RICHLAND COUNTY AUTOMATED WEIGH AND SORT SYSTEM

PART 1 – GENERAL

1.1   SCOPE

A. Work in this Section and in the Contract Documents will be referred hereto as Automated Weigh and Sort System and/or System and Subsystems. The objective of the Owner/Agency is to have a fully functional, operational and integrated Mainline Weighing and Sorting System capable of accurately and automatically pre-screening vehicles in motion at interstate speeds for enforcement purposes per the requirements of the state of South Carolina.

B. Design, provide and install a Commercial Vehicle Information Systems and Networks (CVISN) compatible, fully operational and fully integrated Automated Weigh and Sort System, coordinated through the General Contractor and with the provisions of these Contract Documents. All components must be fully compatible and integrated into a complete working system. Configure the completed system in such a manner that the proposed Mainline WIM sensors work in conjunction with as well as independently of the Static Scale subsystems at the Operators' option and control. The system and subsystems shall automatically and manually (when so selected by Operator) weigh, measure and sort all vehicles with a sorting and reporting capacity of at least 1200 vehicles per hour. The system must interface completely with all functions of the existing South Carolina Commercial Vehicle Information Exchange Window (CVIEW) with compatible software and connectivity.

C. The required operations of this system are based on compliance with Federal and State weight, dimension, classification and credentials criteria, while the vehicle is traveling on westbound Interstate 26 at interstate speeds. Vehicles meeting the aforementioned criteria will be notified by overhead signage and if compliant, allowed to bypass the Weigh Station, thus ensuring greater efficiencies for both the commercial vehicle and the Weigh Station infrastructure. Vehicles not meeting the criteria will be processed through the Weigh Station Static Scale system.

D. The purpose of this project is not for research and development of a system which might perform the objectives as described above. Therefore the Contractor shall be required to furnish documentation which demonstrates to the satisfaction of the Owner/Agency that all equipment and functionalities of system proposed for use in the Mainline Sorting System is of standard manufacture; that the manufacturer has had similar equipment and functionalities in a working enforcement weigh station for not less than three (3) years; and has a proven acceptable performance history while in use under conditions similar (Truck ADTs, hours of operation, number of staff per shift and climate) to those for the intended use. Refer to the Automated Weigh and Sort System Qualifications section of this specification.

E. The System shall include, but not be limited to, the following primary components with all affiliated infrastructure:

1. Mainline Open/Closed Signals
2. Mainline Weigh-In-Motion (WIM) System (Type III as per ASTM 1318-02)
3. Over-Height Detection System
4. Mainline Overhead Signalization prior to gore
5. Radar Bypass Detection System
6. License Plate Reader (LPR) System
7. Overview Imaging Video Capture (Mainline LPR/WIM)
8. Static Scale System (modification of existing as required)
9. Electronic Message and Traffic Control Signage and Signalization at static scale

10. On-site Communication System
11. Peripheral Equipment:
    a.   Lightning Protection and Grounding (coordinated with overall site systems)
    b.   In Motion Weighing Sensors
    c.   Off-Scale Sensors
    d.   Controllers
    e.   Static Scale Load Cells
    f.   Static Scale Pit and Weighbridges
    g.   Static Scale Weigh Instrument
    h.   Enclosures, Cabinets and Racks (Road side and in building)
    i.   WIM and Static Scale Computers, Programming and Software
    j.   Uninterruptable Power Systems (UPS)
    k.   CMS/DMS/VMS Signage Integration
    l.   CVISN and CVIEW Interface (Hardware and software)
    m.   Total System Integration

F.   Provide all power, control wiring and associated raceways including all underground duct banks, hand holes, pull-boxes, horizontal directional drilling, other raceway components and final connections of all wiring as required for a complete and operational System. SPECIAL NOTE: Power, raceway, control wiring and associated infrastructure indicated on electrical drawings is for general reference and is intended to demonstrate general intent. Include in bid all engineering work required for power distribution to all required weigh and sort system components to be included in submittals and sealed by a licensed SC professional engineer. All power circuits shall be designed for a maximum 3% voltage drop.

G.   Provide poles, enclosures and other support structures required for signals, signage, public address system, cameras, sensors, detectors, radars and all other equipment associated with the System.

H.   System shall include full, complete and operable integration between WIM Sensors, existing Static Scale and all Subsystems including full interface with CVIEW database, and SCDPS database. Include in bid all cost as required for access thru firewalls and for data conversions as required. For reference, Owner/Agency currently uses a Cisco PIX 535 firewall.

1.2   SYSTEM DESCRIPTION

A.   The following describes how commercial vehicles shall be processed and the intent of a fully operable System as specified in the Contract Documents. The following description includes, but is not limited to:
1.   All trucks approaching the Weigh Station on I-26 Westbound will be directed into the right hand lane by means of signage located prior to the Mainline WIM.
2.   Next trucks will be notified if Weigh Station is OPEN or CLOSE by electronic signage.

B.   As a truck first passes over and through the equipment, the equipment in the right-most lane (outside lane) will collect tag number, axle weights, axle group weights and spacing between axles, gross vehicle weight, vehicle speed, classification, vehicle length, over height and if truck is off sensor data. All of the data is then sent to the System Computer for processing and database query. If the truck is in the lane immediately to the left of the WIM lane (inside lane), the radar sensors will detect the truck and an alarm is activated in the Control Room of the Weigh Station to alert Operators that the truck was not weighed with the Mainline WIM equipment and was not processed (bypass detection).

C.   WEB based notification system for bypass trucks: Contractor is responsible for the coordination with SCDPS IT Office for conformance with their software and hardware architecture, expectable formats and protocols for all input data into their clearinghouse server. Shall choose, design and develop software and hardware that minimizes the data package size for each truck. This will reduce storage size requirement and increase capacity of the WEB based notification system. 10 bypass truck data packages will be processed to prove compliance.

D.   If a commercial vehicle is cleared based on weight, dimension, credentials and other criteria to bypass the Weigh Station, a Variable Message Sign (VMS) notifies the driver to bypass the Weigh Station. If the weight, dimension or credentials need to be checked further, or the truck is selected for random inspection, a variable message sign notifies the driver to enter the Weigh Station. Vehicles shall be directed into station upon any violation originating from the new automated weight and sort system.

E.   Two camera systems capture images of trucks as they travel past Mainline WIM location, the Overview Camera system and the LPR (License Plate Reader) camera system. Images of trucks that are not cleared are transmitted with the vehicle record (i.e. weight, vehicle length, over height indication, etc.) to the system computer.

F.   Camera captures images of non-compliant trucks in the right-hand lane that were not cleared. When non-compliant trucks are detected, an alarm message and image of the vehicle is transferred to the Scale House Operator controller display where Operators can view the trucks image and data.

G.   If a truck is not cleared, then it can be automatically or manually diverted to the Static Scale. The sensors and loops located on the Weigh Station Enter Ramp detects that a truck has entered the Weigh Station. The Operator uses the information displayed on the system computer monitor, to identify why a truck was required to report to the Static Scale (i.e. credentials check, weight check or random pull-in), and processes the truck accordingly. All trucks that are not bypassed by the Mainline CVISN equipment will automatically be directed to report to the Static Scale, where they are processed on the Static Scale.

H.   An Operator selectable Back-Up Detection system shall determine if the Ramp queue is full and automatically or manually (at user's option) direct trucks to bypass the Weigh Station until the queue is relieved.

I.   System shall maintain tracking and processing from truck at all points from mainline WIM through exit from station.

1.3   REFERENCES

A.   In addition to the codes and standards listed elsewhere in the Contract Documents, the latest editions of the following codes and standards apply to this work:

National Institute of Standards and Technology (NIST), Handbook 44

National Fire Protection Association (NFPA), 70 - National Electric Code (NEC)

National Electrical Manufacturers Association (NEMA)

Underwriters Laboratories, Inc. (UL/CSA)

Intertek/ETL (ETL)

American Welding Society (AWS), D1.5 - Bridge Welding Code

National Conference on Weights and Measures (NCWM)

SSPC SP 1	Society for Protective Coating Surface Preparation Specifications Solvent Cleaning: Removal of oil, grease, soil, drawing and cutting compounds, and other soluble contaminants
SSPC SP 6	Society for Protective Coating Surface Preparation Specifications Commercial Blast Cleaning
SSPC SP 10	Society for Protective Coating Surface Preparation Specifications Near-White Blast Cleaning
ASTM E1318-02	American Society of Testing and Materials: Standard Specification for Highway Weigh-in-Motion (WIM) Systems with User Requirements and Test Methods

ASTM A36	American Society of Testing and Materials Structural Steel
ASTM A53	American Society of Testing and Materials Black and Hot-Dipped, Zinc Coated, Welded and Seamless
AASHTO	MP 14-05, Provisional Standard Specification for Smoothness of Pavement in WIM Systems
AASHTO	Geometric Design of Highways and Streets, 2004, Chapter 10
AASHTO	Guide for Design of Pavement Structures, 1993, and PCA (Portland Cement Association) Procedures
TRB	Transportation Research Board, Weigh-in-Motion Data Quality Assurance Based on 3-S2 Steering Axle Load Analysis
SCDOT	Highway Design Manual
	Specifications for Highway Construction
	Specifications for Signing Expressways and Freeways
	SC Manual on Uniform Traffic Control Devices for Streets and Highways
USDOT	Federal Highway Administration Manual on Uniform Traffic Control Devices
NTEP	National Type Evaluation Program Certification – Certificate of Compliance

1.4 QUALITY ASSURANCE

A. Quality Assurance is the Contractor's responsibility. Codes and Standards shall comply with state and federal governing regulations as applicable.

