 AGP.

G. Monitor
1. 21-inch.

H. Database
1. SQL Express

I. Installer
1. Shall have an approved and current level II security clearance.
2. Shall be CJIS certified.
3. Shall meet FDOT Security Policy and Procedures.

1-3. Methods of Construction

1-3.1 Installation Plan

A. The Contractor shall develop and adhere to an installation plan that has been signed, sealed, and certified by a Professional Engineer registered in the State of Florida. The installation plan shall provide a detailed, structured set of installation tasks to be performed by the Contractor. The Contractor shall analyze the tasks required and shall provide the Engineer with a draft implementation plan.

B. This plan shall include a detailed schedule. The installation plan shall be submitted to the Engineer for review and approval prior to installation.

1-3.2 Performance Monitoring and Quality Assurance Plan

A. Dynamic Testing of WIM:
1. Provide two commercial vehicles for testing; one - class 9 and one - class 5 each shall be loaded to 95% of their allowable gross weight. Each commercial vehicle shall make 10 passes over each WIM; 5 at posted speed and 5 at 10 MPH less than posted speed for each WIM.

B. The Contractor shall develop and implement a performance monitoring and quality assurance plan.

C. This plan shall document the Contractor's compliance with the functional requirements listed in this document.

D. As part of the performance monitoring and quality assurance plan, the Contractor shall generate a performance statistics report for inclusion in the monthly status report that will commence after system acceptance. The contents of the performance statistics report shall indicate whether the Contractor is meeting the functional requirements related to each of the project's program areas.
1. Accuracy of weighing axles, axle groups, internal and external bridges.

2. Accuracy of measuring lengths between axles and overall wheel base.
3. Accuracy of images matching truck data.
4. Accuracy of optical character recognition output matching license plate.

E. The Contractor shall make system improvements as indicated by the results of its performance monitoring activities.

F. The performance monitoring and quality assurance plan shall be submitted to the Engineer for review and approval prior to implementation.

1-3.3 Operations and Maintenance Plan

A. The O&M plan shall include a preventive maintenance checklist and schedules for recommended serving of complete system.

1-3.4 Staffing Certification

A. Staff responsible for data into FDOT network must be CJIS security certified.

1-3.5 Training Plan

A. The Contractor shall develop a training plan to be applied to the training of FDOT staff in the operations and maintenance of the selected Contractor's VBS. The training shall consist of one day of classroom training and one day of hands-on training.

B. Ensure that the training course provided pertains specifically to the individual subsystem, presuming that the course participants have no prior knowledge of the system or the associated technology. Tailor the training to the intended audience or user group – operators, managers, system administrators, or maintenance personnel.

C. Provide this training through the use of lectures, field demonstrations, hands-on workshops, and similar instructional methods. At least 30 days before the training is to begin, submit the following information to the Engineer for approval:
   1. Course outline covering training duration, equipment, facility required, and maximum number of participants for effective instruction.
   2. One complete set of the training materials proposed for use, including the product operations manual.
   3. Qualifications of the proposed instructor.

D. The Engineer will review and approve the training material and class schedule, or request changes.

E. Conduct training courses at no additional cost to the FDOT at a Department-provided location and at a time agreed upon by the Engineer. Ensure that the training material produced for each course includes copies of detailed software documentation, manuals, course presentations, visuals, diagrams, and other handouts for each trainee. Prepare these materials not only as subject guidance, but also as quick-reference material for trainees' future use.

F. Allow a maximum class size of no more than 12 trainees per class.

G. Deliver all approved course materials in a reproducible, electronic format to the Engineer before the course starts.

H. Provide training and training materials.

I. List of any preventative maintenance needed on the entire system.

J. Provide schedule for the list of any preventative maintenance.

K. The Department shall receive 16-hours towards technical training for scale maintenance personnel by SYSTEM Contractor.

L. The 16-hours of training to certify scale maintenance staff in the following:
   1. One 8-hour day for the maintenance of Class 1 Piezoelectric sensor and controller.
   2. One 8-hour day for the maintenance of cameras (overview, LPR and USDOT reader).

M. Operators shall receive 18 hours of training.

1-3.6 Warranty

A. Contractor shall warrant the SYSTEM's equipment in writing against defective material, lightning, and workmanship.

B. Contractor shall warrant the SYSTEM to perform as required by these Technical Special Provisions, giving proper and continuous service under conditions required and specified.

