I-40 WESTBOUND KNOXVILLE WEIGH STATION SPECIFICATIONS

WEIGH-IN-MOTION
WEIGH STATION (WIM)/STATIC SCALE TRUCK WEIGHT ENFORCEMENT SYSTEM

GENERAL OVERVIEW

1.1 LOCATION

A. I-40 E Mile Marker 372 (west bound Knox County Scales in Knox, Tennessee)

1.1 CONTRACTOR TYPE

A. Authorized (with proper ISO certification) Mettler Toledo dealer (service center)

PART 1 - GENERAL

1.1 SUMMARY

A. This section consists of manufacturing, furnishing, installing, burn-in, and testing a ramp sorting Weigh In Motion (WIM)/Static Scale truck weight enforcement system, hereinafter referred to as SYSTEM, and its accessories and appurtenances.

B. A SYSTEM to be manufactured, furnished, installed, burn-in, and tested at West-bound facility.

C. This Technical Special Provision is written for the requirements of one bound (direction).

1.2 REFERENCES

A. Applicable Documents

1. Contract Drawings


B. Applicable Standards

1. National Institute of Standards and Technology (NIST)
   a. Handbook 44
2. National Fire Protection Association (NFPA)
   a. 70 - National Electric Code (NEC)
3. National Electrical Manufacturers Association (NEMA)
4. American Welding Society (AWS)
   a. D1.5 - Bridge Welding Code
5. Society for Protective Coating (SSPC) Surface Preparation Specifications
   a. SP 1- Solvent Cleaning: Removal of oil, grease, soil, drawing and cutting compounds, and other soluble contaminants
   b. SP 6 - Commercial Blast Cleaning
   c. SP 10 - Near-White Blast Cleaning
   b. A36 - Structural Steel
   c. A53 - Black and Hot-Dipped, Zinc Coated, Welded and Seamless
   d. A123 - Galvanizing
7. Current State Standard Specifications

1.3 SYSTEM DESCRIPTION

A. The objective of the Department is to have a fully operative SYSTEM which shall accurately and automatically pre-select vehicles while in motion, for enforcement weighing and automatically direct the selected vehicles to the enforcement static scale, as set forth in the construction documents.

B. The SYSTEM is setup so that compliant trucks proceed in bypass lane with little delay. If a compliant vehicle proceeds to the static scale, the SYSTEM shall track and process with potential violators.
Where a definite material or product description is specified, it is not the intent to discriminate against an “or equal” product. It is the intent to set a definite standard. Open competition is expected and desired but, in all cases, complete supporting documentation must be submitted with the bid package on all substitutions and exceptions purposed. Samples and/or documentation shall be submitted for comparison when requested.

This work includes, but is not limited to the procurement and installation of the following static scale package components with all the described herein:

A. Certified engineering drawings for the scale
B. Certified engineering drawings for the scale foundation and scale outline
C. Hydrostatic load cells (related connections)
D. Weighing platforms, weigh bridges
E. NTEP certified weight indicators
F. Control unit
G. Vehicle counters
H. Recording elements
I. Uninterruptible power Supply(s) (UPS)
J. Computer(s) and Printer(s)
K. Traffic control subsystems (signals and poles)
L. Conduit, cable and electrical wiring
M. Concrete
N. Installation, start-up and calibration

Additionally, this specification provides for qualified supervisory personnel at the jobsite, complete truck weigh static scale system instrumentation, and the procurement and installation of audible alarms.

Furthermore, all incidental items necessary for the complete installation of the truck weigh static scale system will be provided for as indicated on plans, in this specification, or as directed by the Engineer.

All components of the System must be new and cannot be refurbished from the old system.

C. The SYSTEM shall automatically provide the following

1. Sort potential violators to the static scale for legal static weighing and/or enforcement
   a. Potential violators are trucks in violation of any of the following
      (1) Weight
         (a) Axle
         (b) Gross
(c) Tandem

(d) Bridge formula

(2) Exceeding 13’-10” height requirements

(3) Exceeding posted speed limit

(4) Off the WIM scale

(5) Over dimension

(a) Overall length (75’)

(b) King pin (rear bridge 46’)