1.5 INSTALLER QUALIFICATIONS

A. A firm or individual experienced in installing, erecting, or assembling work similar in material, design and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance for a minimum of three (3) years.

1.6 MANUFACTURER/VENDOR QUALIFICATIONS

A. A firm experienced in manufacturing products or systems similar to those indicated for this project and with a record of successful in-service performance for a minimum of three (3) years.

1.7 FABRICATOR QUALIFICATIONS

A. A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units for a minimum of three (3) years.

1.8   FACTORY-AUTHORIZED SERVICE REPRESENTATIVE QUALIFICATIONS

A.   An authorized representative of the Manufacturer/Vendor who is trained and approved by manufacturer to administer the installation of manufacturer's products that are similar in material, design, and extent to those indicated for this project and with a record of successful in-service performance for a minimum of three (3) years.

1.9   PROFESSIONAL ENGINEER QUALIFICATIONS

A.   A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated.

1.10   SOURCE LIMITATIONS

A.   Obtain each type of equipment and it's components through one source from a single manufacturer. All materials and equipment furnished under these specifications shall be new.

1.11   SOURCE QUALITY-CONTROL TESTING

A.   Tests and Inspections that are performed at the source, e.g., plant, mill, factory, or shop.

1.12   AUTOMATED WEIGH AND SORT SYSTEM QUALIFICATIONS

A.   At a minimum, comply with following:
      1.   Automated Weigh and Sort Systems Manufacturer's/Vendor's Experience and Performance Qualifications: The Manufacturer/Vendor shall have a minimum of three (3) years experience in the manufacture, supply, installation and integration of comparable systems and at least five (5) operational and successfully delivered projects. Manufacturer/Vendor shall demonstrate in-place system operation at the request and to the satisfaction of the Owner/Agency.
      2.   Automated Weigh and Sort Systems Project Manager Experience and Performance: The Manufacturer/Vendor shall provide a Project Manager for the duration of the project with a minimum of five (5) years' experience in the installation and integration of comparable systems and at least three (3) operational and successfully delivered projects in place. See Section 013100 for Systems Project Management responsibilities to the General Contractor.
      3.   Automated Weigh and Sort Systems Integrator Experience and Performance: The Manufacturer/Vendor shall provide a system and subsystems Integrator with a minimum of three (3) years' experience in the installation and integration of comparable systems and at least five (5) operational and successfully delivered projects in place.
      4.   Shortly after award, the Owner/Agency, Architect, and consultants may elect to visit an operational site with the successful Manufacturer/Vendor to verify system qualifications as noted above at the expense of the Owner/Agency.

1.13   SUBMITTALS

A.   Within four (4) days of the Bid Opening, the Manufacturer/Vendor, through the Contractor, shall furnish documentation which demonstrates to the satisfaction of the Architect that the WIM Systems, Static Scale, Subsystems, and Software proposed for use in the Automated Weigh and Sort System fulfill all of the requirements. Refer to Quality Assurance and provide the Manufacturer's/Vendor's, Integrator's and Project Manager's credentials complying with the requirements of that section.

B.   Prior to the pre-construction conference, the contractor shall furnish:
      1.   Written documentation and information for all components of the Automated Weigh and Sort System to the Architect, to include the following:

a. Manufacturer's Name
b. Model Number(s), supported by descriptive material for, but not limited to, the standard package system including but not limited to:
c. List of all functionalities for processing trucks in both automatic and manual mode
d. List of all functionalities for safety of processing trucks in both automatic and manual mode
e. List of all functionalities that trigger alarms in both automatic and manual mode and define types of notifications for each alarm event
f. Catalogs
g. Cut Sheets
h. Diagrams
i. Performance Curves
j. Charts
k. Other data published by the manufacturer, to demonstrate to the Architect the Contractor's intent to comply with the Contract Documents and plan requirements
l. All accessories identified
m. Integration features and compatibility

2. System manufacturer shall submit the following to the Contractor for submittal to the Architect:
a. Equipment Drawings
b. General Arrangements
c. Foundation Requirements
d. Field Wiring Diagrams
e. Instruction Manuals
f. Bill of Materials
g. Spare Parts List

3. Contractor shall submit the following equipment documentation for acceptance prior to fabrication:
a. Detailed description of each Subsystem, their components and requirements, including a step-by-step description of how the System would function in processing trucks both compliance and non-compliance scenarios.
b. Inductive loops as necessary for a fully functional, integrated and operable system.
c. Contractor shall submit a detailed System Acceptance Test (SAT) plan to the Architect for review by Architect and the Owner/Agency not later than 90 days after notice to proceed.
d. Manufacturer/Vendor shall design and submit six (6) complete sets of full size drawings suitable for construction on base templates as applicable as provided by the Architect in AutoCad version 2007 or compatible format. Structural drawings shall be stamped and sealed by a South Carolina Registered Engineer. Drawings shall be site specific and all components located. Submit shop drawings along with the supporting calculations. Drawings are to be approved by the Architect and the Owner/Agency prior to fabrication. At a minimum include the following:
e. All Automated Weigh and Sort System components, configurations and locations
f. All field wiring (power and controls), conduits, pull boxes, transformers, and other pertinent data required for a complete installation.
g. Overhead structures and foundation support
h. Acceptance of bid or approval of shop drawings by the Architect/Owner/Agency does not relieve the Contractor of the responsibility or the necessity of furnishing material and/or performing work to meet the intent of the Contract Documents.

PART 2 – WARRANTY

2.1 WARRANTY PERIOD OF PERFORMANCE

A. The period of performance for the Warranty shall be one (1) year from the successful completion of the 56-day SAT period.

B. The warranty coverage shall be renewable on an annual basis for an additional one (1) year by mutual agreement by both parties. Immediately after contract award, provide an estimated cost of such an extended warranty period to the Architect.

2.2 SCOPE OF SYSTEM AND SUBSYSTEM WARRANTY

A. Included in the cost of the Work, ensure the components of all systems are in good working condition and take appropriate action to remedy performance issues. Good working condition is defined under this project as equipment meeting the System specifications for acceptance, accuracy, and tolerances as defined in the Contract Documents.

B. Provide scheduled diagnosis and repair service and/or respond to repair malfunctioning equipment as outlined below:

1. Complete scheduled preventative maintenance, diagnostic testing and repair (if needed) at six (6) month intervals. Preventative maintenance shall be included in the warranty and completed in accordance with equipment manufacturer's recommendations and standard practices. Provide routine checks on all major systems, system components and ancillary equipment and take any corrective action to ensure proper long-term operation. The maintenance shall include, but not be limited to the following activities:
    a. Test and inspect all Static scale equipment, including weighing instruments, load cells, weighbridge, decks, pit, sump pumps, hardware and associated components. Check calibration, clean and repair or replace as required,
    b. Test signal level and lead cable of WIM piezoelectric quartz sensors, off scale piezoelectric sensors, and loops. Repair or replace as required,
    c. Verify WIM piezoelectric sensors, loops, and piezoelectric off scale sensor performance and reliability. Adjust calibration on devices to meet the specifications defined herein for each device. Repair or replace equipment as required to meet specifications,
    d. Check installation of grout and sealant for loops and piezoelectric sensors. Repair or replace as required,
    e. Perform visual inspection of detector housings and repair or replace as required,
    f. Check the calibration of and clean (if needed) all antennas,
    g. Check the calibration of and clean the over height detectors,
    h. Test and visually inspect LPR system, including all functions and displays. Repair or replace as required,
    i. Test and visually inspect Bypass Radar system, including all functions and displays. Repair or replace as required,
    j. Test and visually inspect all electronic signage, including all functions and displays. Repair or replace as required,
    k. Test and visually inspect truck intercom system, including two-way operation. Repair or replace as required,
    l. Clean the interior and exterior of system and subsystem electronics, power supplies, computers, controllers and communications equipment in all field equipment cabinets and in the Scale House. Repair or replace as required,
    m. Check condition of all system and subsystem cables and connectors, terminal strips, and UPS back-up system. Repair or replace as required,
    n. Check all electrical connectors, cables and components. Test and visually inspect utility pole, AC disconnect box, main AC circuit breakers, cabinet AC circuit breakers, AC outlets, grounding and lightning protection systems,
    o. Perform visual inspection of all system and subsystem equipment cabinets. Repair or replace as required,

      p.   Test and visually inspect each equipment cabinet ventilation fan and filter, thermostat, light and fused switch. Repair or replace as required, and

      q.   Test and verify control and sequence of operation of interface components.

