



The Truck Scale Buyer's Guide

CHOOSING A TRUCK SCALE TO LAST 25 YEARS OR MORE



RICE LAKE[®]
WEIGHING SYSTEMS

800-472-6703

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Truck scale basics

Your business has decided to purchase a truck scale in order to determine accurate and reliable vehicle weight for your application. Understanding fundamental truck scale basics will help you know which questions to ask your truck scale distributor to ensure you purchase the truck scale style that fits your needs with the options and accessories that can enhance your application.

Vehicle weighing key terms

Whether monitoring a vehicle's weight for safety guidelines or to complete business transactions, you should know what the information determined by a truck scale means to your business.

Key terms for weight-based sales, shipping and purchasing:

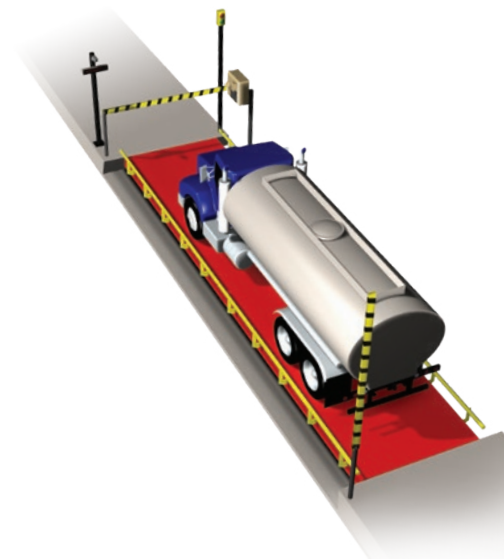
Gross weight: the total weight of the vehicle and loaded product

Tare weight: the weight of only the vehicle

Net weight: the weight of only the loaded product

Key terms for on-road compliance:

Maximum allowed weight: the maximum gross weight of a vehicle and/or the weight carried by each vehicle axle that is within the legal limit range for on-road vehicles within a particular geographical region.





What makes a truck scale, a truck scale?

Foundation

Today, most scales are installed with aboveground or concrete pit foundations. Depending on state or regional requirements, scales can also be installed in a shallow pit, as opposed to the deep pit required by older mechanical scales. A pit installation requires less space than an aboveground scale since longer approaches are generally required for aboveground configurations. However, pit-styles require sump pumps and drains, and are generally more vulnerable to corrosion due to potential standing water.

Weighbridge

The truck scale's body and driving surface is called the weighbridge. Weighbridges are composed of steel or concrete decks, and are typically manufactured in modular designs that are connected together during installation.

Indicator

The indicator, also called a controller or terminal, can display basic weight functions, as well as serve as the command center for a weighing system with truck in/out programs to control the entire truck scale system, including any remote displays and printers.

Load Cells

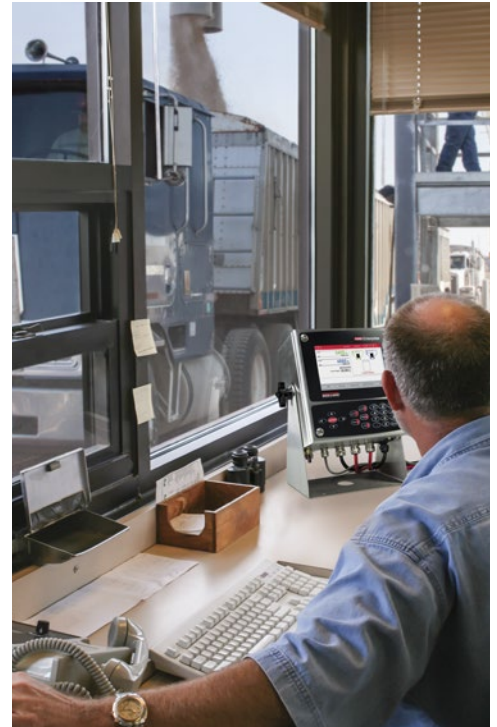
High-quality load cells are vital to truck scale performance. There are various types of load cells, but they all have the same function—to accurately measure weight on the scale. All load cells take an analog measurement, and then that signal is converted to a digital output either at the load cell, junction box or in the scale indicator. Load cells are typically constructed of steel and are integrated within the weighbridge, usually at the corners of each module.

Junction Boxes

A junction box properly manages multiple load cells and weighing systems. By matching the signal of each load cell and summing them into a signal sent to the indicator, junction boxes equalize the system for accurate and reliable weight readouts.

Accessories

Handwriting a ticket for each weight is time consuming and tedious, and also leaves room for human error. Ticketing kiosks, scale data management software and printers eliminate both problems. Most states also require ticket printers. Remote displays, gates, intercoms and other accessories increase truck scale efficiency and safety.





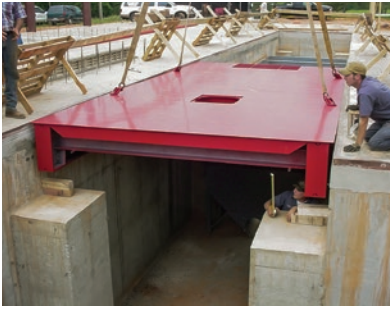
Truck scale site planning

To ensure the longest lifespan and best performance for your truck scale, proper site planning is essential. Your truck scale distributor will help you select the best placement, considering the traffic flow of your operation, the best location for a foundation, electrical and conduit requirements, soil conditions and drainage, ease of maintenance and accessory locations.

Before purchasing your new truck scale, it may be helpful to draw out a flow map of your current operations and determine if there are any areas for improvement. It is also important to consider future site use when planning. If you expand your site in the future, will the traffic flow and truck scale location still allow for easy operation?

Creating an efficient traffic flow is important to keep operations running smoothly. Be sure there is adequate room around the scale to perform maintenance and to accommodate driver safety. Consider the amount of space needed to accommodate a line of trucks, if needed.

Plot out traffic patterns on your flow map, marking where trucks enter the site, load and/or unload material, and exit the site. Make sure there is plenty of room for drivers to maneuver. Take a test drive with a full-size truck around your plotted traffic flow to test for any tight spots or potential safety issues. Note any special filling or dumping that must take place on site to accommodate for the space needed.



