RoughDeck™ LOW-PROFILE FLOOR SCALES

Today's Floor Scale Market Offers Vast Differences in Price *and* Quality

Certain low-profile floor scales seem, at first glance, to be rather unbelievable bargains. Industry competition is intense for this large market, and the wide range of prices reflect this competition. List prices on the most popular sizes have dropped dramatically in the last few years. In fact, you can now purchase a 4' x 4' low-profile scale for 50% less than what the average 4' x 4' scale sold for almost 10 years ago!

This large price differential exists because of the introduction of several lightweight, light-duty floor scales. These scales, in the 4' x 4' size, may weigh as little as 180 lbs, as contrasted to 320 lbs for a heavy-duty model like the RoughDeck. To the casual observer, all floor scales look nearly identical on the surface—a steel platform 3" to 4" high, four beam load cells, four adjustable feet, and usually a junction box. Further muddying the waters, many of these scales are NTEP Class III, 5000d in some capacities, giving the illusion that all low-profile floor scales are equal and will stand up to the toughest industrial use. They aren't, and some won't, but only controlled testing and a close look at construction details reveal why. This technical bulletin summarizes the results of such testing and explains the important quality details to look for in a heavy-duty, low-profile floor scale.

Extensive Testing Highlights Differences

Staff engineers at Rice Lake Weighing Systems conducted a comprehensive floor scale testing program prior to the RoughDeck introduction. Many competitive floor scale designs were rigorously tested, and when the tests were completed, we saw major differences between heavy-duty floor scales and the new breed of light-duty scales.

Light-Duty vs Heavy-Duty

Light-duty floor scales are useful when weighing relatively light loads that are evenly distributed on the deck. Controlled loading of these scales is also necessary to prevent the introduction of damaging point loads from wheeled material handling equipment.

Heavy-duty scales, designed from the ground up for severe use, are necessary for long-term accuracy in tougher applications like the following:

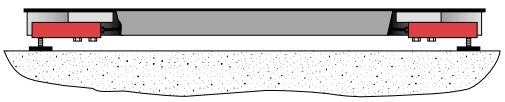
- Concentrated loading in the center of the platform
- Off-center or edge loading with concentrated loads
- Ramp-equipped scales loaded by pallet jacks which may generate very heavy point loads at the wheels
- Scales subjected to any degree of shock loading
- Pit scales

Linearity, Hysteresis, Zero Return

When we aggressively tested competitive low-profile scales to capacity, our engineers found that the lowest-priced, lightweight scales had serious problems with linearity, hysteresis, and return to zero. Many of these lightweight scale decks flexed alarmingly with concentrated test loads. This abnormal deflection significantly impacted the linearity and hysteresis of the tested scales. Also in testing, these light-duty scales would often not return to zero after capacity loading. These problems were caused by poor foot design that allowed extraneous forces to be applied to the load cells.

The Design Challenge

Our engineers determined that these two design challenges—minimizing deck deflection and isolating the cells from extraneous forces—were the two most important keys to low-profile floor scale accuracy and long life.



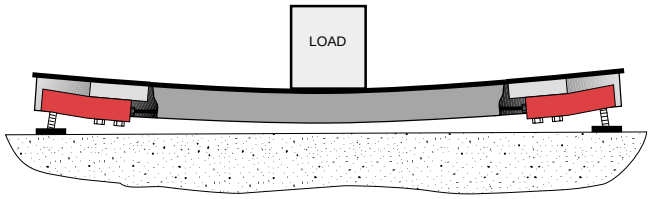
Low profile scales must withstand tremendous bending stresses on shallow deck structures supported only at the corners. Unless the deck structure is carefully engineered, concentrated loads will deflect the deck to a degree that destroys accuracy and may even cause the deck to take a permanent set.

In addition, loaded pallet jacks can generate very concentrated loads beneath their wheels. A lightweight deck plate lacking adequate underdeck support can become warped by the heavy point loads under the wheels.

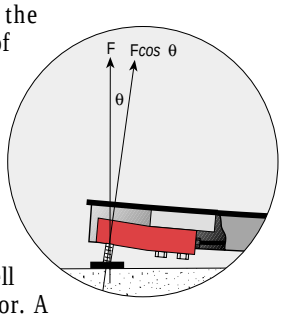
Likewise, accuracy is affected by loading the scale with forklifts or other wheeled material handling equipment that bump or jog the scale, introducing side forces to the load cells.

Platform Structure and Top Plate Design

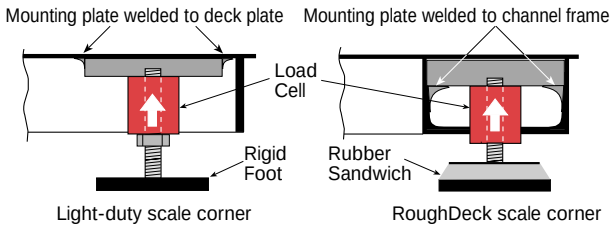
Low-profile decks need extreme rigidity to minimize deflection under severe loading conditions (typical of pallet jacks) or other concentrated loads. The exaggerated figure below illustrates the problems of deck and load cell deflection.