(6) Random

(7) Imbalance

(a) Side to side

(b) Axle to axle within a tandem axle group

(8) Specialized vehicles based on classification

b. Compliant trucks not violating any of the preceding

2. SYSTEM shall automatically determine static scale violations.

   a. Axle

   b. Axle group

   c. Gross

   d. Inner bridge

      (1) Front

      (2) Rear

3. SYSTEM shall automatically release (all classifications) compliant vehicles from the static scales.

4. Sort up to 15,000 trucks in a 24-hour period
5. Divide commercial vehicles into potential violators or compliant vehicles

6. SYSTEM shall detect the following

   a. WIM weight
      (1) Wheel
      (2) Axle
      (3) Axle groups
      (4) Gross

   b. WIM axle spacing
      (1) Axle to axle
      (2) Inner bridge
         (a) Front
         (b) Rear
      (3) Overall

   c. WIM axle imbalance
      (1) Side to side
      (2) Axle to axle within tandem axle group

   d. Speed

   e. Off WIM scale

   f. Over-Height

   g. Static weight violation
      (1) Axle
      (2) Axle group
      (3) Gross
      (4) Inner bridge
(a) Front
(b) Rear

h. Violator in by pass lane

(1) The errant vehicle is identified once it enters the by-pass lane by a loop located at the start of the by-pass lane.

(2) Operator shall be alerted by an audible alarm when the errant vehicle enters the by-pass lane.

(3) The WIM data for the errant vehicle will be displayed on a monitor located in the weigh station when the vehicle taking the inappropriate lane approaches the building.

D. The SYSTEM shall allow the following operator control

1. Static scale accumulation of axle on over length vehicle (up to 19 axles)

2. Ability to manually override the SYSTEM and direct
   a. Individual trucks into the static scale
   b. Select trucks for reporting to the static scale by
      (1) Programmed weight
      (2) Programmed axle spacing
      (3) Random

3. Manual switch or control of the directional signals and traffic light

Combine the operations of the WIM and Static Scale and in conjunction with the WIM and static scale operation control the traffic in the station to either direct vehicles to the static scale lane from the WIM lane, or direct vehicles to exit via the bypass lane based on the previous determined vehicle weight compliance.

The lane control and traffic monitoring system will keep track of truck traffic in the station in vehicle queues from the time the truck enters the WIM lane to the exiting the station. Vehicle queues shall include:

a. Vehicles requiring direction to the static scale
b. Vehicles requiring direction to the station bypass lane

c. Vehicles in the queue for the static scale

The overhead direction signals shall be automatically controlled based on the WIM weight determination and based on the relevant queue the vehicle is in.

The lane control and traffic monitoring system shall utilize an array of loops placed throughout the station location to monitor the position of the vehicles in the facility and to control the lane directional signals when vehicles need to be directed to the relevant lanes (Direct potential violators to the static scale and non-violators to the bypass lane)

Determine backups in the static scale lanes and direct vehicles to bypass lane

Reset signals
 Track vehicle location within weigh station
 Track vehicles exiting the parking lot
 Static scale VMS Sign by informing vehicle positioned on the static scale:
 a. Stop
 b. Back up
 c. Pull Forward
 d. Exit
 e. Park
 f. Bring papers

E. Work for a complete SYSTEM includes the following package components and accessories constructed as shown on the layout and as described in this Technical Special Provision. The System shall be designed with each of the Weigh in Motion sub-system, a Static Scale Enforcement sub-system, and a Lane Control and Traffic Monitoring sub-system. Each component shall be capable of operating as a standalone component; however, a single vendor will be responsible for the integration of these sub-systems into a single operational system for use at the weigh station. All sub-systems shall be open in design and architecture. All communication from the WIM and static scale systems to the lane control and traffic monitoring system will be in an open record (non-vendor proprietary) format over a serial or network link. The system must be designed to allow remote access to the system to perform diagnostics, monitoring and setup of the system.

1. WIM Subsystem

 a. Kistler Sensors
 b. Kistler controller & Software
 c. Field unit
d. Sign signal controller  
e. Virtual graphics controller  
f. WIM software  
g. Printer  
h. Over-height detector  
i. Off Scale Sensor  
j. Communications to the station for display and printing of WIM records  

2. Static Scale Subsystem  
a. Static scales  
b. Load cells  
c. Instrument (digital display)  
d. Static scale computer  
e. Static scale software  
f. Printer  
g. Static scale pit modifications  
h. Approach slabs  
i. Surge voltage protection  

3. Overhead lane control signal (Red “X” and Green arrows)  
4. Tracking and lane monitoring Loops  
5. Static scale VMS sign  

F. WIM Subsystem  

1. The WIM shall determine whether the truck is a potential violator or compliant vehicle and direct the vehicle which direction to proceed by the overhead lane control signals.  