Pit foundation

Choosing a foundation type

Even the toughest scales are put at risk with a poor foundation. Many factors, such as the slope of the site and soil conditions, must be considered prior to construction. The ground must also be free of any settling prior to scale installation. If the foundation is not properly constructed according to the certified drawing provided by your truck scale manufacturer, your truck scale foundation could shift, causing the scale to be outside acceptable calibration tolerance.

Concrete curing periods can vary depending on the type of concrete being used. Work with your scale distributor to integrate the foundation and approach design into your installation and site plan. Your scale distributor should also be able to recommend local contractors with truck scale foundation experience.



Aboveground foundation

Aboveground or pit foundations

Until the early 1970s, all truck scales were mechanical and installed in expensive concrete pits. Today, most scales are installed aboveground or in concrete pits with floor foundations. With the benefit of new modular construction, scales can also be installed in a shallow pit, as opposed to the deep pit required by older mechanical scales.

One of the biggest reasons for choosing a pit-type installation is space—or lack of it. A pit installation requires less space than an aboveground installation since longer approaches are generally required for aboveground foundations. However, pit-type scales require sump pumps and drains, and are more vulnerable to accelerated rust and corrosion due to the potential of standing water in the pit.

	Pit	Aboveground
Cost	More expensive due to additional excavation, reinforcing steel and concrete	Less expensive due to less construction work
Service and Scale Repairs	In some cases, can be more costly due to confined area restrictions, which often require gas detection devices and operator safety harnesses to be used	Less difficult/less costly and allows service from the deck of the scale
Cleanout	Often done manually and can be very time consuming, “bucket by bucket”	Quick and easy—done with a water hose or air compressor from the side
Scale Inspection	Must be done from inside the pit	Can be performed by simply walking around the perimeter of the scale
Restrictions or Hazards	Some states require specified clearances underneath the scale. Must also meet OSHA and confined space hazards regulations.	Some states require specified clearances underneath the scale
Approaches	10 feet flat and level	Often 10 feet flat and level
Ramps	Not required	Typically 25 feet long on each end of the approach. Often requires more real estate to install and operate.
Electricity Needed	Typically has electricity for pit lights and sump pump if no gravity drain is present	No pit light or sump pump required

Foundation designs

Deep Pier Foundation



Typical for colder climates such as those found in northern areas of North America, the deep pier foundation places part of the foundation below the frost line to eliminate the negative effects that freeze-thaw conditions can have on foundations. Discuss with your scale distributor if a deep pier foundation meets your application requirements, or if a deep pier or other specific foundation design is required by your state and region. Similar to isolated pier foundations, the deep pier foundation also requires 2,500-3,000 PSF soil bearing pressure.

Shallow Pier Foundation



Shallow pier foundations are a cost-effective solution for truck scale sites with adequate soil compaction and a warmer climate that will not encounter frost line issues. Discuss with your scale distributor if a shallow pier foundation is best suited for your application and meets state and regional requirements.

Floating Slab Foundation



A full slab foundation is a continuous or monolithic pour of concrete that runs the entire length of the weighbridge. This is the second most cost-effective type of foundation and is designed for ground that has a soil bearing pressure of at least 1,500 PSF. Discuss with your scale distributor if a floating slab foundation is ideal for your application and location, as well as meets state and regional requirements.

Pit Foundation



The pit foundation is available in numerous depths, from two to six feet. Your pit depth should best fit your needs as well as adhere to all state and regional requirements.

Drainage

Efficient water drainage around the foundation is key to preserve scale components. The installation site should have adequate runoff, allowing water to easily drain away from the scale. Areas with heavy rain and melting snow should take extra consideration when planning site drainage.





SECTION
3

Weights and measurement agencies and regulations

On-road weight regulations

Maximum weight regulations for on-road vehicles keep roadways structurally sound and ensure trucks are not overloaded which could cause damage to trucks and create potential safety concerns.

On-road weight regulations are determined on federal, state and regional levels to define the maximum allowed weight on public roadways. Discuss with your scale distributor all on-road vehicle loads your operation requires. Selecting the correct truck scale for your application will help ensure your application's on-road compliance.

Legal for Trade approvals

If your truck scale is going to provide weight readouts for commerce, the scale will need to have a Legal for Trade approval to ensure the weight is within a certain degree of accuracy. Discuss with your scale distributor if you will need a truck scale that meets Legal for Trade approval, and which approval agencies, such as the National Type Evaluation Program (NTEP), Measurement Canada, or state and local approval agencies, need to provide certification for commerce in your area.



**SECTION
4**

Scale designs

Each manufacturer has incorporated specific elements into their truck scale design to offer application advantages. However, most truck scales incorporate similar basic design elements and choices, such as deck and foundation types. Understanding the fundamentals of truck scale designs will help you and your scale distributor discuss which manufacturers offer the designs best suited for your operation and business needs.

Choosing your scale distributor

Take time to choose a scale distributor who will be able to provide the best services in your area. Ask potential scale distributor about the products they sell and services they offer; some distributors are exclusive to one manufacturer, which can work for your business, but it might also limit your choices. Choosing a scale distributor who also specializes in scale service can be an advantage. Having one contact for all your scale maintenance, service and replacement parts can help streamline your initial scale purchase and upkeep throughout its lifespan.

Before choosing a manufacturer, reach out to other truck scale owners, or ask your scale distributor to provide testimonials from similar businesses in your region. Knowing firsthand accounts about scale manufacturers and their reputation for quality products and services can be the deciding factor in your purchase.

Scale design

Most truck scale manufacturers offer standard vehicle scales, but some will make custom designs that save you time and money by eliminating the need for site reconstruction.

To ensure your scale is large enough for your application, plan your truck scale needs based on the largest truck you ever plan to weigh at your operation, including future trucks since truck scales should easily provide 25 years or more of dependable service with reasonable care.

Steel or concrete weighbridge?

A big consideration when choosing a truck scale is whether to select a steel deck or a concrete deck weighbridge. Both have advantages. Here are a few differentiating features that will help you choose the right type.



