

Engineering Specification

Low Profile Concrete Deck Truck Scale

The following set of specifications shall describe a fully electronic, low profile, modular type concrete deck truck scale system, designed to be optionally mounted on an above grade pier, floating slab or pit type foundation. Scale shall be a 3-module, 4-section system that is designed for field pouring of concrete.

1.0 General Provisions – Truck Scale

The scale shall be a fully electronic, low profile, concrete deck design truck scale. The scale platforms, load cells, and digital indicators shall be 100 percent designed, manufactured and assembled by one manufacturer located in the United States of America. The scale shall be a Rice Lake Weighing Systems Model 7011-SC-100-OTR or equivalent, that shall meet the following minimum standards.

Please Check One

Yes **No**

- | | | | |
|--------------------------|--------------------------|------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | 1.1 | The scale shall have a full scale capacity of 135 tons (270,000 lbs) with a displayed resolution of 200,000 lbs x 20 lbs in accordance with NIST, Class III L devices. |
| <input type="checkbox"/> | <input type="checkbox"/> | 1.2 | Scale shall be a fully electronic design. The scale weighbridge shall consist of factory welded modules having a total longitudinal span of 70' (69' 10.5") and platform width of 11'(10' 10.5"). No field assembly or welding shall be allowed. Mechanical lever systems are not acceptable. |
| <input type="checkbox"/> | <input type="checkbox"/> | 1.3 | Each scale module shall be designed with a Concentrated Load Capacity (CLC) of 45 tons (90,000 lbs), as defined by NIST. When the CLC is applied at midspan on a module, according to NIST regulations, the maximum stress of the steel shall not exceed 26,000 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. |
| <input type="checkbox"/> | <input type="checkbox"/> | 1.4 | The scale provided shall have an unobstructed weighing surface of 11' (10' 10.5") wide by 70' (69' 10.5") in length and a 16.25" minimum profile. A minimum clearance of 4.25" shall be provided between the concrete floor and the bottom of the weighbridge. |
| <input type="checkbox"/> | <input type="checkbox"/> | 1.5 | The scale modules shall be designed as such to eliminate use of grout plates requiring setting and leveling prior to arrival of the scale at job site. A maximum of two drilled anchors (3/4" x 7") shall be provided with each load cell stand. |
| <input type="checkbox"/> | <input type="checkbox"/> | 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. |
| <input type="checkbox"/> | <input type="checkbox"/> | 1.7 | The scale shall have a maximum span deflection ratio of no less than 1:1300 under legal highway loading at mid span of module. |
| <input type="checkbox"/> | <input type="checkbox"/> | 1.8 | Minimum weighbridge thickness shall be 12" including steel support structure. A minimum of 4.25" clearance (or sufficient to meet compliance with State and Local Weights and Measures officials) shall be provided between the bottom of the weighbridge and the washout slab. |

- 1.9** The entire length and width of the concrete deck shall be supported by an intricate steel support structure. Only structural wide flange beam construction shall be allowed. Weighbridge designs utilizing junior beams and/or bent plate shall not be permitted.
- 1.10** Concrete deck shall be field poured at job site and have a maximum cured strength of 4000 PSI at 28 days. Concrete deck shall have a minimum thickness 6" with one mat of #4 reinforcing rod on 12" centers. Concrete decks utilizing fiber mesh additives to concrete shall not be allowed. Pre-poured, pre-cast or pre-stressed, concrete decks shall not be permitted.
- 1.11** Internal steel support structure for concrete shall consist of a minimum (2) 12" wide flange, 14 lbs per foot, main beams and (7) 6" wide flange, 9 lbs per foot, beams and a 3/16" bottom plate.
- 1.12** Scale weighbridge shall be designed to accommodate up to 250 trucks per day for a period of 25 years without weighbridge fatigue.
- 1.13** Shear cut galvanized strips shall be attached to the support beams and serve as a forming pan for the concrete deck. Plates shall be installed in a manner to minimize penetration of concrete below the support pan. Module shall arrive at the jobsite ready for field pouring of concrete with no shoring of deck required.
- 1.14** 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.
- 1.15** All non-visible steel surfaces shall be evenly spray coated with an asphalt emulsified undercoating.
- 1.16** All steel elements shall be steel shot blasted to SSPC-A-SP6 standards.
- 1.17** 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.
- 1.18** Minimum of (154) 3/4" x 4-3/16" Nelson sheer studs shall be provided per 23' 4" module both vertically and laterally.
- 1.19** Concrete elements in the weighbridge shall be utilized in a compression application above the neutral axis of the structure. Weighbridge designs allowing the concrete to extend below the neutral axis subjecting the entire concrete deck to tension or bending forces shall not be permitted.
- 1.20** Module end plates shall be a minimum 3/4" 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" steel plate and shall be tied to the end plates using tabs and laser cutouts to reinforce strength of assembly. Scale modules using flat welded or bolted end boxes shall not be allowed.

