

# ENGINEERING SPECIFICATIONS

## Concrete Deck Truck Scale

### 1 GENERAL PROVISIONS

Yes No

- 1.1 Furnish and install one concrete deck truck scale and associated electronic controls.
- 1.2 The scale shall have a clear and unobstructed weighing surface of not less than \_\_\_\_\_ feet long and \_\_\_\_\_ feet wide.
- 1.3 The scale shall have a profile of 14-1/2 inches, which is measured from the top of the scale to the top of the foundation slab or pier at the load cell bearing points.
- 1.4 The scale shall be fully electronic in design and shall not incorporate any mechanical weighing elements, check rods, or check stays.
- 1.5 The scale shall be designed to perform as a single weighing platform and shall be of flat-top design.
- 1.6 The scale model shall have a gross capacity approval up to 100 tons per NIST HB44.
- 1.7 The scale shall have a Concentrated Load Capacity (CLC) of 120,000 pounds.
- 1.8 The scale shall be designed to accept vehicles that generate up to 80,000 pounds per tandem axle.
- 1.9 The scale shall be designed to accept an average daily traffic volume of up to 250 vehicles per day, 365 days per year, for 20 years, assuming that 100% of the vehicles are fully loaded with the equivalent of 80,000 pounds on their dual tandem axle.
- 1.10 In order for the bid to be considered, the supplier must provide written confirmation of empirical testing data to validate the design of the weighbridge through actual life-cycle testing. During the testing process the weighbridge must see a minimum of 2 million cycles, with at least 80,000 pounds of test load, applied on the 8 contact points of a standard truck's dual tandem axle tires. This documentation must be provided with the proposal submittal. Failure to provide this information will result in the bid being considered non-responsive.
- 1.11 Calibration (select one):
  - 1.11.1 The scale shall be calibrated to a minimum of 120,000 pounds by 20-pound increments and not to exceed 200,000 pounds. System configurations with increments greater than 20-pound increments will not be accepted; therefore scales with gross capacities in excess of 200,000 pounds will not be acceptable in order for the scale to meet NTEP Legal-for-Trade regulatory requirements.
  - 1.11.2 The scale shall be calibrated for dual-range weighing to a minimum of 100,000 pounds by 10-pound increments and 100,000 pounds to

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200,000 pounds by 20-pound increments. System configurations with increments greater than 20-pound increments will not be accepted; therefore scales with gross capacities in excess of 200,000 pounds will not be acceptable in order for the scale to meet NTEP Legal-for-Trade regulatory requirements.

- 1.12 The scale's weighing-related electronics shall consist solely of load cells, load cell cables, and digital weight display. No other devices shall be permitted between the load cell and the digital weight display. Junction boxes, summing boards, gathering boards, gathering boxes, totalizers, external analog-to-digital converter boxes, and sectional controller boxes will not be accepted because of their significant and inherent maintenance issues.
- 1.13 The load cells and load cell mounting hardware shall be constructed of stainless steel. The cables shall be stainless steel sheathed. Load cells which are not stainless steel and hermetically sealed shall not be acceptable because of their inability to prevent moisture from entering the load cell and causing a premature failure.
- 1.14 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.
- 1.15 The design and manufacture of the scale weighbridge, load cells, and digital instrument shall all be of one manufacturer to maximize compatibility and availability of components and to insure maximum benefit from the system's lightning protection capability. Also, the manufacturer shall have a quality system that has been registered to the standards of ISO 9001.
- 1.16 The manufacturer or bidder shall provide with the bid proposal a listing of the total cost (labor, parts, travel time, and mileage) for two service technicians to travel to the scale site with a heavy-duty test truck, stay on site for four (4) hours to troubleshoot and replace one load cell in the scale and the main printed circuit board in the weight display. This listing shall be provided for service in the following three timeframes: 6 months after installation, 42 months after installation, and 118 months after installation. Listings of the same costs at these three time periods must also be provided assuming the failure is the result of a lightning strike. The cost of recalibration must be included in each service cost summary. Failure to provide the information required in this section will cause your bid submittal to be considered non-responsive and disqualified from consideration.
- 1.17 The scale shall be a METTLER TOLEDO Model VTC251 or equivalent.