Concrete Deck Advantages

- Concrete provides better traction in wet or icy weather
- Five to seven years longer life, and less maintenance needed
- More mass means less friction and wear
- Better load distribution

A concrete deck, which needs approximately 21 to 28 days to cure, is poured during installation and is usually done by an outside contractor—adding additional costs to your truck scale purchase at installation. Cured, factory-poured concrete decks may be damaged during transport and may have higher installation and transport costs due to the heavy weight of concrete.



Steel Deck Advantages

- Fast installation, and easy relocation and expansion
- Lower profiles and variable deck plates available
- Less initial cost and no need to wait for a concrete deck to cure

Installation usually takes less than one day, and a steel deck scale weighs less, making it easier to relocate and expand if needed. Steel decks usually offer traction treads on the driving surface—beneficial in wet conditions due to rain or snow.

Expansion and upgrades

Weighing applications and process needs can change with the demands of commerce. As businesses grow and weighing requirements are expanded, additional modules may need to be added to an existing truck scale system. You need to be certain that your scale manufacturer can produce an additional module that fits perfectly with your current scale.

Some manufacturers design their truck scales with hinge fixtures that easily allow the addition of new modules to lengthen existing truck scales.



SECTION
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Truck scale quality and protection

There are a variety of options in the truck scale market today and, to the casual observer, initial acquisition price may be the only differentiator. However, manufacturers promising great bargains are able to do so only because they've cut corners at some stage of the process—design, materials, components, finish or all of the above. While the price may seem attractive now, the eventual failure of a lower quality truck scale could mean a higher total cost of ownership from extensive downtime, increased maintenance costs, lost revenue and premature replacement.

The many advantages of quality

A truck scale with a superior design and built-in protection features will save time and resources throughout its lifespan. A high-quality truck scale designed to last 25 years or more will require less repair and downtime due to maintenance or replacement. Your truck scale needs to meet the challenges of your application with long-term performance and accuracy.

Ask your scale distributor for information about various manufacturers and their design and testing procedures. Some manufacturers' designs incorporate only high-quality parts, components and construction materials. The design and engineering involved in producing a truck scale are two factors that can have the most significant impact on the quality of your truck scale.

Use the Truck Scale Total Cost of Ownership calculator at www.ricelake.com/truckscaletco to see how a truck scale with a lower initial price could cost more over its lifetime.

The decision to buy

The decision to purchase a truck scale must be founded on long-range planning that takes into account all present and likely future uses of the scale system. Analyze your company's needs for today, and project what you may need in the future. Consulting with a qualified project engineer familiar with your industry can help you determine the engineering specifications your truck scale will need to accommodate your operation.



Scheduled maintenance and protection features

A high-quality truck scale made with quality components and materials will help reduce scale maintenance. Many manufacturers incorporate features into their scales to help prevent component failure and damage to the scale or foundation, including transient bypass cables, diagnostic junction boxes, self-checking mounts, electrical component protection, single-point grounds and open-bottom designs on steel deck scales to allow moisture to evaporate.

Preventative Maintenance

A preventative maintenance program is a key element in maximizing the life, performance and accuracy of your truck scale. Maintenance frequency is directly related to the daily truck volume and axle loads of the vehicles being weighed. Typically, inspections are recommended at least one to two times per year, depending on equipment usage. However, maintenance may be needed much more frequently depending on your application and the material being weighed. A comprehensive maintenance program consists of inspecting the weighbridge, foundation, load cells, junction box and grounding, and performing routine calibration and testing.

Weighbridge Design and Component Protection

When moisture or standing water seeps into the weighbridge, steel corrodes and the weighbridge can rust from the inside-out, often leading to accelerated corrosion, weakness and eventual failure. An open-bottom design on steel deck scales reduces internal corrosion. Steel decks with bottom plates trap moisture inside the weighbridge. An open bottom also allows maintenance crews to inspect the integrity of the weighbridge during scheduled maintenance, allowing you to plan scheduled downtime to repair, instead of making emergency service calls when the scale needs extensive repairs or component replacement.

Moisture and water can also wreak havoc on electrical components. A load cell and electronics pocket integrated into the weighbridge adds additional strength and protects electronics by keeping these sensitive components up off the ground and away from standing water. Quality component enclosures and environmental seals add extra assurance.

