

# ENGINEERING SPECIFICATIONS

## Steel Deck Motor Truck Scale

### 1 GENERAL PROVISIONS

- 1.1 Furnish and install one steel deck motor truck scale and associated electronic controls.
- 1.2 The scale shall have a clear and unobstructed weighing surface of not less than 70 feet long and 11 feet wide.
- 1.3 The scale shall be fully electronic in design and shall not incorporate any mechanical weighing elements, check rods, or check stays.
- 1.4 The scale shall be designed to perform as a single weighing platform and shall be of flat-top design. Side rails are not acceptable.
- 1.5 The scale shall have a gross weighing capacity of 100 tons.
- 1.6 The scale shall be designed to accept vehicles that generate up to 100,000 pounds per tandem axle and shall have a Concentrated Load Capacity (CLC) of 100,000 pounds.
- 1.7 The scale shall be designed to accept an average daily traffic volume of greater than 250 vehicles per day for 20 years at the rated CLC.
- 1.8 The scale shall be calibrated to a minimum of 120,000 pounds by 20-pound increments.
- 1.9 The junction boxes, load cells, and load cell mounting hardware shall be constructed of stainless steel. The cables shall be stainless steel sheathed.
- 1.10 The scale shall meet the requirements set forth by the current edition of the National Institute of Standards and Technology Handbook 44 (NIST H-44). The scale manufacturer shall provide a Certificate of Conformance (NTEP Certification) to these standards upon request.
- 1.11 The design and manufacture of the scale weighbridge, load cells, and digital instrument shall be of one manufacturer to maximize compatibility and availability of components. Also, the manufacturer shall have a quality system that has been registered to the standards of ISO 9001.
- 1.12 The manufacturer shall provide with the bid proposal a listing of major spare parts and their prices, including (but not limited to) replacement load cells, digital instrument, printer, junction box circuit boards, and associated parts.
- 1.13 The scale shall be a Mettler-Toledo, Inc. DigiTOL® Model 7563 or equal.

### 2 SCALE FOUNDATION REQUIREMENTS

- 2.1 The foundation shall meet all local requirements and the minimum specifications as stated in this section.
- 2.2 The minimum soil bearing required shall be 2,500 pounds per square foot (psf) for a variable footer, 1,500 psf for a beam slab, and 2,500 psf for a pit foundation.

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The buyer shall be responsible for determining whether or not the soil conditions are adequate.

- 2.3 The foundation shall extend the full length and width of the scale platform.
- 2.4 The foundation shall provide a minimum of 3 inches of clearance to the weighbridge.
- 2.5 The foundation must be higher than the surrounding grade to promote drainage away from the scale.
- 2.6 The foundation shall be constructed to provide positive drainage away from its center.
- 2.7 The foundation shall be poured and constructed of concrete with a minimum strength of 3,000 psi at a 28-day cure with 5 to 7% air entrainment.
- 2.8 The foundation shall be reinforced in all load-bearing areas.
- 2.9 The foundation shall be designed to include an approach on each end of the scale in accordance with local regulations and the guidelines of NIST H-44.

### **3 WEIGHBRIDGE SPECIFICATIONS**

- 3.1 The scale weighbridge shall be capable of weighing trucks that have dual-tandem axle weights (4 feet minimum between dual axles and at least 10 feet from next axle) of up to 100,000 pounds.
- 3.2 All welding shall be completed in accordance with the American Welding Society (AWS) D1.1 Structural Welding Code.
- 3.3 All welding shall be performed by welding operators who have been certified to the AWS D1.1 Structural Welding Code.
- 3.4 All welding shall be performed in position 1F to ensure maximum weld integrity.
- 3.5 Longitudinal weighbridge members shall be welded continuously, using a high-penetration, submerged arc welding process. The use of intermittent welds on longitudinal members is unacceptable.
- 3.6 The weighbridge shall be designed to allow access to the junction boxes, load cell cables, base plates, and all foundation anchor bolts from the top of the scale platform.
- 3.7 All required junction boxes, load cell cables, and interconnecting cables shall be installed and pre-wired prior to shipment by the manufacturer.
- 3.8 The weighbridge and load cell mounting assemblies shall be designed to allow installation or replacement of a load cell with only one additional inch of clearance or less required between the top of the foundation and the bottom of the weighbridge on pitless installations.

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- 3.9 There shall be no bolted connections between the load cell and weighbridge assemblies.
- 3.10 There shall be no field welding or field fabrication required for the installation of the scale.