Load cells normally deflect under load, but when the deck also flexes, the load cells deflect from level, making the centerline through the load hole no longer vertical. If the load cell deflects through angle θ, the load sensed by the cell is only the Fcosθ component of the total force F. A torque is also present if the foot does not allow the threaded stem to rotate with the load cell. The greater the deck deflection, the greater the impact on accuracy. If θ is just 5°, the cosine error alone is .4%.

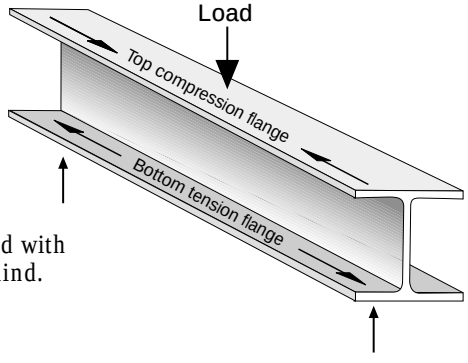


Localized deflection of the load cell mount plate also increases the error. A load cell mounting plate welded directly to a poorly-supported deck plate will deflect if the deck plate dishes under load. To prevent the load cell mount plate from deflecting, it should be attached to a heavy support frame member rather than to the deck plate.

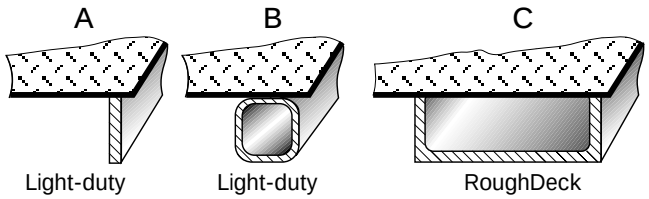


Good Supports Work Like Rigid I-Beams

To minimize deflection and stress under load, the scale's structural supports should function in the same manner as I-beams; the scale's deck plate acts as the compression flange and is connected by a vertical web to the bottom portion of the support that functions as a tension flange. An I-beam efficiently puts the material where it is most needed, in the top and bottom flanges. Scale structures should be designed with that principle in mind.



In our testing, we were surprised to find that many manufacturers had not taken advantage of this basic engineering concept to provide rigidity to their platform structures. To illustrate, various cross sections of low-profile floor scale supports are shown below.



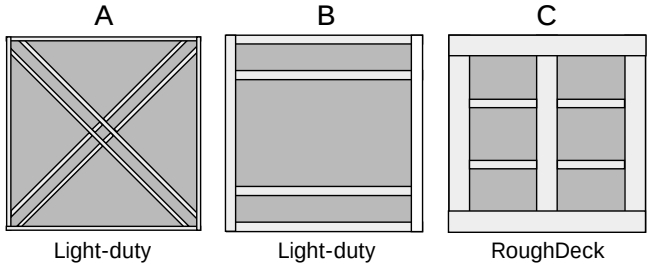
Scale A lacks a bottom flange entirely and therefore loses any I-beam advantage. Scale B uses a lightweight tubing structure and derives some I-beam benefit from the bottom section of the tubing acting as a tension "flange." The RoughDeck, by welding a heavy 6" channel to the deck plate, takes advantage of the deck plate as the compression flange and the 6" wide channel as the tension flange, providing exceptional rigidity. It should be noted that a very heavy top plate does not compensate for support members that lack a bottom flange.

Underdeck Supports

Underdeck structural support members should be engineered to meet two design goals:

- Minimize deck deflection in all directions
- Support the deck top plate adequately to prevent localized warping from heavy point loads over large, unsupported areas

Several designs used in low-profile scales are shown below:



Scale A uses double flat bar stock in a central "X" with a single flat bar around the perimeter. This design lacks intermediate supports to prevent the top plate dishing in the triangular-shaped areas, and the entire platform tends to deflect excessively from loads placed toward the center of one edge.

Scale B uses 2" x 2" tube supports and is more rigid in one direction than in the other. This design also leaves a large unsupported area at the center of the deck prone to dishing.

The RoughDeck design is equally rigid in both directions and provides good support to the top plate both along each edge and through the center. Intermediate supports are added to reduce unsupported areas that might otherwise result in the top plate dishing under heavy point loads.

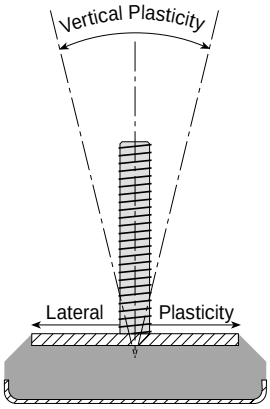
This design has proven so superior that the RoughDeck carries a full five-year warranty on the deck structure.