Lightning and Transient Protection

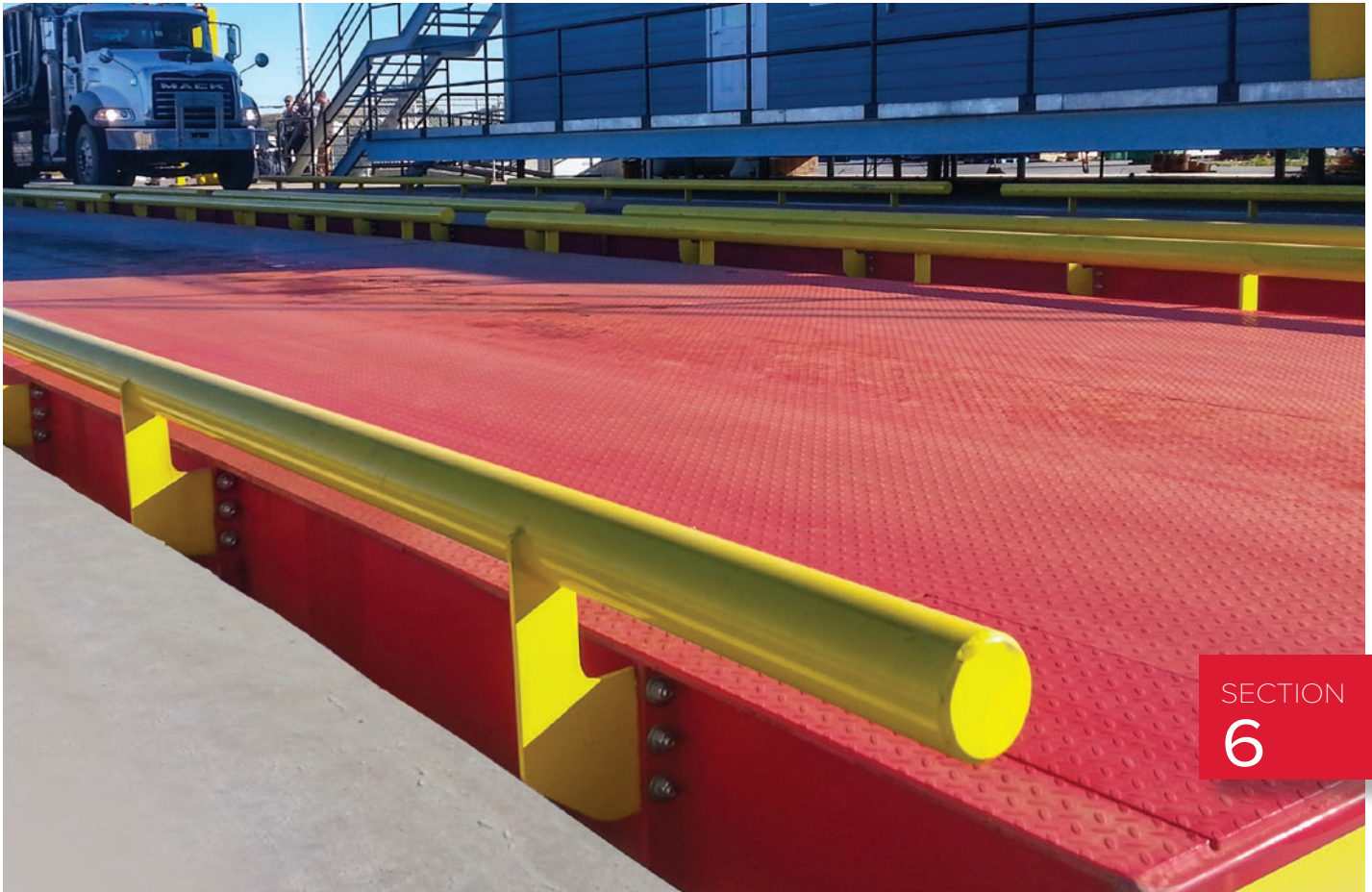
Protecting your truck scale from lightning and transient spikes is critical to prolonging its lifespan and reducing electrical component repairs and replacements. Many manufacturers provide lightning and transient protection packages that include the following features:

- DC transient protection boards in junction boxes
- Copper transient bypass cables for load cells
- DC transient protection in home run cable to the indicator
- Single-point grounding
- Bare ground conductor cable buried in the ground from the scale frame to the AC power ground lug
- Uninterrupted power supply/surge protector in the AC line before reaching the indicator
- Lightning and transient protection warranty

Proper lightning protection can mean the difference between emergency repairs and business as usual. Discuss with your scale distributor which manufacturers include the above protection features standard. Reputable manufacturers and distributors will want to ensure your truck scale survives as long as possible, even in the harshest conditions.



Keeping the foundation clean and well-drained will help ensure a more accurate and dependable vehicle scale.

SECTION
6

Weighbridge design and capacity

The structural integrity of the weighbridge is the single most important consideration in the purchase of any truck scale. A failing weighbridge results in continued problems that can only be solved with replacement. Each manufacturer incorporates design elements into their weighbridge to distinguish it in the marketplace. Internal structural designs on the market include I-beams, lighter steel beams, C-channels, bent plates and steel tubing, among others.

Weighbridge strength

One of the best ways to judge a scale's strength and ability to withstand high-traffic volume is the weighbridge design and steel content. Ask your scale distributor to show you the advantages and disadvantages of each weighbridge design. Also, ask your scale distributor to provide the steel content of each manufacturer's weighbridge so you can determine which scale is strong enough for your needs.



Two industry recognized terms often associated with weighbridge capacity and vehicle scale load ratings are concentrated load capacity (CLC) and dual tandem axle (DTA). These ratings define the maximum load the weighbridge is designed to support by a group of two axles with a center line spaced four feet apart and an axle width eight feet apart. A National Type Evaluation Program (NTEP) test records a truck scale loaded to CLC/DTA and the displayed weight. If the scale falls within acceptable testing tolerances, the scale has that CLC/DTA weight recorded on its Certificate of Conformance.