- 1.21** Structural steel elements shall have a combined minimum weight of 23,600 lbs.
- 1.22** 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 with bid.
- 1.23** Access covers to the load cells shall be from the top of the scale and shall be boltless in design. Cover plates shall be reinforced to adequately handle axle traffic over the covers and shall be kept in place with 1/2" diameter x 1" long steel dowels. Cover plates utilizing bolts of any type shall not be permitted.
- 1.24** Manhole frame and cover (24" square) shall be provided for access to the pit area beneath the scale. (Optional for pit installations)
- 1.25** The truck scale shall be provided with a fabricated cleanout area measuring 12" x 84" with removable end plates at each end of the scale system.(Optional)
- 1.26** Scale shall be equipped with optional gusseted bolt-on safety guide rails on each side of the scale with a minimum of 4" diameter pipe. A minimum of three bolts shall be used at each gusset to attach side rail. Guide rails welded to weighbridge shall not be permitted. (Optional)
- 1.27** The scale provided shall be a Rice Lake Weighing Systems Survivor Series Model 7011-SC-100-OTR or equivalent.

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' 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 lbs each with an overload safety factor of 150 percent. Scales utilizing a lower capacity load cell than 75,000 lbs shall not be permitted.
- 2.3** Scales utilizing adjustable bumper bolts or embedded plates in the wall to minimize movement of the bridge 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 boltless steel access panels. Covers should be form fitted and should be accessible without use of tools.

- 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.
- 2.8** Load cells shall be of 4340 alloy steel nickel plated and shall be scientifically 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™ single directional membrane vent. Steel junction boxes shall not be permitted.
- 2.12** Load cell stands shall be flush mounted to concrete piers and anchored using wedge locks or similar bolts. A maximum of (2) 3/4" x 7" anchor bolts shall be required per stand and shall be included in cost of scale. Grout plates or embedded items in the foundation concrete shall not be allowed.
- 2.13** 1" braided copper transient bypass cables 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** Load cells shall be warranted a full five 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 920i® Programmable HMI indicator/controller complete with operator friendly diagnostics for the load cells and digital junction 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 III-L 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 a NEMA 4X/IP66 stainless steel, measuring 10.5" wide x 11.5" high x 4.5" diameter with swing-away mounting base for ease of installation.

- 3.3** Scale instrument shall have the ability to be panel mounted.

- 3.4** The instrument shall be 100 percent manufactured by the manufacturer of the weighbridge assembly.

- 3.5** The instrument shall be microprocessor based.

- 3.6** The scale instrument shall be fully programmable and configurable according to the needs of the application. Custom programming for the application shall be available through common programming techniques.

- 3.7** The scale display shall be a backlit LCD graphical display with minimum size of 3.4" high x 4.6" wide with characters from .25" to 1.2" high. Display must be capable of displaying alpha and numeric characters or graphic images.

- 3.8** The instrument shall allow hook up of a QWERTY-type, computer-style keyboard.

- 3.9** The front panel of the instrument shall have the following operational keys as standard with tactile feedback:
 - Zero
 - Gross/Net
 - Tare
 - Units
 - Print
 - Clear
 - Decimal Point
 - Numeric 0-9

- 3.10** The instrument shall have the following custom soft keys - 5-user defined function keys:
 - Driver Number
 - Contract Number
 - Weigh In
 - Weigh Out
 - Truck Register

- 3.11** The instrument shall have the following displayed operational annunciators:
 - Gross, Tare, Net, Zero, Motion
 - Three units of measurement

- 3.12** The scale instrument shall have the capability of powering up to 16 - 350 Ohm load cells.

- 3.13** 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.

- 3.14** 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

• Data base report

- 3.15** The instrument shall have a minimum of four standard bi-directional serial ports with the following configurations available:
Com. 1 – RS-232
Com. 2 – RS-232
Com. 3 – RS-232, 20mA current loop
Com. 4 – RS-232, RS-485, 20mA current loop
- 3.16** Set Points
Four digital I/O ports on board.
- 3.17** The scale instrument shall be designed to provide noise protection for RFI, EMI and ESD.
- 3.18** The excitation voltage shall be 10 VDC.
- 3.19** The instrument shall have an automatic zero tracking feature that shall be programmable and in compliance with NIST, Measurement Canada and OIML regulations.
- 3.20** The instrument shall be fully configurable through the front panel.
- 3.21** The instrument shall include as standard surge voltage protection as recommended by the manufacturer.
- 3.22** The digital instrument shall be warranted by the manufacturer for two years from date of installation.
- 3.23** The instrument shall have a multi-level digital filtering system for environmental noise or vibration.
- 3.24** Individual load cell monitoring and system diagnostics when paired with the iQUBE[®] digital diagnostic junction box.
- 3.25** The scale instrument shall have an internal resolution of 8,000,000 counts.
- 3.26** Operating temperature for the instrument shall be 14°F to 104°F (-10°C to 40°C).
- 3.27** Customized programmable print formats including 20 auxiliary print formats.
- 3.28** Operational power input shall be 115 or 230 VAC, ±10 percent @ 3.15 Amp maximum. 50/60 Hz single phase.
- 3.29** The scale instrument shall have the capability of receiving custom programs with up to 256 display widgets and 10 screens.
- 3.30** The instrument shall have a real time clock and battery backed feature.

- 3.31** A/D conversion rate shall be updated at 120 times per second minimum.
- 3.32** Multi-range/internal selection for setting two or three weight ranges with different display division sizes.