2. The WIM subsystem shall include a function that automatically resets loop queues.
3. WIM Subsystem shall determine
   a. Weight
      (1) Gross
      (2) Individual axle
      (3) Individual wheel
      (4) Tandems
      (5) Tri-Axle
      (6) Bridge
         (a) Front
         (b) Rear
   b. Axle imbalance percent difference side to side
   c. Axle imbalance percent difference axle to axle within tandem axle group
   d. Speed
   e. Axle spacing
   f. Off WIM scales
   g. Classification of vehicle
   h. Violation
   i. Over height

G. Static scale subsystem shall determine
   1. Static weights for
      a. Steer Axle
      b. Drive axle(s)
      c. Trailer Axle(s)
      d. Gross
e. Inner Bridge
   
(1) Front

(2) Rear

2. Determine location of steering axle on platform one to within 2" of the actual

3. Automatically determine if vehicles are in compliance to State's weight limits including bridge formula

   a. Front based on axle spacing and weight

   b. Rear based on axle spacing and weight

4. Automatically determine if all axles are properly position on static scale, if not alert operator by visual and audio alarms

5. Determine if vehicle is violator and if so, alert operator by visual and audio alarms, and if not a violator auto release all vehicle classifications

6. Automatically determine the number of axle(s) on each platform

7. Record and store static and WIM shift counts

8. Auto-calibrate the WIM sensors

H. Directional signals shall

   1. Direct potential violators to the static scale and non-violators to bypass lane

I. Traffic Light (New replacement)

   1. Tell vehicles when to exit static scale

J. Loops shall

   1. Determine backups in the static scale lanes and direct vehicles to bypass lane

   2. Reset signals

   3. Track vehicle location within weigh station
4. Track vehicles exiting parking lot

K. Warranty

1. SYSTEM manufacturer shall warrant the SYSTEM’s equipment in writing against defective material, lightning, and workmanship.

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

3. SYSTEM manufacturer’s warranty shall be for a period of five years, but not less than the manufacturer's standard warranty for the products from the date of final acceptance of the project and at which time shall transfer to the Department.

   a. SYSTEM manufacturer’s routine maintenance procedure must be performed by the manufactures authorized local service provider and shall be paid for under a separate contract. This separate SYSTEM support contract shall be between the end user and the SYSTEM manufacturer and at a minimum be for the length of the warranty.

   b. Each load cell shall be unconditionally warranted for the life of the scale or for a period of ten (10) years whichever is less. Each load cell shall be warranted to have 100% immunity to barometric pressure changes, RFI/EMI interference, lighting, water damage and to damage from welding on or around the weigh bridge at the time during the life of the scale.

1.4 PAYMENT

A. SYSTEM will be paid on percent completion based the following milestones:

   1. Payment upon safe and secure delivery of equipment at a storage location approved by the Engineer 65%

   2. Complete installation of the entire SYSTEM 20%

   3. Completion of calibration and burn-in 5%

   4. Completion of the training 10%
The price shall also include calibration and testing, acceptance performance testing and six (6) months warranty. Training for the state personnel, including follow-up sessions will be included in the price. This will include a minimum of two (2) sessions of training.

1.4 ADDITIONAL INFORMATION

A. Shipping is to be included in the final bid price

B. State and local taxes shall not be billed

1.5 Certification

The load cells shall be NTEP certified. Certification documents shall be provided to the state.

1.6 Description of Work

Within thirty (30) days of the issuance of the work order, the contractor shall submit four (4) sets of completed brochures and specifications for the scales, scale platform, instrumentation and related equipment proposed to be furnished and installed. This submittal shall consist of dimensioned drawings, complete wiring diagrams, sequence of operation and information on related items and shall be sufficiently detailed to allow the State to determine acceptability. Three (3) incidental scale units are required for each truck weigh static system: a steer axle platform, a drive axle platform and a trailer platform. The work shall include furnishing and installing all anchor bolts and sleeves required for the truck weigh static scale pits, including bolting plans or bolts shown on plans which meet scale and State requirements. All truck weigh scale systems and components shall be installed in accordance with the manufacturer’s recommendations.