2. Confirm the Mainline WIM accuracy by printing the WIM accuracy report from the System Computer every six (6) months. The accuracy report shall verify system and interface operations, including self-calibration function. If found to be out of tolerance the WIM piezoelectric quartz sensors shall be calibrated or replaced as required. This calibration shall be performed with random traffic and the Static scale.

3. Provide up to one (1) system operations refresher course every six (6) months either before or after each scheduled preventative maintenance service. The decision to have a refresher course shall be at the discretion of the Owner/Agency. Contact the Owner/Agency four (4) weeks prior to preventative maintenance to determine the need for the refresher course. The refresher courses shall have a maximum duration of four (4) hours scheduled immediately before or after the scheduled preventative maintenance. Include in the refresher courses a hands-on demonstration of system functionality. The Owner/Agency will provide facilities for the refresher courses.

4. Provide emergency repair services, on an as needed basis. The response time for emergency repair service shall be as follows:
      a.   24 hours to acknowledge request
      b.   48 hours to respond to request
      c.   7 days to repair equipment and return system to full and complete functionality.

5. The repaired system shall function to the specifications defined in the Contract Documents for acceptance, accuracy, and tolerances.

6. Document all activities performed under the warranty agreement, both preventative and emergency maintenance, in an electronic form that facilitates sorting the records by time period and/or device type. Submit a proposed format for this database for the Owner/Agency's approval. Include, as a minimum:
      a.   Date and time of scheduled preventative maintenance
      b.   All preventative maintenance activities completed
      c.   All parts repaired or replaced during preventative maintenance
      d.   Technician completing preventative maintenance work
      e.   Repair history for all systems and subsystems
      f.   Date and time of emergency maintenance request
      g.   Date and time of technician on site to respond to emergency maintenance request
      h.   Description of defective equipment or malfunctioning operations during emergency maintenance request
      i.   Technician responding to emergency maintenance request
      j.   Corrective actions taken during emergency maintenance request
      k.   Date and time that operations restored after emergency maintenance request
      l.   Model and serial number of any equipment repaired and replaced during emergency maintenance request.

7. Provide both electronic, in Microsoft Word format, and hardcopy records of the updated database within ten (10) days of each maintenance activity. Provide three (3) copies each.

8. Document all itemized material, equipment, and labor costs incurred to maintain the Westbound I-26 Weigh Station during the warranty period. The cost records shall differentiate between preventative and emergency maintenance costs. Provide these records to the Owner/Agency on a semi-annual basis within fifteen (15) days after the end of the six-month period. The purpose of this requirement is to provide the Owner/Agency with information to estimate the maintenance budget needed for the system after the warranty period. These records will not be used as a basis of payments to the Contractor. Ensure that these cost records are as complete and accurate as practicable. The Owner/Agency may perform an audit to verify the accuracy of the cost records.

C. Provide proven (not research and development) software upgrades for all new software revisions completed during the warranty period at no additional cost to the Owner/Agency. After

software upgrade has been field tested at some other like kind enforcement station for 60 days trouble free, Install within 30 days thereafter. Identify a cutover procedure for all software upgrades, which shall ensure that there is no interruption of service or failure of any operation as a result of upgrading the software. Also develop a contingency plan to re-install older versions of software, by the Contractor, if any operation fails or any system degradation is encountered as a result of a software upgrade. Upgrade is defined as software improvements developed by Manufacturer/Vendor.

D. All equipment and related components shall be warranted by the manufacturer, in writing, against defects in or from material, workmanship, lightning, and to perform as required by these Contract documents, giving proper and continuous service under all conditions required and specified, or which may reasonably be inferred, for a period of one (1) year from the date of acceptance. The manufacturer's routine maintenance schedule shall be stated. The written manufacturer's Warranty shall be furnished to the Owner/Agency by the Contractor at the time the equipment performance supporting data is submitted. The Warranties shall also state they are subject to transfer to the Owner/Agency.

2.2 WARRANTY EVALUATION

A. Two (2) months prior to the end of the Warranty period, the Owner/Agency will observe the system thoroughly for potential system defects. This observation will be performed by the Owner/Agency's personnel or representative(s). Assist the Owner/Agency's personnel or representative(s) during this observation. One (1) week prior to the observation, provide a summary report of all preventative and emergency maintenance records. This report shall document and certify that all components have been maintained fully in accordance with the provisions set forth herein and the manufacturer's vendor's recommendations and that all warranties that extend beyond the Contractor's warranty period(s) have been in no way compromised.

B. Following the observation, the Owner/Agency will determine if there are any unresolved defects with equipment hardware or software. The Owner/Agency will provide a punch list to the Contractor for the replacement or repair of defective components or repairs to system software. Replace or repair equipment and software identified in the punch list within one (1) month of receipt of the punch list. Also replace any components whose manufacturer's warranty has been voided or compromised by any action/inaction on the part of the Contractor. Document all repairs or replacements completed, providing the documentation to the Owner/Agency within two (2) months of receipt of the punch list.

C. At the end of the Warranty period, provide an agreement for the extended five (5) year Warranty to the Owner/Agency.

2.3 PROSECUTION AND PROGRESS

A. Complete construction operations within these timeframes:
- Systems & Subsystems Substantial Completion [TBD/t=0]
- Burn-In Period for Systems & Subsystems [t + 2 weeks]
- Scale House Training [t + 3 weeks]
- System Acceptance Test (SAT) [t + 3 weeks, allow 2 months]

B. Be advised that there may be multiple mobilizations for such items as traffic control, signing items, temporary pavement marking, salvaged topsoil, seeding, mulching, drainage items and other incidental items related to staging. No additional payment will be made by the department for said mobilizations.

C. Upon successful completion of the System Acceptance Testing (SAT) period, the Owner/Agency will accept the system, providing that all errors and omissions in Contractor-

supplied documentation have been fixed and all other requirements of the Contract Documents have been met. Final acceptance will be in writing from the Architect, the Owner/Agency, and the Office of the State Engineer (OSE). Refer to Payment and Warranty paragraphs of this Section.

D. The Contractor will be entitled to receive all amounts paid or payable to the Contractor in accordance with the payment provisions for the Automated Weigh and Sort System.

E. If downtime of the System exceeds that specified for the System Acceptance Testing (SAT) and the System is rejected by the Owner/Agency, such System failure will constitute default. The Owner/Agency may execute the performance bond.

2.4 PAYMENT

A. Payment shall be made based on all materials, equipment and labor affiliated with this system up to 80% until the successful completion of the 56 day test and acceptance of the fully operational System by the Architect, the OSE and the Owner/Agency. Payment for work under this section shall be based on the following: Refer to the System Acceptance Test (SAT) and Performance and Prosecution sections of this specification.
   1. Payment upon safe and secure delivery of all equipment at a storage location approved by the Architect shall be 50%
   2. Complete installation of the entire System and Subsystems shall be 25%
   3. Completion of Calibration and Burn-in shall be 5%
   4. Completion of the SAT to the satisfaction of the Architect and Owner/Agency shall be 20%

2.5 ACCEPTABLE MANUFACTURERS/VENDORS

A. Subject to compliance with the requirements of this section and the Contract Documents, the following Manufacturers/Vendors are approved. It is the intent of this document to specify the provision, installation and full integration of a complete and operational System(s). Differences in Systems and/or the System's components between Manufacturers/Vendors shall not serve as a basis of change to the Owner/Agency.
   1. Cardinal Scale Manufacturing Company
   2. International Road Dynamics, Inc.
   3. Mettler-Toledo, Inc.

2.6 SOFTWARE PACKAGES

A. System manufacturer is to provide all software necessary for complete and efficient operation of the weigh-in-motion/static weight enforcement scale systems. Software shall be CVISN compatible. The software shall be supplied with the report formats acceptable to the Owner/Agency. Report formats shall be supplied as an integral part of the system.

B. Provide the Owner/Agency with backups of computer operating system, application programs, data files, and any other elements necessary to fully restore the computers and system to normal operation after repair or replacement. Include full instructions for restoring software and data.

C. Provide the Owner/Agency with all source code for software and firmware developed by the Contractor, and which is not commercial (off-the-shelf) software provided by other vendors, to a mutually agreed upon third party escrow agent whose cost shall be included in the Work. If the Contractor is no longer in business or fails to meet the requirements of the warranty provisions, the Owner/Agency shall have full rights to the source code as needed to modify the software and firmware.