C. Contractor's full warranty shall be for a period of four years, but not less than the manufacture's standard warranty for the products from the date of final acceptance of the project.

D. The Contractor shall furnish the written warranty to the Department's Engineer at the time equipment performance supporting data is submitted.

E. The warranties shall state that they are subject to transfer to the Department.

F. The Contractor's written warranty must be acceptable and approved by the Engineer 45 calendar days prior to the anticipated installation of the warranty's subject.

G. The Contractor shall also warrant the SYSTEM during construction until final acceptance, equipment furnished, installed and described in this Technical Special Provision.

H. The warranty shall be in accordance with the Technical Special Provisions and suitable to the Engineer for the purpose intended.

I. SYSTEM shall function in the manner intended by the Department and be acceptable to the Engineer and MCSAW Engineer.

J. The warranty shall cover materials, equipment, service, labor; travel expenses, and incidentals necessary for warranty service.

K. This SYSTEM warranty excludes damage caused by flooding, accidents, vandalism, or natural disasters.

L. The Contractor shall commence to provide such warranty service during construction and after final acceptance within 2- hours and repair within 8 hours, including weekends and holidays, of notice that warranty work is required.

M. All equipment and software provided by the Contractor as part of this project shall be warranted and guaranteed against defects and/or failures in design, materials, and workmanship from the date of final system acceptance as recorded by the Engineer.

N. The warranty shall provide that, in the event of a malfunction during the warranty period, the defective system component shall be replaced with a new component within 8 hours. The Contractor shall be responsible for all labor, travel, equipment and shipping costs for installing the new component.

O. A log shall be maintained for all warranty-related operations conducted after final acceptance.

P. Any and all replacement parts, all repair hours, and a brief description of activities shall be reported in the log and submitter to Engineer after each occurrence. No additional charges shall be incurred during the warranty period.

1-3.7 Project Inventory

A. The Contractor shall keep an inventory of all equipment purchased with FDOT or federal funds for use on this project. Equipment information to be included as part of this inventory shall include a minimum of the following:
   1. A description of all equipment.
   2. Serial numbers.
   3. A FDOT property decal.
   4. Date of purchase.
   5. Location of equipment with the latitude/longitude coordinates and the mile post/offset distance from the roadway.
   6. Warranty information, including expiration date.
   7. Contractor contact information.

B. The Contractor shall also provide to Engineer a legal copy of all software and detailed documentation used in the project.

1-3.8 Submittals

A. Submit as specified in FDOT Standard Specifications for Road and Bridge Construction.
   1. Includes, but not limited to, the following:

f. Equipment drawings.
g. General arrangements.
h. Foundation requirements.
i. Circuit diagrams.
j. Field wiring diagrams.
k. Instruction manuals.
l. Bill of materials.
m. Spare parts list.
n. Samples.
o. Contractor's product data.
p. Certified test reports.
q. Material certifications.

B. In addition to the items specified in FDOT Standard Specifications for Road and Bridge Construction the Contractor shall submit the following equipment documentation for acceptance prior to fabrication:
   1. Detailed description of how the SYSTEM requirements are met, including a step-by-step description of how the SYSTEM would function in processing each of the following violations, as well as the non-violation scenario:
      e. Over weight.
      f. Off scale.
      g. Over speed.
      h. Over length.
   2. Inductive loops, according to the contract documents.

C. Contractor shall submit six complete sets of full size drawings:
   1. Showing fields wiring, conduits, pull boxes, transformers, and other pertinent data required to make a complete installation.
   2. Drawings are to be approved by the Engineer prior to fabrication.
   3. After approval, one complete set of reproducible drawings shall be submitted certified for construction.

D. The Contractor shall:
   1. Design foundation supports.
   2. Submit shop drawings, along with the supporting calculations, to the Department Engineer for review and approval.
   3. Provide as-built drawings that show type and location of conduits, pull boxes, junction boxes, loops and any other items installed in the right-of- way.
   4. Provide technical documentation on accessories used in the system.
   5. Provide documentation that all items for this project are off the shelf items only.