Upon completion of work, a non-rigidly checked truck scale system shall be installed in each common scale pit, at each specified truck weigh-inspection station specified. Each truck weigh static scale system shall have a minimum of a four (4) hydrostatic load cells per weighbridge. There shall be no electronic junction boxes or connections in any scale pits. The system design shall provide for at least two (2) manholes for access to the scale pit. The hydrostatic load cells shall be Winslow Model 136-50 or equivalent.

Deliverance of all products, training, and materials, as well as, completion of work shall be completed by the Contractor within six (6) months of the issuance date of the purchase order. Any time needed beyond this deadline should be discussed and agreed upon by the State prior to the implementation of a new deadline.

PART 2 - PRODUCTS
2.1 ACCEPTABLE MANUFACTURERS

A. Mettler-Toledo, Inc.

2.2 GENERAL

A. All materials and equipment shall conform to the plans and this Technical Special Provision.

B. The SYSTEM manufacturer shall be responsible to the Contractor for meeting all requirements of the SYSTEM.

C. SYSTEM provider must be under current contract with State of Tennessee for calibration and service of weigh stations.

D. Static and WIM must be from same manufacturer (Mettler-Toledo)

2.3 WIM SUBSYSTEM

A. Provide a dynamic weighing and screening system designed to meet all requirements of this Technical Special Provision.

1. Determine possible violators from compliant vehicles

2. Direct possible violators to static scale

3. Identify vehicles that failed to proceed over the WIM sensors

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, axle spacing, or over height limits

3. Control overhead lane signals to direct all over weight, over height, and over dimensional trucks to the static scale for confirmation

4. Direct all compliant vehicles to continue on in bypass lane without stopping

5. Operate accurately at vehicle speeds between 5 to 85 miles per hour

6. Accept individual axle weights up to 50,000 pounds
7. Be capable of accommodating trucks with up to 19 axles
8. Measure speed
9. Indicate over speed violations
10. Indicate off-scale occurrences
11. Indicate king pin violators
12. Indicate imbalances
   a. Side to side
   b. Axle to axle within a tandem group
C. The dynamic weighing subsystem for one direction of traffic shall consist of the following items

<table>
<thead>
<tr>
<th>ITEM</th>
<th>QTY.</th>
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</thead>
<tbody>
<tr>
<td>1. Set of Kistler sensors</td>
<td>1</td>
</tr>
<tr>
<td>2. Off-scale sensor</td>
<td>1</td>
</tr>
<tr>
<td>3. Support software</td>
<td>1</td>
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<tr>
<td>4. Field unit (roadside enclosure)</td>
<td>1</td>
</tr>
<tr>
<td>5. Virtual graphics controller</td>
<td>1</td>
</tr>
<tr>
<td>6. Control unit (computer) and software</td>
<td>1</td>
</tr>
<tr>
<td>7. Printer</td>
<td>1</td>
</tr>
<tr>
<td>8. Minimum number of Inductive loops</td>
<td>Site Dependent</td>
</tr>
</tbody>
</table>
   a. SYSTEM manufacturer shall determine size, location, and number of turns in inductive loops for accurate tracking of vehicles.
D. Kistler WIM sensors
1. Locate in the deceleration lane of weigh station
2. Sense the weight of each axle of the truck as it moves in motion over the sensors
3. Determine vehicle speed and axle spacing without the need of other in road devices

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

5. Provide two sensors per wheel path
   a. Right wheel path shall consist of one 2M
   b. Left wheel path shall consist of one 2M

6. 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
   a. Axle weights ± 15% (95% of trucks)
   b. Tandem weights ± 10% (95% of trucks)
   c. Gross weights ± 6% (95% of trucks)
   d. Axle spacing ± 6 inches or 5% (68% of axles), whichever is greater

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

F. Field Unit
   1. Shall communicate with the WIM sensors, inductive loops, over height detectors, off scale sensors and control unit
   2. Place at least 37 feet from the truck lane, but no more than 250 feet from the sensors
   3. Construct in a standard outdoor traffic control cabinet
   4. Made capable of supporting an interface for AVI equipment
   5. Receive cables from the sensors, loops, off-scale sensors and transmit data to the WIM computer through fiber optic cable or wireless
6. Install on a suitable concrete pad large enough to provide standing area for maintenance staff.