D. Provide manuals for all software, including screen-by-screen tutorial indicating all controls and parameters associated with each screen. Include range of parameter values, default values and procedure for modification of any values as required. Include four (4) hard copy sets and four (4) electronic copies in Microsoft Word or other agreed upon Format.

E. Ensure proven (not research and development) software performance upgrades that occur during the contract period are available to the Owner/Agency at no additional cost.

F. Proven software upgrades that are developed to correct operating characteristics shall be available to the Owner/Agency at no additional cost until the warranty period expires.

G. The software shall:
1. Allow the user to log-in/dial-up and perform remote troubleshooting and diagnostics. Log-in/dial-up shall be via web-based or commercially available dial-up software.
2. Interface with the Static Scale Indicators and the WIM controllers.
3. Display and accumulate Static Scale weights and display WIM data for the vehicle that is positioned on the Static Scale.
4. Provide adjustable thresholds to each steer axle, axle, tandem, and gross.
5. Automatically check weights to platform thresholds, bridge threshold (based on WIM axle spacing), and auto-release or auto-hold all vehicle classifications or alert Operator of violation.
6. Provide distinctively audible and visual alerts.
7. The System Computer shall be the main Operator interface for both the Static and WIM scales.
8. Perform multi-lane WIM operation.
9. Weigh all vehicles in outside lane of Mainline.
10. Classify all vehicles in Mainline.
11. Perform weight compliance analysis on vehicles in accordance with State regulations.
12. Insert sequence numbers for vehicle records and tracking purposes.
13. Perform data collection, data storage, file management and report generation functions for collected vehicle information.
14. Direct trucks to the static scale for enforcement weighing if truck exceeds any of the following parameters, or other parameters as directed by Owner/Agency:
   a. Gross
   b. Axle
   c. Tandem
   d. Inner bridge weights
      1. Front
      2. Rear
   e. Speed
   f. Over length
   g. Random
   h. Imbalance
      1. Side to side
      2. Axle to axle within tandem.
   i. Over height
   j. CVIEW LPR
   k. Off scale
15. Generate data for the Operator display terminals.
16. Direct compliant vehicle to bypass Weigh Station.
17. Detect and identify violators that have not entered Weigh Station.
18. Violator's WIM data shall be displayed on System Computer when vehicle is on Static Scale.

19. All vehicle information, including violation information, will be determined in real time and shall be displayed on the System Computer display similar to the following example, not intended to be Manufacturer/Vendor specific:

Each vehicle record shall contain a digital image of all vehicles and shall be similar to the following example, not intended to be Manufacturer/Vendor specific:

H. CVISN System:
1. CVIEW files are located on a local system that is updated on a nightly basis. In addition to the local CVIEW file, the SC CVIEW also provides access to real-time "system-to-system" web service queries which can also be used for screening.
2. The SC CVIEW contains a local "subset" of screening data elements that are transferred to a local file for quick screening decisions. Aside from this local file, CVISN data may be accessed via the SC CVIEW through a web service/XML interface. A published WSDL file will be provided to the selected vendor at project initiation.

2.7 SYSTEM COMPUTER

A. System Computer shall display on the screen the WIM data in the form of a graphic display when vehicle is on Static Scale. From overview camera, display picture of vehicle with WIM data on system computer monitor when vehicle is on Static Scale.
1. Display on the screen the static weights.
    a. Individual Axle Weight and Measurements:
        1. Steer Axle

        2.   Drive Axle(s)
        3.   Trailer Axle(s)
        4.   Inner Bridge
                a. Front
                b Rear
b. Accumulated Sum Weights
c. WIM Record
d. Static Scale Shift Counts

2. Display on the screen the shift counts, time and date.
3. Display or print shift count report for Static, WIM sensors, and average delay for statically -weighted vehicles during shift.
4. Display or print real time WIM accuracy.
5. Write the established data to a database.
6. The database shall include:
    a.   WIM Weight Data
    b.   Steer Axle
    c.   Drive Axle(s)
    d.   Trailer Axle(s)
    e.   Gross
7. Static Weight Data
    a.   Individual Weighments
        1.   Steer
        2.   Drive Axle(s)
        3.   Trailer Axle(s)
        4.   Accumulated Sum Weight
8. The collected data is used to perform:
    a.   Continuously and automatically calibrate the WIM sensors based on Static Scale weights
    b.   Prove the WIM sensor accuracy as defined in this Contract document paragraph System Acceptance Test and during routine maintenance
    c.   Determine and record delay time for each statically weighted vehicle
9. The database can only be accessed using a password with the highest level of security.
10. Database for the truck weighment records is to be stored in Windows environment.
11. Data retrieval may either be from the site directly or accessed remotely.
12. The System computer shall be 100 percent Windows compatible Pentium microprocessor-based microcomputer.
13. Acceptable brands are IBM, Compaq or Dell.
14. The minimum acceptable configuration shall include:
    a.   Microprocessor rated at a minimum of 2.4GHz
    b.   Minimum of 512 Mbytes RAM
    c.   Minimum of 80 GB hard drive
    d.   Minimum of 48xDVD drive
    e.   88.9 mm 1.44 MB high-density diskette drive
    f.   Minimum of three PC1 and one AGP slots
    g.   Parallel interface for connection to the printer
    h.   2 – 22 inch SVGA 26 dpi monitors with non-glare screen (one monitor for Mainline reporting, one for Static reporting)
    i.   101 key enhanced keyboard
    j.   Real-time clock/calendar with battery backup
    k.   Power supply as required by system configuration
    l.   System utilities and diagnostic software
    m.   Interface to the WIM electronics enclosure.
    n.   Interface to digital outputs
    o.   High-speed analog to digital converter
    p.   Surge protection
    q.   Network card

r. Internal modem card compatible with V.32 standards (56 K full duplex) or greater
s, System password protected lock for user access restriction
t. All access ports, cables and accessories to provide a working system
u. USB ports
v. The Static scale and software shall determine location of steer axle on platform 1 to within 2" of actual, and all other axles within 8" This feature shall confirm that the truck is positioned properly on the scale.
w. Use WIM data to determine auto or manual sequence
x. Continuously update WIM calibration based on static weights
    1. Perform automatically based on site programmed sample size
    2. Shall calibrate the WIM scale based on speed ranges and classification of vehicle
    3. Shall have the capability to determine and update multiple different dynamic calibration factors per vehicle class
y. Provide local and remote diagnostics for Static Scale indicator, Static Scale load cells, and WIM controller
z. Display static and WIM data in a format containing, but not limited to, the following:
    1. Static
        a. Individual platform weights
        b. Sum weight
        c. Inner bridge weights
        d. Front
        e. Rear
        f. WIM record
        g. Static scale shift counts
    2. WIM
        a. Weight
        b. Gross
        c. Individual axle
        d. Individual wheel
        e. Tandems
        f. Tri-Axle
        g. Bridge
            1. Front
            2. Rear
        h. Speed
        i. Axle spacing
        j. Classification of vehicle
    3. Provide within the display the following features:
        a. Selectable auto release
        b. Display shift counts
        c. Violations shall be displayed in red (the only information allowed in red is violations)
        d. Zero scale
        e. Reset scale
    4. Print requirements shall include but not limited to:
        a. Site Identification
        b. Axle Weight and Measurements
        c. Inner Bridge
            1. Front
            2. Rear
        d. Gross
        e. Time and Date
        f. WIM Axle Spacing
15. Static Scale Laser Printer

<div style="margin-left: 2em;">

    a.   Provide one printer for each station
    b.   Minimum print speed of 12 pages per minute
    c.   Minimum print quality of 600 dpi
    d.   Minimum 8 Mb of memory

</div>

2.8   FUNCTION AND OPERATOR CONTROL

A.   The System shall function under manual or automatic control; individually as subsystems or in as a total system in conjunction with all components.
    1.   Under automatic control, the compliance system shall automatically direct a suspected violator to the Static Scale and compliant vehicle to bypass
    2.   In manual mode, directional signals can only be operated or changed by the Operator

C.   Operate under an industry standard multi-user, real-time multi-tasking Windows-Based Operating System.

D.   The WIM calibration shall be automatic and continuously updated based on actual Static Scale weights.
    1.   System shall have an adequate number of passes for dynamic calibration factors based on appropriate speed increments and classification of vehicle (13 classifications) to verify and assure accuracy.
    2.   System shall alert Operator when accuracy of WIM sensors are out of allowable range as define by ASTM 1318-02, Table 2, Type III Functional Performance Accuracy and this contract document.