#### **4 SURFACE PREPARATION AND FINISH**

- 4.1 The weighbridge shall be shot blasted to a minimum SSPC-SP6 specification prior to painting.
- 4.2 All enclosed chambers created by joining two steel members must be hermetically sealed to eliminate internal corrosion.
- 4.3 All exterior surfaces of the scale shall have a two-part epoxy finish of Carboline 15LO or equal, providing a total Dry Film Thickness of 5-7 mils.
- 4.4 The finish shall be force cured in order to reduce risk of contamination and ensure durability of the surface.

#### **5 LOAD CELL SPECIFICATIONS**

- 5.1 Each load cell shall have a minimum capacity of 45 metric tons (100,000 pounds).
- 5.2 Load cells shall be certified by NTEP and meet the specifications as set forth by NIST H-44 for Class III devices. The manufacturer upon request shall provide a Certificate of Conformance to these standards.
- 5.3 Load cells shall be digital with an integral microprocessor and analog-to-digital conversion function located within the load cell housing.
- 5.4 Load cells shall output only converted digital information to the scale instrument. Analog output of signals from the load cell is not acceptable.
- 5.5 The load cell assembly shall be constructed so as to perform as a rocker pin and shall have no positive fixed mechanical connectors, such as bolts or links, that are required in mounting the load cell to the weighbridge or foundation base plates.
- 5.6 The load cell shall not require check rods or chain links for stabilization.
- 5.7 The load cell shall be of stainless steel construction and hermetically sealed with a minimum NEMA 6P / IP68 (submersible) rating.
- 5.8 The load cell shall contain integral Transient Voltage Suppressors (TVS) for all input and communication lines. Each TVS shall contain self-resetting thermal breakers to protect the load cell components from voltage and current surges.
- 5.9 The load cell shall come equipped with a neoprene rubber boot to keep debris from contaminating the lower bearing surface.

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- 5.10 The load cell shall have a positive-lock quick connector integral to its housing for connecting and disconnecting the load cell interface cable at the load cell. The connector shall be of glass-to-metal, pin-type construction to maintain a hermetic seal.
- 5.11 The load cell shall have the following specifications:
  - 5.11.1  $V_{\min}$ : 5.0 pounds maximum
  - 5.11.2 Hysteresis:  $\pm 0.025\%$  of full scale
  - 5.11.3 Non-Linearity:  $\pm 0.015\%$  of full scale
  - 5.11.4 Creep (30 minutes):  $\pm 0.017\%$  of applied load
  - 5.11.5 Temperature range:  $-10^{\circ}\text{C} + 40^{\circ}\text{C}$
- 5.12 The load cell interface cable shall be stainless steel sheathed for environmental and rodent protection.
- 5.13 The load cell shall have a minimum 5-year warranty against defects in materials and workmanship. The warranty shall cover all costs associated with replacement parts, travel, mileage, and on-site labor.
- 5.14 Load cells shall be Mettler-Toledo, Inc. MTX load cell or equal.

### 6 SCALE INSTRUMENT SPECIFICATIONS

- 6.1 The scale instrument shall be designed for use in vehicle scale weighing applications. It shall be capable of performing basic weighing operations including but not limited to:
  - 6.1.1 Inbound/outbound two-weighment operations.
  - 6.1.2 Single weighment operations where vehicle tare weights are known either through preset tares which are stored in the scale instrument memory or manually entered tare values which are entered through the keyboard.
  - 6.1.3 Transient vehicle weighing operations where the transaction is to be completed but the record will not be added to memory accumulators or totals.
- 6.2 The instrument shall as a minimum utilize a 1/4-VGA monochrome graphical display to present the transactional information along with weight to the operator. During normal weighing operations the display will incorporate the following elements:
  - 6.2.1 Weight
  - 6.2.2 Time and Date
  - 6.2.3 Center of Zero
  - 6.2.4 Mode of Operation (Gross or Net)
  - 6.2.5 Weighing Unit (lb or kg)
  - 6.2.6 Selected Scale
- 6.3 The scale instrument shall have the following keyboard operations:

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- 6.3.1 0-9 Numeric Keys
  - 6.3.2 . (Decimal Point)
  - 6.3.3 Clear
  - 6.3.4 Tare
  - 6.3.5 Zero
  - 6.3.6 Print
  - 6.3.7 Select Scale
  - 6.3.8 Four Application-Specific Assignable Soft Keys
  - 6.3.9 Five Scale-Function Soft Keys
  - 6.3.10 Screen Navigation Keys for Up, Down, Left, and Right Commands
  - 6.3.11 Enter
- 6.4 The operator shall be capable of entering alphanumeric characters through the terminal without the need for an external keyboard. However, the scale instrument shall, as an accessory, be capable of being interfaced to a standard PS2-style computer keyboard without modifications to the scale instrument hardware or software for the purpose of entering alphanumeric information, as well as emulation of application and scale instrument soft-key functionality, if required.
- 6.5 The scale instrument shall have the following operational parameters:
- 6.5.1 Capable of communicating with up to 5 pairs of digital load cell assemblies with the ability to expand to 12 pairs, if required.
  - 6.5.2 Ability to digitally average the weight information sent from the load cells and updating the instrument's weight display 15 times per second.
  - 6.5.3 The scale instrument shall be capable of being programmed for sign-corrected net weighing so that all net weights are positive.
  - 6.5.4 The scale instrument shall have a transaction counter to automatically assign sequence numbers to transactions.
  - 6.5.5 The scale instrument shall have automatic zero capture on power-up selectable to capture zero at 2% or 10% of the full-scale capacity.
  - 6.5.6 The scale instrument shall have adjustable digital filtering.
  - 6.5.7 The scale instrument shall have adjustable automatic zero maintenance selectable for 0.5, 1, or 3 displayed increments.
  - 6.5.8 The scale instrument shall have push-button zero selectable for 2% or 20% of full-scale capacity.
  - 6.5.9 Tare, Zero, and Print functions shall be inhibited while the weight display is changing. Motion detection shall be selectable for 0.5, 1.0, 2.0, or 3.0 increments.
  - 6.5.10 The scale instrument shall only receive digital information from the load cell assemblies. There shall be no analog-to-digital conversion function in the scale instrument.
- 6.6 The scale instrument shall have the following service characteristics:

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- 6.6.1 Set-up and navigation through all phases of set-up, calibration, and testing shall be intuitive through a decision-tree format.
  - 6.6.2 Capable of performing calibration, span, zero, and shift adjustment through software calculations that require no in-scale adjustment.
  - 6.6.3 Entry of information shall be accomplished through the instrument's keyboard only.
  - 6.6.4 Capable of assigning each load cell with its own unique identification number and displaying the weight reading of each individual load cell through the instrument without disconnecting any of the load cells from the system.
  - 6.6.5 Ability to display digital raw counts for the attached digital load cells with their values being updated on a real-time basis. The scale instrument shall also be capable of displaying the raw count values of multiple digital load cells on the graphical display.
  - 6.6.6 Ability to identify and to immediately display an error condition associated with an individual load cell in the event of a failure or out-of-tolerance condition. The displayed message shall identify the failed load cell and the cause of the failure.
- 6.7 The scale instrument shall be NTEP certified and meet or exceed the specifications set forth by NIST H-44 for Class II, III, and III-L Devices. The manufacturer upon request shall provide a Certificate of Conformance to these standards.
  - 6.8 The scale instrument shall be housed in a metal enclosure that is suitable for desk or wall mounting.
  - 6.9 The scale instrument shall have flexible storage capability with a minimum of 4.5 Mbytes of flexible memory in which to store pertinent vehicle, transactional, and commodity information. The scale instrument shall be capable of storing the weight information automatically or enabling the operator to assign a memory location to the weight manually.
  - 6.10 The scale instrument shall have subtotal and total weight accumulators.
  - 6.11 The operator shall be able to enter up to 12 digits of alphanumeric ID through the instrument keyboard.
  - 6.12 The scale instrument shall have gross/net weight switching.
  - 6.13 The scale instrument shall be capable of being programmed and calibrated in pounds or kilograms.
  - 6.14 The scale instrument shall have the following data communications capabilities:
    - 6.14.1 One com port RS232 or 20 mA current loop
    - 6.14.2 One com port RS232, RS422, or RS485
    - 6.14.3 One TCP/IP 10 Base-T Ethernet
  - 6.15 The scale instrument shall output the following information:

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- 6.15.1 Gross, Tare, and Net Weight
- 6.15.2 ID
- 6.15.3 Transaction Counter
- 6.15.4 Time and Date
- 6.15.5 Variable Application-Specific Information
- 6.15.6 Standard Reports Generated by the Scale Instrument
- 6.16 The scale instrument shall be UL/cUL listed.
- 6.17 The scale instrument shall be a Mettler-Toledo, Inc. Model IND310 or equal.
- 7 **PRINTER SPECIFICATIONS – DOCUMENT PRINTER**
  - 7.1 The printer shall be housed in a suitable enclosure for desktop mounting.
  - 7.2 The printer shall interface with the scale instrument using a singular cable with quick connectors on each end and shall not require any modifications to the instrument or printer.
  - 7.3 The printer shall have a serial interface capable of communicating with the instrument using an RS232C interface with selectable transmission rates from 300 to 9,600 baud. Transmission must be on demand.
  - 7.4 The printer shall have a nine-pin dot matrix print head with a minimum rated life of 200 million characters.
  - 7.5 The printer shall be capable of printing at a minimum speed of 300 characters per second.
  - 7.6 The printer shall have an easily replaceable ink ribbon cartridge that shall be rated for a minimum life of 3 million characters.
  - 7.7 The printer shall be capable of accepting single or up to six-part forms.
  - 7.8 An adjustable paper guide shall be provided.
  - 7.9 The printer shall provide both friction-feed and tractor-feed paper advance.
  - 7.10 The printer shall have a minimum buffer memory capable of storing at least 28,000 characters.
  - 7.11 The printer shall be capable of printing all information sent from the scale instrument, including:
    - 7.11.1 Gross, Tare, and Net Weights
    - 7.11.2 Time and Date
    - 7.11.3 Transaction Counter Number
    - 7.11.4 12-Digit Alphanumeric ID
    - 7.11.5 Standard Reports Generated by the Scale Instrument
  - 7.12 All materials, components, and electrical design shall comply with UL and CSA standards and requirements.
  - 7.13 The printer shall be an Okidata Microline 320 Turbo or equal.