7. Include a module for terminating all in-road items (sensors, loops, off scale detectors, over height) and provide necessary communication to computer
   a. The cabinet shall include power supply, convenience outlet with light, and lightning/electric surge protection.

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

9. Shall provide ground buss for cables and lightning equipment

G. Virtual Graphics Controller
   1. Consist of a 22" flat panel monitor with speakers and shall interface with the static scale computer
   2. Include a graphical representation of the weigh station layout with symbols to indicate the function of vehicle tracking devices and the status of all signals
   3. Allow for a true manual control of all signals
   4. Shall have symbols and audibly alert operator of high water condition in each pit

H. Computer
   1. The WIM computer shall be a Pentium microprocessor based computer with Windows XP operating system
   2. Acceptable Manufacture
      a. Dell
      b. Industrial computer source or approved by Engineer
   3. The minimum acceptable configuration shall include
      a. Microprocessor rated at a minimum of 2.4 GHZ
      b. Minimum of 512 MB RAM
c. Minimum of 80 GB hard drive
d. Minimum of 48X CD drive
e. 88.9 millimeters 1.44 MB high-density diskette drive
f. Minimum of three PCI and one AGP slots
g. Parallel interface for connection to the printer
h. 21-inch SVGA 26dp monitor with non-glare screen
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. Internal modem card compatible with V.32 standards (56k full duplex) or greater
r. System password protected lock for user access restriction
   (1) All access ports, cables and accessories to provide a working system
s. WIM system computer shall contain diagnostic software to analyze the condition of the weighing and sorting process

I. WIM Software

1. SYSTEM manufacturer is to provide all software necessary for complete and efficient operation of the weigh-in-motion/static weight enforcement systems.

2. The software must be supplied with the report formats
3. Report formats must be supplied as an integral part of the SYSTEM.

4. Allows the user VPN access to perform diagnostics.

5. The WIM software must provide the following features:
   a. Perform Multi-lane WIM operation.
   b. Weigh all vehicles as they travel down deceleration lane.
   c. Classify all vehicles as they travel on interstate.
   d. Perform weight compliance analysis on vehicles in accordance with State regulations.
   e. Insert sequence numbers for vehicle records and tracking purposes.
   f. Perform data collection, data storage, file management and report generation functions for collected vehicle information.
   g. Direct trucks to the weigh station for enforcement weighing if truck exceeds any of the following parameters:
      1. Gross
      2. Axle
      3. Tandem
      4. Inner bridge weights
         (a) Front
         (b) Rear
      5. Height
      6. Speed
      7. Over length (first to last axle)
      8. Over bridge rear length (king pin)
      9. Random
(10) Imbalance
   (a) Side to side
   (b) Axle to axle within tandem.

6. Generate data for the operator display terminals

7. Direct non-violators to continue in bypass lane as determined by design

8. Detect and identify violators that have entered bypass lane

9. All vehicle information, including violation information, will be determined in real time and shall be displayed on the scale house display as follows
   a. Violator’s WIM data shall be displayed on virtual graphics display when vehicle is on static scale
   b. Compliant vehicles WIM data will be displayed on virtual graphics display as vehicle proceeds down bypass lane

10. The system will function under manual or automatic control
    a. Under automatic control, the compliance system will automatically direct a suspected violator to the static scale and compliant vehicle to continue in bypass lane
    b. In manual mode, directional signals and traffic light can only be operated or changed by the scale house operator

11. Operate under Windows XP Operating System

12. The Operating System, together with application programs, must support interrupts, context switching, foreground and background programs execution, color graphic and window-based applications.