E.   Vehicle records shall be displayed on the System Computer Monitor.

F.   Record WIM and Static Scale shift counts.

G.   Accumulation of axles on vehicles (up to 19 axles).

H.   Ability to manually override the Mainline WIM system and direct individual trucks into the Weigh Station.

I.   Select trucks for reporting to the Static Scales by:
    1.   Programmed Weight
    2.   Programmed Axle Spacing
    3.   Random
    4.   CVIEW or other Database Rating
    5.   Speed
    6.   Classification of Vehicle
    7.   Over-height
    8.   Off-scale

J.   Provide manual control of the Mainline VMS signal, and Static Scale VMS signal.

2.9   MAINLINE WIM SUBSYSTEM

A.   Provide a dynamic weighing and screening system designed to meet all requirements the State of South Carolina and of this Contract Document. The system shall determine possible violators from compliant vehicles and direct possible violators to Static Scale.

B.   The dynamic weighing and screening Subsystem shall:
    1.   Have the necessary components for the in-motion weighing of trucks.
    2.   Determine if any vehicle exceeds state weight and axle spacing.

3. Control mainline signals to direct all over weight, over dimensional, over height, or CVIEW violators to enter Weigh Station for confirmation.
4. Direct all compliant vehicles to bypass Weigh Station without stopping.
5. Include a function to automatically reset radar queues.
6. Operate accurately at vehicle speeds between 5 to 85 miles per hour.
7. Accept individual axle weights up to 50,000 pounds.
8. Be capable of accommodating trucks with up to 19 axles.
9. Measure speed.
10. Indicate over speed violations.
11. Indicate off-scale occurrences.
12. Indicate king pin violators.
13. Indicate imbalances.
   a. Side to side
   b. Axle to axle within a tandem group
14. Indicate over height.

C. The dynamic weighing Subsystem for one direction of traffic shall include Kistler piezoelectric sensors, inductive loops, roadside (field unit) cabinet/enclosure, overview camera, computer graphic display, controller, software and other components as required for a complete, fully functional and operable system.

D. Subsystem shall be fully compatible with and integrated with Automated Weigh and Sort System and other subsystems.

E. Calibration of the WIM system shall be automatic and performed by electronic or software interface with Static Scale. Acceptance testing shall confirm the WIM accuracy and calibration performance.

2.10 KISTLER PIEZOELECTRIC WIM SENSORS

A. Sense the weight of each axle of the truck as it moves in motion over the sensors.
B. Determine vehicle speed and axle spacing without the need of other in road devices.

C. Sense, with the system software, any axles that fail to go fully over the sensors.

D. Provide two sensors per wheel path:
   1. Right wheel path shall consist of one 2M
   2. Left wheel path shall consist of one 2M

D. WIM accuracy on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be as follows:

Axle Weights: + 15% (95% of trucks)
Tandem Weights: + 10% (95% of trucks)
Gross Weights: + 6% (95% of trucks)
Axle Spacing: + 6 inches or 5% (68% of axles), whichever is greater

F. Sensors
   1. Degree of protection IP68.
   2. Have temperature compensation of .02% per degree C.
   3. Provide lightning and surge protection

2.11 FIELD UNIT

A. Shall communicate with the WIM sensors, inductive loops, and control unit.

B. Place at least 15 feet from the truck lane, but no more than 80 feet from the WIM sensor.

C. Construct in a standard outdoor traffic control cabinet.

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

E. Receive cables from the WIM sensors, loops, and transmit data to the System Computer through Fiber optic cable.

F. Install on a suitable concrete pad large enough to provide standing area for maintenance staff. Standing area to be as wide as cabinet and 3 feet deep from door.

G. Include a module for terminating all in-road items (sensors and loops) and provide necessary communication to System Computer.
    1. The cabinet shall include power supply, convenience outlet with light, and lightning/electric surge protection.
    2. There shall be no computer in the cabinet due to the extreme weather, cold, heat and humidity.

H. Have the capability of sampling the outputs from the WIM sensors and loops over the full range of operating speeds and accurately determine the axle weights and axle spacing.

I. Provide ground bus for cables and lightning equipment.

2.12 WIM CONTROLLER

A. Shall be printed circuit board design.

B. Shall communicate via Ethernet and serial.

C. Shall have integrated Digital Signal Processing (DSP) sampling.

D. Shall have integrated surge protection.

E. Shall have self-contained diagnostic software to analyze the condition of the system, which can be accessed over the system network.

2.13 OVER HEIGHT DETECTOR

A. Provide one (1) Over Height Detector with a photo-eye system.

B. Detector shall meet the following criteria:
    1. Input: 120 VAC ± 20 percent, 50/60 Hz
    2. Output:
        a. Relay closure
        b. Rate contact 10 amps, 117 VAC
        c. Adjustable time from 5 to 30 seconds
        d. Electronics: Solid state on printed circuit boards
    3. Effect of ambient light shall be eliminated.
    4. Temperature Range: 40° to 135° Fahrenheit

C. Environmental Control
    1. Internal temperature, air flow and moisture controls allow continuous operation in fog, ice, snow, dust and heat.

2. Provide external housing with heavy aluminum castings to minimize potential damage from vandalism.

D. Housings
   1. Made of cast and sheet aluminum
   2. Minimum 1/8 inch thick
   3. The pole cap is the mounting bracket and sighting base

E. One piece, seamless, 6 inches minimum diameter round aluminum tube
   1. Hand hole is centered 1.5 inches above the bottom of the shaft
   2. Secure by stainless steel cover screws
   3. One-piece base flange cast aluminum socket with 8-17/64 inches bolt center
   4. No surface preparation or painting is required

F. Include all poles (break-away), mast assemblies, structure, foundations, brackets and related hardware as required for a complete installation.

G. Include a minimum 3/4" x 10' copper-clad steel grounding rod driven at detector location and connected to ground terminal.

2.14 OFF SCALE SENSORS

A. Provide sensor to detect off scale condition.

B. Sensors shall be field replaceable.

C. Sensors shall be mounted flush to the road surface and coordinated with all scoring and joints.

D. Couple sensor to amplifiers in the road side cabinet as required for complete operation.

2.15 RADAR BYPASS DETECTION SYSTEM

A. Basis of specification for radar system is Wavetronix, RTMS or equal.

B. Shall detect trucks that bypass Mainline WIM and/or Weigh Station facility and alert Operator to breach and automatically provide image of vehicle on system computer monitor. WIM data shall be provided in addition to overview image when WIM was not bypassed.

C. May be used to determine back up in the Static scale lanes and track vehicles within Weigh Station and Mainline.

D. May be utilized to reset signals as required.

E. The system shall consist of WIM sensors, multiple radar assemblies, and loops. The WIM sensors will determine the vehicles axle weights, axle spacing, classification, speed, and weight violation status. The radar system shall determine vehicle speeds, approximate lengths of vehicles and lane. Loops shall be used to initiate WIM sensors, trigger cameras (overview and LPR) and reset the electronic Mainline signage.

F. Vehicle class, weight, and speed shall be determined when vehicle crosses WIM sensors. This data will then be tracked through a series of queues until the vehicle, enters the Weigh Station, or passes the Weigh Station.
   1. Additional loop queues shall be used once the vehicle has entered the Weigh Station to track it to the Static Scale or Static Scale bypass lane.
   2. The Mainline sort signal shall activate when truck crosses Mainline WIM sensors. This shall happen as soon as the truck is past the WIM sensors if there are no other trucks

between the truck just weighed and the sort signal. If there are other trucks in that queue, the signal will be activated as soon as the first truck in queue has passed the signal. Multiple trucks may be in queue at the same time. In that case, the sort signal will activate appropriately for each truck as the truck in front of it passes the signal reset loop. The signal shall have three states – directing a truck to enter the Weigh Station, directing a truck to bypass the Weigh Station, or no message (off). Trucks will get one of the two messages TRUCK ENTER WEIGH STATION or TRUCK BYPASS WEIGH STATION.

3. As trucks advance toward the station and pass by the radar, vehicle speed, length and lane is determined. This data is compared with possible matches from the previous radar and/or WIM sensors. A match shall be based on vehicle type and a time window of when that vehicle would have been expected based on its speeds and the distances between the devices.

2.16 LPR CAMERA: (CVIEW LOOKUPS)

A. The system shall incorporate a license plate reader system which will automatically detect the presence of a vehicle; capture an image containing the license plate, locate and identify the corresponding alphanumeric information and jurisdiction / location of issue.

B. The system shall automatically read all types of commercial vehicle license plates, and shall provide digital image on system computer monitor to allow Operator to identify vehicles with no plates or with plates that may have become unreadable due to dirt, snow or other factors.

C. The system shall automatically capture, identify and look up alphanumeric code, state of origin, and county of origin as available from the CVIEW database. The system shall be configured to identify and differentiate all plates by jurisdiction within the eight state regions.

D. The system shall have demonstrated an 85% full plate and origin accuracy read rate for readable plates as reasonable pending weather, congestion or other factors as approved by the Owner/Agency. The system shall read both reflective and non-reflective plates.

E. System shall include cameras, illuminator system, poles, brackets, equipment, cabinets, software, wiring and all associated work as required for a complete and operable system.

