

# **Engineering Specification**

## **Low Profile, Portable Steel Deck Truck Scale**

The following set of specifications shall describe a fully electronic, self-contained portable type modular steel deck truck scale system. This scale has been designed to be installed on a temporary type foundation with adequate soil support. Scale may be installed on concrete, asphalt, timber, crushed stone, or other suitable material. Scale shall be suitable for easy movement. **NOTE:** Most states require that portable truck scale installations are limited to six months unless installed on a permanent foundation.

### **1.0 General Provisions – Truck Scale**

The scale shall be a fully electronic, low profile, portable fabricated steel deck design truck scale self-contained in a tubular steel frame. The scale platform shall be designed and manufactured in the United States of America. The scale platform, load cells and digital indicators shall be percent assembled in the United States of America. The scale shall be a Rice Lake Weighing Systems Model 7011-ST-100-ATV or equivalent that shall meet the following minimum standards.

- 1.1** The scale shall have a gross capacity of 135 tons (270,000 lb) with a displayed resolution of 200,000 lb x 20 lb in accordance with NIST, Class IIII devices.
- 1.2** Scale shall be a fully electronic fabricated steel design with self-aligning tubular steel frame. Mechanical lever systems are not acceptable. The scale weighbridge shall consist of three factory welded modules each having a minimum longitudinal span of 23 ft 4 in with a total longitudinal span of 70 ft (69 ft 10.5 in) and platform width of 11 ft (10 ft 10.5 in). No field assembly or welding shall be allowed.
- 1.3** Each scale module shall be designed with a Concentrated Load Capacity (CLC) of 45 tons (90,000 lb), as defined by NIST. When the CLC is applied at mid span on a module, according to NIST regulations, the maximum stress of the steel shall not exceed 26,500 PSI as determined by Finite Element Analysis (FEA) software. The deflection at this loading condition shall not cause the scale to exceed the allowable accuracy tolerance as specified by NIST in Handbook 44.
- 1.4** The scale provided shall have an unobstructed weighing surface of 11 ft (10 ft 10.5 in) wide by 70 ft (69 ft 10.5 in) in length and a 20-1/8 in minimum profile. Maximum profile should not exceed 20-1/8 in from base to top of steel deck.
- 1.5** Reinforced fabricated steel bulkheads shall be bolted at each end of the scale for placement of ramping material. Bulkheads shall be fabricated from minimum 1/2 in steel plate and shall be suitable for high compression backfilling with gravel or aggregate.
- 1.6** The scale system shall be a full electronic design, with internal self-checking weigh-bridge. Weighbridges using bumper bolts, externally fixed check rods or embedded bumper plates in the end walls shall not be permitted.

- 1.7** Scale shall be an open bottom design. Weighbridges that utilize a sealed bottom plate shall not be permitted.
- 1.8** Diamond checkered steel tread plate shall be supported with a minimum of (12) 12 in wide flange, 14 pounds per foot, structural longitudinal beams, welded to top flange of beam and module end plates. Only structural wide flange beam construction shall be allowed. Weighbridge designs utilizing junior beams or bent plate shall not be permitted.
- 1.9** The entire bridge assembly shall be cleaned prior to the addition of any coatings or paint to the weighbridge modules. Customer reserves the right to inspect the steel surfaces prior to application of any coatings to the prepared steel surfaces. All steel surfaces shall be free of all welding gases, residue, oil, mill scale and rust.
- 1.10** All non-visible steel shall be evenly spray coated with an asphalt emulsified coating or have equal protection applied.
- 1.11** All steel elements shall be steel shot blasted to SSPC-A-SP6 standards.
- 1.12** All visible steel surfaces shall receive a 3-5 mill application of a high solids urethane primer and a high solids acrylic urethane top coat to a finish of 2-3 mill thickness.
- 1.13** Module end plates shall be a minimum 3/4 in thick, and shall be reinforced on each side with longitudinal I-beams. Load cell pockets shall be integrated into the module structure and constructed of 3/4 in steel plate and shall be tied to the end plates using tabs and laser cutouts. Scale modules using flat welded or bolted end boxes shall not be allowed.
- 1.14** The scale shall be NTEP Certified and shall meet the requirements set forth by the NIST Handbook 44 for Class III-L devices. The bidder shall submit a current copy of Certificate of Conformance (COC) with bid.
- 1.15** Access covers to the load cells shall be from the top of the scale and shall be a bolted design. Cover plates shall be reinforced to adequately handle axle traffic. Scale with side only access to load cells shall not be permitted.
- 1.16** A 1/2 in diameter steel rock guard shall be welded to the bulkheads.
- 1.17** The truck scale shall be provided with a fabricated cleanout area measuring 12 in x 84 in with removable end plates at each end of the scale system.
- 1.18** Scale shall be equipped with optional gusseted bolt-on safety guiderails on each side of the scale with a minimum of 4 in diameter pipe. A minimum of 3 bolts shall be used at each gusset to attach side rail. Guiderails welded to weighbridge shall not be permitted. (Optional)
- 1.19** Structural steel elements shall have a combined minimum weight of 35,700 pounds