1-3.9 Interface Control Documents

A. The Contractor shall install the system devices detailed in the design plans and specifications.

B. Device installations shall not occur until the Engineer has reviewed and approved the Contractor’s installation plan.

C. All project-related shop drawings submitted by the Contractor shall be endorsed (i.e. signed, sealed and certified) by a Professional Engineer licensed in the State of Florida.

D. The Contractor shall consider the following information when developing all shop drawings:
   1. Maximizing the use of the utility power.
   2. Maximizing the effectiveness of VBS.
   3. Minimizing the impact to concurrent/future construction projects.
   4. Minimizing utility conflicts and adjustments.
   5. Minimizing traffic impact during installation and O&M.
   6. Maximizing accessibility and ease of equipment maintenance.
   7. Maximizing the safety of equipment maintenance personnel and the traveling public.
   8. Minimizing environmental impacts.
   9. Ensuring that all FDOT mounting requirements are fully complied with.
   10. Minimizing aesthetic and visual impacts.

E. The Contractor shall submit six sets of each of the submittals identified below. Each submittal shall consist of both electronic PDF format on CD's and hard copies.

1-3.10 Field Device Installation

A. The Contractor shall furnish and install all equipment in accordance with the manufacturer's recommendations and the project requirements, project documentation, and plans prepared by the Contractor and approved by the Engineer. The Contractor shall inspect all equipment before installation to ensure that it is free of any defects or damage. Whenever possible, the Contractor shall maximize the use of existing structures for the mounting of VBS, as well as existing power service and communications.

B. Equipment shall be mounted on properly prepared surfaces that are adequate for the size and weight of the equipment. All power equipment, cabling, and grounding shall be installed according to the manufacturer's recommended installation procedures.

C. The SYSTEM shall be installed in strict conformance with the requirements of the Contractor to provide a complete and fully operable system.

D. The SYSTEM shall be installed in strict conformance with the rules of the Department of Transportation. Including all Maintenance of Traffic (MOT) requirements.

E. The WIM control pavement:
   1. Shall test and document the existing pavement smoothness for areas 200 feet upstream to 100 feet downstream of centerline of WIM location in both directions of travel. This testing shall be performed after all in pavement items have been installed. This testing shall be witnessed by Engineer. The results of this test will be the foundation for potential accuracy of the WIM system in this environment. Six sets of the Existing Pavement Smoothness Report shall be provided to the Engineer.

F. Cables and wires from the weigh sensors, loops, cameras and all other system and subsystem items shall terminate in the pole mounted equipment enclosure.

G. Shall provide 2 test trucks as per ASTM E 1318-02 for accuracy testing of type I WIM systems and speed of data from detection devices to laptop computers.

1-3.11 System Burn-in and Testing

1-3.11.1 Burn-in and Acceptance Test Plan

A. The acceptance test plan shall include a description of the Contractor's approach to verifying that the integrated system meets its requirements. The plan shall include a description of test cases that will demonstrate the functional threads through the system.

B. After approval of the acceptance test plan, the Contractor shall develop acceptance test procedures in accordance with the approved plan. The test procedures shall be of sufficient detail that a person unfamiliar with the system can execute the test procedures and get a repeatable result each time. The test procedures shall identify the requirements being verified in each step and shall describe the test set up; shall support the hardware and software needed for each test case; and shall predict the result of each step in the procedure. The acceptance test shall verify the system's ability to meet or exceed all system requirements. The acceptance test shall include testing the system functions using the communication system specified for the project by the Contractor. The acceptance test shall commence only after the acceptance test plan has been reviewed and approved by the Engineer.

C. Prior to formal acceptance testing, a test readiness review shall be held no earlier than three business days prior to formal testing. The final test procedures shall be approved by FDOT. The acceptance test procedures document shall be signed by the FDOT and the Contractor prior to the start of formal testing.

D. At a minimum, the test procedures shall include:
   1. A traceability matrix to ensure that all contractual requirements that are being met by the system will be tested.
   2. Test responsibilities.
   3. Test monitoring methods.
   4. Pretest activities.
   5. Test environment requirements, including any hardware and software required for testing.
   6. A description of the expected operational outputs and test results.
   7. Test duration and a proposed test schedule.
   8. A data form to be used to record all data and quantitative results obtained during the test.
   9. A description of any special equipment, setup, manpower, or conditions required for the test.
   10. Wherever practicable, a description of the thresholds that would qualify test results as acceptable/unacceptable.
   11. An end-to-end test plan that provides for the testing of all deployed elements.