13. The system shall consist of a computer, color monitor, keyboard, mouse, and interface electronics.

14. The system will display errors associated with vehicles missing the in-sensors. Where appropriate, these error
messages will be attached to the display of the vehicle record on the scale house terminal

15. The system's calibration shall be continuously updated based on actual static 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

16. Vehicle records must be displayed on the console monitor in a format similar to the following

   a. See Exhibit 1 at the end of this Technical Special Provision

17. Store WIM shift counts in real time

18. Shall sort all over length (first to last axle) and over height violators to static scale

J. Print requirements includes

1. Printout the WIM scale axle spacing

2. Printout the WIM scale weights
   
   a. Individual wheel
   
   b. Axle
   
   c. Tandem
   
   d. Gross

3. Printout shall indicate pounds and/or kilograms

4. Data printed shall match the ticket format presently in use or as selected by the user

   a. Automatic Print Mode
      
      (1) Automatically print violators that bypass weigh station
   
   b. Manual Print Mode
K. Network Printer

1. The printer shall be a commercially available laser printer

2. Acceptable manufacturers
   a. Dell
   b. HP
   c. Approved equal

L. Over Height Detector

1. Provide one over height detector with a photo-eye system

2. Input
   a. 120 VAC ± 20 percent
   b. 50/60 Hz

3. Output
   a. Relay closure
   b. Rate contact 10 amps, 117 VAC
   c. Adjustable time from 5 to 30 seconds
   d. Electronics
      (1) Solid state
      (2) Printed circuit boards

4. Effect of Ambient Light
   a. Eliminated by use of infrared
   b. Pulsed light emitting diodes and a series of 7 optically flat light traps in eye of the receiver

5. Temperature Range: 40° to 135° Fahrenheit

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

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

7. Housings

a. Made of cast and sheet aluminum

b. Minimum 2/16-inch thick

c. The pole cap is the mounting bracket and sighting base

8. One piece, seamless, 6 inches minimum diameter round aluminum tube

a. Hand hole is centered 1.5 inches above the bottom of the shaft

b. Secure by stainless steel cover screws

c. One-piece base flange cast aluminum socket with 8-17/64 inches bolt center

d. No surface preparation or painting is required

M. Off Scale Sensor

1. Provide sensor to detect off scale

2. Make sensor field replaceable

3. Mount sensor flush to the road surface

4. Couple sensor to amplifiers in the road side cabinet

2.4 STATIC SCALE SUBSYSTEM

A. Provide multi-platform static scale designed to meet all requirements of this Technical Special Provision

B. Require HS-20 loading structural requirements as described in the latest edition (at time of letting) of the Standard Specifications for Highway Bridges as adopted by the American Association of State Highway and Transportation Officials
C. Multi-platform static scale shall be designed for highway use in a law enforcement application

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

1. The WIM record that is established by the WIM subsystem is transmitted to the static scale display on the Static scale monitor when vehicle is positioned on Static scale.

   a. This record shall include

      (1) Speed
      (2) Axle spacing
      (3) Inner bridge
      (a) Front
      (b) Rear
      (4) Vehicle length
      (a) Overall
      (b) Inner bridge (Front and Rear)
      (5) Axles weights
      (6) Individual wheels weights
      (7) Tandem axle weights
      (8) Gross weight
      (9) King pin length
      (10) Imbalance
      (a) Side to side
      (b) Axle to axle within a tandem

E. Static scale shall have the following features

1. Scale gross capacity shall be 385,000 pounds gross (105,000 pounds for both platforms 1 and 2, 175,000 pounds for platform 3)
2. Each scale consists of 3 independent weigh bridge structures
   a. First weigh bridge is 12 feet long by 12 feet (or existing pit) wide
   b. Second weigh bridge is 24 feet long by 12 feet (or existing pit) wide
   c. Third weigh bridge is 44 feet long by 12 feet (or existing pit) wide

3. Minimum of 10 inch thick concrete deck with double mat reinforced steel

4. Must be NTEP approved

5. Pit construction per approved shop drawings

6. 70,000 pounds tandem axle capacity

7. Handle trucks traveling over the scale at up to 32 miles per hour

8. Provide a fatigue life of a minimum of 20 years

9. All welding during manufacturing shall comply with AWS D1.5 certification

10. Fully electronic load cells shall be used in static scale and shall not incorporate any mechanical weighing elements, check rods, or check stays

11. The scale weigh bridge assemblies shall incorporate no bolt connections or mechanical links between the load cells and weigh bridge assemblies

12. The independent scale weigh bridge platforms shall be coupled together with fixed distance/zero moment transfer links

13. Surface Preparation and Finish
   a. Shot blast the weigh bridges to a minimum SSPC-B-SP6 specification prior to painting
   b. Provide a two part epoxy finish of Carboline 15L0, or equal to all exterior surfaces of the scale
(1) Provide a total Dry Film Thickness of 6-8 mils