**1.20** During transport, the scale shall utilize load cell transport lock out system.

## **2.0 Load Cells and Junction Boxes**

Load cells are rigidly mounted utilizing a single link suspension to provide equal and consistent and evenly distributed force to the load cell. Load cells are totally self-contained, and come complete with mounting stands, single-link suspension, and 60 ft of cable to junction box. Compression or rocker style load cells shall not be permitted.

- 2.1** Load cells shall be rigidly mounted in fabricated steel stands parallel to traffic flow. Suspension system shall be E4340 material forged single link suspension hardened to Rockwell "C" 40-45 to allow self-centering and free floating platform. Rocker column or compression type load cells requiring check rods, anti-rotation pins or bumper bolts shall not be permitted.
- 2.2** Load cells shall be of the analog type and have a minimum capacity of 75,000 lb each with an overload safety factor of 150 percent. Scales utilizing a lower capacity load cell than 75,000 lb shall not be permitted.
- 2.3** Scales utilizing adjustable bumper bolts shall not be allowed.
- 2.4** Systems utilizing internal circuitry to convert analog to digital conversion of the load cell signal within the load cell shall not be permitted.
- 2.5** All access to load cells shall be from the top of the scale through formed steel access panels.
- 2.6** Steel conduit shall be provided within the weighbridge for load cell cable runs.
- 2.7** A flexible screw-type conduit fitting shall be provided at each load cell. Load cell cable shall be totally enclosed within permanent conduit provided within the weighbridge. Load cells using connectors of any type shall not be permitted. Braided metal cable covering shall not be used in place of steel flex conduit or hardened steel conduit.
- 2.8** Load cells shall be of 4340 alloy steel nickel plated and shall be sealed with a minimum IP67 rating.
- 2.9** Replacement load cells shall be available from a multitude of vendors nationally, and shall not be single sourced or of a proprietary design.
- 2.10** Load cells shall be non-proprietary in design, including both mechanical operation and electronic transmission of data. Manufacturers using proprietary load cell technology available from a single source shall not be permitted.
- 2.11** Fiberglass Reinforced Polyester (FRP) junction box with formed contoured edges and gasketed top access. Junction box shall have a Gore-Tex™ single directional breather vent with a hydrophobic membrane for pressure equalization. Steel junction boxes shall not be permitted.
- 2.12** Load cell stands shall be mounted to steel pads extending the width of the

scale.

- 2.13** A 1 in braided copper transient bypass cable shall be provided at each load cell from the weighbridge to the base stand.
- 2.14** UPS Duplex Voltage regulating transformer, or equivalent.
- 2.15** UJB-3T6 DC Transient circuitry protection or equivalent.
- 2.16** The weighbridge, load cells, junction box, digital weight indicator and remote display shall be warranted for a minimum of full twelve years against failure of all types including lightning or surge voltage.
- 2.17** A single-point grounding system shall be provided. Systems utilizing a multiple point ground shall not be permitted.