F. Camera pole and foundation design shall be signed and sealed by a Professional Engineer registered in the State of South Carolina. This design shall be submitted with the shop drawings to the Engineer for approval prior to construction.

2.17 DETECTOR LOOPS

A. Shall be designed and located by System manufacturer.

B. Shall be installed per approved shop drawings.

C. Shall track vehicles within Weigh Station to Static Scale.

D. Shall reset Mainline signals as required.

E. Shall conform to SCDOT standard specifications.

F. Shall be coordinated with all pavement scoring and joints.

G. Shall be utilized to provide for system operations to include WIM sensors, off-scale detection, signalization, and other relevant information as needed.

2.18 STATIC SCALE SUBSYSTEM

Current static scale model is:

Mettler/Toledo LYNX/30 ton Single Pad Serial No. 5000492-5NZ Fac. No. LTHA0000000, Volts 100-120

A. Static scale is existing and shall be modified/upgraded as required for a complete integration into new system. Existing static scale is Mettler-Toledo.

B. Provide modifications to existing Static Scale designed to meet all requirements of the State of South Carolina and this Contract Document.

C. The Scale shall:

1. Determine location of steer axle on platform one (1) to within 2" of the actual and all other axles within 8" of the actual.
2. Automatically determine if each vehicle is in compliance to weight limits including front and rear bridge based on WIM axle spacing.
3. Automatically determine if axles are properly position on Static Scale; if not, alert Operator by visual and distinctively audible alarms.
4. Determine if vehicle is a weight violator, or has credential issues or was flagged for over height and if so, alert Operator by visual and distinctively audible alarms and automatically hold truck for operator definable amount of time.
5. Record and store static and WIM shift counts.
6. Auto-calibrate the WIM Sensors.

D. The Static Scale Subsystem is used when a truck is identified by the WIM as a possible violator or random selection.

E. The WIM record that is established by the WIM controller is transmitted to the System Computer and displayed on the system monitor when vehicle is positioned on Static Scale.

F. This record shall include:
1. Speed
2. Axle spacing
3. Inner bridge
    a. Front
    b. Rear
4. Vehicle length
5. Overall
    a. Inner bridge (Front and Rear)
6. Axles weights
7. Individual wheels weights
8. Tandem axle weights
9. Gross weight
10. Imbalance
    a. Side to side
    b. Axle to axle within a tandem
11. Off-scale
12. Fully electronic digital or remotely supervised hydraulic type load cells shall be used in Static Scale.
13. Manufacturer authorized representative shall supervise all modifications of the Static Scale.

2.19 LOAD CELLS

A. Load cells shall be mounted in such a manner as to be easily replaced.

B. Mountings shall be designed to provide for thermal expansion and contraction of weighbridge steel and for shock loading.

C. Load cells shall meet the latest adopted edition of the NIST Handbook 44 at the time of contract letting and shall be NTEP approved.

D. Load cells shall be constructed of 304 stainless steel with a minimum capacity of 110,000 pounds.

E. Load cells shall be hermetically sealed with a minimum NEMA 6P submersible rating including the load cell cable connection.

F. A certified technician shall be able to replace one load cell once in position at the load cell with a jack (and blocks if required) within a maximum of 3 minutes

G. Allowable Creep (30 minutes): ± 0.017% of applied load.

H. Design Temperature Range: 14° to 104° Fahrenheit.

I. Load cell interface cables shall be stainless steel sheathed for environmental and rodent protection.

J. Load cells shall provide 150 percent safe overload capability and 250 percent ultimate overload capability.

K. Load cells shall not require junction boxes for connection to Static Scale instrument and load cell cable shall not be integral part of the load cell.

L. Load cell system shall have predictive diagnostics:
    1. Breach detection which detects loss in load cell hermetic seal
    2. Record and store maximum overloads
    3. Record and monitor load cell temperature minimum, maximum, and actual
    4. Store and display the load cell serial number
    5. Record and store load cell voltage minimum, maximum, and actual
    6. Record and store load cell communication signal high and low

M. There shall be no load cell cable junction boxes in the pit.

2.20 STATIC SCALE INSTRUMENT: (DIGITAL DISPLAY)

A. Static Scale Indicator.

B. Microprocessor based item(s) for scale readout and control and data handling functions

C. The scale instrumentation shall be compact and approved by the Architect.

D. Manufacturer shall provide proof that the instruments have been in use successfully for at least three (3) years at a minimum of 5 Weigh Station Enforcement Facilities.

E. Provide microprocessor-based digital instrument with Ethernet weight output to the System Computer and the system monitor for totalizing and printer controls.

F.   This connection shall provide diagnostics of Static Scale load cells (load cell raw counts) to the Static Scale PC or a remote PC.

G.   Provide with software diagnostics to facilitate fault finding.

H.   Provide a certificate of conformance from the NIST Handbook 44, latest adopted edition.

I.   The Static Scale instruments shall include:
1.   Ability to power up all two (2) scale platforms
2.   From the same manufacturer as the Static Scale weighbridge and WIM controller
3.   All instrument setup functions and calibration sequences are programmable through the keyboard/display, No at-scale adjustments required for these functions
4.   Minimum of 15 updates per second
5.   Shall have full color LCD display showing individual platform weights and the summation of the platform weights
6.   Shall be suitable for desktop or set-in mounting, level or at angle
7.   Display the raw counts of each individual load cell without disconnecting any of the load cells from the system
8.   Perform all Static Scale instrument set-up functions via Static Scale internet explorer web pages. Download to instrument via Ethernet connection
9.   Selectable weight increment size from 20 to 50 lb.
10. Display up to 1 part in 10,000
11. Internal resolution 1 part in 1,000,000
12. Setup functions stored in nonvolatile RAM memory
13. Adjustable digital filtering
14. Adjustable automatic zero maintenance
15. Serial ASCII output port configuration for connection to computer. Baud rate to be selectable from 300 to 9600
16. Motion detection should be selectable from ±0.5, ±1.0, ±2.0, ±3.0 increments
17. Include display verification test
18. Static Scale instruments shall meet the current specifications of the NIST Handbook 44, current adopted edition
19. The instrument shall be UL/ETL listed
20. Provide one button printing

2.21   STATIC SCALE CERTIFICATION

A.   The Static Scale must be certified by Department of Agriculture's Weights and Measures Section as a part of Substantial Completion. Contractor is responsible to request, coordinate and obtain certification from Department of Agriculture.

2.22   APPROACH SLABS

A.   The foundation shall include 10' approaches on each end of the scale which are in accordance to the guidelines of NIST H-44 and have smoothness (flat) of .125"

2.23   SURGE VOLTAGE PROTECTION

A.   AC Line Voltage Protector: Used "in-line" with external 120 VAC power line to protect equipment from incoming surges.
1.   Clamping Level: 200 Volts
2.   UL 1449 Surge Protection Rating: 330 Volts
3.   Protection Modes: Line to Neutral, Line to Ground, Neutral to Ground
4.   Line Voltage: 120 VAC, 50/60 Hz
5.   Maximum Current Rating: 15 Amperes (1800 Watts)
6.   EMI/RFI Noise Filtration: 50 db. (99.7%) from 100 kHz to 1 MHz

7. Response Time: <1 Nanosecond
8. Energy Dissipation: 30,000 Amperes

2.24 INTERCOM/PUBLIC ADDRESS SYSTEM

A. Provide two-way public address/intercom system for communication between Operator in either control area (tower or downstairs) and truck driver on Static scale. System shall include electronic processing to filter motor and highway noise.

B. System at a minimum shall include:
1. 110 VAC control unit that shall supply up to 10 watts output to three (3) sets of two (2) 8 ohm horn speakers. Speakers shall be mounted at height of intended target. The system shall be able to address each of the three (3) sets of speakers individually, or all at once, as chosen by the Operator.

C. To place a call, a TALK button on the control unit should be depressed for each set of speakers the Operator wishes to transmit voice to. Releasing the TALK button allows voice to be received from the chosen speakers to the control unit. An OFF button places the system in a standby mode, where voice to, and from, the speakers is silenced.

D. Volume adjustment of HIGH, MID and Low for both receive and transmit voice, as needed for intelligible communication.

F. A minimum of two speakers shall be provided for Static Scale.

G. Intercom pole/pedestal and foundation design shall be signed and sealed by a Professional Engineer registered in the State of South Carolina. This design shall be submitted with the shop drawings to the Engineer for approval prior to construction.

2.25 ELECTRONIC MASSAGE AND TRAFFIC CONTROL SUBSYSTEM

A. Mainline VMS Signal: ("Truck Enter Weigh Station" / "Truck Bypass Weigh Station" / "Weigh Station Closed)

B. Mainline Variable Message Signs (VMS) shall when Weigh Station is open direct each vehicle on the Mainline to enter Weigh Station or bypass Weigh Station based on the results of the Mainline sort decision.