12. A 30-calendar day APT of all deployed elements that will be initiated after the successful completion of the 14-calendar day system Burn-in.

E. At a minimum, the system Burn-in shall demonstrate full monitoring and control of the VBS by the Contractor via the communication system and Web-based interface developed as part of the project. The Burn-in shall also verify the system's ability to provide the data collected by the VBS deployed in the field to the FDOT MCSAW mainframe in Tallahassee.

F. As part of the acceptance test plan, the Contractor shall provide a methodology for assessing the degree to which their deployed system conforms to the VBS penetration rate and confidence level requirements described in this scope of work. The Contractor shall provide all equipment and software necessary to carry out all penetration rate and confidence level requirements testing described in this methodology.

1-3.11.2 Burn-in: Contractor Testing for 14-Calendar Day

A. After all equipment has been installed in accordance with the applicable requirements and plans, and each subsystem has been tested by the Contractor and is reported to be operating properly, the 14-calendar day system Burn-in shall be conducted by the Contractor to validate the operational characteristics of the system. During the burn-in period, the selected Contractor shall provide qualified personnel to diagnose and repair system equipment.

B. Field verification test methods shall meet ASTM E 1318-02.
Excerpt from ASTM E 1318-02 follows:

Type of Vehicle	Test Description	Number of Vehicles
Test Vehicles	Each test vehicle makes five or more runs over the sensors in each lane at an attempted speed approximately 5 mph less than the maximum speed, and then five or more additional runs at an attempted speed approximately 5 mph greater than the minimum speed. At each speed, one or more test runs shall be made with the test vehicle tires near the left-hand edge, and near the right-hand edge.	2
Additional Vehicles	Additional vehicles included in the loading test unit serve the function of subjecting the WIM system to loading by a representative variety of vehicle classed.	51

C. In the event of a failure during the burn-in test, all problems shall be corrected. The Contractor shall be responsible for repairing and replacing all hardware and software used on the project that has become defective during the burn-in test. Repairs made shall conform to the plans submitted by the selected Contractor as part of the design process and this scope of services. The selected Contractor shall be responsible for all costs associated with the maintenance, repair, or replacement of equipment.

1-3.11.3 Hot Wash-up

A. A hot wash-up denotes an immediate review of a process or test, and is used to verify that all participants perceived the same results or to identify significant differences of opinion on the results of the process or test. Immediately after burn-in period, the FDOT will convene a meeting with the Contractor's Engineer and test director to discuss the results of the testing and to agree on a preliminary list of actions that may result from the final acceptance test. The FDOT will publish the minutes of the hot wash-up, and the Contractor shall provide review and comment.

1-3.11.4 Acceptance Performance Test (APT) for 30-Calendar Day

A. After successful completion of the 14-calendar day system Burn-in, as approved by the FDOT, the selected Contractor shall first provide to the State final software documentation of entire operating system and then conduct a 30-calendar day Acceptance Performance Test (APT).

B. The system acceptance test shall test the system's ability to perform all system functions in actual operating conditions. The system acceptance test shall consist of the field operation of the system in a manner that is in full accordance with project requirements, the plans, and all applicable standards. The system acceptance test shall commence only after the system acceptance test plan has been reviewed and approved by the Engineer.

C. No intermittent failure shall be permitted to persist during the APT period. If such problems are encountered, the test shall be terminated and restarted after the cause of the intermittent failure is identified and removed from the system. The system may be shutdown for the purposes of testing and correcting identified deficiencies. For each period of system shut down, the scheduled 30-calendar day acceptance test shall be extended for the same period of time. If the total number of system shut downs exceeds 3 during the 30-calendar day test period, the system acceptance performance test shall be repeated for the full 30-calendar day period.

D. All software required to diagnose malfunctions of hardware and software shall be supplied by the Contractor and approved by the FDOT. A copy of all diagnostic software shall be supplied to the FDOT with full documentation. The Contractor shall correct any failure in the hardware or the software supplied by the Contractor at no additional cost to the FDOT. The Contractor shall submit failure report logs to demonstrate that error rates are within the requirements.