### **3.0 Digital Instrumentation Specifications**

The scale instrument shall be a Rice Lake Weighing Systems 1280 Enterprise™ Series programmable indicator/controller complete with operator-friendly diagnostics for load cells and digital j-box or equivalent.

- 3.1** The scale instrument shall be NTEP Certified and meet or exceed all specifications set forth by NIST Handbook 44 for Class II, III, and IIII devices. Additionally, the instrument shall meet or exceed approvals for UL, C-UL and CE. The manufacturer, on request, shall provide a Certificate of Conformance (COC) to these standards.
- 3.2** The scale instrument shall be housed in an all stainless steel 304, IP69K enclosure measuring 10.85" wide x 12.50" high x 5.25" deep.
- 3.3** The instrument shall be 100 percent manufactured by the manufacturer of the weighbridge assembly.
- 3.4** The instrument shall be Linux® based
- 3.5** The scale instrument shall be fully programmable and configurable according to the needs of the application.
- 3.6** The scale display shall be a LCD graphical, color display with minimum size of 800 x 480 pixels and be available in 500 or 1,000 NIT.
- 3.7** The instrument shall allow connection of a QWERTY-type, computer-style keyboard.
- 3.8** The front panel of the instrument shall have the following operational keys as standard with tactile feedback:
  - Zero
  - Tare

- Print
- Gross/Net
- Clear
- Decimal Point
- Units
- Numeric 0-9

- 3.9** The instrument shall have the following displayed operational annunciators: gross, tare, net, zero, motion and three units of measurement
- 3.10** The scale instrument shall have the capability of powering up to (16) 350 Ohm load cells.
- 3.11** The instrument shall have the ability to display both gross and net weights and the ability to recall gross or tare weights in the net mode.
- 3.12** The instrument shall have the ability to provide in/out, gross/tare/net calculation of individual truck weights and storage for the following information:
- 1,000 open transactions
  - 1,000 tare weights
  - Database report
- 3.13** The instrument shall have six smart card slots for additional scale channels, serial ports, digital inputs and outputs, analog outputs and protocol interfaces.
- 3.14** The instrument should have 100 setpoints, 18 configurable setpoint types.
- 3.15** The scale instrument shall be designed to provide noise protection for RFI, EMI and ESD.
- 3.16** The excitation voltage shall be 10 +/- 0.5 VDC.
- 3.17** The instrument shall have an automatic zero tracking feature that will be programmable and in compliance with NIST, Measurement Canada and OIML regulations.
- 3.18** The instrument shall be fully programmable.
- 3.19** The instrument shall include as standard surge voltage protection as recommended by the manufacturer
- 3.20** The digital instrument shall be warranted by the manufacturer for two years from date of installation.
- 3.21** The instrument shall have a multi-level digital filtering system for environmental noise or vibration.
- 3.22** Individual load cell monitoring and system diagnostics shall be available when paired with the iQUBE<sup>2</sup>® digital diagnostic junction box.
- 3.23** The scale instrument shall have an internal resolution of 8.000.000 counts.

- 3.24** Operating temperature for the instrument shall be -4°F to 131°F (-20°C to 55°C).
- 3.25** Customized programmable print formats, including 20 auxiliary print formats, shall be available.
- 3.26** Operational power input shall be 115 or 230 VAC, ±10 percent. 50/60 Hz single phase.
- 3.27** The scale instrument shall have the capability of receiving custom programs.
- 3.28** The instrument shall have a real-time clock and battery-backed feature.
- 3.29** A/D conversion rate shall be selectable from 7.5 Hz to 960 Hz.
- 3.30** Multi-range/internal selection for setting two or three weight ranges with different division sizes
- 3.31** The digital instrument should have web server capabilities.