14. Deck channel shall be hot dipped galvanized
   a. ASTM A123

15. Corrugated deck plate for concrete deck

16. Manholes to access scale pits
   a. Provide manhole with rings and covers
   b. Provide three manholes per scale

17. The weigh bridge main girders shall be a minimum of W24 x 68 pounds

18. Each of the weigh bridges is supported by the appropriate number of load cells based on their span
   a. Minimum fourteen 45 metric ton capacity load cells used per scale

19. Manufacturer or manufacturers authorized representative shall supervise the installation of the static scales

20. The static scales shall be a standard production type that is in use in the United States for weight enforcement.

F. Load Cells

1. Mount 14 load cells in such a manner as to be easily replaced

2. Design mountings to provide for thermal expansion and contraction of weigh bridge steel and for shock loading

3. Meet the latest adopted edition of the NIST Handbook 44 at the time of letting

4. Must be NTEP approved

5. Minimum capacity of 45 Metric tons

6. Construct of 304 stainless steel
7. Seal hermetically with a minimum NEMA 6P submersible rating

8. Require a certified technician maximum of 3 minutes to replace one load cell once in position at the load cell with a jack (and blocks if required)

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

10. Temperature Range: 14 degrees Fahrenheit to 104 degrees Fahrenheit

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

12. Provide 150 percent safe overload capability

13. Provide 250 percent ultimate overload capability

14. Shall not require junction box to connect load cells to static scale indicator

G. Static scale instrument (digital display)

1. Static scale indicator

2. Microprocessor based item(s) for
   a. Scale read out
   b. Control and data handling functions

3. The scale instrumentation shall be compact and approved by the Engineer.

4. Manufacturer shall provide proof that the instruments have been in use successfully for at least two years

5. Provide microprocessor-based digital instrument with Ethernet weight output to the static scale PC and the monitor for totalizing and printer controls

6. This connection shall provide diagnostics of static scale load cells (load cell raw counts) to the static scale PC or a remote PC

7. Provide with software diagnostics to facilitate fault finding

9. The static scale instruments shall include
   
a. Must be able to power up to 4 scale platforms

b. Static Scale Instruments must be of the same manufacturer as the Static scale weigh bridge and WIM weigh bridge

c. All instrument setup functions and calibration sequences are programmable through the keyboard/display
   
   (1) No at-scale adjustments required for these functions

d. Minimum of 15 updates per second

e. One display showing individual axle weights and the summation of the individual weights

f. Shall be suitable for desktop or set-in mounting, level or at angle

g. Display the raw counts of each individual load cell without disconnecting any of the load cells from the system

h. Perform all static scale instrument set-up functions via static scale internet explorer web pages
   
   (1) Download to instrument via Ethernet connection

i. Selectable increments size from 20 to 50,000.

j. Display up to 1 part in 10,000

k. Internal resolution 1 part in 1,000,000

I. Setup functions stored in nonvolatile RAM memory

m. Adjustable digital filtering

n. Adjustable automatic zero maintenance

o. Serial ASCII output port configuration for connection to computer. Baud rate to be selectable from 300 to 9600
p. Motion detection should be selectable from ±0.5, ±1.0, ±2.0, ±3.0 increments

q. Display verification test

r. Display height at .5 inches with wide angle view

s. Static scale instruments shall meet the current specifications of the NIST Handbook 44, current adopted edition

t. The instrument shall be UL/CSA listed

u. Provide one button printing

H. Static scale display shall

1. Display on the screen the WIM data as depicted in exhibit 1 when vehicle is on static scale.

2. Display on the screen the static weights
   a. Individual platform weights
   b. Sum weight
   c. Inner bridge weights
      (1) Front
      (2) Rear
   d. WIM record

4. Display on the screen the shift counts, time and date

5. Display or print shift count report for both Static, WIM scales, and average delay for statically weighted vehicle during shift

6. Display or print real time WIM accuracy

7. Write the established data to a database

8. The database shall include
   a. WIM weight data
      (1) Steer axle
(2) Drive axles
(3) Trailer axles
(4) Gross

b. Static weight data
(1) Platform one weight
(2) Platform two weight
(3) Platform three weight
(4) Sum weight