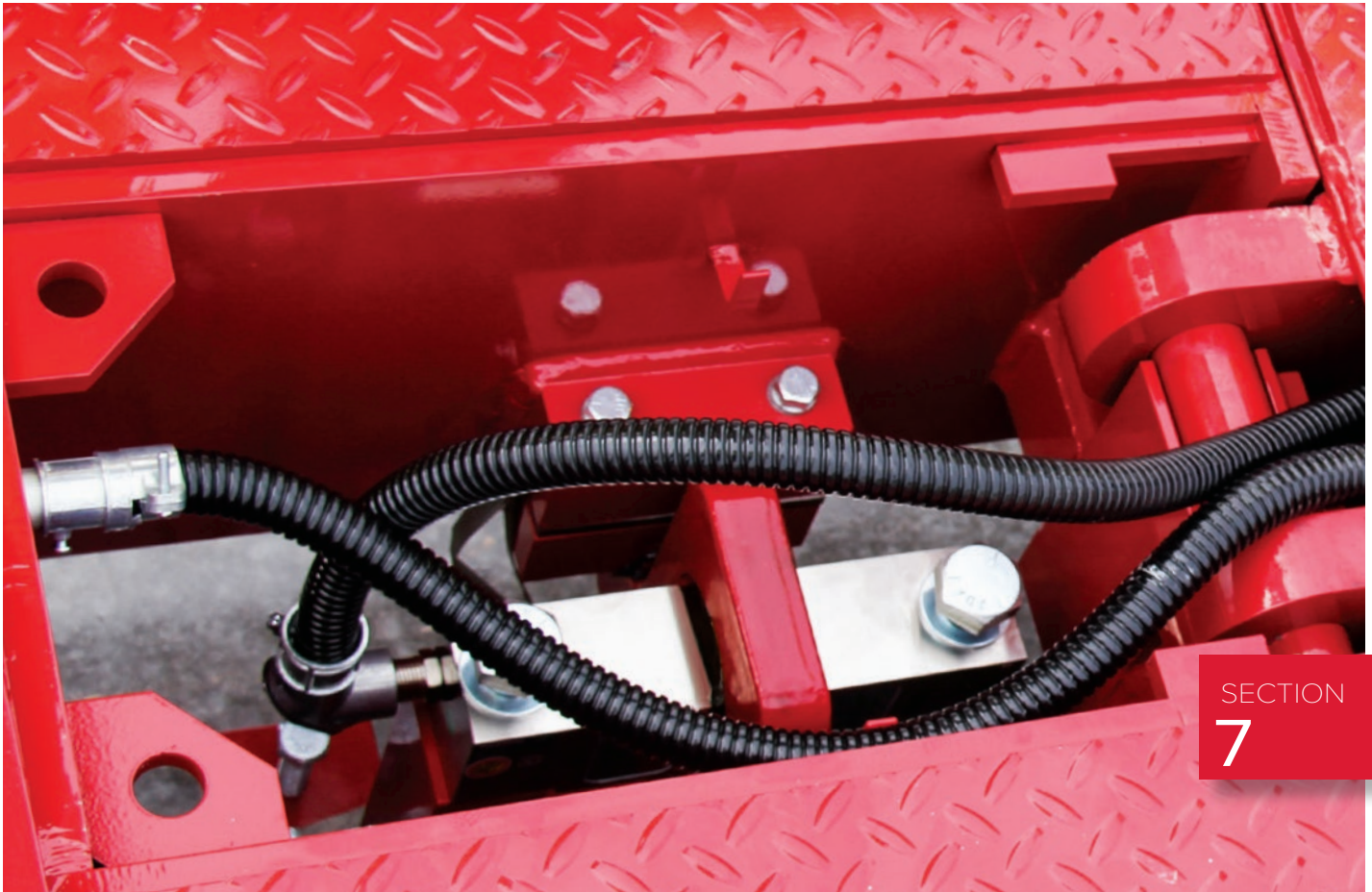
Closely examine each manufacturer's truck scale specifications with your scale distributor and discuss what each specification means for your application. Note that load cell capacities do not directly correlate to the capacity of the scale, and always be mindful of the type of loads you will use on your truck scale. Depending on your average axle loads, a truck scale may need more strength to withstand fewer, heavy loads than the average scale designed for frequent, legal highway

loading. If your application needs to process Legal for Trade transaction weighments, ask your scale distributor to discuss all scale options, including scales that can provide legal weights in as little as 10 pound increments.

Always discuss your Legal for Trade needs with your scale distributor and closely examine each manufacturer's certifications to be confident your truck scale will meet your application's needs. NTEP provides a set of procedures for the uniform testing and evaluation of weighing equipment. For more information on your region's requirements for full scale capacity, CLC/DTA and NTEP Certification and guidelines, speak with your scale distributor and determine the best scale to meet those guidelines.

Keep Future Capacity in Mind

Ask your scale distributor to show you truck scales with a full scale capacity that exceeds the weight of a full-size loaded truck you currently use in your operation, and then discuss how heavy your trucks may weigh in the future if operations change. A high-quality scale should last 25 years or more with proper care and use. Ensuring your scale will last through changes in operational capacity is an important factor to consider before purchasing.



SECTION
7

Load cells and mounting systems

What is a load cell?

A load cell, also called a transducer, converts a mechanical force into an electrical signal. In its simplest form, the load cell bends when weight is applied.

In a compression-mounted load cell where the load cell is beneath the weighing vessel, like a truck scale, the load cell compresses when a load is applied. The load cell produces an analog output signal proportional to the applied weight or force. The load cell transmits this signal to a controller that converts the signal into a digital weight measurement.

When an application requires multiple load cells, each load cell should measure the same proportion of the total load. So in a four-load-cell system, each load cell should measure exactly one-quarter of the load.

Many load cells are proprietary to a specific manufacturer, and may require additional maintenance and costs of ownership. Carefully discuss with your scale distributor all options for load cell systems.

Analog load cells

The most common load cells on the market work on the strain gauge principle. All load cells need to convert their analog values to digital before the load's weight reading can be displayed on an indicator. Some load cells are directly cabled to the digital weight indicator where the translation occurs. Other cells are connected to summing junction boxes on the scale where the box sums analog readings from multiple load cells, converts it to a digital signal and sends that signal to the digital weight indicator.

Hydraulic load cells (pressure transmitters)

Unlike most other load cells, hydraulic load cells do not use strain gauges or internal circuitry. Instead, hydraulic load cells contain hydraulic fluid, and during compression, a change in pressure is created and transmitted via tubing to a summing system where the pressure is applied to an analog load cell to determine weight.

Analog-to-digital load cells

Some analog load cells perform the analog-to-digital signal conversion within the load cell housing. Although sometimes referred to as digital load cells, the cell still measures in analog.

Making the conversion from an analog signal to a digital signal in the load cell allows the system to compare the output of individual load cells and perform a diagnostic analysis based on that information. Because the conversion happens in the load cell, sensitive electronic components are increased throughout the scale system, making them susceptible to damage from vibration, moisture and increased solder joints.

Types of load cells

Double-ended Shear Beam

This is the most widely used vehicle scale load cell configuration in North America. A double-ended shear beam load cell is a compression load cell that offers a broad capacity range from 1,000 to 200,000 pounds. The double-ended shear beam is secured at both ends with the load applied to the center of the load cell. As in all shear beam designs, the strain gauges are mounted on a thin web in the center of the cell's machined cavity. The load cell also has the advantages of being less expensive in high-capacity applications than the canister load cell because it does not require checking, making it virtually a maintenance-free solution.

Canister

A canister load cell is the oldest load cell type. These compression devices are shaped like a vertical canister and can handle loads from 100 to 1 million pounds. It is either hermetically sealed or welded to protect the gauges. This load cell's drawbacks include the fact that it requires checking—installing check or stay rods to hold the weighbridge in place on the load cell's top plate during weighing.

Rocker Column

Some manufacturers prefer rocker column load cells because they are inexpensive. However, they require check rods and bumper bolts that require maintenance, increasing your cost of ownership. The cost saved by the manufacturer on the raw material is passed down the line to the end user in the form of additional maintenance.