E. Equipment configurations and software shall not be changed during the system acceptance testing period. If a configuration change must occur, the test must be restarted. The Contractor shall certify the configuration of all elements prior to the start of the system acceptance test.

F. The Contractor shall ensure that the VBS data shall be provided at least 99.0 percent of the time, excluding any failure of utility power. These metrics shall be addressed as part of the Contractor's performance monitoring and quality assurance plan. Failure to comply with the requirements included in the performance monitoring and quality assurance plan shall amount to Contractor paying Liquidated Damages (LDs) as per

section 8.10.2 of the FDOT's Standard Specification for Road and Bridge Construction.

G. Corrective action for a failure shall be a part of the documentation process. The Engineer shall approve the corrective action.

H. The Contractor shall be responsible for repairing and replacing all hardware and software used on the project that has become defective during the system acceptance test. Repairs made shall conform to the plans submitted by the Contractor as part of the design process and this scope of services. The Contractor shall be responsible for all costs associated with the maintenance, repair, or replacement of the equipment.

I. In the event that more than one system acceptance test is necessary, the Contractor shall be responsible for all costs.

1-3.11.5 Final System Inspection

Prior to final acceptance, the Contractor shall repair and replace all components/software that may have become defective during the system acceptance test. All repairs made shall conform to the plans submitted by the Contractor as part of the design process and this scope of services. The Engineer will perform the final inspection of the entire system in the presence of a representative of the Contractor.

1-3.11.6 Final Acceptance Test Report

The FDOT will generate a final acceptance test report based on the results of the system acceptance test and the final system inspection. The Contractor shall review and comment on the final acceptance test report. Once the Contractor has addressed all comments and deficiencies noted in the final acceptance test report to the satisfaction of the Engineer, the FDOT will issue a formal notification of system acceptance. At such time, the FDOT will assume system ownership, and the Contractor shall become responsible for the hardware and software warranties and maintenance.

1-3.11.7 Corrective Action Plan

The Contractor shall generate a plan to correct any deficiencies noted by the FDOT in the final acceptance test report. In some cases, no corrective action may be required if the Engineer's analysis of the reported anomaly does not constitute a failure of the system. At a minimum, the corrective action plan shall address each final acceptance test discrepancy noted in the final acceptance test report by:

1. Noting the test procedure where the discrepancy was observed.
2. Noting what requirements were not met and by how much.
3. Providing a description of the problem and its impact on the suitability and functionality of the system.
4. Providing a description of possible solutions.
5. Providing any interim work-around procedure recommended until the problem is fixed.
6. Providing an estimated schedule for how long it will take to correct the problem and test the software.
7. Noting what FDOT resources are needed to support the Contractor in fixing the problem.

The Engineer will review and approve the corrective action plan. In some cases, the Contractor may request a deviation or waiver for the requirement(s) not met. The Engineer has the discretion to approve the request, and will seek either consideration or a contract adjustment.

1-3.12 Ownership of Data

The FDOT shall retain all rights and ownership of all VBS data collected as part of this project.

1-3.13 Privacy Requirements

The Contractor shall ensure that all data adheres to ITS America's Fair Information and Privacy Principles as adopted by the Intelligent Transportation Society of America (ITS America™) Board of Directors. All data received from the VBS shall be encrypted prior to transmission of this data to the FDOT for security and anonymity purposes. The Contractor shall ensure that encrypted information can be matched subsequent to encryption for the purpose of calculating link travel times. All encryption and other information protection methods shall be documented and provided to the Engineer prior to system implementation.

1-4. Basis of Payment

Price and payment will be full compensation for all work and materials specified in this Section.