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### 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 2,000 psf for a pit foundation. 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 along the length of the scale.
- 2.5 The foundation shall be constructed to provide positive drainage away from its center.
- 2.6 The foundation must be higher than the surrounding grade to promote drainage away from the scale.
- 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 HB-44.

### 3 WEIGHBRIDGE SPECIFICATIONS

- 3.1 The prefabricated scale modules shall be so designed to enable field pouring of the concrete without additional field forming. Field reinforcement shall be accomplished through the use of polypropylene fibers such as Fiber-Lok or equivalent.
- 3.2 The scale deck shall have rebar preinstalled at the factory to ensure proper placement. Field installation of rebar is prohibited.
- 3.3 The scale deck shall have integrated conduit inside the module for protection and easy cable routing. Cable routing outside of the weighbridge shall be prohibited to prevent damage.
- 3.4 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 80,000 pounds, and shall have a Concentrated Load Capacity (CLC) of 120,000 pounds.
- 3.5 The scale deck shall be poured and constructed of concrete with a minimum strength of 4,000 psi at a 28-day cure with 5 to 7% air entrainment.

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- 3.6 The concrete deck shall be a minimum of 10 inches thick and reinforced with rebar.
- 3.7 The concrete deck shall be supported by an integral steel structure of sufficient design and construction to meet the loading and life expectancy as specified in Section 1 of this specification.
- 3.8 The scale deck shall have safety steering guide beams integrated in the deck to help the driver maintain a straight path on and off the scale.
- 3.9 All welding shall be completed in accordance with the American Welding Society (AWS) D1.1 Structural Welding Code.
- 3.10 All welding shall be performed by welding operators who have been certified to the AWS D1.1 Structural Welding Code.
- 3.11 The scale modules must be able to be configured for a single scale application or independent scales by module within the scale. This allows for getting gross weights or individual axle group weights.
- 3.12 The weighbridge shall be designed to allow access to load cell cables, base plates, and all foundation anchor bolts from the top of the scale platform.
- 3.13 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.
- 3.14 There shall be no bolted connections between the load cell and weighbridge assemblies.
- 3.15 The load cell assembly shall be designed so that when you are at the scale weighbridge with a lifting jack, the load cell can be replaced in less than 5 minutes.
- 3.16 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 exterior surfaces of the scale shall have a two-component, high-build epoxy finish, flake filled for increased corrosion resistance and UV protection, providing total Dry Film Thickness of 8-10 mils (Sherwin Williams MACROPOXY 646 or equivalent).

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- 4.3 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 Load cell capacity (select one):
  - 5.1.1 Each load cell shall have a minimum capacity of 50 metric tons (110,000 pounds) with 300% ultimate overload rating.
  - 5.1.2 Each load cell shall have a minimum capacity of 30 metric tons (66,000 pounds) for calibration of 100,000 pounds by 10-pound increments with 300% ultimate overload rating.
- 5.2 All load cells shall be certified by NTEP and meet the specifications as set forth by NIST HB-44 for Class III L devices. The manufacturer shall provide a Certificate of Conformance to these standards upon request.
- 5.3 All load cells shall be certified to meet the specifications set forth by the International Organization of Legal Metrology (OIML) in document R60 for C3 load cells, which requires 60% tighter accuracy tolerances than NIST HB-44 for Class III L devices. The manufacturer shall provide a Certificate of Conformance to these standards upon request.
- 5.4 Load cells shall be digital with an integral microprocessor and analog-to-digital conversion function located within the load cell housing.
- 5.5 Load cells shall output only converted digital information without load correction for load position to the scale instrument. Analog output of signals from the load cell is not acceptable due to susceptibility of signal interference.
- 5.6 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.
- 5.7 The load cell shall not require check rods, flexures, or chain links for stabilization, as these items are sources of ongoing maintenance requirements.
- 5.8 The load cell shall not require a junction box to communicate between the load cell and scale instrument. No other devices shall be permitted between the load cell and the digital weight display. Junction boxes, summing boards, gathering boards, gathering boxes, totalizers, external analog-to-digital converter boxes, and sectional controller boxes will not be accepted because of their significant and inherent maintenance issues.
- 5.9 The load cell shall be of stainless steel construction and hermetically sealed with a minimum NEMA 6P / IP68 (submersible) and IP69K rating.