Load Cell Material

Truck scale load cells are generally made of stainless steel or steel alloy, but most manufacturers offer a variety of load cell solutions that best fit your application needs.

Tool Alloy Steel Load Cells

Load cells manufactured from tool alloy steel elements are by far the most popular cells in use today. The cost-to-performance ratio is better compared to either aluminum or stainless steel designs. The most popular alloys are 4330 and 4340 because they have low creep (the change in load cell output over time while under load) and low hysteresis (the difference between load cell output readings for the same applied load).

Stainless Steel Load Cells

Stainless steel cells are more expensive than tool alloy steel load cells. They are sometimes fitted with hermetically sealed web cavities, which make them an ideal choice for corrosive, high-moisture applications. Stainless steel load cells that are not hermetically sealed have little advantage over comparable cells constructed of tool alloy steel, other than a higher resistance to corrosion.



Canister Load Cell



Double-ended Beam



Rocker Column Load Cell



SECTION
8

System accessories

Quality truck scale accessories increase efficiency and optimize the flow of trucks in and out of your plant. Knowing which accessories will complement your current operations can help you better select an overall truck scale system and manufacturer.

Refer to your site planning flow map to see where an accessory can speed up processes and reduce the risk of human error. Always consider the space an accessory will need prior to installing your truck scale system to ensure the best truck maneuverability and flow. Accessories include attended and automated ticketing kiosks, remote displays, traffic signals, printers, guiderails and more.

These accessories can all help promote safety for truck drivers and site employees. Ticketing kiosks allow drivers to check in, weigh in and out, and print tickets without exiting the cab of their truck. Remote displays, gates and traffic signals can help route trucks safely and quickly through the weighing process, while guiderails help ensure the trucks stay on the scale platform.

Truck scale system accessories

Automated Ticketing Kiosks

From RFID truck identification to load assignment, weighing and ticketing, unattended automated ticketing kiosks optimize truck traffic and improve safety by keeping drivers behind the wheel. Many manufacturers' kiosks can integrate with your central office and accounting systems.

Printers

Printers offer an ideal way to improve efficiency and accuracy. With connectivity to most digital weight indicators, printers can provide accurate weighment information quickly that is also easy to read.

Truck Scale Data Management

Truck scale data management software can print tickets or reports, as well as store information to a central database. Data management software enhances the functionality of automated ticketing kiosks by providing advanced data management and reporting capabilities. Most software systems are adaptable to a wide variety of industries and are compatible with many popular operating systems, streamlining your scale house or front office operations with your truck scale. Most manufacturers' software allows you to generate reports, often broken down by a number of variables including customer, hauler, truck, product and vendor.

Remote Displays

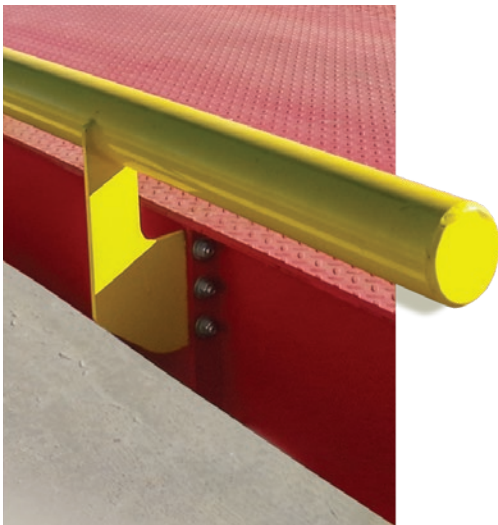
Remote displays show weight information and provide direction to drivers, increasing efficiency. Displays are customizable and may feature stop/go red and green signal lights.

Traffic Stop Lights

Industrial-strength stop lights communicate the universal stop/go red and green signals at a distance, speeding up scale traffic and reducing congestion.

Barrier Gates

Barrier gates block access at the entry or exit of your truck scale. Most gates are electronically controlled to open or close after a designated action is taken.



Guiderails

Guiderails offer drivers protection against accidental drive-offs. Many manufacturers offer guiderails; make sure you examine the designs of each with your scale distributor closely, including the shape and strength of the rail. Some guiderails have open-ended rails, while others are sealed or plugged with an end cap. Open-ended rails can accumulate debris and moisture, and guiderails plugged with an end cap can corrode from the inside if moisture seeps past the cap. Caps with a welded seal offer the best protection, keeping debris and moisture buildup out of the rail.



**SECTION**
9

Installation

Easy installation means immediate operation

Quality doesn't stop once the manufacturing process on your truck scale is complete. One of the most important factors to buying a truck scale, especially if time is a factor, is the ease of installation. Ask your truck scale distributor for the time commitments needed to install many different manufacturers' models.

Some scales can be installed in as little as one day, allowing you to start using your truck scale sooner than others. Models that incorporate boltless module fittings are often more user-friendly and timely during installation.

Some manufacturers use bolts to secure their modules together. Although bolting your truck scale together seems more secure, there are several negatives to this approach. Bolting each module together takes much more installation time. Also, depending on your geographic location, bolts could bind or freeze during freeze-thaw seasons or potentially corrode from the elements.

How long does installation usually take?

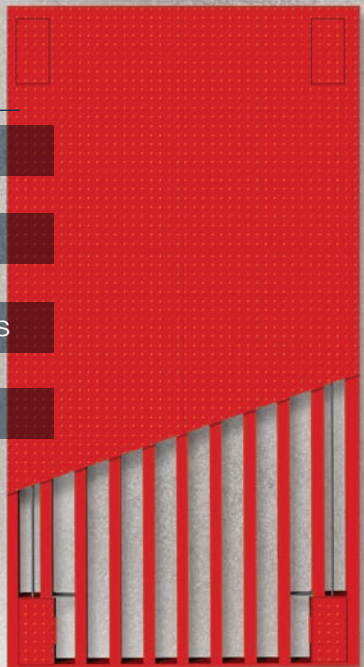
Concrete Deck

Foundation Prep and Finishing	2 Days
Foundation Concrete*	1-2 Days
Scale Installation <i>For two technicians</i>	2 Days
Concrete Deck Cure <i>Number of days depends on the concrete</i>	2-28 Days
Initial Calibration	2 Hours



Steel Deck

Foundation Prep and Finishing	2 Days
Foundation Concrete*	1-2 Days
Scale Installation <i>For two technicians</i>	2-6 Hours
Initial Calibration	2 Hours



* Concrete curing time is based on the site contractor's recommendations.