Dependable Accuracy from the Bottom Up

Accuracy Requires a Specialized Foot

No matter how much steel is built into the platform, there will be some deck deflection under load. Also by design, load cells deflect under load; therefore, a good foot design must:

- Accommodate the unavoidable deflections in the platform and load cells
- Compensate for uneven floors
- Accommodate side impacts so the scale's return-to-zero is not impaired



Many foot designs cannot meet all these criteria. The RoughDeck was engineered to use a steel and neoprene sandwich design called SUREFOOT™. A steel cup sits on the floor and is bonded by a pliable neoprene cushion to a steel top plate with attached threaded stem. This pliable sandwich allows the stem and top plate some plasticity to move laterally and tilt independently of the bottom steel cup. This allows the foot to accommodate small deflections and uneven floors.

We found that many scales retained side loads and suffered from poor return to zero when bumped laterally. The slight plasticity flow of the SUREFOOT design eliminates such residual side loads and provides excellent return to zero.

Load Cell and Cable Protection

The unique channel structure of the RoughDeck provides enclosed protection for underdeck components so they can't be ripped out through rough handling and use.

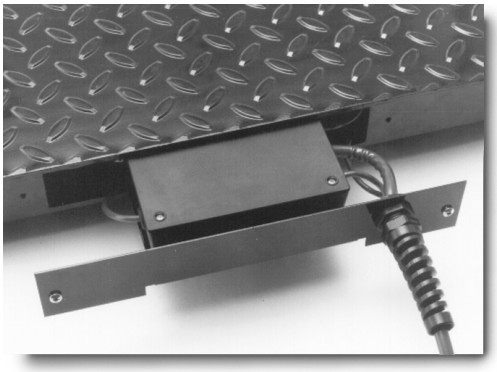
Load cells are recessed within the 6" channels, and conduit lies within the channels to ease pushing load cell cables through and deter rodent damage to cables. A 20' length of hostile environment indicator cable is included to complete the installation.

Junction Box Accessibility

Many industrial floor scales do not include a summing board with potentiometers, and cannot be accurately calibrated.

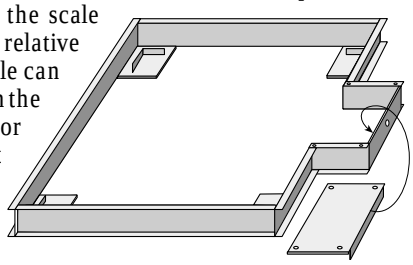
All RoughDeck stainless steel models have a NEMA 4X stainless steel junction box. Steel models include a corrosion-resistant junction box for mechanical protection. All RoughDeck models use a signal-trim summing board within the junction box with individual potentiometers for each load cell.

The RoughDeck junction box is protected within the deck and channels, and is mounted on a handy slide-out tray that eases setup and service access. Top-access junction box arrangements require a cutout in the top deck surface that invites water entry. The RoughDeck side-entry tray allows an unbroken deck surface to guard against water and dirt infiltration.



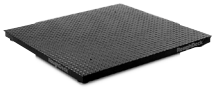
Versatility for Pit Mounting

All RoughDeck scales can be pit mounted using our rigid channel pit frames. Each frame is the exact depth needed for the installation, so it can be used as a concrete form when pouring the pit. Each frame has a covered compartment for accessing the scale's slide-out J-box, and corner plates with integral stops to hold the scale feet in correct position relative to the pit wall. Any scale can be ordered with holes in the deck above each foot for adjusting foot height easily through the deck with a screwdriver.



NOTE: Additional structural reinforcements may cause the design of heavy-capacity models (10K to 30K) to differ from diagrams shown.

Superior RoughDeck Performance for Every Application



RoughDeck™ HP is our high-precision model, NTEP-certified as legal-for-trade in high-accuracy (Class III, 5000 divisions) commercial weighing applications. Construction is steel throughout, with NTEP-certified tool steel load cells. A diamond treadplate safety deck and corrosion-resistant junction box on a steel slide out tray are standard. Twenty feet of SURVIVOR EL147HE hostile environment load cell cable is included. Sizes and capacities range from 2.5' x 2.5' to 5' x 7', 500 lb to 10,000 lb. The HP-H (Heavy Capacity) ranges from 4' x 4', 20,000 lb to 8' x 10', 30,000 lb.

RoughDeck™ SS is also NTEP-certified and is built for dry corrosive and dry chemical applications. Constructed of 304 stainless steel throughout, it has a smooth top plate for easy cleaning. Environmentally-protected, stainless steel load cells and a NEMA 4X stainless steel junction box complete the SS package. Twenty feet of SURVIVOR EL147HE hostile environment load cell cable is included. Sizes and capacities range from 2.5' x 2.5' to 5' x 7', 500 lb to 10,000 lb.