C. VMS shall:
1. Direct potential violators to the Weigh Station
2. Direct compliant vehicles to bypass Weigh Station
3. Only illuminate for commercial vehicles
4. Display Weigh Station closed when not open

D. Messages shall be programmable via the System Computer:
1. Password protected
2. A message shall not exceed two lines of 16 characters per line
3. Shall store minimum 20 messages
4. Allow for six active messages
5. Active messages shall be controllable via Static Scale program, Static Scale mouse, keyboard, or system computer monitor.

E. Variable Messages Signs shall have the capability to be post mounted or mast arm mounted. Mounting shall be as required to suit the site conditions.

F. Each character height shall be minimum 12" (7 pixel font).

G. Each sign shall have multi-color capacity utilizing three (3) LEDs per pixel (1 red, 1 green, 1 blue).

H. Each sign shall have a minimum estimated life of 100,000 hours.

I. Each sign shall have a viewing angle of 90 degrees horizontal and 40 degrees vertical.

J. Each sign shall have front access.

K. Each sign shall be capable of displaying text, graphics, logos, basic animation, multiple font styles and sizes.

L. VMS signs shall be powered by 120/208 VAC single phase.

M. VMS signs shall be capable of communicating via RS232, RS422, modem, serial fiber, or Ethernet fiber.

N. VMS sign shall have a minimum of 64 levels of display dimming (automatic or manual control).

O. Include all poles (break-away design), mast assemblies, structure, foundations, brackets, and related hardware as required for a complete installation.

P. Signal pole and foundation design shall be signed and sealed by a Professional Engineer registered in the State of South Carolina. This design shall be submitted with the shop drawings to the Engineer for approval prior to construction.

Q. Supports shall prevent interference/vibrations from truck gust.

R. Include a minimum 3/4" x 10' copper-clad steel grounding rod driven at sign location and connected to ground terminal.

2.26 STATIC SCALE VARIABLE MESSAGE SIGN

A. Variable Message Signs (VMS) shall:
   1.   Inform or direct the vehicle that is positioned on Static Scale.
      a.   STOP NOW (8 char.)
      b.   PULL FORWARD (12 char.)
      c.   BACK UP (7 char.)
      d.   GO PARK (7 char.)
      e.   BRING PAPERS (12 char.)
      f.   EXIT (4 char.)
   2.   Messages shall be programmable via the Static Scale Computer.
      a.   Password protected.
      b.   A message shall not exceed two lines of 16 characters per line.
      c.   Shall store minimum 20 messages.
      d.   Allow for six active messages.
      e.   Active messages shall be controllable via Static Scale program, Static Scale mouse, keyboard, or graphics panel.

   3.   Sign shall be capable of displaying text, graphics, logos, basic animation, multiple font styles and sizes.
   4.   VMS signs shall be powered by 120/208 VAC single phase.
   5.   VMS signs shall be capable of communicating via RS232, RS422, modem, serial fiber, or Ethernet fiber.
   6.   VMS sign shall have 64 levels of display dimming (automatic or manual control).

7. Include all poles, mast assemblies, structure, foundations, brackets, and related hardware as required for a complete installation.
8. Sign pole and foundation design shall be signed and sealed by a Professional Engineer registered in the State of South Carolina. This design shall be submitted with the shop drawings to the Engineer for approval prior to construction.
9. Include a minimum 3/4" x 10' copper-clad steel grounding rod driven at sign location and connected to ground terminal.

2.27 MAINLINE OPEN/CLOSED SIGNAL: (RED "CLOSED" / GREEN "OPEN")

A. Each signal shall have a visibility of 0.25 miles at all times under normal atmospheric conditions.

B. Provide the control signals with hinged, ventilated protective sun screens to eliminate "phantom" effect from unlit lamps and protect the signal lamps from damage due to thrown objects and flying birds.

C. Provide 10" high characters.

D. Provide clear legible message that attracts attention under any lighting conditions.

E. At full intensity, the signal shall be highly visible anywhere within a 15-degree cone centered about the optic axis.

F. The signal shall consist of, but not be limited to:
1. Weatherproof housing and door.
2. LED Light source
3. Segment control boards

G. System controls the signals to provide the truck traffic with a clear and concise signal as to whether to the Weigh Station is opened or closed.

H. Either the WIM controller or the Operator manual override can change this signal.

I. Signals finish shall be acid etched and painted with two coats of zinc-chromate primer. Door frame, face plate, interior of housing, and visor shall be painted with two coats of high quality flat black enamel. Exterior of housing shall be painted with two coats of high quality semi-gloss black enamel.

J. Sign pole and foundation design shall be signed and sealed by a Professional Engineer registered in the State of South Carolina. This design shall be submitted with the shop drawings to the Engineer for approval prior to construction.

K. Include a minimum 3/4" x 10' copper-clad steel grounding rod driven at sign location and connected to ground terminal.

PART 3 – EXECUTION

3.1 INSTALLATION

A. This project has been designed to include a grounding system, electric power surge protection and a single point ground system. Install and test these systems in accordance with manufacturer guidelines.

B. Construction of these protective systems shall be completed prior to installation of any of the electronic components of the project.

C. All electronic components shall be tied to and or protected by the protection systems immediately upon installation so as to reduce the chances of lightning damage during construction.

D. Any lightning damage to components or conductors which results from the equipment being installed prior to completion and operation of the protection systems as shown in the plans and this Contract Document is responsibility of the Contractor.

E. The Contractor shall replace within one week any damaged components and conductors at their own expense.

3.2 METHODS OF CONSTRUCTION

A. The System shall be installed in strict conformance with the requirements of the manufacturer to provide a complete and fully operable system.

B. The System shall be installed in strict conformance with the Contract.

C. The System shall comply with all applicable codes, state and federal.

D. Refer to the Contract for other sections that may apply to the installation of the System.

E. The WIM concrete control pavement:
   1. Provide a distance of 200 feet on the approach side.
   2. Provide a distance of 100 feet beyond the in-motion sensors.
   3. Provide a distance of 40 feet to each entrance and exit end of the Static Scales.
   4. Provide a smooth and level pavement and in the same plane as the platform.
   5. See Roadway Plans for location of control pavement.

F. The surface of the control pavement shall be uniform such that a 6 inches diameter circular plate 0.125 inch thick cannot be passed beneath a 20 feet long straightedge.

G. Grinding of the pavement shall be required to meet the above noted tolerances. This shall be done at no additional cost to the Owner.

H. The pavement shall meet ASTM E1318-02, Section 6.1.1 through 6.1.5.

I. All cables and wires from the sensors and loops shall terminate in the field unit equipment enclosure located adjacent to the roadway as shown on the approved shop drawings.

J. All in-grade loops, sensors and similar equipment shall be coordinated with all pavement scoring and joints.

3.3 BURN-IN

A. Refer to the anticipated project schedule for Burn-In time and sequence. This two week period shall be utilized by the System manufacturer to troubleshoot and fine tune the System and Subsystems. Project shall be Substantially Complete before Burn-In can start. During this period, no other construction activity will be allowed on the site other than activities affiliated with the Automatic Weigh and Sort System.

3.4 AUTOMATED WEIGH AND SORT SYSTEM TRAINING

A. The cost for the training sessions defined herein and as indicated in the warranty requirements shall be included in the contract price. The Owner/Agency will, from time to time review any future training requirements. The WIM vendor shall agree to provide future and additional training sessions upon receipt of requests from Owner/Agency. The Owner/Agency shall reimburse the WIM vendor the cost of providing additional training sessions on a per diem basis and at a rate agreed upon by the Owner/Agency at the time of the request. The Owner/Agency will provide classroom space for training session.

B. Provide four training courses covering operation and maintenance of the equipment and software being supplied as part of this project. One of the courses shall train Weigh Station personnel to properly operate the truck regulation enforcement system. Manufacturer's representatives shall conduct the training courses.

C. At least 40 days prior to commencement of each training course, submit detailed course curriculums, draft manuals and handouts, and resumes of the instructors. The Owner/Agency will review and request modifications of that material as appropriate.

D. Limit training courses to no more than six hours of training in any one day. Conduct all courses on weekdays at times to be specified by the Owner/Agency.

E. Conduct Operator training courses in the Scale House and the field portions at the relevant components at the Weigh Station. Exercise all necessary safety precautions in compliance with applicable safety and traffic control measures.

F. Conduct Classroom portion of the technician training courses in a meeting room at SCDPS, STP Division Headquarters in Blythewood, SC.

G. The training material generated for each course shall contain manuals and other handouts for each attendee that serve not only as subject guidance, but as quick reference material for future use by the students. Use the training courses to familiarize the students with all documentation that has been provided as part of this project. Deliver all course material, in reproducible form, to the Owner/Agency immediately following course completion.