SECTION
10

Truck scale calibration

Every vehicle scale should be calibrated and tested frequently to ensure proper performance. Accurate truck scale calibration is vital to any operation, especially Legal for Trade applications.

A truck scale should be calibrated and tested by a state-licensed service agency using no less than 12.5 percent of the scale's nominal capacity, or 25,000 pounds of certified test weights. The scale's calibration interval is determined by the frequency of use, individual application requirements, and federal, state and local guidelines. Each section of the scale should be tested and detailed test reports should be provided to the customer and government authorities.

Load cell trimming

It may be necessary to trim the load cell outputs as a first step before starting the calibration process. Trimming is performed at the junction box to equalize the weight reading from all load cells in the truck scale system. This ensures that the scale weighs correctly regardless of where the load is applied to the scale. Load cell trimming and calibration should always be performed by licensed technicians.

There are also multiple systems on the market to trim and calibrate a truck scale through a digital interface. Discuss each manufacturer's calibration systems with your scale distributor to determine the best system for your application.

SECTION
11

Maintenance

A preventive maintenance program will help you maximize the life of your scale. Not only do regular inspections find repairs needed on the scale, they can also reveal potential component replacements before they cause unplanned scale downtime. At a minimum, scale inspections are recommended every six months depending on equipment usage, scale type and application. If your truck scale is used to weigh material that can easily seep under the scale or cause potential bindings, regular scale inspections and cleaning between scheduled maintenance inspections are necessary to keep your scale's high performance and accuracy.

Truck scale maintenance should include comprehensive inspections of the weighbridge, foundation, load cells, grounding as well as calibration and testing as required by your local weights and measurement authority.

Weighbridge inspection

Proper weighbridge inspections are essential to ensure accurate and consistent truck scale performance. Conduct visual inspections of the top deck surface, including welds, during every maintenance visit. Clean out areas beneath the bridge and inspect for potential mechanical bindings as a result of debris, loose bolts or misalignments. Debris, snow and ice between the approach bulkhead and the end of the scale should also be removed. Paint conditions should be examined and noted yearly.

Foundation maintenance

Your truck scale is only as good as the foundation on which it rests. Keep the foundation clean and well-drained to maintain accuracy. Visually check sump pumps and drains at least once a month. Keeping the condition of concrete piers, slabs and concrete approaches maintained is very important for maximum scale performance.

Any cracks in the concrete or evidence of heaving due to frost or poor soil conditions should be recorded and resolved immediately. Foundation issues are common causes of inaccurate scale performance.



Load cells and junction box inspection

Inspect load cells for cable damage and any loose or damaged connectors or fittings. Remove any standing debris around the load cells and check for moisture damage and standing water. All cable connectors should be checked and any corrosion should be removed.

Check the junction for any moisture or corrosion from moisture damage to internal circuitry. Air filters and desiccant packets should be inspected and exchanged on an annual basis. Cable connectors should be inspected and checked for tight fittings.

Grounding

Many manufacturers recommend single point grounding for truck scale systems to protect against damage from transient voltage. Single point grounding ties all parts of a DC system to a single ground plane. Without single point grounding, there is potential for ground loops, or voltage between any points of a DC system, that can cause damage to the scale system.

During regular maintenance, your scale distributor should check AC power and ground, resistance of the scale system and transient protection.



SECTION
12

Warranties

A warranty is a guarantee provided by the manufacturer of a product. A truck scale is a big investment and should come with assurance that it will operate as intended for many years. Warranties may come with conditions that include setting up contracts for regular service, derating of the warranty over time or warranty covering only certain parts of the system. Violating or breaking the conditions of a warranty will void the terms, meaning manufacturers aren't responsible for repairs or replacement of damaged products. Warranties can be confusing and it is best to work with a trusted scale distributor to review the terms and ensure you understand the details prior to choosing your truck scale.

Glossary of terms

A

ANALOG TO DIGITAL (A/D) Conversion of continuously varying (analog) voltage levels to discrete binary-numbered (digital) values (e.g., a load cell output can be fed through an A/D converter to produce a continuous stream of digitized information and sent to a digital indicator).

ASPHALT EMULSION UNDERCOATING A special coating applied to non-visible steel surfaces on the weighbridge to protect the steel from internal moisture due to high humidity, excessive rain or standing water under the scale.

B

BUMPER BOLTS A checking system used to keep the weighbridge centered. Bumper bolts need to be tight so they don't move on their own, yet maintain clearance when the scale is empty and loaded. Bumper bolts need lifelong maintenance during seasonal changes to deter binding from expanded concrete and steel due to temperature fluctuations.

C

CALIBRATION The comparison of load cell outputs against standard test loads.

CAPACITY The amount of weight the scale is capable of weighing accurately.

CC (NTEP CERTIFICATE OF CONFORMANCE) Certification that a device meets all applicable requirements of Handbook 44.

CHECK RODS Rods installed to prevent a vessel or other weighing system component from gross tipping or extended travel. They do not interfere with normal travel or expansion.

CLASS III Vehicle, axle-load, livestock, railway track scales, crane and hopper (other than grain hopper) scales.

CONCENTRATED LOAD CAPACITY (CLC) Maximum load designated by the manufacturer that can be placed anywhere on the platform of a vehicle, axle load or livestock scale using the prescribed test pattern (an area at least four feet long and as wide as the scale platform).

CREEP The change in load cell output occurring with time while under load, and with all environmental conditions and other variables remaining constant; usually measured with rated load applied and expressed as a percent of rated output over a specific period of time.

D

D (DIVISION) Value of the smallest increment indicated (displayed) by a scale.

DEAD LOAD The fixed force of the weighbridge, platform, and other load-supporting structures of the scale, the value of which is to be permanently balanced or canceled out in the weight or measuring system.