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### **8 PRINTER SPECIFICATIONS – TICKET PRINTER**

- 8.1 The printer shall be housed in a suitable enclosure for desktop mounting.
- 8.2 The printer shall interface with the scale instrument using a singular cable with quick connectors on each end and shall not require any modifications to the instrument or printer.
- 8.3 The printer shall have a serial interface capable of communicating with the instrument using an RS232C interface with selectable transmission rates from 300 to 9,600 baud. Transmission must be on demand.
- 8.4 The printer shall have a nine-pin dot matrix print head with a minimum rated life of 70 million characters.
- 8.5 The printer shall be capable of printing 3.1 lines per second.
- 8.6 The printer shall have an easily replaceable ink ribbon cartridge that shall be rated for a minimum life of 1.2 million characters.
- 8.7 The printer shall be capable of accepting forms up to 0.25 mm thick, original plus 2.
- 8.8 The printer shall provide friction-feed paper advance.
- 8.9 The printer shall have a minimum buffer memory capable of storing at least 2000 bytes.
- 8.10 The printer shall be capable of printing all information sent from the scale instrument, including:
  - 8.10.1 Gross, Tare, and Net Weights
  - 8.10.2 Time and Date
  - 8.10.3 Transaction Counter Number
  - 8.10.4 12-Digit Alphanumeric ID
- 8.11 All materials, components, and electrical design shall comply with UL and CSA standards and requirements.
- 8.12 The printer shall be a Mettler-Toledo, Inc. APR 310 or equal.

### **9 JUNCTION BOXES AND CABLES**

- 9.1 All junction boxes shall be NEMA 4X rated and constructed of stainless steel.
- 9.2 Junction boxes shall be accessible for inspection and maintenance from the top of the scale platform.
- 9.3 Load cell cables and scale instrument cables shall be stainless steel sheathed for environmental and rodent protection.

### **10 LIGHTNING PROTECTION SPECIFICATIONS**

- 10.1 A comprehensive lightning protection system shall be provided with the scale.

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- 10.2 The system shall not require complicated wiring or devices to provide this protection.
- 10.3 Major scale components including load cells and scale instrument shall be included in the lightning protection system.
- 10.4 Grounding of all scale components including load cells and scale instrument shall be to one common point. Systems with multiple ground points are not acceptable.
- 10.5 An AC line surge protector shall conveniently plug into a common electrical outlet and have receptacles for the scale instrument.
- 10.6 Each AC line surge protector required shall have one isolated grounding, hospital-grade duplex receptacles, and an internal 15-amp circuit breaker.
- 10.7 Verification of the lightning protection system performance shall be available in writing from a third-party verification laboratory upon request.
- 10.8 The lightning protection system shall be a Mettler-Toledo, Inc. StrikeShield Lightning Protection System or equal.

#### **11 WARRANTY REQUIREMENTS**

- 11.1 The scale manufacturer shall warrant the scale assembly including all load cells, weighbridge structure, scale instrument, junction boxes, and associated cables from failures due to a defect in manufacturing, workmanship, lightning, or surge voltages.
- 11.2 The guarantee will warrant the product for a period of 5 years from date of installation or 62 months from date of shipment to the Buyer, whichever occurs first. Bidder shall promptly correct any such defect appearing within the warranty period.
- 11.3 The guarantee shall support 100% coverage of repair parts, labor, travel time, and mileage from the closest service location, or replacement of the product under warranty.
- 11.4 A service program of regular maintenance with the manufacturer and/or its local authorized representative is required. The level of service, to be determined at the time of sale, will depend upon the site and usage conditions, but should comply with the guidelines set forth by the manufacturer, local regulations, and NIST Handbook 44.