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- 5.10 The load cell shall contain integral Transient Voltage Surge Suppressors (TVSS) for all input and communication lines. Each TVSS shall contain self-resetting thermal breakers to protect the load cell components from voltage and current surges.
- 5.11 The load cell shall come equipped with a neoprene rubber boot to keep debris from contaminating the lower bearing surface.
- 5.12 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.
- 5.13 The system shall be so designed as to permit a load cell cable to be replaced without either splicing the load cell cable or replacing the load cell, either of which will contribute to eventual system failure and unnecessary service costs. The system shall be so designed as to permit replacing the load cell cable without requiring the scale to be recalibrated, further reducing service and maintenance costs.
- 5.14 The load cell shall have the following specifications:
  - 5.14.1  $V_{min}$ : 5.0 pounds maximum
  - 5.14.2 Hysteresis:  $\pm 0.025\%$  of full scale
  - 5.14.3 Non-Linearity:  $\pm 0.015\%$  of full scale
  - 5.14.4 Creep (30 minutes):  $\pm 0.017\%$  of applied load
  - 5.14.5 Temperature range:  $-10^{\circ}\text{C} + 40^{\circ}\text{C}$
- 5.15 The load cell interface cable shall be stainless steel sheathed for environmental and rodent protection. Neoprene covered load cell cable shall not be permitted.
  - 5.15.1 Load cell cables which are hard wired directly to the load cell are not acceptable due to the failure rates associated with moisture wicking into the load cell from aged cables or damaged cables, and due to the unnecessary expense associated with replacing entire load cells when only a cable has been damaged.
- 5.16 The load cell shall have a minimum 10-year warranty against defects in materials and workmanship and failure resulting from lightning or surge voltages. The warranty shall cover all costs associated with replacement parts, travel, mileage, on-site labor, and recalibration after repair, the full cost of which shall be supported solely by the manufacturer and not in part by any other third party.
- 5.17 Load cells shall be METTLER TOLEDO POWERCELL<sup>®</sup> PDX<sup>®</sup> load cell or equivalent.

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### 6 JUNCTION BOXES AND CABLES

- 6.1 Junction boxes shall not be permitted in the scale, attached to the exterior of the scale, or remotely mounted from the scale. Sectional controllers with encapsulated PCBs shall not be permitted due to the failure rates associated with PCBs that have wired connections made within enclosures which are not hermetically sealed.
- 6.2 Load cell cables and scale instrument cables shall be stainless steel sheathed for environmental and rodent protection.
- 6.3 In order to minimize maintenance issues, only a single cable shall be used to transmit data or weight signals between the weighbridge and the digital weight display.

### 7 LIGHTNING PROTECTION SPECIFICATIONS

- 7.1 A comprehensive lightning protection system shall be provided with the scale.
- 7.2 The system shall not require complicated wiring or devices to provide this protection.
- 7.3 Major scale components including load cells and scale instrument (terminal) shall be included in the lightning protection system.
- 7.4 Grounding of all scale components including load cells, scale instrument, and accessories shall be to one common point. Systems with multiple ground points are not acceptable.
- 7.5 An AC line surge protector shall conveniently plug into a common electrical outlet and have a receptacle.
- 7.6 Each AC line surge protector required shall have one isolated, grounding, hospital-grade duplex receptacle, and an internal 15-amp circuit breaker.
- 7.7 Verification of the lightning protection system's performance shall be available in writing from a third-party verification laboratory upon request. Proposals submitted without confirming the availability of third-party verification that the load cells, cables, and instrument as a system have been able to withstand the equivalent of a lightning strike with 80,000 amperes will be rejected.
- 7.8 The lightning protection system shall be a METTLER TOLEDO StrikeShield™ Lightning Protection System or equivalent.

### 8 WARRANTY REQUIREMENTS

- 8.1 The scale manufacturer shall warrant the scale assembly including weighbridge structure, scale instrument, and associated cables from failures due to a defect in manufacturing, workmanship, lightning, or surge voltages.

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- 8.2 The warranty will warrant the product for a period of 10 years from date of installation or 122 months from date of shipment to the Buyer, whichever occurs first. Bidder shall promptly correct any such defect appearing within the warranty period.
  
- 8.3 The warranty shall support 100% coverage of repair parts, labor, travel time, and mileage from the closest service location, or at the manufacturer's sole discretion, replacement of the product under warranty. The full cost of warranty as specified herein shall be supported solely by the manufacturer and not in part by any other third party or service provider.