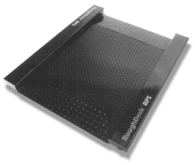
RoughDeck™ HE, for hostile environments, is designed for washdown and wet corrosive applications, and is NTEP-certified. Hermetically-sealed stainless steel load cells, a smooth top plate, and a NEMA 4X junction box that can be remotely located up to 10 feet away assure protection in the toughest washdown applications. Twenty feet of SURVIVOR EL147HE hostile environment load cell cable is included. Sizes and capacities range from 2.5' x 2.5', 2000 lb to 5' x 7', 10,000 lb.

RoughDeck™ QC is ideal for food processing and other applications requiring frequent washdowns. Constructed of 304 stainless steel with four stainless steel, hermetically-sealed shear beam load cells and a diamond treadplate deck, the QC offers easy underdeck cleaning by using dual gas shock lifting cylinders to raise the top of the scale. Twenty feet of SURVIVOR EL147HE hostile environment load cell cable is also included with this NTEP-certified scale. Sizes and capacities range from 2.5' x 2.5', 2000 lb to 5' x 7', 10,000 lb.

RoughDeck™ SD is built with an easy-to-lift polyethylene top plate making it ideal for food processing and other applications requiring frequent washdown. The understructure design features 304 stainless steel construction with four stainless steel hermetically-sealed shear beam load cells, and a remote stainless steel NEMA 4X junction box. Twenty feet of SURVIVOR EL147HE hostile environment load cell cable is included. Sizes and capacities range from 2.5' x 2.5', 2000 lb to 5' x 7', 10,000 lb. NTEP-certified.

RoughDeck™ FXB is designed for abusive conditions such as shock-loading, end-loading, or extreme motion, and does it with NTEP Class III, 5000 division accuracy (see catalog for NTEP-certified models). The all-steel construction with spring steel flexures and heavy-duty lever system transmit load forces to one centralized load cell, providing for extreme durability and lower overall operating and maintenance costs. Sizes and capacities range from 18"W x 24"L x 6.62"H, 500 lb to 96"W x 120" L x 19.25"H, 30,000 lb.

RoughDeck™ DeckHand is designed for easy one-person operation with two large rubber wheels for easy movement on rough floors. Unlike portable scales that rest on four wheels, the DeckHand's wheels only touch the floor when the unit is tilted back for movement. The weighing platform remains stable even on uneven floors. Two opposed off-center load cells provide superior accuracy without the need for leveling feet. These rugged scales are available in painted steel or stainless steel. Overall size is 31"W x 41"L x 4.5"H in 500 lb, 1000 lb or 2000 lb capacities. Column is 59" H. NTEP-certified.



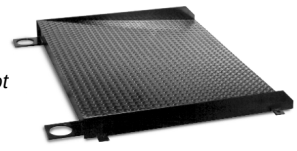
RoughDeck™ BPS is built with rugged dependability. The versatile roll-on barrel scale doubles as a pallet scale with its 3.5" high live rails. Barrels can be rolled onto the 1.5" high non-skid deck, or wheeled up the 9" ramp section with a barrel dolly. Pallets and wider items up to 1,000 lb can be loaded on the live rails with a forklift. Load cells are recessed into structural steel channels and the junction box is fully protected in the frame, yet is easily accessible. The BPS is available in mild steel or 304 stainless steel. Portable models in mild or stainless steel with lockdown wheels and integral indicator stand are available.

Refer to our color literature, catalog pages, or visit us on-line for a complete list of scale and accessory sizes and capacities.

Options/Accessories

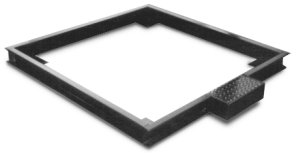
Access Ramps

Conveniently screwed to the floor and connected to the scale with integral foot anchor plates. Available in mild or stainless steel. Sizes range from 2.5'W x 3'L x 3.5"H to 8'W x 5'L x 5"H



Pit Frame

Forms a shallow pit with convenient junction box access. Acts as form for pouring concrete. Available in mild or stainless steel. Sizes range from 2'W x 5'L to 8'W x 10'L.

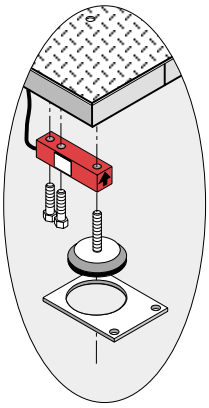


Indicator Stand

A freestanding indicator pedestal stand is available, suitable for use with a variety of digital indicators.

Anchor Plates

Secures the scale with bolt-down floor anchor plates around two of the four feet.



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