DEFLECTION (VERTICAL FLEXING) The change in length along the primary axis of the load cell between no-load and rated load condition.

DUAL TANDEM AXLE (DTA) An industry recognized term for load rating any vehicle or axle load scale. The rating defines the maximum load for which the weighbridge is designed as applied by a group of two axles with a center line spaced four feet apart and an axle width eight feet apart.

G

GRADS Specifies the number of full scale graduations. Capacity = grads x count.

GRADUATION A mark on an instrument or vessel indicating degrees or quantity.

H

HANDBOOK 44 (H-44) A comprehensive set of requirements for weighing and measuring devices that are used in commerce and law enforcement activities; not a federal law, but developed and updated annually by the National Conference on Weights and Measures. Its complete title is "Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices."

HERMETICALLY SEALED Refers to load cells that have a metallic protective cover welded or soldered in place to protect the strain gauge cavity. Some cells of this type have additional protection at the cable entry such as a glass-to-metal seal. These load cells provide the best possible protection in harsh chemical or washdown environments.

HYSTERESIS The maximum difference between load cell output readings for the same applied load. One reading is obtained by increasing the load from zero and the other reading is obtained by decreasing the load from rated load. Measurements should be taken as rapidly as possible to minimize creep.

I

INDICATOR/CONTROLLER Also called a terminal, indicators function as the control device for the truck scale system. They collect the digital weight readout from the scale's junction box(es), and can also be programmable to perform complex tasks and integrate with scale data management software, printers and kiosks.

ISO 9001 CERTIFICATION Certification that an organization meets and maintains their standard of quality system in place.

J

JUNCTION BOX (J-BOX) A box or enclosure used to join different runs of cable or wiring; it contains space and terminals for connecting and branching the enclosed conductors and adjustments to provide load cell trimming.

L

LEGAL FOR TRADE An industry recognized term to distinguish approval from the appropriate weights and measures regulating authority to use a scale for weight-based transactions and commerce.

LOAD The weight or force applied to the load cell.

LOAD CELL A device that produces an output signal proportional to the applied weight or force. Types of load cells include beam, S-beam, platform, compression and tension.

M

MEASUREMENT CANADA An agency that regulates measurement in Canada through measurement law administration. Measurement Canada's Weights and Measures Act and Regulations documents specifications and requirements for accurate and fair measurement-based transactions in Canada.

N

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST) An agency within the United States Department of Commerce. NIST regulates measurement in the United States to ensure accurate weight-based commerce. NIST's specifications and requirements for fair and accurate weighing systems are documented in Handbook 44 (H-44). If a truck scale conforms to NIST H-44, it can be tested for NTEP Legal for Trade Certification.

NATIONAL TYPE EVALUATION PROGRAM (NTEP) A program of cooperation between the National Conference On Weights & Measures, NIST, state weights and measures officials and the private sector for determining conformance of weighing equipment with the provisions of H-44.

NEUTRAL AXIS The axis in a truck scale weighbridge that separates how forces affect the module. Above the neutral axis, the weighbridge is pushed in a compression application. Below the neutral axis, the weighbridge is pulled in tension. On the neutral axis, the weighbridge is in neither tension nor compression, but with zero stress points. Scales using concrete above and below the neutral axis subject concrete to dangerous tension forces that can result in cracks in the concrete and premature scale failure.

O

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY (OIML) Treaty organization that recommends technical requirements for weighing and measuring equipment prior to the sale or distribution of a model or type within the state, nation, etc.

OUTPUT The signal (voltage, current, pressure, etc.) produced by a load cell. Where the output is directly proportional to excitation, the signal must be expressed in terms such as volts per volt, millivolts per volt, or volts per ampere, etc., of excitation.

R

RESOLUTION The smallest change in mechanical input that produces a detectable change in the output signal.

S

STAY RODS Rods installed to rigidly restrain a vessel or other weighing system component in the horizontal position. They will have little effect on the accuracy of the system when installed properly.

SELF CHECKING A type of mounting system that eliminates the need for check rods, stay rods and bumper bolts by using 100 percent of the gravitational force from the loading action against itself to center the weighbridge and protect the scale from binding and damaging side-load shocks.

T

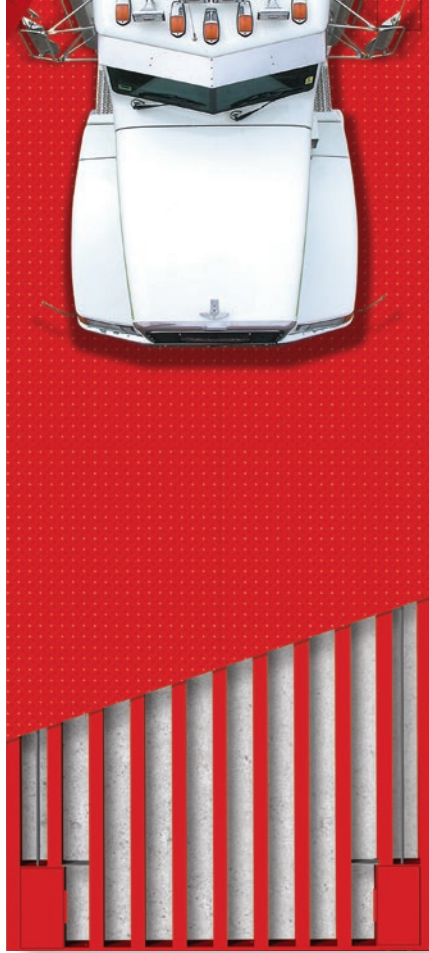
TARE The weight of an empty container or vehicle, or the allowance or deduction from gross weight made on account thereof.

U

UNITS The unit of measure that is to be represented: lb, kg, oz, etc.

W

WEIGHBRIDGE The structural body and driving surface of the truck scale. Weighbridges can vary in size, design and deck type (steel or concrete).



RICE LAKE[®]
WEIGHING SYSTEMS

230 W. Coleman St., Rice Lake, WI 54868 • USA
TEL: 715-234-9171 • FAX: 715-234-6967 • www.ricelake.com

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