9. The collected data is used to perform
   a. Continuously and automatically calibrate the WIM scales based on operator selected sample size
   b. Prove the WIM scale accuracy
   c. Determine and record delay time for each statically weighted vehicle

10. The database can only be accessed using a password with the highest level of security

11. Database for the truck weighment records is to be stored in Windows environment

12. Data retrieval may either be from the site directly or accessed remotely

I. Static Scale Software

1. SYSTEM manufacturer shall provide all software necessary for complete and efficient operation of the weigh-in-motion/static weight enforcement scale systems

2. The software must be supplied with the report formats

3. Report formats must be supplied as an integral part of the SYSTEM

4. Allows user VPN access to perform remote diagnostics as described below for troubleshooting from a remote location
a. Static scale instrument setup

b. View individual live raw counts for static scale load cells

5. SYSTEM manufacturer shall provide commercially available VNC software

6. The Static Scale software must provide the following features

   a. Interface with the static scale indicator and the WIM controller

   b. Display all static scale weights and the WIM data for the vehicle that is positioned on the static scale

   c. Display the inner bridge values

      (1) Front

      (2) Rear

   d. Provide adjustable thresholds to each static scale platform weight, gross weight, and inner bridge weights

   e. Automatically determine the bridge threshold based on axle spacing and platform weights refer to State regulations

   f. Automatically check weights to thresholds and release vehicle or alert operator of violation

      (1) Audio and visual alerts

   g. The static scale computer shall be the main operator interface for both the static and WIM system.

   h. Determine location of steering axle on platform one to within 2” of actual

      (1) Shall use the WIM data to calculate backwards and determine if all axles are properly positioned on scale.

      (2) Shall use WIM data to determine axle and/or inner bridge violation per State’s weight limits and auto release if compliant or alert (audio and
visual) if violator. System shall auto release all compliant classifications of vehicles.

i. 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

(3) Shall calibrate the WIM scale based on vehicle classification

(4) Shall have the capability to determine and update 10 different dynamic calibration factors based on speed and 13 based on classifications

j. Provide local and remote diagnostics for static scale indicators and load cells

k. Display static and WIM data in a format similar to the following

(1) See Exhibit 2 at the end of this Technical Special Provision

(2) Provide within the display the following features

(a) Selectable auto release

(b) Accumulate axles

(c) Display shift counts

(d) Violations shall be displayed in red

(e) Zero scale

(f) Reset scale

I. Print requirements include but not limited to

(1) Site identification

(2) Gross, all platforms and bridge weights
(3) Time and date

(4) WIM axle spacing

J. Static Scale Pit Modification

1. Pit per shop drawing

   a. Pit coping angle on each end of scale shall be 6" x 4" x 5/8" hot dipped galvanized

   (1) ASTM A123

K. Approach Slabs

1. 10’ approaches on both ends of pit shall be per handbook 44 and be part of the static scale pit drawing. The expansion joint between the pit wall and the 10’ approaches shall be 1-1/2” expansion joint.

L. Surge Voltage Protection

1. AC Line Voltage Protector: Used “in-line” with external 115 VAC power line to protect equipment from incoming surges

   a. Clamping Level: 200 Volts

   b. UL 1449 Surge Protection Rating: 330 Volts

   c. Protection Modes: Line to Neutral, Line to Ground, Neutral to Ground

   d. Line Voltage: 120 VAC, 50/60 Hz

   e. Maximum Current Rating: 15 Amperes (1800 Watts)

   f. EMI/RFI Noise Filtration: 50 db. (99.7%) from 100 kHz to 1 MHz

   g. Response Time: <1 Nanosecond

   h. Energy Dissipation: 30,000 Amperes

2.5 OVERHEAD LANE CONTROL SIGNAL SUBSYSTEM (RED “X” and GREEN Arrow)

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 18 inches by 18 inches lens box

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

E. At full intensity, the signal will be highly visible anywhere within a 20-degree cone centered about the optic axis.

F. The signal consists, but not limited to
   1. Weatherproof housing and door
   2. LED Signals

G. SYSTEM controls the signals to provide the truck traffic with a clear and concise signal as to whether to proceed back to the interstate or to the static scales.

H. Either the WIM controller or the operator manual override can change Bypass lane 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.

2.6 LOOPS

A. Located by SYSTEM manufacturer

B. Shall be installed per approved shop drawing