3.5   SCALE HOUSE OPERATOR TRAINING

A. This training course shall train Weigh Station personnel to use all features and functions of the software and new hardware. Divide the training course into two parts. Conduct each part of the course twice. Provide each part of the course for up to fifteen (15) people.

B. The training course shall be a minimum of twelve (12) hours duration. Include both classroom instruction and practical experience on the central equipment. Design the first part of the course to provide students with an introduction to the system and the theory of its operation. At a minimum, the first part of the course must include the components of the system, central software operation, and the configuration of the central and field equipment. The second part of the course shall provide each trainee with hands-on experience with the computer and controller system and the video surveillance system. The course shall cover the operation of all software provided in this project. The course shall also cover the proper operating techniques and user maintenance procedures for each piece of equipment, including modification and/or fine tuning of the system thresholds. Particular attention shall be paid to precautions that should be observed in operating or handling the equipment or materials.

3.6   TECHNICIAN TRAINING

A. Design the courses to train technician-level personnel in the maintenance of Contractor-installed Systems and Subsystems. Extend the courses from the basic equipment operating theory to the detection and identification of malfunctions in the equipment through use of

diagnostic programs and the Contractor-supplied test equipment. Include field level troubleshooting, as well as bench repair. Also include the proper use of all test and maintenance equipment supplied in this Contract.

B. Provide each course for up to fifteen (15) people.

C. The training shall cover all Owner/Agency serviceable equipment with a separate course on each of the following categories of equipment:

D. New sensors, including the mainline piezoelectric quartz sensors, piezoelectric sensors, over height and Bypass sensors. This course shall run at least 4 hours,

E. Communication system, including fiber optic cable and transceivers, Ethernet equipment, wireless communication system, and AVI equipment. The emphasis shall be on troubleshooting. This course shall run at least 4 hours,

F. Threshold modification and fine tuning. This course shall run at least 4 hours.

G. Each training course shall consist of a presentation of the functional operation and programming of the equipment, followed by a "hands-on" workshop. A second presentation shall cover routine maintenance and troubleshooting procedures. This shall be followed by a "hands-on" workshop wherein personnel troubleshoot simulated faults to the component level. Finally, the trainees will be taken to the Weigh Station and given a tour, in which every cabinet (indoor and outdoor) will be opened and every component identified.

3.7   WEIGH STATION SOFTWARE TRAINING

A. Furnish software manuals for the new Weigh Station CVISN-compatible system. For each screen, the manual shall explain the controls and parameters that are associated with the screen, including: the acceptable range of parameter values; any default values that may exist; and a procedure for modifying these ranges and default values. Present these screens and messages in logical sequence.

B. Submit the software manual to the Architect for approval. Provide five hard copy sets and an electronic copy. The manuals required by this Subsection are in addition to any material given to participants in the Operator training course. The System Acceptance Test will not begin until the user's manual has been approved by the Architect and the Owner/Agency.

3.8   TRAINING SCHEDULES

A. Provide Classroom Training before or simultaneously with the Burn-In period. Provide Scale House training within the one-week period between Burn-In and the SAT. Technician Training and other training as necessary to comply with these training requirements may occur during the SAT period within the parameters set forth in this specification.

3.9   SYSTEM ACCEPTANCE TEST (SAT)

A. The System Acceptance Test shall demonstrate to the satisfaction of the Architect and Owner\Agency that the Automated Weigh and Sort System has been constructed and consistently meets the performance requirements of the Contract Documents. During the System Acceptance Test, the entire Automated Weigh and Sort System shall be fully operational under normal traffic conditions and operate trouble free for 56 consecutive days as defined herein. Accuracy data shall be printed weekly during the SAT.

B. The SAT will be the basis for acceptance or rejection of the systems (Mainline and Static) as a result of demonstrated performance. In the event that the system does not meet the criteria

specified herein, the Owner/Agency may execute the performance bond. The Contractor will be entitled to receive all amounts paid or payable to the Contractor in accordance with the payment schedule defined in this Section.

C. During the entire System Acceptance Period, the system shall monitor all the system components and devices and perform all functions required by the Contract Documents.

D. If any hardware item provided under this Contract fails, repair the item at the Contractor's expense.

E. During the SAT period, have Manufacturer/Vendor personnel respond to the problem within two (2) hours after being notified of a problem by the Department. Within one calendar day, Manufacturer/Vendor has personnel on-site, with replacement components, addressing problems encountered with the System or Subsystems at the earliest possible time,

F. If any other problem is discovered, such as intermittent communication or erroneous computations, the observation period will be suspended until the Contractor fixes the problem at his expense. Once the problem has been eliminated, the observation period will resume. If the problem was one that affected the entire system, rather than just an isolated component, the observation period will not resume until the system has performed properly for at least 72 hours. During this 72-hour period, demonstrate that any corrections or modifications made are valid, that the problems which restricted system operation have been corrected, and no new problems have resulted from the changes,

G. Total system "down time" may not exceed 30 hours during the entire period. Down time includes the time of suspension of the observation period as described in the previous paragraph. Down time is a condition caused by failure of the central equipment, system software, field equipment or communication system, which causes the system to cease normal operation. If total system "down time" exceeds 30 hours, a full duration of the 56 day SAT shall begin again at the discretion of the Architect and/or the Owner/Agency.

H. In addition, the Automated Weigh and Sort System shall be considered unavailable when:
    1. A major system component completely fails which significantly degrade the performance or operation of the Weigh Station. This situation is said to have prevailed if either the WIM system or the communication system has failed.
    2. More than one system component fails to operate or respond to Operator commands and/or system automation for more than thirty minutes.
    3. Weekly WIM accuracy is not met.

I. Upon successful completion of the observation period, the Architect and the Owner/Agency will accept the system, providing that all errors and omissions in Contractor-supplied documentation have been fixed and all other requirements of the Contract Documents have been met.

J. The Office of the State Engineer shall issue a Certificate of Final Completion upon successful completion of the System Acceptance Test and training program. See Project Close-out requirements.

K. Contractor shall submit a detailed test plan to the Architect, Owner/Agency for approval not later than 90 days after notice to proceed.

L. The Owner\Agency will check the accuracy performance by printing an accuracy report from an electronic database which is created and stored on the System Computer.

M. The report for WIM accuracy shall be printed from the System Computer in the presence of the Owner/Agency. Once calibration is complete, accuracy performance shall be checked bi-weekly during the SAT period.

3.10 SAT CALIBRATION/ACCEPTANCE PROCEDURE

A. Contractor shall provide the Architect, Owner/Agency one week's notice of the in-motion calibration tests**.** Follow the latest version ASTM E1318 Standards.

B. Testing shall be performed utilizing live traffic stream with Certified Static scale, allowing system to automatically record accuracy values to spreadsheet or database.

C. Trucks shall be sorted from Mainline to Static scale and WIM weights compared to Static scale weights and WIM system calibrated accordingly.

D. Testing shall utilize multiple truck types, varying truck speeds and traffic flows to ensure accuracy is maintained for typical truck traffic expected at Weigh Station.

E. The testing will continue until the system passes all criteria according to latest version ASTM E1318 Standards.

3.11 SCHEDULED SYSTEM MAINTENANCE SERVICE:

A. The Vendor's routine maintenance on all major systems, system components, and ancillary equipment shall be scheduled at 6-month intervals. A semi-annual maintenance report shall be submitted to the Owner/Agency upon completion of the scheduled maintenance service. Scheduled maintenance, emergency maintenance and refresher training (as required) shall be included as part of the one (1) year warranty.

B. The scheduled maintenance service shall include the following:
   1. Visual inspection, signal checks and testing measures on all loops;
   2. Cleaning, repair and testing measures on WIM sensors (Mainline and Ramp);
   3. Clean, repair, grease and test measures on Static Scale.
   4. Visual inspection and testing measures on all off-scale sensors;
   5. Visual inspection, testing measures and signal checks on all piezoelectric sensors (Mainline);
   6. Visual inspection and cleaning of cabinet and system electronics;
   7. Maintenance of WIM cables, connectors, terminal strips and back-up batteries;
   8. Electrical inspection;
   9. Cabinet mechanical condition inspection;
   10. Heating, ventilation and air conditioning maintenance; 1002-04-71 115 of 851;
   11. Interface card operation inspection, testing measures and maintenance;
   12. Notification sign inspection, testing and maintenance;
   13. Structural integrity check of all poles and mast arms;
   14. Inspection and verification of computer communication systems; and
   15. Camera and video inspection, testing and maintenance.

C. A report shall accompany the scheduled maintenance service and shall be submitted to the department. The report shall include:
   1. Pass/Fail grading of all loops, static scales, off scale sensors and piezoelectric WIM sensors;
   2. A checklist of all components checked as listed above, as well as the location of the components and comments on their general state; and
   3. A checklist and commentary detailing whether each component (as listed above) met standards or required repairs/replacement.