Payment will be made under:

Pay Item No. 0742-1-1 TMS Weigh-in-Motion, Electronics Unit, F&I
Pay Item No. 0742-2-12 TMS Weigh-in-Motion, Electronics Sensors, F&I
Pay Item No. 0785-2-191 ITS Field Cabinet, F&I, Special, Pole Mount

APPENDIX A - Figures

Figure 1: Picture of Display Settings

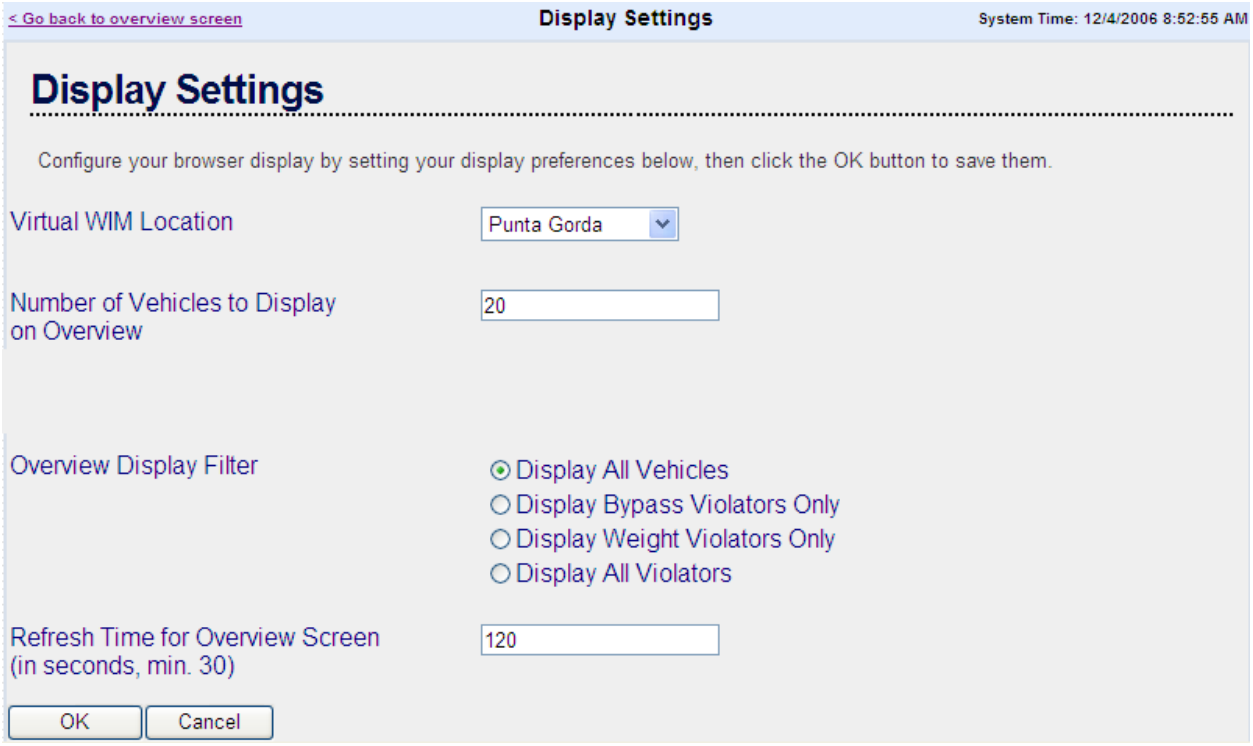

Figure 2. Picture of Vehicle Overview

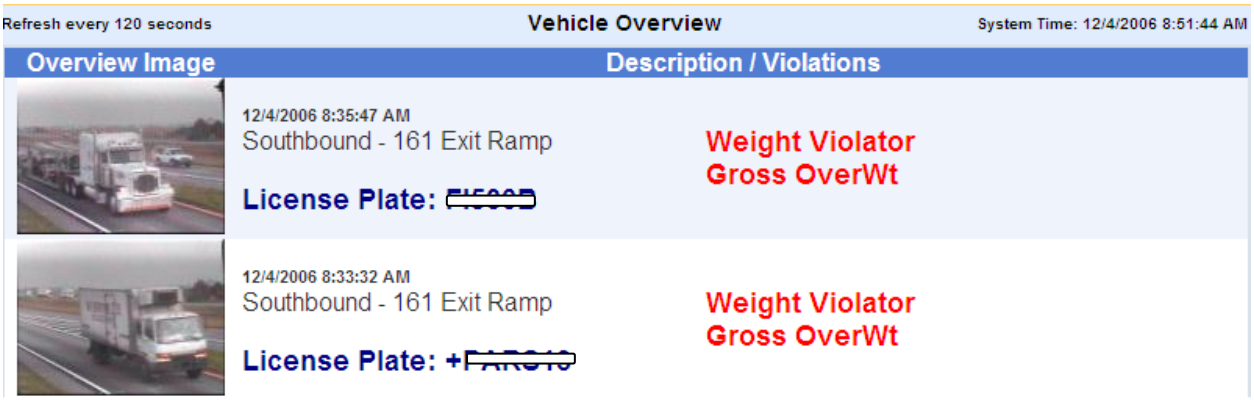
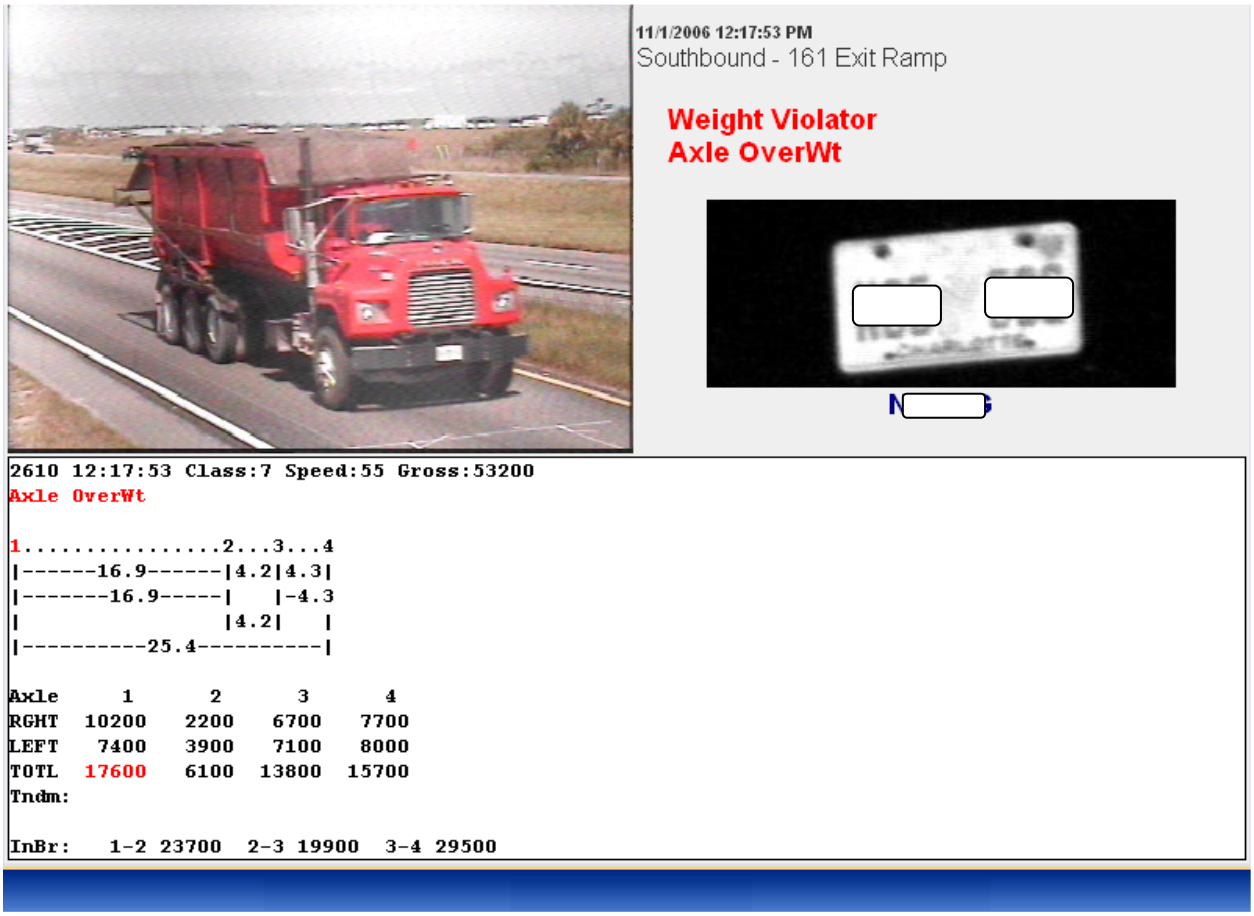
Figure 3 . Picture of Vehicle Details